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Master Thesis

The determinants impact on poverty reduction in Vietnam

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Abstract

The progress of poverty reduction in Vietnam determined by regions and the education level of the household members. During 2006-2014, the spillover of the poverty reduction polices in Vietnam was transmitted through accessibility to government preferential credit and public healthcare services. Ensuring that rural households were able to approach to immunization can improve their household's wealth. The aim of the thesis was an assessment of determinants impacted on poverty in Vietnam, captured by the household characteristics, educational attainments, agricultural resources, and regions. The thesis also evaluated the effectiveness of the poverty reduction policy applied by the Vietnamese government. Subsequently, the interaction effects were used to investigate the role of women in the progress of poverty reduction and how the level of regional development influenced on poverty. The results showed that the probability of being poor decreased when households have favorable conditions in term of household characteristics, educational attainment, and regions. Accessibility to government preferential credits reduced the urban household's poverty, and health care policies were more compatible with rural households. The yielding results of OLS model and probit models were consistent, guaranteed for robust estimation. The interaction effects showed the effectiveness of policy variables to the corresponding beneficiaries, but the proxies of government agriculture support were insignificant. Further research is recommended to use alternative proxies to have a better evaluation on the poverty reduction policies.

Acknowledgement

I wish to express my sincere appreciation to my supervisor, Dr. Sandor Schrijner, for his dedicated support and guidance. He continuously provided encouragement and was always willing and enthusiastic to give me a comprehensive and objective critique. Without his help, the thesis could not be materialized. I would also like to thank my parents and my friends for staying by my side and encouraging me to overcome all difficulties. Their unconditionally supports were my motivation in such special period.

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I. Introduction

Poverty is defined as the deprivation of material wealth and opportunities to lead a life that corresponds to certain minimum standards. The material poverty covers the lack of food or other basic needs, unemployment, or do not earn enough income to survive (United Nations, 2011). The lack of opportunities encompasses the lack of access to education and healthcare or the lack of access to clean water and sanitation (World Bank, 2011). Fundamentally, poverty pronounces for the inability of having enough human's needs, including basic goods and services (Gordon, 2005).

The consequences of poverty are persistent and severe, regardless of whether it occurs to individuals, households, or communities. Poverty is the cause of diseases or disability, reduces the human life expectancy (Trumbull, 2007; Cano & Librado, 2010). The poor often faces to serious illnesses due to lack of healthcare and living in less hygiene conditions. Poverty is associated with hunger and malnutrition, that increases the impediments to improve the living standards of the poor (Trumbull, 2007). Because the budget for food of the poor is usually greater and more sensitive than wealthy people, their stable livelihoods would be threatened whenever food prices rise. Furthermore, children from poor households tend to associate with higher dropout rate, thereby losing their opportunities to improve cognitive development and to enable their income in the future (Lynch, 2014). Poverty triggers more serious discrimination, especially between gender, thus excluded disadvantaged individuals from the community (Collado, 2012).

Hence, poverty reduction is the mission on the top priority, not only by governments but also by non-governmental organizations. Since the Millennium Development Goals (MDGs) have been popularized, many empirical studies on the progress of poverty reduction have been conducted in various countries so far. These studies have been conducted in order to examine the determinants of poverty or to evaluate the impact of poverty reduction strategies. Facing the challenges that poverty poses, an understanding of the determinants of poverty is essential to eradicate poverty steps by steps.

This thesis set up in the circumstance of Vietnam, a remarkable progress of poverty reduction among developing countries (Besley & Cord, 2007). The World Bank (WB) recognized that

Vietnam has done well in their National poverty reduction strategies (Kozel, 2014). The pillar of the National poverty reduction strategies is the Socio-economic development program for extremely difficult communes in ethnic minority and mountainous areas, shortly referred as The Program 135. Before the national strategies was launched, 65% of Vietnamese households lived below the WB poverty line (Demombynes & Vu, 2015). In 1998, The Program 135 was approved by the Vietnamese government, created a fundamental transformation of poverty status in Vietnam. After 15 years, Vietnam declared the achievements of the Millennium Development Goals (MDGs) on eradication of poverty, reaching the goals 10 years ahead of schedule (2015). The Ministry of Labor, Invalids and Social Affairs (MOLISA) reported that the average poverty rate of Vietnam decreased to 5.35% by the end of 2018. From these figures, the reasons standing behind Vietnam's progress is worth investigating further, in both academic aspects and practical aspects.

The thesis aims to examine the determinants of poverty in Vietnam. Once the determinants of poverty are identified, the thesis can achieve a dual goal. First, the thesis identifies the factors in the progress of poverty reduction in Vietnam. Second, by these factors, the thesis evaluates the effectiveness of The Program 135, thereby proposing reasonable adjustments for future.

The determinants of poverty in Vietnam are evidenced at household level. Compared to the individual level, data at the household level is more reliable because of the advantages of statistical application (Hess et al., 2001). First, the surveys on living standards are mainly implemented at the household level, by the sake of efficiency, to save time and costs. Second, many household factors are decided at the household level rather than individuals, such as the household assets or the characteristics of household head. In the thesis, the factors determined at the household level will include the household characteristics (i.e. household demographics, living areas and ethnic groups), the education levels of household adult members (i.e. head and spouse), agricultural resources, the schemes of The Program 135 (i.e. government preferential credits, accessibility to public healthcare services and support for agricultural instruments) and regions.

From the above statements, the thesis formulates the research question:

"What are the determinants of poverty reduction in Vietnam at the household level?"

For academic contributions, the thesis is expected to draw an up-to-date understanding about the poverty in Vietnam. Various studies of Vietnamese poverty utilized a usual set of explanatory variables, including household demographic characteristics, the education level of household members and regions (Balisacan et al., 2003; Giang & Pfau, 2009; Baulch et al., 2009, Hoang et al., 2014). This triggers to a shortage of the evaluation for the effectiveness of The Program 135 that the Vietnamese government has adopted so far. Some studies emphasized on the impact of some schemes, but they have referred them separately and potentially causing the desertion of the simultaneous effects when they are implemented together. Examples for these studies are Hoang et al. (2014) for agricultural support from the government; the role of vaccinations for children in Kozel (2014); and the impact of accessibility to government credits is examined in Diem (2017). Therefore, to evaluate the simultaneous effectiveness of The Program 135 when embed in the specific circumstances of Vietnam, it is necessary to organize the set of explanatory variables in a more comprehensive manner. In order to do so, the thesis considers the interaction effects of the available proxies for schemes of The Program 135.

Given the limitations of intensive judgements of The Program 135, the thesis integrates both the traditional elements in relevant literatures and the proxies for the schemes. This combination expects to deal with the aims of the thesis. So far, empirical studies in Vietnam used only one regression method for their analysis, making their conclusion was discrete and less generalized, especially when applied for different poverty indicators. To ensure a robust and effective estimation, the thesis will utilize the OLS-Probit approach. Furthermore, to grasp the latest improvement of Vietnamese poverty, the thesis also updates the research period to 2014, two years later since Duong's dissertation (2016) using 2012 data. Unlike previous studies using Vietnam Household Living Standards Survey (VHLSS) provided by General Statistical Offices (GSO), the thesis uses the *Multiple Indicator Cluster Survey* (*MICS*) derived by United Nations Children's Fund (UNICEF). The use of independent dataset is expected to yield objective empirical results, and if the impacts of determined factors are similar to those used by VHLSS, they will be reaffirmed as decisive elements of poverty reduction in Vietnam.

For practical contributions, Vietnam changed its approach to poverty by adopting the multi-dimensional lines according to the United Nations Development Programme (UNDP) recommendations in 2015 (Wiesen et al., 2018). In the context of substantially eradicated income

poverty in Vietnam, some of the current schemes of The Program 135 will no longer be relevant. The thesis expects to make judgments about the effectiveness of current schemes, thus timely suggest for appropriate adjustments of the National Poverty Reduction Strategy in the future.

To answer the research question, the thesis follows 5 steps corresponding to 5 chapters. Chapter 2 presents the theoretical background. The first section demonstrates a conceptual background of poverty, following by a systematical review of the relevant literatures, those were conducted in the circumstance of Vietnam and other countries having the same level of development. The third section presents the theoretical model that will be utilized for the empirical analysis. Chapter 3 discusses about the methodology of the thesis. Firstly, the estimation methods will be discussed based on the reference of previous studies. Secondly, data and data processing will be presented. Lastly, variables measurements are presented. Chapter 4 presents the descriptive statistics and empirical results. Chapter 5 is the conclusions of the thesis. The main findings and discussions about them will be summarized in this chapter. On that basis, several relevant policy implications are suggested.

II. Theoretical background

Chapter 2 includes three sections. The first section introduces the understanding of the concept poverty, thereby indicates the rationale of using absolute poverty line to define the poverty group in almost quantitative studies. The arguments of section 1 will follow in chapter III on the use of the wealth index to measure household poverty. The second section presents an overview of relevant literatures about poverty in Vietnam and other developing countries, and summaries the determinants frequently appearing in the international and domestic studies. Eventually, the third section draws a theoretical model based on the frequent factors of the relevant literatures and the specific characteristics of Vietnamese circumstance.

II.1. The measurements of poverty

Poverty is one of the priority concerns on the agenda of many development agencies. Poverty not only leaves severe physical and mental consequences for the poor people, but also inhibits the economic growth and deepens inequality of the whole society. The Sustainable Development Goals (SDGs), universally called by United Nations (UN) in 2015, mentioned that ending extreme poverty for all people everywhere is one of the 17 goals those are urgently essential to accomplish by 2030.

In general, the concept of poverty describes the deprivation of opportunities to lead a life that corresponds to certain minimum standards. These standards are flexible since it was based on the different criteria of different conceptions. Among those conceptions, the minimum standards of absolute poverty and relative poverty are usually applied to identify the poor groups. The minimum standards of absolute poverty are referred to the absolute poverty line, which was initiated by the World Bank (WB) in 1990 and popularized in almost countries. The absolute poverty line is identified by the minimum amount of money to purchase a shopping cart of human basic needs (including food, safe drinking water, sanitation facilities, health, shelter, education, and information) (Ravallion et al., 2009). Currently, the SDG goals identifies the absolute poverty line for the poor group is less than $1.25 per day. The relative poverty line is officially used by developed countries, defined relative poverty as the inadequate provision of material and non-material resources to people of certain social classes compared to the affluence of that society (Ravallion et al., 2009). The relative poverty line considers the socio-cultural poverty and the lack of participation in social life as the most serious social challenges. In

comparison to the relative poverty line, absolute poverty line is computed firmly by numeric criteria. The different computation between two poverty lines convinced quantitative studies to utilize the absolute poverty line to determine the level of poverty, especially in developing countries.

