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The determinants of poverty and inequality in Vietnam

A thesis

submitted in partial fulfilment

of the requirements for the Degree of

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at

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by

Linh Thuy Nguyen

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Abstract of a thesis submitted in partial fulfilment of the requirements for the Degree of Doctor of Philosophy in Economics

Abstract

The Determinants of Poverty and Inequality in Vietnam

by

Linh Thuy Nguyen

Since the country's reform in 1986, Vietnam has experienced economic growth and achieved significant development goals, particularly in living standard improvement, poverty reduction and income distribution. However, Vietnam faces a high, persistent poverty incidence among the rural areas and ethnic minority groups, an increasing gap between rich and poor and wide inequality income distribution between the rural than the urban sector.

Despite many studies on poverty and inequality in Vietnam, there is a lack of evidence on the factors that determine both the probability of living in poverty and poverty intensity. This study investigates the determinants of poverty and poverty intensity and the sources of inequality in Vietnam particularly in rural areas and ethnic minority communes since the country became a middle-income country in 2009.

Household and commune-level data are obtained by combining the 2012, 2014 and 2016 Vietnam Household Living Standards Surveys. The empirical models include multiple linear regression, binary and fractional logistic regression to examine the determinants of real per capita expenditure, the likelihood of falling into poverty, and the poverty intensity for the Total Households (TH), the Total Rural Households (TRH), and the Rural Ethnic Minorities (REM) during the study period (2012-2016). In addition, we use the Generalised Entropy (GE) index decomposition method to examine the main drivers of income inequality among all households in Vietnam, particularly in the rural and ethnic minority communes.

At the household level, our findings show that the household head, the household and regional characteristics significantly affect the household groups' real per capita expenditure and the likelihood and intensity of poverty. In particular, residential location (rural and urban areas, six regions in Vietnam), ethnicity, education level, employment, household size, housing conditions and development programmes are strong determinants of welfare, poverty and the intensity of poverty of the three household groups. At the commune level, we found that general commune characteristics,

infrastructure, land and non-agricultural employment opportunities significantly affected TRH's and REM's expenditure and the probability and intensity of poverty.

Previous studies that use only logit models neglected several influences on poverty intensity; this study overcomes the issue. For example, language barriers, farm size and overseas remittances did not affect REM's likelihood of poverty but significantly influenced REM's poverty intensity. Limited access to the district hospital or a post-office widened REM's poverty gap; it had no statistically significant impact on the likelihood of poverty in the REM communes.

We found decreasing income inequality for all Vietnamese households during the study period (2012-2016). For the decomposition of income inequality, the decreasing income inequality for both rural/urban areas and the ethnic majority was the main driver of the country's narrowing income inequality. However, we found ethnic minorities' increasing income inequality negatively affected the country's total income equality. In addition, the income inequality levels within groups and between the top 10% and the bottom 10% were the main drivers of income inequality in rural areas and ethnic minority communes.

Keywords: Poverty, poverty intensity, income inequality, economic well-being, real per capita expenditure, Vietnam.

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Table of Contents

Abstract ..... **iii**

Table of Contents ..... **vi**

List of Tables ..... **ix**

List of Figures ..... **xi**

Chapter 1 Introduction **1**

1.1 Background 1

1.2 Poverty and Inequality in Vietnam 5

1.3 Problem Statement 8

1.4 Research Objectives 10

1.5 Study Contributions 11

1.6 Structure of the Thesis 12

Chapter 2 Literature Review **13**

2.1 Overview of the Literature on Economic Growth, Poverty and Inequality Reduction in Vietnam 13

2.1.1 Economic Reforms and Growth in Vietnam 13

2.1.2 Anti–Poverty Policies and Programmes in Rural and Ethnic Minority Communes in Vietnam 15

2.1.3 Policies to Reduce Inequality in Income, Education and Health in Vietnam 16

2.1.4 Achievements and Challenges in Poverty Reduction in Rural and Ethnic Communes in Vietnam 17

2.1.5 Increasing Income Inequality in Vietnam 23

2.2 A Definition of Poverty 27

2.3 Expenditure Poverty 29

2.4 The Poverty Line 30

2.5 Measures of Poverty 31

2.6 Measures of Income Inequality 32

2.6.1 The GINI Coefficient 32

2.6.2 Generalised Entropy Indexes 34

2.7 Causes of Poverty 35

2.8 The Determinants of Living Standards and Poverty 37

2.8.1 Household Head Characteristics 37

2.8.2 Household Characteristics 41

2.8.3 Commune Characteristics 50

2.8.4 Regional Characteristics 51

Chapter 3 Research Data and Methodology **53**

3.1 Data Collection 53

3.1.1 The Vietnam Household Living Standards Surveys (2012-2016) 53

3.1.2 Estimation of Real Per Capita Expenditure and Income 54

3.1.3 The Use of Weights in the Study 55

3.2 Empirical Methods 56

3.2.1 Regression Model for Research Objective 1 57

3.2.2 Binary Logistic Regression Model for Research Objective 2 66

3.2.3 Fractional Logistic Regression Model for Research Objective 3 70
3.2.4 The Decomposition of Income Inequality for Research Objective 4 73

Chapter 4 Descriptive Analysis 75

4.1 Economic Well-Being of Households in Vietnam.... 75
4.1.1 The Differences in Real Per Capita Expenditure between Poor and Non-Poor Households....75
4.1.2 The Differences in Real Per Capita Income between Poor and Non-Poor Households....78
4.2 Data on the Determinants of Real Per Capita Expenditure, Poverty and the Poverty Gap... 82
4.2.1 Descriptive Data at the Household Level....82
4.2.2 Descriptive Data at the Commune Level....89

Chapter 5 The Determinants of Poverty and Inequality of Total Households in Vietnam 93

5.1 The Impact of Household-Level Factors on the TP, TNP and TH's Expenditure 93
5.1.1 Ordinary Least Squares Estimation Results of the TH Model 93
5.1.2 Differences in the Ordinary Least Squares Estimates Between the TP and TNP Models....95
5.1.3 The Impact of Household-Level Factors on the TP's Expenditure 95
5.2 The Impact of Household-Level Factors on the TH's Poverty.... 97
5.2.1 The Impact of Living in Rural Areas....98
5.2.2 The Results of the Two Binary Logistic Regression Models for the TH....98
5.3 The Impact of Household-Level Factors on the TH's Poverty Gap 100
5.3.1 The Different Impacts of Rural Area and Borrowing in Two Fractional Logistic Regression Models of the TH 100
5.3.2 The Results of the Two Fractional Logistic Regression Models of the TH 102
5.3.3 A Comparison of the Binary and Fractional Logistic Regression Model Results of the TH 102
5.4 The Determinants of Income Inequality for the TH in Vietnam 103
5.4.1 Income Growth and Inequality in Vietnam....103
5.4.2 The Income Gap Between Household Groups....105
5.4.3 Decomposition of Income Inequality in Vietnam 107
5.5 Chapter Summary 108

Chapter 6 The Determinants of Poverty and Inequality of the Total Rural Households in Vietnam 110

6.1 The Determinants of the TRH's, TRNP's and TRP's Expenditure 110
6.1.1 The Determinants at the Household Level 110
6.1.2 The Determinants at the Commune Level 113
6.2 The Determinants of TRH's Poverty.... 116
6.2.1 Poverty Determinants of the TRH at the Household Level....117
6.2.2 Poverty Determinants of the TRH at the Commune Level....121
6.3 The Determinants of TRH's Poverty Gap 123
6.3.1 The Determinants of TRH's Poverty Gap at the Household Level 123
6.3.2 The Determinants of TRH's Poverty Gap at the Commune Level....124
6.4 The Determinants of Income Inequality in Rural Vietnam 126
6.4.1 Income Growth and Inequality in Rural Vietnam 127
6.4.2 The Decomposition of Income Inequality in Rural Vietnam 128
6.5 Chapter Summary 129

Chapter 7 The Determinants of Poverty and Inequality of Ethnic Minorities in Vietnam.....130
7.1 The Determinants of the RPE's, RNPE's and REM's Expenditure 130
7.1.1 The Determinants at the Household Level 131
7.1.2 The Determinants at the Commune Level 134
7.2 The Determinants of REM's Poverty..... 136
7.2.1 Poverty Determinants of the REM at the Household Level 136
7.2.2 Poverty Determinants of the REM at the Commune Level.....139
7.3 The Determinants of REM's Poverty Gap 142
7.3.1 The Determinants of REM's Poverty Gap at the Household Level 142
7.3.2 The Determinants of REM's Poverty Gap at the Commune Level 143
7.4 The Determinants of Income Inequality Among Ethnic Minorities in Vietnam..... 144
7.4.1 Emerging Income Inequality Among Ethnic Minorities 144
7.4.2 Decomposition of Income Inequality Among the Ethnic Minorities.....148
7.4.3 Emerging Income Inequality Among the REM 149
7.5 Chapter Summary 150

Chapter 8 Conclusions and Recommendations.....152
8.1 Introduction and Overview of the Study 152
8.2 A Summary of the Findings..... 153
8.2.1 Ordinary Least Squares Estimation Results.....153
8.2.2 Binary Logistic Regression Model Results.....155
8.2.3 Fractional Logistic Regression Model Results.....156
8.2.4 Results of the Income Inequality Analysis 157
8.3 Research Implications and Policy Recommendations 157
8.4 Study Limitations 160
8.5 Suggestions for Future Research 161

Appendix A Poverty Indicators and Development Programmes.....163

Appendix B Correlations Among Variables.....164

Appendix C Ordinary Least Squares Estimation Results and Precision of Binary Logistic Regression Model.....165

Appendix D Income Inequality 168

References 169

List of Tables

Table 1. 1 Poverty Indexes and Distribution of the Poor by Region (in 2012 and 2015) 2
Table 1. 2 The Gini Index of Regions and Selected Countries 5
Table 2. 1 General Economic Indicators of Vietnam, 1986-2016 14
Table 2. 2 Poverty Rate in Vietnam by Urban and Rural, Ethnicity, and Region, 1993-2016 (in %) 18
Table 2. 3 Monthly per Capita Income and Expenditure by Urban and Rural Areas 20
Table 2. 4 Number and Distribution of the Poor in Vietnam (in 2016) 22
Table 2. 5 Poverty Gap and Poverty Severity in Vietnam, 1993-2016 (in %) 23
Table 2. 6 Monthly Per Capita Income and Expenditure by Income Quintile 24
Table 2. 7 Income Gini Coefficient in Urban and Rural Areas and Regions in Vietnam, 2002-2016 25
Table 2. 8 Monthly Per Capita Income in Regions and Selected Provinces in Vietnam 26
Table 2. 9 Expenditure Poverty Lines in Vietnam, 1993-2016 (Unit: VND 1,000/person) 31
Table 3. 1 Definitions of the Regression Model Variables at the Household Level for the Household Samples 60
Table 3. 2 Definitions of Variables at the Commune Level for Total Rural Households and Rural Ethnic Minorities 64
Table 4. 1 Annual Real per Capita Expenditure by Poverty Status and Household Group (VND 1,000) 76
Table 4. 2 The Structure of Annual Real Per Capita Income for Three Household Samples, 2012-2016 (VND 1,000) 79
Table 4. 3 The Income Gap Between the Poor and the Non-poor, 2012-2016 82
Table 4. 4 Descriptive Statistics for the Total Households and Rural Households Models at the Household Level 84
Table 4. 5 Descriptive Statistics for the Rural Ethnic Minorities Models at the Household Level ... 88
Table 4. 6 Descriptive Statistics for the Total Rural Household Models at the Commune Level 90
Table 4. 7 Descriptive Statistics for the Rural Ethnic Minorities Models at the Commune Level 91
Table 5. 1 Ordinary Least Squares Estimates of RPCE Models of the TH, TP, and TNP at the Household Level 94
Table 5. 2 Estimation Results of Binary Logistic Regression Models of Total Households (TH) at the Household Level 99
Table 5. 3 Estimates of the Fractional Logistic Regression Models of Total Households (TH) at the Household Level 101
Table 5. 4 Income Growth and the Gini Index in Vietnam by Location and Ethnicity (2012-2016) 104
Table 5. 5 Income Inequality in the Distribution of All Vietnamese Households' Incomes 106
Table 5. 6 Decomposition of Income Inequality of All Vietnamese Households by Location and Ethnicity 108
Table 6. 1 Ordinary Least Squares Estimates of RPCE Models for the TRP, TRNP, and TRH at the Household Level 111
Table 6. 2 Ordinary Least Squares Estimates of RPCE Models for the TRH, the TRP, and the TRNP at the Commune Level 114

Table 6. 3 Estimates from the Binary and Fractional Logit Models for the TRH at the Household Level 118
Table 6. 4 Estimation Results of the Binary and Fractional Logistic Regression Models for TRH at the Commune Level 125
Table 6. 5 Distribution of Urban and Rural Household Income Inequality 127
Table 6. 6 Urban and Rural Income Inequality and Decomposition of Rural Income Inequality by Ethnicity 128
Table 7. 1 Estimation Results of the Linear Regression Models of the REM at the Household Level 132
Table 7. 2 Estimation Results of the Linear Regression Models of REM, RPE and RPNE at the Commune Level 135
Table 7. 3 Estimation Results of the Binary and Fractional Logit Model of REM at the Household Level 137
Table 7. 4 Estimation Results of the Binary and Fractional Logit Models of REM at the Commune Level 141
Table 7. 5 Per Capita Income and Gini Index of Ethnic Minorities in Vietnam 145
Table 7. 6 Income Inequality in the Distribution of Vietnam Household Incomes by Ethnicity 147
Table 7. 7 Generalised Entropy Indexes of Ethnic Minorities by Rural and Urban Areas (2012-2016) 148

Appendix

Table A. 1 Poverty Headcount, Poverty Gap and Poverty Severity by Region in Vietnam, 2016 (in %) 163
Table A. 2 Beneficiaries of Development Programmes by Groups of Household (2012-2016) 163
Table B. 1 Correlation Between the Variable of Rural and Other Variables Excluded From The Binary Model 1 for the TH 164
Table C. 1 Linear Regression Model Results of the TH at the Household Level Using Averaged Cross-Sectional Weights 165
Table C. 2 Estimation Results of the RPE's Linear Regression Models at the Household Level in 2016 166
Table C. 3 Predictive Accuracy of the Binary Logit Model Estimation for the REM Without Fitting the Sample Weights 167
Table D. 1 Income Share by 20 Quantiles and Ethnicity in Vietnam in 2012 and 2016 168

List of Figures

Figure 1. 1 Global Poverty Headcount Ratio and Distribution of the Poor, 1981-2015.....1

Figure 1. 2 Global Inequality and Decomposition of Global Inequality, 1988-2013 3

Figure 2. 1 Economic Growth Rate and Poverty Incidence in Vietnam, 1993-2016 (in %) 19

Figure 2.2 Annual Real Per Capita Expenditure by Ethnicity in Vietnam, 2010-2016 (VND 1,000, at constant 2010 prices) 21

Figure 2.3 The Bottom 40%'s Income Share in Vietnam, 2002-2014 24

Figure 2. 4 The Gini Index and the Lorenz Curve (From Giovanni Bellù and Liberati, 2005) 33

Figure 3. 1 Pooled Study Design and the Number of Sampled Households, 2012 - 2016 56

Figure 5. 1 Income Inequality Comparisons for All of Vietnam, 2012- 2016 105

Figure 5. 2 Income Shares of the Bottom 50%, Mid 40% and Top 10%, 2012-2016 107

Figure 6. 1 A Comparison of Income Inequality in Vietnam's Rural and Urban Areas in 2016..... 128

Figure 7. 1 Ethnic Minority Income Inequality Comparisons 2012, 2014, and 2016 145

Figure 7. 2 Vietnam Income Inequality Comparison by Ethnicity (2012)..... 146

Figure 7. 3 Income Inequality Comparison in Vietnam by Ethnicity (2016)..... 147

Figure 7. 4 Income Inequality of the Vietnam's Rural Ethnic Minorities and Majority in 2016..... 150

Chapter 1

Introduction

1.1 Background

Poverty is a global issue that exists in both developing and developed countries (United Nations (UN), 1998). Since 1990, the World Development Report has included information about poverty. One of the World Bank's (WB) primary aims is to create a world where there is no poverty (WB, 2018a). In 2013, the WB set two important goals related to global poverty reduction: (1) to reduce extreme poverty to below 3% of the total global populace living on less US$1.90 a day (calculated using 2011 purchasing power parity (PPP)) by 2030; and (2) to increase the world's poorest individuals' incomes (WB, 2016b). In 2010, the UN's Millennium Development Goal (MDG) was to eliminate extreme poverty. To date, this goal has not been achieved. In September 2015, the UN established the Sustainable Development Goal of no hunger and no poverty by 2030 (WB, 2016). Even though the WB and the UN are genuinely committed to these goals, a significant part of the world's population still struggles with severe poverty; 736 million world people lived on less than US$1.9/day (based on 2011 PPP) in 2015 (see Figure 1.1). Thus, poverty is still a major global issue.

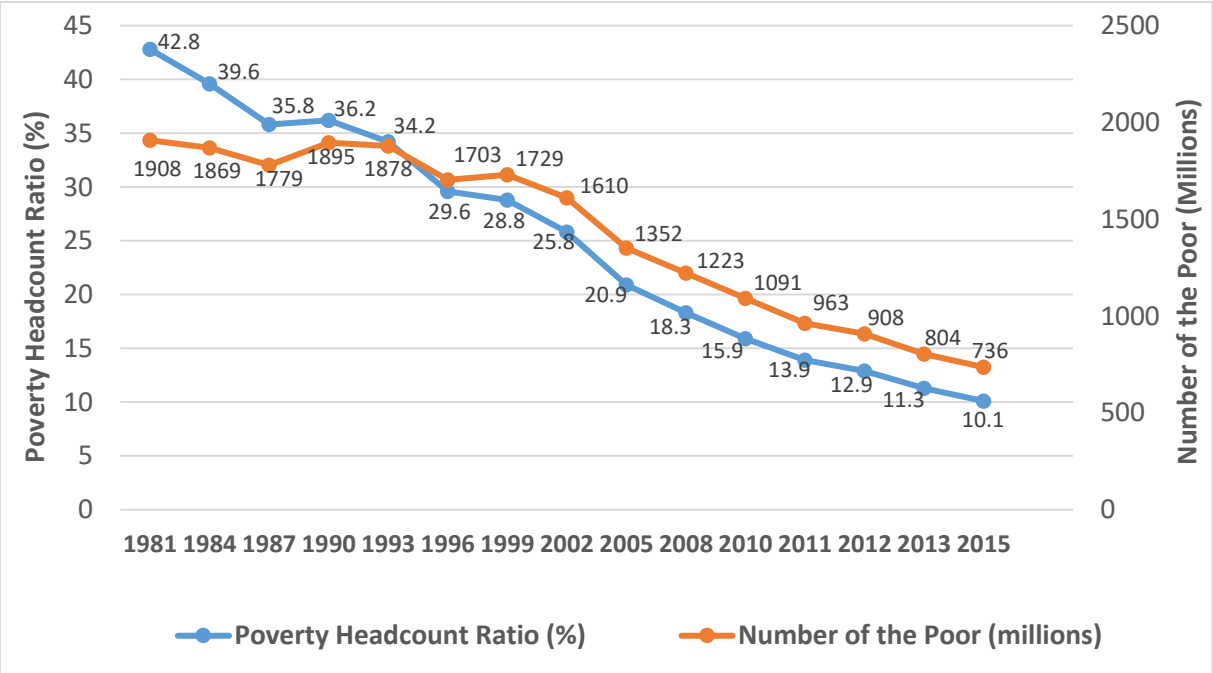

Figure 1. 1 Global Poverty Headcount Ratio and Distribution of the Poor, 1981-2015
Source: WB (2017)

The UN faces great challenges to meet its Sustainable Development Goal, because largely of uneven success in poverty reduction efforts around the world (WB, 2018a). Though East Asian Pacific countries

like China, Indonesia and India, have made significant progress in the war against poverty, African countries have achieved far less (WB, 2018). Table 1.1 shows that, in 2012, there were approximately 406 million poor people in Sub-Saharan Africa, which accounted for 45% of the world's total extreme poor. From 2012 to 2015, only 7.2 million Sub-Saharan African people escaped poverty; this figure can be contrasted with the 97.4 million people who were lifted out of poverty in the East Asian Pacific region. The term, poverty gap, reflects the ratio by which the mean expenditure/income of the poor falls below the poverty line. In other words, the poverty gap indicates how poor the poor truly are. The world's poorest people reside in Sub-Saharan Africa. In 2015, the Sub-Sahara's poverty gap was 15.79%, nearly six times greater than the average poverty gap (3.1%) of every country in the world. This figure not only means that the largest proportion of global poor resides in Sub-Sahara but that this is also the world's poorest region.

Table 1. 1 Poverty Indexes and Distribution of the Poor by Region (in 2012 and 2015)

Region	*Headcount Ratio (%)*		*Poverty Gap (%)*		*Squared Poverty Gap*		*Number of the Poor (millions)*	
	2012	***2015***	***2012***	***2015***	***2012***	***2015***	***2012***	***2015***
East Asia and the Pacific	7.25	2.32	1.49	0.46	0.48	0.16	144.57	47.18
Europe and Central Asia	1.86	1.47	0.53	0.40	0.24	0.18	8.94	7.15
Latin America and the Caribbean	4.72	4.13	1.83	1.54	1.11	0.92	28.61	25.90
Middle East and North Africa	2.68	5.01	0.54	1.28	0.18	0.50	9.42	18.64
Other High Income	0.57	0.68	0.43	0.49	0.37	0.42	6.09	7.32
South Asia	18.18	12.4	3.54	NA	1.04	NA	304.73	216.4
Sub-Saharan Africa	43.82	41.10	17.21	15.79	9.09	8.24	406.05	413.25
World Total	**12.80**	**10.00**	**3.78**	**3.10**	**1.74**	**1.49**	**908.40**	**735.86**

Notes: Poverty indexes were calculated using the 2011 US$1.9/day poverty line; NA: Data not available
Source: WB (2018)

In developing countries, poverty is more prevalent among rural, young and poorly educated people. Those who are employed in agriculture and those with large households (who have a large number of family members) are also more likely to be poor (WB, 2016a). In 2013, the rural poverty headcount ratio in developing countries (18.2%) was much higher than in urban areas (5.5%). Rural poor accounted for 80% of the all poor. Most rural people (64%) work in the agriculture sector; the prevalence of poverty for agricultural workers was four times higher than for non-agricultural employees. The 2013 poverty rate for illiterate people was approximately 25%, but only 1.5% for those who had tertiary education. Child poverty is a serious problem for developing countries with over 50% of people aged 17 and below lived under the poverty threshold in 2013 (WB, 2016).

As the eradication of poverty is the prime objective, it is necessary to identify the causes of poverty. This enables policymakers to propose, design and implement effective strategies and policies.

Although the cause of poverty varies in different countries, there are common poverty determinants. Poverty is typically associated with a low education level, a dearth of health services, a lack of employment opportunities and a high dependency ratio (Chen & Wang, 2015; Islam et al., 2017; Jansen et al. 2014). Poverty is considered a rural and ethnic phenomenon (Churchill & Smyth, 2017; Glauben et al., 2012). Gender inequality is another challenge for countries attempting to combat poverty (Chaudhry & Rahman, 2009; Millar & Glendinning, 1989). Another determinant of poverty is adverse shocks. Adverse shocks are events that negatively affect a household's income and/or expenditure. Examples of adverse shocks include farmland loss, crop loss, natural calamities, diseases, economic and environmental changes around the world (global economic recessions), financial shocks, high inflation, and climate change (Bolitho et al., 2003; Dartanto & Nurkholis, 2013; Hertel & Rosch, 2010; Kanbur, 2009; Tran et al., 2015). Contractions in the global economy have led to declining production and decreased levels of employment that inevitably increase the unemployment rate and affect poverty rates. For example, from 1997 to 1998, over 50 million Indonesian people fell into poverty because of the Asian financial crisis (Bolitho et al., 2003). Similarly, the global financial crisis of 2008 caused 53 million people worldwide to fall into poverty (based on a poverty line of US$1.25 in 2005 PPP) (Ravallion & Chen, 2009). Furthermore, climate change increases a household's likelihood of falling into poverty and facing the risk of starvation (Hertel & Rosch, 2010).

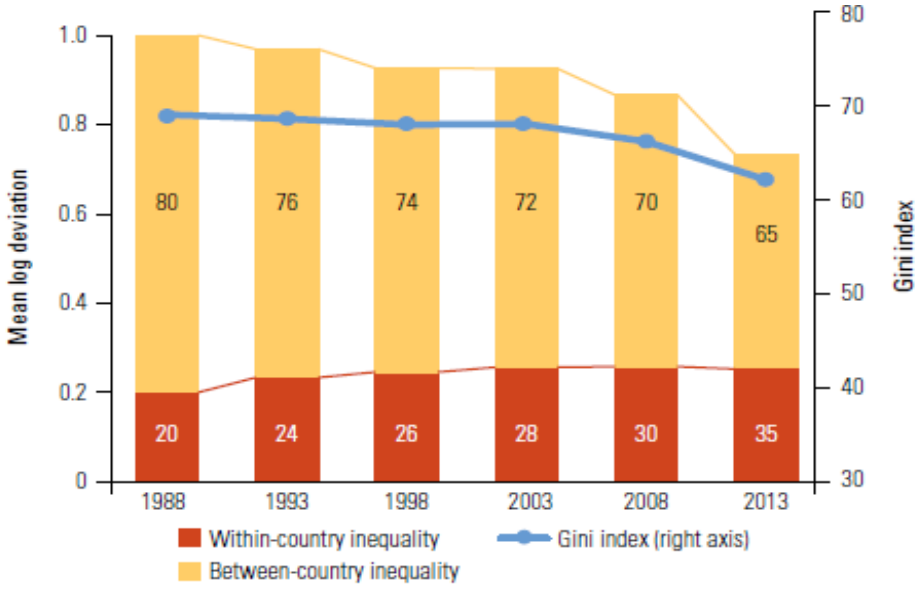

Figure 1. 2 Global Inequality and Decomposition of Global Inequality, 1988-2013 (From WB, 2016, p. 10)

Income inequality is another major concern in the international community (Oxfam, 2017; Perera & Lee, 2013; WB, 2016a). Since 2000, the WB has identified income inequality as a major issue in its development policies (Naschold, 2002). For example, in 2013, the WB's second goal was to ameliorate income distribution for the bottom 40% (WB, 2016a). The reason why the Bank included this goal was

that the poorest and the middle-class contribute the greatest amount to GDP growth. Improvement of their income share reduces not only income inequality but also poverty around the world (Dabla-Norris et al., 2015). Using the Gini index to reflect the income inequality level, in 2016, the WB (2016) showed that global inequality was at an unacceptably high level, albeit with a slight decrease over the period 1988 to 2013 (see Figure 1.2). In particular, the global Gini index was 0.697 in 1988 versus 0.625 in 2013. Similarly, the International Monetary Fund (IMF) (2015) showed a persistently high level of global income inequality over a similar time period (approximately 0.7 between 1990 and 2012).

To investigate the main contributors to global income inequality, it is necessary to decompose income disparity into two components: (1) between countries and (2) within countries. This distinction enables us to understand changes in global income distribution, which is driven either by income differences between countries or within countries. Information relating to the decomposition of inequality will help policymakers design appropriate policies. For example, economic development policies in poorer countries can reduce global inequality if income dispersion amongst countries is the main cause of global inequality. Based on the WB's 2016 estimate, inequality between countries was the main driver of global distribution; it accounted for 65 - 80% of the total global inequality during 1988-2013 (see Figure 1.2). The WB explains that China's and India's recent high growth rates have helped decrease global inequality. However, Figure 1.2 depicts the decreasing inequality between countries in terms of total global income disparity between 1988 and 2013. In contrast, inequality within countries increased during the same period.

Increased income inequality is a common challenge for both advanced and developing countries (Alvaredo et al., 2018; Dabla-Norris et al., 2015). Based on the 2018 World Inequality Report (Alvaredo et al., 2018), income inequality was increasing in almost every country in the world from 1980-2016. The report also reveals that, during this period, the 1% global richest had benefited twice as much from global income growth as the bottom 50%. Of all the countries in the world, inequality in Russia and China rose quickest with a 5 - 26% increase in the Gini coefficient during the period (see Table 1.2). For inequality among the world's regions, Table 1.2 demonstrates that, in 2012, income inequality was the severest in Latin America, with the highest Gini index (0.44), followed by Sub-Saharan Africa (0.43) and Asia (0.42). Europe had the lowest Gini index (0.31). However, Dabla-Norris et al. (2015) showed that the speed of increase in income inequality was the fastest in developed countries from 1990-2012. Although the trend of widening inequality differs from country to country, the causes tend to be the same regardless of the level of economic development of countries. The main factors include gaps in knowledge and skills among workers, unequal access to job opportunities and credit, education level and healthcare, or no pro-poor policies (Dabla-Norris et al., 2015; Oxfam, 2017; WB, 2016).

Table 1. 2 The Gini Index of Regions and Selected Countries

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Source : Data are from Dabla-Norris et al. (2015). (https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2016/12/31/Causes-and-Consequences-of-Income-Inequality-A-Global-Perspective-42986)

Why has increasing income inequality become a major concern globally? One reason is that rising income inequality can negatively affect economic growth and poverty (Berg et al., 2012; Oxfam, 2017; Perera & Lee, 2013). High income dispersion reflects economic inefficiency. In general, high inequality in a country is harmful for the growth of aggregate demand and GDP. The rich comprise only a small percentage of the total populace but share a larger part of the national income. The rich's total expenditure is lower than that of the poorer populace (IMF, 2015; Naschold, 2002; Wade, 2004). Income inequality inhibits economic growth because of a decreasing GDP. Similarly, highly unequal income dispersion can hamper a country's efforts to eradicate poverty. The Asian Development Bank (2012) argued that if income inequality had changed slowly in Asia, a greater number of people would have escaped poverty from 1990-2010. Income inequality can also lead to social instability (Dabla-Norris et al., 2015; Perera & Lee, 2013). Income inequality means unequal income distribution and negatively affects disadvantaged individuals or groups of people in society. High income dispersion often leads to frustration and creates conflict between different individuals, ethnicities, or regions. In fact, GDP growth cannot be maintained unless countries tackle the problem of social justice. To ensure sustainable long-term economic development, a country must distribute income fairly. In short, reducing income inequality can improve a country's social stability and pro-poor growth.

1.2 Poverty and Inequality in Vietnam

Vietnam, an S-shaped country, is located on the eastern margin of the Indochina Peninsula. In 2019, Vietnam's population was approximately 96.5 million people, of which about 63% lived in rural areas (WB, 2020). Vietnam has 54 ethnicities of which the Kinh people are the largest, representing 85% of the country's population (General Statistics Office of Vietnam (GSO), 2012; WB, 2018). Although Chinese (Hoa) people account for only a minority of Vietnam's population, their living standards are higher than those of the Kinh people. In poverty research, the Hoa are often included in the ethnic

majority group (Baulch & Masset, 2003; Hinsdale et al., 2013). The GSO combined the Kinh and Chinese (Hoa), categorising them as the ethnic majority. The GSO categorises the remaining 52 ethnicities as the ethnic minorities[1].

After the U.S. withdrew its financial and military support from the Southern Vietnam States, in general, Vietnam suffered in the aftermath of the war with a serious number of socio-economic problems and challenges including poverty (Phan et al., 2006). During the late 1970s and early 1980s, Vietnam fell into an economic recession with shortages of food, housing, medicines, and consumer goods because of the extremely adverse effects of prolonged wartime disruptions on the agriculture and industry (Phan et al., 2006). As a result, Vietnam's household living standards declined; almost all Vietnamese people from manual workers to civil servants, armed forces personnel, and labourers experienced serious economic difficulties in their everyday lives then. In the mid-1980s, Vietnam had one of the lowest global Gross National Income (GNI) per capita figures (Glewwe et al., 2004; Pham et al., 2003). The per capita income was approximately US$130 in 1985, making Vietnam one of the five least developed economies across the globe. In the mid-1980s, seven of every ten people lived in poverty (WB, 1999).

To grow the economy and reduce poverty, the Vietnamese government has launched many policies since 1986 (see Section 2.1). As a result of these policies, Vietnam has achieved substantial progress in socio-economic development and poverty alleviation over the past 30 years (WB, 2018). Based on the WB's calculations, the GNI per Vietnamese person grew from US$130 to US$980 between 1990 and 2008[2], transforming Vietnam from a lower-income nation to a lower-middle-income nation (Dang, 2011)**.** Poverty incidence decreased sharply, from 58.1% in 1993 to 9.8% in 2016 (Hinsdale et al., 2013; WB, 2018). The nation was also able to curb the malnutrition rate in children under five, from 44% in 1994 to 17.5% in 2010 and 14.5% in 2014 (GSO, 2016b; Millennium Development Goals Achievement Fund, 2018). According to the UN, in 2010, Vietnam fulfilled the first MDG by eradicating extreme poverty and hunger earlier than the 2015 scheduled date. However, the war against poverty in Vietnam has not yet been won; there are still high rates of poverty, particularly among rural and ethnic minority communes. They are not adequately served by rudimentary social services. Although Vietnamese living standards have improved significantly since 2009 when Vietnam became a lower-middle-income nation, the country must now work on decreasing the gap between the rich and the poor (Hinsdale et al., 2013). Recently, Vietnam's task of alleviating poverty has become more difficult

[1] see "Poverty and migration profile 2012". These data were previously available from GSO in 2018 (http://www.gso.gov.vn) but are no longer available. A hard copy of the data is available on request.

[2] The WB's country classification is based on the average per capita GNI and is revised annually on 1 July. According to the WB's 2008 per capita GNI data (calculated using the Atlas approach), economies are classified as low-income countries if they have a per capita GNI of US$975 or less; lower middle- income includes countries with a per capita GNI of between US$976–3,855; upper middle – income of between US$3,856–11,905; and high income countries with a GNI per capita of US$11,906 or more.

with macro instability and slowing economic growth. As a result of these factors, many less well-off people have fallen back into poverty. To overcome these difficulties, the Vietnamese government needs to design and implement effective policies that address the current poverty rates and income inequality in the country.

The Vietnamese government's efforts led to a dramatic reduction in poverty incidence from 1993 to 2016 (WB, 2018). However, the rate still remains high (UN, 2004). The poverty incidence rate differs across regions and ethnic groups. Poverty is more pronounced in rural areas, especially in ethnic minority communes (Hinsdale et al., 2013). In 2016, the rural poor comprised 94.7% of the total poor (WB, 2018). Ethnic minorities constituted approximately 73% of the poor but comprised only 15% of the nation's population in 2016 (WB, 2018). Amongst the six regions in Vietnam, the Midlands and Northern Mountains (MNM), Central Highlands (CH) and Northern and Coastal Central (NCC) have the highest incidences of poverty (GSO, 2016a). In 2016, these three remote regions comprised over 83% of the total number of Vietnamese poor (WB, 2018). The concentration of poverty in rural and ethnic minority households and the three regions, is the result of poor geographic location and limited productive resources (low education levels, limited access to financial services, and less productive land) (Baulch et al., 2010; WB, 2018). These factors inhibit a household's ability to generate earnings and, thus, reduce their living standards and welfare.

In Vietnam, the poor often have precarious living conditions and limited access to social services. Because of their low incomes, many poor individuals struggle to meet their basic needs and often go without food, clothes, housing, water, education and healthcare. Most live on less than the poverty threshold. According to the (GSO)[3], in 2012, 38% of the total poor lacked electricity, water and housing. These figures were even higher for the rural poor (44%) and poor ethnic minorities (70%). Moreover, 47% of the poor had never gone to school or received any educational qualifications. In 2012, 30% of the poor were unskilled workers (GSO, 2018). The Vietnamese poor often reside in rural, mountainous, and remote areas and struggle with extreme difficulties related to geographical and social isolation and the lack of public infrastructure. They, thus, have fewer chances to improve their lives and well-being (Hinsdale et al., 2013). As a result, many suffer from hunger, malnutrition, illness, and illiteracy. The poor have limited money to spend and low levels of access to the social welfare system.

The third issue related to the war on poverty in Vietnam is the ever-increasing gap between the rich and poor (Hinsdale et al., 2013). Not every group of people has benefited equally from Vietnam's recent impressive economic gains; the poor have benefited far less than the non-poor from Vietnam's economic expansion. The income and expenditure of the bottom 20% of income earners have increased much less than those of the richest 20% of the population (GSO, 2017a). In particular, the

[3] See "Poverty and migration profile 2012".

poorest quintile's per capita income was 10% of the richest quintile in 2016. Apart from the widening gap between the rich and the poor, since 2012, Vietnam has witnessed a higher level of income inequality for rural households than urban households; though the urban Gini was higher than the rural Gini index from 2002-2010, from 2012-2016 the rural Gini index overtook the urban Gini index (GSO, 2018)[4]. In 2012 and 2014, the Gini coefficient of the rural sector was 0.014, 0.001 higher than that of urban sector. In 2016, the rural Gini index was 0.005 higher than in the urban area's one. This finding is significant because it is opposite to the income inequality trend in developing countries where income inequality is higher in the urban sector (Akita & Lukman, 1999; Cao & Akita, 2008; Estudillo, 1997).

1.3 Problem Statement

Poverty is a sensitive socio-economic issue. The Vietnamese government has prioritised the issue by launching numerous poverty reduction programmes, such as the National Targeted Programmes (NTPs) on Hunger Eradication and Poverty Reduction (HEPR) and Programme 135[5]. However, these programmes have been largely unsuccessful for a variety of reasons such as a high poverty incidence among the rural areas and ethnic minority groups, the poor's scant access to basic public services, the increasing gap between the rich and the poor, and the less equal income distribution for the rural sector than for the urban sector. The war against poverty and inequality in Vietnam cannot be accomplished without a comprehensive analysis of the determinants of poverty and inequality. It is essential to evaluate both the source of poverty and what the poor need, especially those in the rural and ethnic minority communes. Understanding the determinants of poverty, poverty intensity and inequality is key to formulating appropriate policies and strategies to elevate the poor's living standards and reduce poverty and inequality in Vietnam (Bui et al., 2017; Tran et al., 2015). This study seeks to answer four questions:

1. What are the determinants of economic well-being and poverty in Vietnam?
2. Why does poverty persist in the rural area and ethnic minority communes in Vietnam?
3. Does the poverty intensity change depending on different groups of people in Vietnam?
4. Why is income inequality higher in rural Vietnam?

A number of studies have investigated differences in economic well-being, poverty and inequality in Vietnam (Glewwe et al., 2002; Imai et al., 2011; Hinsdale et al., 2013; Minot et al. 2003; Nguyen et al. 2010; Pham et al. 2003). For example, using the 1992 and 1998 Vietnam Living Standards Surveys (VLSSs), Glewwe et al. (2002) estimated various household characteristics and residence location's

[4] See Table 2.7 for futher details.

[5] Programme 135 is a socio-economic programme that targets communes with extreme difficulties in mountainous and remote areas.

effects on consumption. They found that education, gender, employment and/or geographic region are key factors that affected Vietnamese households' consumption and rural poverty during the 1990s. Pham et al. (2003) also used the 1998 VLSS to analyse factors affecting poverty. The authors explored the determinants of poverty, including non-agricultural income, landholdings and location of residence in Vietnam. Imai et al. (2011) concluded that geographical disadvantage, low education level and vulnerability to adverse shocks were the key drivers of poverty and inequality for Vietnam's ethnic minority communes.

This study explores the determinants of economic well-being of Vietnamese households using a linear regression model and pooled data from the results of a national survey conducted over three different years: the 2012, 2014 and 2016 Vietnam Household Living Standards Surveys (VHLSS). In addition, we examine the determinants of poverty in Vietnam from 2012-2016. For the empirical models, we use binary logistic regression models to test the factors that determine the likelihood that a household is poor. This study explores the social problems that accompany poverty at individual, household, commune and regional levels. The study also examines the effectiveness of programmes designed to help the poor, in general, and ethnic minorities in particular; it uses various empirical models to assess credit, scholarship, pension and free healthcare programmes. Finally, using the Generalised Entropy (GE) index decomposition, we decompose the overall income inequality in Vietnam by urban/rural and ethnicity to identify the sources and main factors driving the country's income inequality.

There is a limited number of studies and a lack of evidence on the factors that determine both the probability of living in poverty and poverty intensity (Rodgers & Rodgers, 2000; Tran et al., 2015). The binary logistic regression model can estimate only the likelihood that a household will be poor. It cannot estimate the effects of various factors on the poverty gap (an indicator that shows how poor the poor are, or how far below the poverty line they live). In terms of poverty measures, the poverty headcount ratio is the most common measure used to determine the proportion of poor people residing in an area. Though two areas may have the same poverty headcount ratio, the total cost of lifting all the poor up to the poverty threshold may differ between the two areas. The poverty headcount ratio does not include information about the poverty gap, or how far below the poverty line an individual's spending falls (Foster et al., 1984; WB, 2009). This gap is the intensity of the poverty (known as the poverty intensity); governments need this information to determine how much funding to allocate for poverty elimination. Rodgers and Rodgers (2000) claim that most empirical studies of poverty in Australia and other countries lack evidence of poverty intensity; very few studies have tried to model poverty intensity. For example, Osberg and Xu (1999) did not model the influences of poverty intensity in Canada; they note only that poverty intensity is increasing because of decreased social assistance. Others, who modelled poverty intensity, omit a number of predictor covariates in their studies. For example, Bhaumik et al. (2006) provide empirical evidence of the determinants of poverty

intensity in Kosovo, but do not examine some keys determinants such as access to infrastructure. Likewise, (Tran et al., 2015) provide some initial evidence of the determinants of poverty intensity in Northwest Vietnam, but ignore language barriers, remittances, and government support. To overcome this limitation, we determine the poverty intensity of the REM in Vietnam using a fractional logit model that is the most appropriate approach to estimate a fractional outcome variable (Papke & Wooldridge, 1996).

This study differs from prior research in two areas. First, this study examines the determinants of poverty and poverty intensity in a middle-income country for 2009. In 2010, Vietnam implemented an updated poverty monitoring system, based on the VHLSS, and a new method for measuring poverty (Dang, 2011; Gibson et al., 2017)[6]. Therefore, compared with previous studies that used data before 2010, this study uses recent data from the 2012, 2014 and 2016 VHLSSs. Secondly, the study merges the three national surveys to generate a bigger study sample whereas many previous studies used repeated cross-sectional data from several VHLSSs[7]. This provides us with more information and thus increases our model's predictive precision.

1.4 Research Objectives

The main goal of this study is to examine the influences of economic well-being, poverty and poverty intensity at the aggregate level for all total households (TH) in rural and urban Vietnam. However, as poverty is concentrated and more pronounced in rural areas where there are more ethnic minority communes (Hinsdale et al., 2013, WB, 2018)[8], the study focuses on these groups; total rural households and rural ethnic minorities or TRH and REM, respectively. The study also compares the poor's living standards against the non-poor's living standards; thus, each household sample will be divided into two sub-samples: the poor and the non-poor based on the poverty expenditure benchmark. In addition to poverty, this study analyses the trend of overall income inequality in Vietnam during the study period. However, this study emphasises spatial and ethnic inequality and their contributions. This study has four research objectives:

1. To investigate the significant factors that affect the economic well-being of total poor households (TP), total rural poor households (TRP), and the rural poor ethnic minorities (RPE) in Vietnam.
2. To examine the factors that affect the TH, TRH and REM's poverty in Vietnam.
3. To identify the factors that influence the TH, TRH and REM's poverty intensity in Vietnam.

[6] See Section 2.4 for the improvements of the 2010 VHLSS and subsequent surveys.

[7] See Section 3.1.3 for further discussion on merging the VHLSSs.

[8] The WB (2018) shows that in 2016, 95% of poor ethnic minority households lived in rural areas.

4. To identify the factors that affect income inequality in Vietnam, especially in rural and ethnic minority communes.

1.5 Study Contributions

This study is the first to investigate both the determinants of poverty and poverty intensity, and sources of inequality in Vietnam and in rural areas and ethnic minority communes since the country became a middle-income country. Tran et al.'s (2015) study is the only one that has identified factors that contribute to poverty intensity in Northwest Vietnam. This study expands Tran et al.'s (2015) work; it studies the intensity of poverty at both a national level and commune level (rural and ethnic minority communes).

In the research approach, this study provides two contributions. First, the study uses three different methods to provide a comprehensive analysis of the poverty determinants. Researchers often use either a linear regression model or a binary logit model to examine the determinants of poverty. Each approach has its own advantages and can be used to complement each other in poverty analysis. In terms of the expenditure poverty, researchers separate the populations into two groups: the poor and the non-poor. Researchers use the logit model to estimate the prevalence of poor households. However, binary logistic regression cannot model the influences of poverty. Though this method can explain why a household is poor, it is unable to explain the factors that affect the poor's expenditure. Our approach is more comprehensive. Using a linear regression model to regress the poor's per capita expenditure is more useful because it allows us to understand how poor the poor truly are. In this study, we use both linear regression and binary logit models. Secondly, this study uses a fractional logistic regression (a more suitable technique than linear regression[9] (Papke & Wooldridge, 2008), to estimate the factors that influence the depth of poverty; researchers have tended to ignore this important issue. Using a fractional logit model, the study examines the determinants of distance from the poor's per capita spending to the poverty threshold, which measures how poor the poor are, in more detail than per capita expenditure estimated by the linear regression model.

Using data from the 2012, 2014 and 2016 VHLSSs, this study provides improved empirical evidence about the determinants that influence poverty, poverty intensity and income inequality. In developing countries, there is greater income inequality in urban areas than in rural areas. However, in Vietnam, the opposite is true; since 2012, there has been greater income disparity in rural areas than in urban areas. Therefore, we will provide new evidence about the main contributors to this distinctive trend of inequality in Vietnam. Finally, this study will provide policymakers with useful information that will

[9] See Section 3.2.3.

enable them to design more effective strategies and programmes to reduce poverty and inequality in Vietnam.

1.6 Structure of the Thesis

This thesis includes eight chapters organised as follows. This chapter introduced the research rationale, research purpose, research objectives, significance of the study and background information about poverty, income inequality and economic growth. Chapter 2 builds on this chapter by providing an overview of the literature on poverty determinants and income inequality. Chapter 3 presents the research methodology, including the econometric models of consumption, poverty incidence and poverty intensity, and the method of decomposition for income inequality. Chapter 4 provides a descriptive analysis. Chapters 5, 6 and 7 present model estimation results and discussion. The final chapter summarises the study's major findings. It provides policy recommendations, discusses the study's limitations and offers recommendations for future studies.

Chapter 2

Literature Review

2.1 Overview of the Literature on Economic Growth, Poverty and Inequality Reduction in Vietnam

2.1.1 Economic Reforms and Growth in Vietnam

In the second half of the 20th century, Vietnam was a poor country, ravaged by wars against foreign aggressors that lasted many years (Fritzen, 2002; Vandemoortele & Bird, 2011). In the early 1980s, the Vietnamese economy fell into a severe recession as a result of war, hyperinflation, the loss of financial aid from the socialist countries and weaknesses associated with economic mechanisms related to a centrally planned management. Consequently, Vietnamese standards of living declined significantly. The country faced serious food shortages and there was widespread famine (Kolko, 2008). To confront these difficulties, the Vietnamese government implemented new economic reforms in 1986; these were known as the "Doi Moi" policies (Tarp, 2017). Since then, Vietnam has made tremendous progress, especially in its transition from a centrally planned economy to a market-based economy via the Sixth Congress of the Vietnamese Communist Party in 1986. The Doi Moi policies have helped Vietnam to quickly reduce its poverty levels and build an industrialised economy. They have also helped it achieve high economic growth coupled with relatively high levels of economic equality (Litchfield & Justino, 2004). Since 2009, Vietnam has been considered a lower middle-income country (Dang, 2011).

With the adoption of the Doi Moi reforms, the Vietnamese government focussed on the development of agriculture. The introduction of the Land Laws in 1988 and 1993 (amended in 2001 and 2003), have led to the redistribution of agricultural land, the freeing up of the agricultural land market, the privatisation of land use rights and the issuing land use certificates (Kompas et al., 2012). As a result of the land and market reforms, the agriculture sector has been transformed from a highly centralised collectivised agricultural market to free-market agriculture in a relatively short time (Dalila & Joe, 2010). Indeed, the laws have created production motivations and incentives for farmers. They have contributed to the increased production of agricultural goods and the diversification of rural incomes. In 1986, Vietnam imported nearly half a million tons of rice. As a result of the new Land Laws, the country has today become the second-largest rice exporter in the world (Kompas et al., 2012).

Since Doi Moi, Vietnam has concentrated on the production of consumer goods and trade. As a result, it has attracted foreign investment (Nguyen & Yuqing, 2008). Opening its economy to the world market and diversifying multilateral foreign economic relations has enabled Vietnam to attract and benefit

from foreign investment. Vietnam has applied a two-track approach to trade; some sectors of the economy are open to international markets, others are not. This strategy ensures a good investment environment for foreign investors but protects important national industries (Rama, 2008). As a result of this strategy, foreign direct investment (FDI) rocketed from US$40 thousand in 1986 to US$8 billion in 2010. In 2016, this figure had increased to US$12.6 billion (WB, 2018). The FDI and GDP ratio increased from 0.0002% to 6.14% between 1986 and 2016 (see Table 2.1).

Table 2. 1 General Economic Indicators of Vietnam, 1986-2016

Year	*1986*	*1993*	*1998*	*2002*	*2004*	*2006*	*2008*	*2010*	*2012*	*2014*	*2016*
GDP (Billion US$)	24	36.7	54.7	69.1	79.4	91.3	103.4	115.9	129.6	144.8	164.1
GDP Growth (%)	2.78	8.10	5.80	6.30	7.50	7.00	5.70	6.40	5.30	6.00	6.20
Agriculture	2.99	3.30	3.60	4.20	4.50	3.80	4.70	0.50	2.90	3.40	1.40
Industry	10.94	12.60	8.30	7.20	9.90	7.30	4.10	-9.90	7.40	6.40	7.60
Services	-2.62	8.60	5.10	6.80	7.10	8.40	7.60	-7.60	6.70	6.20	7.00
Share of GDP (%)											
Agriculture	38.10	29.90	25.80	23.00	21.80	20.40	22.20	21.00	21.30	19.70	18.10
Industry	28.90	28.90	32.50	38.50	40.20	41.50	39.80	36.80	37.30	36.90	36.40
Services	33.00	41.20	41.70	38.50	38.00	38.10	38.00	42.20	41.40	43.40	45.50
Openness (%)											
Export/GDP	6.62	28.70	44.80	54.70	59.70	67.70	70.30	72.00	80.00	86.40	93.60
Import/GDP	16.60	37.50	52.20	62.00	73.30	70.60	84.00	80.20	76.50	83.10	91.10
Trade Openness	23.22	66.2	97	116.7	133	138.3	154.3	152.2	156.5	169.5	184.7
FDI/GDP (%)	0.0002	7.03	6.14	3.99	3.54	3.62	9.66	6.90	5.37	4.94	6.14
GDP Per Capita ($)	384	505	697	842	950	1073	1192	1310	1433	1565	1735

Note: GDP and GDP per capita were calculated at 2010 constant prices.
Sources: GSO (2005, 2006, 2011)*;* WB (2018)

In terms of foreign trade, Vietnam joined the ASEAN Free Trade Area (AFTA) in 1995 and the World Trade Organisation (WTO) on 11 January 2007 (Elliott & Ikemoto, 2004; WTO, 2007). Vietnam's participation in these organisations has benefited the country in terms of increasing trade openness. In particular, Vietnam's international trade increased dramatically from 23.22% to 184.7% of GDP between 1986 and 2016 (see Table 2.1). From a marginal player on the international market, Vietnam has strived to become a leading exporter of a number of commodities. With its competitive advantages, in 2016 Vietnam's total export values exceeded US$2 billion. Products included phones, garments, electronics and electronic components, footwear, fishery products, wood and wooden products, coffee, shelled cashew nuts, crude oil, and rice (GSO, 2018b). Likewise, since the Doi Moi reforms, the total volume of imports has increased; it grew from 1.6.6% to 91% of the country's GDP from 1986-2016 (see Table 2.1). Vietnam imports goods and items mainly for production activities; these imports play an important role in enhancing the country's GDP. They accounted for approximately 90% of the total imports from 1986-2005. Imports included machinery and equipment (30%) and raw materials (60%) (Vietnam Institute for Development Strategies, 2008). In 2016, the value of imports of machinery, instruments and accessories constituted 35% of Vietnam's GDP. Imports of

fuel and raw materials were 42% of the country's GDP (GSO, 2018b). Vietnam has taken advantage of opportunities created in the process of international integration to fuel the total value of foreign trade that has brought benefits for most Vietnamese (Jenkins, 2004).

Through industrialisation and modernisation, Vietnam has transformed its economy. The industry and service sectors now contribute more to the GDP than agriculture. Table 2.1 shows that in the late 1990s the agriculture, forestry and fishery sector constituted the largest proportion of the country's GDP; the industry sector contributed the smallest proportion to the country's GDP. However, in the last three decades, the agriculture's share of GDP fell from approximately 38% to around 18%, becoming the smallest contributor to the GDP. In contrast, the industry and construction, and service sectors are increasingly expanding. In 2016, these two sectors contributed over 80% of the country's GDP.

By renovating the whole country through effective policies, Vietnam has witnessed considerable changes in almost every aspect of the economy. In particular, the country has undergone rapid economic growth, from 2.8% in 1986 to 6.2% in 2016 (see Table 2.1). As with other countries, the 2008 global recession had a negative impact on Vietnam's economy. As a result, the economic growth rate decreased to 5.7% in 2008 and 5.4% in 2012 compared with the high 2004 (7.5%) and 2006 (7%) levels (Abbott & Tarp, 2012). As a result of the achievements in economic growth over the past 30 years, the real output of goods and services is increasing. GDP increased by 600% from 1986-2016; from nearly US$24 billion to US$164 billion (WB, 2018)[10]. In 1986, per capita GDP was only US$384. It increased 5.4 times to US$1,735 in 2016. Overall, the expanding economy has improved Vietnam households' living standards. However, economic growth policies cannot lift all Vietnamese poor out of poverty. Poverty is still a major concern in Vietnam, especially in rural and ethnic minority communes[11]. Another problem that the country contends with, is rising inequality as a result of economic growth[12]. To overcome these problems, Vietnamese policymakers have launched new policies related to poverty reduction and income inequality.

2.1.2 Anti–Poverty Policies and Programmes in Rural and Ethnic Minority Communes in Vietnam

Since the 1990s, the Vietnamese government has shown a strong commitment to poverty reduction via several anti-poverty policies and programmes. In the early 1990s, the government introduced measures to eradicate hunger and reduce poverty in two metropolitan cities, Hanoi and Ho Chi Minh (HCM). In 1998, the government approved the "NTP of HEPR in the 1998-2000 period". In the same year, it also approved Programme 135, designed to assist the poorest ethnic communes in

[10] GDP is calculated in US dollar at 2010 constant prices.

[11] See Section 2.1.4 for further details.

[12] See Section 2.1.5 for further details.

mountainous and isolated areas. Broadly speaking, these two programmes introduced corrective measures to address socio-economic issues amongst the poor and minority ethnic people. In 2002, the government launched a consolidated programme, The Comprehensive Poverty Reduction and Growth Strategy. This programme's aim was to upgrade the living standards of the poor and promote sustainable growth in Vietnam from 2001-2010. During this period, the government launched an additional five NTPs designed to improve the poor's living standards.

During 2012-2015, the government implemented 16 NTPs designed to assist rural and ethnic minority communes in terms of access to healthcare, education, safe water, transport, agriculture and rural development (Decision No. 2406/QĐ-TTg). Though these NTPs operated in the same communes they were run by different ministries. Overlapping financial management and activities, and poor monitoring systems have meant that these NTPs have been ineffective in achieving their aims (WB, 2017a). To deal with these problems, the government merged the original NTPs into two NTPs that were implemented during 2016-2020. The first NTP focuses on New Rural Development (NTP-NRD) that is overseen by the Ministry of Agriculture and Rural Development (MARD). The second NTP is the Sustainable Poverty Reduction Programme (NTP-SPR) managed by the Ministry of Labour, Invalids and Social Affairs (MOLISA), along with the Committee for Ethnic Minority Affairs (CEMA). It manages Programme 135, as a sub-programme of the NTP-SPR. The main objective of these two NTPs is to raise the rural populace's income levels and productivity and reduce the wide socio-economic gap between the rural and urban populations (WB, 2017a). The NTP-NRD was designed to enhance public services and the infrastructure for the entire rural area of the country. The NTP-SPR enhances infrastructure, livelihoods, basic services and capacity building for the most impoverished districts and communes in Vietnam's coastal areas.

2.1.3 Policies to Reduce Inequality in Income, Education and Health in Vietnam

Article 52 in the 1998 Vietnam Constitution pronounces equity among its citizen as a basic but important human right (*The 1992 Constitution of the Socialist Republic of Vietnam*, 1992). This right was consolidated in Article 16 in the 2013 Vietnam Constitution (The 2013 Constitution of the Socialist Republic of Vietnam, 2013). It stresses that every Vietnamese citizen should be treated equally and not discriminated against. However, since the Doi Moi reforms, inequality in general, and economic inequality, in particular, have been steadily increasing in Vietnam (Dang, 2019; Oxfam, 2017). Equitable policies have been gaining more attention. These are designed to reduce inequality and create equity in the country. In the results of the 2014 Vietnam Household Living Standards Survey, GSO (2016) reported that there was a trend of increasing income inequality between the urban and rural populations, between ethnicities, regions and provinces in Vietnam. To close this income gap, the government has implemented new poverty reduction policies (see Section 2.1.2). A rise in the public

spending over time has helped to improve access to public services and ensure that every citizen equally benefits from the economy's growth and development (Hoang et al., 2015; Holsinger, 2007).