To identify the level of household poverty, numerous empirical studies compare the absolute poverty line with household income or household expenditure. Both indicators have their pros and cons. First, household income represents their ability to earn a living. Apparently, if the household income is under the poverty line, that household will be marked as poor. But defining the level of poverty by household income has its disadvantage: insufficient to grasp the depth of poverty between different living areas. For example, Cherdchuchai & Otsuka (2006) mentioned that urban inflation was relatively higher, thus urban households consumed a lower amount of goods and services than rural households having the same level of income. This disadvantage is overcome by using household expenditure to define the level of poverty. The approach of household expenditure is more focus on the shortage of living standards, in other words, understands what the poor households need to escape poverty (Datt et al., 2000). The literatures using household expenditure were Datt et al. (2000) in Mozambique; Datt & Jolliffe (2005) in Egypt; Gounder (2013) in Fiji. Some studies used both indicators simultaneously, like Balisacan et al. (2003) in Vietnam; Bruck et al. (2010) in Ukraine; Duong (2016) in Vietnam, however, the authors had to construct two different models for each indicator. This inconvenience prompts the thesis to use another indicator to define the level of poverty, which not only represents the status of household's poverty, but also reflects the demands that the households need to escape poverty. The alternative indicator for household’s poverty will be discussed in chapter III.

II.2. Literature reviews

Literature reviews consider the quantitative studies in term of poverty in Vietnam and other countries with similar background. Generally, the factors frequently used to study household’s poverty were the demographic characteristics of the household, the educational levels of the household head and other adult members (usually the spouse or partner of the household head), living areas (urban and rural areas) and regions (according to geographical characteristics). The roles of public healthcare policies and agricultural activities were seldomly concerned in some thematic studies. Among studies of poverty, access to healthcare facilities was often mentioned

by its dual reflections: representing for the regional development and the level of investment for human capital (Datt et al., 2000; Bruck et al., 2010; Quyen, 2019). In developing countries, the agricultural sector played a crucial role in escaping poverty, especially in short term (Cherdchuchai & Otsuka, 2006). The remarkable differences between the studies conducting in Vietnam and other countries were the division of the ethnic groups and the application method of government preferential credits scheme.

II.2.1. International studies

At household level, international studies mainly emphasized on the demographic characteristics of households, education level of household members and living areas, such as Datt et al. (2000), Datt & Jolliffe (2005), Cherdchuchai & Otsuka (2006) and Bruck et al. (2010). The literatures focused on the impact of demographic characteristics and living areas of the household were Datt et al. (2000) in Mozambique, Datt & Jolliffe (2005) in Egypts and Bruck et al. (2010) in Ukraine. Datt & Jolliffe (2005) also intensively analyzed the role of education in household's poverty, especially the education level of the household head. The role of public goods and services was affirmed by Datt et al. (2000) in Mozambique, that the accessibility to public healthcare policies was critically important for household to escape poverty. Lastly, Cherdchuchai & Otsuka (2006) provided an overview of the role of agriculture in reducing poverty in both short and long term by conducting in an extensively agricultural economy like Thailand.

First, by the demographic characteristics, the frequently used factors were household size, household dependency ratio and the characteristics of the household head (gender and marital status). The household having the larger size were more likely to be poor and usually associated with higher dependency ratio (Datt & Jolliffe, 2005; Thapa, 2005; Treichel, 2005, Cherdchuchai & Otsuka, 2006). The dependency ratio of households implied for the number of members that unable to earn income in the household. This could be interpreted that the higher dependency ratio created more pressure on the income share for each household member. However, in case of elderly members were able to earn their livings (might be from pension or working), they might attribute to the household income (Mukherjee & Benson, 2003; Thapa, 2005; Bruck et al., 2010). Especially for female elderly, Thapa (2005) found a positive relationship between female workers aged over 60 and household income in South Asian countries. Finally, the heads, those who were not living with their spouse or partner, would increase the probability of staying in

poor of households (Treichel, 2005). Normally, the household with male head seemed to stay in poor longer than household with female head (Datt & Jolliffe, 2005). The male adults tended to consume more on indulged goods as alcohol and tobacco; thus, they could potentially decrease the budget for basic needs of the household.

For education levels, the role of education was considered as a substantial factor of escaping poverty in developing countries. Basically, the more educated household members were, the less likely that household was to be poor (Datt & Jolliffe, 2005). A higher education level of household head usually guaranteed for a stable source of income in the future, like in Datt & Jolliffe (2005) in Egypt and Bruck et al. (2010) in Ukraine. Furthermore, the high education level of adult members usually accompanied with a reasonable expenditure of the household (Datt & Jolliffe, 2005). The risk of becoming poor tended to be lower when the education level of the spouse or partner increased, since they could attribute more to the total income of the household (Bruck et al., 2010). The positive and significant correlation between education level of adult working members with the ability of escaping poverty was found in rural areas of Thailand (Cherdchuchai & Otsuka, 2006). The accessibility to public healthcare sector was commonly used in the studies about the role of government strategies on poverty reduction. The availability of public healthcare facilities declined the health risks of the poor because they not only avoided more health risks, but also reduced the medical costs compared to private sectors (Datt et al., 2000).

In developing countries, the impacts of the agricultural sector to poverty were relatively large due to the high proportion of poor people were farmers (Datt & Jolliffe, 2005; Cherdchuchai & Otsuka, 2006). Unlike education, the impacts of agriculture on poverty reduction could be positive or negative. On the one hand, agriculture production improved the livelihoods of the poor in short term, such as the findings of Cherdchuchai & Otsuka (2006) in rural areas of Thailand. Agricultural jobs addressed locally the employment for the poor and especially increased household income after the crop (Cherdchuchai & Otsuka, 2006). On the other hand, the agricultural employees in developing countries usually maintained a low productivity, because they were not equipped by mechanized instruments. This created a stagnant in the progress of poverty reduction in rural areas for long run (Datt et al., 2000, Cherdchuchai & Otsuka, 2006).

In summary, the overview of international studies highlighted several main findings about the determinants of poverty in developing countries. At household level, the household size and household dependency ratio impacted on the income and the expenditure of the household, however, it should be noted that these effects were specialized by the national demographics. Besides, the gender and marital status of the household head determined the household's ability to escape poverty. In term of education level and living areas, these factors impacted on poverty in almost literatures, but the magnitude of these effects varied by the national development level of different countries. Finally, agricultural sector was found a significant influence on poverty reduction in short-term, especially in rural areas (Datt et al., 2000 in Mozambique; Cherdchuchai & Otsuka, 2006 in Thailand).

II.2.2. Vietnamese studies

Quantitative studies on poverty in Vietnam mostly used the data sets of Vietnam Household Living Standards Survey (VHLSS). This dataset is derived by the General Statistics Office (GSO) every two years to systematically monitor the living standards of all strata in Vietnam. VHLSS includes data for both household income and household expenditure, hence it allows the quantitative studies to apply two indicators to define the level of poverty. However, the studies in Vietnam mainly concentrated on the household expenditure because the demands of the vulnerable groups to escape poverty were more concerned rather than the status of poverty (Baulch et al., 2009). Among the relevant literatures, Giang & Pfau (2009) and Bui et al. (2014) were employed the data on household expenditure to determine the essential needs for the households with elderly heads and households were vulnerable to natural disasters, respectively. Some studies employed both indicators to grasp an overview about poverty in Vietnam, such as Balisacan et al. (2003) or Duong (2016).

Similar to international studies, the primary factors in Vietnamese studies were the household demographic characteristics. Frequently, household size, household dependency ratio, household compositions and the characteristics of household head (age, gender, and marital status) were utilized. Household size and dependency ratio had negative impacts on the household's poverty status (Giang & Pfau, 2009; Baulch et al.,2009; Bui et al.,2014; Diem, 2017), except for the case of elderly people were able to earn income (Giang & Pfau, 2009). This was also similarly

reflected in household composition, the higher children dependency ratio increased the probability of being a poor household (Giang & Pfau, 2009; Bui et al., 2014).

The age of the household head affected on the ability of household to earn income, especially for the case of elderly household head (over 60 years old), it increased the probability of staying in poor (Balisacan et al., 2003; Giang & Pfau, 2009). In case of female household head, the probability of escaping poor was moderately increased because she seemed to manage the household expenditure better than male head (Diem, 2017). If the marital status of the female head was unfavorable (such as widowed or divorced), the negative impact on the household income was larger than the same case of male household head because female's income was relatively lower than their counterparts (Balisacan et al., 2003; Giang & Pfau, 2009; Baulch et al.,2009; Diem, 2017).

The education level usually appeared in studies about poverty in Vietnam, but the stronger impact was found in urban areas. The high education levels of adult members were associated with the better ability to earn living of the household. The education level of the household head influenced on the poverty status of the household, regardless of gender. In case of male household head, the impact of education level was significantly stronger if he was in working age (Baulch et al, 2009). If he experienced tertiary education, the probability of being poor was very relatively small, but there was no evidence for the difference between the head completing primary education and the head completing secondary education (Diem, 2017). In case of female household head, the positive impact was found in Giang & Pfau (2009) and Baulch et al. (2009), however, it significantly weaker than in the case of male heads. For the education level of spouse or partner, the education level of wife or female partner performed a more obvious influence on the household income and household expenditure (Balisacan et al., 2003; Giang & Pfau, 2009).

Regions was a pivotal factor among studies about poverty. The relevant literatures were based on the division of Vietnamese government for six economic regions: Red River Delta, North East and North West, North Central and South-Central Coast, Central Highlands, South East and Mekong River Delta. This division based on geographical and economic characteristics of each region; hence it represented for the levels of development and poverty status of each region (Balisacan et al., 2003). Besides, the living areas in Vietnam also divided into urban area and rural area like in Balisacan et al. (2003), Baulch et al. (2009), Giang & Pfau (2009), Bui et al.

(2014). In general, rural households were more likely to be poor than urban households due to their inferiority of employment opportunities and less of access to public goods and services (like electricity or clean water).