Income inequality closely correlates with inequality in education and healthcare that constrain the accumulation of human capital and reduces labour productivity (Gregorio & Lee, 2002; Pickett & Wilkinson, 2015). To mitigate inequality in education and healthcare, the government increased its expenditure on education and healthcare over time. Specifically, the Vietnamese government increased public spending on education from 4.9% of GDP in 2008 to 5.7% of GDP in 2013 (WB, 2020a) The Vietnamese government provides equal educational opportunities for children or free tuition at public primary schools (Glewwe & Patrinos, 1999; Trines, 2017). The government has other support policies such as the policy of exemption and reduction of tuition fees for poor students; funding for educational development for ethnic minority and remote area children and provides scholarships and learning means and materials for disabled children (Dinh, 2017). In addition, the preferential credit programme for students through the Vietnam Bank for Social Policies has enabled millions of students from poor and near-poor households[13] to borrow money for their studies. By 2016, the total loan turnover of the programme reached over VND 56 trillion. Over 3.3 million students have received loans through the preferential credit programme (Dinh, 2017). Recently, with the 2018 Education Law, the government established free tuition for five-year-old children. This policy is designed to encourage parents to send their children to preschool, especially children from low-income families of ethnic minorities (Quynh Trang, 2018).

Similarly, to reduce the disparities in access to public health services, the government has invested more in the national healthcare system. Government expenditure on public health increased from 7.4% to approximately 10% between 1995 and 2012 (Hoang et al., 2015). Government health spending now includes funding for free health insurance cards for children under six years old and the elderly (over 80 years old). Poor and vulnerable groups of people in ethnic minority communes and isolated areas are also provided with free health insurance cards (Article 12 Law on Health Insurance 2014, 2014). The government has also sought to improve access to healthcare for the near-poor, individuals with disabilities and students, by reducing the costs of medical appointments and treatments.

2.1.4 Achievements and Challenges in Poverty Reduction in Rural and Ethnic Communes in Vietnam

In Vietnam, poverty elimination is associated with economic development. As a result of the anti-poverty policies and programmes and the efforts of poor people, Vietnam has an impressive record in poverty alleviation (Thang et al., 2006). Table 2.2 shows that poverty incidence in Vietnam declined

[13] Near-poor households are those that have escaped poverty but are still vulnerable to falling back into poverty (WB, 2012).

significantly, from 58.1% to 14.5% of the total population between 1993 and 2008. From 1993 to 2008 poverty rates have been on a steady decline. Though the average poverty rate decreased by approximately 4.1% per year between 1993 and 1998, it fell by only 2 .1% over the next four years. From 2004 – 2008, it reached only 1.3%[14].

Table 2. 2 Poverty Rate in Vietnam by Urban and Rural, Ethnicity, and Region, 1993-2016 (in %)

Year	*1993*	*1998*	*2002*	*2004*	*2006*	*2008*	*2010*	*2012*	*2014*	*2016*
National	58.1	37.4	28.9	19.5	16	14.5	20.7	17.2	13.5	9.8
Urban	25.1	9.5	6.6	3.6	3.9	3.3	6	5.4	3.8	1.6
Rural	66.4	45.5	35.6	25	20.4	18.7	26.9	22.1	18.6	13.6
Ethnic Majority	53.9	31.1	23.1	13.5	10.3	9	12.9	9.9	6.3	3.1
Ethnic Minorities	86.4	75.2	69.3	60.7	52.3	50.3	66.3	59.2	57.8	44.6
- Urban Ethnic Minorities	NA	NA	NA	NA	NA	NA	36.5	38.1	NA	20.4
- Rural Ethnic Minorities	NA	NA	NA	NA	NA	NA	68.9	61[a]	60.5[a]	47.1[a]
Red River Delta	NA	NA	21.5	11.8	8.9	8.0	11.9	7.5	5.2	2.2
Midlands & Northern Moutains	NA	NA	47.9	38.3	32.3	31.6	44.9	41.9	37.3	28.0
Northern & Coastal Central	NA	NA	35.7	25.9	22.3	18.4	23.7	18.2	14.7	11.8
Central Highlands	NA	NA	51.8	33.1	28.6	24.1	32.7	29.7	30.4	24.1
Southeast	NA	NA	8.2	3.6	3.8	2.3	7.0	5.0	3.7	0.6
Mekong River Delta	NA	NA	23.4	15.9	10.3	12.3	18.7	16.2	9.8	5.9

Notes: a: Authors' calculations using the VHLSS data (2012-2016); NA: Data not available.
Sources: GSO (2016a); WB (2018a)

Vietnamese living standards have improved since 2009 when the country became a lower middle-income nation (Hinsdale et al., 2013). The old poverty line used to identify the poor from 1993-2008 was revised in 2010 (Hinsdale et al., 2013). After adjusting the national poverty line to 653 thousand VND per month in 2010[15], the poor comprised 20.7% of the nation's population (see Table 2.2). Since then, Vietnam has continued to reduce poverty and increase economic growth. The poverty rate decreased to 17.2% and 9.8% in 2012 and 2016, respectively.

Figure 2.1 shows that, from 1993-2016, the incidence of poverty was always higher in rural areas than in urban areas. Specifically, in 2010, the rate of poor people in rural areas was 27% compared with only 6% in urban areas (see Table 2.2). Similarly, in 2016 the poverty rate was 13.6% in rural areas versus 1.6% in urban areas. The speed of poverty alleviation for rural people was slower than for urbanites. From 1993-2008 the poverty rate declined by approximately 5.8%, and 4.8% annually in urban and rural areas, respectively. From 2010-2016, the figures were 12.2% for urban areas and 8.2% for rural areas[16]. Among the six regions in Vietnam, MNM, CH and NCC had the highest poverty rates (see Table

[14] Calculations based on data in Table 2.2.

[15] See Section 2.4 for further details.

[16] Calculations based on data from Table 2.2.

2.2). These three rural and remote regions comprised over 83% of the total Vietnamese poor in 2016 (WB, 2018).

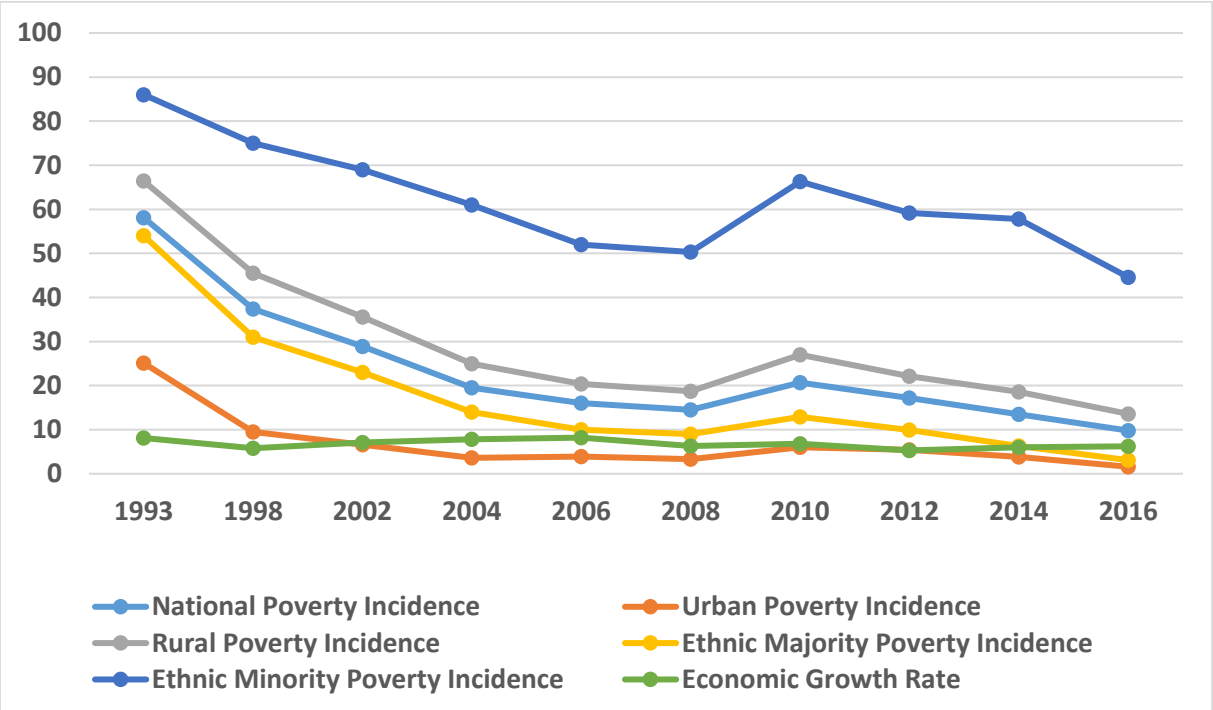

Figure 2. 1 Economic Growth Rate and Poverty Incidence in Vietnam, 1993-2016 (in %)
Sources: GSO (2016a; 2016b; 2017); WB (2018)

Table 2.3 shows that though the rural-urban income and expenditure gap has narrowed, the level of poverty reduction is higher in urban areas than in rural areas. The table demonstrates that the rural poor have not benefited in the same way, economically, from the country's economic development compared with those in urban areas. One reason for the lower urban poverty incidence is that urban households have higher education levels than rural households which generate higher returns to urban households (Nguyen et al., 2007). Most of the rural population are employed in agriculture. Agricultural productivity is the lowest compared with the industrial and services sectors (GSO, 2016a). Moreover, rural poor people confront more disadvantages, such as limited access to vital infrastructure, credit and public services. Likewise, "an urban bias development policy" contributes to poverty reduction in urban areas (Nguyen et al., 2007).

The WB (2018) and Baulch (2010) conclude that the concentration of poverty in rural areas and among the three hinterland regions is the result of disadvantaged geographic location and limited productive resources such as low education level, limited access to financial services and less productive land. These poor endowments inhibit a household's ability to generate earnings and, thus, lead to a reduction in their living standard and welfare. Specifically, rural residents' per capita income and expenditure are lower than those of the urban residents (see Table 2.3). The monthly per capita

income for rural areas in 2016 was VND 2,437 thousand (at current prices) compared with VND 4,368 thousand for urban areas. In 2016, rural residents' per capita expenditure was VND 1,609 thousand, which was only 56% of urban residents' per capita spending.

Table 2. 3 Monthly per Capita Income and Expenditure by Urban and Rural Areas

Year	*1995*	*2002*	*2004*	*2006*	*2008*	*2010*	*2012*	*2014*	*2016*
Monthly Per Capita Income (VND 1,000, at current prices)									
National	206.1	356.1	484.4	636.5	995.2	1378.1	1999.8	2637.3	3049.0
Urban	452.8	622.1	815.4	1058.4	1605.2	2129.5	2989.1	3964.5	4368.0
Rural	172.5	275.1	378.1	505.7	762.2	1070.4	1579.4	2038.4	2437.0
Monthly Per Capita Income (VND 1,000, at constant prices 2010*)									
National	450.7	715.1	875.9	988.4	1159.9	1378.1	1544.2	1836.6	2038.1
Urban	990.3	1249.2	1474.5	1643.5	1870.9	2129.5	2308.2	2760.8	2919.8
Rural	377.3	552.4	683.7	785.2	888.3	1070.4	1219.6	1419.5	1629.0
Monthly Per Capita Expenditure (VND 1,000, at current prices)									
National	170.0	294.0	397.0	511.0	792.0	1211.0	1603.0	1888.0	2016.0
Urban	364.8	498.0	652.0	812.0	1245.0	1828.0	2288.0	2613.0	2886.0
Rural	143.4	232.0	314.0	402.0	619.0	950.0	1315.0	1577.0	1609.0
Monthly Per Capita Expenditure (VND 1,000, at constant 2010 prices*)									
National	371.8	590.4	717.9	793.5	923.1	1211.0	1237.8	1314.8	1347.6
Urban	797.8	1000.0	1179.0	1260.9	1451.0	1828.0	1766.8	1819.6	1929.1
Rural	313.6	465.9	567.8	624.2	721.4	950.0	1015.4	1098.2	1075.5
Urban to Rural (Times)									
Income	2.63	2.26	2.16	2.09	2.11	1.99	1.89	1.94	1.79
Expenditure	2.54	2.15	2.08	2.02	1.96	1.92	1.74	1.66	1.79

Note: *: Authors' figures calculated by dividing the monthly per capita income and expenditure (at current prices) by the GSO's annual CPI with the base year 2010.
Sources: GSO (2002, 2016, 2017)

The WB (2018) and Baulch (2010) conclude that the concentration of poverty in rural areas and among the three hinterland regions is the result of disadvantaged geographic location and limited productive resources such as low education level, limited access to financial services and less productive land. These poor endowments inhibit a household's ability to generate earnings and, thus, lead to a reduction in their living standard and welfare. Specifically, rural residents' per capita income and expenditure are lower than those of the urban residents (see Table 2.3). The monthly per capita income for rural areas in 2016 was VND 2,437 thousand (at current prices) compared with VND 4,368 thousand for urban areas. In 2016, rural residents' per capita expenditure was VND 1,609 thousand, which was only 56% of urban residents' per capita spending.

Ethnic minority poverty remains a serious social dilemma in Vietnam (Nguyen et al., 2012). Vietnam has made remarkable progress in decreasing its poverty rate, but ethnic minorities have seen less progress than the rest of Vietnam's populace. Table 2.2 shows the poverty incidence of ethnic minorities has always been higher than the ethnic majority from 1993-2016. From 1993 to 2008, the risk of being poor amongst ethnic minority groups declined on average by 4.8% annually; the

corresponding figure for the ethnic majority was over 33%[17]. From 2010, after adjusting the national poverty line, the poverty rate of ethnic minorities remained at a higher level than the ethnic majority. Ethnic minority communes experienced a steep decline in poverty (poverty for this group decreased by 21.7%) from 2010-2016. In contrast, the share of the ethnic minority poor relative to the overall total poor of the country sharply increased from 47% in 2010 to 73% in 2016 (WB, 2018). For the economic welfare differential, the 2012 per capita income of ethnic minorities was only half that of the ethnic majority (Bui et al., 2017). Between 2010 and 2016, the ethnic minorities' per capita expenditure was always lower than the Kinh/Hoa's (see Figure 2.2). Ethnic minorities' spending was only 41 to 45% of that of the ethnic majority during the same period (WB, 2018d).

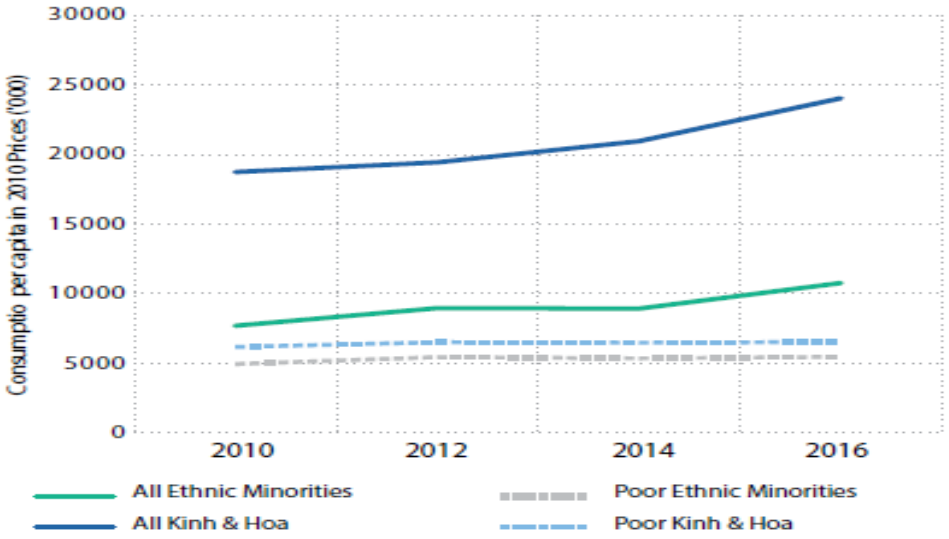

Figure 2.2 Annual Real Per Capita Expenditure by Ethnicity in Vietnam, 2010-2016 (VND 1,000, at constant 2010 prices) (From WB, 2018, p. 11)

The problem of ethnic minority poverty in Vietnam is confined to those living in rural locations because rural areas are home to most of the ethnic minorities (90%) (Phung et al., 2016). Moreover, the poverty incidence rate for rural ethnic minorities is much higher than for their urban counterparts. In 2016, the poverty incidence of rural ethnic minorities (51%) was much higher than that of urban ethnic minorities (20.4%) based on the data in Table 2.4. Specifically, most rural ethnic minority poor live in three regions, MNM, CH, and NCC (Hinsdale et al., 2013)[18]. In 2010, ethnic minorities living in the MNM region had the highest poverty incidence of 67.3% (Nguyen et al., 2017), and though they accounted for only 7% of the total population, they constituted 25% of Vietnam's poor.

[17] Calculations based on data from Table 2.2.

[18] In 2015, the ethnic minority population was 13.4 million people in which 6.7 million ethnic minorities resided in the MNM region (Phung et al., 2016). Two regions, the CH and the NCC had about 2 and 1.9 million ethnic minority people, respectively. The remaining population lived in the South (Phung et al., 2016).

Table 2. 4 Number and Distribution of the Poor in Vietnam (in 2016)

	Number of People*		***Number of Poor People***		***Poverty rate** (%)*
	Persons	*%*	*Persons*	*%*	
National	93,099,357	100	9,123,737	100	9.8
Urban	30,377,625	33	486,042	5.3	1.6
Rural	62,721,732	67	8,637,695	94.7	13.6
Ethnic Majority	79,134,454	85	2,469,855	27.1	3.1
Ethnic Minorities	13,964,903	15	6,653,882	72.9	44.6
Where:					
- ***Urban Ethnic Minorities***	1,536,139	11	313,372	4.7	20.4
- ***Rural Ethnic Minorities***	12,428,764	89	6,340,510*	95.3	51.0*

Note: * Authors' figures based on data from the WB (2018)
Source: WB (2018)

Poverty incidence varies among ethnic minority groups in Vietnam[19]. In 2009, in the largest ethnic minority group, approximately 50% of the poor resided in the MNM region (Hinsdale et al., 2013). In particular, the Hmong had the highest poverty incidence rate (93%), followed by the Dao (75.6%). The San Diu had the lowest rate (37.5%). The second poorest region in Vietnam, CH, is home to the Gia Rai, Ede, Ba Na and Xo Dang. In 2009, their poverty incidences ranged from 75-91%. In 2009, the Khmer (43%) and Cham (57%), who tend to live in the lowlands in the Mekong River Delta (MRD), and the NCC, had lower poverty incidences than the ethnic minority groups in the MNM and CH regions.

Recently, Vietnamese authorities have implemented numerous policies aimed at reducing poverty in the minority groups, such as Programme 135 and the HEPR programme. Although ethnic minorities have received substantial assistance from the government and donors, they benefit less from socio-economic development in Vietnam than the ethnic majority (Hinsdale et al., 2013; WB, 2009). According to the WB (2009, p. 59) report, six specific "pillars" of weakness have meant that those in the ethnic minority remain poor: "lower levels of education; less mobility; less access to financial services; less productive lands; lower market access; and stereotyping and other cultural barriers." As a result of these disadvantages, the ethnic minorities' living standards are much lower than those of the majority: this widens the gap between the majority and minority populations in terms of well-being (WB, 2009).

Vietnam's record of poverty reduction reveals successes, not only in the total number of poor but also in terms of the poverty gap and severity of poverty. The poverty gap indicates the prevalence of the minimum cost to the maximum cost of deprivation alleviation whereas poverty severity (P_2), which is the squared poverty gap, gives more weight to poorer people. Table 2.5 shows that the poverty gap

[19] The population sizes of ethnic minority groups are unequal. Tay, Thai, Muong, Khmer, Nung and Hmong are major ethnic minority groups with over 1 million people in each group in 2015 (Phung et al., 2016). In contrast, the three groups O Du, Brau, Ro Mam have the least population with fewer than 500 people for each group (Phung et al., 2016).

and poverty severity have been decreasing in Vietnam since 1993. Increases in per capita income and expenditure have helped reduce the intensity and severity of poverty in Vietnam (see Table 2.3). In particular, between 1993 and 2016, the national poverty gap dropped from 18.5% to 2.6%.

Table 2. 5 Poverty Gap and Poverty Severity in Vietnam, 1993-2016 (in %)

Year	*1993*	*1998*	*2002*	*2004*	*2006*	*2008*	*2010*	*2012*	*2014*	*2016*
					Poverty Gap					
National	18.5	9.5	7	4.7	3.8	3.5	5.9	4.5	3.7	2.6
Urban	6.4	1.7	1.3	0.7	0.8	0.5	1.4	1	0.8[a]	0.4[a]
Rural	21.5	11.6	8.7	6.1	4.9	4.6	7.8	5.9	5.2[a]	3.6[a]
Ethnic Majority	16	7.1	4.7	2.6	2	1.7	2.7	1.9	1.2[a]	0.5[a]
Ethnic Minorities	34.7	24.1	22.8	19.2	15.4	15.1	24.3	19.2	19.2[a]	13.5[a]
					Poverty Severity					
National	7.9	3.6	2.4	1.7	1.4	1.2	2.4	1.7	1.5[a]	1[a]
Urban	2.4	0.5	0.4	0.2	0.2	0.1	0.5	0.3	0.3[a]	0.2[a]
Rural	9.2	4.4	3	2.2	1.8	1.7	3.2	2.3	2.1[a]	1.4[a]
Ethnic Majority	6.4	2.4	1.4	0.8	0.6	0.5	0.9	0.6	0.4[a]	0.2[a]
Ethnic Minorities	17.6	10.6	9.6	8	6.2	6.2	11.3	8.2	8.5[a]	5.7[a]

Notes: Data for the poverty gap and poverty severity from 1993 -2008 were previously available from GSO in 2018 (http://www.gso.gov.vn) but are no longer available. A hard copy of the data is available on request; a: Authors' calculations based on the VHLSS data (2012- 2016).

Source: WB (2018)

However, during this period, the rural poverty gap was always higher than that of the urban poor. In 2012, the rural poor's per capita expenditure was 5.9% below the poverty threshold, compared with 1% for poor urban residents. Similarly, poverty was more severe for ethnic minorities than the ethnic majority. The poverty gap of the ethnic minorities was 19.2% versus only 1.9% for the ethnic majority (see Table 2.5). In terms of differentials in poverty severity, P_2 was 2.3 for the rural households; the corresponding figure for those residing in urban areas in 2012 was only 0.3. The ethnic minorities' P_2 was 8.2, much larger than that of the ethnic majority (0.6).

2.1.5 Increasing Income Inequality in Vietnam

From 1990-2016, Vietnam's GDP growth rate was the second highest in the world after China (Trines, 2017). However, since the Doi Moi reforms, growing income inequality has been a persistent trend. In other words, income is distributed unequally. This comes even though Vietnam is still classified as an economy with a moderate level of income inequality (according to the bottom 40% income share developed by the WB) (GSO, 2016)[20]. The income share of the poorest 40% of the population in the

[20] The "40%" benchmark of income inequality measure proposed by the WB is used to assess income distribution (GSO, 2016). This benchmark assesses the income share captured by poorest 40%. If this share is smaller than 12%, the level of income inequality is high. If it lies from 12% to 17%, the inequality in income occurs at a medium level and if the share is larger than 17%, there is relative equality exists.

gross national income is decreasing (see Figure 2.3). In particular, the lowest 40%'s income share dropped by 3% from 2002 to 2014.

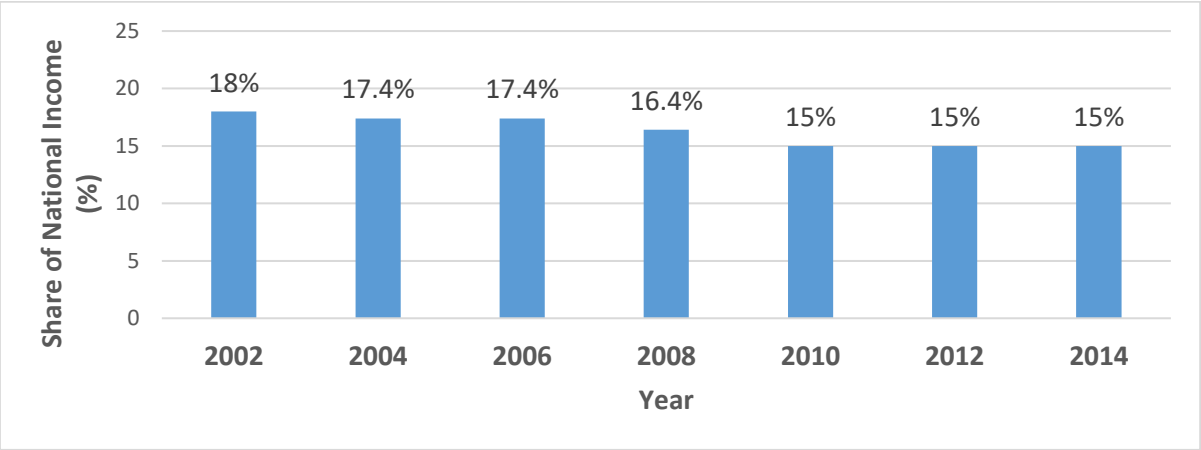

Figure 2.3 The Bottom 40%'s Income Share in Vietnam, 2002-2014

Source: GSO (2016)

Table 2.6 shows that the income gap between the rich and the poor has widened during the last two decades. Though the per capita income of quintile 1 (the poorest) is improving, it has not kept pace with the increased earning of quintile 5 (the richest). Specifically, Table 2.6 shows that the growth of the per capita income of quintile 1 increased by 1.86 times from 1995 to 2016 and quintile 5's income rose threefold. As a result, the poorest continue to lag far behind as the income gap between these two quintiles grows.

Table 2. 6 Monthly Per Capita Income and Expenditure by Income Quintile

Year	*1995*	*2002*	*2004*	*2006*	*2008*	*2010*	*2012*	*2014*	*2016*
Monthly Per Capita Income (VND 1,000, at Constant 2010 Prices*)									
Quintile 1	184.8	216.5	256.2	286.4	20.5	369.4	395.1	459.5	528.7
Quintile 2	310.2	358.4	434.9	495.6	556.1	668.8	759.9	915	1,026.1
Quintile 3	414.7	504.5	627.0	713.1	815.7	1,000.4	1,158	1,372.9	1,552.1
Quintile 4	566.2	744.6	929.1	1,054.5	1,244.0	1,490.1	1,716.2	1,971	2,243.3
Quintile 5	1,292.6	1,754.4	2,136.3	2,395.7	2,864.8	3,410.2	3,694.6	4,465.7	5,183.8
Monthly Per Capita Expenditure (VND 1,000, at Constant 2010 Prices*)									
Quintile 1	210.2	247.2	289.1	313.9	384.6	499.0	549	576.6	598.9
Quintile 2	299.3	341.7	408.4	444.4	536.1	720.0	795.4	871.2	881.0
Quintile 3	368.9	430.1	531.2	585.8	662.0	914.0	1,025.5	1,101	1,126.3
Quintile 4	421.7	582.3	730.6	810.6	904.4	1,247	1,322.8	1,406	1,473.3
Quintile 5	866.9	1,103.4	1,292.0	1,425.0	1,621.1	2,311.0	2,110.4	2,183.2	2,362.3
Quintile 5 to Quintile 1 (Times)									
Income	6.99	8.11	8.34	8.37	8.94	9.23	9.35	9.72	9.8
Expenditure	4.12	4.46	4.47	4.54	4.21	4.63	3.84	3.79	3.9

Note: * Authors' figures calculated by dividing the monthly per capita income and expenditure (at current prices) by the GSO's annual CPI with the base year 2010.

Sources: GSO (2006, 2016a, 2017)

According to the GSO, the trend of widening income inequality is not only evident across Vietnam but also in rural areas and most regions except the Red River Delta (RRD) and Southeast regions (see Table 2.7). Specifically, from 2002-2016, the national Gini coefficient rose by 4%[21]. More importantly, the rural Gini index climbed sharply (by 13%) over the same period[22]. Income inequality is also emerging in the CH and the MNM where the poverty incidence is highest. Both regions exhibit a substantial rise in income disparity, with the Gini indexes increasing over 7%[23] in 2016 compared with 2008.

Table 2. 7 Income Gini Coefficient in Urban and Rural Areas and Regions in Vietnam, 2002-2016

Year	*2002*	*2004*	*2006*	*2008*	*2010*	*2012*	*2014*	*2016*
Whole Country	0.420	0.420	0.424	0.434	0.433	0.424	0.430	0.436
Urban	0.410	0.410	0.393	0.404	0.402	0.385	0.397	0.402
Rural	0.360	0.370	0.378	0.385	0.395	0.399	0.398	0.407
Red River Delta	NA	NA	NA	0.411	0.408	0.393	0.407	0.407
Midlands & Northern Mountains	NA	NA	NA	0.401	0.406	0.411	0.416	0.430
Northern & Coastal Central	NA	NA	NA	0.381	0.385	0.384	0.385	0.390
Central Highlands	NA	NA	NA	0.405	0.408	0.397	0.408	0.436
Southeast	NA	NA	NA	0.410	0.414	0.391	0.397	0.399
Mekong River Delta	NA	NA	NA	0.395	0.398	0.403	0.395	0.403

Sources: GSO (2016, 2017, 2018)

Table 2.8 shows the income levels and income gaps for the regions and provinces. The national income is unevenly distributed among the regions with the highest per capita income levels in the Southeast and the RRD. The MNM, NCC, and CH regions have the lower income levels than other regions (GSO, 2016, 2017). From 2008-2016, MNM was the poorest region because the region had the lowest per capita income. Though the income of the MNM region is improving, it still lags far behind other regions. Table 2.8 shows that, from 2008-2016, the income gap between the Southeast, the richest region in Vietnam, and MNM varied between 2.2 and 2.7 times.

Of the provinces, Hanoi and HCM, the key metropolitan areas, had the highest income levels (Nguyen et al., 2013). In contrast, Lai Chau, Nghe An and Kon Tum located in Vietnam's the poorest regions remained in the tail of the country's income distribution (see Table 2.8). The income gaps between HCM and Lai Chau were between 4.2 and 5.3 times from 2008-2016. Meanwhile, the income gap between Hanoi, Vietnam's capital, and Lai Chau were between 3.1 and 3.8 times. The reason for the highest development levels in these two biggest cities is that they are urban centres. These cities attract substantial industrial capital and highly educated, skilled workforces. Their local economies are

[21] Calculations used data from Table 2.7.

[22] Calculations used data from Table 2.7.

[23] Calculations used data from Table 2.7.

driven by the manufacturing and services sectors (Epprecht et al., 2011; Phan & Coxhead, 2010). In contrast, Lai Chau, Nghe An and Kon Tum are located mostly in rural and hinterland areas. The locals typically have a low education level and skills, and are mostly employed in agricultural jobs. This means that these provinces have the lowest average incomes (Phan & Coxhead, 2010).

Table 2. 8 Monthly Per Capita Income in Regions and Selected Provinces in Vietnam

Year	***2008***	***2010***	***2012***	***2014***	***2016***
Monthly Per Capita Income (VND 1,000, at Current Prices)					
National	**995.2**	**1378.1**	**1999.8**	**2637.3**	**3049**
Red River Delta	**1064.8**	**1580.4**	**2350.6**	**3264.9**	**3610**
Where: - Hanoi	1296.9	2012.9	2944.9	4112.7	5057
- Ha Nam	740.4	1150.2	1753.9	2198.0	2814
Midlands and Northern Mountains	**656.7**	**904.6**	**1258.4**	**1613.4**	**2033**
Where: - Thai Nguyen	850.7	1149.4	1747.1	2238.5	3023
- Lai Chau	414.2	566.8	758.0	987.0	1314
Northern and Coastal Central	**728.2**	**1018.0**	**1505.2**	**1982.3**	**2432**
Where: - Da Nang	1366.6	1897.2	2865.2	3611.5	4369
- Nghe An	639.9	919.6	1366.6	1582.7	1818
Central Highlands	**794.6**	**1087.9**	**1643.3**	**2008.5**	**2562**
Where: - Lam Dong	903.9	1257.2	1848.4	2498.9	2963
- Kon Tum	663.9	947.2	1294.4	1587.0	1947
Southeast	**1773.2**	**2304.3**	**3172.8**	**4124.9**	**4485**
Where: - HCM	2191.7	2737.0	3652.7	4839.7	5481
- Binh Phuoc	1195.3	1525.7	2217.6	2692.9	3132
Mekong River Delta	**939.9**	**1247.2**	**1796.7**	**2326.8**	**2798**
Where: - Can Tho	1130.8	1540.4	2324.9	2672.6	3347
- Tra Vinh	772.2	1088.8	1397.9	2098.2	2213
- Soc Trang	728.3	1028.5	1323.6	1912.9	2536
Income Gap (Times)					
Southeast/Midlands and Northern Mountains	2.7	2.5	2.5	2.6	2.2
HCM/Lai Chau	5.3	4.8	4.8	4.9	4.2
Hanoi/Lai Chau	3.1	3.6	3.9	4.2	3.8

Sources: GSO (2016, 2017)

There are many reasons why income inequality has been increasing in Vietnam since 1995. According to the GSO (2012), most of the poor work in the agriculture sector, which is associated with low and unstable income. In contrast, richer households earn higher incomes than the less well-off because they have more family members working in other occupations (not agriculture). Oxfam (2017) reported that economic growth seemed to create more benefits for the rich in Vietnam. Another reason for the increasing gap between the rich and poor gap is that poor households often have large families, low education levels and a lack of appropriate work skills (GSO, 2016). Furthermore, most poor people live in areas where there is a lack of infrastructure. In contrast, in urban and high socio-economic areas, people tend to have smaller families, higher education levels and vocational skills.

They also work in the industry and service sectors which means they have higher incomes and hence a better living standard (Benjamin et al., 2017; Nguyen et al., 2007). Oxfam (2017) reported that rising inequality was the result of unfairly distributed public resources; the poor often do not have access to public services such as education and healthcare. Many poor households are unable to invest in their children's education or afford general healthcare. Accordingly, the less well-off lack opportunities to accumulate human capital (Cao & Akita, 2008). Inequality in learning opportunities and healthcare impairs the poor's capacity to earn income (Benjamin et al., 2017). Thus, in Vietnam, the poor become poorer, and the rich become richer.

2.2 A Definition of Poverty

Poverty may be defined as the deprivation of well-being. Poverty can be explained in monetary terms (expenditure or income) and non-monetary terms (access to services, education, healthcare, social capital and curtailing risk, vulnerability and social exclusion). For the economic aspect, poverty is typically understood as deprivation in terms of expenditure or income. Poverty can also include a person's ability to "function in society" (Haughton & Khandker, 2009, p. 2); those with little/no education or poor health are more likely to be poor.

Poverty is also measured in absolute and relative terms. The UN (1995, p. 41) outlines absolute poverty as:

> "a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to social services.

As this definition suggests, absolute poverty is a state where individuals lack the minimum level of income necessary to cover basic living needs over a prolonged period. A person is identified as poor if his/her income is below the poverty line (Haughton & Khandker, 2009). Benchmark standards for absolute poverty are homogenous among countries. In 1990, the WB benchmarked the global absolute poverty line as those living on less than US$1 a day (using PPP exchange rates) (Ravallion et al., 2009). They subsequently adjusted this to US$1.90 a day in 2015 (WB, 2018b). In 2018, the bank used two different absolute poverty lines to measure poverty rates in two country groups: 1) US$3.20 a day for the lower-middle-income countries, and 2) US$5.5 a day for the upper-middle-income nations (WB, 2020b).

The meaning of poverty can be expanded from an absolute level to a relative level. Townsend (1979) defined relative poverty in the following manner:

> "Individuals, families and groups in the population can be said to be in poverty when they lack the resources to obtain the types of diet, participate in the activities and have

> the living conditions and amenities which are customary or are at least widely encouraged or approved, in the societies to which they belong. Their resources are so seriously below those commanded by the average individual or family that they are, in effect, excluded from ordinary living patterns and activities (p. 31).

Besides identifying a shortage of resources for living, Townsend also emphasised the concept of social participation. Relative deprivation exists when individuals "cannot obtain, at all or sufficiently, the condition of life – that is, the diets, amenities, standards and services – which allow them to play the roles, participate in the relationships and follow the customary behaviour which is expected of them by virtue of their membership of society" (Townsend, 1993, p. 36).

Scholars often use relative poverty to compare incomes for the bottom quintile and the better-off quintile of the populace (Förster, 1994). For example, relative poverty is often used to determine how many people in a given society live on earnings below half the median income (Haughton & Khandker, 2009). Though absolute poverty refers to the failure to satisfy the minimum requirements for the maintenance of basic human life, relative poverty refers to an individual's inability to participate in community and social activities (Mowafi & Khawaja, 2005). Moreover, relative poverty expresses the degree of respect an individual command compared with others from the same community and society (Sen, 1983; WB, 2020).

The UN (1995) adopted a definition of overall poverty. If absolute poverty focuses on poverty in regards to the lowest acceptable level of well-being, overall poverty is viewed as a broader concept, which considers many factors that lead to deprivation. Overall poverty is comprised of factors like a

> "lack of income and productive resources to ensure sustainable livelihoods; hunger and malnutrition; ill health; limited or a lack of access to education and other basic services; increased morbidity and mortality from illness; homelessness and inadequate housing; unsafe environments and social discrimination and exclusion. It is also characterised by a lack of participation in decision-making and in civil, social and cultural life (UN, 1995, paragraph 19, p. 38).

UN (1995) also reported that overall poverty can occur as a result of serious macroeconomic instability like an economic recession. Besides conflict, natural disasters are key characteristics of poverty. Poverty can occur for those who are unemployed or have low-paid jobs or lose their family support and it is impossible to reach social safety nets (UN, 1995).

Amartya Kumar Sen, Nobel Prize winner in welfare economics in 1998, provided a broader view of poverty. He defined poverty as a shortage of opportunities to participate in the selection process of community development (Sen, 1999). From Sen's point of view, poverty is linked to the distribution of

opportunities in a society (Alkire, 2005; Hick, 2012). Poor people are deprived of opportunities to take part in community development and their ability to meet their basic needs. As a result, they often have low levels of self-confidence, feel powerless and/or do not feel their voices are heard. Specifically, the poor have fewer choices when it comes to health, education, political freedom, social participation, cultural enrichment, and a safe/healthy living environment (Sen, 1999).

2.3 Expenditure Poverty

For the monetary dimension of poverty, many scholars use per capita expenditure to determine the poverty level in developing countries (Achia et al., 2010). This is because consumption reflects a household's or person's ability to obtain material goods such as food, water, shelter, clothing, education, healthcare, and other basic needs. Compared with income poverty, expenditure poverty is likely to have more advantages for data collection and empirical assessment (Coudouel et al., 2002).

Two key measures of well-being are expenditure and income that estimate the monetary extent of poverty. Consumption covers the goods and services that a person consumes or purchases. When measuring poverty by per capita expenditure, a poor person is one who does not have enough to meet their needs (Haughton & Khandker, 2009). Using consumption expenditure to measure poverty has the following advantages: it reflects a household's actual material living standards. Therefore, it directly measures the household's well-being (Mukherjee & Benson, 2003). In cases of income fluctuation, individual or household consumption is a better reflection of well-being and poverty. In some countries, a number of farmers are regarded as self-producers; they are self-employed and consume some of their own goods. It is more difficult to obtain income information from these farmers because of problems with underreporting. This in turn, results in measurement errors (Haughton & Khandker, 2009; Imai et al., 2011; Mukherjee & Benson, 2003). Nevertheless, expenditure is a proper measurement because statistical data on expenditure are usually gathered in detail. Households and individuals can usually recall what they spent, purchased, and consumed over a given time. In short, in developing countries, expenditure poverty can provide a better picture of household welfare.

However, there are also some limitations with only using expenditure to measure poverty. It may be difficult for a person to remember some items that they borrowed or were given through social networks. Another problem is that some types of spending overlap and are difficult to divide or calculate, such as durable goods (Haughton & Khandker, 2009).

Although there are several limitations of monetary poverty measures and the need for alternative approaches such as multidimensional poverty measures, our study focusses on the expenditure poverty because it is the most conventional view of poverty and per capita expenditure is the main indicator of household well-being (Haughton & Khandker, 2009). In addition, our study uses the 2012,

2014, and 2016 VHLSSs data. In these surveys, the GSO consistently conducted and used expenditure poverty to measure the national poverty indices. Therefore, for the consistency of data usage and econometric models estimation, we use the expenditure poverty line to classify the poor and the non-poor. The non-monetary poverty measures are only used by the Vietnamese government since 2016 (Lo, 2019). These measures include healthcare, education, housing, water and sanitation, and information access.

2.4 The Poverty Line

The poverty threshold/line defines who is poor and who is not (Demombynes & Vu, 2015). There are two poverty thresholds: relative and absolute poverty. The relative poverty line is used to measure poverty in developed countries whereas the absolute poverty line is commonly used in developing countries (West, 2014). The former is used to define the relatively poor. For example, in European nations, the poor are those people who earn less than half the average per capita income of the nation's population (Haughton & Khandker, 2009). This benchmark is used to define the relative poor in some Asian countries such as Japan, South Korea and Singapore (McCurry, 2017; Quah, 2015). The relative poverty line can be adjusted as the median income changes. It is also viewed as a measure of inequality. In contrast, the latter is used to define the absolute poor. The absolute poverty line is the minimum income/spending level that is sufficient for a person to maintain the lowest acceptable standard of living (Ravallion, 1992). In other words, the absolute poor are those people who have income or expenditure below the poverty line. According to Ravallion (1992), a country's absolute poverty line is fixed over time. It is a useful tool for assessing the impact of particular policies or projects against poverty over time.

Vietnam currently uses two poverty lines, the General Statistics Office-World Bank (GSO-WB) level and the Ministry of Labour, Invalids and Social Affairs (MOLISA) level, to define the poor. The MOLISA technique considers household income, economic development, budget allocations for anti-poverty measures and the living standards in specific areas of Vietnam. The GSO-WB uses the expenditure poverty line, which does not change across spaces or regions. Also, this figure does not depend on the state budget. The welfare indicator, measured by monthly per capita expenditure, provides a better indication of the poor's living standards over time. It is for this reason that we use the GSO-WB poverty threshold.

Once Vietnam became a lower middle-income nation, the poverty monitoring system and the poverty line established in the early 1990s became outdated (Hinsdale et al., 2013). From 2009, Vietnam introduced a new system to ensure a more accurate measure of household welfare. The GSO and WB also used a new method to measure poverty. The first improvement in the new system involved

reconstructing the expenditure poverty line. Whereas the old poverty line was calculated based on the 1992-1993 VLSS consumption patterns, the new line was calculated based on the household consumption statistics from the 2010 VHLSS. Secondly, consumption calculations were improved by using a new spatial cost-of-living index (SCOLIs). Thirdly, data for measuring the new poverty line were collected from the 2010 VHLSS[24]. Table 2.9 shows that, in 2010, the expenditure poverty line was applied at VND 653,000/month a person or US$ 2.25 (2005 PPP) in both rural and urban locales. The poverty threshold was VND 871,308 and 964,000/month a person in 2012 and 2014, respectively. The poverty line for 2016 was VND 969,167 per person per month. Table 2.9 shows the corresponding yearly poverty lines from 1993 to 2016.

Table 2. 9 Expenditure Poverty Lines in Vietnam, 1993-2016 (Unit: VND 1,000/person)

Year	***1993***	***1998***	***2002***	***2004***	***2006***	***2008***	***2010***	***2012***	***2014***	***2016***
Monthly Poverty Line	97	149	160	173	213	280	653	871	964	969
Annual ***Poverty line***	1,164	1,788	1,920	2,076	2,556	3,360	7,836	10,456	11,563	11,630

Sources: Demombynes & Vu (2015); GSO (2007, 2012); WB (2018a)

2.5 Measures of Poverty

To investigate the determinants of poverty and poverty intensity, we estimated the effects of various factors on poverty and poverty intensity. It is useful to understand how to measure the proportion of the populace falling into poverty and how poor the poor are. This section discusses three poverty indexes developed by Foster et al. (1984). These are the "incidence of poverty", the "poverty gap" and the "severity of poverty". These indexes are given as:

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{Z-Y_i}{Z}\right)^\alpha \qquad (2.1)$$

where: N is the population; Y_i represents per capita expenditure of the *i-th* household; Z is the poverty line (threshold); and q is the number of people with average per capita expenditure below the poverty line.

If α= 0, then $P_\alpha = P_0 = \frac{q}{N}$, is the headcount index (incidence of poverty) which measures the percentage of the population living in poverty. P_0 is the most commonly-used measure of poverty because it is easily understood and simple to calculate. However, P_0 counts only the number of poor people; it does not take into account the intensity and depth of poverty in a country or region. In other

[24] See Section 3.1 for further details about the VHLSS' method of data collection.

words, P_0 just classifies all individuals below the poverty line as poor; it cannot distinguish who is poorer or the poorest in that country or region.

To measure the intensity of poverty, Foster et al. (1984) developed the poverty gap index. If α = 1, then $P_\alpha = P_1 = \frac{1}{N}\sum_{i=1}^{q}(\frac{Z-Y_i}{Z})^1$, represents the "poverty gap or the depth of poverty". This index is used to measure the distance between the poor's expenditure and the poverty threshold. P_1 takes a value between 0 and 1. A larger poverty gap means more severe poverty. The non-poor have a zero poverty gap. P_1 is more effective for measuring poverty than P_0 because P_1 reflects the extent of poverty and the distribution of the poor under the poverty benchmark. P_1 can be used by states to determine how much they must spend to lift the poor out of poverty or above the poverty line. However, this measure of poverty does not consider differences in the severity of poverty because it gives equal weight to each individual's poverty gap.

If α= 2, then $P_\alpha = P_2 = \frac{1}{N}\sum_{i=1}^{q}(\frac{Z-Y_i}{Z})^2$, represents the mean value of "squared poverty gap" of each poor person. P_2 is called "poverty severity." This indicator refers to the inequality among the poor in which a higher weight is assigned to the poor who are further away from the poverty line (Coudouel et al., 2002).

2.6 Measures of Income Inequality

Inequality is related to poverty. Whereas poverty emphasises poor populations, inequality is a broad phenomenon and focuses on an entire population (Haughton & Khandker, 2009). There are many measures used to calculate inequality. This study uses two common types of index to measure income inequality: (1) the Gini coefficient and (2) the Generalised Entropy index. The former index is the most common measure of income inequality; it is closely linked to the Lorenz curve (Gastwirth, 1972). The latter index is less common than the former, but satisfies all six criteria for decomposing income inequality (Haughton & Khandker, 2009).

2.6.1 The GINI Coefficient

To analyse income inequality in Vietnam, we used the Gini coefficient to compare the income distribution of households in different areas of Vietnam. This coefficient, formulated by Corrado Gini in 1992, is also called the Gini index (Cerian & Verme, 2012). The index synthesises income distribution into a single value to indicate a region or nation's income inequality. This coefficient is estimated using the Lorenz curve (Lorenz, 1905). The shape of this curve reveals the distribution of income (how income is distributed among individuals in society). The Lorenz curve maps the cumulative income/expenditure share and accumulative population share. Figure 2.4 shows the Gini coefficient as the area A (created by a Lorenz curve and the 45^0 line) divided by the area of A and B (the area of

the right triangle below the 45^0 line) (Giovanni Bellù & Liberati, 2005). The Gini coefficient (G) is calculated as:

$$G = \frac{\text{The area of A}}{\text{The area of A and B}} \qquad (2.2)$$

$$G = 1 - \sum_1^N (F_i - F_{i-1})(Y_i + Y_{i-1}) \qquad (2.3)$$

where: F_i- equals the cumulative population share of i^{th} person; and Y_i- equals the cumulative expenditure/income share of i^{th} person. $0 \leq G \leq 1$.

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Figure 2. 4 The Gini Index and the Lorenz Curve (From Giovanni Bellù and Liberati, 2005). (https://www.researchgate.net/publication/51024658_Charting_Income_Inequality_The_Lorenz_Curve)

The Lorenz curve depicts the distribution of income. If everyone has an equal income, the Lorenz curve becomes the equidistribution line (the 45^0 line). If the area A = 0 then the Gini coefficient = 0. Such a result indicates complete equality or suggests that there is no inequality in society. In contrast, if only one person gets 100% of the whole income, the Lorenz curve's shape is created by the right triangle below the 45^0 line. Therefore, the area A = 1/2, and the Gini coefficient = 1, which indicates that there is complete inequality.

In practice, a typical Lorenz curve has a convex shape. The more convex the curve is, the more unequal the distribution is. In this case, area A is more than 0 and less than ½. So, $0 < G < 1$. The higher the coefficient, the higher the degree of inequality in the society.

Though G is the best-known measurement of income inequality, it is not perfect (Kang & Imai, 2012). Among the six criteria of a good measure, G satisfies five of them: it does not satisfy the criterion of decomposability (Haughton & Khandker, 2009). In particular:

- Mean independence: by increasing all incomes by the same percentage, the measure will not change. G has this property.
- Population size invariant: when the population changes, the measure's size will not be affected. G also satisfies this criterion.
- Symmetry: when two individuals swap their incomes, the measure does not change. G has this property.
- Pigou-Dalton's transfer principle: if the income of rich people is transferred to the poor, the degree of inequality decreases. G is satisfactory under this criterion.
- Decomposability: inequality can be distinguished by separate groups of people or income sources or ethnicities. It is difficult to decompose the Gini coefficient into different groups. The reason is that the overall size of G is unequal to the value calculated by summing the Gini indexes of the subgroups.
- Statistical testability: we can check the significance of variation in the index across time. However, this issue is not as serious as it used to be because using bootstrap techniques we can create the confidence interval.

2.6.2 Generalised Entropy Indexes

The GE indexes are the most widely used measures of income inequality because they meet all criteria (Haughton & Khandker, 2009). GE takes the following form (Haughton & Khandker, 2009; Shorrocks, 1980):

$$GE_\alpha = \frac{1}{\alpha(1-\alpha)}\left[\sum_{i=1}^{N}\frac{1}{N}\left(\frac{Y_i}{\bar{Y}}\right)^\alpha - 1\right] \quad \alpha \neq 0, 1 \qquad (2.4)$$

$$GE_0 = \frac{1}{N}\sum_{i=1}^{N} log\left(\frac{\bar{Y}}{Y_i}\right) \quad \alpha = 0 \qquad (2.5)$$

$$GE_1 = \frac{1}{N}\sum_{i=1}^{N}\frac{Y_i}{\bar{Y}} log\left(\frac{Y_i}{\bar{Y}}\right) \quad \alpha = 1 \qquad (2.6)$$

where: GE_α represents the family of GE indexes of income inequality. GE has a zero as its lower limit and infinity as its upper limit. 0≤GE≤∞.

The parameter α denotes the weight given to distances between incomes in the income distribution parts. It can take any real value. When α decreases, GE reacts more to transfers/changes in income in the right-skewed tail of the distribution. In contrast, GEs are more reactive to transfers/changes in income in the left-skewed tail as α increases; α=0; 1 and 2 are the most common values used.

GE_0 is called a "Theil's L" index if $\alpha = 0$ (Haughton & Khandker, 2009). Y_i represents the income of the individual *i* in the total sample N; $\bar{Y}$ represent the average income of the total sample. GE_0 uses the

population shares as weights; thus, it is more sensitive to changes in the lower parts of the income distribution.

GE_1 is known as a "Theil's T" index when $\alpha = 1$ (Haughton & Khandker, 2009; Yanrui, 2013). GE_1 uses income shares as weights. GE_1 gives the same/equal weights to gaps in income across the distribution. Thus, GE_1 is more sensitive to changes in the upper parts of income distribution.

Suppose that N people are grouped into m groups. The GE indexes can be decomposed as follows (Bui et al., 2017; Shorrocks, 1980):

$$GE_\alpha = \sum_{j=1}^{m} \left(\frac{\bar{Y}_j}{\bar{Y}}\right)^\alpha \left(\frac{N_j}{N}\right)^{1-\alpha} GE(\alpha)_j + \frac{1}{\alpha(1-\alpha)}\left[\sum_{j=1}^{m} \frac{N_j}{N}\left(\frac{\bar{Y}_j}{\bar{Y}}\right)^\alpha - 1\right] \quad \alpha \neq 0, 1 \quad (2.7)$$

$$GE_0 = \sum_{j=1}^{m} \frac{N_j}{N} GE_{0j} + \sum_{j=1}^{m} \frac{N_j}{N} log\left(\frac{N_j/N}{Y_j/Y}\right) = L_W + L_B \quad \alpha = 0 \quad (2.8)$$

$$GE_1 = \sum_{j=1}^{m} \frac{Y_j}{Y} GE_{1j} + \sum_{j=1}^{m} \frac{Y_j}{Y} log\left(\frac{Y_j/Y}{N_j/N}\right) = T_W + T_B \quad \alpha = 1 \quad (2.9)$$

$GE(\alpha)_j$ is the GE_α of the *j-th* subgroup. GE_{0j} and GE_{1j} are the "Theil's L" and "Theil's T" indexes for the *j-th* subgroup. *Y* represents the total income of *N* people in the total sample; Y_j represents the total income of N_j people in the subgroup j. $\bar{Y}_j$ represents the average income of all N_j people in the subgroup *j*.

Using Stata 15 software, the income inequality of the total sample is decomposed into two parts in equations (2.7), (2.8), and (2.9). The first part indicates "within-group" inequality and the second shows the "between-group" inequality.

2.7 Causes of Poverty

Poverty is a global phenomenon that exists in both high and low-income economies (UN, 1998). The sources of deprivation are numerous, changing from region to region, and from nation to nation. However, at the global scale, there are common factors that lead to poverty, such as geographic causes, and climate risks (McGrath, 2013; WB, 2020), unintended consequences of economic expansion, coupled with a lack of individual and government responsibility (Shah, 2011).

Poverty is apparent in the areas where there are geographic and natural challenges. Mountainous and remote areas, less productive land, extreme weather, and poor infrastructure systems all contribute to high levels of poverty. Consequently, people in these areas have higher vulnerability because of external influences, such as limited scope to increase production, issues accessing basic public services

and resource endowments, and ineffective governments (Bird et al., 2002). Additionally, obstacles and challenges associated with geographic and natural characteristics make it more difficult for governments and organisations to help poor people to improve their livelihoods and living conditions. Therefore, poor people often face many difficulties in their attempts to escape poverty.

Although economic growth in many countries has meant significant progress in poverty alleviation, its negative externalities have extended the rich-poor gap and raised relative poverty (Glewwe et al., 2004; Hinsdale et al., 2013). Yapa (1996) argued that poverty can be alleviated by economic development that creates jobs and increases the poor's income. However, Yapa also showed that the poor experience conditions of deprivation because of unequal opportunities for advancement initiated by economic growth processes. Similarly, the UN (2013) attributed the constrained accessibility to productive capital, social utilities, and asymmetries in knowledge and markets as major factors that lead to poverty in disadvantaged and marginalised populations.

In Vietnam, poverty is a rural and ethnic minority phenomenon (Hinsdale et al., 2013). Most poor people live in rural, mountainous and remote locations where public investment is limited and the infrastructure is poor (WB, 2012). The limited availability of basic public utilities and chances for employment put rural and ethnic minority people at an extremely high, persistent risk of impoverishment (GSO, 2016). The UN (2013) showed that worldwide income inequality is increasing. This means that efforts to reduce poverty are less effective. To alleviate poverty and help the poor improve their lives, it is essential to have effective policies and strategies that address the problems associated with inequality.

Man-made factors contribute to poverty in the global context. For example, the famine in Ethiopia in the early 1980s was caused by political and economic issues. The regional war between drafted farm workers and the army led to a lack of labourers for cultivation which, in turn, contributed to the famine and poverty there (Gosselin, 2009). As well as natural disasters, such as floods, droughts, earthquakes, tsunamis, or hurricanes, environmentally destructive activities also contribute to poverty. Highly industrialised economies that do not care for the environment add to the air, water, and land pollution. This behaviour has led to global warming, melting polar ice caps and rising sea levels which, in turn, jeopardise the livelihoods of a huge part of the world's population that relies on agricultural production, and whose success hinges on a favourable environment. In short, certain human activities pollute the environment and, in turn, the environment is unable to support human life. This means that many people continue to live in poverty (Duraiappah, 1998).

2.8 The Determinants of Living Standards and Poverty

To estimate monetary measures of poverty, we use expenditure as an indicator of economic well-being (see Section 2.3). The four of key factors identified by prior poverty studies are: the characteristics associated with the household head; the household; the commune; and the region. A number of researchers have tested the effects of these factors on average per capita expenditure and poverty incidence (Dartanto & Nurkholis, 2013; Glewwe, Gragnolati, & Zaman, 2002; Nahar & Arshad, 2017; Nguyen et al., 2013; Tran et al., 2015). The next section summarises the studies on poverty in Vietnam and other countries.

2.8.1 Household Head Characteristics

The household head characteristics are age, gender, marital status, educational attainment and employment. Previous studies provide inconsistent findings on the effect of age on poverty (Casey & Yamada, 2002; Dartanto & Nurkholis, 2013). Casey and Yamada (2002) examined and compared the well-being of older people in the U.S., Japan, and seven other countries in the Europe, in the mid-1990s. Using the Luxembourg Income Study data, the authors illustrated that the spending levels of older people in these countries fell compared with younger people, except for the consumption of particular items. As individuals reach retirement age, they reduce their working hours or leave paid employment. The authors found that the income of elderly people in these countries was 20 to 30% lower than that of the population in the labour force. Elderly people comprised a large portion of the lowest income quintile, especially older women living alone. Elderly people in this study tended to live in smaller households, which prevented them from benefiting from economies of scale[25], consequently, deflating their total disposable income. Between 1994 and 1995 the disposable income of an elderly person living alone was approximately 30% lower than that of a person living with his/her spouse who took advantage of economies of scale. Of the older widows, between 40% and 80% of them were in the poorest income quintile since when their husbands died, they lost this income source (Casey & Yamada, 2002). Casey and Yamada's (2002) study shows that elderly people can easily fall into poverty.

Similarly, Barrientos (2002) analysed the association between age and poverty in developing countries. Based on the structure of the population, groups of the population by age are often categorised by their expenditure. For example, younger people (those under 15 years of age) spend more on studies whereas the elderly spend more on health services. Barrientos concluded that the elderly are more likely to be poorer because of restricted access to social and health insurance. They are also more likely

[25] Large households can take advantage of scale economies in consumption: e.g., through purchasing bulk goods at discounted prices (Nelson, 1988). This helps households reduce their consumption expenditure and, thus, inflates their disposable income. Details of the impact of household economies of scale in consumption are discussed in Section 2.7.2.

to work in the informal sector. In contrast, older people are assumed to be comparatively wealthier than the young because they have spent more years earning and saving for their retirement (Barrientos, 2002).

Pham et al. (2003) showed that older household heads have more work skills and experience that enable them to effectively invest or allocate the household's resources. Working skills and experience can be accumulated over an individual's lifetime and contribute to increased household income and expenditure. Pham et al. (2003) found a negative relationship between age and the possibility of poverty in Vietnam. Ennin et al. (2011) used binominal poverty models to investigate the determinants of poverty in Ghana based on per capita household expenditure. Using data from the Ghanaian Living Standards Surveys 1991/92, 1998/99 and 2005/06, the authors found that a key determinant of poverty was age. In particular, the authors concluded that older household heads were less likely to be poor than younger household heads. In contrast, Dartanto and Nurkholis (2013) used an ordered logit model to test the determinants of poverty status in Indonesia. The authors found that the likelihood of becoming poor is higher as household heads become older. To support this finding, Dartanto and Nurkholis showed that in Indonesia the mean age of the poor tends to be higher than that of the non-poor. Similarly, Mukherjee and Benson (2003) concluded that an increased age of the household head led to declines in the consumption per capita per day; in short, older individuals in rural Malawi are more likely to be poor than younger people.

The relationship between gender and poverty is controversial because the impact of gender on expenditure and poverty is mixed. Mukherjee and Benson (2003) used a multiple regression model to estimate the impact of the factors related to household and commune characteristics on the logarithm of daily per capita expenditure in three regions in rural Malawi: South, North and Central Malawi. They found mixed results for the effect of gender on household welfare. Male-headed households in the southern rural area had lower per capita expenditure than female-headed households. In contrast, the effect of gender on per capita expenditure was opposite for the central rural area. To explain the results, Mukherjee and Benson (2003) showed that disadvantaged male household heads in the southern rural areas had fewer opportunities to engage in wage-paying employment than their counterparts in the central rural areas. For old-age poverty in the U.S., older women suffered disproportionate levels of impoverishment compared with older men (Meyer, 1990). Additionally, as in the WB's "Comprehensive Poverty Reduction and Growth Strategy" (2002), gender inequality adversely affects women's living standards.

The WB (2020) revealed that the impact of gender on poverty is puzzled in countries around the world. In WB (2020), the percentage of women in 2018 among the global poor was higher than that of men. However, this is not so in many high-income nations in the Europe and Central Asia. Chaudhry and

Rahman (2009) showed that the female-male ratio has a significant, negative impact on the likelihood of being poor. Shaffer (1998) found gender does not affect the likelihood of poverty in Guinea based on the consumption poverty measurement. However, using the human poverty and participatory poverty assessments methods, Shaffer showed that women were more likely to fall into poverty than men.

It is also worth considering the effects of marital status on living standards and poverty. Household heads who are single, widowed, divorced or separated may be poorer than married household heads. According to Jayakody et al. (1993), marital status is linked with poverty in the U.S.. The author showed that the percentage of poor single-mother families was much higher than married woman-headed families. Single mother households' average earnings were a third of married-couple families. Using records from the National Survey of Black Americans, the authors found that married mothers had "broader kin networks, including their own families and in-laws". With respect to family support, married mothers tended to receive more "financial assistance" and "emotional assistance (e.g., visiting and companionship)" than never-married mothers. Compared with married households in the study, single-mother households were more vulnerable to adverse shocks and therefore were more likely to be/become poor. The authors found that in an unstable economy, poor single mothers had a much lower probability of obtaining family financial assistance than married mothers (Jayakody et al., 1993). This result also indicates that single mother households have fewer chances to escape from poverty than families where the parents are married.

Ananat and Michaels (2008) investigated how marital dissolution affects single-mother families in the U.S.. Using the 1980 Census data on the living standards of women and children, the authors found that those mothers who were divorced or separated had less household income; single-mother headed households were more likely to become poor. Imai et al. (2011)) found a positive effect of married household heads on the ethnic majority's per capita expenditure in Vietnam. The authors' findings are consistent with Glewwe et al.'s (2004) results that per capita expenditure is significantly higher for parents who are married than those who are not. However, Imai et al. (2011) found mixed results; the married couples variable had a positive, significant effect on the ethnic minorities' poverty but a negative effect on the ethnic majority's poverty. Their findings were based on the 2002 VHLSS data. Dartano and Nurkholis (2013) conclude that marriage protects Indonesian households from being poor. In other words, married households are less likely to be poor than unmarried ones

Per capita expenditure and the probability of living in poverty depend on household heads' education. The direction of the causal relationship between education level and expenditure is not easily determined because causation presumably does not move solely from an independent to a dependent variable (Holland, 1986). Low education levels are often associated high incidence of poverty, but

poverty also leads to low education levels. Thus, conceptually low education levels generate a vicious cycle of poverty. It is assumed that better-educated household heads are less likely to fall into poverty than those who are less educated. Many empirical studies have shown the impact of education level on well-being and poverty (Baulch et al., 2010; Dartanto & Nurkholis 2013; Datt & Jolliffe, 2005; Ennin et al., 2011; Imai et al., 2011; Minot et al. 2006). For example, Imai et al. (2011) found a positive relationship between education and expenditure, with the reverse being true for poverty for both the ethnic majority and minorities in Vietnam. Baulch et al. (2010) compared the education enrolment rate and school dropouts for the ethnic majority with their ethnic minority counterparts. The authors explored why the ethnic majority's average per capita expenditure exceeded that of the main six ethnic minority groups in Vietnam from 1998 to 2006. Similarly, Datt and Jolliffe (2005) concluded that education level has a significant effect on living standards and is vital in poverty alleviation in Egypt. Ennin et al. (2011) showed a higher probability of being poor for illiterate heads than their counterparts who attended school in Ghana. Minot et al. (2006) investigated the determinants of per capita expenditure among rural and urban households in Vietnam using data from the 1997-1998 VLSS and the 1999 PHC. The authors found that the education levels of household heads and their spouses were predictors with strong positive effects on per capita expenditure in both areas (Minot et al., 2003). Regarding poverty reduction policies, Jha et al. (2004) explored the positive influence of public expenditure on education, health and poverty in the Indian States. Using a panel dataset from the National Sample Surveys, the authors estimated poverty and found a poverty-reducing impact for education, especially at the tertiary and vocational level.

Household heads employed in the agriculture sector spend less than those in the industry and service sectors. The agriculture sector depends on the weather. Hence, income from the agriculture sector is often unstable and lower than from the industry or service sectors. Pham et al. (2003) showed that, compared with the industry and services sectors in Vietnam, agriculture has the lowest workforce productivity. Moreover, the productivity gap between the agriculture and industry and services sectors widened during the period of 1986-2001. As a result, households working in the agriculture sector over that period consumed less than those who were employed in other sectors. Datt and Jolliffe (2005) estimated the impact of the employment sector as a determinant of expenditure and poverty of households in Egypt. They used data from the Egypt Integrated Household Survey (1997). They found that the employment had a significant effect on households' per capita consumption in rural areas. Their regression results showed that households employed in other industries (apart from agriculture) had higher levels of per capita expenditure (Datt & Jolliffe, 2005). Ennin et al. (2011) found that household heads employed primarily in agriculture were worse off than people employed in other sectors. Ancharya and Leon-Gonzalez (2012) showed that agricultural wages negatively affect the per capita consumption of Nepalese households. Like with previous research, Dartanto and Nurkholis

(2013) found that the employment sector is linked to the poverty status of Indonesian households. Most poor people in Indonesia work in the agriculture sector; from 2005-2007, 80% of chronically poor households were employed in agriculture versus 45% of the non-poor. Based on their ordered logit model, Dartanto and Nurkholis conclude that households whose heads who work in the agriculture sector were more likely to live in poverty because of low agricultural productivity and low wages (2013).

2.8.2 Household Characteristics

In terms of household characteristics, the most important factors that affect a household's living standards and poverty are place of residence, ethnicity, household size, dependency ratio, working rate, language, residential land and shelter, farmland, durable assets, health status, receiving remittances, access to safe water and electricity source.

The rural population tends to have a lower living standard than the urban population. Poverty is influenced by spatial patterns, especially in rural areas, or remote and mountainous areas (Hinsdale 2013; Imai et al., 2011). Mukherjee and Benson (2003) investigated the contributors to household welfare and poverty status in Malawi. The authors found that the dependency ratio in rural households in Malawi is higher than urban households. In contrast, rural households had lower education levels and fewer members formally employed in the manufacturing, sales and service sectors. Rural households also had limited access to services and basic infrastructure (i.e., health care, electricity, and transport) compared with urban populations. This explains the rural households' lower per capita expenditure and their higher likelihood of falling into poverty.

In Vietnam, poor people often live in rural areas where they experience great disadvantages associated with geographical factors (harsh climate and difficult terrain) and less public investment in education, healthcare, and roads (Minot et al., 2006). A lack of human ability can lead rural people to fall into more severe deprivation than those living in urban areas. Pham et al. (2003) demonstrated that there is a link between rural poverty and farm employment, because of low wages and an unstable income source. Additionally, the rural population is more likely to fall into poverty than its urban counterpart (Pham et al., 2003). Dartanto and Nurkholis (2013) support this finding. The authors argue that adverse shocks, such as fluctuations in agricultural prices or crop losses, mean that those employed in this industry are more likely to be poor.

Another household characteristic is ethnicity. Individuals belonging to ethnic minorities appear to spend less than those who are of the ethnic majority. According to Glewwe et al. (2004), in Vietnam, ethnic minority households have substantially lower well-being than those in the ethnic majority. The authors conclude that low enrollment rates, a higher number of children, and limited access to health

services are the main reasons why ethnic minorities are worse off than the ethnic majority. Van de Walle and Gunewardena (2001) discovered that living in a disadvantaged geographical location is associated with lower per capita expenditure for an ethnic minority than the ethnic majority group in Vietnam. According to the authors, the ethnic minority population often lives in upland, remote areas that have poor infrastructure and a lack of basic public services. Additionally, they live far from market and information centres. Furthermore, ethnic minorities face discrimination in the labour market and have fewer non-farm employment opportunities and limited income sources than the ethnic majority. Because of lower education levels, ethnic minorities' well-being tends to be lower than that of the rest of the Vietnamese population.

Imai et al. (2011) used decomposition analysis to evaluate distinctions in poverty and expenditure of two ethnic groups in Vietnam. They decomposed the differences in expenditure and poverty into two components. First, the household characteristics component that included the impact of educational level, landholding or residential location on expenditure and poverty. Secondly, the structural component is demonstrated by the impact of household characteristics on expenditure and poverty. Their analysis showed that ethnic minorities were poorer than the ethnic majority because they had negative characteristics such as lower education levels and mostly live in the hinterland. The authors found that the positive impact between education and land ownership on poverty incidence for ethnic minorities was less than that for the majority group.

Larger families tend to be poorer than those with smaller families. Ennin et al. (2011) state that poverty is a bigger issue for larger families than it is for smaller families. This is a common finding and has been documented in several studies (e.g., Datt & Jolliffe, 2005; Pham, 2009; Tran et al., 2015). They all found that per capita expenditure decreased with family size. Nkonya (2008) disagrees with this view, asserting that a larger family means a larger labour force: more family members potentially means more labourers and thus a better economic welfare. In addition, household size can enhance economic growth as increased population fuels consumption and a country's GDP. Pham et al. (2003) concur with Ennin et al. (2011) and Nkonya's (2008) results. Pham et al. (2003) point out that larger households (those with more members) often have a greater number of dependents resulting in a higher financial burden on household expenditure. These authors also assume that larger households may have a positive effect on household income and per capita expenditure because these families are able to take advantage of economies of scale. In particular, they can share private goods (food, household equipment or shelter), have increased returns in terms of household production (e.g., decreased cooking time and money spent per person) and through the purchase of bulk of goods at discounted prices (Nelson, 1988). Large households that make use of economies of scale decrease the cost per person and yet obtain the same living standard. As a result, with fixed resources, these households can enjoy more goods and services and increase their consumption per capita. Using a probit model, Pham

et al. (2003) identified that household size has a statistically significant impact on the probability of being poor in Vietnam. Dartano and Nurkholis (2013) agreed with this finding. They found that from 2005-2007 the likelihood of averting poverty declines with family size in Indonesia.

Existing research has investigated the influence of the dependency ratio on per capita expenditure and poverty (Chen & Wang, 2015; Nguyen et al., 2013; Pham et al., 2003; Tran et al., 2015). The dependency ratio refers to the non-working population rate; in Vietnam this includes those under 15 years of age and those who are retired (over 60 or 55 years for men and women, respectively). Pham et al. (2003) note that more dependents generate higher stress between nonworking and working family members thus a higher dependency ratio is associated with a greater risk of becoming poor. They have shown that among the population deciles in Vietnam, the poorest households have the highest number of children. Chen and Wang (2015) echo Pham et al.'s (2003) results. The authors used multilevel logistic regression to investigate the influences on poverty in Taiwan. Chen and Wang (2015) showed that the dependency ratio increases the risk of becoming impoverished in Taiwan (Nguyen et al., 2013). Tran et al. (2015) demonstrated that, in 2010 in the Northwest of Vietnam, the dependency ratio of the ethnic minority poor was nearly double that of the non-poor. In non-poor ethnic minority households, there was one dependent to two working members. In contrast, in the poor ethnic minority households there was one dependent to one working member. Tran et al. (2015) found that a higher dependency rate was associated with a higher likelihood of becoming poor.

In contrast to the dependency ratio, the working rate has a positive relationship with expenditure. The working rate has a poverty-reducing effect since more working family members compared with family size enables a household to earn more income. Nguyen et al. (2013) used a logit model to test the effects of the working rate on income, per capita expenditure and poverty incidence of households in the key metropolitan areas (Hanoi and HCM) in Vietnam. The authors showed that a higher proportion of working members increased per capita income and expenditure leading to a lower risk of poverty for urban households in both cities. To predict whether expenditure and the proportion of working members are related, Nguyen et al. (2010) tested the impact with stepwise regression and found that a higher proportion of working members led to higher per capita expenditure. Similarly, Glewwe et al. (2004) showed that Vietnamese households with a high working population had higher consumption per capita whereas those with more dependents had a lower consumption level. Acharya and Leon-Gonzalez (2012) showed that the number of working-age members positively, significantly impacted Nepalese households' consumption levels. In contrast, the effect of the number of children and elderly people showed the reverse sign. This indicates that households with a higher working member ratio experience lower per capita expenditure compared with households with a smaller ratio.

Apart from the household composition characteristics, language constraint is a factor that negatively influences consumption and poverty. Grafton et al. (2007) posited that the exchange of knowledge using a common language contributes to a country's productivity and GDP, hence it enhances future consumption. The absence of a widely used language can lead to communication barriers in societies. This in turn, inhibits innovative knowledge and the transfer of ideas, as well as productive capital acquisition and productivity. Using an optimal growth model, the authors showed that the greater the language barrier, the lower the accumulation of human and physical capital. Improvements in establishing knowledge links increase the total factor productivity (TFP). The authors used the ordinary least squares (OLS) approach to test the effects of social barriers (language, ethnicity and religion) on human and physical capital stock per worker and TFP. The regression outputs showed that the language impediment negatively affects human and physical stock per worker and the TFP (Grafton et al., 2007). In the growth model, the authors demonstrated that per capita expenditure is a function of human and physical capital and positively depends on such capital stock. Grafton et al.'s (2007) findings indicate that language barriers constrain the establishment of knowledge connections and per capita expenditure.

In their study of Bolivia, Chiswick et al. (2000) found that language plays a role in people participating in the labour market and earning income. There are a number of languages spoken in Bolivia but Spanish is predominantly used in the formal labour market and economic life; ethnic minorities speak many indigenous (native) languages. The authors used OLS to test differences in earnings among three groups of people: those who spoke only Spanish; those who spoke indigenous languages; and those who spoke a mixture of both Spanish and indigenous languages. Using data from the 1993 Bolivian household survey, the authors found that people who could speak only an indigenous language had the lowest earnings whereas those who could communicate in both Spanish and indigenous languages had the highest income. The authors note that indigenous people who are able to speak two languages had lower earnings than the Spanish monolingual communicators. Chiswick et al. (2000) found that the indigenous population, who cannot speak Spanish or with poor Spanish proficiency, faced discrimination in the labour market and received lower wages. Thus, they had a higher likelihood of becoming poor.

Vietnamese is Vietnam's national language. It is used in modern and formal economic sectors (Vasavakul, 2003). One reason that poverty persists in ethnic communes is that many individuals cannot speak Vietnamese (WB, 2009). Ethnic minorities have their own indigenous languages and speak Vietnamese as a second language. In Vietnam, lessons are in Vietnamese. Therefore, ethnic minorities must be fluent in Vietnamese to benefit from public schooling. Proficiency in the national language enables ethnic minorities to trade in the market, to benefit from better employment opportunities (through migration) and to use public services (Vasavakul, 2003; WB, 2009).

Baulch (2010) indicated that an inability to speak the official language affects ethnic minorities' living standard and is associated with poverty in Vietnam. Using OLS estimation, the author regressed the per capita expenditure on a set of explanatory variables related to household and commune characteristics. The author used data from the 1993-1998 VLSSs and the 2002-2006 VHLSSs. Baulch (2010) showed that an inability to speak Vietnamese reduces ethnic minorities' consumption. The author also found a link between lesser Vietnamese language proficiency and a greater probability of becoming poor. In 2006, the rural poverty incidence for ethnic minorities who speak only their mother language was nearly double that of bilingual speakers who could speak both Vietnamese and their native language. The figure was almost eight times as much as the ethnic majority who speak the national language.

Nguyen et al. (2017) tested the effects of language constraints on the ethnic majority and minority populations' per capita expenditure in rural Vietnam. They used data from the 2006 VHLSS. The authors showed that a large share of the interviewed ethnic minorities (30%) experienced difficulty in using Vietnamese to communicate. In particular, they found that language constraints have a direct expenditure-reducing effect for ethnic minorities. Among the rural ethnic minority populace, the per capita expenditure of people requiring interpretation services during the interview sessions was approximately 12% lower than that of people who did not need to use an interpreter. The authors illustrated that an inability to speak Vietnamese impeded the returns to infrastructure utilities, especially in education. A one-year increase in the number of schooling years led to a 1.4% growth in consumption per capita for ethnic minorities who were not proficient in Vietnamese compared with 5.6% for the ethnic majority people whose native language is Vietnamese.

Economic characteristics are considered the determinants of per capita expenditure and poverty include the property and assets that a household owns. The indicators of property and assets include cultivated land, household living area, type/s of toilet, and durable assets such as motorbikes, TVs, and machinery. These indicators represent a household's wealth and positively impact investment opportunities (Haughton & Khandker, 2009; Pham et al., 2003). Cultivated land is an essential resource for household agricultural production. Imai et al., (2011), Krongkaew et al. (2006) and Tran et al. (2015) have all shown that the more cultivated land or farmland that a household owns, the less likely it will be poor. For example, Tran et al. (2015) reported that the poor in the minority groups in Northwest Vietnam have much smaller areas of annual crop and perennial land compared with the non-poor. Their findings indicate that the risk of becoming poor is inversely related to how much land a household owns.

Poor households often lack the capacity to invest in farm and non-farm activities because of their landlessness or they do not have the title to their land (Brandt & Tarp, 2017; Hoang et al., 2014;

Reardon et al., 2000). Using land as collateral, farmers can get loans for farming production or to develop non-farm businesses. Land-poverty and tenure insecurity restrict poor farmers' access to credit (Baiyegunhi et al., 2010; Reardon et al., 2000). Using data from the Vietnam Access to Resources Household Surveys (2006-2014), Brandt and Tarp (2017) showed that in Vietnam having a land use rights' certificate has a positive effect on agricultural investment. The authors reported that owning a land title enhances a farmer's probability of obtaining a loan for an irrigation system and expand the farm's irrigated area. However, poor farmers tend to have lower levels of access to titled land than richer farmers (Brandt & Tarp, 2017). Poor farmers thus face credit constraints and a lack of capital for agricultural production. This reduces farm output and means that poor farmers with unsecured land–use rights are more likely to remain poor (WB, 2009). Farm irrigation positively impacts household expenditure. Nguyen et al. (2017) provided evidence that Vietnamese households' expenditure increases with irrigated annual land area. They used OLS estimation and data from the 2006 VHLSS. Specifically, they showed that the expenditure increasing-effect of irrigated annual land is higher than that of non-irrigated annual land.

Reardon et al. (2000) demonstrated that land as collateral for credit is a determinant of non-farm start up business and diversification of income sources for households in the Philippines. Undertaking non-agricultural activities requires capital to invest in such activities. However, land-poverty is a barrier for non-agricultural investment and income because it impedes a household's ability to borrow from a bank. Inequality in accessibility to scarce land results in the dispersion of non-farm employment opportunities. In Vietnam, non-farm income plays an important role in the total income of rural households (Brandt & Tarp, 2017). Specifically, poor farmers can increase their consumption through the diversification of their income sources from non-farm activities (Hoang et al., 2014). Using data from the 2002-2008 VHLSSs, Hoang et al. (2014) showed that among five expenditure quintiles in Vietnam, the poorest quintile has the lowest income share from non-agricultural income in their total income. The authors argued that land constraint is a factor that affects rural household's non-farm participation. Landlessness is thus correlated with household non-farm income, expenditure and poverty.

Hinsdale et al. (2013) showed that the initial step of a four-step pathway to break the vicious cycle of ethnic minority poverty in Vietnam is shifting subsistence grain production towards cash crop production. To do this, poor farmers need productive factors (labour, capital and land). However, poor farmers lack capital to purchase agricultural inputs and to invest in irrigation that would raise crop productivity. Not every poor farmer can access credit because they lack the collateral required by the banks. Vietnamese ethnic minorities depend on landholding and land title. In contrast, Van de Walle and Gunewardena (2001) criticise that such advice from Vietnamese policymakers that encourage ethnic minorities to grow cash crops is ineffective. The authors show that the poor agroclimatic

condition in upland areas where most Vietnamese poor ethnic minorities live is unsuitable for cash crops and few ethnic minorities have enough financial resources to buy complementary inputs for such crop production. Moreover, they also have less access to roads and markets to sell their products.

Agricultural extension plays an important role in improving household welfare and poverty reduction in rural areas in developing countries (Davis et al., 2011; Dercon et al., 2009; L. A. Hoang et al., 2006). Through agricultural extension activities, farmers can access useful information and new technologies for their agricultural production. They can also receive training on agricultural markets and prices. Dercon et al. (2009) showed that agricultural extension activities have a positive effect on household expenditure growth and poverty reduction in rural Ethiopia. Using panel data from households in 15 Ethiopian villages from 1994 to 2004, the authors reveal that if farmers receive one more visit of agricultural extension worker during the primary/main cultivating season, household expenditure increases by 7.1%. Moreover, the probability of households falling into poverty reduces by 9.5% with an additional visit from an extension advisor. Davis et al. (2011) evaluated the impact of agricultural extension programmes on household income and poverty reduction in rural East Africa. Using panel data from 1,126 participants in the "farmer field schools project" between 1998 and 2008 in East Africa, the authors concluded that participation in the project increased average crop productivity (32%) and the livestock value (14%). Average household income increased by 60% as a result of participating in this programme. Increased income helps alleviate poverty in East Africa (Davis et al., 2011).

Durable goods are considered fixed household assets. According to Jalava and Kavonius (2007), if the consumption of durable goods is considered a component of total household consumption expenditure, an increase in possessions will increase expenditure on durable goods and thus the total household consumption expenditure. In addition, consumption of these items can be seen as a source of investment that generates an income flow or service. For example, housing that households own can produce house rental services and certain types of machines can be hired out. These investments will increase a household's disposable income and, subsequently, future expenditure possibilities. These indicators have a significant effect on poverty. Nguyen et al. (2013) revealed that households with larger living areas have higher income and expenditure; households with a flush toilet or concrete floor have lower odds of becoming poor; and the number of motorbikes per head has a negative effect on poverty. Tran et al. (2015) showed that the total value of durable goods of the non-poor is approximately double that of the poor in ethnic minority groups in Northwest Vietnam. The ownership of more durable assets is linked to a lower risk of being poor.

The health of the household head and other family members is another indicator associated with poverty. Castel (2009) demonstrated that, for poor people in Vietnam, a major constraint in seeking

healthcare is the cost of using such services. Although poor people in Vietnam are provided with health insurance cards, there are still costs that are uncovered and are an extra burden on people already struggling financially. Castel concluded that the poor's inability to pay for uncovered health care expenses is one main reason why they do not use health facilities. The poor seek healthcare only when they are seriously ill. Castel's finding supports Ennin et al.'s (2011) work that Ghanaian household heads who do not consult "health personnel" when they get sick will be poorer than people who visit healthcare facilities. Because of their inability to pay for health consultations, many poor household members do not go to the doctor when they are ill. Consequently, they spend more time recovering from sickness that decreases their work time, productivity and income. Dartano and Nurkholis (2013) showed that the poor in Indonesia suffer from health problems that affect their daily activities, and that the poor spend twice as many days recovering as the non-poor. Using an ordered logit model, the authors posited that the likelihood of being poor rises with the period over which household members are sick. However, people with health insurance are less likely to be poor. Similarly, Nguyen et al. (2013) revealed that in metropolitan areas in Vietnam the percentage of poor people with chronic diseases is higher than for the non-poor, whereas the proportion of non-poor people with health insurance is almost twice that of the poor. The authors conclude that household heads who have chronic diseases tend to be poorer. Nevertheless, Nguyen et al. (2013) revealed that a higher proportion of members with health insurance can help urban people escape poverty in Vietnam.

Remittances are considered a determinant of per capita expenditure and poverty. Nguyen et al. (2013) indicated that households that receive remittances have a lower probability of being poor whereas those with higher borrowings have a higher likelihood of being poor. From the literature, it is assumed that remittances contribute to poverty reduction in many countries. According to Nahar and Arshad (2017), remittances increase migrants' household income, which helps them obtain their basic needs in Indonesia. Households with migrant workers can use the remittances for purposes that improve their economic well-being, such as investment in their children's education or for entrepreneurial purposes. The authors showed that remittances have a negative effect on poverty incidence by testing the relationship between poverty and remittances with other factors (proportion of labour force, GDP per capita, inflation, inequality, and the exchange rate). They used Indonesian remittance data from 1983 to 2015. The authors' finding supports earlier work by Adams and Page (2005), Acharya and Leon-Gonzalez (2012), and Gupta et al. (2009). Adams and Page (2005) evaluated how remittances impacted poverty in 71 developing countries. They provided evidence of the poverty-reducing effect of remittances. The authors used an OLS regression to estimate the effects of per capita international remittances on poverty incidence. Their finding shows that a 10% rise in per capita remittances results in a 3.5% reduction in the likelihood of being poor.

Similarly, Gupta et al. (2009) applied an OLS regression to test how remittances affect poverty at the aggregate level across 76 countries. The authors concluded that the ratio between remittances and GDP negatively affects poverty. Specifically, if the ratio increases by 10%, the poverty headcount decreases by 1%. Obviously, the growth of remittances contributes to poverty reduction. The authors conducted a similar test on 24 Sub-Saharan African countries using the region as a dummy variable in their regression model. However, because of limited observations, the positive effect of remittances on poverty mitigation was statistically insignificant.

Acharya and Leon-Gonzalez (2012) revealed that, in Nepal, the estimated per capita expenditure of households receiving remittances is 6% higher than families that do not receive remittances. Additionally, they found that remittances play a role in alleviating poverty during migration. The authors used a function of household expenditure with the conditional fixed effect to estimate the impact of remittance income and a remittance dummy variable based on panel data from the 1996 and 2004 Nepal Living Standards Surveys. Results from the fixed effect estimation demonstrate that both factors are positive and significant in influencing household consumption. Based on the remittance income model, the authors applied a simulation method to predict the effect of the share of remittance receiving families on poverty. The simulation results demonstrated that a 1% rise in households receiving remittances yielded a 0.2% decrease in individuals living below US$1 a day.

Poor households have limited access to utilities like clean water and hygiene than non-poor households. Several studies (Dartanto and Nurkholis, 2013; Kanagawa and Nakata, 2008; Nguyen et al., 2013) analysed the impact of clean water and electricity on expenditure and poverty. Nguyen et al.'s (2013) study showed that the percentage of houses that have tap water is statistically significant only for per capita expenditure; it has no impact on the likelihood of poverty in urban Vietnam. Kanagawa and Nakata (2008) revealed that having electricity has a positive outcome on both education and poverty. In fact, poor households often have lower education levels than average and upper-income groups. If they have access to electricity, poor households can use TVs, the radio, or other electric devices for their children's study. This not only helps the poor obtain their basic human needs but also improves their literacy. Poor households that have higher education levels can find better employment opportunities, earn more money and improve their living standard. In other words, improved access to electricity contributes to poverty reduction. According to Dartanto and Nurkholis (2013), the probability of escaping poverty improves with better accessibility to electricity in Indonesia. The authors explained that the average price Indonesian households pay for electricity is low and that this helps decrease their living costs. This means that households could have more savings for other household activities such as their children's education or to invest in other projects, which would generate household income. In short, improved access to electricity can effectively reduce poverty.

2.8.3 Commune Characteristics

At the commune level, infrastructure is essential to commune and household development. There is a variety of indicators related to commune characteristics that influence poverty such as the distance to the market, city or district centre, railway station, whether there is a concrete road, irrigation work, post office, off-farm opportunities or natural calamity and crop diseases in the commune where the households are. Datt and Jolliffe (2005) used the social capital index, including the presence of schools, hospitals and police stations at the commune level to test the level of household poverty in Egypt. The authors showed that a decrease in the distance to a railroad results in higher consumption per person and a lower probability that a household will live below the poverty line. These results are consistent with Gannon and Liu's (1997) study that showed a positive outcome of transport on poverty reduction in developing countries. They concluded that transport projects such as local roads and "inter-city" roads could benefit the daily life of the poor by improving their access to the transport system, cutting transport costs and generating employment opportunities.

Van de Walle (2003) provided evidence to show that irrigated land increases the crop income for rural farmers in Vietnam; the effect is over double that of non-irrigated land. Tran et al. (2015) showed that in Northwest Vietnam the level of access to infrastructure and off-farm opportunities for the non-poor ethnic minority populace is higher than for the poor ethnic minorities. Specifically, the authors found poverty-reducing effects in access to concrete roads and non-farm employment. In addition, they demonstrated that the percentage of the poor who experienced adverse shocks, such as natural calamity and animal/crop diseases, was higher relative to the non-poor. This evidence supports their finding that such shocks raise the risk of being poor. In other words, adverse shocks negatively influence well-being and poverty.

Natural disasters such as floods, droughts and earthquakes, have devastating impacts on human lives and the likelihood that households will fall into poverty (Sawada & Takasaki, 2017). The WB and UN (2010) have shown that many poor people in less developed countries tend to live in regions where natural calamities occur more frequently. The poor are the most vulnerable to natural disasters that mean that they live in precarious conditions and get caught in a vicious cycle of poverty (Arouri et al., 2017). Arouri et al. (2017) tested the impact of storms, floods and droughts on expenditure and the poverty of rural people in Vietnam using 2004 to 2010 VHLSS data. The authors provided evidence that the adverse natural shocks reduce the per capita expenditure and increase the risk of being poor. This finding is consistent with Kurosaki's (2015) study. Using the weighted least squares method, the author assessed the effects of natural disasters on the household consumption growth based on a panel dataset that included 1,609 rural households in Pakistan between 2001 and 2004. The author's results showed that floods negatively affect expenditure in rural Pakistan. Kurosaki's (2015) finding confirmed

Bui et al.'s (2014) one that the Vietnamese expenditure reduced by approximately 7% because of the impact of adverse natural shocks. Using 2008 VHLSS data, the authors found that poverty increased by 3% for households that were exposed to natural disasters in Vietnam in 2008.

Dercon and Krishnan (2000) posited that adverse shocks related to a low level of rainfall and crop/livestock diseases affected consumption and the poverty of rural households in Ethiopia. The authors used a fixed effect regression method to estimate the impact of negative shocks on expenditure. Their results were based on a panel dataset that included 1,411 Ethiopian rural households from 1994 to 1995. Their findings revealed that negative shocks reduced consumption per equivalent adult. The authors illustrated that in the year in which the households suffered from problems associated with droughts or crop/animal diseases, poverty incidence was predicted to increase by 12-15% compared with years without such shocks.

2.8.4 Regional Characteristics

Annim et al. (2012) showed that poverty in Ghana varies across the country. However, disparities in economic well-being are more prevalent in the northern part than in the southern part of the country. Poverty incidence is highest in the Upper West, Upper East, and the Northern Regions. Ghana has implemented many policies to develop the country, including investment in regions with exportable products and policies that support infrastructure. However, these policies have caused disparity in income among the regions; spatial inequality follows as a consequence of the unequal economic development. Specifically, the severest poverty occurred in the three above regions as a result of less investment.

Dartanto and Nurkholis (2013) disaggregated poverty in Indonesia in two regions, Java-Bali and outside Java-Bali from 2005 to 2007. The authors revealed that differences in household characteristics and socio-economic development contributed to disparities in poverty between the two regions. Java-Bali has a higher economic development level and better infrastructure than outside Java-Bali. Manufacturing and services are the main employment sectors in Java-Bali whereas people outside Java-Bali work mostly in the agricultural and mining sectors. Java-Balinese people also have higher levels of education and better access to health services. Therefore, people in Java-Bali have higher levels of expenditure and a lower poverty incidence than those outside Java-Bali. Conversely, people outside Java-Bali have a greater prevalence of being poor. Dartanto and Nurkholis (2013) explain that the well-being of people outside Java-Bali significantly depends on the income sources from agriculture and mining. However, the unstable prices of these commodities adversely affect their income and expenditure.

According to the Poverty Working Group (1999), poverty incidence differs from region to region in Vietnam. Among the seven regions, the Northern Uplands[26] have the highest incidence of poverty; the MRD region has the lowest incidence of poverty. Pham et al. (2003) argued that region is an important variable in explaining the probability that households are poor. The authors concluded that people in the MRD and the southeast regions have a higher probability of escaping from poverty because these two lowland locales are the most developed in Vietnam. In contrast, the three mountainous and remote regions, the Northern Uplands, the North Central, and the CH are the poorest regions. The mountainous terrain and geographical location result in difficulties for agricultural production and limited access to public facilities for local people. These features mean that local people are less able to take advantage of the economic growth than people in other regions.

Glewwe et al. (2004) showed that region significantly affected the living standards and the possibility of being poor in Vietnam from 1992-1998. They found that, among the seven regions, the RRD experienced the greatest percentage of poverty reduction whereas poverty incidence was lowest in the southeast. However, households in the southeast had the highest expenditure per person and the highest possibility of escaping from poverty. In contrast, the Northern Uplands had the highest proportion of persistent poor.

Minot et al. (2006) confirmed that poverty is spatially concentrated and that the incidence of poverty varies among regions in Vietnam. The poverty headcount is the highest for upland areas whereas the MRD and RRD regions, which are low lands and intensively irrigated agricultural areas, have the lowest poverty level. The authors reported that agro-climatic factors and accessibility to markets explain the differences in poverty among the regions. Households in regions with higher rainfall or larger arable land areas tend to have a lower likelihood of poverty. The poverty-reducing impact of access to a market is stronger in poorer remote or mountainous areas than in richer lowland regions.

[26] The Northern Uplands include the North West and the North East regions in Vietnam (Minot, 2006). In the VHLSS from 2010 onwards, the Northern Uplands is also called the Midlands and Northern Mountains region (GSO, 2012, 2016a)

Chapter 3

Research Data and Methodology

This chapter summarises the data collection methods and the empirical models used to investigate the determinants of living standards, poverty and inequality in Vietnam. The chapter is divided into two sections. Section 3.1 presents the data collection methods. Section 3.2 presents the empirical models used to identify the determinants of RPCE, poverty, and the poverty gap for three household groups (TH, TRH, and REM) in Vietnam. Section 3.2 explains the methods used to identify the factors that lead to income inequality in Vietnamese households, especially for TRH and REM.

3.1 Data Collection

3.1.1 The Vietnam Household Living Standards Surveys (2012-2016)

This study used secondary data obtained both from the WB, and statistical data and information published by the Vietnam government. Additionally, this study used data from the Vietnam Household Living Standards Surveys (the 2012, 2014 and 2016 VHLSSs) conducted by the GSO. The surveys examine the determinants of poverty and inequality in Vietnam.

Since 2002, the GSO has conducted the VHLSS every two years. The surveys evaluate Vietnamese living standards, poverty levels, and income disparities between the rich and the poor for policy making purposes and socio-economic development planning. However, since 2010, the GSO and WB have implemented an updated poverty monitoring system in Vietnam. In particular, the survey design has been improved to include different sample frames and consumption calculations to reflect changes in living standards and poverty rates. From 2010 onwards, the survey sample frames use a list of interviewed communes from the 2009 PHC (Hinsdale et al., 2013). In short, the 2010, 2012, 2014 and 2016 VHLSSs are comparable in terms of the data they provide. In particular, VHLSS 2010 was the fifth survey collected in accordance with Decision No. 320/QĐ-TCTK dated May 26, 2010 by the GSO Director General.

The VHLSS is a reliable dataset. The survey has been designed to systematically collect data related to the living standards of Vietnam's population. It uses geographically stratified sampling (Bui & Imai, 2019) and consists of four sampling levels: communes, the smallest unit of analysis; districts, supersets of communes; provinces, supersets of districts; and regions, supersets of provinces. Sample selection for the VHLSSs is a three-stage procedure. The first stage involves selecting which communes to sample. In the second stage, organisers choose three enumeration areas (EAs) from within each selected commune. However, only one EA is used for each national survey. Finally, in the third stage

of the sample selection, three households within the selected EA are interviewed for both income and expenditure data. Both communes and EAs are selected with probability proportionate to size; for the 2010 VHLSS and the subsequent surveys, size refers to the number of households as outlined by the 2009 PHC. For the EA selection, the GSO selects 50% of the total EAs in each survey to re-interview in the subsequent survey. For example, 50% of the 2016 VHLSS's EAs were the same as the 2014 VHLSS's EAs. The other 50% of the 2016 VHLSS's EAs were newly chosen from the 2009 PHC sample frame. Similarly, only 50% of the 2014 VHLSS's EAs were surveyed in the 2012 VHLSS; the remaining EAs were different from the 2012 survey's EAs (see Section 3.1.3 for more details).

Because of budget constraints, the GSO uses both long and short questionnaires for each VHLSS survey. The short survey sample includes a larger number of households than the long survey. The short survey collects only household income data. In contrast, the long survey includes both income and expenditure information but for a smaller household sample. To answer the research objectives, we used data from the long version, which includes two questionnaires designed to collect data at both the household and commune levels. This survey is conducted in June, September and December of each survey year. The GSO uses two different sets of questionnaires, each with its own purpose. Household-level data include demographic and socio-economic characteristics and information about household participation in targeted programmes. Each household survey in the VHLSSs during the study period includes 9,399 households living in 3,063 communes (of which, approximately 30% are in urban areas and 70% in rural areas). Commune data are obtained by directly interviewing commune leaders and relevant local officials. Each survey (from 2012 to 2016) includes general characteristics for 2,330 communes in rural areas; every survey year includes general information about the populace, their ethnicity(ies) and religion(s). It also summarises common economic resources, infrastructure, agricultural and non-agricultural opportunities, aid and relief programmes, and social and environmental affairs.

3.1.2 Estimation of Real Per Capita Expenditure and Income

The study analysed Vietnamese households' living standards, poverty and inequality using real per capita expenditure (RPCE) and income (RPCI) from three national datasets (the 2012, 2014 and 2016 VHLSSs). Our study assumed that members of a single-family use common family resources. These resources are shared equally among family members; thus, each member has a similar standard of living. This assumption allowed us to use the nominal per capita expenditure and income data published in the VHLSSs. To generate nominal per capita expenditure and income, the GSO divides nominal total household expenditure and income by household size. Total household expenditure comprises seven types of consumption: expenditure on food, education, healthcare, durable goods, water, electricity, and other (non-food consumption). Total household income covers six primary

income sources: crop income, non-agricultural business income, wage earnings, domestic and foreign remittances, aid, and other sources.

However, the national surveys and the expenditure component were conducted over different time periods and in different regions. To ensure consistent comparisons over time and geography, this study converted nominal per capita expenditure into constant prices at January 2010 using three different types of price index. These data were converted using three steps: (1) Using the within-year monthly CPI included in each database, the nominal household expenditures were converted into the constant prices of January in each survey year (Benjamin et al., 2017; GSO, 2016, 2017b; Nguyen et al., 2017). The conversion excluded the price change by survey month as the number of interviewed households in each survey were allocated in different months of the year. It was necessary to convert the figures to correct for high inflation in different years. (2) To exclude changes in prices among the three surveyed years, we used the annual CPI (with the base year, 2010, published by the WB) to adjust January prices from 2012, 2014, and 2016 into January 2010 prices (Benjamin et al., 2017). (3) We used the Scolis index to convert per capita expenditure to remove geographical differences associated with living costs (Gibson et al., 2017). Using these steps enabled us to generate the RPCE (Benjamin et al., 2017). Other monetary variables were also converted into January 2010 prices using the same conversion method.

The study combined data from the three VHLSS surveys (2012, 2014, and 2016) to empirically estimate the influences of RPCE, poverty, and the poverty gap. We calculated two types of RPCE: (1) the household-level RPCE was calculated by dividing the real total household expenditure by the number of household members. In short, the RPCE was calculated for each household. (2) The commune-level RPCE was calculated by dividing the real total expenditure of all households living in the same commune by the total number of people in that commune. The commune-level RPCE was an average RPCE for all households living in the same commune. Like the VHLSS surveys, this study applied sampling weights to ensure the precision of the descriptive statistics and model estimates (see Section 3.1.3).

3.1.3 The Use of Weights in the Study

We combined the three national surveys (the 2012, 2014 and 2016 VHLSS) to generate the study period estimates (such as the annual real per capita expenditure and income means). In other words, these estimates do not reflect the living standards in Vietnam for each survey year but the entire study period (from 2012-2016) (Thomas & Wannell, 2009). To obtain the pooled mean per capita expenditure, income, and model estimates, we used two weighted approaches: 1) the non-reweighted approach; and 2) the reweighted approach.

Regarding the non-weighted approach, we treated repeated households in survey years as independent observations. Therefore, we used cross-sectional weights (the original weights provided in each survey)[27]. As for the reweighted approach, we applied the reweighted technique suggested by Thomas and Wannel (2009). In particular, we used an averaged weight of the three survey years (2012, 2014, and 2016). In other words, the pooled estimates are an average of the cross-sectional estimates for the repeated observations. Specifically, we aggregated the original sampling weights given in the three VHLSSs (2012, 2014 and 2016) and divided this figure by the number of years (k) that an individual was interviewed during the study period. For example, for an individual with three years of data, k equals 3; for an individual who was interviewed in two years, k equals 2; and for an individual who had only one year of data, k equals 1 (the weight is the original weight from the year the individual was interviewed). Figure 3.1 shows the pooled study design and the number of households interviewed multiple times during the study period.

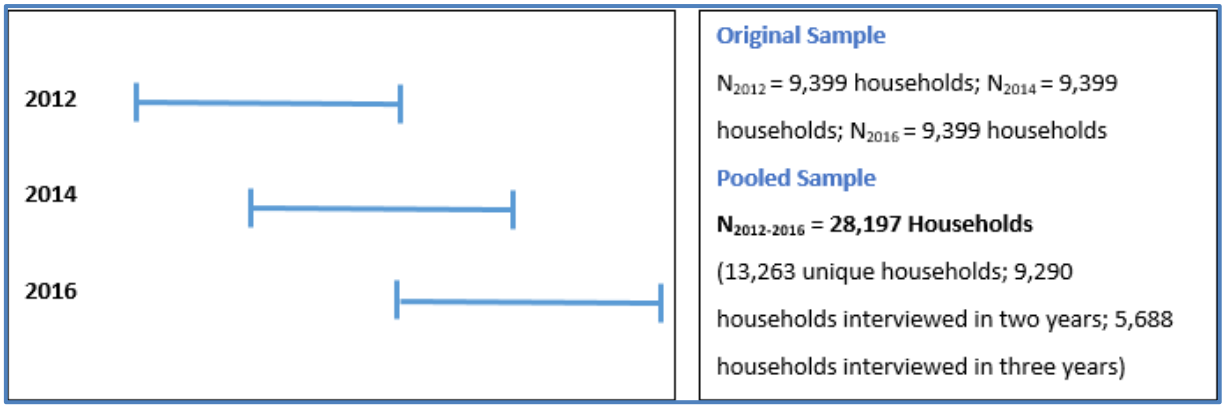

Figure 3. 1 Pooled Study Design and the Number of Sampled Households, 2012 - 2016
Source: Authors' illustration based on VHLSS data (2012-2016)

According to Thomas and Wannel (2009), means and regression estimates obtained from the two weighting approaches are similar. For brevity, we report only the descriptive statistics and model estimates using the non-reweighted approach (the cross-sectional weights). The reweighted model results are presented in Appendix C, Table C.1.

3.2 Empirical Methods

This section discusses the estimation methods used to answer the four research objectives. Regression is the most common method applied in studies on poverty determinants (Haughton & Khandker, 2009). In this study, we applied two main types of analysis: (1) identified the effects of the factors on

[27] Two types of sampling weights (household weights and population weights) are provided in the 2012-2016 VHLSSs. The population weights are calculated by multiplying the household weights by the household size. We used population weights in our analysis because we estimated value indicators at the household member level, such as the per capita income and expenditure.

the RPCE using multiple linear regression; and (2) assessed whether a family is poor using binary logistic regression models. To determine how poor a household is, the study applied a more advanced regression technique, fractional logistic regression (Wagner, 2001).

We estimated the empirical models for three household samples. The largest sample consists of all the surveyed households across Vietnam and is referred to as total households (TH). The second-largest sample consists of total rural households (TRH). The smallest sample includes rural ethnic minorities (REM). We divided the TH sample in two: the total poor (TP) and the total non-poor (TNP). TRH included the total rural poor (TRP) and the total rural non-poor (TRNP). The REM sample was split into the rural poor ethnic minorities (RPE) and the rural non-poor ethnic minorities (RNPE) as follows:

TH = TP + TNP where:	TH: Total households or all the households included in the three national surveys for the study period.
	TP: Total poor households, it includes poor households residing in both rural and urban areas.
	TNP: Total non-poor households includes all of the rural non-poor households (TRNP) and all of the urban non-poor households.
TRH = TRP + TRNP where:	TRH: Total rural households.
	TRP: Total rural poor (contains the RPE and the ethnic majority).
	TRNP: Total rural non-poor households.
REM=RPE + RNPE where:	REM: Rural ethnic minorities.
	RPE: Rural poor ethnic minorities.
	RNPE: Rural non-poor ethnic minorities.

3.2.1 Regression Model for Research Objective 1

Research objective 1 is to investigate the major factors that affect the TP, TRP and RPE's economic well-being. This study used an OLS estimation to determine the factors that affect the TP, TRP and RPE's RPCE. The GSO provides data collected from the household and commune surveys. At the household level, the GSO collects data for all households. However, the GSO collects only commune-level data for the rural households' sample. Thus, we used two classical regression models with two different types of data to examine the factors that affect RPCE. The first regression model estimated the factors that affect the TP, TRP and the RPE's RPCE using the household-level data. The second regression model estimated the effect of commune characteristics on the RPCE of just two samples (the TRP and the RPE).

We made three multiple linear regression estimates with three poor households groups: the TP, the TRP, and the RPE. The RPCE models for the three poor household groups are discussed in Sections 3.2.1.1, 3.2.1.2, and 3.2.1.3. The socio-economic characteristics vary among the three groups, thus, we

used three different sets of independent variables in the estimates to determine the main factors affecting the economic well-being of each poor household group.

3.2.1.1 The Total Poor Households (TP) Sample

A multiple linear regression model was used to identify the factors that affect the TP's RPCE using pooled data from the three national surveys (the 2012, 2014 and 2016 VHLSSs). The model was used to investigate the determinants of the TP's well-being in Vietnam. In addition, we used the classical regression model to examine the influences of TNP's RPCE. The two models, the TP and the TNP's RPCE, enabled us to distinguish the determinants of the TP's RPCE from the TNP's. We also estimated the TH's RPCE model. In contrast to the TP and TNP's RPCE models, we added the poverty status variable to the TH's model to examine the impact of living in poverty on the TH's RPCE.

We applied the same model used in the prior studies to identify factors that affect RPCE in Vietnam. For example, we used the same linear regression method as Glewwe et al. (2002) who investigated the main factors affecting household welfare using data from the VLSS (1992-1993 and 1997-1999). However, our study differs from Glewwe et al.'s (2002) one in three ways. First, we used the total poor/non-poor and total households' per capita expenditure whereas Glewwe et al. (2002) investigated all Vietnamese households' per capita expenditure. Secondly, we added more Independent variables into our linear regression models to determine their effects on the RPCE; Glewwe et al. (2002) focussed only on factors related to household characteristics and the locations where households were. In short, our study considered a larger set of factors, including individual, household, and regional characteristics to avoid an omitted variable bias[28]. We estimated the effects of remittances, housing conditions, and access to social services on the RPCE. Glewwe et al. (2002) did not examine these factors in their study. Third, we used more recent, revised data (the 2012, 2014 and 2016 VHLSSs).

Using a multiple linear regression model, Nguyen et al. (2013) estimated the determinants of urban households' per capita expenditure in Vietnam. Imai et al. (2011) used the same model to identify the influences of Vietnamese ethnic minorities' per capita expenditure. This study uses Nguyen et al.'s (2013) linear regression model to examine the determinants of the TP, TNP and TH's RPCE in Vietnam. The TP, TNP and TH regression models take the following form:

$$\ln(Y_{irg}) = \alpha_{rg} + \sum_{h=1}^{H} \beta_h \, HHH_{ih} + \sum_{j=1}^{J} \gamma_j \, HHC_{ij} + \sum_{l=1}^{L} \lambda_l \, REG_{il} + e_{irg} \quad (3.1)$$

$$i = 1, 2, \ldots, N$$

[28] An omitted variables bias can lead to biased regression estimates and invalid standard coefficient errors (Dougherty, 2011).

where: g represents the total households sample. We divide the TH sample into two sub-samples: poor and non-poor; r represents the two sub-samples, the TP and the TNP.

In the regression model in equation (3.1), $\ln(Y_{irg})$[29] denotes the natural logarithm of RPCE of the *i-th* poor/non-poor household in the TP and the TNP groups. We used the RPCE as the dependent variable. We measured it in thousand Vietnamese Dong, using January 2010 prices to correct for different inflation rates because of the surveys being conducted in different years and in different regions of the country. As we combined three national surveys' data, we converted Y_{irg} from the 2012, 2014 and 2016 prices into January 2010 prices.

HHH_{ih} is a vector of household head (individual) that include five variables, household head's age, gender, marital status, educational attainment and employment. HHC_{ij} is a vector of household characteristics. Household characteristics include variables regarding place of residence, ethnicity, household size, dependency ratio, working rate, language, housing land and condition, farm sizes, durable assets, health insurances, access to safe water sources, receiving remittances, and access to development programmes (free health insurance, scholarship, pension, and borrowing). REG_{il} is a vector of regional characteristics, including six socio-economic regions of Vietnam. In the total sample (the TH) model, we used independent variables related to the household head, and the household and regional characteristics. However, for the TRH and REM samples we used another model with explanatory variables related to commune characteristics because GSO collected only commune-level data for these two samples (see equation (3.2) in Section 3.2.1.2).

The notations, H, J, L, refer to the total number of covariates representing the household head, household and regional characteristics, respectively; β, γ, and λ represent the vector of coefficients for the household head, and the household and regional characteristics, respectively. In equation (3.1) a random error e_{irg} measures the error and effects of unobservable influences. In the TP, the TNP and the TH models, the independent variables were related to the household head, and the household and regional characteristics. Table 3.1 defines the model variables and their expected signs.

[29] See Section 3.1.2 for further details.

Table 3. 1 Definitions of the Regression Model Variables at the Household Level for the Household Samples

Independent Variables	*Description*	*Expected Sign*	*TH*			*TRH*			*REM*		
			TH	*TP*	*TNP*	*TRH*	*TRP*	*TRNP*	*REM*	*RPE*	*RNPE*
Household Head Characteristics											
Age	Age of household head (years)	**+/-**	✓		✓	✓		✓	✓		✓
Gender	Gender of household head, where female=1; male=0.	**+/-**	✓		✓	✓		✓	✓		✓
Education	Household head's years of school attendance (number of years).	**+**	✓		✓	✓		✓	✓		✓
Marital Status	Marital status of household head: single/never married=1; married=2 (base group); widowed=3; divorced/separated=4.	**+**	✓		✓	✓		✓	✓		✓
Occupation	The employment sector in which household heads work as their main job. Agriculture=1 (base group), non-farm self-employment =2; wage-paying employment =3.	**+**	✓		✓	✓		✓	✓		✓
Household Characteristics											
Poverty Status	Is the household poor or non-poor? Poor=1, non-poor=0.	-	✓		×	✓		×	✓		×
Rural Areas	The place where households is; rural=1, urban=0.	-	✓		✓	×		×	×		×
Ethnicity	The religion of household, divided into the ethnic majority (Kinh/Chinese) or minority (the remaining 52 ethnicities in Vietnam), where minority=1, majority=0.	-	✓		✓	✓		✓	×		×
Language Barriers	Whether or not a household needs an interpreter during an interview session. Yes=1, no=0.	-	×		×	×		×	✓		✓
Household Size	Number of family members in the household.	+/-	✓		✓	✓		✓	✓		✓
Working Rate	The percentage of working members in relation to total family size (in %).	+	✓		✓	✓		✓	✓		✓
Living Area	Per capita land area (m^2).	+	✓		✓	✓		✓	✓		✓
Durable Goods	The logarithm of real per capita spending on durable goods (in 1,000 VND).	+	✓		✓	✓		✓	✓		✓
Water Sources	The main water sources a household uses, where tap water =1 (base group), clean and protected water=2, other=3.	-	✓		✓	✓		✓	✓		✓
Toilets	The type of toilet a household has, where flush toilet=1, other toilet=2, no toilet=0. Other toilets include non-flush toilets such as a suilabh, barrel/pot, and/or fishing bridge.	+	✓		✓	✓		✓	✓		✓
Domestic Remittances	The logarithm of real per capita domestic remittances a household receives (in 1,000 VND).	+	✓		✓	✓		✓	✓		✓
Overseas Remittances	The logarithm of real per capita overseas remittances a household receives (in 1,000 VND).	+	✓		✓	✓		✓	✓		✓

Farm Size	The size of farmland (area) that a household manages or uses, where farm size=1 if farmland =0 ha; 2 if 0 ha < farmland area < =0.5 ha; 3 if 0.5 ha < farmland area <=1 ha; 4 if 1 ha < farmland area <= 1.5 ha; 5 if farmland area > 1.5 ha.	+/-	✓	✓	✓	✓	✓	✓
Health Insurance Premiums	The percentage of family members who have purchased health insurance (%).	+	✓	✓	✓	✓	✓	✓
Development Programmes								
Free Health Insurance Rate	The percentage of family members who have free health insurance (%).	+	✓	✓	✓	✓	✓	✓
Scholarship	The logarithm of real per capita scholarship a household receives (in 1,000 VND).	+	✓	✓	✓	✓	✓	✓
Pension	The logarithm of real per capita pension a household receives (in 1,000 VND).	+	✓	✓	✓	✓	✓	✓
Borrowing	Whether or not a household borrows money from the preferred credit programmes implemented by the Social Policy Bank and other organisations such as the Farmer's Association and the Women's Association, where yes=1, no=0.	-	✓	✓	✓	✓	✓	✓
Regional Characteristics								
Region1	Households live in Midlands and Northern Mountains (base group for REM models), where yes=1, no=0.	-	✓	✓	✓	✓	✓	✓
Region2	Households live in Red River Delta (base group for TH, TRH models), where yes=1, no=0.	+/-	✓	✓	✓	✓	✓	✓
Region3	Households live in Northern and Coastal Central,[30] where yes=1, no=0.	-	✓	✓	✓	✓	✓	✓
Region4	Households live in Central Highlands, where yes=1, no=0.	-	✓	✓	✓	✓	✓	✓
Region5	Households live in Southeast, where yes=1, no=0.	+/-	✓	✓	✓	✓	✓	✓
Region6	Households live in Mekong River Delta, where yes=1, no=0.	+/-	✓	✓	✓	✓	✓	✓
Survey Year								
Interview Year	Year the survey was conducted. Year 2012=1 (base year), year 2014=2, year 2016=3.	+	✓	✓	✓	✓	✓	✓

Notes: The symbol "✓" represents variables that are used in the regression models; the symbol "X" is used to indicate variables not included in the models.