Ethnic groups were basic features of Vietnam's population structure. Statistically, 80% of the Vietnamese are Kinh and Hoa, and mainly distribute in the delta and coastal regions like Red River Delta, North Central and South-Central Coast, South East and Mekong River Delta. Meanwhile, ethnic minorities live in mountainous areas such as North East, and North West and Central Highlands. These regions are lack of access to the minimum utilities such as electricity or clean water, making ethnic minorities in Vietnam were more vulnerable to poverty (Baulch et al., 2009). Ethnic minorities were disadvantaged in terms of education quality, basic infrastructure (like schools or hospitals), and stereotyping. This finding was concluded by Baulch et al. (2009) in a research at national level, but also affirmed by Diem (2017) in the Mekong Delta regions.

The agricultural sector accounts for 60% of Vietnam's labor force (GSO, 2014), thus the effects of agricultural factors on poverty were frequently considered in the Vietnamese studies. The positive effects of agricultural activities on household expenditure and poverty reduction in rural Vietnam was found in Hoang et al. (2014). Consistent with the findings of Cherdchuchai & Otsuka (2006) in Thailand, the agricultural activities increased the seasonal income of the household in short term. Meanwhile, Bui et al. (2014) indicated the negative impacts of agricultural activities on poverty by two reasons. First, when agricultural resources were available (such as land or livestock), households' employment tended to stay in the agricultural sector. Agricultural employments were associated with low productivity and income instability, thus delaying the process of escaping poverty in the long term. Second, in the regions with a low level of urbanization, the livelihoods of the poor relied mainly on the household agricultural resources, which were vulnerable to natural disasters and degenerated over time. The dependence on agricultural resources made the household's income became more unstable due to natural shocks.

The thesis not only aims to assess the impact of determinants on poverty in Vietnam but also to evaluate National strategies on poverty reduction. The core of the National poverty reduction strategies is The Program 135, which was divided into two phases: Phase I was completed before

2006 and Phase II has conducted from 2006 to present. The Phase I of Program 135 included a series of macro schemes at national and provincial levels, which concentrated on investing for basic infrastructure (such as construction of schools, hospitals, electricity, telecommunications, and transportation improvement). On the contrary, the Phase II directed its schemes to micro-level beneficiaries: poor individuals and households. Since the early 2000s, a significant number of studies about poverty reduction have been conducted after The Program 135 was approved. Because the thesis uses the dataset from 2006, only the literatures related to the schemes of Phase II are considered.

In general, the studies of poverty in Vietnam usually focused on the impact of a certain scheme rather than integrated many schemes of The Program 135-Phase II in one research background. The studies concentrated on a certain scheme brought an in-depth understanding about the effectiveness of each scheme in The Program 135- Phase II. The frequent concerned schemes of Program 135- Phase II were government preferential credits (Quach, 2005; Nghiem et al., 2012 and Diem, 2017), increasing the accessibility to public healthcare services (Kozel, 2014 and Quyen, 2019) and modernizing agricultural production (Bui et al., 2014).

First, the government preferential credits, which was the most widely implemented scheme, aimed to complement capital for the poor households by a loan with low interest rates and long repayment period. This scheme directly increased the household income and allowed the household to access to higher living standards (such as healthcare, electricity, or clean water) (Jalilian & Kirkpatrick, 2002; Quach, 2005; Nghiem et al., 2012), especially for rural households (Nghiem et al., 2012). The second schemes of The Program 135- Phase II was increasing the accessibility to public healthcare services. Better healthcare conditions were the motivation of poverty reduction by improving the labor productivity of the poor, ensuring their stable income, and minimizing the cost of health risks (Ahmed et al., 2016). Therefore, access to public healthcare services would significantly reallocate the household expenditure, helping them to save money for other basic needs. Finally, the scheme of modernizing agricultural production was implemented to increase the labor productivity of the poor farmers by supporting mechanized instruments (such as plows, harvesters, tractors). The increase of labor productivity would lead to the improvement of household income (Bui et al., 2014).

In summary, the literatures in term of the poverty in Vietnam frequently used the determinants of household demographic characteristics and education level of household adults like in many international empirical studies. Regions and living areas appeared in most of relevant literatures, indicated the differences of the level of poverty between communities. The negative impact of ethnic minorities on poverty reduction was reflected by the unfavorable living conditions, hence the ethnic minority household were the main beneficiaries of the national poverty reduction strategies: The Program 135- Phase II. The Program 135- Phase II impacted on poverty in Vietnam through three schemes: the accessibility to government preferential credit, increasing the accessibility public healthcare services and supporting agricultural instruments. Because these schemes were studied separately, the thesis will integrate schemes into one research background to consider the total impact of The Program 135- Phase II.

II.3. Theoretical model

To obtain a comprehensive understanding about the determinants impacted on Vietnamese poverty, the thesis analyzes the effect of relevant factors at household levels. To conduct such an analysis, a theoretical model is needed to grasp the key elements and construct empirical models. The theoretical model is mainly based on the models in Balisacan et al. (2003), Giang & Pfau (2009), Baulch et al. (2009) and Hoang et al. (2014). The determinants in Balisacan et al. (2003) and Giang & Pfau (2009) were characterized for household demographic characteristics, education levels of household and regions of Vietnam. Baulch et al. (2009) was an intensive study on the role of ethnic groups in poverty reduction of Vietnam. The schemes of Program 135-Phase II were studied in Quach (2005) and Diem (2017) for government preferential credits; Koo et al. (2007) and Baulch et al. (2009) for health care policy; and Hoang et al. (2014) for the role of agriculture resources and instruments. The schematic representation of the theoretical model is shown in the following figure.

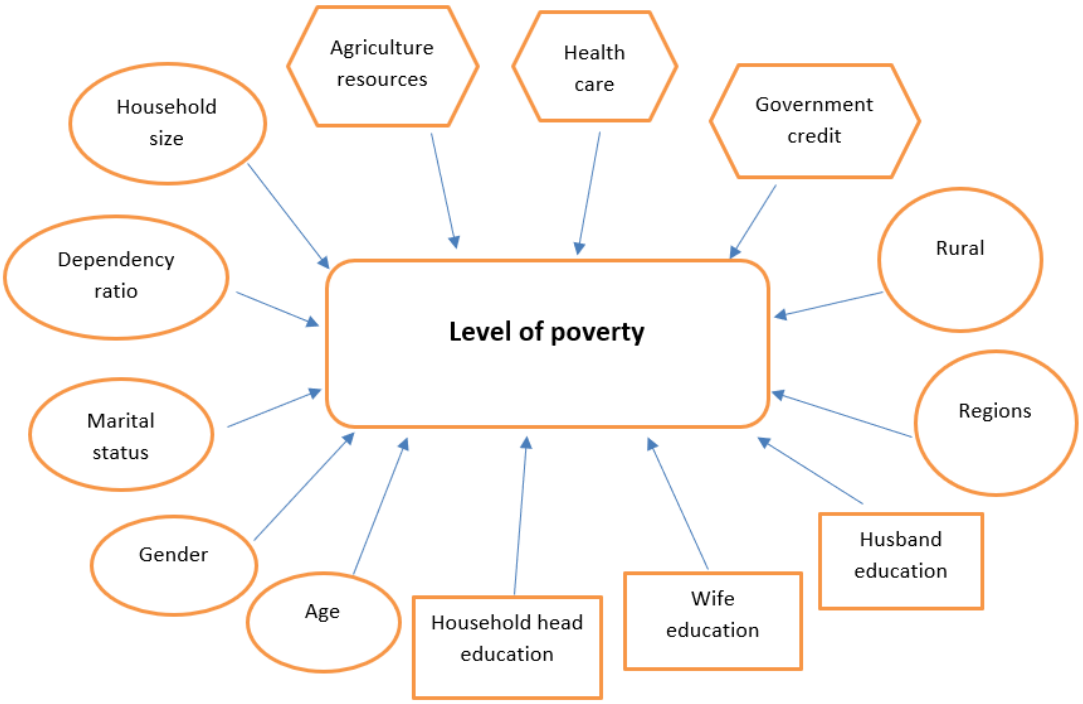

Figure 1: The determinants of the theoretical model

- *Household characteristics*

First, by demographic characteristics, the household size was influential to household poverty status, as most of the poor households have larger size than the average number (four members per household) (Balisacan et al., 2003; Quyen, 2019). The age of the household head and household compositions were closely related to the level of household poverty (Giang & Pfau, 2009; Bruck et al., 2010). The household head in working-age group would lead to higher living standards for household (Duong, 2016; Bui & Nguyen, 2017; Diem, 2017). The higher children dependency ratio increased the probability of being poor (Bruck et al., 2010). If there were more adult members in the household, the children dependency ratio would be inversely proportional to the household's income. In addition, the role of female adults in the household was critical since they not only contributed to the household's income but also were one of the main beneficiaries of The Program 135- Phase II. The gender and marital status of the household head were decisive factors on the level of poverty, as the household having the female head usually associated with a higher probability of escaping poverty, especially in rural areas (Diem, 2017). For the sake of simplicity, the presence of elderly is excluded from the model because their deviation impacts.

By living area, household income and household expenditure apparently differed between urban and rural areas. Households in urban areas were more likely to earn a higher income because of better access to employment opportunities, while the income of rural households were lower and unstable due to they often engaged in agriculture-related jobs (Bui et al., 2014). Meanwhile, the expenditure on indulgent goods and health risks of the rural households were also significantly larger than for urban households, by relating to living habits (Giang & Pfau, 2009). The living area also shaped the household size and household composition. Usually, the rural households had larger size and children dependency ratio because they tended to maintain a multi-generational family (Giang & Pfau, 2009). Lastly in terms of education, the adult members of rural household had lower average levels (Balisacan et al., 2003), because the lack of access to educational institutions. In rural area, the density of schools was sparser, whereas of tertiary education institutions were mainly concentrated in urban areas.

By ethnic groups, this factor impact on the level of household's poverty by the differences of living areas and regions. If the household were Kinh or Hoa, the probability of becoming a poor household would be significantly lower (Baulch et al, 2009; Diem, 2017). As for living area, Kinh and Hoa households mainly lived in urban areas, so they would assign with the favorable characteristics of urban households, such as the capacity to earn income, reasonable expenditure structure (less for indulgent goods), household size and composition, and education level. For regions, ethnic minority households allocated in less developed regions like North East and North West or Central Highlands, making their poverty more severe than the delta and coastal regions (Baulch et al., 2009).

- *Education levels*

The education of household head and adult members was indicated as the most important factor to minimize the probability of being poor households (Datt & Jolliffe, 2005). The education level of the household heads was causally related to their employments. The high levels of education enabled household adults to access to sustainable livelihoods and to earn higher incomes (de Janvry & Sadoulet, 2000 in Latin America, Vu & Baulch, 2011 in Vietnam). The education level of the spouse was a secondary factor in term of education, representing for the supportive contribution to household income. The education level of female spouse (referred shortly as "wife" for the rest of the thesis) in the household was also critical in term of managing the

household expenditure (Baulch et al, 2009; Sohn & Revilla, 2015). However, the education level of male spouse (referred shortly as "husband" for the rest of the thesis) seldomly showed as the supportive sources of income. This was because although the husband was not the legal head of the household, his earning was often the main source of household income. (Hoang et al. 2014; Bui et al, 2014).

- *Agricultural resources*

As an agricultural economy, the impact of agricultural resources on poverty reduction in Vietnam was significant (Arndt et al, 2012). Agricultural resources included the household's original assets serving agricultural activities such as land, surface water, or animal husbandry (cattle, poultry, or waterfowl). The higher accumulation of agricultural resources represented for a larger amount of household assets. According to Hoang et al. (2014), households with the larger amount of agricultural resources were less likely to be poor. However, it is necessary to notice about the negative impact of agricultural resources, as mentioned in Bui et al. (2014).

- *Schemes of the Program 135-Phase II*

The scheme of government preferential credits was implemented by disbursing loans with low interest rates and long repayment periods. The beneficiaries of the scheme were the poor households, especially to the ethnic minority households in the rural or mountainous areas. To receive the transference, the beneficiaries must commit that they would dedicate the loans to the purposes of improving household livelihoods and living standards; and consciously repay their debts in time (Diem, 2017). The funding for this scheme was mobilized from the government budget for poverty reduction and from the sources of socialization (MOLISA, 2006). The credits transferred to the beneficiaries through household bank accounts to supervise the using purpose and repayment terms of the loan by the bank staffs. Hence, if the household has a bank account, it implied that they were able to access to government preferential credits.

The beneficiaries of the public healthcare schemes were women and children in the household, to boost the working capacity of the wife and minimize health risks of household through vaccines and nutritional supplements (Kozel, 2014). For women, the schemes were primarily aimed at ensuring reproductive health and limiting health risks through immunization. For children, especially children aged under 6, the main schemes were providing free vaccines and nutritional

supplements. For households, the healthcare scheme directed household members to approach to the health services provided by the public sector. Koo et al. (2007) concluded that the women with good health conditions would contribute significantly to the household incomes, while most of poor children were associated with a lack of access to health services. Binh (2008) reaffirmed that support for healthcare for pregnant women and children under 6 years old declined the probability of households falling back into poverty again. The impact of stunting children on poverty in mountainous areas was evidenced by Baulch et al. (2009).

Another scheme of the Program 135- Phase II was modernizing agricultural production. The modern agriculture was characterized by mechanized production with high labor productivity. The government implemented this scheme by supporting to the households the mechanized instruments, corresponding with their locally agricultural products, to increase their productivity. For example, households in regions engaged in rice production would be given a tractor to increase their labor productivity. The supplement of agricultural instruments not only improved household income (by increasing labor productivity) but also increased the total assets of the household (Hoang et al., 2014). In order to carry out this funding, households would pay in installments for the agricultural instruments and repay for the government on a regular basis.

- *Regions*

Regions strongly influenced on the level of poverty status Vietnam. If the household were living in the Red River Delta, the South East and the Mekong Delta, the probability of being poor was significantly lower than that in the remaining regions because of the outstanding levels of development (Balisacan et al., 2003; Baulch et al, 2009; Bui et al., 2014; Diem, 2017). In contrast, the North East and North West was the least likely to escape from poverty (Baulch et al, 2009; Bui et al., 2014). Meanwhile, the North Central and South Central Coast had the highest probability of falling back into poverty because of its vulnerability to natural shocks (Baulch et al., 2009; Bui et al., 2014).

III. Methodology

The aim of this chapter is to describe the methodology of the thesis. The first section presents the rationale for the selection of the MICS dataset and how it is processed in the econometric model. In the second section, the reason of choosing and the procedure of the OLS- Probit approach are introduced. Thirdly, the measurement of the dependent variable and the set of explanatory variables are explained. To examine the determinants of poverty at the household level, the thesis employs the theoretical model which was extensively discussed in Chapter II.

III.1. Data

The national survey of household living standards were favored in studies about poverty in developing countries. In Vietnam, the studies about poverty before 2002 utilized data of the Vietnam Living Standards Survey (VLSS) (e.g. Beard & Argawan, 2002; Balisacan et al.,2003; Baulch et al., 2009). After 2002, the VHLSS dataset was used to replace VLSS as an upgraded version. The studies utilized the VHLSS dataset were Giang & Pfau (2009); Baulch et al. (2009); Vu & Baulch (2011); Hoang et al. (2014); Duong (2016); Diem et al. (2017). Both of two surveys are derived by the General Statistical Office (GSO).

To obtain a different perspective on the impact of determinants on poverty reduction in Vietnam, the thesis uses another dataset- Multiple Indicator Cluster Surveys (MICS) of UNICEF. MICS datasets are household surveys conducted at national levels to offer internationally statistical data on the status of children and women in developing countries. The MICS helps to decompose the poverty status of household members and the movement of poverty among vulnerable social groups. By experiencing an internationally standardized set of data, the thesis expects to yield objective and updated empirical results on poverty, as well as to gain a deeper understanding of household's poverty status in Vietnam.

Data samples were aggregated from the MICS of Vietnam in three years 2006, 2010 and 2014. This sample includes 129,042 observations from 11614 households. This aggregation has some advantages. First, regarding to the structure of the dataset, aggregated sample combined data from several type of measurements and replaced observation groups with summary statistics (Kabacoff, 2010, p.112). This data processing was appropriate to analysis such a large sample and allowed to visibly summarize the trends of determinants. Second, regarding to the reliability

of the empirical results, the increase of the sample size would restrict the influences of the outliers, thereby limiting the heteroscedasticity and estimation bias. Furthermore, the large sample datasets would minimize the consequences of multicollinearity, narrow the confidence intervals of t-statistics, hence ensuring for the accuracy of the estimation.

III.2. Method

The common methods to identify the poor household include: the poverty probability method; the ordinary least squares (OLS) regressions; the principal components analysis; and the quantile regressions (Vu & Baulch, 2011). However, the probability method was the most preferred approach in term of poverty studies, as in Baulch et al. (2002) or Giang & Pfau (2009). This method adapts by estimating a probit model. The level of poverty was identified by a cut-off value referred to the absolute poverty line, and then estimating the probability of being poor. Based on the datasets of VHLSS 2006, Vu & Baulch (2011) indicated this was the most accurate method to determine the poor household, especially for the years that household surveys were not carried out (Vu & Baulch, 2011).

In Vietnam, the initial application of the probability method was used in Baulch et al. (2002) to identify the poverty status of different living areas. The author set up two different poverty lines for urban and rural areas, then used the probit regression to determine the factors of the poor households in each area. Thereafter, Giang & Pfau (2009) also used the probit regressions to estimate the probability of being poor of elderly household heads. However, the findings of Baulch et al. (2002) and Giang and Pfau (2009) both find some technical limitations of the probit regression approach. First, the methodology of probit regression was based on totally accurate quantification, hence some exceptions would be eliminated. Second, this method yielded out the robust estimations when assessing the impact of factors on the household's poverty, however, but it did not show the elasticity of household's poverty with the determinants (Vu & Baulch, 2011). These limitations potentially led to underestimation, especially in a multivariate model (Vu & Baulch, 2011).

Therefore, the thesis considers utilizing the probit regression with another method. OLS regression was opted because of the sake of simplicity. This procedure was first applied in

Mukherjee & Benson (2003) to estimate the determinants of poverty in Malawi, and inherited in Bruck et al. (2013, in Ukraine) and Gounder (2013, in Fiji).

The estimation process was done in three steps. In step 1, the OLS regression estimated the multivariate relationships between poverty and the determinants of household poverty. Then, the probit regression was applied to double-check the main effects of the significant determinants. Lastly, the interaction effects would be estimated by probit regression to evaluate the simultaneous effect of the determinants with schemes of The Program 135- Phase II.

III.3. Variables measurements

III.3.1. Dependent variable

Currently, there are two methods to determine the poverty line in Vietnam. The first method is utilized by the Ministry of Labor, Invalids and Social Affairs (MOLISA) to identify the beneficiaries of the national poverty reduction strategies and monitor short-term poverty. The MOLISA's poverty line derived data from National Poverty Census, which were conducted every 5 years. In the years without census, MOLISA updated the list of poverty households (determined by household income indicator) based on consultation in the communities. This approach calculates the national welfare target and costs for basic needs to determine poverty lines (Demombynes & Vu, 2015).

The second method is managed by General Statistical Office (GSO) and World Bank (WB), to monitor and analyze poverty in the long term (Demombynes & Vu, 2015). The poverty line according to the GSO-WB approach is determined by the household expenditure indicator, including two categories: (1) poverty of food and foodstuff: the total expenditure is only used for food and foodstuff, how to ensure the minimum nutrition for a person (2100 kcal per day); and (2) general poverty: total expenditure for the whole minimum consumer shopping cart, as determined by estimating the ratio: 70% of the expenditure is for food and 30% for the rest. Most socio-economic studies on poverty in Vietnam used the methods of GSO-WB approach to determine poverty line.

The use of the poverty line is often problematic because the level of household income or household expenditure tend to be more continuous than discrete. If a level of income or expenditure closes to the poverty threshold, it is difficult to interpret the different among

households that are approximate the poverty line (Demombynes & Vu, 2015). For example, the poverty line in 2006-2010 (MOLISA) in rural areas of Vietnam was 200,000 VND (equivalent to $11)/person/month and households with income under this level were marked as poor. At that time, a household with income of $12 would be automatically classified as non-poor, but the shopping cart that they were able to purchase was indifferent from the household with the income of $10. To overcome this limitation, it is necessary to use another poverty indicator instead of the current methods to identify poor households. In the thesis, the indicator of International Wealth Index (IWI) will be utilized to determine the poor household.