[30] The VHLSS from 2010 (GSO, 2012, 2016) uses a new category for region. It consists of the six socio-economic regions in Vietnam rather than the old category that had eight regions. Two regions, the North West and North East in the old category region are combined into one new group: the Midlands and Northern Mountains. Similarly, the North and South-Central Coast regions are merged into the Northern and Coastal Central region. The six regions in Vietnam are: The Red River Delta, the Midlands and Northern Mountains, the Northern and Coastal Central, the Central Highlands, the Southeast, and the Mekong River Delta. To ensure consistency with the GSO, our research uses the six-region-category to analyse regional characteristics.

3.2.1.2 The Total Rural Poor Households (TRP) Sample

To investigate significant factors that affect TRP's economic well-being in Vietnam, we used a multiple linear regression model to examine the factors that influence their RPCE. We used pooled data from the 2012, 2014, 2016 VHLSSs. The current study used OLS estimation to test if the determinants of TRP's RPCE were different from those of the TRNP.

Though previous studies have identified a number of determinants of rural household welfare, they ignored some important factors. For example, Mukherjee and Benson (2003) used OLS estimation to identify the influences of per capita expenditure in rural Malawi. The authors found that the determinants of per capita expenditure of Malawian rural households consist of factors at the household level (demography, education, employment), commune level (commune characteristics and accessibility of social utilities), and agro-eco regions. Minot et al., (2006) used a similar method. They used data from the 1997-1998 VLSS and the 1999 PHC to identify the predictors of per capita expenditure of households in rural Vietnam. The authors used covariates related to household characteristics: family size, employment, qualifications, housing characteristics, access to water and electricity, television and radio ownership, and the region of residence. However, the authors excluded many important household characteristics, such as the household head's gender, access to healthcare, remittances, pension, and borrowing status. We included these characteristics in our study.

Minot et al. (2006) did not consider the impact of commune characteristics on per capita expenditure. We have added commune-level variables, including distance to the post-office and district hospital, infrastructure, non-farm employment opportunities, and natural adverse shocks. Inclusion of these variables enabled us to avoid the omitted variables bias. For example, if the proximity of households to a district hospital or post-office is excluded from the empirical model, there will be spatial autocorrelation. This problem occurs when there is a correlation between the outcome variable/disturbance term of the regression of a household and the outcome variable/disturbance term of their neighbours (Escobal & Torero, 2005). Specifically, household expenditure tends to be correlated with a neighbour's in the sample cluster. As a result, the estimated coefficients of the predictors can be biased or inconsistent; spatial correlation distorts the precision of the household spending estimate (Elbers et al., 2003).

As the VHLSS data were collected at the household and commune level for the TRH, we used two regression models for the TRP. We ran the same regression models for the TRNP and the TRH. The first model is presented in equation (3.1). It estimates the effects of the household-level factors on the TRP, TRNP and TRH's RPCE. In the equation, the regression model uses these households' RPCE as the dependent variables. Ln ($\mathrm{Y_{irg}}$) denotes the natural logarithm of RPCE of the *i-th* household in the TRP,

TRNP, and TRH groups. We define the independent variables in the regression models for the three household groups in Table 3.1.

We used the second regression model to estimate the effect of commune characteristics on TRP, TRNP and TRH's RPCE. We used both the household-level RPCE and commune-level RPCE as dependent variables in the regression models with the form:

$$\ln(Y_{irg}) = \alpha_{rg} + \sum_{k=1}^{K} \delta_k \, COM_{ck} + e_{cg} \qquad (3.2)$$

$$\ln(\overline{Y_{crg}}) = \alpha_{rg} + \sum_{k=1}^{K} \delta_k \, COM_{ck} + e_{cg} \qquad (3.3)$$

$$c = 1, 2, \ldots, N$$

where: g represents the TRH sample; r represents the two sub-samples, TRP and TRNP.

In equation (3.2), $\ln(Y_{irg})$ denotes the natural logarithm of the RPCE of the *i-th* poor/non-poor household in the TRP and TRNP groups. Y_{irg} denotes the household-level RPCE.

In the regression model, outlined in equation (3.3), $\ln(\overline{Y_{crg}})$ denotes the natural logarithm of RPCE of the *c-th* commune in the TRP, TRNP and TRH samples. $\overline{Y_{crg}}$ denotes the commune-level RPCE (see Section 3.1.2 for the commune-level RPCE's calculation method). COM_{ck} are vectors of commune characteristics and include general commune characteristics (geography, religion, natural calamity and population density), commune infrastructure, irrigated cropland, and non-agricultural employment opportunities. K refers to the total number of covariates representing the commune characteristics. δ represents the vector of coefficients for the commune characteristics. A random error e_{cg} measures the error and effect of unobservable influences. The regression model independent variables in equations (3.2) and (3.3) include commune characteristics. Table 3.2 provides the definitions and the expected signs of the model variables.

3.2.1.3 The Rural Poor Ethnic Minorities (RPE) Sample

To investigate the factors that affect the RPE's economic well-being, we study use the same multiple linear regression models outlined in equations (3.1), (3.2) and (3.3) to examine factors influencing their annual RPCE. We use pooled data from the 2012, 2014 and 2016 VHLSSs. Previous studies on poverty have used this method to model the ethnic minority's welfare in Vietnam (e.g., Baulch et al., 2010; Imai et al., 2011; Nguyen et al., 2017). For instance, using OLS estimation and data from the 1993 – 1998 VLSS and the 2002, 2004 and 2006 VHLSSs, Baulch (2010) regressed the Vietnamese ethnic minorities per capita expenditure on both household and commune characteristics.

Table 3. 2 Definitions of Variables at the Commune Level for Total Rural Households and Rural Ethnic Minorities

Independent Variables	*Description*	*Expected Sign*
General Commune Characteristics		
Commune Geography	Where the commune is located (the geographical area). Coastal=1 (base group), delta=2, midlands=3, mountains=4.	**+/-**
Religion	The main religion in the commune, Buddhism=1 (base group), Christian=2, other=3, none=4.	**+/-**
Natural Calamity	Have any natural calamities (wildfires, floods, storms, landslides, or earthquakes) occurred in the commune in which households live in the past three years? Yes=1, no=0.	**-**
Population Density	Number of people per km^2.	**+**
Commune Infrastructrure		
Paved Roads	Are there any paved roads in the commune in which households live? Yes=1, no=0.	**+**
Daily Market	Is there a daily market in the commune where households live? Yes=1, no=0.	**+**
High School	Is there a high school in the commune where the children can go to study? Yes=1, no=0.	**+**
Agriculture and Fishery Extension Centre	Is there an agriculture and fishery extension centre in the commune where the households live? Yes=1, no=0.	**+**
Kilometres to the District Hospital	The distance from the commune centre to the nearest hospital (km).	**-**
Kilometres to the Post-Office	The distance from the commune centre to a post-office (km).	**-**
Land and Non-agricultural Employment Opportunities		
Irrigated Annual Cropland Rate	Percentage of irrigated annual crop land in the commune (%).	**+**
Irrigated Perennial Cropland Rate	Percentage of irrigated perennial crop land in of the commune (%).	**+**
Housing Land Use Right Rate	The percentage of residential land with land use right certificates in the commune (%).	**+**
Production Units	Is there a production/service unit or trade village where the local people in the commune can go to work and return home every day? Yes=1, no=0.	**+**
Survey Year		
Interview Year	The year the survey was conducted. Year 2012=1 (base year), year 2014=2, year 2016=3.	**+**

However, this study differs from Baulch's (2010) in three respects. First, though Baulch (2010) examined the total ethnic minority population across Vietnam, in contrast, we have focussed on the RPE in Vietnam. Secondly, Baulch used a limited number of Independent variables: household decomposition, education, land ownership, infrastructure and geographic region. The author ignored

the impact of employment, housing characteristics, remittances, access to healthcare and credit, and adverse natural shocks; we have added these Independent variables to our study.

Imai et al. (2011) also used this approach to identify the determinants of per capita consumption of ethnic minorities living in Vietnam. They used data from the 2002 and 2004 VHLSSs. The authors focussed on covariates at the household level: age, proportion of female members, dependency rate, marital status, education, and landholding. Although they considered the effect of topography (coastal, mountainous and delta areas) on per capita expenditure, they omitted many variables at the commune level, including access to public services (e.g., water supply, hospitals, and schools). We have included them in our study.

More recently, Nguyen et al. (2017) analysed the well-being of ethnic minorities and their correlates in rural Vietnam using OLS estimation and the 2006 VHLSS data. However, the authors used only a restricted set of covariates and omitted healthcare and adverse natural shock regressors. In contrast to Nguyen et al. (2017), we provide a more comprehensive view of the REM's welfare by adding those omitted variables.

Though most prior studies included demographic and economic variables, there have been limited attempts to assess the impact of limited proficiency in the national language on the REM's RPCE in Vietnam. Van de Walle and Gunewardena (2001) tested this relationship using OLS estimation. They found that a lack of proficiency in Vietnamese had an insignificant effect on ethnic minorities' spending. The WB (2009) argued that language barriers are a major cause of persistent ethnic minority poverty. However, the bank did not quantify the impact of language barriers on ethnic minorities' per capita expenditure. Using the OLS estimation, Baulch (2010) showed that an inability to speak Vietnamese reduces the indigenous population's expenditure. Nguyen et al. (2017) found that language barriers had a consumption reducing-effect for REM in Vietnam. The previous findings show that the ability to speak Vietnamese explains, in part, the welfare of ethnic minorities. However, many studies on poverty in ethnic minority communities ignore this relationship. In Vietnam, many ethnic minority people experience difficulty communicating in Vietnamese[31]. In light of this, it is crucial to investigate the impact of the language constraint on the RPCE. We added language barriers into our empirical analysis so that we could explore this correlation further.

In addition to examining the determinants of the REM's living standards, this study compares the factors that impact the RPE and RNPE's economic well-being at both the household and commune levels. The RPE, the RNPE and the REM linear regression models for the household level are shown in

[31] According to the authors' calculations (based on the 2012 – 2016 VHLSS data), approximately 28% of REM cannot speak Vietnamese, the country's national language.

equation (3.1). In the equation, $\ln(Y_{irg})$ denotes the natural logarithm of the RPCE of the *i-th* household for the three household groups.

The RPE, RNPE and the REM linear regression models for the commune level are shown in equations (3.2) and (3.3). In equation (3.3), $\ln(\overline{Y_{cg}})$ denotes the natural logarithm of RPCE of the *c-th* commune in the three household samples (the RPE, the RNPE and the REM).

The regression model independent variables in equations (3.1), (3.2), and (3.3) for the RPE, RNPE, and REM are presented in Tables 3.1 and 3.2. In contrast to the TP and TRP regression models, we include the language barrier variable in the RPE regression model. For the regional characteristics, MNM was chosen as the reference group to test whether this region is the poorest region in Vietnam (GSO, 2017a; Tran, 2016). We chose this reference group because the MNM is home to the largest rural ethnic minority population (GSO, 1999, 2009; Bui et al., 2017)**.** This region also faces challenges in terms of local economic and social development (WB, 2009). For example, the uplands and steep terrain constrain agricultural production and make access to public facilities difficult for the local ethnic minority people. Hence, to examine the spatial determinants of the RPE's well-being we tested the effect of living in this region on the RPE's RPCE. Similarly, we estimated the impact of residence in the MNM on the RNPE and REM's RPCE.

3.2.2 Binary Logistic Regression Model for Research Objective 2

Research objective 2 is to examine the factors that affect the TH, TRH and REM's poverty. We use a binary logistic regression model to estimate the probability that a household is poor in each household sample to answer the objective. The binary logit model takes the following form (Tran et al., 2015):

$$p_{ig} = P(Y = 1|X) = \frac{Exp\,(\beta'_S X'_S)}{1 + Exp\,(\beta'_S X'_S)} \quad (3.4)$$

where: g represents three household samples, TH, TRH and REM; $p_{ig}(Y = 1|X)$ denotes the likelihood that the *i-th* household is poor in the g sample of the households in Vietnam; Y is a binary outcome that has two values: 1 (a poor household in g sample) and 0 (a non-poor household in g sample); the coefficient β'_S represents the parameters that are estimated in the model; and X'_S represents the model covariates. We estimated two logit models using both household and commune-level data.

At the household level, we estimated the first logit model using household-level data. A linear function of the covariates in equation (3.4) is as follows:

$$\beta'_S X'_S = \alpha_g + \sum_{h=1}^{H} \beta_h\, HHH_{ih} + \sum_{j=1}^{J} \gamma_j\, HHC_{ij} + \sum_{l=1}^{L} \lambda_l\, REG_{il} + e_{ig} \quad (3.5)$$

At the commune level, we estimated the second logit model using commune data to avoid potential correlation between household and commune-level variables. A linear function of the covariates at the commune level in equation (3.4) is:

$$\beta'_S X'_S = \alpha_g + \sum_{k=1}^{K} \delta_k \, COM_{ck} + e_{ig} \quad (3.6)$$

As equations (3.5) and (3.6) denote the cumulative logistic distribution function, the likelihood of not being poor is expressed by:

$$q_{ig} = P(Y = 0|X) = \left(1 - P_{ig}\right) = \frac{1}{1+Exp\,(\beta'_S X'_S)} \quad (3.7)$$

The odds ratio in observing Y=1 is:

$$Odds = \frac{P_{ig}}{1 - P_{ig}} = Exp(\beta'_S X'_S) \quad (3.8)$$

Taking logs of odds ratio to observe Y=1, equation (3.8) becomes:

$$\ln\left(\frac{P_{ig}}{1 - P_{ig}}\right) = \beta'_S X'_S \quad (3.9)$$

Therefore, $\beta'_S X'_S$ in equation (3.8) represents the log of the odds of observing a poor household. In particular, the estimated parameters β'_S are in the log-odds scale that effects of X'_S on the log of the odds of the binary outcome variable.

Although the odds ratios are commonly used for the logistic regression models' interpretation, they are not the probability scale (Perraillon, 2019). They are less intuitive than the marginal effects that are defined as the effect of a small increase or decrease in a continuous covariate X'_S based on the likelihood that the latent outcome variable equals 1 ($Y_i = 1$) (Norton and Dowd, 2018). Therefore, our study uses the marginal effects as an alternative to the odds ratios to interpret the effects of continuous dependent variables on the probability that a household is poor. However, the odds ratios are more meaningful to explain the categorical dependent variables' effects on the outcome variable (Revindo, 2017), thus our study uses them in our discussion.

Our estimates rely on sample survey data from the VHLSSs. The VHLSS data are collected by a multi-stage stratified sampling method. Under the VHLSS sampling, v = 1, …, M communes from m communes are sampled. In every sampled commune, i = 1,…, N_v households from which n_m are sampled. The sampling weight (w_{vi}) represents the number of households that the given sampled household represents the total population. The pseudo-maximum likelihood approach was applied to estimate the model parameters in the logit model that incorporates sampling weights (Archer et al., 2007; Smith et al., 1989). The observed Y_i is the realisation of a binomial outcome with the likelihood

obtained in equation (3.4). This differs for each household (depending on $\beta'_S X'_S$). Therefore, the cumulative probability function (L_p) is transformed as follows (Archer et al., 2007):

$$L_p(\beta'_s) = \prod_{v=1}^{m} \prod_{i=1}^{n_v} p(x_{vi})^{w_{vi} \times y_{vi}} [1 - p(x_{vi})]^{w_{vi} \times (1 - y_{vi})} \quad (3.10)$$

The study estimated three binary logistic regression models using three household samples (TH, TRH and REM). These logit models are outlined in Sections 3.2.2.1, 3.2.2.2 and 3.2.2.3. As the socio-economic characteristics vary among the TH, TRH, and REM groups, we used three different sets of Independent variables in the estimations to identify the determinants of poverty of each household sample.

3.2.2.1 The Total Households (TH) Sample

To identify significant factors influencing TH's poverty, this study used a binary logistic model to estimate the likelihood that a household is poor in the sample. This study follows Tran et al.'s (2015) method. They identified the key factors affecting the likelihood that the Vietnamese ethnic minorities are poor. However, our study differs from Tran et al.'s (2015) in three respects. They used an income poverty threshold to define who is poor; in contrast, we use an expenditure poverty line. Whereas Tran et al. (2015) focussed on families in Northwest Vietnam, we estimate the TH. Finally, we estimate the effects of marital status, health condition, access to water and region on poverty, which Tran et al. (2015) failed to do.

This study also differs from other poverty studies. Ennin et al. (2011) used binary logistic regression to examine factors affecting the likelihood of poverty in Ghana. Nguyen et al. (2013) also used that approach to investigate the influences of urban poverty in Vietnam using data from the Urban Poverty Survey (2008). We test the effects on the odds of poverty of natural calamity not addressed in Ennin et al. (2010a) and Nguyen et al.'s (2013) studies.

In the TH binary logit model, outlined in equation (3.4), $p_{ig}(Y = 1|X)$ denotes the likelihood that the *i-th* household is poor (using the total household sample in Vietnam). Y is a binary outcome of the poverty status (poor and non-poor) of the *i-th* household in the TH sample. Y takes two values: 1 (a poor household in the TH sample) and 0 (a non-poor household in the TH sample).

The logit model contains household-level factors (independent variables) that are included in equation (3.5). These covariates are like those in the TP regression model presented in Table 3.1. However, the expected effects of these variables one TH's poverty are opposite to those on the RPCE in equation (3.1).

3.2.2.2 The Total Rural Households (TRH) Sample

To examine the significant factors affecting TRH's poverty, we use the same binary logistic regression model in equation (3.4) to estimate the probability that a Vietnamese rural household is poor. Chaudhry and Rahman (2009) used the same method to estimate the probability of being poor for rural households in Pakistan. They used data from the 1999 Pakistan Socio-Economic Survey. However, the authors focussed on the impact of gender disparity in education on poverty rates. Hence, they considered only a limited number of Independent variables: gender, proportion of female members, literacy ratio of female members compared with males, the ratio of female to male earners, household size, education, age, the proximity of the household to schools, physical assets and land area. In contrast to Chaudhry and Rahman (2009), we have included larger sets of factors related to demographics and household composition, human and physical assets, commune infrastructure, geographic location, and natural agricultural production risks.

De Janvry and Sadoulet (2000) examined rural poverty in Latin America. The authors show that rural poverty in Latin America is the result of disadvantages associated with geographic characteristics and poor households' endowments (such as land, human, institutional and social assets). The authors used data from 1997 on rural households in Mexico to investigate the determinants of rural poverty. However, they used only OLS to estimate the impact of these factors on household income. According to Haughton and Khanker (2009), while De Janvry and Sadoulet's (2000) linear regression analysis can explain the variance of rural income by household assets and regional characteristics, the method does not take into account the probability of being rural and poor. To overcome this issue, we used a binary logit model to estimate the likelihood of being rural poor, together with a multiple linear regression model to investigate the determinants of the TRP's RPCE in Vietnam (see Section 3.2.1.2).

Like equation (3.3), $\mathrm{p_{ig}}(\mathrm{Y}=1|\mathrm{X})$ calculates the likelihood that the *i-th* household is poor in the TRH sample. Y is a binary outcome that assumes two values: 1 (a poor rural household) and 0 (a non-poor rural household).

The TRH logit model independent variables include variables related to the household head, household, commune and regional characteristics (see equation 3.5 and 3.6). These logit independent variables are like those in the TRP regression model (see Tables 3.1 and 3.2). However, the expected effects of these variables on the likelihood of households living in poverty are opposite to those on the RPCE in equations (3.1) and (3.2).

3.2.2.3 The Rural Ethnic Minorities (REM) Sample

We used the same binary logistic regression model in equation (3.4) to estimate the probability that the REM are poor. There have been numerous studies on ethnic minority poverty in Vietnam. Recently, Tran et al. (2015) studied the determinants of ethnic minority poverty in the Northwest. The authors

used binary logistic regression to estimate the likelihood of being poor. However, the authors focussed only on ethnic minority households in the northern mountainous areas. In contrast, we include data on all ethnic minority populations in rural Vietnam (the REM). Furthermore, though Tran et al. (2015) used data from the 2010 Northern Mountainous Baseline Survey (NMBS), we use data from three years of a national survey of Vietnamese households (the 2012, 2014 and 2016 VHLSSs). Although Tran et al. (2015) considered a relatively comprehensive set of covariates, they did not study the relationship between language and migration on the poverty of ethnic minorities. Our study examines the impact of a lack of national language proficiency and remittances on the odds of being poor for the REM.

Nguyen et al. (2017) used two data sets (from the 2010 NMBS and the 2010 VHLSS), to identify the reasons why the ethnic minority population in the northern region is poorer than those in other regions and the ethnic majority in Vietnam. They concluded that lower productive assets (education and land) and a lack of non-farm income led to a higher probability of being poor for the ethnic minorities in the north. In addition to differences in the use of data and research scope, our study differs from Nguyen et al.'s (2017) in two respects. First, they used per capita income; we use per capita expenditure to differentiate between poor and non-poor individuals. For an agricultural country like Vietnam, using expenditure as a measure better reflects the living standard of poor households than income (see Section 2.3). Secondly, they used only OLS to investigate the determinants of per capita household income; they neglected to examine the determinants of ethnic minority poverty. We use binary logit models to estimate the determinants of REM's poverty.

Like equation (3.4), $\mathrm{p_{ig}(Y = 1|X)}$ denotes the likelihood that the *i-th* ethnic minority household is poor in rural Vietnam. Y is a binary outcome that has two values: 1 (a poor household in the REM sample) and 0 (a non-poor household in the REM sample).

The binary logit model uses independent variables like those in the REM regression model outlined in Tables 3.1 and 3.2. However, the expected effects of these variables on poverty are opposite to those for the RPCE, which is estimated by equations (3.1) and (3.2)

3.2.3 Fractional Logistic Regression Model for Research Objective 3

Research objective 3 is to identify the factors that influence the TH, TRH and REM's poverty gap. The poverty gap is represented by poverty intensity (Tran et al., 2015). Accordingly, we use a regression model to examine the influences of the poverty gap. Using data at the household level, the expected values of the poverty gap conditional on a vector of covariates are as follows:

$$\mathrm{E}\big(\mathrm{Y_{ig}}\big|\mathrm{X}\big) = \alpha_{\mathrm{g}} + \sum_{\mathrm{h=1}}^{\mathrm{H}} \beta_{\mathrm{h}}\,\mathrm{HHH_{ih}} + \sum_{\mathrm{j=1}}^{\mathrm{J}} \gamma_{\mathrm{j}}\,\mathrm{HHC_{ij}} + \sum_{\mathrm{l=1}}^{\mathrm{L}} \lambda_{\mathrm{l}}\,\mathrm{REG_{il}} + \mathrm{e_{ig}} \quad (3.11)$$

Using data at the commune level, we estimate the expected values of the poverty gap conditional on a vector of covariates:

$$\mathrm{E}(\mathrm{Y_{ig}}|\mathrm{X}) = \alpha_{\mathrm{g}} + \sum_{\mathrm{k=1}}^{\mathrm{K}} \delta_{\mathrm{k}}\, \mathrm{COM_{ck}} + \mathrm{e_{ig}} \quad (3.12)$$

where: g represents the three household samples: TH, TRH and REM; Y_{ig} is the poverty gap of the *i-th* household in the *g* sample of the households, 0≤Y≤1; E is the expected value of the fractional response outcome ($\mathrm{Y_{ig}}$) conditional on a vector of explanatory variables; and $\mathrm{e_{ig}}$ is the error term.

For the fractional outcome variable (poverty intensity), we chose not to use OLS and binomial logistic regression because they are not suitable (Papke & Wooldridge, 2008). OLS estimation does not guarantee an accurate prediction when values lie between 0 and 1. The log-odds ratio approach requires that values are either 0 or 1. The fractional logit model is able to deal with the shortcomings of the OLS and log odds approaches and model a proportional outcome. Hence, to answer research objective 3, we applied Papke and Wooldridge's (1996) fractional logit model. In this model, the dependent variable (poverty gap) is a fraction that takes a value between 0 to 1. The TH, TRH, and REM fractional logit models have the following form (Papke & Wooldridge, 1996):

$$\mathrm{E}(\mathrm{Y_{ig}}|\mathrm{X_i}) = \mathrm{F(X|\beta X)} = \frac{\mathrm{Exp}\,(\beta'_{\mathrm{S}}\mathrm{X}'_{\mathrm{S}})}{1 + \mathrm{Exp}\,(\beta'_{\mathrm{S}}\mathrm{X}'_{\mathrm{S}})} = \mathrm{G}(\beta'_{\mathrm{S}}\mathrm{X}'_{\mathrm{S}}) \quad (3.13)$$

where: F is a function with the condition that the estimated variable, $\mathrm{Y_{ig}}$, has a value lying in the unit interval [0, 1]; and $\mathrm{G}(\beta'_{\mathrm{S}}\mathrm{X}'_{\mathrm{S}})$ indicates the logistic cumulative distribution function of poverty intensity, expressed by $Pig = P\{\mathrm{Y}ig = 1|Xi; \beta\}$, and $\mathrm{Y}ig \in [0,1]$. The coefficient β'_{S} are estimated parameters in the model and X'_{S} represents the predictor variables.

This model can be distinguished from the binary logistic model that defines Y with only two values: 0 and 1. The maximum likelihood method cannot yield robust estimates for $\mathrm{E}(\mathrm{Y}_i|X_i)$ since it cannot overcome the distributional failure (Papke & Wooldridge, 1996). Therefore, we use the quasi-likelihood method to estimate the parameters in the fractional logit model. Accordingly, the Bernoulli log-likelihood function is written as:

$$\mathrm{l_i}(\beta) = \mathrm{Y_i}\log[\mathrm{G}(\beta'_{\mathrm{S}}\mathrm{X}'_{\mathrm{S}})] + (1 - \mathrm{Y_i})\log[1 - \mathrm{G}(\beta'_{\mathrm{S}}\mathrm{X}'_{\mathrm{S}})] \quad (3.14)$$

This study uses three fractional logit estimations with three household samples: TH, TRH and REM. The estimates are discussed in Sections 3.2.3.1, 3.2.3.2 and 3.2.3.3. According to Bhaumik et al. (2006), the factors that determine the poverty intensity are like those that affect the probability of poverty. Therefore, the fractional logit models use the household-level Independent variables presented in Table 3.1 and the commune-level Independent variables in Table 3.2. The effects of these variables on the poverty gap are like those in the binary logit models.

3.2.3.1 The Total Households (TH) Sample

To identify the factors that affect TH's poverty intensity, we applied a fractional logistic regression model outlined in equation (3.13). This approach has been used in numerous studies (see (Bhaumik et al., 2006; Cardoso et al., 2008; Jonasson, 2011; McGuinness & Wooden, 2009). For example, McGuinness and Wooden (2009) used this model to estimate variations in the possibility of losing a job (the fractional dependent variable) among employees in Australia. They estimated the effects of sex, age, and marital status, working hours, employment status, job tenure, firm size, and industry on the proportion of job loss. Bhaumik et al. (2006) used this method to estimate the poverty gap and its influences in Kosovo. The authors found that education, employment, private transfer, the value of livestock, and the proportion of family members aged 25 and below significantly affected poverty intensity.

In the TH fractional logit model, given in equation (3.13), Y_{ig} is the poverty gap of the *i-th* household in the TH sample. According to Bhaumik et al. (2006), the factors that determine poverty intensity are like those that affect the probability of poverty. Hence, to estimate the TH's poverty intensity we use the Independent variables in Table 3.1 for the TH fractional logit model.

3.3.3.2 The Total Rural Households (TRH) Sample

To identify the influences of TRH's poverty intensity, we use the same model outlined in equation (3.13). In the TRH fractional logit model, given in equation (3.13), Y_{ig} is the poverty gap of the *i-th* household in rural Vietnam. The independent variables for the fractional logit model are like those in the TRH logit models defined in Tables 3.1 and 3.2.

Previous studies have analysed the poverty intensity across countries. For example, Bogale et al. (2005) measured the poverty gap of rural people in Ethiopia using the poverty index proposed by Foster et al. (1984). They used data from 149 families in three rural areas (Alemaya, Hitosa, and Merhabete) from 1999-2000. The authors found different poverty intensity across the three districts. They showed that the overall poverty gap was 0.047; this figure indicates the level of resources (4.7% of the poverty threshold) needed for the rural poor to escape poverty in the three districts. However, the authors did not provide econometric evidence on the correlates of poverty intensity in rural Ethiopia. In other words, their study does not, and cannot, explain the reason why the depth of poverty for people in Merhabete is higher than that of the two other districts.

Similarly, Osberg and Xu (1999) measured the poverty intensity of various provinces in Canada using microdata from the Survey of Consumer Finance (1984-1996). The authors found an inverse relationship between poverty intensity and government assistance for provincial households for the study period. The authors also found that higher government transfers helped reduce the poverty

intensity of families with more children. In addition, they found that waged employment was a correlate of poverty intensity.

Although the two studies above used the poverty gap to reflect the distribution of poor people under the poverty threshold, they did not use econometric analysis to model the determinants of poverty intensity. To provide robust empirical evidence on the determinants of poverty intensity, we use a fractional logit model to estimate the factors that affect TRH's poverty gap in Vietnam.

3.3.3.3 The Rural Ethnic Minorities (REM) Sample

To identify the factors that affect REM's poverty intensity, we use the model outlined in equation (3.13). In the REM fractional logit models, given in equation (3.13), Y_{ig} is the poverty gap of the *i-th* ethnic minority household in rural Vietnam. The independent variables for the fractional logit models are like those in the REM logit models defined in Tables 3.1 and 3.2.

Our study is similar to Tran et al.'s (2015) one that also used a fractional logit model to examine the influences of poverty intensity of the ethnic minority groups in Northwest Vietnam. They used data from the 2010 NMBS. We use more recent data from three national surveys (the 2012, 2014 and 2016 VHLSSs). In addition, we use per capita expenditure as the dependent variable in our model to measure the poverty gap as the dependent variable. This differs from their dataset; because of a lack of information about expenditure, they used per capita income as a proxy of household welfare to calculate the poverty gap. Further, we add more Independent variables into our model, including the language barrier and remittances. Tran et al.'s (2015) study focussed on ethnic minority groups residing in the Northwest region whereas this study concentrates on the REM.

Many previous poverty studies have ignored determinants of the poverty gap. For example, Nguyen et al. (2017) calculated the poverty gap of the Vietnamese ethnic minorities in 2010 using the poverty index proposed by Foster et al. (1984). They found that the depth of poverty differs among the ethnic minorities. More importantly, the authors demonstrated that ethnic minorities in the Northern Uplands are the poorest and their poverty intensity is the most severe among all ethnic minority groups in Vietnam. However, Nguyen et al.'s (2017) study did not consider determinants of the ethnic minorities' poverty gap. We investigate them in this study.

3.2.4 The Decomposition of Income Inequality for Research Objective 4

We provide an overview of income inequality in Vietnam during the study period via a descriptive analysis. In particular, we compare the RPCI by residential location and ethnicity. We use the Gini coefficient to compare the income distribution both of households in rural and urban areas and between the ethnic minorities and majority over the study period (2012-2016). Moreover, we use the

decile dispersion ratio to measure income inequality, e.g., the ratio of the 90th to the 10th (P90/P10), P75/P25, and P25/P10.

Research objective 4 is to identify the factors that contribute to income inequality in Vietnam. To answer research objective 4, we decomposed income inequality by ethnicity and urban/rural to estimate the income inequality level "within-group" and "between-group"[32] in the total income inequality using the Generalised Entropy indexes. Equations (2.7), (2.8), and (2.9) in Section 2.6.2 present the GE decomposition method. The first part refers to the "within-group" inequality and the second shows the "between-group" inequality. This separation enables us to evaluate the main factors driving income inequality and provide a foundation for policy suggestions relating to income inequality (Haughton & Khandker, 2009).

Platt (2011) applied this method when investigating income inequality in the United Kingdom (from 1968 to 2009). Likewise, Bui et al. (2017) used this approach to decompose income inequality among ethnic groups in 266 Vietnamese communes where most ethnic minorities reside. They used data from both the 2007 Baseline Survey and the 2012 Endline Survey. The authors found that within-group inequality was the main contributor to total income inequality for all households sampled in the two surveys. To extend Bui et al.'s (2017) work, we examine the impact of ethnicity on total income inequality during the study period.

There is evidence that, over the study period, rural income inequality was higher than the figures for the urban area (see Table 2.7). This result differs from previous research that has shown higher levels of income inequality for the urban population in developing countries (Cao & Akita, 2008; Estudillo, 1997). Therefore, we decompose the income inequality for all rural households by ethnicity; we, therefore, extend Bui et al.'s (2017) study. They decomposed income inequality by two ethnic groups (the ethnic minorities and the ethnic majority) in the upland and mountainous areas.

[32] Between-group income inequality is the income disparity between two people groups (Haughton & Khandker, 2009). For example, income is unequally distributed between the ethnic minority households and the ethnic majority. Within-group income inequality is the income disparity that exists among individuals/households in the same people group such as income inequality among ethnic minority households (Haughton & Khandker, 2009).

Chapter 4
Descriptive Analysis

This chapter provides a descriptive analysis of the characteristics and living standards of Vietnamese households using data from the VHLSS (2012 to 2016). The chapter is divided into two sections. Section 4.1 compares the economic well-being of the poor with that of the non-poor. Section 4.2 presents the descriptive statistics for the model variables using data from the household and commune levels. Specifically, this chapter analyses the poor and the non-poor differentials in individual (household head), household, commune and regional characteristics of three household groups: TH, TRH, and REM.

4.1 Economic Well-Being of Households in Vietnam

4.1.1 The Differences in Real Per Capita Expenditure between Poor and Non-Poor Households

This study provides evidence of variations in the economic well-being of Vietnamese households from 2012-2016. Table 4.1 shows that, during the study period, per capita expenditure for all households across Vietnam was over VND 20 million per year (calculations based on the constant 2010 prices)[33]. The results reveal that household expenditure differs by region. Expenditure is also affected by where households are (urban or rural areas) and one's ethnicity. In particular, among the six socio-economic regions in Vietnam, people residing in the MNM region had the lowest spending levels, VND 13,564.3 thousand per person per year. This level was approximately 50% of the spending per capita of the Southeast population. Likewise, the rural population spent 54% of the amount that the urban population spent. Among the rural inhabitants, ethnic minorities are further disadvantaged. Ethnic minorities in rural areas spent approximately VND 9 million a year, which is approximately 51% of the ethnic majority's (the Kinh and those of Chinese descent) expenditure.

[33] See Section 3.1.2 for the method used to calculate annual real per capita expenditure.

Table 4. 1 Annual Real per Capita Expenditure by Poverty Status and Household Group (VND 1,000)

Region	All		Poor		Non-poor		Difference	
	Mean	SD	Mean	SD	Mean	SD	+/-	%
Urban and Rural Areas								
Whole Vietnam	20129.2	17369.3	5869.2	1481.6	22345.2	17655.7	-16476.0	-73.7
Urban	29297.0	23790.1	6353.4	1312.5	30139.7	23804.4	-23786.3	-78.9
Rural	15843.7	10978.4	5824.9	1488.5	18055.1	10935.8	-12230.2	-67.7
Six Regions								
Red River Delta	25096.3	20458.6	6695.2	1120.6	26045.1	20535.7	-19349.9	-74.3
Midlands and Northern Mountains	13564.3	11591.3	5739.7	1487.7	17876.0	12443.9	-12136.2	-67.9
Northern and Coastal Central	17413.6	13149.4	5806.9	1416.6	19447.1	13232.9	-13640.3	-70.1
Central Highlands	16349.2	14137.0	5114.8	1640.3	20687.9	14437.2	-15573.1	-75.3
Southeast	27334.4	22127.1	6525.0	1258.7	27996.1	22156.7	-21471.1	-76.7
Mekong River Delta	16896.5	13000.5	6291.9	1238.8	18162.4	13190.2	-11870.5	-65.4
Total Rural Households								
Red River Delta	19564.5	12044.8	6683.8	1147.8	20458.43	11947.48	-13774.7	-67.3
Midlands and Northern Mountains	11409.8	8224.7	5723.7	1487.2	15463.0	8649.6	-9739.3	-63.0
Northern and Coastal Central	14474.5	9811.0	5756.8	1415.8	16519.5	9816.0	-10762.8	-65.2
Central Highlands	12945.4	10005.6	5039.9	1620.0	17295.4	10022.1	-12255.4	-70.9
Southeast	20553.6	11598.7	6503.0	1350.1	21319.3	11420.0	-14816.3	-69.5
Mekong River Delta	15510.2	10810.3	6293.3	1231.9	16756.9	10928.0	-10463.6	-62.4
Average	15843.7	10978.4	5824.9	1488.5	18055.1	10935.8	-12230.2	-67.7
Rural Ethnic Minorities								
Red River Delta	15958.7	18967.8	6094.0	1233.5	20389.0	21423.7	-14295.0	-70.1
Midlands and Northern Mountains	8931.1	6389.3	5602.0	1477.6	13572.3	7597.0	-7970.3	-58.7
Northern and Coastal Central	7466.7	4014.9	5222.2	1393.6	11324.6	4117.1	-6102.3	-53.9
Central Highlands	7581.4	4920.7	4890.2	1623.1	12808.4	4974.9	-7918.2	-61.8
Southeast	12893.4	6863.8	5696.0	1901.9	14427.8	6555.6	-8731.9	-60.5
Mekong River Delta	12325.8	7125.8	6255.3	1299.7	14141.2	7151.3	-7885.9	-55.8
Average	8991.8	6742.0	5420.2	1515.2	13499.1	7969.7	-8078.9	-59.8
Rural Ethnic Majority								
Red River Delta	19644.8	11836.2	6752.2	1120.2	20459.6	11734.6	-13707.4	-67.0
Midlands and Northern Mountains	15697.2	9223.6	6675.2	1192.3	17030.9	9144.9	-10355.7	-60.8
Northern and Coastal Central	15891.0	10026.3	6435.5	1124.5	16949.0	10025.5	-10513.5	-62.0
Central Highlands	17647.2	10925.6	6030.6	1206.2	18760.2	10793.2	-12729.5	-67.9
Southeast	20967.0	11659.4	6673.1	1149.7	21640.3	11497.9	-14967.2	-69.2
Mekong River Delta	15781.5	11025.9	6300.1	1221.1	16949.7	11132.1	-10649.5	-62.8
Average	17558.0	11163.5	6478.2	1181.6	18606.7	11116.1	-12128.6	-65.2

Notes: The means and standard deviations (SD) are the averages for three years (2012, 2014, and 2016) at January 2010 prices. Estimates were adjusted for cross-sectional weights. Differences in the two means are significant at the 1% level.

Source: Authors' calculations using the VHLSS data (2012 – 2016)

There was a considerable gap in the poor and non-poor's living standards. In general, the poor spent 54 to 79% less than the non-poor during the study period (see the last column in Table 4.1). Differences in consumption between the two groups depend on where the households were and to which ethnicity they belong. Table 4.1 shows that, at the national level, the average annual expenditure per poor person was VND 5,869.2 thousand. Across Vietnam, the TP's RPCE was approximately 74% lower than that of the TNP (VND 16,476 thousand). The expenditure gap was larger for the developed regions than the less developed regions. Among the six socio-economic regions, the highest expenditure difference between the poor and the non-poor (over 75%) was observed in the Southeast, at VND 21,471.1 thousand; the corresponding figure for the NCC region was VND 13,640.3 thousand. The expenditure gap between the poor and the non-poor was lower for rural than municipal inhabitants. Urban poor consumed approximately 79% less than their counterparts in the non-poor group. However, the difference in RPCE between the TRP and the TRNP was 68% (VND 12,230.2 thousand). Likewise, in the rural ethnic minority communes, the RPE spent almost 60% less than the RNPE.

Expenditure among poor households in Vietnam varied depending on different factors. For poor households as a whole, the average RPCE was VND 5,869 thousand for the three years (2012, 2014 and 2016). Indeed, the TRP were more disadvantaged than the urban poor. The RPCE was VND 5,825 thousand for the TRP as opposed to VND 6,353 thousand for their counterparts in urban areas. The spatial patterning of poverty within rural areas showed that the CH region had the lowest economic well-being, with a RPCE of VND 5,114.8 thousand. For consumption, the RPE's RPCE was lower than that of their counterparts in the ethnic majority. In particular, the RPE spent over VND 5.4 million, whereas rural households from the ethnic majority consumed nearly VND 6.5 million.

The RPE were the most disadvantaged group in Vietnam. They spent the lowest amount of money compared with the TRP and the TP in Vietnam. The RPE's RPCE varied by region. The poorest ethnic minorities live in the CH region. In the CH, the RPE's expenditure was VND 4,890 thousand per person. The ethnic poor in the NCC region had the second-lowest living standards among the poor in rural areas, followed by the MNM region. The ethnic minority poor in the Red and Mekong Rivers and Southeast spent more than those living in the other regions.

4.1.2 The Differences in Real Per Capita Income between Poor and Non-Poor Households

In Vietnam, differences in RPCE among Vietnamese households are associated with variations in RPCI and household income sources (Gallup, 2004). The present study provides evidence on changes in the RPCI[34] and the contribution of various income sources to the TH, TRH and REM's RPCI for the study period (2012-2016). In general, total household income was generated from six main sources. It increased over the study period. Table 4.2 shows that the TH's RPCI rose by nearly VND 3.9 million, from approximately VND 19.3 to 23.2 million. Similarly, the TRH's RPCI increased by over VND 3.3 million. The REM had the lowest increase in RPCI, of over VND 1.6 million between 2012 and 2016. The RPCI from wages and non-agricultural activities showed an increasing trend for all three household samples. For instance, income from wages for the TH increased from approximately VND 8.5 to 10.8 million, and the TRH's wage-earnings rose from approximately VND 6.2 to 8 million. However, per capita agricultural income fluctuated over time and varied by household group. Agricultural income for both the TH and the TRH reduced from 2012 to 2014 but rose in 2016. Income per ethnic minority person fell steadily over all three years.

Although there were mixed results for agricultural income between 2012 and 2016, the importance of agricultural income in terms of total household per capita income[35] decreased significantly for the three household groups (TH, TRH, and REM) (see Table 4.2). TH's share of agricultural income in the total household per capita income was 22.1% in 2012. In 2016, it decreased to 18.6% for all Vietnamese households. There was a 4.4% decrease in the TRH's share of agricultural income. The biggest drop was 10.4%, from 52.4% to 42%, for the REM. Significantly, Table 4.2 indicates that the proportion of remittances in the total household earnings per capita remained the same for TH but increased for TRH and REM. The share of TH's income from remittances remained unchanged at 6.7% in 2012 and 2016, but it reduced to 6.3% in 2014. The proportion of non-labour earnings from remittances in total household per capita income increased by 0.2% and 0.5% for TRH and REM between 2012 and 2016, respectively. Although the share of aid for REM was larger than that for TRH or TH, the value of aid that REM received was not considerably higher than for TH and TRH. For example, REM received VND 241.1 thousand in aid for education and healthcare, which equates to 2.4% of their total income per person in 2016; assistance for TRH and TH was only 1% of total income at VND 219.2 thousand and 237.6 thousand, respectively.

[34] See Section 3.1.2 for the method used to calculate annual real per capita income.

[35] Total household per capita income is understood as the RPCI because we calculated RPCI by dividing the sum of all (six) household income sources by household size using 2010 constant prices.

Table 4. 2 The Structure of Annual Real Per Capita Income for Three Household Samples, 2012-2016 (VND 1,000)

	2012						2014						2016					
	All		Poor		Non-Poor		All		Poor		Non-Poor		All		Poor		Non-Poor	
Income Source	*Mean*	*%*	*Mean*	*%*	*Mean*	*%*	*Mean*	*%*	*Mean*	*%*	*Mean*	*%*	*Mean*	*%*	*Mean*	*%*	*Mean*	*%*
Total Households																		
Agriculture	**4267.5**	**22.1**	**2745.3**	**39.1**	**4583.8**	**21.0**	**4001.2**	**19.3**	**2806.1**	**39.7**	**4188.2**	**18.3**	**4304.8**	**18.6**	**2826.7**	**41.5**	**4464.9**	**17.9**
Non-Agriculture	**3967.6**	**20.6**	**503.7**	**7.2**	**4687.2**	**21.5**	**4513.8**	**21.7**	**393.4**	**5.6**	**5158.7**	**22.5**	**5213.5**	**22.5**	**290.2**	**4.3**	**5746.9**	**23.0**
Wages	**8445.4**	**43.8**	**2877.4**	**41.0**	**9602.3**	**44.0**	**9764.6**	**47.0**	**2971.8**	**42.0**	**10827.8**	**47.2**	**10787.8**	**46.6**	**2758.2**	**40.5**	**11657.8**	**46.7**
Remittances	**1284.2**	**6.7**	**459.0**	**6.5**	**1455.6**	**6.7**	**1302.3**	**6.3**	376.1	5.3	1447.2	**6.3**	**1544.8**	**6.7**	399.8	5.9	1668.8	**6.7**
Domestic	947.8	4.9	397.9	5.7	1062.1	4.9	965.9	4.6	367.3	5.2	1059.6	4.6	1166.7	5.0	336.7	4.9	1256.6	5.0
Overseas	336.3	1.7	61.1	0.9	393.5	1.8	336.4	1.6	8.8	0.1	387.6	1.7	378.1	1.6	63.2	0.9	412.2	1.7
Aid	**204.3**	**1.1**	**112.0**	**1.6**	**223.4**	**1.0**	**175.3**	**0.8**	**150.0**	**2.1**	**179.3**	**0.8**	**237.6**	**1.0**	**197.2**	**2.9**	**242.0**	**1.0**
For Education	45.3	0.2	70.0	1.0	40.1	0.2	34.9	0.2	112.0	1.6	22.8	0.1	64.8	0.3	164.7	2.4	54.0	0.2
For Healthcare	159.0	0.8	41.9	0.6	183.3	0.8	140.4	0.7	38.0	0.5	156.5	0.7	172.9	0.7	32.5	0.5	188.1	0.8
Other	**1126.4**	**5.8**	**323.5**	**4.6**	**1293.2**	**5.9**	**1020.2**	**4.9**	**377.0**	**5.3**	**1120.9**	**4.9**	**1077.4**	**4.7**	**340.9**	**5.0**	**1157.2**	**4.6**
Total	**19295.3**	**100**	**7021.0**	**100**	**21845.5**	**100**	**20777.4**	**100**	**7074.5**	**100**	**22922.0**	**100**	**23165.9**	**100**	6813.1	100	**24937.6**	**100**
Total Rural Households																		
Agriculture	**5475.0**	**32.9**	**2870.1**	**42.0**	**6216.1**	**32.0**	**5340.3**	**30.0**	**2946.4**	**43.7**	**5886.3**	**29.0**	**5666.9**	**28.5**	**2876.1**	**42.9**	**6105.5**	**27.8**
Non-Agriculture	**2976.6**	**17.9**	**433.5**	**6.3**	**3700.2**	**19.1**	**3341.0**	**18.8**	**308.3**	**4.6**	**4032.7**	**19.9**	**3819.7**	**19.2**	**237.6**	**3.5**	**4382.8**	**20.0**
Wages	**6171.0**	**37.1**	**2644.5**	**38.7**	**7174.4**	**37.0**	**6976.8**	**39.2**	**2603.4**	**38.6**	**7974.3**	**39.3**	**7977.2**	**40.1**	**2671.5**	**39.8**	**8811.1**	**40.1**
Remittances	**1177.9**	**7.1**	**444.8**	**6.5**	**1386.4**	**7.1**	**1220.0**	**6.9**	**357.5**	**5.3**	**1416.7**	**7.0**	**1447.6**	**7.3**	**385.8**	**5.7**	**1614.4**	**7.4**
Domestic	879.5	5.3	377.9	5.5	1022.2	5.3	933.7	5.3	349.4	5.2	1067.0	5.3	1069.7	5.4	319.1	4.8	1187.6	5.4
Overseas	298.3	1.8	66.9	1.0	364.2	1.9	286.3	1.6	8.1	0.1	349.8	1.7	377.9	1.9	66.7	1.0	426.8	1.9
Aid	**177.1**	**1.1**	**117.5**	**1.7**	**194.0**	**1.0**	**179.3**	**1.0**	**160.2**	**2.4**	**183.6**	**0.9**	**219.2**	**1.1**	**203.8**	**3.0**	**221.6**	**1.0**
For Education	35.7	0.2	74.1	1.1	24.8	0.1	44.2	0.2	121.8	1.8	26.5	0.1	50.4	0.3	172.8	2.6	31.1	0.1
For Healthcare	141.4	0.9	43.4	0.6	169.2	0.9	135.1	0.8	38.4	0.6	157.1	0.8	168.9	0.8	31.1	0.5	190.5	0.9
Other	**639.1**	**3.8**	**322.3**	**4.7**	**729.3**	**3.8**	**724.2**	**4.1**	**370.5**	**5.5**	**804.8**	**4.0**	**761.9**	**3.8**	**337.2**	**5.0**	**828.6**	**3.8**
Total	**16616.7**	**100**	**6832.8**	**100**	**19400.4**	**100**	**17781.7**	**100**	**6746.3**	**100**	**20298.5**	**100**	**19892.5**	**100**	**6712.1**	**100**	**21964.1**	**100**
Rural Households (Ethnic Minorities)																		
Agriculture	**4419.5**	**52.4**	**3288.0**	**59.1**	**6186.9**	**47.8**	**4321.6**	**47.5**	**3186.3**	**55.8**	**6058.2**	**42.4**	**4229.1**	**42.0**	**3020.5**	**51.4**	**5306.2**	**38.4**
Non-Agriculture	**559.5**	**6.6**	**151.3**	**2.7**	**1197.1**	**9.3**	**597.4**	**6.6**	**100.4**	**1.8**	**1357.5**	**9.5**	**783.3**	**7.8**	**117.6**	**2.0**	**1376.5**	**10.0**
Wages	**2555.2**	**30.3**	**1481.9**	**26.6**	**4231.8**	**32.7**	**3274.2**	**36.0**	**1790.4**	**31.4**	**5543.9**	**38.8**	**3842.6**	**38.2**	**2028.7**	**34.5**	**5459.1**	**39.6**
Remittances	**448.3**	**5.3**	**237.1**	**4.3**	**778.1**	**6.0**	**384.4**	**4.2**	**178.0**	**3.1**	**700.0**	**4.9**	**588.0**	**5.8**	**224.5**	**3.8**	**911.9**	**6.6**
Domestic	322.0	3.8	228.1	4.1	468.7	3.6	339.8	3.7	168.4	2.9	602.0	4.2	512.6	5.1	208.2	3.5	783.9	5.7
Overseas	126.3	1.5	9.0	0.2	309.5	2.4	44.6	0.5	9.6	0.2	98.1	0.7	75.4	0.7	16.3	0.3	128.0	0.9
Aids	**154.0**	**1.8**	**145.2**	**2.6**	**167.6**	**1.3**	**194.8**	**2.1**	**205.2**	**3.6**	**178.7**	**1.3**	**241.1**	**2.4**	**246.1**	**4.2**	**236.6**	**1.7**
For Education	108.5	1.3	117.5	2.1	94.5	0.7	147.7	1.6	178.6	3.1	100.3	0.7	174.3	1.7	224.5	3.8	129.5	0.9
For Healthcare	45.4	0.5	27.7	0.5	73.1	0.6	47.1	0.5	26.6	0.5	78.4	0.5	66.8	0.7	21.6	0.4	107.1	0.8
Other	**302.9**	**3.6**	**257.6**	**4.6**	**373.6**	**2.9**	**322.5**	**3.5**	**247.7**	**4.3**	**436.8**	**3.1**	**385.0**	**3.8**	**243.4**	**4.1**	**511.1**	**3.7**
Total	**8439.3**	**100**	**5561.1**	**100**	**12935.0**	**100**	**9094.8**	**100**	**5708.0**	**100**	**14275.2**	**100**	**10069.0**	**100**	**5880.8**	**100**	**13801.3**	**100**

Notes: Means were calculated using constant prices (January 2010). Estimates were adjusted for cross-sectional weights.
Source: Authors' calculations using the VHLSS data (2012, 2014, and 2016)

4.1.2.1 The Living Standard of the Poor

During the study period, Vietnamese families experienced significant improvement in their economic welfare. However, the poor did not experience any great improvement in their household welfare. At the national level, the TP's RPCI was reduced by 0.2 million, from VND 7 million in 2012 to 6.8 million in 2016 (see Table 4.2). Similarly, in rural areas the TRP's RPCI declined from VND 6.8 to 6.7 million during the same period. Decreases in non-farm income and remittances contributed to the decline in TP and TRP's earnings. However, the living standard of the poor in rural ethnic minority communes improved as a result of a slight growth in their income. In particular, the RPE's RPCI increased by 5.7%, from VND 5.6 million in 2012 to VND 5.9 million in 2016. Improvements in access to paid employment led to an increase in the RPE's total income. The RPE's per capita income from wages increased significantly, from VND 1.5 to 2 million from 2012-2016.

Agricultural income contributed most to the poor's total household per capita income. Agricultural income comprised the most significant share of TP's, TRP's and RPE's income at 41.5%, 42.9% and 51.4% in 2016, respectively. Though the percentage of agricultural income increased for TP and TRP, it reduced significantly for RPE in the same period. In particular, the farm income's share increased from 39.1 to 41.5% for TP and from 42% to 42.9% for TRP (see Table 4.2). In contrast, the farm income share for RPE reduced by 7.7%, from 59.1% to 51.4%, between 2012 and 2016. Income from wages contributed the second-largest share to the poor's total household per capita income; e.g., wages comprised approximately 40% of TP's total earnings in 2016. Though this income source increased for TRP and RPE, there was a slight decrease for TP (0.5%). The poor had limited access to non-farm self-employment during the study period, thus it accounted for only a small percentage of total income. This income source decreased for the three poor household groups over the study period.

Although remittances contributed a declining proportion to the total household per capita income of the poor, its share was higher than income from non-farm self-employment. For instance, in 2012, remittances accounted for 6.5% of TP's and TRP's total income. In 2016, the corresponding figures were below 6% for both disadvantaged groups. As for RPE, income from remittances reduced by 0.5% between 2012 and 2016, from 4.3% to 3.8%. Income from aid constituted the smallest share of TP's and TRP's total income, at no more than 3% in 2016. Grants contributed 4.2% to RPE's total household per capita income, passing the lowest contribution of non-agricultural self-employment earnings (2%) in that year (see Table 4.2).

4.1.2.2. The Living Standard of the Non-Poor

During Vietnam's economic expansion, non-poor households benefited far more than poor households (Hinsdale et al., 2013). Our study confirms that the non-poor's living standards improved with a significant increase in their RPCI from 2012-2016. Table 4.2 shows that TNP's RPCI group was

approximately VND 22 million in 2012. It grew to nearly 25 million in 2016. Likewise, the RPCI of the non-poor in rural and ethnic minority communes increased over time.

The results show differences in the contributions of different income sources to the total income per capita of the non-poor. Among the six income sources, the total household per capita income of the non-poor heavily depended on paid employment (wages). In general, income from paid employment contributed the largest share to the non-poor's total household per capita income (see Table 4.2). In particular, for TNP, wage employment constituted 44% of their total income, equivalent to VND 9.6 million in 2012. This increased to approximately 47% in both 2014 and 2016. Likewise, paid employment contributed 37 to 40% to the total household per capita income of TRNP. In 2012 and 2014, paid employment ranked second among the contributors to RNPE's income in 2012 and 2014. In 2016, it became the largest contributor (39.6%) to RNPE's total household per capita income.

Income from non-agricultural self-employment contributed the second-largest share to TNP's total household per capita income. However, in terms of percentages, for rural and ethnic minority households, this income source was the third highest contributor. Rural Vietnamese people rely heavily on agriculture for their livelihood (Gallup, 2004); approximately 61% of the non-poor households participated in agricultural activities (see Table 4.4). Agricultural income generates more income than non-agricultural self-employment for rural non-poor and ethnic minorities. However, with the national industrialisation, the share of farming income declined. Across Vietnam, it ranked third in terms of its contribution to the non-poor's total income.

Table 4.2 shows a slight difference in income shares from remittances and aid among the three non-poor household groups. Remittances averaged 6 to 7% over the four years. This income source was seven times as much as the income from aid. During the study period, these income sources remained at 7% and 1%, respectively.