Since the 1990s, wealth indicators have become popular instruments to measure the level of households' poverty in developing countries (Smits & Steendijk, 2015). IWI was computed based on weighted comparative evaluation of a set of basic household assets, including consumer durables (possession of a TV, fridge, phone, bike, car, utensils), housing characteristics (number of sleeping rooms, quality of floor material, toilet facility) and public utilities (water and electricity). The use of IWI brought some advantages. First, IWI is a stable index, independent on specific assets, or on data for specific regions (Smits & Steendijk, 2015). Second, IWI is strongly correlated with human development, health and education and reflects the living standards better in (national) income (Smits & Steendijk, 2015).

The data for IWI of Vietnam included in the MICS was derived by Global Data Lab (GDL). In OLS regression, the dependent variable was assigned by IWI score of the household, available in the MICS dataset. In probit regression, dependent variable was determined through the national level of IWI scores. Households with IWI score under 69.5 (in 2010) would be marked as poor and assigned to 1 in the binary model. The use of IWI as a dependent variable made the set of explanatory variables were more organized. The household assets involved in IWI computation, such as household basic assets (e.g. household has TV, fridge, phone, vehicle, …), housing quality (e.g. toilet facility) and access to public utilities (e.g. electricity, clean water, …) would be exclude from the model to avoid unnecessary repetition in the regression. In contrast, household characteristics (household demographics, living areas, ethnic groups), education levels (of household heads and their spouse), agricultural resources (owning land, water surface, animals), participation in the schemes of the Program 135-Phase II and regions would be more emphasized.

III.3.2. Independent variables

- *Household characteristics*

The household characteristics included demographic characteristics, living areas and ethnic groups. The demographic characteristics of household included the relevant variables of the household size, household composition and characteristics of the household head.

In particular, the household size was the number of members living in the household; the household composition included the number of children aged under 5 and aged under 18 (those who were almost unable to support themselves), and the number of adult members (in both gender). From these numeric variables, the dependency ratio of children aged under 5 and aged under 18 could be calculated. The number of children under 5 years old represented for the beneficiaries of the children healthcare schemes. Particularly for the number of female adults in the household, the number of women aged 15-49 would be emphasized because they were beneficiaries of both reproductive healthcare and immunization schemes for women.

The characteristics of the household head included the age, gender, and marital status. The age of household head was measured by numeric value and assigned to all household members. Both gender and marital status of the household head were dummies; gender was assigned to 1 if the household head was female, and assigned to 0 if otherwise; marital status was assigned to 1 if the household head lived with spouse, and assigned to 0 if otherwise.

The living area of households and ethnic groups was also measured by dummy variables. If the household lived in rural areas, they would be assigned to 1, and assigned to 0 if otherwise. The ethnic group of the household was represented by the ethnicity of the household head, which was assigned to 1 if the household head was Kinh or Hoa and assigned to 0 if otherwise.

- *Education levels*

Education levels concerned about the education of the house heads and their spouse. For all subjects, the education level was assigned to 0 if that person did not go to school, and gradually increase from 1 to 4 corresponding to the primary education, lower secondary education, upper secondary education, and tertiary education. The ordinal measurement of education level served for descriptive statistics, providing information on the number of observations completed at each

level and the average educational level of the entire sample. In the regression, dummies were used to control the impact of each education level on household poverty. The highest education level of the individuals would be assigned to 1 and assigned to 0 if otherwise, whereby the non-educated level was selected as a reference.

- *Agriculture resources*

Household agricultural resources were defined as self-sufficient resources for farming and animal husbandry activities. The materials for farming activities included land, water, and forest area whereas the materials for animal husbandry including livestock, poultry, and waterfowl owned by the household. If the household had any type of resources (regardless of meter square or the number of animals), they would be assigned to 1, corresponding to agricultural resources owned by the household. In case the household did not own those agricultural resources, it would be assigned as a reference. However, the MICS dataset did not include data on the forest area owned by the household so this dummy variable would be excluded from the model.

- *Schemes of The Program 135- Phase II*

The schemes of The Program 135- Phase II involved in the model as dummy variables. If the household confirmed their participation in the schemes, the dummy variables would be assigned to 1, otherwise they would be assigned to 0. First, the government preferential credits were transferred to the beneficiaries by bank account to monitor the using purposes and repayment terms. Thus, to measure the effectiveness of government preferential credits, the representative variable was whether the household owned a bank account. To consider the impact of the public healthcare scheme on women, antenatal care and immunization would be assigned to 1 if the answers were yes. For children, vaccinations and participation in free given vitamin A campaigns were assigned to 1 if the answers were yes. For household, the advantage of MICS sample allowed to measure the impact of public healthcare schemes after aggregating data. The public healthcare dummy was assigned to 1 if the household accessed to the health services given by public sector. Besides, if household received any type of medicine to treat illness (aspirin, paracetamol, panadol, acetaminophen) from public health sector, the dummy was assigned to 1. Lastly the dummies for government support were assigned to 1 if the household received any type of agricultural instruments (such as tractor or motorboat).

- *Regions*

The impact of regions on the household's poverty was in term of development level. Households living in more advanced regions had better access to high-income employment opportunities, thereby could improve the quality of housing (in terms of household assets or access to electricity and clean water). At the same time, these households also had better access to public utilities (such as schools, hospitals, or financial facilities). Therefore, to control the influence of the regions on household's poverty, six dummy variables were used to control the level of community development.

III.3.3. Interaction effects

After conducting probit regression with the above independent variables, the second probit model with interaction effects were considered. The second probit model was fundamentally indifferent from the original model, in addition to giving interaction effects. The enhancement of the interaction effects determined the simultaneous effects of the two independent variables on the dependent variable. The model with the interaction effects worked more effectively in interpreting the variability of the level of household's poverty and the effects of the determinants on it.

The interaction effects were concerned with all 5 groups of independent variables. Regarding to the individual beneficiaries (women and children in the households), healthcare schemes interacted with the households with female head, number of women in household, number of children in household, the education level of the head and spouse. These interactions emphasized on the role of women and education level of the adult members in perceiving the schemes (e.g. antenatal care, women's immunization, vaccinations for children and children participated in free given vitamin A campaigns). For household beneficiaries, households with access to public healthcare, and households receiving agricultural instruments interacted respectively with the living areas, ethnic groups, and regions. Particularly for households with a bank account, this variable would be interacted with the educational variables to consider the impact of the ability to spend effectively of the household.

IV. Empirical results

Chapter IV presents the descriptive statistics and the empirical results. In the first section of the chapter, the descriptive statistics are summarized to see the trends and patterns of dependent and independent variables. The second section presents the outstanding results of OLS and probit regression. Lastly, the coefficients of significant interaction effects are present in section 3.

IV.1. Descriptive statistics

Before analyzing the empirical models, the statistical description table of variables is presented (see Table 1). Dummy variables were assigned as in variables measurements section of the last chapter. Due to the number of observations changed year by year, the given proxies for the schemes of The Program 135-Phase II had some missing values. The number of observations of the remaining variables did not appear missing values. The bottom of the table provides the number of observations from each region.

Table 1: Descriptive statistics of variables

Variables		N	Min.	Max.	Mean	Std.Dev.
Dependent variables: IWI		129042	0	100	72.7	18.591
Probit model:	*Non-poor (>=69.5) (=0)*	*79184*				
	Poor (<69.5) (=1)	*49858*				
Household demographic characteristics:						
	Age of household head	129042	15	95	52.72	15.59
	Household size	129042	1	17	4.63	1.881
	Sex of household head:	129042	0	1	0.24	0.425
	Male (=0)	*98534*				
	Female (=1)	*30508*				
	Marital status of household head:	129042	0	1	0.26	0.441
	Living with partner (=1)	*34085*				
	Otherwise (=0)	*94957*				
	Number of women 15-49	129042	0	6	1.23	0.803
	Number of children under 5	129042	0	5	0.53	0.727
	Children dependency ratio under 5	129042	0	3	0.185	0.27419
	Number of children under 18	129042	0	10	1.64	1.247
	Number of adults (18+)	129042	0	12	3.07	1.326
	Number of male adults (18+)	129042	0	7	1.45	0.826
	Number of female adults (18+)	129042	0	6	1.54	0.789
Area		129042	0	1	0.58	0.493
	Urban (=0)	*53960*				

	Rural (=1)	*75082*				
Ethnic groups		129042	0	1	0.83	0.375
	Kinh or Hoa (=1)	*107253*				
	Otherwise (=0)	*21789*				
Educational levels						
	Household head's education:	128752	0	4	2.01	1.119
	None (=0)	*9865*				
	Primary education (=1)	*32748*				
	Lower secondary education (=2)	*48061*				
	Upper secondary education (=3)	*21338*				
	Tertiary education (=4)	*16740*				
	Husband's education:	126757	0	4	0.58	1.102
	None (=0)	*8461*				
	Primary education (=1)	*26308*				
	Lower secondary education (=2)	*52100*				
	Upper secondary education (=3)	*24404*				
	Tertiary education (=4)	*17769*				
	Wife's education:	124651	0	4	0.61	1.106
	None (=0)	*12427*				
	Primary education (=1)	*38959*				
	Lower secondary education (=2)	*47727*				
	Upper secondary education (=3)	*14038*				
	Tertiary education (=4)	*11955*				
Agricultural resources						
	Has own land that can be used in agriculture	129042	0	1	0.56	0.497
	Yes (=1)	*71756*				
	Otherwise (=0)	*57286*				
	Has own water surface that can be used in fishery	129042	0	1	0.11	0.309
	Yes (=1)	*13808*				
	Otherwise (=0)	*115234*				
	Has raise animals	129042	0	1	0.5	0.5
	Yes (=1)	*64411*				
	Otherwise (=0)	*64631*				
Schemes of The Program 135						
	Household has owned a bank account:	129042	0	1	0.29	0.454
	Yes (=1)	*37497*				
	Otherwise (=0)	*91545*				
	Household sought care from public sector:	118370	0	1	0.08	0.275
	Yes (=1)	10672				
	Otherwise (=0)	107698				
	Household has given medicine from public sector:	127359	0	1	0.01	0.113
	Yes (=1)	*1683*				
	Otherwise (=0)	*125676*				

	Women received antenatal care:	125107	0	1	0.03	0.172
	Yes (=1)	*3935*				
	Otherwise (=0)	*121172*				
	Women had own immunization card:	126656	0	1	0.02	0.135
	Yes (=1)	*23863*				
	Otherwise (=0)	*102793*				
	Children ever had vaccination card:	129042	0	1	0.36	0.481
	Yes (=1)	*46736*				
	Otherwise (=0)	*82306*				
	Children participated vitamin A campaigns:	129042	0	1	0.36	0.481
	Yes (=1)	*44523*				
	Otherwise (=0)	*84519*				
	Household has supported a tractor:	122699	0	1	0.04	0.301
	Yes (=1)	*6343*				
	Otherwise (=0)	*116356*				
	Household has supported a motorboat:	123415	0	1	0.04	0.301
	Yes (=1)	*5549*				
	Otherwise (=0)	*117866*				
Regions						
	Red River Delta	19649				
	North East, North West	22030				
	North Central Coast and South-Central Coast	20836				
	Central Highlands	23503				
	South East	21347				
	Mekong River Delta	21603				
	Observations	**129042**				

In term of household demographic characteristics, Table 1 showed that three-quarters of sample were the male-headed household. The average size of household was approximately four members per household, which means that households in Vietnam primarily maintained the structure of a nuclear family. The average age of the household head was relatively large, about 53 years old. In the samples, merely about 26% of household heads were living with their spouse.

The descriptive statistics of the household compositions showed that the structure of Vietnamese household deemed as favorable characteristics for reducing poverty, proved by the dependency ratio of children under 5 was relatively low. The rate of urbanization in Vietnam was relatively slow, because about 60% of the households in the sample were living in rural areas. The ethnic groups of Kinh and Hoa were the majority of Vietnam's population, accounted for over four-

fifths of the population. Referring from GDL the average IWI score of Vietnam was 69.5 (2010), there would be 38% of households marked as poor in the probit model.

In term of education levels, the lower secondary education was the level that the most of household heads, husbands and wives had experienced. The ratio of women with education level under lower secondary was higher than men, and vice versa, the ratio of men in upper secondary level and tertiary level was higher than their comparative group. In the regression, the minimum education level was selected as reference (i.e. non-educated household heads, husbands, and wives).

In term of agricultural resources, the number of households had land that could be used for agriculture and had raised animal was relatively large. This was in line with the ratio of the population living in rural areas, whose livelihoods were mainly based on agricultural production. Because of only Mekong Delta had appropriate geographical conditions (Diem et al., 2017), the number of households having water surface that can be used in fisheries was mainly distributed in this region. In the regression, the households that did not confirm they had land, water surface or animals was selected to references (i.e. cases of otherwise).

In term of the schemes of The Program 135- Phase II, the number of missing values was quite frequent. In the regression, when households did not confirm whether they participated in each scheme, they would be assigned to zero and selected as a reference to the corresponding dummies. Among the schemes, extended vaccination for children and given free vitamin A campaigns were the most popularity. Meanwhiles, households were supported agricultural instruments (tractors or motorboats) by government was the least popular.

IV.2. Regression results

The thesis aims to assess the impact of determinants on the level of poverty in Vietnam. To do so, the main effects of the given factors to the probability of being poor of Vietnamese household were estimated by the probit regression. Thus, the results of the probit regression is more critical than OLS regression. The results of OLS regression was mainly served for two purposes: reaffirming significant effects in the probit model, and for comparing findings with previous studies.

As it stated in the methodology, the OLS regressions was conducted firstly to determine the factors that impacted on the level of poverty, measured by the IWI scores of the households. Afterward, the main effects of those factors were estimated by the probit regressions to reaffirm the determinants. The independent variables in the OLS model and the probit model were similar, the difference was between the dependent variable of the two models. The probit model utilized binary values to assess the probability of being a poor household, while OLS model directly estimated the IWI scores of households. Details of OLS regression can be found in Appendix A, and the parameters of probit regression are in Appendix B.

Table 2 presented the estimated results of the probit regression and the OLS regression, respectively. The statistical significance was considered at 5 percent and 1 percent significance levels. As discussed, in the probit regression, the households having IWI score lower the average value were marked as the poor. Hence, the positive and statistically significant coefficients indicated that those households were more likely to be poor rather than the comparative households. On the contrary, the negative and statistically significant coefficients showed that the comparative households were less likely to be poor. Except for dummy variables which selected as the references, independent variables were insignificant in the probit regression included: Husband's education levels (except for tertiary education), Wife's education levels (lower secondary level), Household received medicine to treat illness, Women received antenatal care, Children participated the vitamin A campaigns, and Central Highlands. The remaining variables were statistically significant in the OLS model.

Table 2: Summarized results of Probit regression and OLS regression

Variables	**Probit model**		**OLS model**	
	Dependent variable: Non-poor (>=69.5) (=0) Poor (<69.5) (=1)		Dependent variable: IWI scores of households	
	B	Std. Error	B	Std. Error
Intercepts	2.249**	.1249	58.254**	.786
Household demographic characteristics:				
Age of household head	.0058*	.0003	.118**	.003
Household size	.213**	.017	-2.361**	.078
Sex of household head	.249*	.0118	.625**	.093
Marital status of household head	-.078**	.0121	1.476**	.105
Number of women 15-49	-.061**	.0074	.907**	.064

Number of children under 5	.103**	.0175	-1.280**	.148
Children dependency ratio under 5	.106*	.0431	-1.383**	.371
Number of children under 18	.180**	.0171	.574**	.081
Children dependency ratio under 18	.019	.0221	.203	.189
Number of adults (18+)	-.065**	.017	-.881**	.148
Number of male adults (18+)	-.035*	.0111	2.901**	.153
Number of female adults (18+)	Ref.	.	.	.
Area	.495**	.098	-7.765**	.088
Ethnic groups	-.850**	.0137	12.786**	.122
Educational levels				
Household head's education:				
None (=0)	Ref.	.	.	.
Primary education (=1)	.519**	.0667	-4.493**	.746
Lower secondary education (=2)	.237**	.0452	-.254*	.745
Upper secondary education (=3)	-.057*	.0269	2.462**	.748
Tertiary education (=4)	-1.493**	.0171	4.122**	.752
Husband's education:				
None (=0)	Ref.	.	.	.
Primary education (=1)	.032	.0447	.640*	.245
Lower secondary education (=2)	.013	.0269	-.684*	.216
Upper secondary education (=3)	-.037	.0233	1.017**	.251
Tertiary education (=4)	-.170**	.0308	1.111**	.300
Wife's education:				
None (=0)	Ref.	.	.	.
Primary education (=1)	.145**	.0244	-1.274**	.243
Lower secondary education (=2)	-.024	.0226	1.807**	.232
Upper secondary education (=3)	-.063*	.030	3.577**	.270
Tertiary education (=4)	-.723**	.4985	3.140**	.310
Agriculture resources				
Has own land that can be used in agriculture	.208**	.0131	-3.083**	.094
Has own water surface that can be used in fishery	.156**	.0097	-1.015**	.120
Has raise animals	.224**	.0108	-3.197**	.890
Schemes of The Program 135				
Household has owned a bank account	-1.385**	.0101	5.698**	.092
Household sought care from public sector	-2.228*	.0207	-3.508**	.178
Household has given medicine from public sector	.091	.0389	2.051**	.335
Women received antenatal care	.037	.225	1.575*	.331
Women had own immunization card	-.170**	.464	2.044**	.407
Children ever had vaccination card	-.218**	.0093	2.635**	.107
Children participated vitamin A campaigns	-.543	.197	3.147**	.081
Household has supported a tractor	-.213*	.185	3.550**	.170
Household has supported a motorboat	-.188	.0142	-1.284**	.121
Regions				

Red River Delta	-.570**	0.0138	3.762**	.130
North East, North West	.256**	0.0127	-.245*	.126
North Central Coast and South-Central Coast	.139**	0.0129	-.200	.126
Central Highlands	-.013	0.0125	-3.553*	.117
South East	-.886**	0.0148	3.980**	.131
Mekong River Delta	Ref.	.	.	.

** P< 0.01, * p< 0.05

First, by the household demographics, the estimated coefficients indicated that the more favorable characteristics, the household was less likely to be poor. In particular, the larger household size, the household had more children under 5 years old and children under 18 years old were associated with higher likelihood of being poor than the comparative households. In contrast, the higher number of adults in household, especially women adults made the household were less likely to be poor. For the characteristics of the household head, the households with the male head were more likely to be poor than the households with the female head. If the household heads were living with their spouse, the likelihood of being poor was substantially lower. By living areas, households living in rural faced with higher probability of being poor than the urban households. By ethnic groups, if the heads were recorded as Kinh or Hoa, the household were less likely to be poor. All the signs of the estimated coefficients were consistent between probit regression and OLS regression.

As for the education levels, the estimated coefficients of the variables were consistent with expectations. The higher education level of the household head triggered to the lower the probability of being poor of the household. This was also true for the education level of the wife in the household. When the education level of household head or the wife was higher than lower secondary level, they would influence positively on household wealth. Another noticeable point was the tertiary education of the household heads, husbands and wives were strongly significant at 1% level. Therefore, graduating lower secondary school was an important breaking point, but the tertiary education was the breakthrough that affected the poverty status in the long run. The explanation of the coefficients in the OLS model were similar to the probit model. As for agricultural resources (land, water surface and animals), those variables were significant at 5% level in both models. However, the signs of these variables were contrary to the expectations of

the theoretical model. If the households owned more agricultural resources, they were more likely to be poor.

Among the schemes of the Program 135- Phase II, the schemes that have a positive effect on the likelihood of being poor were household has own a bank account, women had own immunization card, children had vaccinations card and household was supported a tractor. The three former variables were significant at 1% level and household was supported a tractor was significant at 5% level. Particularly, households having a bank account had the strongest impact, whereas three other coefficients did not show substantial magnitude. These positive signs proved that government preferential credit schemes, immunization for mothers and vaccination for children, and government transfer agricultural instruments were the effective policies and should be considered for long-term maintenance. By regions, households living in Red River Delta and South East were less likely to be poor rather than other regions, except for Mekong River Delta played the role of reference. The households living in South East regions had the lowest probability to be poor, followed by Red River Delta. In contrast, the North East and North West was the regions that had the highest probability of being poor.

IV.3. Interaction effects

Table 3 only summarized the main effects of the significant interaction effects. The interaction effects were conducted by means of probit regressions and kept using independent variables as in the original probit regressions. The interaction effects included the effect of female-headed households, the number of women aged 15-49, the number of children under 5, living areas, ethnic groups, the education levels of the household head, the education levels of wife, schemes of The Program 135- Phase II and regions. Generally, in the model including interaction effects, the signs and statistical significance of these independent variables did not show substantial differences from the original probit model. The estimated coefficients of independent variables same as the original probit model and insignificant interaction effects can be found in Appendix C.