Table 4.2 reveals that poor households had lower levels of economic well-being than the non-poor from 2012-2016. At the national level, TP's RPCI was VND 6,813.1 thousand compared with 24,937.6 thousand for TNP in 2016. At the same time, in rural areas, TP's RPCI was VND 6,712.1 thousand, accounting for 27% of the non-poor's total household per capita income at VND 21,964.1 thousand. Income was also unevenly distributed between RPE and RNPE. Generally, the non-poor experienced greater benefit from economic development in Vietnam. Specifically, inequalities in income distribution led to an increasing income gap between the poor and the non-poor (see Table 4.3). In 2012, TNP's income was 3.1 times as much as that of TP in 2012. The income gap ratio increased to 3.2 in 2014 and 3.8 in 2016. As for the rural population, TRNP earned 2.8 times as much as TRP in 2012; the corresponding figures were 3 and 3.3 times in 2014 and 2016, respectively. However, REM had

better income dispersion than TRH and TH. The ratio between the RPCI of RNPE and RPE was 2.3 times in 2012. It climbed to 2.5 times in 2014 but returned to 2.3 times in 2016.

Table 4. 3 The Income Gap Between the Poor and the Non-poor, 2012-2016

Year	*2012*	*2014*	*2016*
Total Households	3.1	3.2	3.7
Total Rural Households	2.8	3.0	3.3
Rural Ethnic Minorities	2.3	2.5	2.3

Source: Authors' calculations using the VHLSS data (2012, 2014, and 2016)

4.2 Data on the Determinants of Real Per Capita Expenditure, Poverty and the Poverty Gap

In modelling the determinants of expenditure, poverty and the poverty gap, we estimated separate models for the three household samples, namely TH, TRH and REM. This decision was based on three considerations. First, poverty is predominantly and persistently found in rural areas, especially in communes that comprise ethnic minorities (Hinsdale et al., 2013). In addition to investigating the expenditure and poverty attributes of TH and TRH, we consider the poverty of ethnic minority groups living in rural areas. Second, although TH sample is a superset of TRH and REM, we argue that each household sample has sufficiently distinct characteristics to warrant differences in model estimates. Third, commune-level variables were collected for only the rural areas; by modelling the rural sector separately, we were able to use these data. Therefore, the selected variables were grouped broadly into household and commune-level variables for the three household samples. Tables 4.4 to 4.7 provide the descriptive statistics of the model variables.

4.2.1 Descriptive Data at the Household Level

In models, at the household level, we included both household and household head characteristics. Individuals and families' differing endowments help explain variations in living standards and poverty levels. We also investigated variables related to socio-economic development programme access (such as credit, healthcare, education, and pension programmes) to determine whether these programmes are effective. Regional dummies were used to control the spatial impacts of unobserved regional characteristics on expenditure and poverty. Regional variables were used to identify which region(s) is/are the most impoverished. The interview year was used to control for unobserved characteristics in each year.

We combined data from the three years of a national survey (the VHLSS, 2012, 2014, and 2016). Our entire data set included 28,188 households across Vietnam. Of the respondents, approximately 70%

lived in rural areas. Fifteen percent of the households were members of an ethnic minority. Based on the data types, selected model variables were grouped into continuous, dummy and categorical variables for empirical analysis. Table 4.4 presents the descriptive statistics for the TH and TRH models. Table 4.5 presents the descriptive statistics for the REM models.

4.2.1.1. Total Households

Table 4.4 shows that over the study period, 22.5% of all households (TH) in the surveys had a female head. Nearly 85% of all the household heads (TH) were married and approximately 12% were widowed. Household heads had an average of 7.5 years of schooling. The average number of members in each household was five. Approximately 62% of total members in each household worked during the study period. Most household heads were engaged in agricultural employment; only 19% of household heads were employed in paid/salaried work. Over 85% of households belonged to the ethnic majority (the Kinh or Chinese people) and approximately 32% of the families lived in the urban areas. Among the six regions in Vietnam, the RRD region was the most densely populated. In contrast, the CH region was the least densely populated.

Regarding housing conditions for the TH, Table 4.4 shows that only 34.6% of the households had access to tap water at their home; a higher percentage (64.3%) had flush toilets. The average residential area per person was 21 m^2. Household assets were measured using the size of arable land and the value of durable goods owned by the families. Table 4.4 shows that the TH's per capita farmland area was only 1319.5 m^2. The results showed that 37.5% of the households had small farms, less than 0.5 ha. Over one third of the TH were landless. The real annual per capita expenditure on durable goods was VND 2,192.2 thousand.

The average income from domestic remittances of the TH was over VND 1 million per capita per year. This amount was nearly three times as much as that from overseas payments (see Table 4.4). Generally, Vietnamese households bought, or could afford, health insurance for 68% of their family members, 2% lower than the ratio of household members receiving free health insurance from the government. In terms of other financial support, on average, households received VND 21 thousand through scholarships and 756 thousand in pensions per capita. Nearly 18% of the TH had a preferential loan (see Table 4.4).

Table 4. 4 Descriptive Statistics for the Total Households and Rural Households Models at the **Household Level**

Continuous/Discrete Variable	***Total Households***						***Total Rural Households***					
	All		***Total Poor***		***Total Non-poor***		***All***		***Rural Poor***		***Rural Poor***	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Age	50.36	13.54	46.86	15.00	50.90	13.22	49.67	13.54	46.71	14.99	50.33	13.11
Education	7.46	3.67	4.65	3.59	7.90	3.49	6.85	3.58	4.63	3.59	7.34	3.39
Household Size	4.45	1.60	5.20	1.78	4.34	1.54	4.47	1.61	5.19	1.78	4.32	1.52
Proportion of Working Members	62.37	25.32	55.05	21.76	63.51	25.65	61.80	25.56	55.07	21.72	63.28	26.10
Living Area Per Capita	21.04	15.76	12.00	6.64	22.44	16.29	19.76	13.94	12.09	6.60	21.45	14.55
Durable Goods Per Capita (logarit)	7.01	1.26	5.40	1.40	7.26	1.03	6.82	1.26	5.40	1.41	7.13	0.98
Durable Goods Per Capita (VND 1,000)	2192.17	4496.54	377.09	315.80	2474.24	4770.12	1711.29	3282.14	379.45	317.91	2005.26	3556.69
Domestic Remittances Per Capita (logarit)	4.86	2.62	3.81	2.44	5.02	2.61	4.76	2.60	3.74	2.45	4.98	2.58
Domestic Remittances Per Capita (VND 1,000)	1030.10	2953.88	369.53	1118.76	1132.76	3131.87	962.91	2908.47	350.89	1049.44	1098.00	3159.51
Overseas Remittances Per Capita (logarit)	0.34	1.66	0.07	0.75	0.38	1.75	0.28	1.51	0.08	0.77	0.32	1.63
Overseas Remittances (VND 1,000)	350.56	3312.47	43.84	723.84	398.23	3546.74	321.60	3459.11	47.08	754.57	382.19	3802.72
Farm Land Area Per Capita (m^2)	1319.46	3319.26	2029.86	3826.26	1209.09	3219.40	1762.77	3787.66	2162.19	3957.46	1674.63	3743.55
Bought Health Insurance (%)	68.14	37.41	25.44	38.20	74.78	32.61	61.88	40.10	23.16	37.02	70.43	35.44
Free Health Insurance (%)	70.73	32.66	82.62	30.35	68.89	32.62	69.60	33.28	84.34	29.31	66.35	33.22
Scholarship Per Capita (logarit)	0.36	1.07	0.22	0.93	0.38	1.08	0.32	1.01	0.21	0.91	0.34	1.03
Scholarship Per Capita (VND 1,000)	20.95	1139.57	7.31	67.51	23.07	1224.62	8.56	112.37	7.35	69.84	8.82	119.74
Pension Per Capita (logarit)	0.71	2.42	0.09	0.84	0.81	2.57	0.38	1.81	0.08	0.84	0.45	1.95
Pension Per Capita (VND 1,000)	756.04	3332.53	55.24	655.59	864.95	3560.44	402.35	2429.96	53.02	632.10	479.46	2662.15
Dummy/Categorical Variables												
Female	0.23	0.42	0.17	0.38	0.23	0.42	0.18	0.38	0.16	0.37	0.18	0.38
Minority	0.15	0.36	0.59	0.49	0.08	0.27	0.20	0.40	0.62	0.49	0.11	0.31

Never Married	0.02	0.13	0.01	0.12	0.02	0.13	0.01	0.11	0.01	0.11	0.01	0.11
Married	0.85	0.36	0.86	0.35	0.84	0.36	0.86	0.35	0.86	0.35	0.86	0.35
Widowed	0.12	0.32	0.11	0.31	0.12	0.32	0.11	0.31	0.11	0.31	0.11	0.31
Divorced/Separated	0.02	0.14	0.02	0.13	0.02	0.14	0.02	0.13	0.02	0.13	0.02	0.13
Agricultural Employment	0.55	0.50	0.85	0.35	0.50	0.50	0.66	0.47	0.87	0.34	0.61	0.49
Non-farm Self-Employment	0.26	0.44	0.10	0.30	0.28	0.45	0.22	0.42	0.09	0.29	0.25	0.43
Wage-Paying Employment	0.19	0.40	0.05	0.21	0.22	0.41	0.12	0.33	0.04	0.19	0.14	0.35
Rural Areas	0.68	0.47	0.92	0.28	0.64	0.48	0.68	0.47	0.18	0.38	0.82	0.38
Tap Water	0.35	0.48	0.08	0.27	0.39	0.49	0.17	0.37	0.06	0.23	0.19	0.39
Clean Water	0.54	0.50	0.48	0.50	0.55	0.50	0.68	0.47	0.48	0.50	0.72	0.45
Other Water	0.11	0.31	0.44	0.50	0.06	0.24	0.15	0.36	0.47	0.50	0.08	0.28
Toilet_Flush	0.64	0.48	0.15	0.36	0.72	0.45	0.53	0.50	0.13	0.33	0.61	0.49
Toilet_Not Flush	0.31	0.46	0.63	0.48	0.26	0.44	0.41	0.49	0.64	0.48	0.36	0.48
Toilet_No	0.05	0.21	0.22	0.41	0.02	0.14	0.06	0.25	0.23	0.42	0.03	0.17
No-Farmland	0.37	0.48	0.12	0.33	0.40	0.49	0.18	0.38	0.10	0.30	0.20	0.40
0 ha <=Farm Size<0.5 ha	0.38	0.48	0.38	0.49	0.37	0.48	0.47	0.50	0.38	0.49	0.49	0.50
0.5 ha <=Farm Size<1 ha	0.10	0.30	0.16	0.37	0.09	0.28	0.13	0.34	0.17	0.37	0.12	0.33
1 ha <=Farm Size<1.5 ha	0.05	0.23	0.11	0.31	0.05	0.21	0.07	0.26	0.12	0.32	0.06	0.25
Farm Size >=1.5 ha	0.11	0.31	0.22	0.41	0.09	0.29	0.14	0.35	0.24	0.43	0.12	0.33
Borrowing	0.18	0.38	0.27	0.45	0.16	0.37	0.21	0.41	0.28	0.45	0.20	0.40
Red River Delta	0.23	0.42	0.08	0.28	0.26	0.44	0.23	0.42	0.08	0.27	0.26	0.44
Midlands and Northern Mountains	0.14	0.34	0.36	0.48	0.10	0.30	0.16	0.37	0.38	0.48	0.12	0.32
Northern and Coastal Central	0.22	0.41	0.24	0.43	0.22	0.41	0.24	0.42	0.25	0.43	0.23	0.42
Central Highlands	0.06	0.24	0.13	0.33	0.05	0.22	0.06	0.25	0.13	0.33	0.05	0.22
Southeast	0.16	0.37	0.04	0.19	0.18	0.39	0.10	0.30	0.03	0.16	0.11	0.32
Mekong River Delta	0.19	0.39	0.15	0.36	0.19	0.40	0.21	0.41	0.14	0.35	0.23	0.42

Notes: Means and standard deviations (SD) were averaged over three years (2012, 2014, and 2016). Estimates were adjusted for cross-sectional weights. Differences between the two means of the poor and the non-poor samples are statistically significant at 1%, except for the scholarship variable (p-value > 0.1).

Source: Authors' calculations based on the VHLSS data (2012 – 2016)

Table 4.4 shows the TP and TNP differentials in individual (household head), household, and regional characteristics. During 2012-2016, TP generally had more family members, but fewer family members who were working than the TNP. Although the TP were younger, they had lower levels of education than the TNP. Most TP lived in rural areas and were engaged in agricultural jobs. Half of the TNP worked for wages and were employed in non-agricultural jobs. Most of the TP were ethnic minority people who resided in the uplands, especially in the MNM region. The TP had smaller living areas, less durable goods and lived in unsanitary conditions. Only a small number of the TP could afford to buy health insurance; most received free access to healthcare services. The scholarships and rewards that the TP received were less than the TNP. Likewise, the pensions that the TP received after retirement were considerably smaller than the TNP.

4.2.1.2. Total Rural Households

In our dataset, rural households comprise approximately 68% of the total sampled households (19,875 households) from 2012-2016. About 20% of the rural populace was a member of the ethnic minority. Compared with households across Vietnam, TRH had a lower standard of living and faced significant constraints to improve their economic welfare. The rural population had lower levels of access to public facilities. For example, rural people had lower levels of education than the average level of all households across Vietnam. Only 16.6% of the TRH had access to tap water, compared with 34.6% of the TH. Approximately 53% of TRH used flush toilets, lower than TH's 64%. However, the rural populace held more farmland than the total population. The farmland area per rural person was approximately 1,763 m^2 compared with 1,320 m^2 for TH. Similarly, access to preferential credit was 5% higher for TRH than TH.

Table 4.4 shows that 86% of rural household heads were married. Approximately 11% and 2% were widowed and divorced, respectively. Rural households living in poverty had poor endowments. Table 4.4 shows that TRP lived in larger families than TRNP. They also had fewer family members in general work than TRNP. The TRP received less from remittances and spent less on durable goods than TRNP. However, the TRP had a higher level of access to free healthcare services (84.3%) than the TRNP (66.4%). Similarly, more TRP benefited from preferential credit programmes than TRNP. This can be explained by the government's anti-poverty policies, which, recently, have focussed on the poor in rural areas. Poverty in rural male-headed households was greater than in female-headed families. In particular, 18% of the total rural male-headed households fell into poverty compared with 16.5% for rural female-headed households over the study period[36]. The TRP had limited access to non-farm employment over the study period. Of the TRP, 3.7% worked in the wage sector as opposed to 14% of

[36] Calculated by the author using the figures in Table 4.4.

TRNP. Of the rural households working in the agricultural industry, 23.7% were poor; only 5.5% of household heads employed in salaried positions lived in poverty[37].

4.2.1.3. Rural Ethnic Minorities

Though poverty rates have decreased and household welfare has generally increased through Vietnam since 1986, it remains an issue for ethnic minority people (Churchill & Smyth, 2017; Muller & Minot, 2009). To understand the extent of ethnic minority poverty and the reason why poverty is concentrated and persists in rural ethnic minority communes, we summarise REM's socio-economic disadvantages, especially the RPE, between 2012 and 2016. Table 4.5 presents the household-level variables for the empirical models for the REM, the smallest household sample in our study.

In comparing the TH and TRH households, we found that although the household heads in rural ethnic minority communes were younger, they had the lowest education level. The REM lived in the most precarious living conditions, with the smallest residential area (approximately 15 m^2). They also had the lowest usage of tap water (4.7%) and flush toilets (16.4%). A significant proportion of the REM (28.4%) could not communicate in Vietnamese, the country's official language. During the study period, REM's income from remittances was limited; it contributed 4.2 to 5.8% to total household per capita income. Although REM held the largest arable land area per capita (3,177 m^2), they had the lowest expenditure on durable assets among the three household samples.

Between 2012 and 2016, most of REM (88%) lived in destitute geographic regions; approximately two-thirds of REM inhabited in upland areas (MNM, and CH). In the upland localities, people often face adverse geographic topography, such as less fertile soils, uneven terrain, and limited access to irrigation. As a result, farming in upland areas is less effective than agricultural production in plains or coastal areas (Epprecht et al., 2011). Table 4.5 also shows that one-fifth of the REM lived in the NCC region that experiences frequent natural disasters such as storms and flooding (Noy & Vu, 2010).

Table 4.5 shows that 52% of REM households lived in poverty during the study period (2012 to 2016). One unique characteristic of RPE compared with TP and TRP is that the RPE held less farmland than the RNPE. On average, the RPE had nearly 600 m^2 farmland area per capita, a figure that is lower than the RNPE. However, 51% of the RPE cultivated crops in big farms (from 1 ha), 3% higher than the RNPE. Only 2.5% of the RPE were landless, compared with 7.1% for RNPE. This figure shows that RNPE had a greater likelihood of accessing non-farm income opportunities. Table 4.5 also shows that 11.2% of the RNPE had formal/salaried employment, 8% higher than the RPE.

[37] Calculated by the author using the figures in Table 4.4.

Table 4. 5 Descriptive Statistics for the Rural Ethnic Minorities Models at the Household Level

Continuous/Discrete Variable	*All*		*Rural Poor Ethnic Minorities*		*Rural Non-poor Ethnic Minorities*		*t-value/ Pearson Chi²*
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	
Age	44.53	12.59	43.11	12.92	46.32	11.93	***
Education	5.01	3.81	4.11	3.59	6.14	3.78	***
Household Size	5.04	1.77	5.44	1.80	4.54	1.60	***
Proportion of Working Member	61.76	21.87	57.36	19.69	67.33	23.19	***
Living Area/Residential Per Capita	14.77	10.06	11.72	6.44	18.62	12.25	***
Durable Goods Per Capita (logarit)	5.91	1.52	5.27	1.55	6.72	1.01	***
Durable Goods Per Capita (VND 1,000)	779.40	1682.72	362.36	324.37	1305.70	2403.56	***
Domestic Remittances Per Capita (logarit)	3.55	2.48	3.22	2.30	3.95	2.64	***
Domestic Remittances Per Capita (VND 1,000)	398.59	1770.04	201.10	805.27	647.82	2481.73	***
Overseas Remittances Per Capita (logarit)	0.07	0.74	0.02	0.43	0.12	1.01	***
Overseas Remittances Per Capita (VND 1,000)	81.72	1668.76	11.45	300.74	170.41	2484.46	**
Farm Land Area Per Capita	3177.02	4812.72	2914.20	4691.05	3508.84	4943.37	***
Health Insurance Premiums	18.37	34.51	9.40	25.75	29.68	40.35	***
Free Health Insurance	90.15	24.81	93.94	20.12	85.36	28.99	***
Scholarship Per Capita (logarit)	0.23	0.96	0.21	0.95	0.26	0.98	
Scholarship Per Capita (VND 1,000)	9.71	100.04	8.97	78.87	10.63	121.63	
Pension Per Capita (logarit)	0.14	1.09	0.05	0.64	0.26	1.47	***
Pension Per Capita (VND 1,000)	103.86	1092.33	21.21	322.95	208.17	1596.42	***
Dummy/Categorical Variable							
Female	0.12	0.32	0.11	0.31	0.13	0.33	***
Never Married	0.01	0.10	0.01	0.10	0.01	0.11	***
Married	0.90	0.29	0.91	0.28	0.89	0.31	***
Widowed	0.07	0.26	0.07	0.25	0.08	0.28	***
Divorced/Separated	0.01	0.10	0.01	0.10	0.01	0.10	***
Agriculture	0.87	0.34	0.93	0.26	0.79	0.41	***
Non-farm Self-Employment	0.06	0.24	0.04	0.19	0.10	0.29	***
Wage-Paying Employment	0.07	0.25	0.03	0.17	0.11	0.32	***
Language Barriers	0.28	0.45	0.39	0.49	0.15	0.36	***
Tap Water	0.05	0.21	0.03	0.16	0.07	0.26	***
Clean Water	0.39	0.49	0.29	0.45	0.52	0.50	***
Other Water	0.56	0.50	0.68	0.47	0.41	0.49	***
Toilet_Flush	0.16	0.37	0.06	0.24	0.29	0.46	***
Toilet_Not Flush	0.62	0.49	0.62	0.49	0.62	0.49	***
Toilet_No	0.22	0.41	0.32	0.47	0.09	0.29	***
No-Farmland	0.05	0.21	0.03	0.16	0.07	0.26	***
0 ha <=Farm Size <0.5 ha	0.27	0.44	0.26	0.44	0.27	0.45	***
0.5 ha <=Farm Size <1 ha	0.19	0.39	0.20	0.40	0.17	0.37	***
1 ha <=Farm Size <1.5 ha	0.16	0.37	0.17	0.37	0.15	0.36	***
Farm Size >=1.5 ha	0.34	0.47	0.34	0.47	0.34	0.47	***
Borrowing/Credit	0.32	0.47	0.31	0.46	0.33	0.47	***
Red River Delta	0.02	0.16	0.01	0.12	0.04	0.19	***
Midlands and Northern Mountains	0.52	0.50	0.54	0.50	0.49	0.50	***
Northern and Coastal Central	0.20	0.40	0.22	0.42	0.16	0.37	***
Central Highlands	0.15	0.36	0.18	0.38	0.12	0.32	***
Southeast	0.02	0.16	0.01	0.09	0.05	0.21	***
Mekong River Delta	0.08	0.28	0.03	0.18	0.14	0.35	***

Notes: Means and standard deviations (SD) were averaged for the three years 2012, 2014, and 2016. Estimates were adjusted for cross-sectional weights. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on the VHLSS data (2012 – 2016)

4.2.2 Descriptive Data at the Commune Level

At the commune level, our study included 10 variables to measure access to facilities. We used five dummy variables to determine whether households have access to paved roads, daily markets, high schools, Agriculture and Fishery Extension Centres, and production units. We used two continuous variables to measure access to the nearest district hospital and post-office. Each variable was measured using the distance from the commune centre to the facility. We calculated percentages for titled residential land and irrigated annual and perennial croplands; these results were used to evaluate the positive effects of titled and quality land on household livelihood and poverty reduction. In addition to data on access to public services, we used data on each commune's geography, religion, and previous natural calamities to examine the impact of geographic characteristics, religious practices and natural shocks on the rural population's poverty rates and living standards. Finally, we included population density and interview year in TRH and REM models. Tables 4.6 and 4.7 present the commune-level variables for the TRH and the REM empirical models.

4.2.2.1. Total Rural Households

There were 6,615 rural communes in our dataset. Data were obtained from the VHLSS from three years (2012, 2014, and 2016). Data at the rural commune-level (presented in Table 4.6), include welfare estimates for rural Vietnam. Based on selected variables, the average rural commune's population density was 723 people per km^2. The average distance from the commune centre to the nearest post-office and district hospital were 18.2 and 52 km, respectively. In rural communes, annual crop growers had better access to irrigation than those who cultivated perennial crops. In particular, 77.2% of the total commune annual cropland area was irrigated compared with 54.6% for perennial crops. Over 85% of households had residential land use certificates that meant they were legally able to use the land.

Over one-third of rural communes were located in low and high mountains. Over 50% of the rural communes were located in deltas with intensively irrigated agricultural areas (Minot et al., 2006). Vietnam is known for its many natural disasters (Noy & Vu, 2010). In rural communes, 86% of TRH people were affected by at least one natural disaster over the study period (2012 to 2016). On average, approximately 41% of the rural populace are Buddhist; 45% have no religious beliefs/affiliation. The road system in the rural areas was quite developed, with 93% of the population having access to paved roads. Nearly 81% of rural households resided in communes where they could access production units every day. However, the rural population had limited access to facilities such as daily markets, high schools and, significantly for this study, agricultural extension services.

The access level to physical infrastructure was lower for TRP than TRNP (see Table 4.6). Only 15% of TRP resided in localities with high schools, compared with over 21% for TRNP. Approximately 16% of

the TRP lived in communes where they could go to the market every day, 20% lower than for TRNP. However, the results show that there was only a 5% difference in accessibility to paved roads between TRP and TRNP. There was a big gap in non-farm opportunities between TRP and TRNP. Approximately 58% of the TRP had an opportunity to work in nearby non-farm production units, but this figure was still 30% lower than for TRNP.

Table 4.6 shows that the TRP largely resided in remote areas; 71% of TRP resided in mountainous areas and only one quarter lived in deltas. In contrast, 67% of TRNP lived in lowland areas, such as deltas and coasts, with fertile land. Perhaps, severe geographic conditions led to the sparsely populated communes where the TRP often resided. The average population density of TRP was approximately 322 people per km^2, substantially fewer than for TRNP (811 persons per km^2). Less densely populated

Table 4. 6 Descriptive Statistics for the Total Rural Household Models at the Commune Level

Continuous/Discrete Variable	***All***		***Rural Poor***		***Rural Non-poor***	
	Mean	***SD***	***Mean***	***SD***	***Mean***	***SD***
Irrigrated Annual Cropland Rate (%)	77.2	78.2	60.5	42.7	82.2	62.9
Irrigrated Perennial Cropland Rate (%)	54.6	73.5	36.1	76.1	58.8	72.2
Housing Land Use Right Certificate Rate (%)	85.4	42.4	77.7	35.5	87.2	43.7
Distance to District Hospital (km)	52.0	85.0	87.2	126.1	44.1	70.2
Distance to Post-office (km)	18.2	42.1	34.8	69.4	14.0	30.3
Population Density (persons/km^2)	722.5	882.9	321.5	444.5	810.9	929.8
Dummy/Categorical Variables						
Paved Roads	0.93	0.25	0.89	0.31	0.94	0.24
Daily Markets	0.33	0.47	0.16	0.36	0.36	0.48
High Schools	0.20	0.40	0.15	0.36	0.21	0.41
Agriculture and Fishery Extension Centre	0.05	0.22	0.03	0.18	0.05	0.22
Production Units	0.81	0.39	0.58	0.49	0.86	0.35
Natural Calamity	0.86	0.35	0.87	0.33	0.85	0.36
Coasts	0.06	0.24	0.03	0.17	0.07	0.25
Deltas	0.53	0.50	0.24	0.42	0.60	0.49
Midlands	0.05	0.21	0.02	0.14	0.05	0.22
Mountains	0.36	0.48	0.71	0.45	0.28	0.45
Buddhism	0.41	0.49	0.24	0.42	0.44	0.50
Christian	0.08	0.28	0.09	0.28	0.08	0.27
Other Religion	0.06	0.24	0.11	0.31	0.05	0.23
No Religion	0.45	0.50	0.57	0.50	0.42	0.49

Notes: Means and standard deviations (SD) refer to the average mean and SD for the three years 2012, 2014, and 2016 at constant price (January 2010). Estimates are adjusted for the sampling weights. Differences between two the means of the poor and the non-poor samples are statistically significant at 1%.

Source: Authors' calculations using the VHLSS data (2012-2016)

communes indicate that TRP live further from metropolitan cities, which means that they have fewer opportunities to use social amenities such as healthcare and communication services. The district

hospital was over 87 km for TRP as opposed to 70 km for TRNP. Likewise, the TRP travelled an average of 35 km to the nearest post-office compared with 14 km for TRNP.

4.2.2.2. The Rural Ethnic Minorities

Table 4.4 shows that the rural areas were home to 80% of the ethnic majority and 20% of the ethnic minority households. Though the ethnic majority dominated the lowland areas (Epprecht et al., 2011), over 90% of the ethnic minority groups lived in the uplands (see Table 4.7). Difficult geographic conditions negatively affect REM's welfare and poverty rates. Moreover, REM have poor commune endowments. Table 4.7 shows REM's commune characteristics. Compared with the average level of access to physical infrastructure and social amenities of the total rural population, REM lived in more remote villages.

Table 4. 7 Descriptive Statistics for the Rural Ethnic Minorities Models at the Commune Level

Continuous/Discrete Variable	***All***		***Rural Poor Ethnic Minorities***		***Rural Non-Poor Ethnic Minorities***	
	Mean	***SD***	***Mean***	***SD***	***Mean***	***SD***
Irrigrated Annual Cropland rate (%)	54.7	46.8	48.6	43.9	62.4	49.2
Irrigrated Perennial Cropland Rate (%)	29.5	71.4	25.7	88.6	34.3	39.3
Housing Land Use Right Certificate Rate (%)	76.1	33.1	72.5	35.9	80.8	28.6
Distance to District Hospital (km)	82.3	128.7	97.4	142.1	62.9	106.1
Distance to Post-office (km)	33.7	69.4	41.6	79.4	23.5	52.1
Population Density (persons/km^2)	185.2	294.5	146.2	284.8	234.8	299.2
Dummy/Categorical Variables						
Paved Roads	0.90	0.30	0.88	0.33	0.92	0.27
Daily Markets	0.10	0.30	0.07	0.25	0.14	0.35
High Schools	0.17	0.38	0.14	0.34	0.21	0.41
Agriculture and Fishery Extension Centre	0.05	0.21	0.03	0.18	0.07	0.25
Production Units	0.52	0.50	0.43	0.50	0.64	0.48
Natural Calamity	0.87	0.33	0.87	0.34	0.88	0.33
Coasts	0.01	0.10	0.00	0.06	0.02	0.13
Deltas	0.08	0.26	0.03	0.16	0.14	0.34
Midlands	0.01	0.10	0.01	0.09	0.01	0.11
Mountains	0.90	0.29	0.96	0.19	0.83	0.37
Buddhism	0.16	0.36	0.11	0.31	0.23	0.42
Christian	0.07	0.24	0.07	0.26	0.05	0.22
Other Religion	0.11	0.31	0.13	0.33	0.09	0.28
No Religion	0.66	0.47	0.69	0.46	0.63	0.48

Notes: Means and standard deviations (SD) refer to the average means and SD for 2012, 2014, and 2016 at a constant price (January 2010). Estimates are adjusted for the sampling weights. Differences between the two means of the poor and the non-poor are statistically significant at 1%.

Source: Authors' calculations using the VHLSS data (2012-2016)

From 2012-2016, on average, REM travelled approximately 34 km to get to the nearest post-office and 82 km to the district hospital. These distances were further than those for TRH. The results indicate that REM face greater difficulties accessing public facilities than their majority counterparts. In REM communes, villagers invest less in agricultural production with lower percentages of irrigated cropland, than the average investment levels of all rural areas.

Table 4.7 shows that, among the poor in Vietnam, RPE are the most disadvantaged. They live in the most sparsely populated communes, with 146 people per km^2. RPE live in communes with the lowest potential for both agricultural and non-farm production. RPE had the lower levels of access to irrigation than the RNPE. In particular, 49% of the total annual cropland was irrigated in communes where RPE resided, 14% lower than in non-poor REM communes. In addition, only 43% of RPE households resided in communes where there was access to production units. This was 15% to 21% lower than the access levels of less disadvantaged groups (RNPE and TRP). The RPE travelled 10 km to reach the district hospital, further than either RNPE living in the same place or TRP. RPE also faced significant constraints in accessing educational institutions and the daily markets. Approximately 7% of RPE lived in communes with a daily market, whereas 14% of RPE lived in localities with high schools.

Chapter 5

The Determinants of Poverty and Inequality of Total Households in Vietnam

This chapter examines the Total Households' empirical model results using the household-level data from the 2012-2016 VHLSSs. Section 5.1 presents the impacts of household-level factors on the TH's per capita expenditure. Sections 5.2 and 5.3 examine the determinants of TH's poverty and poverty intensity. Section 5.4 presents the trends and driving factors of income inequality of TH in Vietnam.

5.1 The Impact of Household-Level Factors on the TP, TNP and TH's Expenditure

This section explains the effects of household-level factors on the RPCE for the total households across Vietnam (TH) from 2012-2016. We used regression models to estimate the determinants of TP's, TNP's, and TH's expenditure. Table 4.4 provides the descriptive statistics of the predictor variables for each empirical model. Table 5.1 presents the results for the three regression models for the TH and the two sub-samples, the TP (the total poor) and TNP (the total non-poor).

5.1.1 Ordinary Least Squares Estimation Results of the TH Model

Among the three regression models, the TH model fits the data the best; it had the highest R^2. Specifically, 75.7% of the variation in the logarithm of RPCE was explained by characteristics of the household head, household, and region. The reason for the high R^2 was that 34 of 37 exogenous variables had significant effects on the RPCE. Three insignificant variables in the TH model were the widowed, divorced/separated household head groups, and borrowing. As expected, rural households had a lower RPCE than urban households and ethnic minority households had lower levels of consumption than ethnic majority households. The poverty status coefficient of -0.429 was significant at 1%. Regarding its marginal effect, the TP group consumed 35% less than the TNP group, holding other variables constant. As the poor are more disadvantaged than the non-poor, the TP's RPCE was lower than that of the TNP. For example, over 2012-2016, TP had attended school for an average of 4.7 years compared with 7.9 years for the TNP (see Table 4.4). Similarly, for the TP, the labour force participation rate averaged 55% compared with 64% for the TNP. On average, a poor family bought health insurance for 25% of family members whereas it was 75% for a non-poor household. Moreover, 85% of TP heads worked in the agriculture sector (as their primary job) compared with 50% of the TNP group (see Table 4.4).

Table 5. 1 Ordinary Least Squares Estimates of RPCE Models of the TH, TP, and TNP at the Household Level

Variable	*TH*			*TP*			*TNP*		
	Coef.	*SE*	*ME*	*Coef.*	*SE*	*ME*	*Coef.*	*SE*	*ME*
Household Head Characteristics									
Age	0.002***	0.000	0.002	0.002***	0.000	0.002	0.003***	0.000	0.003
Gender	0.033***	0.008	0.034	0.016	0.019	0.016	0.032***	0.009	0.033
Years of Schooling	0.010***	0.001	0.010	0.005***	0.001	0.005	0.011***	0.001	0.011
Never Married	0.042**	0.019	0.043	0.018	0.028	0.019	0.048**	0.020	0.049
Widowed	-0.009	0.012	-0.009	-0.037	0.023	-0.036	0.005	0.013	0.005
Divorced/Separated	0.016	0.017	0.017	-0.025	0.041	-0.024	0.017	0.019	0.017
Non-Farm Self-Employment	0.042***	0.007	0.043	0.069***	0.013	0.072	0.037***	0.007	0.037
Wage-Paying Employment	0.078***	0.008	0.081	0.065***	0.019	0.067	0.064***	0.009	0.066
Household Characteristics									
Poverty Status	-0.429***	0.008	-0.349						
Rural Areas	-0.097***	0.007	-0.093	-0.027*	0.017	-0.027	-0.096***	0.008	-0.092
Ethnicity	-0.046***	0.009	-0.045	-0.080***	0.014	-0.077	-0.035***	0.010	-0.034
Household Size	-0.026***	0.002	-0.025	-0.030***	0.003	-0.030	-0.026***	0.003	-0.026
Working Rate	0.002***	0.000	0.002	0.002***	0.000	0.002	0.002***	0.000	0.002
Living Area	0.191***	0.006	0.210	0.057***	0.012	0.059	0.183***	0.006	0.201
Durable Goods	0.168***	0.004	0.183	0.061***	0.004	0.063	0.209***	0.004	0.232
Clean Water	-0.109***	0.007	-0.103	-0.026	0.017	-0.026	-0.106***	0.007	-0.101
Other Water	-0.121***	0.010	-0.114	-0.063***	0.019	-0.061	-0.133***	0.012	-0.124
Other Toilets	-0.063***	0.006	-0.061	-0.024*	0.013	-0.024	-0.056***	0.006	-0.054
No Toilet	-0.041***	0.012	-0.040	-0.114***	0.018	-0.107	0.005	0.016	0.005
Domestic Remittances	0.006***	0.001	0.006	0.005***	0.002	0.005	0.005***	0.001	0.005
Overseas Remittances	0.009***	0.002	0.009	0.001	0.004	0.001	0.007***	0.002	0.007
No Farmland	0.120***	0.008	0.127	-0.002	0.017	-0.002	0.126***	0.009	0.134
0.5 ha <=Farm Size<1 ha	0.028***	0.008	0.028	0.002	0.013	0.002	0.027***	0.008	0.027
1 ha <=Farm Size<1.5 ha	0.040***	0.010	0.041	-0.002	0.016	-0.002	0.043***	0.012	0.044
Farm Size >=1.5 ha	0.083***	0.009	0.087	0.022	0.014	0.022	0.095***	0.010	0.100
Health Insurance Premiums	0.001***	0.000	0.001	0.001***	0.000	0.001	0.001***	0.000	0.001
Development Programmes									
Free Health Insurance Rate	0.001***	0.000	0.001	0.000	0.000	0.000	0.001***	0.000	0.001
Scholarship	0.011***	0.002	0.011	-0.003	0.005	-0.003	0.012***	0.002	0.012
Pension	0.006***	0.002	0.006	0.005	0.005	0.005	0.005***	0.002	0.005
Borrowing	0.008	0.006	0.008	0.015	0.010	0.015	0.010	0.007	0.010
Regional Characteristics									
Midlands and Northern Mountains	-0.126***	0.009	-0.118	0.046***	0.017	0.047	-0.149***	0.010	-0.139
Northern and Coastal Central	-0.124***	0.008	-0.116	-0.009	0.016	-0.009	-0.127***	0.008	-0.119
Central Highlands	-0.088***	0.011	-0.084	-0.058***	0.021	-0.056	-0.090***	0.012	-0.086
Southeast	0.019*	0.011	0.019	0.024	0.031	0.024	0.017	0.012	0.017
Mekong River Delta	-0.157***	0.009	-0.145	0.004	0.018	0.004	-0.170***	0.009	-0.156
Year 2014	-0.024***	0.006	-0.024	-0.028***	0.010	-0.028	-0.022***	0.006	-0.022
Year 2016	0.035***	0.007	0.035	0.009	0.011	0.009	0.032***	0.007	0.032
Constant	7.762***	0.034	2350	8.247***	0.060	3817.65	7.497***	0.038	1801.7
Observations	24,016			3,407			20,609		
R-squared	0.757			0.411			0.623		
F-value	1368.13***			58.69***			540.44***		
Degree of Freedom	37			36			36		

Notes: Model estimates were adjusted for cross-sectional weights. The estimates for the models adjusted for averaged cross-sectional weights are similar to those adjusted for cross-sectional weights. The results are not reported in the Tables but are available in AppendiX C, Table C.1. Coef.: estimated coefficient; SE: robust standard error. The marginal effect (ME) of each covariate is the difference between the exponentiation of the estimated coefficient of the covariate and 1. Reference groups: Married; Agricultural Employment; Tap Water; Flush Toilet; 0 ha<Farm Size <0.5 ha; Red River Delta. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on the VHLSS data (2012 – 2016)

5.1.2 Differences in the Ordinary Least Squares Estimates Between the TP and TNP Models

We used regression models for TP and TNP to separate the determinants of the poor and non-poor's economic well-being. Table 5.1 shows the differences in the results for the household groups. There were 31 statistically significant variables in the TNP model. However, only 18 explanatory variables were statistically significant in the TP model. This resulted in a lower R^2 for the TP model (41.1%) than for the TNP model (62.3%). The Midlands and Northern Mountains (MNM) sign was positive in the TP model and negative in the TNP model. The positive sign of this estimate in the TP model indicates that the expected RPCE increased for the TP residing in the MNM region compared with those residing in the RRD region, holding other variables constant. Although the RPCE of the TP who lived in the MNM region was approximately 14% lower than that of the TNP in the RRD[38], the spatial effect of this estimator became positive after controlling for other variables. The reverse sign for this dummy regional variable, observed in the TNP and TH models, can be explained by a wider gap in spending between TNP households in the two regions (31%)[39].

5.1.3 The Impact of Household-Level Factors on the TP's Expenditure

Household Head Characteristics

Table 5.1 shows that individual characteristics have significant effects on the TP's spending. Among them, the household head's characteristics of age, education level and employment were strong determinants of the RPCE, significant (α) at 1%. In particular, poor households whose heads had completed more years of schooling, and worked in industries other than farming (non-farm work) or had wage-paying employment had higher levels of spending. Though gender was a determinant of the RPCE in the TNP model, it was insignificant in the TP model. Similarly, marital status was not statistically significant in the TP model despite showing a negative sign for widowed and divorced household heads as expected.

Household Characteristics

For household characteristics, the significant, negative signs of rural area, ethnicity, and household size in the TP model indicate that the RPCE decreased for those who lived in rural and ethnic minority communes, and those with larger households. For every additional family member, the TP's RPCE decreased by 3.3%, holding other variables constant. Table 5.1 shows that living in rural areas reduced the TP's RPCE by 2.7% compared with living in urban areas, holding other variables constant. The RPCE was 7.7% higher for ethnic minorities than for the ethnic majority. In contrast, the RPCE increased

[38] Calculations used data from Table 4.1.

[39] Calculations used data from Table 4.1.

when poor households had a higher percentage of working members and health insurance premiums. A higher RPCE was associated with a larger residential area and more durable assets. The TP's RPCE was related to their sanitary environment. Households that used tap water at their home had higher consumption levels than those who used untreated water or purchased it (in bottles, jars, or small vehicles). Similarly, the RPCE was higher for the TP who used flush toilets than for those who had other toilets (e.g., suilabh, barrel/pot, fishing bridge) or no toilets. Income source from domestic remittances statistically increased the RPCE for TP across Vietnam by 0.46%, holding all other variables constant. However, overseas remittances did not significantly affect the TP's RPCE. On average, foreign remittances generated only VND 44 thousand for the TP compared with approximately VND 400 thousand for the TNP (see Table 4.2).

We also examined the impact of farmland. Farmland is a productive resource for agricultural production for 55% of the TH, 66% of the TRH and 87% of the REM during the 2012-2016 (see Tables 4.5 and 4.7). A larger farm (size) means more land for production and the ability to produce more output. However, large landholders must invest more money into production. In addition, large farm holders also need more technology and agricultural services. However, in the TP model, none of the variables related to farm size was statistically significant. In other words, there was no difference in the TP's RPCE as a result of increased farm size. In short, the TP did not benefit economically from having more land. This might be because of a lack of other productive endowments such as human capital, finance or access to farm technology. In contrast, the significant, positive signs of three farm size groups (no less than 0.5 ha) in the TNP model show that these households' use of farmland was more productive than the TP. Therefore, holding more farmland increased the TNP's livelihood and RPCE. The TP's ineffective use of farmland may be related to the low quality of that farmland. However, information about the quality of farmland was available only in the 2014 VHLSS data, not in the 2012 and 2016 versions.

TP benefited less from development programmes than the TNP. In the TP model, all four public assistance variables, free health insurance, scholarships, pensions, and borrowing were insignificant. In contrast, free health insurance, scholarships, and pensions significantly, positively affected the TNP's RPCE. The lack of statistical significance is probably a consequence of the limited benefit for the TP. For example, only 6.4% of the TP received scholarships, worth VND 100 thousand per person per annum, from 2012 to 2016 (see Appendix A, Table A.2). In fact, the TNP had greater access to scholarships than the TP; significantly, 12.2% of the TNP received scholarships, on average, of VND 172

thousand per person annually. Likewise, the TNP received larger pensions[40] than the TP. Only 0.89% of households received a pension compared with 8.7% of TNP households[41].

The TP benefited from free health insurance and credit programmes. Almost all of TP (95%) accessed free health services; this figure was 5% higher than for TNP. Over a quarter of TP were beneficiaries of preferential credit programmes, a figure that was 10% higher than for TNP. However, the insignificant estimated free health insurance rate and borrowing coefficients indicate that these government interventions are insufficient to boost TP's RPCE in any substantial way.

Regional Characteristics

Apart from individual and household characteristics, the results shows that the TP's RPCE is influenced by the geographical and socio-economic conditions of the region where they reside. Living in the Central Highlands (CH) negatively affected the TP's living standard. Specifically, among the regional variables, the Central Highlands' estimate had the lowest absolute size. This means that the CH is the most impoverished region in Vietnam, holding all other variables constant. Our findings are consistent with Ravallion (1998) who suggested that a lack of "geographic capital - the set of physical and social infrastructure endowments held by specific areas" leads to poor regions. Even within poor regions, inequality in the distribution of geographic capital is associated with discrepancies in the poor's spending and living standards (Ravallion, 1998).

5.2 The Impact of Household-Level Factors on the TH's Poverty

This section explains the effects of household-level factors on the likelihood of poverty of the TH from 2012-2016. Poverty is predominant in rural Vietnam (Hinsdale et al., 2013). The marginal returns to given household endowments greatly depend on where the household is (Ravallion, 1998). We determined the spatial impact of the place of residence (rural or urban) on poverty for the TH sample. We ran two binary logistic regression models. Model 1 had 36 explanatory variables. Model 2 included the same explanatory variables as model 1, but excluded eight variables from model 1. These variables were the four farm size groups, health insurance premiums and the three public assistance programmes (free health insurance, scholarship, and pension)[42].

[40] A pension is defined as income paid to retired individuals who contributed to the Vietnam social pension system. Most beneficiaries were state sector employees (Nguyen, 2019).

[41] Author's calculations based on the VHLSS data (2012 – 2016).

[42] Appendix B, Table B.1 shows that correlations among the eight variables are low except for the correlation between the health insurance premiums and free health insurance rate, -0.514; and covariate pair - rural and farm size with r=0.394.

5.2.1 The Impact of Living in Rural Areas

Table 5.2 provides the estimates from the two logit models. The insignificant, positive sign of rural area in model 1 indicates that rural households are no more likely to fall into poverty than urban households. However, the rural area coefficient was statistically significant at 5%, but remained positive after dropping the eight variables from model 1. The two model results mean that after controlling for the eight variables, rural areas had no impact on poverty in model 1; the eight factors might explain the impact of living in rural areas on the likelihood of poverty. The insignificant impact of rural areas can be explained in three ways. First, the poor tend to live in rural Vietnam. The Vietnamese government has implemented anti-poverty policies that aim to improve rural households' well-being through increased endowments. Effective free health insurance, scholarship, and pension policies should entail/require a reduction in rural poverty rates. Second, the impact of farmland explains the effect of living in rural areas on poverty; most of the rural populace work in the agriculture sector and farmland typically represents the primary resource for agricultural production in rural areas. Third, the poor are able to purchase health insurance for only 23% of their family members, compared with 70% of the non-poor. These impacts were identified in the analysis of poverty determinants in model 2; here we identified the significance of the rural areas coefficient[43].

5.2.2 The Results of the Two Binary Logistic Regression Models for the TH

Household Head Characteristics

Most covariates had the same sign and p-values at 1% in both logit models. These predictor variables included the household head's age and educational attainment. For example, on average, one additional year of schooling decreased the likelihood that the TH would live in poverty by 0.3 to 0.4%, holding the other variables constant. Our findings are consistent with Pham et al. (2003) and the WB (2009). Gender and marital status did not have a statistically significant influence on poverty in either model. Our results are similar to Haughton and Khandker's (2009), who found that female headship did not increase the likelihood of poverty in both Vietnam and Cambodia. This study also found no link between marital status and the TH's likelihood of poverty.

Household Characteristics

Other determinants of TH's poverty were related to household characteristics such as ethnicity, household size, working rate, living area, durable goods, water source, type of toilet, and domestic remittances. The model shows that decreasing the risk of poverty relies on households receiving more domestic remittances, since the sign of domestic remittances was significant and negative.

[43] To confirm our assumption, we also added another logit model for the TRH sample to examine how these eight variables affected rural poverty (see section 5.2.2.1).

Table 5. 2 Estimation Results of Binary Logistic Regression Models of Total Households (TH) at the Household Level

Variable	*Binary Logit Model 1*				*Binary Logit Model 2*			
	Coef.	*SE*	*OR*	*AME*	*Coef.*	*SE*	*OR*	*AME*
Household Head Characteristics								
Age	-0.013***	0.003	0.987	-0.001	-0.014***	0.003	0.987	-0.001
Gender	-0.055	0.120	0.946	-0.003	-0.087	0.120	0.917	-0.005
Years of Schooling	-0.058***	0.010	0.944	-0.003	-0.069***	0.010	0.933	-0.004
Never Married	-0.097	0.269	0.907	-0.005	0.052	0.266	1.053	0.003
Widowed	-0.141	0.162	0.868	-0.008	-0.064	0.163	0.938	-0.004
Divorced/Separated	0.022	0.259	1.022	0.001	0.102	0.256	1.108	0.006
Non-Farm Self-Employment	-0.238**	0.097	0.788	-0.013	-0.289***	0.094	0.749	-0.016
Wage-Paying Employment	-0.400***	0.143	0.671	-0.022	-0.556***	0.134	0.574	-0.031
Household Characteristics								
Rural Areas	0.043	0.118	1.044	0.002	0.224**	0.116	1.251	0.013
Ethnicity	0.834***	0.096	2.302	0.045	1.126***	0.089	3.084	0.063
Household Size	0.198***	0.028	1.219	0.011	0.176***	0.027	1.193	0.010
Working Rate	-0.013***	0.001	0.987	-0.001	-0.014***	0.001	0.987	-0.001
Living Area	-1.025***	0.078	0.359	-0.056	-1.058***	0.076	0.347	-0.059
Durable Goods	-1.050***	0.045	0.350	-0.057	-1.126***	0.045	0.325	-0.063
Clean Water	0.457***	0.126	1.580	0.025	0.565***	0.123	1.760	0.032
Other Water	0.900***	0.141	2.459	0.049	1.030***	0.139	2.800	0.058
Other Toilets	0.782***	0.087	2.186	0.043	0.925***	0.086	2.523	0.052
No Toilet	0.846***	0.125	2.331	0.046	0.966***	0.124	2.626	0.054
Domestic Remittances	-0.047***	0.013	0.954	-0.003	-0.048***	0.013	0.953	-0.003
Overseas Remittances	-0.062	0.039	0.940	-0.003	-0.073**	0.038	0.929	-0.004
No Farmland	-0.461***	0.114	0.631	-0.025				
0.5 Ha <=Farm Size<1 Ha	-0.070	0.098	0.933	-0.004				
1 Ha <=Farm Size<1.5 Ha	-0.326***	0.129	0.722	-0.018				
Farm Size >=1.5 Ha	-0.253**	0.104	0.776	-0.014				
Health Insurance Premiums	-0.018***	0.002	0.983	-0.001				
Development Programmes								
Free Health Insurance Rate	-0.010***	0.002	0.990	-0.001				
Scholarship	-0.113***	0.043	0.893	-0.006				
Pension	-0.074**	0.034	0.929	-0.004				
Borrowing	-0.219***	0.077	0.804	-0.012	-0.116	0.076	0.891	-0.007
Regional Characteristics								
Midlands and Northern Mountains	0.442***	0.131	1.555	0.024	0.511***	0.128	1.667	0.029
Northern and Coastal Central	0.161	0.119	1.174	0.009	0.195*	0.117	1.215	0.011
Central Highlands	0.186	0.147	1.205	0.010	0.127	0.142	1.136	0.007
Southeast	-0.570***	0.198	0.565	-0.031	-0.850***	0.194	0.427	-0.048
Mekong River Delta	0.024	0.132	1.024	0.001	-0.132	0.127	0.877	-0.007
Year 2014	-0.095	0.074	0.909	-0.005	-0.053	0.073	0.948	-0.003
Year 2016	-0.641***	0.085	0.527	-0.035	-0.530***	0.084	0.589	-0.030
Constant	9.430***	0.468	12457.480		7.993***	0.417	2959.036	
Log Pseudo Likelihood	-42538161				-4582.357			
Degree of Freedom	36				28			
Wald Chi-Square	3069.34***				3763.88***			
Pseudo R-Squared	0.553				0.533			
Observations	24,016				24,016			

Notes: Model estimates were adjusted for cross-sectional weights. Coef.: estimated coefficient; SE: robust standard error. Marginal effects were calculated as overall average marginal effects (AME). Reference groups: Married; Agricultural Employment; Tap Water; Flush Toilets; 0 ha<Farm Size <0.5 ha; Red River Delta. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on the VHLSS data (2012 - 2016)

Prior literature has shown that, in many countries, remittances contribute to poverty reduction. Nahar and Arshad (2017) concluded that remittances increase the household income of migrants in Indonesia; increased income helps households meet their basic needs. Migrant workers can use the remittances for investment in their children's education or engaging in entrepreneurship that may help improve their economic well-being. Acharya and Leon-Gonzalez (2012), Adams and Page (2005) and Gupta et al. (2009), showed similar findings. The overseas remittance variable was statistically significant only in model 2.

Regional Characteristics

Geographic variability such as local agro-climatic features and infrastructure, lead to spatial variations in poverty rates (GSO, 2017; Ravallion, 1998). We found that the probability of poverty was 56% to 67% higher in the MNM region than in the RRD region by both logit models. Our findings are consistent with Pham et al. (2003), the Poverty Working Group (1999), and Tran et al.'s (2015) study. These authors found that households in mountainous areas face greater difficulties than those in the RRD, a densely-settled, irrigated agro-ecosystem in Vietnam. Model 2 also showed that the NCC region was more impoverished than the RRD region ($p < 0.1$). Pham et al. (2003) showed that the NCC is one of the three most deprived regions in Vietnam. The significant, negative signs for the southeast indicated that, during the study period, this region had the lowest risk of poverty in Vietnam. The odds ratios showed that the probability of falling into poverty was 43 to 57% lower for southeast households than those in the RRD region. Our finding confirms Glewwe et al.'s (2004) claim that southeast Vietnam is the most developed region with the highest spending and the greatest possibility of escaping from poverty.

5.3 The Impact of Household-Level Factors on the TH's Poverty Gap

This section explains the effects of household-level factors on the TH's intensity of poverty from 2012-2016. We used two fractional logistic regression models to identify the determinants of the TH poverty gap. In fractional logit model 1, we used the same set of covariates as in binary logit model 1 (Section 5.2). The covariates in fractional logit model 2 are similar to those in the binary logit model 2. Apart from the eight variables excluded in the fractional logit model 2, we found different impacts relating to rural areas and borrowing on the TH poverty gap in the two models. The remaining independent variables in both models had the same impact on the TH poverty gap. Table 5.3 provides the two fractional logit model estimates for the TH.

5.3.1 The Different Impacts of Rural Area and Borrowing in Two Fractional Logistic Regression Models of the TH

Although the variable of rural area was positive in both fractional logit models, it was statistically significant ($p<0.01$) only in fractional logit model 2 (excluding farm size, health insurance premiums,

Table 5. 3 Estimates of the Fractional Logistic Regression Models of Total Households (TH) at the Household Level

Variable	*Fractional Logit Model 1*			*Fractional Logit Model 2*		
	Coef.	*SE*	*AME*	*Coef.*	*SE*	*AME*
Household Head Characteristic						
Age	-0.007***	0.002	0.000	-0.008***	0.002	0.000
Gender	-0.039	0.089	-0.001	-0.034	0.093	-0.001
Years of Schooling	-0.036***	0.007	-0.001	-0.048***	0.007	-0.001
Never Married	-0.172	0.155	-0.005	-0.091	0.177	-0.003
Widowed	-0.059	0.110	-0.002	-0.036	0.117	-0.001
Divorced/Separated	-0.098	0.194	-0.003	-0.088	0.208	-0.002
Non-Farm Self-Employment	-0.415***	0.081	-0.011	-0.431***	0.082	-0.012
Wage-Paying Employment	-0.465***	0.111	-0.013	-0.578***	0.106	-0.016
Household Characteristic						
Rural Area	0.096	0.090	0.003	0.190**	0.089	0.005
Ethnicity	0.672***	0.070	0.018	0.966***	0.065	0.027
Household Size	0.135***	0.015	0.004	0.117***	0.016	0.003
Working Rate	-0.012***	0.001	0.000	-0.013***	0.001	0.000
Living Area	-0.695***	0.051	-0.019	-0.763***	0.051	-0.021
Durable Goods	-0.371***	0.017	-0.010	-0.412***	0.018	-0.011
Clean Water	0.391***	0.100	0.011	0.448***	0.100	0.012
Other Water	0.659***	0.105	0.018	0.740***	0.105	0.020
Other Toilets	0.779***	0.081	0.021	0.956***	0.084	0.026
No Toilet	0.934***	0.092	0.026	1.100***	0.097	0.030
Domestic Remittances	-0.038***	0.009	-0.001	-0.038***	0.009	-0.001
Overseas Remittances	-0.095***	0.030	-0.003	-0.107***	0.028	-0.003
No Farmland	-0.097	0.085	-0.003			
0.5 Ha <=Farm Size<1 Ha	-0.078	0.057	-0.002			
1 Ha <=Farm Size<1.5 Ha	-0.182***	0.069	-0.005			
Farm Size >=1.5 Ha	-0.211***	0.059	-0.006			
Health Insurance Premiums	-0.019***	0.002	-0.001			
Development Programmes						
Free Health Insurance Rate	-0.012***	0.002	0.000			
Scholarship	-0.027	0.027	-0.001			
Pension	-0.059**	0.028	-0.002			
Borrowing	-0.120***	0.045	-0.003	-0.069	0.046	-0.002
Regional Characteristic						
Midlands and Northern Mountains	0.223**	0.100	0.006	0.327***	0.098	0.009
Northern and Coastal Central	0.171*	0.096	0.005	0.279***	0.095	0.008
Central Highlands	0.345***	0.103	0.009	0.381***	0.103	0.010
Southeast	-0.360**	0.182	-0.010	-0.434**	0.183	-0.012
Mekong River Delta	0.042	0.107	0.001	0.012	0.108	0.000
Year 2014	0.043	0.046	0.001	0.084*	0.047	0.002
Year 2016	-0.427***	0.051	-0.012	-0.364***	0.052	-0.010
Constant	2.126***	0.324		0.576***	0.265	
Log Pseudo Likelihood	-23275136			-23698226		
Degree of Freedom	36			28		
Wald Chi-Square	7725.55***			7603.9***		
Pseudo R-Squared	0.389			0.376		
Observations	24016			24016		

Notes: Model estimates were adjusted for cross-sectional weights. Coef.: estimated coefficient; SE: robust standard error. Marginal effects were calculated as overall average marginal effects (AME). Reference groups: Married; Agricultural Employment; Tap Water; Flush Toilets; 0 ha<Farm Size <0.5 ha; Red River Delta. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on the VHLSS data (2012 - 2016)

free health insurance, scholarship, and pension). In contrast, the borrowing variable was statistically significant only in fractional logit model 1, despite the same signs in both models. These results mean that farm size, health insurance premium, free health insurance, scholarship, pension, and borrowing might explain the poverty gap of the TH who reside in rural areas.

5.3.2 The Results of the Two Fractional Logistic Regression Models of the TH

Table 5.3 shows that individual, household and regional characteristics had a significant impact on the TH poverty. Among the individual characteristics, employment had the strongest effect on the TH poverty gap; the poverty gap decreased by 1.3 to 1.6% for TH households whose heads had wage-paying employment compared with those employed in agriculture, holding other variables constant. Similarly, non-farm employment reduced the TH poverty gap by between 1.1 and 1.2%, compared with agricultural employment.

Both fractional logit model results show that, among household characteristics, ethnicity was the most important determinant of the TH poverty gap. The poverty gap increased by 1.8 to 2.7% for ethnic minorities compared with those who belonged to the ethnic majority. In addition, residence in the MNM, NCC, and CH regions increased poverty intensity. However, CH increased the poverty gap between 0.9 and 1%, the largest impact on the TH poverty gap among the three variables (the MNM, NCC, and CH). In contrast, residing in the southeast decreased the TH poverty gap between 1 and 1.2%, compared with those living in the RRD region, holding all other variables constant.

5.3.3 A Comparison of the Binary and Fractional Logistic Regression Model Results of the TH

Many parameter estimates in the binary and fractional logit models had the same signs and statistical significance. These results mean that many factors have the same effects on both the likelihood and intensity of poverty. Some factors are predictors of poverty intensity but not the likelihood of poverty and vice versa. It is worth noting that previous studies that used only binary logit or probit models did not consider several influences on poverty intensity. For example, Islam et al. (2016) and Jansen et al. (2015) used only a probit model to estimate the influences on poverty in Bangladesh and South Africa, respectively.

We compared the likelihood of poverty for households whose farmland area was less than 0.5 ha (reference group) against those with larger farms (size). The logit model 1 result (see Table 5.2) indicates that households whose farmland area was over 1 hectare, were less likely to be deprived than the reference households. In the same way, poverty intensity declined with farm size (see Table 5.3). The poverty gap reduced by 0.5 to 0.6% for families who had farms no less than 1 ha compared

with the reference group. Our results confirm Tran et al.'s (2015) finding of an inverse relationship between farmland area and poverty/the poverty gap.

This study differentiated the likelihood and shortfall of farm families' poverty from those who were landless in both the logit and fractional logit models 1. The aim of the models was to compare the probability of poverty, and its intensity, between people working in the agriculture sector and those working in other industries. However, the significant, negative sign of landless households appeared only in logit model 1. This means that, during the study period, households engaged in non-farm activities were less likely to live under the poverty line than families engaged in farming activities. However, there was no effect on the shortfall of poverty.

The Central Highlands variable was a predictor of poverty intensity in both fractional logit models; however, it was not statistically significant in the two models. As the AME show, residence in the CH was associated with a 1% poverty gap increase compared with those living in the RRD region, holding all other variables constant. This impact was consistent with the OLS estimates (Section 5.1), which show that residing in the CH reduced the RPCE by 5.6 to 8.6%. Similarly, the overseas remittance variable was significant at 1% in both fractional logit models and insignificant in logit model 1.

5.4 The Determinants of Income Inequality for the TH in Vietnam

In this section, we analyse income inequality and the factors that contribute to income inequality for all households in Vietnam over the study period (2012-2016). We used the GE indexes decomposition approach to identify the main driver of Vietnamese household's income inequality. We constructed a RPCI that is comparable over the study period. We calculated the RPCI for 2012, 2014 and 2016; these figures were spatially converted into 2010 prices[44]. This enables us to compare levels of income inequality and assess household income growth and inequality by location and ethnicity over time.

5.4.1 Income Growth and Inequality in Vietnam

In terms of income inequality in Vietnam, we found that there was a narrowing trend over the study period (2012-2016). The Gini index for all Vietnamese households decreased from approximately 0.386 in 2012 to 0.37 in 2016 (see Table 5.4)[45]. Our finding is consistent with Benjamin et al.'s (2016) study.

[44] See Section 3.1.2 for further details.

[45] Our study's narrowing trend in income inequality contradicts data published by the GSO (2018). The GSO reported that income inequality was increasing; its calculations showed an increased Gini, from 0.424 to 0.436 from 2012-2016 (see Table 2.7). The reason/s for these differences are not immediately obvious. Perhaps, the GSO used a different dataset; e.g., data from the mini VHLSS surveys that only collect income data. Another possible reason is that the GSO uses nominal incomes to estimate the Gini for Vietnamese households. Price conversions might change the magnitude of inequality index and even reverse the trend of inequality when measured using nominal income (Asra, 1989). However, we reject this argument because the Gini index declined from 2012 to 2016 when we used the nominal per capita household income to calculate the index (results are available on request).

Using the 2012 and 2014 VHLSSs data, they found a pattern of decreasing income inequality in Vietnam; they used the same method of real per capita income conversion[46].

Further analyses of spatial and ethnic inequality show that income inequality for the urban and ethnic majority decreased during the study period. In particular, the urban Gini index reduced by 0.045, from 0.357 in 2012 to 0.312 in 2016. The Gini index for the ethnic majority decreased consistently, from 0.359 in 2012 to 0.341 and 0.337 in 2014 and 2016, respectively. The income inequality in rural areas marginally contributed to the reduction of inequality in Vietnam because it slightly decreased. In contrast, income inequality among ethnic minority households exacerbated the unequal distribution of total income across Vietnam (see Table 5.4)[47].

Table 5. 4 Income Growth and the Gini Index in Vietnam by Location and Ethnicity (2012-2016)

Year	*2012*	*2014*	*2016*	*Delta**		
				2012-2014	*2014-2016*	*2012-2016*
***Population Share** (%)*						
Urban	29.61	34.01	31.88	4.41	-2.13	2.28
Rural	70.40	65.99	68.12	-4.41	2.13	-2.28
Ethnic Majority	85.22	86.00	84.01	0.78	-1.99	-1.21
Ethnic Minorities	14.78	14.00	15.99	-0.78	1.99	1.21
Per Capita Income (VND 1,000)						
All Households	19,295.3	20,777.4	23,165.9	3.77	5.59	4.68
Urban	25,664.8	26,589.0	30,164.6	1.78	6.51	4.12
Rural	16,616.7	17,781.7	19,892.5	3.45	5.77	4.60
Urban/Rural	1.54	1.50	1.52	-0.04	0.02	-0.02
Ethnic Majority	21,101.5	22,569.6	25,452.2	3.42	6.19	4.80
Ethnic Minorities	8,879.2	9,765.3	11,143.9	4.87	6.83	5.84
Ethnic Majority/Minorities	2.38	2.31	2.28	-0.07	-0.03	-0.10
Gini Index						
All Households	0.386	0.37	0.37	-0.016	0.000	-0.016
Urban	0.357	0.321	0.312	-0.036	-0.009	-0.045
Rural	0.38	0.377	0.378	-0.003	0.001	-0.002
Ethnic Majority	0.359	0.341	0.337	-0.018	-0.004	-0.022
Ethnic Minorities	0.38	0.404	0.41	0.024	0.006	0.030
Rural Ethnic Majority	0.348	0.341	0.339	-0.006	-0.002	-0.008
Rural Ethnic Minorities	0.368	0.392	0.384	0.024	-0.008	0.016

Notes: Estimates were adjusted for cross-sectional weights. Incomes were calculated using January 2010 prices. * We calculated the average per capita income growth for a particular period but for the population share and the Gini index we simply compared estimates between the first survey year and the last survey year during a particular period.

Source: Authors' calculations based on the VHLSS data (2012 - 2016)

We plotted the income distribution for all Vietnamese households (see Figure 5.1). The convex shapes of the Lorenz curves were similar for the three years; however, the Lorenz curves were closer to the equi-distribution line (the 45^0 line) for 2014 and 2016, than they were for 2012. The smaller areas

[46] Benjamin et al. (2016) calculated their Gini index using per capita income at 2012 prices.

[47] See Section 7.4 for further details.

between the Lorenz curves and the 45° line for 2014 and 2016 indicate that there was less income inequality in Vietnam from 2012 to 2016. The results are consistent with the data presented in Table 5.4.

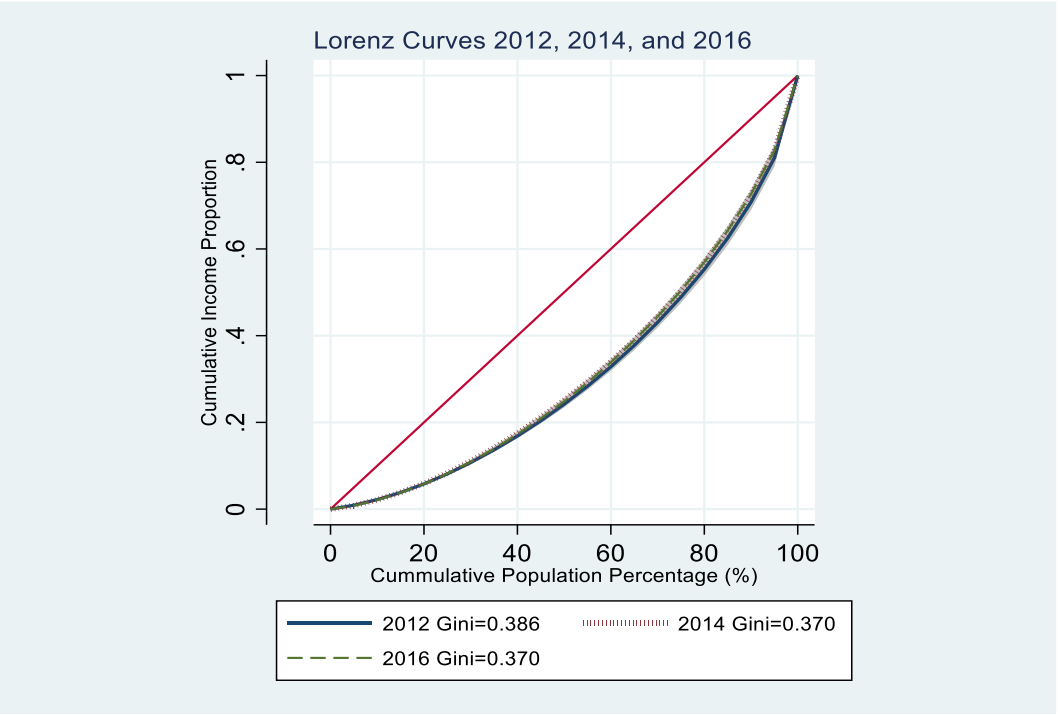

Figure 5. 1 Income Inequality Comparisons for All of Vietnam, 2012- 2016
Source: Author's calculations based on the VHLSS data (2012 - 2016)

Table 5.4 shows that the average growth in per capita income was 4.68% annually for the entire sample during the study period. Specifically, the RPCI rose by approximately 3.8% per year between 2012 and 2014. It continued to increase (by nearly 5.6%), over the next two years. The decline in income inequality, along with the increase in household income growth, indicates that the improved income distribution coincided with improvements in households' economic welfare. These findings confirm the WB's assertion that it is not necessary to sacrifice economic growth to create a more equal society (Gillis et al., 2001). A trade-off between equality and economic growth is a commonly accepted theoretical principle (Okun, 2015). However, Naschold (2002) showed that this trade-off is not compulsory because a low level of inequality provides impoverished people with a greater share of a country's wealth and resources; this in turn, fosters greater economic growth.

5.4.2 The Income Gap Between Household Groups

Previous studies have revealed that rural and ethnic minority households are the most disadvantaged groups; they are often left behind in the development (Churchill & Smyth, 2017; Hinsdale et al., 2013; Van de Walle & Gunewardena, 2001). However, we found that the gap between these groups and the urban and ethnic majority households is lessening. Table 5.4 shows that the growth in rural

households' per capita income exceeded that of urban households. During the study period, the average increase in income was 4.6% annually for the rural populace compared with 4.12% for the urban population. Thus, the rural-urban income ratio reduced by 0.02, from 1.54 times in 2012 to 1.52 times in 2016. This is consistent with the GSO's that shows a decreasing income gap between rural and urban households from 1993-2016 (see Table 2.3). Mirroring the country's economic expansion, ethnic minority households have improved their economic position; these households had a higher growth rate in per capita income than the ethnic majority. Between 2012 and 2016, the ethnic minorities' income increased by 5.84% annually, higher than that of the ethnic majority that saw only a 4.8% increase. Similarly, the ethnic majority-minorities income gap narrowed by 0.1, from 2.38 times to 2.28 times during the same period.

Table 5. 5 Income Inequality in the Distribution of All Vietnamese Households' Incomes

Percentile Ratio	***p90/p10***	***p90/p50***	***p10/p50***	***p75/p25***	***p75/p50***	***p25/p50***
2012	6.18	2.27	0.37	2.48	1.53	0.62
2014	5.95	2.19	0.37	2.38	1.51	0.63
2016	6.06	2.23	0.37	2.46	1.52	0.62

Note: Estimates were adjusted for cross-sectional weights.
Source: Author's calculations based on the VHLSS data (2012-2016)

The Gini index provides an indication of inequality among the general population, not only some tails of the income distribution. We used percentile ratios to measure inequality between income classes (see Table 5.5). For the whole of Vietnam, almost all estimates of inequality measures reduced over time, meaning that income was distributed more fairly (there was less inequality). In particular, the p90/p10[48] ratio decreased by 0.12 times during the study period. The p75/p25 ratio decreased by 0.1, from 2.48 to 2.38 between 2012 and 2014. Subsequently, although the p75/p25 increased to 2.46, in 2016, it was still lower than in 2012. However, at the bottom half of the income distribution, the p10/p50 remained at 0.37. This means that the income of the bottom 10th accounted for 37% of the income of the 50th and that there was no change in income inequality between these two deciles.

Our analysis of income distribution shows that the bottom half and middle 40% of the Vietnamese population earned more from the country's total income over time. Figure 5.2 shows the income shares of the bottom 50%, mid 40% and top 10% over the study period (2012 to 2016). The bottom 50% shared 24.2% of the total income in 2012; they had a 0.7% higher share in 2016. The mid 40% received a larger portion of total earnings from 2012 to 2016. Conversely, the income share of the top 10% (the richest decile) consistently reduced over the same period. In 2012, the richest decile had a

[48] The p90/p10 compares the income of the top 10% to the bottom 10%.

29.2% share of the country's total income. In 2014 and 2016, that share for the richest decile fell to 27.6% and 27.4%, respectively.

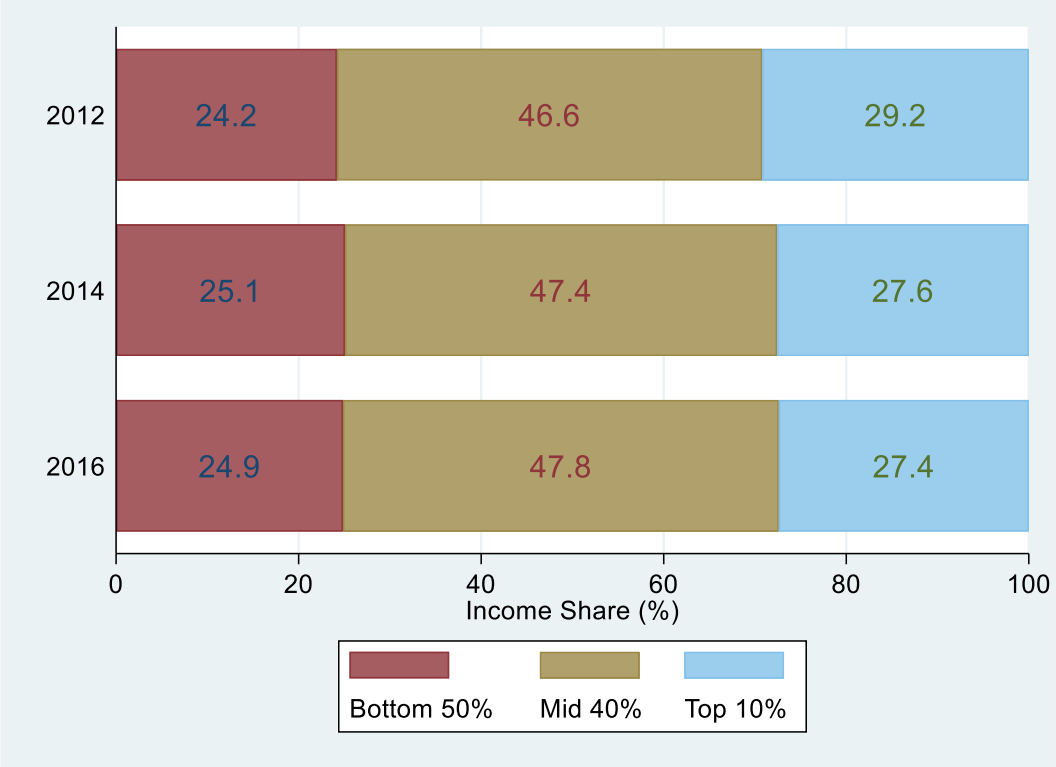

Figure 5. 2 Income Shares of the Bottom 50%, Mid 40% and Top 10%, 2012-2016
Source: Author's calculations based on the VHLSS data (2012- 2016)

5.4.3 Decomposition of Income Inequality in Vietnam

The Gini index shows income inequality was decreasing for all Vietnamese households over the study period. The country's income distribution was similarly less unequal when measured by the Generalised Entropy (GE) index during the same period. Table 5.6 shows that the GE_0 index (Theil's L) fell from 0.261 to 0.245, and the GE_1 (Theil's T) declined from 0.290 to 0.251 from 2012-2016. The same pattern was observed for the GE_2 over the same period.

Results from decomposition of the GE indexes by location show that income inequality among all Vietnamese occurred as a result of both within and between-group inequalities. However, within-group inequality was the main contributor to total income inequality. In particular, the differentiation of incomes of households within a particular location (rural or urban area) comprised over 90% of the variation in the GE_0, GE_1, and GE_2 (see Table 5.5). In contrast, between-group inequality or the urban-rural income gap explained only approximately 4 to 8% of the variation in the total inequality measures.

Decomposition of the GE index by ethnicity provides similar evidence; within-group inequality accounted for most (84 to 96%) of the variation in the three common GE indexes (see Table 5.6). However, between-group inequality occupied only approximately 4 to 16% of the variation in the total inequality measures. Income differences among households within each ethnic group explain income inequality in Vietnam during the study period. Our study confirms Bui et al.'s (2017) finding that a large proportion of total inequality in Vietnam is explained by within-group inequality. The authors used data from 3,515 households from two rounds of the Baseline and Endline Surveys collected by the GSO in 2007 and 2012.

Table 5. 6 Decomposition of Income Inequality of All Vietnamese Households by Location and Ethnicity

	GE_0			GE_1			GE_2		
	2012	***2014***	***2016***	***2012***	***2014***	***2016***	***2012***	***2014***	***2016***
All Households	0.261	0.244	0.245	0.290	0.249	0.251	0.644	0.404	0.435
Decomposition of Income Inequality by Urban and Rural									
Within-group	0.240	0.225	0.225	0.268	0.230	0.231	0.621	0.384	0.414
Between-group	0.021	0.019	0.020	0.022	0.019	0.020	0.023	0.020	0.021
Between-group as a share of total (%)									
	7.962	7.739	7.986	7.502	7.804	8.080	3.556	4.996	4.878
Decomposition of Income Inequality by Ethnicity									
Within-group	0.222	0.209	0.207	0.259	0.221	0.221	0.619	0.381	0.410
Between-group	0.038	0.035	0.038	0.031	0.028	0.031	0.025	0.023	0.026
Between-group as a share of total (%)									
	14.743	14.174	15.491	10.573	11.096	12.218	3.921	5.662	5.898

Note: Estimates were adjusted for cross-sectional weights.
Source: Author's calculations based on the VHLSS data (2012 - 2016)

5.5 Chapter Summary

This chapter explains the impacts of household-level factors on the RPCE, the likelihood and intensity of poverty for all households in Vietnam during the study period. Using OLS, logit and fractional logit regression models, the results show that most expenditure and poverty determinants also affect the poverty gap. The main results show that rural and ethnic minority households have lower RPCE than urban and ethnic majority households. Similarly, rural and ethnic minority households have a higher risk of falling into poverty and their poverty is more severe than the ethnic majority who live in the urban areas. The results also show that other factors such as the individual, household, and regional characteristics significantly affect the TH's expenditure, poverty and the poverty gap. However, some factors (scholarship and no farmland) affect only TH's poverty but not the poverty gap. In contrast, some factors affect only the TH poverty gap, not the likelihood of poverty such as foreign remittances and living in the CH region.

In this chapter, we analysed the factors that affect income inequality for all households in Vietnam during the study period. We found that decreasing income inequality for both rural/urban areas and for the ethnic majority is the main driver of the narrowing income inequality in Vietnam. Our study revealed a positive finding that the ethnic majority-minorities income gap is diminishing. However, we found the ethnic minorities' increasing income inequality negatively affects the country's total income equality. In addition, our study shows that within-group inequalities (within rural/urban areas or within the ethnic majority/minorities) are the main contributors to the total income inequality in Vietnam. In contrast, between-group inequalities are minor contributors to the country's income inequality. The between-group inequality by location (the urban-rural income inequality) explained the country's income inequality less than between-group inequality by ethnicity (the ethnic majority-minorities inequality).

Chapter 6

The Determinants of Poverty and Inequality of the Total Rural Households in Vietnam

The rural households' living standards are lower than those of urban households in Vietnam. Poverty is predominant in rural areas. This chapter presents the TRH's empirical results. Sections 6.1, 6.2 and 6.3 present the determinants of per capita expenditure, poverty and the poverty intensity for the TRH. Section 6.4 compares the rural income inequality and urban income inequality. The section explains the factors that lead to rural income inequality.

6.1 The Determinants of the TRH's, TRNP's and TRP's Expenditure

This section presents the determinants of TRH's RPCE at the household and commune level. Using two regression models, we discuss the different determinants for TRP's and TRNP's RPCE.

6.1.1 The Determinants at the Household Level

6.1.1.1. The Impact of Household-Level Factors on TRH's Expenditure

We found that the predictors of the TRH's RPCE are the same as those for TH. Table 6.1 shows that 32 of the 36 independent variables were significant in the TRH regression model. The R^2 was 0.736, meaning that the OLS regression model fits the data well, with almost 73.6% of the variation in the TRH's RPCE explained by covariates included in the model. These findings show that the TRH's expenditure greatly depends on characteristics associated with the household head, the household and the region where the household is. For example, working rate had a positive impact on the TRH's RPCE. With a 1% increase in working rate, there was approximately a 0.19% increase in RPCE. In rural Vietnam, the RPCE was higher for families that held more farmland. However, the no farmland coefficient was 0.092 and significant at 1%. This means that landless households spent 9.7% more than farming families. Our finding is consistent with Markussen's (2017) work that showed that the wealthiest quintile have the highest rate of landlessness, whereas the poorest quintile hold more farmland than the other four quintiles in rural Vietnam. However, the impact of landlessness endowments revealed in our study contradicts Deininger et al.'s (2009) finding that landlessness ownership negatively affected income, consumption, and the total assets of Indian households (from 1982-1999). Using panel regression models, these authors tested landlessness, a characteristic typically associated with poor Indians, on income and expenditure growth. In India, land has been distributed unequally since the colonial period; land ownership is associated with higher social status and greater political power (Deininger et al., 2009).

Table 6. 1 Ordinary Least Squares Estimates of RPCE Models for the TRP, TRNP, and TRH at the Household Level

Variable	*TRH*			*TRP*			*TRNP*		
	Coef.	*SE*	*ME*	*Coef.*	*SE*	*ME*	*Coef.*	*SE*	*ME*
Household Head Characteristic									
Age	0.002***	0.000	0.002	0.002***	0.000	0.002	0.002***	0.000	0.002
Gender	0.034***	0.010	0.034	0.019	0.022	0.019	0.032***	0.011	0.032
Years of Schooling	0.007***	0.001	0.007	0.005***	0.002	0.005	0.007***	0.001	0.007
Never Married	0.039*	0.022	0.039	0.019	0.030	0.019	0.042*	0.025	0.042
Widowed	-0.005	0.014	-0.005	-0.047*	0.026	-0.046	0.012	0.015	0.012
Divorced/Separated	0.008	0.022	0.008	-0.047	0.045	-0.046	0.013	0.025	0.013
Non-Farm Self-Employment	0.035***	0.008	0.035	0.071***	0.014	0.074	0.028***	0.008	0.028
Wage-Paying Employment	0.058***	0.010	0.060	0.073***	0.022	0.076	0.047***	0.010	0.048
Household Characteristic									
Poverty Status	-0.469***	0.008	-0.374						
Ethnicity	-0.062***	0.009	-0.060	-0.076***	0.015	-0.073	-0.049***	0.011	-0.048
Household Size	-0.029***	0.003	-0.028	-0.031***	0.004	-0.031	-0.028***	0.003	-0.028
Working Rate	0.002***	0.000	0.002	0.002***	0.000	0.002	0.002***	0.000	0.002
Living Area	0.168***	0.007	0.183	0.058***	0.013	0.060	0.167***	0.008	0.182
Durable Goods	0.145***	0.004	0.156	0.061***	0.004	0.063	0.191***	0.006	0.211
Clean Water	-0.060***	0.008	-0.058	-0.020	0.020	-0.019	-0.058***	0.009	-0.057
Other Water	-0.096***	0.011	-0.091	-0.058***	0.022	-0.057	-0.112***	0.013	-0.106
Other Toilets	-0.089***	0.006	-0.085	-0.024*	0.014	-0.023	-0.079***	0.007	-0.076
No Toilet	-0.080***	0.012	-0.077	-0.113***	0.019	-0.107	-0.023	0.017	-0.022
Domestic Remittances	0.006***	0.001	0.006	0.005**	0.002	0.005	0.006***	0.001	0.006
Overseas Remittances	0.006***	0.002	0.006	0.002	0.004	0.002	0.005***	0.002	0.005
No Farmland	0.092***	0.011	0.097	-0.003	0.019	-0.003	0.103***	0.012	0.109
0.5 ha <=Farm size<1 ha	0.022***	0.008	0.022	-0.006	0.014	-0.006	0.021**	0.009	0.021
1 ha <=Farm size<1.5 ha	0.038***	0.011	0.038	-0.008	0.017	-0.008	0.042***	0.013	0.043
Farm size >=1.5 ha	0.082***	0.009	0.086	0.016	0.015	0.016	0.094***	0.011	0.098
Health Insurance Premiums	0.001***	0.000	0.001	0.001***	0.000	0.001	0.001***	0.000	0.001
Development Programmes									
Free Health Insurance Rate	0.001***	0.000	0.001	0.000	0.000	0.000	0.001***	0.000	0.001
Scholarship	0.013***	0.003	0.013	-0.004	0.006	-0.004	0.014***	0.003	0.014
Pension	0.005***	0.002	0.005	0.004	0.005	0.004	0.004**	0.002	0.004
Borrowing	0.016***	0.006	0.016	0.015	0.010	0.015	0.021***	0.007	0.021
Regional Characteristic									
Midlands and Northern Mountains	-0.097***	0.010	-0.092	0.038**	0.018	0.039	-0.120***	0.011	-0.113
Northern and Coastal Central	-0.117***	0.009	-0.110	-0.020	0.017	-0.019	-0.123***	0.010	-0.116
Central Highlands	-0.082***	0.012	-0.079	-0.070***	0.023	-0.068	-0.078***	0.014	-0.075
Southeast	0.006	0.015	0.006	0.027	0.042	0.027	-0.007	0.015	-0.007
Mekong River Delta	-0.134***	0.010	-0.126	0.000	0.019	0.000	-0.152***	0.011	-0.141
Year 2014	-0.017***	0.006	-0.017	-0.026***	0.010	-0.025	-0.016**	0.007	-0.016
Year 2016	0.010	0.007	0.011	0.016	0.012	0.017	-0.001	0.008	-0.001
Constant	7.932***	0.039	2785.8	8.228***	0.065	3744.2	7.614***	0.046	2026.4
Observations	17,596			3,153			14,443		
R-squared	0.736			0.410			0.523		
F-value	1011.33***			45.96***			271.67***		
Degree of Freedom	36			35			35		

Notes: Model estimates were adjusted for cross-sectional weights. Coef.: estimated coefficient; SE: robust standard error; marginal effect (ME) is the difference between the exponentiation of the coefficient and 1. Reference groups: Married; Agricultural Employment; Tap Water; Flush Toilets; 0 ha<Farm Size <0.5 ha; Red River Delta. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on VHLSS data (2012 - 2016)

Better housing conditions were associated with higher expenditure. In particular, having a larger residence, clean water and sanitary toilets, and durable goods had a positive correlation with rural households' spending. Development programmes (free health insurance, scholarships, pensions and borrowing) contributed to improving the rural population's living standard; the signs of these factors were all positive and statistically significant at 1%. With the exception of southeast Vietnam, rural families living in the RRD region were better off than those residing in other regions.

Our analysis found a significant, negative sign (-0.47) for poverty status; the TRP had a lower RPCE than the TRNP. Specifically, the marginal effect of poverty status was a 37.4% increase in the mean of RPCE switching from TRP to TRNP, holding other variables constant. However, variations between the TRP's and TRNP's endowments have been widely reported (Decron, 2009; Ravallion, 1998) in studies on rural Vietnam. Thus, we separately fitted two models for TRP and TRNP to differentiate the impact of household-level characteristics on these two household groups' well-being. Analysis of these two models revealed that only 18 variables were significant in the TRP model; but there were 30 significant covariates in the TRNP model (see Table 6.1).

6.1.1.2. Impact of Household-Level Factors on the TRP's Expenditure

The TRP model's results show that age, education level, employment, ethnicity, and household size are strong determinants of TRP's expenditure. Other factors associated with TRP's RPCE were working members, health insurance premiums, housing conditions, and domestic remittances. Of the six regions, TRP living in the CH region had the lowest RPCE. Suprisingly, TRP in the MNM region had a higher RPCE than those in the RRD region. Marital status affected only widowed household heads' expenditure in the TRP model ($p<0.1$). The RPCE of poor households whose heads were widowed reduced by half compared with poor married couples. However, the never married or divorced/separated group coefficients were not significant. Similarly, farm size and development programmes did not show any significant effect on the TRP's RPCE.

6.1.1.3. The Impact of Household-Level Factors on TRNP's Expenditure

The TRNP model's results show the positive influences of development programmes and farm size on TRNP's spending. All four government intervention programmes and four farm size variables were significant at either 1% or 5%. Another result observed for the TRNP model, which distinguishes it from the TRP model, is the spatial effect of regional dummies. For example, the Midlands and Northern Mountains' estimate was negative and significant at 1%, meaning that, during the study period, the TRNP in this region had a lower RPCE than their counterparts in the RRD region.

In summary, we used the pooled, TRP and the TRNP samples, to determine differences. The aggregate TRH model did not allow us to distinguish between the impacts of anti-poverty programmes and

farmland use on the two household groups' economic welfare. The TRH model also has limitations in terms of understanding spatial variations in each sub-sample's economic welfare.

6.1.2 The Determinants at the Commune Level

Our study estimated the effects of commune characteristics on the RPCE using OLS estimations. For the dependent variables, we computed two types of RPCE: 1) the household-level RPCE, which is the average expenditure per capita calculated for each household [49]; and 2) the commune-level RPCE, which is the average expenditure per capita calculated for each commune [50]. The predictor covariates used in these two models are variables related to infrastructure, geography, religion, agricultural land conditions and off-farm opportunities in the communes where rural households are. We found that TRP possess negatively unique commune characteristics compared with TRNP. In addition to the TRH model, we fitted two linear regression models for TRP and TRNP. The descriptive statistics of TRH commune-level factors are presented in Table 4.6.

6.1.2.1. A Comparison of the Commune-Level and Household-Level Expenditure Models

Our analysis shows that the models that regressed the average expenditure at the commune level fit the data better than those that were used to estimate average expenditure at the household level. The OLS estimates are presented in Table 6.2. Generally, the RPCE models for each commune had a larger R^2 than the other models. For example, R^2 was over 33% in the TRH model that regressed the average expenditure at the commune level compared with only 23.4% for the TRH model that estimated average consumption at the household level. The commune-level expenditure models had a greater number of significant predictor covariates than the RPCE models for each family. For instance, when used to estimate the commune-level average expenditure (as the outcome variable), the TRH model had 16 significant factors. However, the number of significant factors reduced to 14 when the TRH model was used to estimate RPCE at the household level. The results indicate that the set of independent variables explained the commune-level RPCE better than the household-level RPCE. In other words, the linearity line, which reveals the relationship between each commune's RPCE and its predictor covariates, fits the data better (Wooldridge, 2009).

Further analysis of the TRP models shows that six strong variables affected both types of RPCE. These determinants were commune characteristics related to the commune's physical infrastructure, geography, religion, and off-farm employment opportunities. In particular, the RPCE increased with

[49] See Equation (3.2) for more details.

[50] See Equation (3.3) for more details.

Table 6. 2 Ordinary Least Squares Estimates of RPCE Models for the TRH, the TRP, and the TRNP at the Commune Level

Variable	*Household-Level RPCE*						*Commune-Level RPCE*					
	TRH		*TRP*		*TRNP*		*TRH*		*TRP*		*TRNP*	
	Coef.	*SE*	*Coef.*	*SE*	*Coef.*	*SE*	*Coef.*	*SE*	*Coef.*	*SE*	*Coef.*	*SE*
General Commune Characteristics												
Coasts	-0.007	0.026	0.035	0.034	-0.041*	0.024	-0.009	0.019	0.098*	0.056	-0.045**	0.019
Midlands	0.118***	0.029	-0.10	0.063	0.096***	0.027	0.107***	0.024	-0.154*	0.084	0.108***	0.023
Mountains	-0.208***	0.020	-0.102***	0.027	-0.027*	0.017	-0.213***	0.016	-0.296***	0.031	-0.072***	0.016
Christian	0.008	0.029	-0.046	0.040	0.035	0.024	0.007	0.024	-0.083*	0.047	0.042**	0.019
Others	-0.184***	0.028	-0.033	0.035	-0.092***	0.025	-0.189***	0.022	-0.090**	0.037	-0.121***	0.022
No Religion	-0.022	0.016	0.045*	0.026	-0.003	0.014	-0.024**	0.012	0.011	0.029	-0.003	0.012
Natural Calamity	-0.015	0.019	-0.017	0.023	0.015	0.019	-0.014	0.015	-0.040*	0.022	0.008	0.016
Population Density	0.0001***	0.000	0.000	0.000	0.0001***	0.000	0.0001***	0.000	0.0001**	0.000	0.0001***	0.000
Commune Infrastructure												
Paved Roads	0.153***	0.027	0.091***	0.025	0.061***	0.023	0.150***	0.022	0.136***	0.028	0.081***	0.023
Daily Market	0.155***	0.019	0.013	0.034	0.095***	0.016	0.159***	0.015	0.086*	0.050	0.120***	0.013
High Schools	0.052***	0.016	0.040*	0.022	0.015	0.015	0.057***	0.012	0.126***	0.022	0.012	0.012
Agriculture and Fishing Extension Centre	0.046	0.029	0.033	0.033	-0.018	0.026	0.044**	0.022	0.089**	0.046	-0.010	0.021
District Hospital_Kilometres	-0.0004***	0.000	-0.0001	0.000	-0.000	0.000	-0.0005***	0.000	-0.0003***	0.000	-0.0002***	0.000
Post-Office_Kilometres	-0.001***	0.000	-0.0004***	0.000	-0.0004**	0.000	-0.0008***	0.000	-0.0002*	0.000	-0.001***	0.000
Land and Non-Agricultural Employment Opportunities												
Irrigated Annual Cropland Rate	0.0004***	0.000	0.001**	0.000	-0.0002**	0.000	0.0003***	0.000	0.001**	0.000	-0.0002*	0.000
Irrigated Perennial Cropland Rate	0.0002***	0.000	0.000	0.000	0.0001**	0.000	0.0002***	0.000	0.000	0.000	0.0002***	0.000
Housing/Land Use Right Rate	0.0003***	0.000	0.0003	0.000	0.000	0.000	0.0003***	0.000	0.001***	0.000	0.0001**	0.000
Production Units	0.202***	0.019	0.072***	0.018	0.063***	0.016	0.200***	0.016	0.109***	0.021	0.099***	0.015
Year 2014	-0.011	0.020	-0.026	0.023	0.018	0.018	-0.015	0.016	0.010	0.027	0.003	0.015
Year 2016	0.055***	0.021	-0.035	0.026	0.054***	0.020	0.044***	0.018	-0.020	0.031	0.057***	0.017
Constant	9.072***	0.045	8.582***	0.058	9.370***	0.041	9.143	0.035	8.964	0.068	9.330	0.035
Observations	7,566		1,681		5,885		7,566		1,681		5,885	
R-Squared	0.234		0.108		0.071		0.330		0.306		0.156	
F-Value	93.74***		9.75***		17.15***		137.16***		38.83***		39.92***	
Degree of Freedom	20		20		20		20		20		20	

Notes: Estimates were adjusted for cross-sectional weights. Reference categories: Deltas; Buddhist. *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations based on the VHLSS data (2012 – 2016)

the availability of paved roads. Our result supports Decron et al.'s (2009) finding that expenditure growth is positively linked with paved roads in Ethiopia. Table 6.2 also shows the positive impact of high schools and production units on TRP's consumption. TRP residing in mountainous areas had a lower RPCE than their counterparts living in deltas. This finding is identical to that presented in Table 6.1 (see Column 4, Section 6.1.1) which shows a negative association between residence in the CH (a mountainous upland region) and the TRP's RPCE. The significant, positive sign of irrigated annual cropland rate indicates that those rural households or communes that were able to irrigate their crops during the study period had a higher RPCE. However, limited access to a post-office was associated with decreased RPCE. There was a 0.02 to 0.04% decrease in spending when the distance from the commune centre to the nearest post-office increased by 1 kilometre, holding other variables constant

Ten factors affected only the TRP's commune-level RPCE, not the household-level RPCE. For instance, the presence of a daily market and agricultural extension services increased the TRP's commune-level RPCE. Decron et al. (2009) also identified a significant positive link between shared farm technologies or knowledge on the growth of Ethiopian rural households' consumption. The authors reported that receiving agricultural extension visits increased a household's expenditure growth by over 7% annually over the period 1989-1994. In this study, the corresponding figure was almost 9.3% for TRP in the study period (2012-2016). Similarly, the proportion of residential land use right certificate had a positive effect on the commune's RPCE. There was a 0.07% increase in the commune's RPCE followed by a 1% increase in the percentage of housing land use rights. Our result is consistent with Deininger et al.'s (2009) finding that land reforms that transferred the land use rights to poor farmworkers contributed to increased Indian household welfare, the accumulation of human capital, and a reduction in poverty level from 1982-1999. We also found a positive relationship between spending and population density. In contrast, limited access to a district hospital reduced the commune-level RPCE. Natural calamities such as wildfires, floods, storms, landslides and earthquakes explain the 4% decrease in the commune-level RPCE.

Religion is also a determinant of the TRP's RPCE. Religion's signs were consistent in the two TRP models. However, two groups, Christians and other religions, were significant only in the model that regressed the commune-level RPCE. The negative signs of these two factors mean that in communes where the main religion was Buddhism, the RPCE was higher. The 'no religion' variable was significant only in the linear regression model used to estimate the household-level RPCE. The positive sign of no religion indicates that poor households who did not identify as a member of any religious group had significantly higher spending (4.6%) than their counterparts engaged in Buddhism. In short, some factors influenced the household-level RPCE but not the commune-level RPCE and vice versa.

6.1.2.2. Results from the TRP and the TRNP's Expenditure Models

We identified differences in TRP and TRNP's expenditure. Some factors statistically affected TRP's expenditure but not TRNP's, e.g., the availability of high schools, agricultural extension services and natural calamities. The significant, positive coefficients of high schools in the TRP model suggest that the presence of high schools increased TRP's spending. Access to high school was more limited for TRP than TRNP. About 15.2% of TRP lived in communes where there was a high school (see Table 4.8); for TRNP the corresponding figure was 21.2%. Unequal distribution of education may lead to significant variations in TRP's RPCE. Although the percentage of TRNP households that had experienced a natural calamity (87.5%) was higher than that of TRP (86.9%), the negative impact of natural calamity was found only in the commune-level average expenditure of TRP. The irrigated perennial cropland rate statistically increased TRNP's RPCE but was not statistically significant in the TRP models. Access to irrigated land enables more efficient perennial crop production (Franklin et al., 2017; Rios & Shively, 2006). However, the average rate of irrigated perennial cropland was only 36% in TRP communes, nearly 23% lower than in TRNP communes (see Table 4.9). Poor farmers' limited access to irrigation may reduce their production level which, in turn, reduces the amount they have to spend.

Our analysis shows that commune-level factors explain TRP's expenditure better than TRNP's. Although the number of observations in the TRP models was smaller than in the TRNP models, TRP models' R^2 of were larger than TRNP models; for models estimating the commune–level RPCE, the R^2 of the TRP model was 30.6% as opposed to 15.6% in the TRNP model. Furthermore, 16 independent variables were significant in the TRP model for commune-level average expenditure compared with 15 significant covariates in the TRNP model. Though previous research has combined the results, our study shows the importance of analysing the determinants of TRP's expenditure separately from TRNP's expenditure.

6.2 The Determinants of TRH's Poverty

In this section, we analyse the determinants of poverty for the TRH sample. We ran two logit models with two different levels of data. In the first logit model, we used the set of independent variables for the household level for TRH in Table 3.1. In the second logit model, we used the set of independent variables for the commune level in Table 3.2.

6.2.1 Poverty Determinants of the TRH at the Household Level

Table 6.3 shows the logit estimation results for TRH at the household level. After examining all households (see Chapter 5), we then focussed on the total rural households (TRH). In the TRH logit model, the number of observations was reduced to 17,596 households. The TRH logit model had the same predictor covariates as the TH model except for the rural area variable. The logit estimates for TRH were similar to those for the TH model. Here we provide more detail about the impact of the 27 predictors on TRH's poverty. As expected, many covariates were correlated with poverty at 1% and 5% levels. We estimated the impact of eight variables that reduced the p-value of rural areas in the TH logit model 1 (see section 5.2.1). These are four farm size variables, health insurance premiums and three public assistance programmes (free health insurance, scholarship, and a pension).

Table 6.3 shows that seven of the eight variables significantly reduced TRH's poverty. As expected, the parameter estimate of farm size equal to 0.5 ha and less than 1 ha had an insignificant but positive sign. Other farm sizes were correlated with poverty in rural Vietnam. We used farms smaller than 0.5 hectares as a reference group to compare poverty with other farm groups. The result shows that the coefficient of no farmland was -0.354, which is significant at the 1% level. This means that the likelihood of poverty was reduced for households that did not have farmland during the study period. Therefore, we infer that landlessness is not a cause of poverty in rural Vietnam. Our result confirms Markussen's (2017) claim that landlessness is not associated with rural poverty in Vietnam. Markussen found a positive relationship between household income and a lack of farm ownership. Markussen found that the top 20% of the rural populace has the highest percentage of landlessness, whereas the bottom 20% have the lowest level of no farmland (Markussen, 2017).

Two other farm size variables (equal to or larger than 1 ha) had negative, significant signs. Compared with the reference farms (less than 0.5 ha), larger farms had lower odds of poverty (21-28%). This result supports Tran et al.'s (2015) claim that the decrease in the prevalence of poverty is associated with ethnic minorities' larger annual and perennial cropland holding in Northwest Vietnam. However, during the study period, the probability of poverty was not significantly lower for farmers who had farms equal to 0.5 ha and less than 1 ha than the control group.

Health insurance contributes to poverty reduction. However, its impact differs depending on whether a household pays insurance premiums or is entitled to free health insurance. During the study period, the impact of health insurance premiums almost doubled that of the free health insurance rate. The coefficient for the former variable was -0.016 versus -0.009 for the latter variable. Specifically, the percentage of family members who bought health insurance reduced the probability that a household was poor. If the percentage of health insurance premiums increased by 10%, the likelihood of poverty decreased by 1.1%, holding other variables constant. The poverty-reducing effect of health insurance

Table 6. 3 Estimates from the Binary and Fractional Logit Models for the TRH at the Household Level

Variable	*Binary Logit Model*				*Fractional Logit Model*		
	Coef.	*SE*	*OR*	*AME*	*Coef.*	*SE*	*AME*
Household Head Characteristic							
Age	-0.012***	0.003	0.988	-0.001	-0.006***	0.002	0.000
Gender	-0.137	0.129	0.872	-0.009	-0.052	0.094	-0.002
Years of Schooling	-0.059***	0.011	0.943	-0.004	-0.035***	0.007	-0.001
Never Married	0.069	0.282	1.071	0.005	-0.108	0.160	-0.004
Widowed	-0.075	0.171	0.928	-0.005	-0.026	0.116	-0.001
Divorced/Separated	0.237	0.293	1.268	0.016	0.010	0.213	0.000
Non-Farm Self-Employment	-0.194*	0.104	0.824	-0.013	-0.391***	0.084	-0.014
Wage-Paying Employment	-0.537***	0.155	0.585	-0.036	-0.586***	0.118	-0.021
Household Characteristic							
Ethnicity	0.804***	0.102	2.235	0.054	0.651***	0.074	0.023
Household Size	0.197***	0.031	1.218	0.013	0.136***	0.016	0.005
Working rate	-0.013***	0.002	0.987	-0.001	-0.011***	0.001	0.000
Living Area	-1.008***	0.084	0.365	-0.068	-0.669***	0.054	-0.024
Durable Goods	-1.034***	0.048	0.354	-0.070	-0.354***	0.016	-0.013
Clean Water	0.295**	0.142	1.343	0.020	0.336***	0.107	0.012
Other Water	0.746***	0.156	2.108	0.050	0.613***	0.112	0.022
Other Toilets	0.819***	0.095	2.268	0.055	0.787***	0.088	0.028
No Toilet	0.887***	0.131	2.428	0.060	0.954***	0.098	0.034
Domestic Remittances	-0.050***	0.014	0.951	-0.003	-0.038***	0.009	-0.001
Overseas Remittances	-0.046	0.040	0.955	-0.003	-0.089***	0.030	-0.003
No Farmland	-0.354***	0.128	0.702	-0.024	-0.013	0.093	-0.001
0.5 Ha <=Farm Size<1 Ha	-0.056	0.102	0.945	-0.004	-0.038	0.058	-0.001
1 Ha <=Farm Size<1.5 Ha	-0.334***	0.134	0.716	-0.023	-0.156**	0.070	-0.006
Farm Size >=1.5 Ha	-0.235**	0.108	0.791	-0.016	-0.182***	0.061	-0.007
Health Insurance Premiums	-0.016***	0.002	0.984	-0.001	-0.018***	0.002	-0.001
Development Programmes							
Free Health Insurance Rate	-0.009***	0.002	0.991	-0.001	-0.010***	0.002	-0.000
Scholarship	-0.133***	0.041	0.875	-0.009	-0.036	0.025	-0.001
Pension	-0.066*	0.036	0.936	-0.005	-0.054*	0.030	-0.002
Borrowing	-0.190**	0.080	0.827	-0.013	-0.113***	0.045	-0.004
Regional Characteristic							
Midlands and Northern Mountains	0.558***	0.138	1.747	0.038	0.303***	0.105	0.011
Northern and Coastal Central	0.279**	0.126	1.322	0.019	0.257***	0.101	0.009
Central Highlands	0.281*	0.159	1.324	0.019	0.422***	0.110	0.015
Southeast	-0.690***	0.225	0.502	-0.047	-0.485**	0.207	-0.017
Mekong River Delta	0.062	0.142	1.064	0.004	0.067	0.116	0.002
Year 2014	-0.103	0.078	0.903	-0.007	0.032	0.047	0.001
Year 2016	-0.634***	0.089	0.531	-0.043	-0.453***	0.052	-0.016
Constant	9.220***	0.493	10095		1.829***	0.327	
Log Pseudo Likelihood	-37287581				-21327588		
Degree of Freedom	35				35		
Wald Chi-Square	2550.05***				6750.8***		
Pseudo R-Squared	0.53				0.359		
Observations	17,596				17,596		

Notes: Model estimates were adjusted for cross-sectional weights. Coef.: estimated coefficient;**.** OR: odds ratio; AME: Average marginal effects. Reference groups: Agricultural Employment; Married; Clean Water; Flush Toilets; 0 ha<Farm Size <0.5 ha; Midlands and Northern Mountains. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on the VHLSS data (2012 - 2016)

premiums implies that people who cannot afford or spend less on health insurance, have a higher likelihood of falling into poverty. Moreover, the likelihood of poverty was reduced by 0.6% if the share of free health insurance increased by 10%. Our finding supports Nguyen et al. (2013) who revealed that a larger percentage of members with health insurance helps Vietnamese people escape poverty. Dartano and Nurkholis (2013) reported that the Indonesian government provides a similar healthcare scheme for the poor. However, Dartano and Nurkholis found that the programme was largely ineffective because it did not target the right households and/or was distributed unequally in different regions.

We tested the impact of scholarships, pensions, and credit for the poor, near-poor, disabled or disadvantaged individuals on poverty. Table 6.3 shows that these development programmes contributed to lifting the rural populace out of poverty; the coefficients of scholarships, pensions, and credit (borrowing) were statistically positive and significant at 1%, 10% and 1% levels, respectively. The parameter estimates for the development programmes in the logit model were identical to the OLS regression model for TRH in Table 6.1. In particular, the consumption regression result shows the positive effects of greater access to healthcare, education, pension, and credit on the increase in the TRH's average expenditure. However, the logit model provided us with an insight into the distributional impacts of these public assistance programmes on reducing the likelihood of poverty for rural households.

Household Head Characteristics

For household head characteristics, age, education, and employment of household heads were predictors of poverty. The age of the household head is negatively correlated with poverty. Holding other variables in the model constant, a one-year increase in age decreased the probability of poverty by 0.1% (see Table 6.3). Poverty reduction depends upon education level; an additional year of schooling reduces the likelihood of poverty by 0.4%. This finding supports prior work by Hoang et al. (2001) who showed that rural households with higher education levels earn more and are less likely to fall into poverty. Likewise, Ennin et al. (2011) showed that household heads in Ghana who were illiterate had a higher probability of being poor than those who attended school The likelihood that rural households are poor may decrease if the household head's primary occupation is either non-agricultural self-employment or wage-paying (as opposed to casual employment). In particular, the likelihood of poverty was reduced by 28% for non-agricultural self-employed heads of households versus those working in the agriculture sector (see Table 6.3). Household heads working in wage-paying employment were 42% less likely to be poor than those working in the agriculture sector. Our results support the findings of Kinh et al.'s (2001) and Tran et al. (2015).

Household Characteristics

Ethnicity is a strong determinant of poverty in rural Vietnam. Ethnic minority households have a 1.235 higher chance of falling into poverty than ethnic majority households. Our study thus confirms Imai et al.'s (2011) finding that ethnic minorities are poorer than those who are part of the ethnic majority/majorities; minority groups often have lower education levels and/or live mostly in the hinterland.

Other household characteristics affect rural poverty, such as household size, working rate, residential area, durable assets, water source, type of toilet, and domestic remittances. Table 6.3 shows that household size has an increasing effect on the likelihood of poverty. The poverty ratio increased by 1.33% with an additional family member, holding other variables constant. This finding is similar to Imai et al. (2011), and Pham et al. (2013). Those authors identified a direct relationship between household size and the probability of being poor in Vietnam. Similarly, Dartano and Nurkholis (2013) confirmed that the likelihood of averting poverty declines with household size in Indonesia (from 2005-2007). Moreover, the proportion of working members directly relates to the probability that rural people are impoverished. A 1% increase in the working rate reduced the likelihood of poverty by 0.09%, holding all other covariates in the model constant.

The living area coefficient was negative and significant at 1%. In other words, a larger residential area per capita was correlated with lower odds of poverty. The odds ratio for the natural logarithm of residential area per capita was 0.365, meaning that an approximately 63.5% lower odds of poverty was associated with an "*Euler's number*"[51] – fold (or 2.72 times) increase in the residential area per capita. The inverse relationship between the residential area and poverty is consistent with our descriptive analysis in Table 4.4, which shows the residential area per TRP was 12.09 m^2 versus 21.45 m^2 for the TRNP. Previous studies, such as Nguyen et al. (2013), found that households with larger residential areas have higher income and expenditure. Tran et al. (2015) provided evidence that shows the poverty-decreasing effect of residential land in the Northwest ethnic minority communes in Vietnam.

The estimated coefficient of per capita durable expenditure (as a logarithm) was -1.034. The negative sign means that, all else being equal, households who spend more on durable goods are less likely to fall into poverty. Clean water plays an important role in reducing poverty. Families that used tap water in their homes during the study period had a lower chance of being poor than those without this service. The other water coefficient was 0.746, larger than the 0.295 for the clean water coefficient. This result means that households who have limited access to clean water have a higher probability of poverty. Households that have flush toilets have a lower probability of poverty than households with

[51] The number *e,* (*Euler's number*), is a mathematical constant and is approximately equal to 2.71828. It is the base of the natural logarithm (Collier, 2017).

other toilets or no toilets. Our findings confirm previous research which has suggested that the poor are more likely to live in precariously residential conditions (Oxfam, 2017). For domestic remittances, the negative coefficient of this variable (-0.05) implies that holding other variables in the model constant, if domestic remittances increased the likelihood that a rural household is poor would be reduced. However, the overseas remittances variable was insignificant and did not affect the TRH's poverty (see Table 6.3).

Regional Characteristics

In terms of socio-economic regions, we used a categorical variable with six levels; we used the RRD region as our reference group. The logit estimate shows that the MNM region was poorer than the RRD region, with almost 75% higher odds of falling into poverty, holding other variables constant. The NCC and CH regions were poorer than the reference region. The Southeast had a 50% lower risk of poverty than the RRD region. The Mekong River Delta estimate was not statistically significant.

6.2.2 Poverty Determinants of the TRH at the Commune Level

We found that many commune-level factors significantly affected rural poverty. Results from the logit model show that of the total (20), 15 were significant independent model variables (see Table 6.4). Almost all of these variables were expenditure predictors of rural households (see Section 6.1.2).

General Commune Characteristics

Our study builds on research that illustrates that rural communes across Vietnam have different geographic endowments, and that rural poverty is associated with specific geographic conditions (Tran et al., 2005, Ravallion, 1998). More specifically, mountainous geography most strongly affected rural poverty. Those living in rocky communes were 216.9% (2.169 times) more likely to become poor as those communes located in lowland deltas. Living in midlands during the study period had lower odds of falling into poverty than those living in deltas. This result is consistent with the findings from the linear regression models for the TRH and the TRNP; they all showed a positive association between household spending and residence in midlands areas. However, the linear regression model for the TRP's expenditure produced a contrasting result; it showed a negative link between living in the midlands and TRP's economic well-being.

Religion is also linked to rural poverty. Our investigation reveals that people who were engaged in Buddhist practices during the study period had lower odds of falling into poverty than those who identified with other faiths (except Christian) or those who were agnostic or had no religion. For example, the odds that a household was poor were 17% greater for families who did not practise any faith, holding other variables constant. Islam (2016) considered the importance of religious activities

on poverty in Bangladesh but found no difference in the effects of Muslim and non-Muslim religions on whether or not a household lives under the poverty line defined by probit maximisation.

The probability that rural households are poor increased on account of adverse natural events. The reducing-effect of natural calamity on the commune-level expenditure of the TRP was observed in the linear regression model. A natural calamity is a strong determinant of TRH's welfare and poverty. Bui et al. (2014), and Dercon and Krishnan (2000) provided similar evidence on the negative effect of natural disasters on poverty in Vietnam and Ethiopia, respectively.

Commune Infrastructure

The presence of public infrastructures, such as paved roads, daily markets, high schools, and agricultural extension centres, diminished the risk of impoverishment. Among the four variables, having a daily market had the most significant impact on poverty reduction; its coefficient was -0.766, the maximum magnitude. Its odds ratio was 0.465, meaning that access to a daily market reduced the odds of falling into poverty by 53.5% in rural communes, holding other variables constant. Paved roads appear to have the second-highest effect on poverty. The odds of being poor were 45% lower for households that had access to paved roads than those residing in communes without a proper road. The presence of a high school in a commune reduced the likelihood of rural poverty. Additionally, Agricultural Fishing Extension Centres are associated with poverty reduction. The odds of poverty were reduced by 43.5% when there was a farming fishing extension centre located in the commune.

Limited access to healthcare and post-office services increased the risk of deprivation. In particular, the average marginal effect of district hospital was 0.0002, meaning that the odds of poverty increased by 0.02% with an additional one kilometre from the commune centre to the district hospital. The corresponding figure doubled for one more kilometre from the commune centre to the post-office.

Land and Non-agricultural Employment Opportunities

Rural poverty reduction also depends on access to productive land resources. In particular, the percentage of irrigated annual cropland and residential land use right certificates reduced the likelihood of poverty; the relationship was stronger for the latter factor. In addition, population concentration is associated with rural poverty. The significant, negative coefficient of population density indicates that poor households were more likely to live in sparsely populated communes.