Given the estimated interaction effects, the interaction effect between the education levels of the household head and other variables was the most transparent. Meanwhile, the interaction effect of schemes of The Program 135- Phase II with the gender of the household head, the

number of women aged 15-49 in the household, living areas and ethnic groups were vague. Among schemes, the interaction effect of government preferential credit was the one that showed the most significant estimation coefficients. By regions, the interaction effects of schemes were not statistically significant.

Table 3: Summarized results of interaction effects in probit model

Interaction effects	B	Std. Error	p-value
Household head is female with			
Area	.155**	.021	.000
Ethnic groups	.212**	.033	.000
Household sought care from public sector	-.112*	.043	.010
Children ever had vaccination card	-.109**	.022	.000
Number of women 15-49 with			
Area	-.136**	.011	.000
Ethnic groups	-.177**	.014	.000
Areas with			
Has own land that can be used in agriculture	.053**	.021	.013
Household has owned a bank account	.348**	.022	.000
Ethnic groups with			
Has own land that can be used in agriculture	.187**	.033	.000
Has raise animals	-.115**	.030	.000
Household has owned a bank account	.332**	.045	.000
Children ever had vaccination card	-.0773**	.027	.004
Household head's education level with			
Area			
Household head with primary education	.498*	.215	.021
Household head with lower secondary education	.740**	.212	.000
Household head with upper secondary education	-.668**	.616	.009
Household head with tertiary education	-.559**	.214	.009
Ethnic groups			
Household head with primary education	-1.192*	.479	.013
Household head with lower secondary education	-1.244**	.479	.009
Household head with upper secondary education	-.740**	.212	.000
Household head with tertiary education	-1.552**	.481	.001
Household has owned a bank account			
Household head with upper secondary education	-.482*	.278	.011
Household head with tertiary education	-.673*	.279	.031
Household has supported a tractor			
Household head with primary education	.690*	.332	.037
Household head with lower secondary education	.796*	.330	.016
Household head with tertiary education	1.125**	.366	.002

Wife's education level with			
Household has owned a bank account			
Wife with upper secondary education	-.080**	.029	.010
Wife with tertiary education	-.222**	.055	.000
Children ever had vaccination card			
Wife with primary education	-.153**	.055	.006
Children participated vitamin A campaigns			
Wife with primary education	-.294**	.026	.000
Regions with			
Household has owned a bank account			
Red River Delta	-.214**	.035	.000
North Central Coast and South-Central Coast	.099**	.035	.004
Central Highlands	.068	.036	.054
South East	-.449**	.033	.000
Mekong River Delta	Ref.	.	.

** p< 0.01, * p< 0.05

North East, North West

By household demographic characteristics, the interaction effects of female-headed households and the number of women aged 15-49 years were conducted to assess the role of women in poverty reduction. Meanwhile, to consider the effectiveness of the schemes, the number of women aged 15-49 and the number of children under 5 years of age were interacted with the corresponding policies. The interaction effects considered the number of women aged 15-49 in the household because they were the beneficiaries of both the antenatal care scheme and the women immunization scheme. Similarly, children under 5 years old were the beneficiaries of the children vaccination scheme and the vitamin A free provision scheme. However, the interaction effects of these schemes with their beneficiaries was not statistically significant (see details in Appendix C). The significant interaction effects suggested that the female-headed households in rural areas and ethnic minority households were more likely to be poor than their comparative groups. However, female-headed households had better access to health care schemes such as public health care or vaccinations for children.

The interaction effects of living areas and ethnic groups concerned about the agricultural resources of the household and the effectiveness of The Program 135-Phase II schemes. The negative signs of the interaction effects showed the rural households and the ethnic minority households were more likely to be poor if they owned each type of agricultural resources but less likely to be poor if they participated in each scheme, and vice versa. By living areas, the rural

household having more women aged 15-49 and having a bank account were less likely to be poor than their comparative groups. In contrast, rural households owning land that can be used for agricultural production faced with the higher likelihood of being poor. By ethnic groups, the interaction effects having positive impact included the ethnic minority households with more women aged 15-49 and the ethnic minority households raising animals. On the contrary, owning land that could be used in agriculture made ethnic minority households more likely to be poor. The children vaccinations scheme worked remarkably for the ethnic minority households.

As for education level, the interaction effects included living areas, ethnic groups, and the schemes of The Program 135- Phase II with the education of the household head and the education level of wife. The interaction effects with the education level of the household head indicated the impact of schemes on the whole household, whereas the interaction effect on the education level of the wife showed the impact of schemes on the direct beneficiaries of the policy- women and children in the household. Given the significant interaction effects, the household head with education below the lower secondary level and living in rural areas were more likely to be poor than their comparative groups. For ethnic minority households, if the head experienced the level higher than primary education, the likelihood of being poor would substantially decrease. In term of schemes, households having a bank account showed the positive impact on the likelihood of being poor of both level of beneficiaries, however, this policy was only effective in case of the head and the wife in the household experienced upper secondary education or higher. For the whole household, the government's tractor support schemes made the households were more likely to be poor, regardless of the household head's education level. For women and children in the household, the significant coefficients were only found in healthcare schemes for children (children vaccinations and children participated in vitamin A campaigns) with the wife experiencing primary education.

By regions, the interaction effects were computed between dummy variables for each region and schemes of The Program 135- Phase II. The statistically significant interaction effects indicated the compatibility of each scheme with each region. The concerned schemes were households having a bank account, households sought healthcare from public sector, and households received agricultural instruments support (tractor and motorboats). Given the tested interaction effects, only regional effects for households with a bank account were statistically significant.

The estimated coefficients showed that the government preferential credits had positive effects on poverty reduction in Red River Delta and South East region, however, made the households in North and South-Central Coast and Central Highlands were more likely to be poor.

V. Conclusion

Chapter 5 introduced the conclusive findings and discussions to suggest the policy implications. The first section summarized the main findings and draw the limitations of the thesis for future research. Subsequently, to grasp further analysis about the determinants of poverty in Vietnam, the discussion section interprets the estimated results and compares them with the findings of relevant literatures. From the empirical findings, the thesis assesses the effectiveness of policies, thereby suggesting some policy implications to make appropriate adjustments for the next phase of the national poverty reduction strategies.

V.1. Main findings and limitations

This thesis identifies the determinants of poverty in Vietnam. The research question is answered, based on a quantitative analysis of household-level factors. It can be concluded that geographic factors such as living area and regions affecting the poverty of both models. The results indicated that wealthier households live in favorable regions such as urban areas, Red River Delta, and South East. The empirical results also indicated the which schemes performed outstanding effects when applied simultaneously in one research background. The interaction effects between the policies variables with traditional factors has seldomly done in previous studies, hence the simultaneous evaluation on the schemes of The Program 135-Phase II is emphasized by the thesis.

The aims of the thesis are sacrificed. The determinants impact on Vietnamese poverty are examined. The factors having similar findings with previous studies include the household characteristics, education levels and regions, thereby reaffirming the role of the factors on the progress of poverty reduction in Vietnam. The ownership of agricultural resources increased the probability of being a poor household, in contrast to the expectations. Among the policy variables, households with access to government preferential credit and public healthcare services were the most effective of The Program 135-Phase II.

These empirical findings indicated a strong relevance to the setting in the chapter 1 of the thesis. Firstly, it determines and reaffirms the factor of household's poverty in Vietnam. Secondly, new empirical evidence has also been released, regarding to the significantly positive impact of women's education levels on household' wealth and the effectiveness of the Program 135-Phase

II as well. By testing interaction effects, the healthcare schemes show a significant effect on individual beneficiaries, while government preferential credits have a positive effect on both household and its female adults. However, the government support for agricultural instruments did not work for both beneficiaries. These findings illustrate the rationality of improving women's education; and interaction effects show the lesson of allocation the agriculture support.

The thesis proposes some contributions on academic and practical aspects. Academically, the thesis reaffirmed the impact of usual factors in poverty, integrated with evaluating the effectiveness of The Program 135-Phase II to build up a new set of explanatory variables. The combination between OLS model and probit model was also initially implemented on Vietnam dataset. In practices, the research period of the thesis study had ended before Vietnam turned to the multi-dimensional poverty line. This was a critical time to make an assessment for the effectiveness of The Program 135-Phase II, thus then adjust the National poverty reduction strategies in a way that would be more appropriate for the contemporary conditions.

The thesis attempts to provide a systematic understanding about poverty in Vietnam. Despite reliable empirical results, the thesis still has limitations that can be improved by the future studies. About method, the combination of the OLS and probit models allows to yield a more robust estimations, but there are still other methods that future studies can pursue. Furthermore, estimation by OLS and probit models does not guarantee the reliability of results once the problem of endogeneity occurs. About the data, the thesis uses the aggregated data from the MICS in 2006, 2010 and 2014. The reliability of empirical findings depends on quality of the surveys; however, such the survey often faces with the problem of unofficial statistics. For example, this survey does not accurately describe the informal migration, hence the movement from rural poverty to urban poverty is unable to examine. About the schemes, since the coefficients of the interaction effects with agricultural instruments supporting schemes are insignificant, it calls for changing or adding other explanatory variables to give more reasonable results. It is expected that future studies can overcome the existing limitations of the thesis.

V.2. Discussions and policy implications

Given the empirical results, the main findings about determinants of poverty in Vietnam exhibit the expected impacts on household’s poverty, except for the ownership of agricultural resources

have an adverse conclusion with Hoang et al. (2014), however, is similar to Cherdchuchai & Otsuka (2006) in Thailand. In term of schemes, government preferential credit has the strongest positive effect on the probability of being non-poor household. For individual beneficiaries, expanding immunization for women and children are the effective healthcare schemes. For household, the accessibility to public healthcare sector is more effective in comparison to given medicines to treat illness. The findings of the interaction effects are discussed after the direct effects, thereby suggesting some appropriate policy implications.

Particularly, the impacts of household size and household composition are similar to previous studies in both Vietnam and other developing countries (e.g. Datt et al., 2000 in Mozambique Balisacan et al., 2003 in Vietnam, Giang & Pfau, 2009 in Vietnam). However, the negative effect of household demographics has diminished compared to the findings of Balisacan et al. (2003), thereby suggesting that the household's poverty in Vietnam has been solved to a certain extent. The impacts of household composition confirm the role of female adults, especially those who are in the working age. This implies for the contribution of women to household wealth is more concrete than men like in Giang & Pfau (2009) and Diem (2017).