Non-farm employment opportunities had a positive impact on poverty reduction. The odds of poverty were almost 50% lower for households with access to a nearby production/service unit or trade village than those without access to non-farm earning opportunities.

6.3 The Determinants of TRH's Poverty Gap

6.3.1 The Determinants of TRH's Poverty Gap at the Household Level

Table 6.3 shows the estimates for the fractional logit model that determined the influences on TRH's poverty gap. The parameter estimates have similar signs and significance levels to those for the TRH logit model (Section 6.2.1). This finding is consistent with Bhaumik et al. (2006) and Tran et al. (2015), who concluded that the factors that determine the intensity of poverty also impact the likelihood of poverty. However, two variables, no farmland and scholarship, which were significant in the logit model, were insignificant in the fractional logit model. By contrast, overseas remittances significantly affected the shortfall of poverty but did not impact the likelihood of rural poverty. The results show that TRH's poverty gap depends on characteristics associated with the household head, household, and region.

Household Head Characteristics

For the individual characteristics, the household head's age, education level, and non-farm/wage-paying employment decreased the poverty gap (the distance from the RPCE to the poverty line). One additional year of age was associated with a 0.023% decrease in the poverty gap, holding other variables constant. Years of schooling had a more significant impact on the poverty gap than the household head's age. One additional year of schooling reduced the expenditure gap ratio by 0.13% between the poverty line and the RPCE. The positive effect of wage-paying employment was more substantial than non-farm self-employment. The poverty intensity-reducing impact of the former variable was 2.1 percentage points as opposed to 1.4% for the latter predictor covariate.

Household Characteristics

For the household characteristics, ethnicity, as expected, had a significant influence on TRH's poverty intensity at the 1% level. For AME, ethnic minority households had a 2.3% poverty gap wider than the ethnic majority households in rural Vietnam, holding other variables constant. Family size also increased the gap between the RPCE of the rural poor and the poverty line. One additional family member increased the poverty gap by 0.5 percentage points. By contrast, a 10% increase in the proportion of working members in a household was associated with a 0.4% decrease in the shortfall of poverty. Bhaumik et al. (2006) who investigated the influence of this factor on the poverty intensity found no statistically significant impact.

Residential area and durable goods that households own help to decrease the poverty gap. However, limited access to tap water and modern toilets has a negative impact on the lives of impoverished people. In particular, the poverty gap was 1.2% wider for TRH that used drilled well water than for families who had access to tap water at their homes. However, the other water coefficient (0.613) was

larger than clean water coefficient (0.336). Therefore, considering tap water, the poverty gap-increasing impact of other water (rain water or purchased water for daily use) was stronger than drilled well water. For AME, the poverty gap became wider (2.2%) if TRH used rainwater or had to buy water. TRH's poverty gap increased by 2.8% and 3.4% for households who used other toilets and those with no toilets, respectively.

The intensity of poverty depends on the area of farmland households own. Farmland equal to or larger than 1 hectare reduced the expected poverty gap by 0.55 to 0.65%, compared with farms less than 0.5 ha. For farms between 0.5 ha and less than 1 ha, there was no evidence that the poverty gap was reduced compared with the smallest farm size. This finding is similar to the logit model that showed that farms between 0.5 - 1 ha did not diminish the probability of poverty in rural areas.

Development programmes have poverty intensity-reducing effects. Free health insurance, pensions and credit programmes significantly narrowed TRH's poverty gap. The credit programme was the most successful in reducing TRH's poverty intensity because the coefficient and the AME of borrowing were the largest among the public assistance variables. However, the coefficient of scholarship was insignificant in the TRH fractional logit model.

Regional Characteristics

We found a relationship between poverty intensity and the spatial variation in socio-economic development in the six regions of Vietnam. Rural poor residing in CH had the most substantial poverty gap: 1.5% higher than those living in the RRD region, holding other variables constant. Residing in the MNM and NCC increased the poverty gap by 1.1%, and 0.9%, respectively. Living in the southeast reduced the poverty intensity by 1.7% versus living in the RRD.

6.3.2 The Determinants of TRH's Poverty Gap at the Commune Level

We found a strong relationship between commune characteristics and the intensity of rural poverty. Table 6.4 shows the direction and magnitude of the impact of commune-level variables on the TRH's poverty intensity. Fourteen of the variables had signs and significance levels as expected. We found that most of these variables were linked to the probability of rural poverty (see Section 6.2.1). In other words, the signs and significance levels of variables in the TRH fractional logit model were identical to those in the logit model. However, three variables (midlands, no religion and population density), which were significant in the logit model, were insignificant in the fractional logit model. The insignificant Christian coefficient in the logit model was significant in the fractional logit model. The evidence shows that the poverty intensity was more severe in communes with high numbers of Christians than those populated by Buddhists.

Table 6. 4 Estimation Results of the Binary and Fractional Logistic Regression Models for TRH at the Commune Level

Variable	*Binary Logit Model*				*Fractional Logit Model*		
	Coef.	*SE*	*OR*	*AME*	*Coef.*	*SE*	*AME*
General Commune Characteristic							
Coasts	-0.206	0.217	0.814	-0.029	-0.161	0.244	-0.009
Midlands	-0.507**	0.223	0.603	-0.071	-0.072	0.250	-0.004
Mountains	1.153***	0.141	3.169	0.161	1.305***	0.200	0.075
Christian	0.076	0.144	1.079	0.011	0.238*	0.142	0.014
Other Religions	0.635***	0.143	1.887	0.089	0.558***	0.126	0.032
No Religion	0.158*	0.095	1.171	0.022	0.084	0.093	0.005
Natural Calamity	0.233**	0.110	1.262	0.032	0.187**	0.089	0.011
Population Density	-0.001**	0.000	0.999	0.000	-0.001	0.000	0.000
Commune Infrastructrure							
Paved Roads	-0.597***	0.139	0.551	-0.083	-0.602***	0.114	-0.036
Daily Market	-0.766***	0.135	0.465	-0.107	-0.754***	0.142	-0.044
High Schools	-0.239***	0.096	0.787	-0.033	-0.296***	0.094	-0.017
Agriculture and Fishing Extension Centre	-0.440**	0.188	0.644	-0.061	-0.356**	0.182	-0.021
District Hospital_Kilometres	0.002***	0.001	1.002	0.000	0.001**	0.000	0.00043
Post-Office_Kilometres	0.003**	0.001	1.003	0.000	0.001***	0.001	0.00078
Land and Non-agricultural Employment Opportunity							
Irrigated Annual Cropland Rate	-0.003***	0.001	0.997	0.000	-0.004***	0.001	0.000
Irrigated-Perennial-Cropland-Rate	-0.001	0.002	0.999	0.000	-0.000	0.001	0.000
Housing Land Use Right Rate	-0.004***	0.001	0.996	-0.001	-0.003***	0.001	0.000
Production Units	-0.677***	0.082	0.508	-0.094	-0.604***	0.072	-0.035
Year 2014	0.036	0.116	1.037	0.005	-0.033	0.087	-0.002
Year 2016	-0.291**	0.124	0.747	-0.041	-0.330***	0.098	-0.019
Constant	-0.561***	0.292	0.571		-2.249	0.285	
Log Pseudolikelihood	-29941322				-14571883		
Degree of Freedom	20				20		
Wald Chi-Square	855.29***				1303.37		
Pseudo R-Squared	0.207				0.153		
Observations	7,566				7,566		

Notes: Estimates were adjusted for cross-sectional weights; OR: Odds ratio; AME: Average marginal effects. Reference categories: Deltas; Buddha; *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on the VHLSS data (2012 – 2016)

General Commune Characteristics

The geographical variables reveal the magnitude of the coefficient of mountains was the largest (1.305). In other words, households who resided in communes in mountainous areas during the study period had the most severe poverty intensity: The TRH living in the mountains had a 7.5% poverty gap wider than those in the deltas, holding other variables constant. Similarly, natural calamity had a significant impact on the shortfall of poverty: the TRH's poverty intensity increased by 1.1% for communes where fires, floods, storms, landslides, or earthquakes had occurred.

Commune Infrastructure

All commune infrastructure variables affect TRH's poverty gap. The daily market coefficient was negative (-0.754) and significant at 1%. For AME, the presence of daily markets in communes narrowed TRH's poverty gap by 4.4%. Therefore, daily markets had a higher effect on TRH's poverty intensity than paved roads (3.6%) and the presence of an agricultural extension centre (2.1%). A high school reduced the poverty gap by 1.7%; this figure is the lowest impact of commune infrastructure on TRH's poverty gap. In contrast, the further the distance to the district hospital and post-office made TRH's poverty intensity worse. However, the negative impact of the distance to the post-office was higher than the impact of the distance to the district hospital. One more kilometre to the post-office was associated with a 0.0078% increase in the poverty gap. However, TRH's poverty gap increased by only 0.0043% for every additional kilometre from the commune centre to a district hospital.

Land and Non-agricultural Employment Opportunities

Access to good quality land and titles narrowed the gap ratio between the poor households' expenditure and the poverty line. Specifically, a 1% increase in the rate of irrigated annual cropland or residential land titles was associated with 0.02% reduction in the poverty intensity, holding other variables constant. The presence of production units in the communes helped reduced the poverty intensity of TRH by 3.5%, holding other variables constant.

6.4 The Determinants of Income Inequality in Rural Vietnam

This section analyzes income inequality in rural Vietnam over the study period (2012-2016). As estimated in Chapter 5, the income gap between urban and rural areas was narrowing over the period. However, income inequality was more unequal for rural households than urban households. This study focusses on rural income inequality, which is prevalent in Vietnam. In rural areas, ethnic minorities are predominant but their living standards are lower than that of the ethnic majority (see Section 6.1). Therefore, we decomposed rural income inequality by ethnicity to identify whether the ethnic majority–minorities inequality is the main factor causing rural income inequality.

6.4.1 Income Growth and Inequality in Rural Vietnam

We found that income inequality in rural Vietnam slightly reduced over the study period. The Gini index for rural Vietnam households decreased from approximately 0.380 in 2012 to 0.377 in 2014 but it increased to 0.378 in 2016 (see Table 5.4). Our finding is consistent with Benjamin et al.'s (2016) finding that the Gini index reduced for rural households between 2012 and 2014. For income growth, we found no trade-off between income growth and income inequality for all rural households. This is because their income grew an average of 4.6% (see Table 5.4) annually and was distributed more equally among rural households over the study period.

However, the income percentile ratios provide insight into rural income inequality. Though the overall rural income inequality decreased during the study period, income inequality did not reduce for all sub-populations. Table 6.5 shows that, in rural areas, the income ratios of the p90/p50, p10/p50, p75/p25, and p75/p50 reduced slightly (0.01 to 0.02) over the study period. Conversely, the p90/p10 rate increased significantly, from 6.09 in 2012 to 6.15 and 6.22 in 2014 and 2016, respectively. The higher inequality between the richest and the poorest deciles was the main contributor to income inequality in rural Vietnam.

Table 6. 5 Distribution of Urban and Rural Household Income Inequality

Percentile Ratio	*p90/p10*	*p90/p50*	*p10/p50*	*p75/p25*	*p75/p50*	*p25/p50*
Urban						
2012	4.32	2.12	0.49	2.12	1.47	0.69
2014	4.24	2.10	0.50	2.01	1.45	0.72
2016	3.98	2.00	0.50	1.99	1.40	0.71
Rural						
2012	6.09	2.29	0.38	2.53	1.55	0.61
2014	6.15	2.22	0.36	2.51	1.52	0.61
2016	6.22	2.27	0.37	2.52	1.54	0.61

Note: Estimates were adjusted for cross-sectional weights.
Source: Authors' calculations based on the VHLSS data (2012 - 2016)

Many previous studies have reported higher income inequality for the urban population relative to the rural income distribution in developing countries (Cao & Akita, 2008; Estudillo, 1997). We found that over the study period, income distribution in rural Vietnam was more unequal than in urban areas. In 2012 the rural Gini index was 0.380 compared with 0.357 for urban households (see Table 5.4). Likewise, in 2016 the rural Gini index was 0.378 compared with 0.312 for urban households (see the Lorenz curves in Figure 6.1 for the difference in income distribution between the two areas). In particular, rural households' Lorenz curve was more convex than the urban households one in 2016. The gap/area between the two Lorenz curves (0.066) is because of the higher level of income inequality for rural households than urban households in 2016 (Zimm & Nakicenovic, 2020).

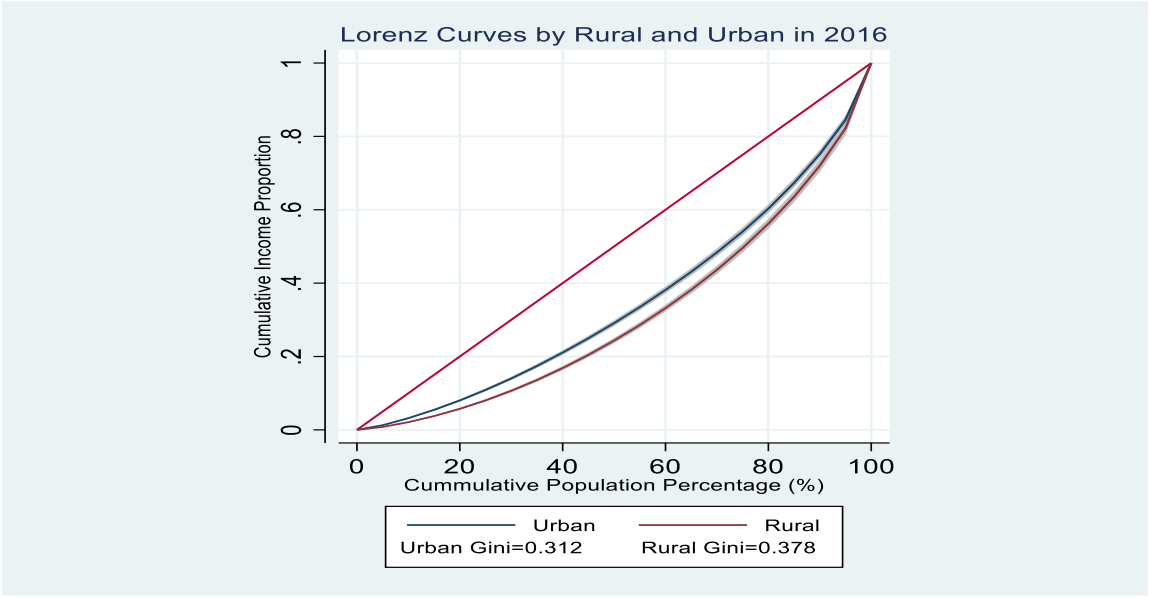

Figure 6. 1 A Comparison of Income Inequality in Vietnam's Rural and Urban Areas in 2016
Source: Authors' calculations based on the VHLSS data (2016)

6.4.2 The Decomposition of Income Inequality in Rural Vietnam

The Generalised Entropy indexes for rural areas changed over time, but in the opposite direction to the rural Gini index. Table 6.6 shows that all three income inequality measures, the GE_0, GE_1, and GE_2, rose from 2012-2016; however, there was an uneven increase among these measures. The GE_0 (Theil's L) increased slightly, by 0.006, from 0.248 to 0.254, between 2012 and 2016. We found greater increases in GE_1 (Theil's T), and especially in GE_2 over the same period. In particular, the GE_1 rose by 0.015, from 0.256 to 0.271; GE_2 rose by 0.208, from 0.365 to 0.573. It must be noted that the GE index is more sensitive to changes in the upper parts of income distribution when the alpha value increases (Haughton & Khandker, 2009; Yanrui, 2013). The substantial increase in the richest-poorest gap (p90/p10) had a greater impact on the GE_1 and GE_2 than on GE_0.

Table 6. 6 Urban and Rural Income Inequality and Decomposition of Rural Income Inequality by Ethnicity

	GE_0			***GE_1***			***GE_2***		
	2012	***2014***	***2016***	***2012***	***2014***	***2016***	***2012***	***2014***	***2016***
All Households	0.261	0.244	0.245	0.290	0.249	0.251	0.644	0.404	0.435
Urban	0.221	0.200	0.165	0.287	0.216	0.174	0.822	0.362	0.233
Rural	**0.248**	**0.266**	**0.254**	**0.256**	**0.298**	**0.271**	**0.365**	**0.459**	**0.573**
Decomposition of Rural Inequality by Ethnicity									
Within-group	0.207	0.210	0.207	0.222	0.229	0.233	0.336	0.449	0.540
Between-group	0.041	0.040	0.047	0.034	0.033	0.039	0.029	0.029	0.033
Between-Group as a Share of Total (%)									
	16.55	15.15	18.34	13.29	11.22	14.30	7.95	6.23	5.79

Note: Estimates were adjusted for cross-sectional weights.
Source: Authors' calculations based on the VHLSS data (2012 - 2016)

Income inequality in rural areas can be explained by income disparities between the ethnic majority and minorities and within each ethnic group. Decomposition of the rural GE indexes shows that between-group inequality occupied only 6 to 18% of the variation in the total income inequality in rural areas (see Table 6.6). Conversely, within-group inequality accounted for most (no less than 82%) of the variation in rural inequality. Hence, income differentiation among households within each ethnic group significantly contributed to rural income inequality over the study period.

6.5 Chapter Summary

This chapter presents the impacts of household and commune-level factors on expenditure, poverty and poverty gap in rural areas using three empirical models (regression, logit, and fractional logit models). The main conclusions from the models are as follows. First, the OLS regression model shows that among household-level factors, ethnic minorities in rural areas (REM) had a lower economic well-being level than the ethnic majority who lives in the same location. Similarly, the binary and fractional logit models revealed that REM experienced a greater probability of poverty and a poverty gap than the rural ethnic majority. Other household-level factors such as education level, employment, household size, water source, healthcare, credit, and region are strong determinants of welfare, poverty and its intensity for rural households. Second, among the commune-level factors, commune infrastructure, land and non-farm employment opportunities, and general commune characteristics strongly affect expenditure and the likelihood and intensity of poverty in rural Vietnam from 2012-2016. Third, this study found that one advantage of the fractional logit models is it avoids omitting some determinants of rural poverty that logit models do, e.g., overseas remittances and the Christian religion.

This chapter also discusses the factors that lead to rural income inequality. Income inequality in rural areas measured by the Gini and GE indexes showed contradictory findings. Based on the Gini index, rural income inequality slightly reduced over the study period. The slight decrease in the percentile ratios (the p90/p50, p10/p50, p75/p25, and p75/p50) is the main reason for reduction of income inequality in rural areas. However, using GE indexes, rural income inequality significantly increased, especially for GE_2. The significant increase in the p90/p10 explained the rising income inequality measures such as GE_0, GE_1, and GE_2 in rural areas. In terms of the GE index decomposition by ethnicity, we found that within-group inequality is the main contributor to income inequality in rural Vietnam. Specifically, the significant increase in income inequality among the REM (see Table 5.4) contributes to the rural income inequality[52]. In contrast, the ethnic majority-minority inequality affects rural income inequality marginally.

[52] See Section 7.4.3 for more discussion on the REM's income inequality.

Chapter 7

The Determinants of Poverty and Inequality of Ethnic Minorities in Vietnam

Over the past 30 years, Vietnam has achieved substantial progress in its socio-economic development and poverty alleviation (Glewwe et al., 2004; WB, 2018). Despite the nation's success in poverty alleviation, many ethnic minority households still live below the poverty line. This fact prompted the government to launch poverty reduction programmes. Although receiving substantial national and international assistance, these anti-poverty programmes have not been particularly effective, in part, because they do not meet ethnic minorities' needs (Bui et al., 2017; Nguyen et al., 2017; Van de Walle & Gunewardena, 2001). As a result, the poverty headcount ratio remains exceptionally high (44.6% in 2016) among the ethnic minorities group. In short, many ethnic minority households live in persistent poverty (Bui et al., 2017; GSO, 2018; Nguyen et al., 2017). Moreover, the poverty gap of ethnic minorities is more severe than that of the ethnic majority. In 2016, the ethnic minorities' poverty gap was 13.5% compared with only 0.5% for the ethnic majority[53]. In addition, income inequality in ethnic minority communes is emerging as a negative effect on economic growth in Vietnam.

This chapter discusses the empirical results of the REM. Sections 7.1, 7.2, and 7.3 present the REM determinants for per capita expenditure, poverty, and poverty intensity. Section 7.4 presents the increasing trend and driving factors of income inequality for ethnic minorities in general and for the REM in particular.

7.1 The Determinants of the RPE's, RNPE's and REM's Expenditure

We use linear regression models to investigate the determinants of the REM's RPCE. The data were obtained by combining (pooling) all observations for rural ethnic minority households from three national surveys (the Vietnam Household Living Standards Surveys) in 2012, 2014, and 2016. Table 4.5 presents the descriptive statistics of the household-level factors in the REM models. A summary of the commune-level factors is provided in Table 4.7. The REM empirical models, with three exceptions, used the same set of independent variables as in the TH and the TRH models. First, we added the language barrier variable to the REM models to capture the impact of ethnic minority language. In addition, we added clean water to the reference group to avoid a high correlation with other water sources. Finally, we added the Midlands and Northern Mountains region as the reference group. This region is home

[53] See Table 2.5.

to most of REM (52%). The region also had the lowest RPCE among all households across Vietnam (see Table 4.1).

7.1.1 The Determinants at the Household Level

7.1.1.1. The Impact of Household-Level Factors on the RPE's Expenditure

We used a linear regression model to examine the impact of household-level factors on the RPE's RPCE. Table 7.1 shows the RPE model results. The RPE model included 2,145 households, accounting for 52.3% of the total rural ethnic minorities during the study period. There were 22 significant predictor covariates in the RPE model. The R^2 was 37.72%.

Household Head Characteristics

Among the individual characteristics, marital status had a significant effect on the RPE's RPCE. Households whose heads were divorced or separated spent 14.4% less than couples (the reference group). Single parents or widowed household heads had an RPCE 9.4% lower than the reference group. Another determinant of RPE's expenditure was the household head's gender. The expected increase in RPCE for a male household head group to the female head group was 6.1%, holding other variables constant.

The magnitude of the non-farm self-employment coefficient (0.094) is virtually equal to that of wage-paying employment (0.093). The expenditure-increasing effect of non-farm and wage-paying employment ranged from 9.7% to 9.9% compared with farm employment, holding other variables constant. The household head's education level and age also had positive effects on the RPE's RPCE. A one-year increase in education level or age of household head was associated with a 0.46% or 0.19% increase in the RPE's RPCE, respectively.

Household Characteristics

RPE's expenditure significantly depends on household characteristics. Table 7.1 shows that hygiene conditions were strongly associated with the RPCE. RPE households without access to toilets had a RPCE 10.6% lower than those that had flush toilets. We observed a 3.7% decrease in expenditure for RPE who did not have access to clean water. The language barrier negatively affected RPE's RPCE ($p<0.01$). In particular, RPE's RPCE was reduced by 3.5% for individuals who spoke only their ethnic minority language compared with their counterparts who were fluent in Vietnamese. Our results support Baulch's (2010), Grafton et al.'s (2007), and Nguyen et al.'s (2017) findings. The magnitude of the effect of one additional person in a RPE household on the RPCE was equivalent to the impact of the language constraint. In contrast, working rate, residential area, durable goods, and income from remittances all had a positive impact on RPE's RPCE (see Table 7.1).

Table 7. 1 Estimation Results of the Linear Regression Models of the REM at the Household Level

Variable	*REM*			*RPE*			*RNPE*		
	Coef.	*SE*	*ME*	*Coef.*	*SE*	*ME*	*Coef.*	*SE*	*ME*
Household Head Characteristic									
Age	0.001***	0.001	0.001	0.002***	0.001	0.002	0.000	0.001	0.000
Gender	0.065***	0.023	0.067	0.059*	0.033	0.061	0.089***	0.031	0.093
Years of Schooling	0.007***	0.002	0.007	0.005**	0.002	0.005	0.008***	0.002	0.008
Never Married	0.027	0.037	0.027	-0.010	0.048	-0.010	0.030	0.061	0.031
Widowed	-0.026	0.029	-0.026	-0.099***	0.040	-0.094	0.040	0.041	0.040
Divorced/Separated	-0.072	0.051	-0.069	-0.156**	0.076	-0.144	-0.052	0.061	-0.050
Non-farm Self-Employment	0.082***	0.022	0.086	0.094***	0.030	0.099	0.062**	0.030	0.063
Wage-Paying Employment	0.066***	0.023	0.068	0.093***	0.031	0.097	0.037	0.031	0.038
Household Characteristic									
Poverty Status	-0.557***	0.014	-0.427						
Language-Barrier	-0.015	0.013	-0.015	-0.036***	0.014	-0.035	0.028	0.030	0.028
Household Size	-0.024***	0.005	-0.024	-0.036***	0.005	-0.036	-0.008	0.009	-0.008
Working Rate	0.002***	0.000	0.002	0.002***	0.000	0.002	0.001***	0.000	0.001
Living Area	0.129***	0.015	0.137	0.069***	0.017	0.001	0.175***	0.024	0.192
Durable Goods	0.068***	0.005	0.070	0.058***	0.005	0.001	0.100***	0.016	0.106
Tap Water	0.012	0.026	0.012	-0.008	0.042	-0.008	0.023	0.033	0.023
Other Water	-0.063***	0.013	-0.061	-0.038***	0.014	-0.037	-0.098***	0.022	-0.093
Other Toilets	-0.069***	0.016	-0.067	-0.029	0.027	-0.029	-0.071***	0.020	-0.068
No Toilet	-0.123***	0.019	-0.116	-0.112***	0.030	-0.106	-0.031	0.031	-0.031
Domestic Remittances	0.004**	0.002	0.004	0.005*	0.003	0.000	0.005	0.003	0.005
Overseas Remittances	0.019***	0.007	0.019	0.012*	0.006	0.000	0.017**	0.008	0.018
No Farmland	0.082***	0.031	0.086	0.052	0.048	0.053	0.102***	0.039	0.108
0.5 ha <=Farm Size<1 ha	0.024*	0.014	0.024	0.001	0.017	0.001	0.049**	0.022	0.050
1 ha <=Farm Size<1.5 ha	0.032**	0.016	0.033	0.005	0.020	0.005	0.053**	0.027	0.055
Farm Size >=1.5 ha	0.048***	0.013	0.049	0.028	0.017	0.028	0.065***	0.020	0.068
Health Insurance Premiums	0.001***	0.000	0.001	0.000	0.000	0.000	0.002***	0.000	0.002
Development Programmes									
Free Health Insurance Rate	0.001**	0.000	0.001	0.000	0.001	0.000	0.001**	0.000	0.001
Scholarship	0.008	0.005	0.008	-0.003	0.007	0.000	0.020***	0.007	0.020
Pension	0.011**	0.005	0.011	0.010*	0.006	0.000	0.008	0.005	0.008
Borrowing	0.013	0.010	0.013	0.023*	0.013	0.023	0.002	0.016	0.002
Regional Characteristic									
Red River Delta	0.165***	0.046	0.180	0.080**	0.041	0.083	0.212***	0.066	0.236
Northern and Coastal Central	-0.088***	0.015	-0.084	-0.081***	0.018	-0.078	-0.108***	0.025	-0.103
Central Highlands	-0.060***	0.017	-0.059	-0.097***	0.021	-0.093	-0.044	0.030	-0.043
Southeast	0.000	0.042	0.000	-0.068	0.112	-0.066	-0.004	0.046	-0.004
Mekong River Delta	-0.013	0.024	-0.013	0.014	0.044	0.014	-0.038	0.030	-0.037
Year 2014	-0.035***	0.012	-0.035	-0.036***	0.014	-0.035	-0.028	0.020	-0.028
Year 2016	0.010	0.013	0.010	0.019	0.015	0.019	0.002	0.021	0.002
Constant	8.418***	0.074	4528.68	8.189***	0.091	3602.43	8.044***	0.143	3115.8
Observations	4,080			2,145			1,935		
R-squared	0.757			0.377			0.398		
F-value	243.86***			30.35***			17.94***		
Degree of Freedom	36			35			35		

Notes: Estimates were adjusted for cross-sectional weights. Reference groups: Clean Water, Farm Size <0.5 ha; Midlands and Northern Mountains. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on VHLSS data (2012 - 2016)

Credit and pension development programmes had a positive influence on RPE's economic well-being ($p<0.1$). Holding other variables constant, households that accessed a credit programme had expenditure 2.3% higher than those who could not access a credit programme. Similarly, RPE's RPCE was increased by 0.01% when there was a 1% increase in RPE's pension. The marginal returns for a preferential loan and pension statistically significantly improved RPE's living standard. However, these effects were not observed in the TRP and TP linear regression models (see Sections 5.1.3 and 6.1.1.2).

Regional Characteristics

Table 7.1 shows that among the six regional variables CH had the largest impact on the RPE's RPCE. Holding other variables constant, the RPCE of RPE was reduced by 9.3% for households residing in the CH region compared with MNM. These findings are consistent with the findings presented in Table 4.1, which show the lowest expenditure of the RPE in CH with VND 4,890.2 thousand from 2012-2016. Similarly, RPE's RPCE was reduced by 7.8% for households residing in NCC compared with MNM. However, RPE in the RRD region had a VND 6,094 thousand RPCE, higher than the reference region with VND 5,602 thousand (see Table 4.1). Table 7.1 also shows a significant, positive coefficient of Red River Delta in the RPE model (0.08); the RPCE increased by 8.3% for RPE living in the RRD region compared with living in the MNM region.

7.1.1.2. The Impact of Household-Level Factors on RNPE's Expenditure

Table 7.1 shows the linear regression estimates for the RNPE model. Though the RNPE model had only 18 significant variables, the R^2 was higher than for the RPE model. Like the RPE model, many household-level factors affected the RNPE's RPCE. Some factors affected only the RNPE's well-being and not the RPE and vice versa. For example, farm size was insignificant in the RPE model, but was a strong determinant of RPCE in the RNPE model. Specifically, RPNE families with small farms (no larger than 0.5 ha) had lower expenditure than either families that had no land or bigger farms. Free health insurance and scholarships significantly increased RNPE's expenditure but had no effect on the RPE's RPCE. In contrast, credit and pension programmes were ineffective in increasing RNPE's living standards. These programmes significantly increased the RPE's RPCE ($p<0.1$).

7.1.1.3. The Impact of Household-Level Factors on REM's Expenditure

In the REM model, 26 independent variables were statistically significant. Only 10 variables were insignificant (see Table 7.1). The value of R^2 was 75.73%; the highest value found among the OLS regression models in this study. This figure indicates that the 36 model variables well explained variations in the REM's RPCE and the model fits the data best. The poverty status coefficient was -0.557, significant at 1%. This means that holding other variables constant, the RPE had 42.7% lower expenditure than the RNPE. The language barrier was not significant in the REM model. The reason for

this finding is that the language constraint reduced only RPE's spending but not RNPE's RPCE. Likewise, borrowing was not significant in the REM and RNPE models, but was a predictor of the RPE's RPCE. Previous studies such as Glewwe et al. (2002) and Imai et al. (2011) may have ignored some determinants of RPE's expenditure if they did not differentiate/separate out the RPE model from the RNPE and REM models. For example, using the 2004 VHLSS data, Imai et al. (2011) showed that marital status did not affect expenditure of the ethnic minorities. However, the authors used only a combined household sample of both poor and non-poor ethnic minorities to examine the impact of marital status on the ethnic minorities' per capita expenditure. The REM model result is consistent with Imai et al.'s (2011) finding that marital status had no impact on REM's RPCE, holding other variables constant. In contrast, the RPE model result showed that marital status was a key determinant of RPE's RPCE.

7.1.2 The Determinants at the Commune Level

The impact of commune-level factors on RPE, RNPE and REM's welfare is presented in Table 7.2. We used two outcome variables, the household-level RPCE and the commune-level RPCE in the RPE, RPNE and REM models. In addition, we used the commune-level explanatory variables presented in Table 3.2. Table 7.2 shows the results for the RPE, RNPE and REM models at the commune level. The results reveal that linear regression models explain the commune-level RPCE better than the household-level RPCE. For example, the R^2 was higher for the RPE model that estimated the commune-level RPCE (18.7%) than the household-level RPCE model (8.5%). Moreover, there were more significant independent variables (13 variables) in the former model than in the latter model (nine variables).

Table 7.2 shows that the predictors of RPE's household-level average expenditure were also the significant variables in the commune-level average expenditure model. In particular, the irrigated annual cropland rate and the presence of paved roads, a high school, and production units had a positive effect on expenditure. In contrast, difficult geography and limited access to a post-office had a negative impact on expenditure. Religion affected RPE's economic well-being; Christian families had approximately 12% lower expenditure than those who practised Buddhism.

There were four additional predictors of commune-level expenditure in the RPE model. Specifically, the availability of an agricultural and fishing extension centre increased the commune-level average expenditure by approximately 13.4%. The same effect was found in the densely populated communes. The population density variable was positive and was significant at 1%, but the absolute magnitude was small (0.0000732). However, this effect may become strong since this predictor variable has a significant value. In RPE communes, the population density varies from 1 to 4713 people per $km^{2,}$ so even a minimal coefficient can multiply out to have a large effect (i.e., 0.0000732* 4713=0.345). Likewise, households that did not belong to any religion spent more than those engaged in Buddhist practices. Another significant variable was district hospital; limited access to a district hospital led to a

Table 7. 2 Estimation Results of the Linear Regression Models of REM, RPE and RPNE at the Commune Level

Variable	*Household-Level RPCE*						*Commune-Level RPCE (Average)*					
	REM		*RPE*		*RNPE*		*REM*		*RPE*		*RNPE*	
	Coef.	*SE*	*Coef.*	*SE*	*Coef.*	*SE*	*Coef.*	*SE*	*Coef.*	*SE*	*Coef.*	*SE*
General Commune Characteristic												
Coasts	0.268***	0.104	0.268***	0.074	0.235**	0.104	0.207***	0.070	0.123*	0.068	0.223***	0.069
Midlands	-0.565***	0.170	-0.283**	0.141	0.698**	0.070	-0.632***	0.163	-0.705***	0.145	0.534**	0.250
Mountains	-0.375***	0.057	-0.063	0.084	-0.017	0.055	-0.422***	0.046	-0.417***	0.071	-0.128**	0.059
Christian	-0.151**	0.075	-0.118*	0.068	0.056	0.089	-0.109	0.074	-0.130**	0.062	0.133*	0.079
Other Religions	-0.033	0.053	0.007	0.056	-0.054	0.048	-0.048	0.042	0.008	0.046	-0.091*	0.051
No Religion	0.086**	0.044	0.073	0.051	0.038	0.042	0.069*	0.037	0.087**	0.041	0.021	0.045
Natural Calamity	-0.040	0.034	-0.026	0.029	0.036	0.043	-0.046*	0.027	-0.043	0.027	0.018	0.038
Population Density	0.000	0.000	0.000	0.000	0.000	0.000	0.0001*	0.000	0.0001***	0.000	0.000	0.000
Commune Infrastructrure												
Paved Roads	0.127***	0.047	0.091***	0.031	-0.065	0.065	0.155***	0.042	0.151***	0.032	0.014	0.073
Daily Market	0.198***	0.066	-0.078	0.092	0.171***	0.051	0.172***	0.055	-0.054	0.096	0.196***	0.047
High Schools	0.115***	0.033	0.054**	0.028	0.024	0.030	0.162***	0.024	0.205***	0.026	0.014	0.029
Agriculture and Fishing Extension Centre	0.204***	0.055	0.047	0.048	0.040	0.049	0.182***	0.039	0.134***	0.050	0.048	0.047
District Hospital_Kilometres	-0.0003**	0.000	0.000	0.000	0.000	0.000	-0.0003***	0.000	-0.0003***	0.000	0.000	0.000
Post-Office_Kilometres	-0.0004***	0.000	-0.0004***	0.000	0.000	0.000	-0.0004***	0.000	-0.0003**	0.000	-0.0006***	0.000
Land and Non-Agricultural Employment Opportunities												
Irrigated Annual Cropland Rate	0.001***	0.000	0.001**	0.000	0.000	0.000	0.001***	0.000	0.001**	0.000	0.0003**	0.000
Irrigated Perennial Cropland Rate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001**	0.000
Housing Land Use Right Rate	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
Production Units	0.131***	0.026	0.067***	0.021	0.014	0.026	0.141***	0.022	0.075***	0.022	0.086***	0.027
Year 2014	-0.032	0.035	0.035	0.029	-0.046	0.039	0.029	0.029	-0.038	0.032	0.039	0.038
Year 2016	0.059	0.038	0.038	0.032	-0.042	0.042	0.032	0.033	-0.041	0.035	0.042	0.040
Constant	8.979***	0.087	8.509***	0.092	9.415***	0.099	9.065***	0.065	8.944***	0.082	9.274***	0.099
Observations	2202		1207		995		2202		1207		995	
R-Squared	0.163		0.085		0.059		0.249		0.187		0.168	
F-Value	22.47***		44.67***		15.75***		40.94***		100.32		10.76***	
Degree of Freedom	20		20		20		20		20		20	

Notes: Estimates were adjusted for cross-sectional weights. Reference categories: Deltas; Buddha. *** p<0.01, ** p<0.05, * p<0.1.
Source: Author's calculations based on the VHLSS data (2012 – 2016)

lower commune-level RPCE level for the RPE.

We found that the pooled models (REM model) had the biggest number of significant predictors. However, it is useful to divide the pooled sample into two sub-samples and estimate the models to separate the correlates of RPE and RPNE's expenditure. There are three reasons why it was necessary to separate the models. The first is that each sub-sample has unique characteristics (see Tables 4.5 and 4.7). Generally, RPE reside in areas with difficult geographic conditions and poor infrastructure meaning that there is a lack of social amenities. For example, during the study period, 96% of RPE and 83% of RNPE lived in the high mountains. Only 7% of RPE had access to a daily market; the ratio for the RNPE was double that. In addition, the access to other productive resources and social services was lower for RPE. Second, we observed some differences in the signs of some variables for both household groups. The midlands and Christian signs were negative in the RPE models but positive in the RNPE models (see Table 7.2). Finally, the set of independent variables explained more variations in RPE's expenditure than that of RNPE. In particular, the R^2 were 2 to 3% higher for RPE models than for RNPE models.

7.2 The Determinants of REM's Poverty

Poverty is more severe in ethnic minority households. In this section, we discuss the poverty determinants for the smallest REM sample. We use two logit models with both household and commune-level data. The first logit model used household-level data or the set of independent variables for REM presented in Table 3.1. The second logit model used the set of independent variables for the commune-level data in Table 3.2.

7.2.1 Poverty Determinants of the REM at the Household Level

Table 7.3 shows the logit model results for REM's poverty at the household level. The Wald chi-square (653.6) with a statistical significance of 0.01, shows that at least one of the explanatory variables affected the likelihood of falling into poverty. The pseudo R-squared (0.39) indicates that the logit model explains variations in the outcome variable (poor or non-poor households) (McFadden, 1977)[54]. Specifically, the logit model was 81% successful in predicting the likelihood that a REM household will be poor[55]. This result shows that the signs and significance levels of parameters in the logit model are identified as expected, except for employment, water sources, farm size, free health insurance rate

[54] McFadden (1977) suggested that the binomial logistic regression model is appropriate if the Pseudo R-square value falls in the range of 0.2 to 0.4.

[55] See Appendix Table A6 for predictions on the poor and non-poor logit regression model for the REM. We calculated the precision of the logit estimate without fitting the sample weights; in Stata, the command "lstat", used to estimate the precision of the logit model, is not available after an estimation accounting for sample weights. The results of the sampling unweighted logit model changed very little.

Table 7. 3 Estimation Results of the Binary and Fractional Logit Model of REM at the Household Level

Variable	*Binary Logit Model*				*Fractional Logit Model*		
	Coef.	*SE*	*OR*	*AME*	*Coef.*	*SE*	*AME*
Household Head Characteristic							
Age	-0.014***	0.005	0.986	-0.002	-0.008***	0.002	-0.001
Gender	-0.178	0.197	0.837	-0.024	-0.134	0.100	-0.016
Years of Schooling	-0.069***	0.015	0.933	-0.009	-0.034***	0.007	-0.004
Never Married	-0.533	0.410	0.587	-0.072	-0.143	0.150	-0.018
Widowed	-0.162	0.263	0.851	-0.022	0.076	0.128	0.009
Divorced/Separated	-0.443	0.757	0.642	-0.060	0.071	0.221	0.009
Non-farm Self-Employment	-0.231	0.191	0.794	-0.031	-0.471***	0.133	-0.058
Wage-Paying Employment	-0.564***	0.226	0.569	-0.076	-0.540***	0.142	-0.066
Household Characteristic							
Language Barrier	0.171	0.135	1.187	0.023	0.127***	0.052	0.016
Household Size	0.127***	0.050	1.135	0.017	0.128***	0.017	0.016
Working Rate	-0.013***	0.002	0.987	-0.002	-0.011***	0.001	-0.001
Living Area	-1.082***	0.142	0.339	-0.146	-0.521***	0.064	-0.064
Durable Goods	-0.931***	0.076	0.394	-0.125	-0.277***	0.015	-0.034
Tap Water	-0.296	0.349	0.744	-0.040	-0.249	0.160	-0.030
Other Water	0.727**	0.348	1.539	0.058	0.262***	0.056	0.032
Other Toilets	0.807***	0.175	2.242	0.109	0.597***	0.124	0.073
No Toilet	0.941***	0.211	2.562	0.127	0.830***	0.129	0.101
Domestic Remittances	-0.038*	0.022	0.963	-0.005	-0.020*	0.010	-0.002
Overseas Remittances	-0.098	0.097	0.906	-0.013	-0.128***	0.047	-0.016
No Farmland	-0.401	0.330	0.670	-0.054	-0.194	0.170	-0.024
0.5 Ha <=Farm Size<1 Ha	0.115	0.141	1.122	0.016	0.007	0.061	0.001
1 Ha <=Farm Size<1.5 Ha	-0.225	0.161	0.799	-0.030	-0.134*	0.070	-0.016
Farm Size >=1.5 Ha	-0.151	0.138	0.860	-0.020	-0.184***	0.063	-0.023
Health Insurance Premiums	-0.007***	0.003	0.993	-0.001	-0.008***	0.002	-0.001
Development Programmes							
Free Health Insurance Rate	0.000	0.004	1.000	0.000	-0.003	0.003	0.000
Scholarship	-0.140**	0.059	0.869	-0.019	-0.028	0.027	-0.003
Pension	-0.068	0.048	0.934	-0.009	-0.063*	0.033	-0.008
Borrowing	-0.295***	0.108	0.745	-0.040	-0.140***	0.049	-0.017
Regional Characteristic							
Red River Delta	-1.176***	0.335	0.309	-0.158	-0.578***	0.198	-0.071
Northern and Coastal Central	0.122	0.163	1.130	0.017	0.092	0.070	0.011
Central Highlands	-0.204	0.157	0.816	-0.028	0.1431**	0.065	0.018
Southeast	-1.609***	0.399	0.200	-0.217	-0.705**	0.352	-0.086
Mekong River Delta	-1.370***	0.277	0.254	-0.185	-0.835***	0.196	-0.102
Year 2014	0.284**	0.119	1.329	0.038	0.156***	0.052	0.019
Year 2016	-0.452***	0.125	0.637	-0.061	-0.306***	0.057	-0.037
Constant	9.619***	0.844	15052.53		1.596***	0.369	
Log Pseudo Likelihood	-14851688				-13894371		
Degree of Freedom	35				35		
Wald Chi-Square	653.56***				2359.4***		
Pseudo R-Squared	0.394				0.179		
Observations	4,080				4,080		

Notes: Model estimates were adjusted for cross-sectional weights. Reference groups: Agricultural employment; Married; Clean Water; Flush Toilets; 0 ha<Farm Size <0.5 ha; Midlands and Northern Mountains. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on the VHLSS data (2012-2016)

and pension.

Household Head Characteristics

Table 7.3 shows that marital status had no impact on the likelihood of poverty. Similarly, our study found no evidence that female-headed households were more likely to live under the poverty line in REM communes in Vietnam during the study period. The household head's education level and age had positive effects on poverty reduction. Higher education levels and age significantly reduced the likelihood of poverty. Only wage-paying employment significantly affected the odds that REM would be poor. Although it had a positive sign, the non-farm self-employment coefficient was statistically insignificant.

Household Characteristics

For demographic characteristics, the results show that household size and number of working members were strong determinants of poverty in rural ethnic minority communes. In particular, an additional family member increased the risk of falling into poverty by 1.7%, holding other variables constant. In contrast, the proportion of working members in a household had a positive effect on poverty reduction; a 1% increase in the percentage of working members led to a 0.2% decrease in the probability of poverty. Although it had a positive sign, the language barrier had an insignificant effect on the likelihood of poverty.

REM households' poverty was related to residential area and durable assets; they reduced the likelihood of poverty for REM. Durable assets strongly affected the probability of REM being poor. Hygiene conditions were also associated with poverty. The likelihood of living in poverty for REM using other toilets was 124% higher than for REM using flush toilets[56]. Similarly, other water was significant among the three water source variables. Households that used untreated or purchased water (in bottles, jars, or small vehicles) were more likely to be poor than those who had access to clean, protected water from streams or wells.

We show that although the farm size variables had the expected signs, none significantly affected poverty. These results indicate that RPE may use farmland ineffectively or that they were unable to fully utilise the land to escape poverty; though greater land area is associated with more output and income it also requires greater expenditure. Low quality farmland may constrain RPE's agricultural production[57]. We found lower percentages of irrigated annual and perennial cropland in communes where RPE resided than in RNPE's communes (see Appendix Table A5). Our study found a positive link

[56] We considered whether the type of toilet used by a household were associated with poverty. The type of toilet one uses is an indication of one's wealth (not being able to afford a flush toilet is an indication of poverty, not a cause of poverty).

[57] Information about land quality is included only in the 2014 VHLSS not in the 2012 and 2016 surveys. As suggested by Markussen (2017), we use irrigated land in communes as a measure of land quality.

between health insurance premiums and poverty reduction. Similarly, domestic remittances significantly decreased REM's odds of being poor; this was not true for overseas remittances.

We found that the impact of free health insurance and pensions were not statistically significant in reducing the likelihood of poverty. These findings are consistent with Abrams et al. (2016) who provided evidence that, in northern Vietnam, ethnic minorities with mental health issues who live far from commune health centres seek help from traditional shamans[58] before obtaining medical treatment. Similarly, Van de Walle and Gunewardena (2001) found that free healthcare for REM was ineffective because they would visit shamans for treatment instead of the local healthcare centre. The authors also discussed the allocation of funds for development policies that were not appropriate for ethnic minorities. In particular, they identified the national educational curriculum as ineffective in meeting the needs of local people. However, our logit results indicate that scholarships had a positive impact on REM's poverty rates during the study period. Credit programmes also had a strong impact on REM's poverty rates: Holding other variables constant, the likelihood of poverty was reduced by 25% for REM households with access to credit programmes.

Regional Characteristics

Poverty studies have identified the spatial effects on the likelihood that a household is poor (Epprecht et al., 2011; Mukherjee and Benson, 2003; Ravallion, 1998). Similarly, we show that the probability of poverty depends on where REM reside. Our results show that during the study period very few poor individuals from the ethnic minority resided in the most developed region, southeast Vietnam (0.8%) (see Table A4). In contrast, 94.4% of the RPE lived in upland and coastal areas. The difficult geographic location and limited access to socio-economic centres partially explain why ethnic minority poverty is concentrated and persists in specific areas of Vietnam, i.e., the CH or Northwest Vietnam (Tran et al., 2015; Van de Walle and Gunewardena, 2001). The logit results show that REM in the MNM region had a higher likelihood of living in poverty than individuals/households in the RRD, MRD or southeast Vietnam. The Northern and Coastal Central and Central Highlands coefficients were insignificant, meaning that there was no difference in the probability that REM would be poor between the two regions and the MNM region.

7.2.2 Poverty Determinants of the REM at the Commune Level

General Commune Characteristics

[58] A shaman is a religious specialist who is believed to have the ability to communicate with a non-human world (Pharo, 2011). In some ethnic minority communes in Vietnam, a shaman is considered an illness healer because s/he has the ability to search for the lost, wandering, or attacked soul and bring it back to the body in the human world (Pinson-Perez et al., 2005).

We found that REM's poverty depends on commune characteristics. Geographical conditions were most strongly linked to ethnic minority poverty (see Table 7.4). Of the three geographical factors, two variables, midlands and mountains, were significant at 1%. The midlands coefficient was approximately 2.92, larger than the 1.98 for mountains. The variable coasts had a negative sign but was insignificant in the REM logit model. The effects of natural calamity, religion and population density on poverty were statistically insignificant.

Commune Infrastructure

For access to public infrastructure, our results show that access to an agriculture and fishing extension centre had the greatest impact on the likelihood of poverty. The odds ratio of poverty between households who could access agricultural and fishing extension services was 41.17%, holding other variables constant. In other words, the likelihood of living in poverty was approximately 59% lower for families who had access to agricultural and fishing extension services than those without access. The second largest impact on ethnic minority poverty reduction was access to a daily market. The likelihood of poverty was almost 52% lower for families living in a commune with a daily market than those who could not access a daily market. Access to paved roads and a high school mitigated the likelihood of poverty by 45% and 35% respectively, holding other variables constant. The distance from the commune centre to a post-office and a district hospital had an insignificant impact on REM's probability of living in poverty.

Land and Non-agricultural Employment Opportunities

The negative, significant sign of irrigated annual cropland rate indicates that farmers who had access to irrigation during the study period had lower odds of falling into poverty. A 1% increase in the irrigated annual cropland rate resulted in a 0.1% reduction in the probability of living in poverty. In contrast, the percentage of irrigated perennial cropland was uncorrelated with REM's risk of poverty.

Production units, a measure of off-farm earning opportunities, also contributed to a reduction in ethnic poverty during the study period. The odds ratio was 0.643, suggesting that the probability of poverty was reduced by almost 36% for households with access to off-farm opportunities.

Table 7. 4 Estimation Results of the Binary and Fractional Logit Models of REM at the Commune Level

Variable	*Binary Logit Model*				*Fractional Logit Model*		
	Coef.	*SE*	*OR*	*AME*	*Coef.*	*SE*	*AME*
General Commune Characteristic							
Coasts	-1.067	1.059	0.344	-0.223	-2.247**	1.035	-0.331
Midlands	2.918***	0.706	18.503	0.609	2.268***	0.404	0.334
Mountains	1.984***	0.333	7.274	0.414	1.605***	0.346	0.237
Christian	0.520	0.323	1.683	0.109	0.484***	0.197	0.071
Other Religions	0.119	0.246	1.126	0.025	0.066	0.168	0.010
No Religion	-0.165	0.193	0.848	-0.034	-0.210	0.144	-0.031
Natural Calamity	0.247	0.166	1.281	0.052	0.161*	0.094	0.024
Population Density	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Commune Infrastructrure							
Paved Roads	-0.584***	0.213	0.558	-0.122	-0.427***	0.106	-0.063
Daily-Market	-0.741***	0.274	0.477	-0.155	-0.325	0.240	-0.048
High Schools	-0.428***	0.152	0.652	-0.089	-0.338***	0.105	-0.050
Agriculture and Fishing Extension Centre	-0.888***	0.257	0.412	-0.185	-0.604***	0.219	-0.089
District Hospital_Kilometres	0.001	0.001	1.001	0.000	0.0006*	0.000	0.000
Post-Office_Kilometres	0.001	0.001	1.001	0.000	0.001**	0.000	0.000
Land and Non-agricultural Employment Opportunities							
Irrigated Annual Cropland Rate	-0.003***	0.001	0.997	-0.001	-0.003**	0.001	-0.001
Irrigated Perennial Cropland Rate	0.001	0.000	1.001	0.000	0.0004**	0.000	0.000
Housing Land Use Right Rate	-0.001	0.002	0.999	0.000	0.000	0.001	0.000
Production Units	-0.441***	0.114	0.643	-0.092	-0.372***	0.072	-0.055
Year 2014	-0.038	0.173	0.963	-0.008	0.053	0.097	0.008
Year 2016	-0.545***	0.180	0.580	-0.114	-0.266***	0.109	-0.039
Constant	-0.406	0.441	0.667		-2.243***	0.403	
Log Pseudo Likelihood	-11793125				-9058894.1		
Degree of Freedom	20				20		
Wald Chi-Square	188.84				286.97		
Pseudo R-Squared	0.111				0.051		
Observations	2,202				2,202		

Notes: Estimates were adjusted for the cross-sectional weights; OR: Odds ratio; AME: Average marginal effects; reference categories: Deltas; Buddha;
*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations based on the VHLSS data (2012 – 2016)

7.3 The Determinants of REM's Poverty Gap

7.3.1 The Determinants of REM's Poverty Gap at the Household Level

Household Head Characteristics

Table 7.3 shows the results of the fractional logit estimation for REM at the household level. The results reveal that education and age were strong predictors of the poverty gap ($p<0.01$). Although it was negative in the REM fractional model, gender was not significant. These findings show that female-headed households do not have a wider poverty gap than male-headed households, holding other variables constant. For REM, marital status was not associated with the poverty gap.

Both non-farm and wage-paying employment significantly decreased the poverty gap. However, the poverty gap-reducing effect of wage-paying employment was larger than non-farm employment. The poverty gap was reduced by 6.6% for households whose heads had wage-paying employment compared with farming employment, holding other variables constant. Similarly, non-farm self-employment reduced the poverty gap by 5.8% compared with farming.

Household Characteristics

Larger households had a greater poverty gap. If REM households have one additional member, the poverty gap increases by 1.6%. Likewise, the language barrier negatively affects the poverty gap ($p<0.01$). For the average marginal effect, the results show that the poverty gap was increased by 1.6% for individuals who could not speak Vietnamese (they can speak only their ethnic minority language) compared with native-Vietnamese speakers, holding other variables constant.

The ratio between the RPCE and the poverty line is decreased for REM who use clean water and flush toilets. Likewise, the poverty gap is reduced for REM who have a larger residential area and durable consumption expenditure. In the logit model, the impact of farmland area on the probability of poverty was not significant. However, a large farm holding (from 1 ha) reduced REM's poverty gap by 1.6 to 2.3% compared with a small farm holding (less than 0.5 ha). The study found a poverty intensity-decreasing effect for domestic and overseas remittances and health insurance premiums.

Of the public assistance programmes, the credit programme had a strong impact on poverty intensity ($p<0.01$). Holding other variables constant, households that had access to the credit programme for the poor had a 1.7% narrower poverty gap than those who could not access such programmes. Having a pension also significantly reduced the poverty gap ($p<0.1$); a 1% increase in the pension was associated with a 0.8% reduction of poverty intensity. Scholarships and free health insurance both had no effect on REM's poverty gap.

Regional Characteristics

REM's poverty gap depends heavily on differences in geographic and socio-economic conditions among the six regions in Vietnam. The poverty gap was smaller for households that were in the two Deltas (RRD and MRD) and southeast during the study period, compared with those who lived in the MNM region in which the poverty gap reducing-effect of residence in the MRD was the largest at 10.2% ($p<0.01$). The NCC coefficient was positive but insignificant; this means that living in the NCC did not increase the poverty intensity compared with living in the MNM. In contrast, living in the CH led to a wider poverty gap (1.8%), compared with living the MNM region, holding other variables constant. These findings show that, during the study period, that the CH was home to the poorest ethnic minority households. Similarly, data in Table 4.1 show that RPE living in the CH had the lowest expenditure.

7.3.2 The Determinants of REM's Poverty Gap at the Commune Level

Table 7.4 shows the REM fractional logit model results at the commune level. We found that eight commune-level factors affecting the risk of poverty were also predictors of poverty intensity. These were: midlands, mountains, paved roads, high school, off-farm opportunities, irrigated annual cropland rate, and access to an agriculture and fishing extension centre. However, six other commune characteristics and infrastructure, natural calamity, coastal area, religion, irrigated perennial cropland, access to a post-office and a hospital, affected only the poverty intensity.

General Commune Characteristics

All three commune geography variables were statistically significant in the fractional logistic model. The results show that disadvantaged geographical characteristics had a negative impact on the poverty gap. For the average marginal effects, midlands had a 33.4% poverty intensity higher than the deltas, holding other variables constant. REM in mountainous areas had a 23.7% poverty intensity higher than those in the deltas. Therefore, the poverty intensity-increasing effect of midlands was more significant than the mountains. Our result is consistent with Tran et al. (2015), who found that ethnic minority families residing in high mountains had less severe poverty intensity than those in low mountains in Northwest Vietnam. Families residing in coastal regions experienced a lower poverty intensity (33%) than those living in the deltas. Vietnam has narrow flat coastal lowlands extending from the south of the RRD to the MRD. The coastal stretch is fertile (Adger et al., 2002; University of Michigan - Department of Geography, 1962). Farming in fertile soil in the coastal areas increases ethnic minorities' agricultural productivity that, in turn, improves their living standard and reduces their poverty intensity. Natural calamity had a detrimental impact on poverty intensity ($p<0.1$). REM who had experienced a natural disaster/s had a 2.4% larger poverty gap than those who had not experienced any natural disasters. Similarly, a wider poverty gap was observed for REM who were practising Christians compared with those who were Buddhists.

Commune Infrastructure

Access to paved roads, a high school and agricultural extension centres strongly affected the poverty gap. Additionally, limited access to a district hospital or post-office widened the poverty gap. In terms of the AME, a one-kilometre increase in the distance from the commune centre to the district hospital or post-office led to a 0.01% increase in the poverty intensity. A daily market insignificantly reduced the poverty intensity but diminished the odds that REM are poor.

Land and Non-agricultural Employment Opportunities in the Commune

Irrigated annual cropland rate was associated with a decreased poverty gap for REM. Surprisingly, the irrigated perennial cropland rate increased the poverty intensity of REM. One possible reason is that REM had limited investment in their perennial crops. In other words, these households cannot produce more output to improve their living standard (see Table 7.2). The insignificant sign of borrowing indicates the ineffectiveness of the credit policy on the RPE's RPCE. Access to non-farm opportunities reduced the poverty gap by 5.5%, holding other variables constant.

In summary, the binary and fractional logistic regression models' results are relatively consistent in determining the probability and intensity of poverty. The result confirms previous studies (Bhaumik et al., 2006; Tran et al., 2015) that demonstrated that many factors affect both the prevalence and intensity of poverty. Our results show that some covariates reduced the poverty intensity, but did not affect the likelihood of falling into poverty: (1) seven household-level covariates: non-farm employment, language barrier, overseas remittances, two types of large farms (no less than 1 ha), pension, and Central Highlands; and (2) six commune-level covariates: natural calamity, coasts, religion, irrigated perennial cropland, access to the post-offices and hospitals. In addition, we found that scholarship and a daily market significantly affected the likelihood of poverty but not poverty intensity.

7.4 The Determinants of Income Inequality Among Ethnic Minorities in Vietnam

7.4.1 Emerging Income Inequality Among Ethnic Minorities

Our findings show that income growth coincided with growing income inequality for ethnic minorities from 2012-2016, the study period (see Table 7.5)[59]. Over this time, the ethnic minority Gini index consistently increased: from 0.38 in 2012 to 0.404 and 0.41 in 2014 and 2016, respectively.

[59] See the ethnic minority' increasing income over the study period in Table 5.4.

Table 7. 5 Per Capita Income and Gini Index of Ethnic Minorities in Vietnam

	2012	*2014*	*2016*
Per Capita Income(VND 1,000)			
Ethnic Minority	8,879.2	9,765.3	11,143.9
- Urban Ethnic Minorities	1166.8	1382.4	1831.8
- Rural Ethnic Minorities	703.3	757.6	838.8
Urban/Rural Ethnic Minorities	1.66	1.82	2.18
Gini Index			
Ethnic Minority	0.381	0.404	0.410
- Urban Ethnic Minority	0.402	0.373	0.393
- Rural Ethnic Minority	0.368	0.392	0.384
Ethnic Majority	0.359	0.341	0.337

Note: Estimates were adjusted for cross-sectional weights.
Source: Author's calculations based on the VHLSS data (2012 - 2016)

Income distribution estimates for ethnic minority households are shown in Figure 7.1. The Lorenz curve for the 2014 and 2016 estimates was more convex than in 2012. In other words, the area between the Lorenz curve and the 45° line became larger for 2014 and 2016. This indicates that higher levels of income inequality occurred among the ethnic minority households over the study period.

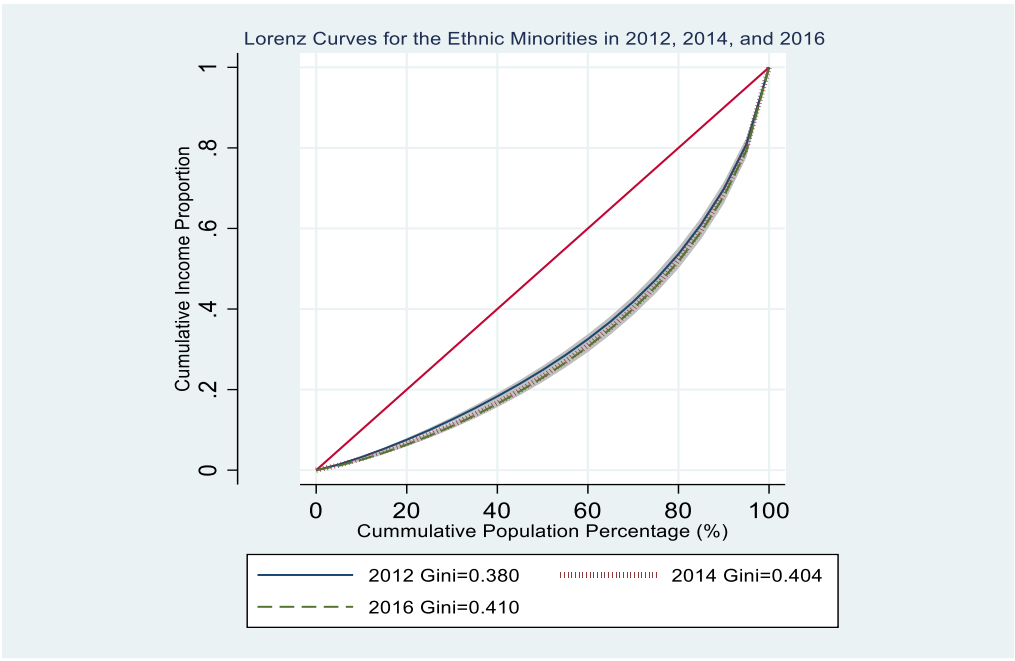

Figure 7. 1 Ethnic Minority Income Inequality Comparisons 2012, 2014, and 2016
Source: Author's calculations using the VHLSS data (2012- 2016)

Income inequality was higher for ethnic minorities than for the ethnic majority. Table 7.5 shows that the Gini index was 0.38 for the ethnic minorities, which is 0.021 higher than the Gini index for the ethnic majority (0.359) in 2012. Subsequently, there was a larger difference in the Gini indexes for the two ethnic groups for 2014 and 2016: 0.063 and 0.073, respectively. Though most majority-minorities'

income gap was decreasing during the study period (see Table 5.4), one negative result was that the income was distributed more unequally among the ethnic minorities than among the Kinh and those of Chinese descent.

The Lorenz curves in Figures 7.2 and 7.3 reveal the differences in income distribution between the two ethnic groups. In general, ethnic minorities' Lorenz curves were more convex than those of the ethnic majority in both 2012 and 2016. However, for 2012, the two Lorenz curves intersect at a point that shows that the bottom 35% shared approximately 15.4 to 16.1% of the total income of each ethnic group[60]. In this case, income distribution was equal for the two groups. To the left of that point, the Lorenz curve of ethnic minorities was above (dominated) the Lorenz curve of the ethnic majority, meaning that there was less inequality for the former households. Conversely, to the right of that point, the Lorenz curve of the ethnic majority dominated the Lorenz curve of the ethnic minority households' income distribution. In other words, income was more unequally distributed for the top 65% of ethnic minorities than their counterparts in the majority.

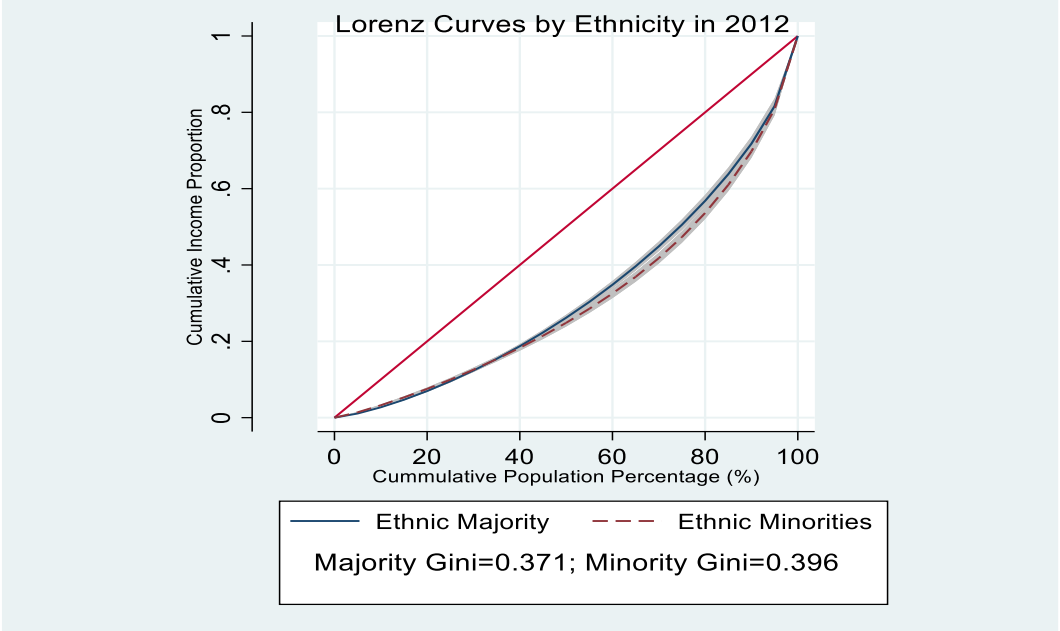

Figure 7. 2 Vietnam Income Inequality Comparison by Ethnicity (2012)
Source: Authors' calculations based on the VHLSS data (2012)

[60] See Table D.1 in Appendix D for the income shares by 20 quantiles.

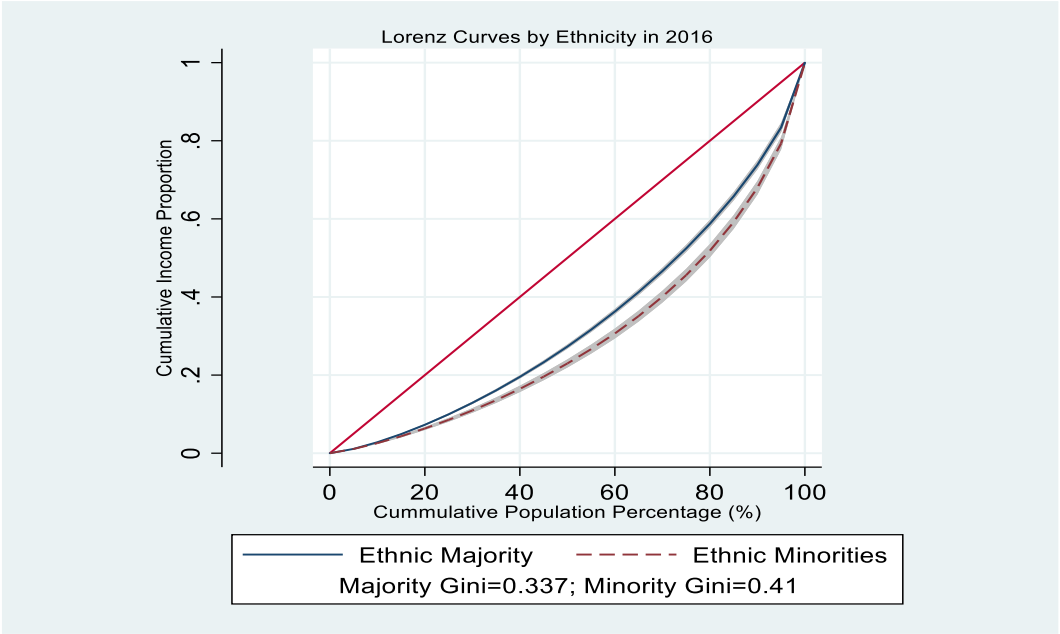

Figure 7. 3 Income Inequality Comparison in Vietnam by Ethnicity (2016)
Source. Authors' calculations based on the VHLSS data (2016)

Table 7. 6 Income Inequality in the Distribution of Vietnam Household Incomes by Ethnicity

Percentile Ratio	***p90/p10***	***p90/p50***	***p10/p50***	***p75/p25***	***p75/p50***	***p25/p50***
Ethnic Majority						
2012	4.81	2.19	0.46	2.21	1.48	0.67
2014	4.65	2.12	0.46	2.16	1.47	0.68
2016	4.50	2.08	0.46	2.15	1.45	0.67
Ethnic Minorities						
2012	4.96	2.76	0.56	2.34	1.67	0.71
2014	5.84	2.77	0.47	2.63	1.67	0.63
2016	6.02	2.79	0.46	2.57	1.66	0.65

Source: Authors' calculations based on the VHLSS data (2016)

We found that income inequality increased not only for the entire sample of the ethnic minorities but also for the sub-population of REM[61]. For income inequality for urban ethnic minorities, Table 7.5 shows that there was a narrowing trend over 2012-2016. The Gini index for these households was reduced from 0.402 to 0.393 during that time.

For the income gap between percentiles, the increase in the p90/10 and the p75/p25 ratios significantly contributed to the income inequality of the ethnic minorities (see Table 7.6). At the tails of the income distribution, the income gap between the richest 10% and the poorest 10% rapidly increased from 4.96 to 6.02 between 2012 and 2016. Similarly, the income gap between the 75th percentile and the 25th percentile increased from 2.34 to 2.57 in the same period.

[61] See Section 7.4.3 for more details.

At the bottom half of the ethnic minorities' income distribution, the p10/p50 and the p25/p50 reduced over the study period. This means income inequality increased between the 50th decile (the median income group) and the 10th/the 25th percentiles. For example, the p10/p50 ratio was reduced from 0.56 to 0.46 between 2012 and 2016. This means that the income of the bottom 10% accounted for 56% of the income of the 50th in 2012 and decreased to 46% in 2016. The income of the 25th percentile was 71% of the income of the 50th percentile in 2012. Subsequently, it dropped to 65% in the last year (2016). Conversely, the reduction of p90/10, p90/p50, p75/p25, and p75/p50 ratios led to decreasing income inequality of the ethnic majority over the study period (see Table 7.6).

7.4.2 Decomposition of Income Inequality Among the Ethnic Minorities

Compared with the Gini index, the ethnic minorities' income distribution was more unequal when measured by the GE indexes. Table 7.7 shows that the GE_0 index grew from 0.232 to 0.276 and GE_1 increased from 0.265 to 0.302 between 2012 and 2016. The same pattern was observed for the GE_2: It increased from 0.398 to 0.446 in the same period.

Table 7. 7 Generalised Entropy Indexes of Ethnic Minorities by Rural and Urban Areas (2012-2016)

	GE0			***GE1***			***GE1***		
	2012	***2014***	***2016***	***2012***	***2014***	***2016***	***2012***	***2014***	***2016***
Ethnic Minorities	0.232	0.266	0.276	0.265	0.298	0.302	0.398	0.459	0.446
- Urban Ethnic Minorities	0.272	0.24	0.277	0.271	0.227	0.254	0.344	0.26	0.299
- Rural Ethnic Minorities	0.217	0.249	0.242	0.25	0.287	0.267	0.38	0.466	0.396
Decomposition of Income Inequality by Urban and Rural									
Within-group	0.222	0.248	0.245	0.252	0.278	0.265	0.384	0.435	0.399
Between-group	0.011	0.017	0.031	0.012	0.02	0.038	0.014	0.024	0.047
Betwwen- group as a share of total (%)	4.64	6.54	11.25	4.66	6.8	12.42	3.59	5.23	10.53

Note: Estimates were adjusted for cross-sectional weights.
Source: Author's calculations based on the VHLSS data (2012 - 2016)

Results from the decomposition of the GE indexes by location show that income inequality among all ethnic minorities occurred as a result of both within and between-group inequalities. However, within-group inequality was the main contributor to total income inequality for ethnic minorities. In particular, the differentiation in the incomes of ethnic minority households in a particular location (rural or urban area) was over 87% of the variation in the GE_0, GE_1, and GE_2 (see Table 7.7). In contrast, the between-group inequality or the income gap between the urban ethnic minorities and the REM explained only 4.6 to 12.4% of the variation in the total ethnic minority inequality measures. It is worth noting that the between-group inequality has contributed a larger share in the total ethnic minorities' income inequality over time (see Table 7.7). Table 7.6 provides evidence to corroborate this finding;

the rural-urban income ratio for the ethnic minorities continuously increased over time. It increased from 1.66 in 2012 to 1.82 and 2.18 in 2014 and 2016, respectively.

7.4.3 Emerging Income Inequality Among the REM

In Vietnam, REM's poverty is a serious problem that needs to be solved. As poverty and inequality are interlinked (Naschold, 2002), we analysed income inequality for REM. We measured REM's income inequality by both Gini and GE indexes. Whereas the rural Gini index reduced slightly (0.002, see Chapter 6), the Gini index for its subset of REM increased by 0.016, from 0.368 to 0.384 from 2012 to 2016 (see Table 7.5). Between 2014 and 2016, REM's Gini index reduced by 0.008. However, in 2016, this coefficient was higher than in 2012. Table 7.7 also shows REM increased income inequality based on the GE indexes for the same period. The GE_0 and GE_1 continuously increased over the study period, but GE_2 rose from 0.38 in 2012 to 0.466 in 2014 and declined to 0.396 in 2016.

REM's Gini index was higher than the rural ethnic majority over the study period. Figure 7.4 shows the more convex Lorenz curve for REM in 2016. The gap (0.013) between the two Lorenz curves shows the unequal income distribution of REM in 2016. Using data from the 2012 and 2014 VHLSSs, Benjamin et al. (2016) also found a higher level of income inequality for REM than those who belong to the rural ethnic majority. Conversely, our result contradicts Bui et al. (2017) who found that income distribution was more uneven for the ethnic majority in 2007 and 2012[62]. One possible reason for the contradictory finding is that Bui et al. (2017) analysed the ethnic dimension of inequality in an earlier period than our study. Since 2012, the ethnic minorities have experienced higher growth in their income than the Kinh/Chinese (see Table 5.4); in this study, the pattern of ethnic inequality was reversed. Another possible reason for the contradictory finding is that Bui et al. (2017) used data only from households in poor communes whereas we used data from a variety of households across Vietnam.

[62] Benjamin et al. (2016) found the same trend in the ethnic minority inequality from 2002 to 2012 as Bui et al. (2017).

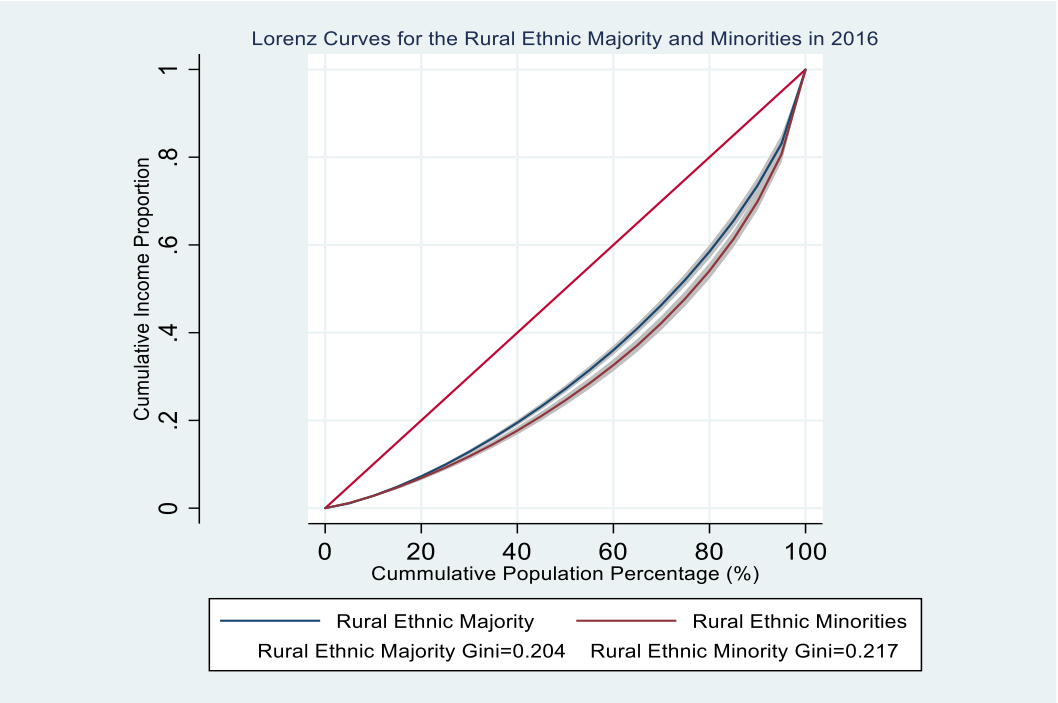

Figure 7. 4 Income Inequality of the Vietnam's Rural Ethnic Minorities and Majority in 2016
Source: Authors' calculations based on the VHLSS data (2016)

7.5 Chapter Summary

This chapter examines the factors that affect the economic well-being, poverty, poverty gap and income inequality of REM during the study period. We used linear, binary and fractional logistic regression models to investigate the determinants of the REM's RPCE, poverty, and poverty intensity. The results show that both household and commune-level factors affect REM's expenditure, poverty, and poverty intensity. Among the household factors, education level, housing conditions, wage-paying employment, and domestic remittances increased the RPCE and reduced poverty and its intensity. Our findings contradict Nguyen et al.'s (2017) and Van de Walle and Gunewardena's (2001) findings that show anti-poverty programmes in the ethnic minority communes are ineffective. We found that poverty incidence reduction hinges on some development programmes (credit availability and scholarships). The likelihood and shortfall of poverty declined for REM households residing in the RRD and MRD regions, and in southeast Vietnam. The language barrier, farm size and overseas remittances influenced poverty intensity, but not the likelihood of poverty.

At the commune level, the availability of a high school, paved roads and production units helped improve REM's economic well-being and reduce poverty. Additionally, limited access to a district hospital or a post-office widened the poverty gap; it had no statistically significant impact on the likelihood of poverty. It is worth noting that previous studies that use only logit models have neglected several influences on poverty intensity; this study overcomes that issue.

Regarding income inequality among the ethnic minorities, we found there was a widening trend over the study period. This trend happened not only for the entire sample but also for REM. For the decomposition of income inequality, we show that inequality among ethnic minorities living in each location (urban or rural areas) was the main driver of the total ethnic minority income inequality. Specifically, during the study period, the increase in income inequality of REM significantly contributed to the widening income inequality for all ethnic minorities.

We show that the ethnic minority income inequality increased in most parts of the income distribution, but especially at the tails of the income distribution. The rapid increase in inequality between the top 10% and the bottom 10% significantly exacerbated the total income inequality of ethnic minorities. This finding implies that the rich-poor income gap is becoming an emerging issue for development in Vietnam. Similarly, the income dispersion between urban ethnic minorities and REM widened over the study period. This reflects the fact that REM confront low living standards and increasing inequality compared with their counterparts who live in urban areas.

Chapter 8

Conclusions and Recommendations

8.1 Introduction and Overview of the Study

During the last three decades, Vietnam has experienced economic growth and achieved significant development goals, particularly in poverty reduction and income distribution. By implementing equitable, pro-poor growth policies, the Vietnamese government has fueled high GDP growth and transformed the country from a lower-income to a lower-middle-income nation. The incidence of poverty has substantially decreased, from 70% in the mid-1980s to less than 10% in 2016. However, this success has been far from uniform; rural and ethnic minority communes still suffer from high levels of poverty and widening income inequality. Furthermore, in these communes, the income gap between the rich and the poor has been widening.

This study provides updated empirical evidence on poverty and inequality in Vietnam. Specifically, it sought to answer the following four research objectives:

1. To investigate the significant factors that affect the economic well-being of TP, TRP and RPE in Vietnam.

2. To examine the factors that affect the TH, TRH and REM's poverty in Vietnam.

3. To identify the factors that influence the TH, TRH and REM's poverty intensity in Vietnam.

4. To identify the factors that affect income inequality in Vietnam, especially in rural and ethnic minority communes.

To answer these research objectives, we used pooled data from the 2012, 2014 and 2016 VHLSSs. We also used the 2012, 2014 and 2016 GSO-WB poverty lines to determine if an individual was poor. We used multiple linear regression models to examine the determinants of real per capita expenditure for three poor household groups (TP, TRP, and RPE). For the second objective, we used binary logistic regression models to estimate TH's, TRH's, and REM's likelihood of falling into poverty. For the third objective, we applied fractional logistic regression models to examine TH's, TRH's, and REM's poverty gap. Finally, by decomposing the GE indexes, we explored the dominant contributors to decreasing income inequality among households across Vietnam during the study period. We used the GE decomposition method to examine the main drivers of income inequality in rural and ethnic minority communes.

8.2 A Summary of the Findings

Using data from three recent national surveys, we have provided improved empirical evidence about the determinants of economic well-being, poverty and the poverty intensity of Vietnamese households from 2012-2016. At the household level, we found that the household head's, household's and regional characteristics strongly affect TH's, TRH's and REM's economic well-being and the probability and intensity of poverty. At the commune level, we found that general commune characteristics, infrastructure, land and non-agricultural employment opportunities, significantly affect TRH's and REM's expenditure and the probability and intensity of poverty.

8.2.1 Ordinary Least Squares Estimation Results

We showed that the RPCE strongly depends on where the households are and which ethnicity the household belongs to. Results from the TH regression model show that the RPCE was 9.3% lower for rural households than for urban households during the study period, holding other variables constant. The TH's RPCE reduced by 4.5% for ethnic minorities, compared with the ethnic majority. More importantly, living in poverty negatively and significantly affected the living standard of Vietnamese households. The OLS estimation results show that the TP had a 35% lower RPCE than the TNP.

The study found that the influence of farmland use and development programmes on the RPCE differed for the poor and non-poor. Though all variables related to farm size were significant in TNP's RPCE model, these variables were insignificant in TP's model. The results were similar for TRP's and RPE's RPCE models. This means that, during the study period, the poor in Vietnam did not make effective use of the farmland and, therefore, did not experience a significant improvement in their economic well-being.

For development programmes, TNP benefited from free health insurance, education, credit, and pension programmes. Participation in these programmes did not influence the TP's RPCE. Similarly, TRP did not significantly benefit from these programmes. Only the credit and pension programmes positively affected the RPE's RPCE. These findings indicate that, during the study period, the four development programmes had a limited influence on the Vietnamese poor's economic well-being.

Common Household-Level Determinants of RPCE of the TP, the TRP and the RPE

Using linear regression models, we estimated the determinants of TP's, TRP's, and RPE's RPCE. The results showed that many determinants of the RPCE are like those for the three poor household groups. However, the impact of these factors on RPCE varies across the groups. At the household level, the household head's education level and employment were strong determinants of the three poor groups' RPCE. In terms of household characteristics, household size, working rate, domestic

remittances, and place of residence significantly affected the three poor groups' RPCE. For regional characteristics, living in the MNM, CH, and NCC reduced the RPCE compared with living in the RRD.

Different Household-Level Determinants of RPCE Among TP, TRP and RPE

The empirical results showed differences in the determinants of the RPCE for each poor household group. For the household-level determinants of economic well-being, the significance of the household head's gender and marital status and region where households were on the RPCE differed among the three poor household groups. Whereas the household head's gender was not significant in the TP's and TRP's RPCE models, female-headship significantly, positively affected the RPE's RPCE ($p < 0.1$). This positive finding reflects the effectiveness of programmes that raise gender equality awareness among the RPE. Though the household head's marital status was insignificant in TP's RPCE model, it significantly affected TRP's and RPE's RPCE. Among the TRP, the RPCE was statistically and significantly lower for households whose heads were widowed than if a married couple. However, marital status had a greater impact on RPE's RPCE than TRP's; widowed or divorced/separated household heads were more likely to have a lower RPCE ($p < 0.05$).

For regional characteristics, residing in the MNM region negatively affected TP's and the RPE's RPCE compared with living in the RRD, holding other variables constant. In contrast, TRP living in the MNM had a higher RPCE than those in the RRD. Moreover, the TP's and the TRP's RPCE did not vary by place of residence (neither NCC nor RRD). However, the RPE of those who resided in the NCC had a lower RPCE than those living in the RRD.

We found that a limited ability to speak Vietnamese (the national language) had a negative impact on RPE's economic well-being. This impact was estimated for only the RPE since a significant proportion of ethnic minorities speak only their mother language.

Common Commune-Level Determinants of the TRP and the RPE's RPCE

We focussed on TRP's and RPE's living standards because they are more disadvantaged than urban and ethnic majority poor households. We found that, during the study period, TRP's and the RPE's RPCE depended on commune characteristics, in particular geographical characteristics, access to agricultural and irrigation services, a high school, roads, and non-farm employment opportunities, were strong determinants of the two poor groups' welfare.

Different Commune-Level Determinants of TRP's and RPE's RPCE

Besides common determinants for the two groups (TRP and RPE), access to a daily market, housing land use certificate, and a natural calamity significantly affected TRP's commune-level RPCE but not RPE's commune-level RPCE.

8.2.2 Binary Logistic Regression Model Results

The TH logit model results showed the likelihood of poverty is higher for rural and ethnic minority households. This model provided evidence that households in the MNM were more likely to fall into poverty compared with households living in the RRD during the study period. The descriptive statistics showed 48% of the TP resided in the MNM compared with 28% of the poor living in the RRD (see Table 4.4). In Vietnam, the RRD is a densely-settled, irrigated agro-ecosystem region whereas the MNM is an upland, mountainous region. The disadvantages of MNM's geographical characteristics explained why poor people in MNM face greater difficulties than those living in the RRD. In contrast, living in the southeast reduced the probability of living in poverty by 44 to 53% compared with living in the RRD. This finding indicates that the southeast experienced the lowest probability of living in poverty.

Common Household-Level Determinants of Poverty for the TH, the TRH and the REM

The logit model results for TH, TRH and REM showed the common determinants of poverty for the three household groups were the household head's age, education level and employment. Comparing the AME among the three groups, the poverty-reducing impacts of these factors were the greatest for REM. For example, one additional year of schooling reduced REM's probability of poverty by 0.9% (see Table 7.3). However, a one-year increase in education level reduced the probability of living in poverty only for TRH and the by 0.4 and 0.3%, respectively (see Tables 5.2 and 6.3).

For household characteristics, a large household (number of members), poor sanitary conditions and a lack of healthcare strongly limited a household's ability to escape poverty. Conversely, domestic remittances and durable assets reduced poverty. Two development programmes, scholarships and credit, appear to be effective in reducing poverty. Among the six regions in Vietnam, the southeast experienced the lowest probability of being poor among the three household groups.

Different Household-Level Determinants of Poverty for TH, TRH and REM

Based on their unique characteristics, REM are more disadvantaged than TH and TRH. Therefore, they exhibited different determinants of poverty from TH and TRH. Though non-farm self-employment significantly affected TH's and the TRH's likelihood of poverty, it was insignificant in the REM logit model. No farm size variable significantly influenced REM's poverty. The three farm size variables (except for 0.5-1 ha farms) had an impact on TH and TRH's poverty. The four development programmes contributed to poverty reduction for TH and TRH. However, free health insurance and pension programmes were ineffective in helping REM escape poverty. These findings support prior research, that has shown that the anti-poverty policies have failed to tackle poverty in ethnic minority communes (Bui et al., 2017; Nguyen et al., 2017; Van de Walle & Gunewardena, 2001). The likelihood

of falling into poverty was not significantly different for TH and TRH living in MRD and RRD. However, the possibility of poverty was lower for REM residing in MRD than those in the RRD.

Similar Commune-Level Determinants of TRH's and REM's Poverty

At the commune level, the results showed that the majority of rural and ethnic minority households reside in the most difficult geographic locations, such as the uplands or high mountains. These results further reveal that living in remote, sparsely populated areas contributes to the persistence of the poverty of TRH and REM. We support the spatial effect of location on poverty (Ravallion, 1998).

The availability of a high school, paved roads, and production units, helped reduce TRH's and REM's poverty rates during the study period. Access to agricultural extension services significantly reduced the probability of poverty. As most of two household groups (TRH and REM) work in the agriculture sector, access to irrigation significantly reduced levels of household poverty.

Different Commune-Level Determinants of TRH's and REM's Poverty

The TRH and REM logit model results show seven variables affected TRH's poverty at the commune level: no religion, other religions except for Buddhism and Christianity, natural calamity, population density, distance to the nearest district hospital and post-office, and housing land use right. This was not so for REM's poverty at the commune level.

8.2.3 Fractional Logistic Regression Model Results

Results from both the binary and fractional logit models show that many factors that affect the likelihood of poverty (see Section 8.2.2) also influence the intensity of poverty (poverty gap). For example, the likelihood and intensity of poverty was reduced by 43% and 6.6% for REM household heads who had salaried employment compared with those who worked in agricultural jobs, respectively. During the study period, education level has a moderate, positive effect on REM's poverty intensity; a one-year increase in education reduced the poverty gap by 0.4%. Given that the mean of ethnic minority poor's schooling was five years (most graduated only from primary schools), if the RPE were to complete nine years of school (graduate from secondary school), the poverty gap would be decreased by 1.6% (0.4% multiplied by four years). Using the 2016 figures, this number is equivalent to VND 186 thousand/person (1.6% of the 2016 poverty line).

There are advantages and disadvantages using a fractional logit model to examine the determinants of poverty intensity. The fractional logistic model overcomes the limitations of the binary logistic model that ignores some important determinants related to poverty depth. At the household level, seven variables affected REM's poverty intensity; non-farm self-employment, language barrier, overseas remittances, farm size no less than 1 ha, pension, and Central Highlands. However, they had no impact

on the probability of poverty in REM communes. The results from the fractional logit models in this study showed that, among the six regions in Vietnam, poverty in the CH was the most severe. At the commune level, six variables affected REM's poverty gap: natural calamity, coasts, being Christian, irrigated perennial cropland rate, distance to the post-office and district hospital.

However, fractional logit models do not consider the factors that affect the likelihood of poverty. Specifically, whereas the scholarship and daily market coefficients appeared to be significant in the binary logit model, they had no impact on REM's poverty intensity in the fractional logit models. Based on our OLS estimates, the scholarship and daily market coefficients do not significantly improve RPE's expenditure. This finding is consistent with the results of the fractional logistic models.

8.2.4 Results of the Income Inequality Analysis

The results show that, across Vietnam, income inequality was declining over the study period. However, we found a higher level of income inequality among the rural populace than the urban populace. Though income inequality slightly declined in rural areas over the same period, it rose significantly in ethnic minority communes.

The results from the GE decomposition show that within-group inequality was the main factor causing income inequality for the whole country and the sub-populations (TRH and the ethnic minorities) during the study period. We found that the increasing income gap between the top 10% and the bottom 10% in rural and ethnic minority communes significantly contributed to rural and ethnic minority households' income inequality.

8.3 Research Implications and Policy Recommendations

We used three empirical models (regression, logit and fractional logit) to provide up-to-date evidence on poverty in Vietnam. The logit model estimates the likelihood of poverty. Instead of using a usual binary outcome variable, we used this model to estimate a latent variable (poor and non-poor). Therefore, it discards information associated with the continuous variable (expenditure) and the fractional variable (poverty gap) (Papke & Wooldridge, 2008; Ravallion, 1998). The logit model neglects some crucial predictors of poverty. For example, the TH logit model results show the poverty-reducing impact of large farms (no less than 1 ha) compared with small farms (less than 0.5 ha). These findings are identical with the TH regression model result used to estimate all Vietnamese households' RPCE. However, when reducing the sample to the TP, we found that farm size did not affect TP's RPCE. Though we found that overseas remittances had a poverty gap-reducing effect in the fractional logit models for the three household groups (TH, TRH, and REM), this variable was insignificant in logit models. These results mean that we can use the regression and fractional logit models to crosscheck the logit model results in our analysis of poverty.

We used pooled data from the 2012, 2014, and 2016 VHLSSs, which generated a big sample. We have more coefficients that are significant in our empirical models than in the models that used cross-sectional data from each VHLSS (2012, 2014, and 2016). For example, using the pooled data, the language constraint and borrowing variables significantly affected RPE's RPCE during the study period. However, when using only the 2016 VHLSS data, these variables were not statistically significant in the RPE regression model (see Appendix C, Table C.3). We suggest that researchers might consider combining data from multiple VHLSSs surveys to increase the sample size and so improve the model estimation accuracy of studies. It is important to include household groups that constitute only a small proportion of the surveyed sample such as REM.

The empirical findings show that it is useful to assess the effectiveness of development programmes for each household group. The influence of these programmes on TH's welfare and poverty is similar to TRH's. However, the impact differs for REM. Besides, the descriptive statistics (see Chapter 4) show that a higher percentage of the non-poor received scholarships and pensions than the poor. Our finding is consistent with Giang (2012) study that revealed a lower proportion of the poor benefited from the pension policy than the non-poor. This suggests that one anti-poverty strategy is to expand the pension programme's coverage to reach a larger number of the poor as its beneficiaries. Similarly, scholarship programmes should reach more poor people to enhance their access to schooling.

Policymakers need to increase these development programmes' effectiveness for all poor household groups, especially for RPE (the most disadvantaged of the three poor household groups). One strategy is to increase access to the credit programme because it appeared to be the most effective among the four development programmes; it not only reduced the three household groups' likelihood and intensity of poverty, but also increased RPE's RPCE. The results showed that the free health insurance programme contributed to reducing TH’s and the TRH's likelihood of and intensity of poverty. However, we did not find the same impact for REM. We found that though the RPE had the highest acceptance of free health insurance (98%) among the household groups, they had to travel the furthest (97.4 km) to reach the nearest district hospital. The results suggest that reducing REM's travel time or distance to healthcare services would increase the programme's effectiveness.

Our study provides policy planners with some strategies to decrease Vietnamese poverty levels and elevate the poor’s living standard. Our descriptive analyses show that the poor have fewer productive resources including human capital (low education level) and physical capital (fewer durable assets) than the non-poor. Therefore, we focus on strategies that enhance the poor human and physical capital, especially for the most marginalised people such as RPE. Improving education is one strategy that has a long-term impact on poverty reduction. It helps build human resources, creates employment, and raises awareness about the importance of family planning. Table 4.5 shows that the

RPE had 4.1 schooling years which is the lowest educational level among all the poor. Therefore, a pathway to reduce ethnic minority poverty is increasing the RPE's education level to the national average schooling years of all Vietnamese household heads (7.5 years). Having a vocational degree is also an important tool for the RPE to seek employments, increase economic welfare and reduce their poverty. We found the language constraint had a negative impact on RPE's RPCE and REM's poverty intensity. Therefore, removing the language constraint is one strategy for REM's poverty reduction. As lessons in the general education programme in public schools are taught in Vietnamese, removing the language barrier would improve RPE's participation rate and, in turn, their future. This would require the incorporation of Vietnamese classes and/or introducing bilingual school curriculums for those RPE who speak only ethnic minority languages. Moreover, government agencies, such as healthcare and agricultural extension services, should also provide information in ethnic minority languages. This would allow greater use of public services.

In addition, solutions that mitigate the negative impact of natural calamities help reduce poverty. Rural diversification, through increasing non-farm employment opportunities, would raise the poor's income and expenditure. The poor's economic activity depends heavily on agriculture. However, TRP and RPE have a lower level of access to irrigation and agricultural services that lead to a higher likelihood of living in poverty and more severe poverty. Therefore, an effective anti-poverty strategy is to increase the efficiency of farmland use and agricultural income for the poor by improving their access to irrigation and agricultural extension services that are suitable for specific geographical conditions and local farming practices. Though Programme 135 focusses on strengthening the infrastructure of the poorest ethnic minority communes, this anti-poverty programme should make greater provision for access to clean water, paved roads, and non-farm employment for the ethnic minority poor. This programme can help thus the poor break the commune-level constraints on existing poverty.

We support the conceptual and theoretical model of the spatial effect of location on poverty (Ravallion, 1998). Specifically, the MNM, NCC and CH regions confronted a higher likelihood and intensity of poverty compared with other areas during the study period. Among these regions, CH had the lowest living standard and the largest poverty gap. Therefore, to lift the poorest segment of the Vietnamese population out of poverty, the state budget allocation needs to target this region. Our descriptive analysis shows that, in 2016, CH's poverty gap was 9.1% (see Appendix A, Table A.1). This result reveals that the state budget needs to allocate an average of VND 1,053 thousand (using 2016 nominal price) to help one person in the CH region escape poverty. The cost would be 91 times as much to lift one southeast person of poverty in 2016 (VND 11.6 thousand).

Although economic growth reduced the incidence of poverty for Vietnamese households during the study period, it increased the income gap between the poor and the non-poor. Specifically, the rich-

poor gap increased substantially among the rural populace. Its effect is most evident in ethnic minority households. This is one negative impact of economic growth in Vietnam during the study period (2012-2016). As inequality is harmful to the poor (Fosu, 2010 & 2017), when implementing economic growth policies, the Vietnamese government must increase social benefits to ensure that the poor can achieve a sustainable standard of living.

8.4 Study Limitations

The study has identified the proximate causes of poverty. We did not check for potential endogeneity among every covariate because the selected independent variables in our empirical models were based on the WB (2009) guidelines and previous empirical studies that show the likely exogenous determinants of poverty. Moreover, to address the potential causality effects among covariates, we need to use relevant instrument variables that are not easily found. However, multicollinearity tests of our regression models showed that no variable had a variance inflation factor (VIF) value greater than 7.8; these results indicate a weak correlation among the covariates[63].

However, we checked for potential endogeneity among three variables: education level, household size, and the propotion of working members because Nguyen et al., (2017) suggested that these variables are likely to be correlated. In particular, a higher education level may decrease the poverty rate, because educated individuals may choose to have fewer children. Reverse causality shows that families with more members are less likely to be uneducated or be able to provide education for all their family members (Marteleto & de Souza, 2012). Because of a lack of education, some family members may not be able to find employment; this, in turn, reduces the total number of household members with jobs. With Pearson's correlation test, we show a weak link between these variables; the absolute Pearson's r-values were less than 0.15[64]. This test indicates the correlation among these variables is not a concern in our empirical models.

A lack of available information on land quality in the VHLSS data in 2012 and 2016 is a concern in our poverty analysis. Land quality is an essential factor in agricultural production that many poor people's livelihood relies on; thus it is a critical factor in determining poverty. Though the ethnic minority poor have less agricultural land than the non-poor, it is worth exploring how the quality of land affects poverty levels (Markussen, 2017). Social capital such as social networks that households engage in is becoming more helpful in determining the poverty level (Haughton & Khandker, 2009). Hoang et al. (2006) show that social networks are vital to information access and contribute to an increase in

[63] An explanatory variable that has a large VIF is more likely to be associated with multicollinearity. When evaluating a VIF, a researcher should be concerned about any value larger than 10 (Alin, 2010).

[64] The coefficient of correlation (Pearson) measures how strongly two numerical variables are correlated (Abu-Bader, 2021). In social science research, a Pearson's r-value of lower than 0.3 is considered a very weak correlation whereas a Pearson's r-value ranging between 0.71 and 0.9 corresponds is a strong correlation (Abu-Bader, 2021).

income for farmers in Northern Vietnam. Tran et al. (2015) found the negative relationship between participating in a social network and poverty incidence in Northwest Vietnam. However, our study could not use this variable as a covariate in the regression models because data on social capital are available on only in the 2014 and 2016 VHLSSs but not in the 2012 VHLSS.

In addition to the CPI indexes, this study used the Scolis index, an improved price index, to reflect variations in prices by region and to convert nominal expenditure and income into real expenditure and income, respectively. This conversion allowed us to exclude the diverging spatial price from changes in household expenditure and income. However, the GSO collected this index for only 2010 and 2016. Therefore, we used the 2016 Scolis index to convert household expenditure and income for 2012, 2014 and 2016.

We analysed the poverty-reducing effects of development programmes using pooled data from the 2012, 2014 and 2016 VHLSSs. A better analysis of the long-term impact of these programmes on poverty reduction performed using longitudinal panel data. However, during the study period, only 50% of the households in each of the VHLSS were re-interviewed in the following survey year. For example, the 2012 and 2014 VHLSSs generated a two-year panel dataset using approximately 4,700 households. The same number of households was sampled in both the 2014 and 2016 VHLSSs. Combining the 2012-2016 VHLSSs forms a four-year panel dataset; however, this dataset includes only 5,688 households (see Figure 3.1). This represents a big loss in terms of valuable data. It also represents a significant constraint in analysing the poverty-reducing effects of development programmes in a dynamic context.

To define a poor household, our study used the GSO-WB's expenditure poverty line that is a consistent, comparable threshold over time. However, a shortage of available data on the 2018 poverty incidence measured by the expenditure poverty line is a challenge to use the most recent data in our study. Recently, the GSO published the 2018 VHLSS. Nevertheless, in the survey results, GSO (2019) does not include data on poverty incidences calculated by the GSO-WB's poverty line for rural and urban areas, ethnicities, and regions in Vietnam in 2018. As a result of data limitation, in Chapter 2 (Literature Review), we update data only poverty incidences until 2016. We used only the 2012, 2014 and 2016 VHLSSs in our regression models.

8.5 Suggestions for Future Research

To improve the results of this empirical study, we suggest that further studies delve into poverty dynamics. Researchers should estimate factors that affect those who are persistently poor or transient poor (move into or out of poverty). Though this study used a binary (binomial) logit model to estimate the likelihood of poverty at time, dynamic poverty analysis could use a multinomial logit model to

estimate the probability of remaining poor, moving out of poverty, or falling into poverty at two times or several years (Bui et al., 2017; Dartanto & Nurkholis, 2013). By identifying the persistent causes of poverty and appropriate anti-poverty strategies, a study such as ours could help individuals escape miserable poverty, particularly ethnic minorities.

It is important to understand the causes of rising inequality among ethnic minorities. We showed a link between income growth and income inequality, particularly rising income inequality, among REM. Similarly, Wan et al. (2020) found a reverse relationship between inequality and poverty reduction in Asia from the 1906s to the 2010s. Therefore, quantifying and modelling the impact of rising income inequality on poverty levels further enhances our understanding of the poverty-inequality nexus. Further research can use econometric models to examine this relationship and provide more evidence. Future study could measure the effect of income inequality on poverty using a log functional form of poverty headcount with the explanatory variables, the Gini index, and a logarithm of income as suggested by Fosu (2010). This approach requires time series data on real per capita expenditure, a poverty headcount, and the Gini index. Similarly, future research can use the 2018 VHLSS data to analyse Vietnam's inequality since the GSO recently published the survey data.

Appendix A

Poverty Indicators and Development Programmes

Table A. 1 Poverty Headcount, Poverty Gap and Poverty Severity by Region in Vietnam, 2016 (in %)

	Poverty Headcount ratio	*Poverty gap*	*Poverty Severity*
Red River Delta	2.2	0.4	0.1
Midlands and Northern Mountains	28.0	7.6	2.9
Northern and Coastal Central	11.8	2.9	2.9
Central Highlands	24.1	9.1	4.6
Southeast	0.6	0.1	0.0
Mekong Delta	5.9	1.0	0.3
All Vietnam	9.8	2.6	1.0

Source: Authors' calculations based on the VHLSS data (2016)

Table A. 2 Beneficiaries of Development Programmes by Groups of Household (2012-2016)

	No of HH	*%*	*Mean*	*No of HH*	*%*	*Mean*
Support/Assistance		***TP***			***TNP***	
Free health insurance (%)	3632	94.63	86.91	21866	89.80	74.45
Scholarship (VND 1,000)	246	6.41	100.90	2971	12.20	171.46
Pension (VND 1,000)	34	0.89	5428.67	2116	8.69	9483.47
Borrowing (Yes)	1046	27.27		3962	16.27	
Support/Assistance		***TRP***			***TRNP***	
Free health insurance (%)	3361	93.52	88.37	14502	89.07	72.45
Scholarship (VND 1,000)	216	6.01	107.82	1730	10.63	71.88
Pension (VND 1,000)	30	0.83	5243.37	863	5.30	9515.24
Borrowing (Yes)	1000	28.30		3233	19.78	
Support/Assistance		***RPE***			***RNPE***	
Free health insurance (%)	2195	97.77	96.16	1931	94.70	89.74
Scholarship (VND 1,000)	126	5.61	150.94	167	8.19	121.32
Pension (VND 1,000)	13	0.58	3184.10	66	3.24	6842.48
Borrowing (Yes)	701	31.23		670	32.85	

Source: Authors' calculations based on the VHLSS data (2012 – 2016)

Appendix B

Correlations Among Variables

Table B. 1 Correlation Between the Variable of Rural and Other Variables Excluded From The Binary Model 1 for the TH

Variable	*Rural*	*Farm Size*	*Health Insurance Premium*	*Free Health Insurance*	*Scholarship*	*Pension*
Rural	1					
Farm Size	0.3937	1				
Health Insurance Premiums	-0.24	-0.2248	1			
Free Health Insurance	-0.0337	0.027	-0.5144	1		
Scholarship	-0.0763	-0.0271	0.0709	0.0626	1	
Pension	-0.1825	-0.1323	0.0382	0.1489	-0.0352	1

Appendix C

Ordinary Least Squares Estimation Results and Precision of Binary Logistic Regression Model

Table C. 1 Linear Regression Model Results of the TH at the Household Level Using Averaged Cross-Sectional Weights

Variable	*Coef.*	*SE*	*p-value*
Household Head Characteristic			
Age	0.002	0.000	0.000
Gender	0.033	0.008	0.000
Years of Schooling	0.010	0.001	0.000
Never Married	0.038	0.019	0.040
Widowed	-0.007	0.011	0.526
Divorced/Separated	0.017	0.017	0.319
Non-Farm Self-Employment	0.044	0.007	0.000
Wage-Paying Employment	0.076	0.008	0.000
Household Characteristic			
Poverty Status	-0.428	0.008	0.000
Rural Areas	-0.097	0.007	0.000
Ethnicity	-0.047	0.009	0.000
Household Size	-0.027	0.002	0.000
Working Rate	0.002	0.000	0.000
Living Area	0.191	0.006	0.000
Durable Goods	0.169	0.004	0.000
Clean Water	-0.109	0.007	0.000
Other Water	-0.120	0.010	0.000
Other Toilets	-0.065	0.006	0.000
No Toilet	-0.043	0.012	0.000
No Farmland	0.120	0.008	0.000
0.5 ha <=Farm Size<1 ha	0.028	0.007	0.000
1 ha <=Farm Size<1.5 ha	0.041	0.010	0.000
Farm Size >=1.5 ha	0.086	0.008	0.000
Health Insurance Premiums	0.006	0.001	0.000
Domestic Remittances	0.009	0.002	0.000
Overseas Remittances	0.001	0.000	0.000
Development Programme			
Free Health Insurance Rate	0.001	0.000	0.000
Scholarship	0.011	0.002	0.000
Pension	0.006	0.002	0.000
Borrowing	0.009	0.006	0.115
Regional Characteristic			
Midlands and Northern Mountains	-0.128	0.009	0.000
Northern and Coastal Central	-0.125	0.008	0.000
Central Highlands	-0.089	0.011	0.000
Southeast	0.019	0.011	0.082
Mekong River Delta	-0.159	0.008	0.000
Year 2014	-0.024	0.006	0.000
Year 2016	0.037	0.007	0.000
Constant	7.766	0.034	0.000
Observations	24,016		
R-squared	0.758		
F-value	1390.58		
Degree of Freedom	37		

Source: Authors' calculations based on the VHLSS data (2012 – 2016)

Table C. 2 Estimation Results of the RPE's Linear Regression Models at the Household Level in 2016

Variable	*Coef.*	*SE*	*p-value*
Household Head Characteristic			
Age	0.000	0.001	0.905
Gender	0.065	0.081	0.424
Years of Schooling	0.006	0.004	0.106
Never Married	-0.035	0.096	0.720
Widowed	-0.069	0.091	0.449
Divorced/Separated	-0.001	0.147	0.995
Non-farm Self-Employment	0.125	0.061	0.043
Wage-Paying Employment	-0.001	0.068	0.989
Household Characteristic			
Language-Barrier	-0.028	0.028	0.322
Household Size	-0.030	0.008	0.000
Working Rate	0.003	0.001	0.000
Living Area	0.042	0.032	0.186
Durable Goods	0.044	0.010	0.000
Tap Water	-0.027	0.055	0.621
Other Water	-0.092	0.026	0.001
Other Toilets	-0.042	0.036	0.254
No Toilet	-0.145	0.043	0.001
No Farmland	0.007	0.086	0.932
0.5 ha <=Farm Size<1 ha	-0.022	0.033	0.508
1 ha <=Farm Size<1.5 ha	0.070	0.038	0.062
Farm Size >=1.5 ha	0.043	0.032	0.180
Domestic Remittances	0.010	0.005	0.057
Overseas Remittances	0.011	0.010	0.283
Health Insurance Premiums	0.001	0.001	0.405
Development Programme			
Free Health Insurance Rate	0.000	0.001	0.879
Scholarship	0.002	0.013	0.877
Pension	0.019	0.009	0.039
Borrowing	0.005	0.026	0.836
Regional Characteristic			
Red River Delta	0.083	0.117	0.478
Northern and Coastal Central	-0.173	0.032	0.000
Central Highlands	-0.210	0.044	0.000
Southeast	-0.047	0.137	0.730
Mekong River Delta	-0.087	0.066	0.189
Constant	8.388	0.159	0.000
Observations	589		
R-squared	0.4178		
Degree of Freedom	33		

Notes: Estimates were adjusted for cross-sectional weights; reference groups: Clean Water, Farm Size <0.5 ha; Midlands and Northern Mountains.

Table C. 3 Predictive Accuracy of the Binary Logit Model Estimation for the REM Without Fitting the Sample Weights

Logistic model for PoorHH

	True		
Classified	D	~D	Total
+	1760	413	2173
-	385	1522	1907
Total	2145	1935	4080

Classified + if predicted Pr(D) >= .5
True D defined as PoorHH != 0

Sensitivity	Pr(+| D)	82.05%
Specificity	Pr(-|~D)	78.66%
Positive predictive value	Pr(D| +)	80.99%
Negative predictive value	Pr(~D| -)	79.81%
False + rate for true ~D	Pr(+|~D)	21.34%
False - rate for true D	Pr(-| D)	17.95%
False + rate for classified +	Pr(~D| +)	19.01%
False - rate for classified -	Pr(D| -)	20.19%
Correctly classified		80.44%

Source: Authors' calculations based on the VHLSS data (2012 – 2016)

Appendix D

Income Inequality

Table D. 1 Income Share by 20 Quantiles and Ethnicity in Vietnam in 2012 and 2016

Year			*2012*					*2016*	
Quantile	*Coef.*	*SE*	*95% Confidence Interval*		*Quantile*	*Coef.*	*SE*	*95% Confidence Interval*	
		For the Ethnic Majority					***For the Ethnic Majority***		
0	0.000	(omitted)			0	0.000	(omitted)		
5	0.011	0.000	0.010	0.011	5	0.011	0.000	0.010	0.012
10	0.027	0.001	0.026	0.028	10	0.028	0.001	0.027	0.029
15	0.047	0.001	0.045	0.049	15	0.049	0.001	0.047	0.050
20	0.070	0.001	0.067	0.072	20	0.073	0.001	0.071	0.075
25	0.095	0.002	0.092	0.099	25	0.100	0.001	0.097	0.102
30	0.123	0.002	0.119	0.127	30	0.129	0.002	0.126	0.132
35	0.154	0.002	0.149	0.159	35	0.161	0.002	0.157	0.165
40	0.187	0.003	0.181	0.193	40	0.195	0.002	0.191	0.200
45	0.223	0.003	0.216	0.230	45	0.233	0.003	0.228	0.238
50	0.262	0.004	0.254	0.270	50	0.273	0.003	0.267	0.279
55	0.303	0.005	0.294	0.312	55	0.316	0.003	0.310	0.323
60	0.348	0.005	0.338	0.358	60	0.363	0.004	0.356	0.370
65	0.397	0.006	0.385	0.408	65	0.413	0.004	0.405	0.420
70	0.449	0.006	0.436	0.461	70	0.466	0.004	0.458	0.475
75	0.506	0.007	0.491	0.520	75	0.524	0.005	0.515	0.533
80	0.568	0.008	0.553	0.584	80	0.587	0.005	0.577	0.597
85	0.638	0.009	0.621	0.655	85	0.658	0.005	0.647	0.668
90	0.718	0.010	0.699	0.737	90	0.738	0.006	0.727	0.749
95	0.816	0.010	0.796	0.837	95	0.834	0.006	0.822	0.846
100	1.000	.	.	.	100	1.000	.	.	.
		For the Ethnic Minorities					**For the Ethnic Minorities**		
0	0.000	(omitted)			0	0.000	(omitted)		
5	0.014	0.000	0.013	0.015	5	0.011	0.000	0.010	0.012
10	0.032	0.001	0.031	0.034	10	0.026	0.001	0.024	0.028
15	0.053	0.001	0.050	0.056	15	0.043	0.002	0.040	0.046
20	0.075	0.002	0.072	0.079	20	0.063	0.002	0.059	0.067
25	0.100	0.002	0.095	0.104	25	0.085	0.002	0.080	0.090
30	0.126	0.003	0.120	0.131	30	0.109	0.003	0.104	0.115
35	0.153	0.003	0.147	0.160	35	0.136	0.004	0.129	0.143
40	0.183	0.004	0.175	0.191	40	0.165	0.004	0.157	0.173
45	0.215	0.004	0.206	0.224	45	0.196	0.005	0.187	0.205
50	0.248	0.005	0.239	0.258	50	0.230	0.005	0.219	0.240
55	0.285	0.006	0.274	0.296	55	0.267	0.006	0.255	0.278
60	0.325	0.006	0.313	0.337	60	0.306	0.007	0.294	0.319
65	0.369	0.007	0.356	0.382	65	0.351	0.007	0.337	0.365
70	0.418	0.007	0.404	0.432	70	0.401	0.008	0.386	0.416
75	0.473	0.008	0.458	0.488	75	0.456	0.008	0.440	0.472
80	0.536	0.008	0.521	0.552	80	0.518	0.009	0.501	0.535
85	0.610	0.008	0.593	0.627	85	0.592	0.009	0.574	0.609
90	0.698	0.009	0.681	0.715	90	0.679	0.009	0.662	0.697
95	0.809	0.008	0.792	0.825	95	0.793	0.008	0.778	0.809
100	1.000	.	.	.	100	1.000	.	.	.

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