In term of the household head, the empirical evidence for the negative impact of the elderly is relatively weak in comparison to Giang & Pfau (2009), because they only focus on the elderly-head household. Gender of the household head reaffirms the positive impact of female, as mentioned in Diem (2017), making the poverty gap between household members and female heads smaller. The marital status of the head confirms the role of the spouse for supportive contribution, concurrent with the findings of Balisacan et al. (2003), Giang & Pfau (2009) and Diem (2017).

The findings about the impacts of living areas and ethnic groups consolidate for the conclusions of previous studies. For example, Baulch et al. (2009) concluded that ethnic minorities facing with a higher risk of becoming poor households than the majority (Kinh and Hoa) because they live in remote areas. This is also related to the difference between the level of development between urban and rural areas, not only in Vietnam but also in other countries such as Thailand (Cherdchuchai & Otsuka, 2006) or Ukraine (Bruck et al., 2010). Among the impacts of household characteristics, the impact of living areas and ethnic groups on poverty are largest.

The findings on educational level of the household head and the spouse are basically the same as those of Datt & Jolliffe (2005) in Egypt or Baulch et al. (2009) in Vietnam. The positive impact of educational attainment ensures the household's wealth, especially when completing the breakpoint of lower secondary level (Diem, 2017). The new findings were detected by using dummy variables for each level, instead of using ordinal measurements like in Baulch et al. (2009). First, the higher education level was proportional to household wealth, regardless of gender. Second, the female spouse experienced tertiary education makes the household's wealth soar compared to lower educational degrees. This finding is initiated because previous studies such as Giang & Pfau (2009) or Baulch et al. (2009) only considered women education level more or less than lower secondary degree.

The qualitative results provide some empirical findings about the positive impact of The Program 135- Phase II. Government preferential credit and immunization schemes yielded the consistent results with relevant literatures. Furthermore, interaction effects rationalize the policy to appropriate audiences regarding to the effectiveness. The significant interaction effects will be presented after discussing the direct effects of schemes.

First, the government preferential credit is the most powerful and stable scheme towards the poor households in regions of high development, reinforces for the findings in Quach (2005) and Nghiem et al. (2012). This also implies that the effectiveness of government credit is limited to the poor people within the high-developing areas. In addition, the significant coefficients of the interaction effects show that government credit has a strong influence on those experienced upper secondary education at least.

Second, the interventions of public healthcare had a stronger impact on individual beneficiaries rather than household. On the one hand, women who having better health conditions are able to contribute better to household income, same as the findings of positive healthcare in Koo et al. (2007), Binh (2008) and Kozel (2014). On the other hand, the accessibility to public healthcare sector influenced on the household wealth by minimizing costs for health risks. In term of interaction effects, public healthcare schemes directed their effectiveness on ethnic minority children and female-headed households.

Lastly, although the empirical result indicated significantly positive effect of supporting tractor on household wealth, the interaction effects are insignificant in almost regions. Furthermore, the higher-educated household were more likely to be poor when receiving the support, due to it inadvertently creates a burden of repayment for them (Bui et al., 2014).

The impacts of the regions are consistent with the conclusions in Balisacan et al. (2003) and Baulch et al. (2009). Households living in the Red River Delta and South East regions have a significantly lower probability of being poor compared to other peers. This can be explained by the advantages of natural conditions and the level of regional development. The difference in regional development level is also associated with the distribution of ethnic minorities, since most of this vulnerable population group are living in mountainous areas.

The empirical outcomes also yielded some unexpected results. The signs of agricultural sources are contrary to the theoretical model's expectations. The availability of agricultural resources performed a relatively large negative impact on the improvement of household's poverty. There were two feasible explanations for this contradiction. The first explanation related to the regional development, as in Baulch et al. (2009), the less-developing areas associating with more agricultural resources. However, they not only were not equipped to fully exploit these resources, but also were unable to switch to industry or services sector due to slow urbanization. The second explanation was related to the term of poverty reduction. The agricultural resources were positive factors of reducing poverty in short-term, especially in agricultural economies. Nevertheless, agricultural resources made the progress of poverty reduction become stagnant in the long run, as explained in Cherdchuchai & Otsuka (2006) or Bui et al. (2014), because their seasonal income declined once the quality of agricultural resources decreased. The later explanation suggested the governments to guide the poor to exploit agricultural resources effectively through transferring technology.

The empirical findings suggest some policy implications regarding to the schemes of The Program 135. First, living areas, ethnic groups and regions decisively determined the level of poverty, so in the future, the policy adjustments should be more concentrated on the population in less favorable areas and ethnic minorities. Public healthcare schemes have brought certain benefits to this vulnerable population, but government preferential credit was not compatible

with them. This finding suggests the necessity of the financial infrastructure development in remote areas beside a stricter supervision in disbursements. Second, the role of women in the progress of poverty reduction is extremely important. The findings suggest that financing for women's education as well as improving the accessibility of women to public healthcare are essential to sustainably eliminate poverty. Finally, with the current level of development of Vietnam, traditional agriculture has become an obstacle to escaping from poverty. Nevertheless, the inefficiency of supporting agricultural instruments schemes indicates that government's supports must be compatible with the characteristics of beneficiaries to help poor people escape poverty.

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Appendix

a. Set to zero because this parameter is redundant.

b. Hessian matrix singularity is caused by this parameter. The parameter estimate at the last iteration is displayed.

c. Fixed at the displayed value.

Appendix A: Results of OLS regression

(Dependent Variable: International Wealth Index (IWI))

OLS Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
(Constant)	58.254	.786		74.121	0.000
Household characteristics					
Age of household head	.118	.003	.010	3.246	.001
Household size	-2.361	.078	-.239	-30.189	.000
Sex of household head	.625	.093	.014	6.700	.000
Marital status of HH head	1.476	.105	.035	14.035	.000
Number of women aged 15 - 49	.907	.064	.039	14.224	.000
Number of children <6 in hh	-1.280	.148	-.050	-8.653	.000
Child dependency ratio under 6	-1.383	.371	-.020	-3.728	.000
Number of children <18 in hh	.574	.081	.039	7.071	.000
Child dependency ratio under 18	.203	.189	.006	1.073	.283
Number of adults (18+) in HH	-.881	.148	-.064	-5.951	.000
Number of male adults (18+) in hh	2.901	.153	.129	19.010	.000
Number of female adults (18+) in hh	3.581	.148	.152	24.262	.000
Child dependency ratio under 6	-1.383	.371	-.020	-3.728	.000
Area	-7.765	.088	-.206	-87.843	.000
Ethnic groups	12.786	.122	.258	105.110	.000
Education levels					
HH head without education	.000[b]				
HH head with primary education	-4.493	.746	-.105	-6.021	.000
HH head with lower secondary education	-.254	.745	-.007	-.341	.733
HH head with upper secondary education	2.462	.748	.049	3.290	.001
HH head with tertiary education	4.122	.752	.074	5.483	.000
Husband without education	.000[b]				
Husband with primary education	.640	.245	.008	2.609	.009
Husband with lower secondary education	.684	.216	.011	3.161	.002
Husband with upper secondary education	1.017	.251	.012	4.057	.000
Husband with tertiary education	1.111	.300	.011	3.703	.000
Wife without education	.000[b]				
Wife with primary education	-1.274	.243	-.017	-5.242	.000
Wife with lower secondary education	1.807	.232	.032	7.802	.000
Wife with upper secondary education	3.577	.270	.040	13.265	.000

Wife with tertiary education	3.140	.310	.033	10.129	.000
Agricultural resources					
Household owns land that can be used for agriculture	-3.083	.094	-.082	-32.660	.000
Household members own any water surface area that can used for fishery	-1.015	.120	-.017	-8.424	.000
Household raise any animals	-3.197	.089	-.086	-35.949	.000
Schemes of Program 135-Phase II					
Household members own a bank account	5.698	.092	.139	62.004	.000
Women received antenatal care	-1.063	.331	-.010	-3.207	.001
Women has own immunization card	2.044	.407	.015	5.019	.000
HH sought care from public sector	-3.508	.178	-.052	-19.750	.000
HH has given medicine to treat this illness	2.051	.335	.013	6.122	.000
Children have ever had vaccination card	2.635	.107	.068	24.647	.000
Children participated Vitamin A campaigns	3.147	.081	.081	39.030	.000
Boat with motor	-1.284	.121	-.021	-10.588	.000
Tractor	3.550	.170	.041	20.859	.000
Regions					
Red River Delta	3.762	.130	.073	28.921	.000
North East, North West	.245	.126	.005	1.947	.051
North Central Coast and South-Central Coast	.200	.126	.004	1.584	.113
Central Highlands	-3.553	.117	-.074	-30.406	.000
South East	3.980	.131	.080	30.421	.000
Mekong Delta	-2.191	.132	-.044	-16.547	.000

Appendix B: Results of probit regression (without interaction effects)

(Dependent variables: International Wealth Index (IWI), cut-off value =69.5)

Parameter	B	Std. Error	Hypothesis Test			95% Wald Confidence Interval for Exp(B)	
			Wald Chi-Square	df	Sig.	Lower	Upper
(Intercept)	2.249	.1249	324.165	1	0.000	7.422	12.112
Household characteristics							
agehead	.006	.0003	4.852	1	.028	1.000	1.001
hhsize	.213	.0170	156.597	1	0.000	1.197	1.279
hhsex	.249	.0118	4.866	1	.027	1.003	1.047
marstat1	-.078	.0121	41.477	1	.000	1.056	1.107
nw15_49	-.061	.0074	69.683	1	.000	1.048	1.079
nch018	.180	.0171	111.097	1	0.000	.808	.864
nch05	.103	.0175	34.783	1	.000	.872	.934
nadult	-.065	.0170	14.743	1	.000	.906	.969
nadultm	-.035	.0111	10.004	1	.002	.945	.987
nadultw	.000[b]						
cdeprat5	.106	.0431	6.049	1	.014	1.022	1.210
cdeprat18	.019	.0221	.778	1	.378	.939	1.024
rural	.495	.0098	2563.556	1	0.000	.598	.621
ethnic1	-.850	.0137	3851.823	1	0.000	2.278	2.404
Education level							
hedu0	.000[b]						
hedu1	.519	.0667	60.680	1	.000	.522	.678
hedu2	.237	.0452	27.376	1	.000	.722	.862
hedu3	.057	.0269	4.404	1	.036	.896	.996
hedu4	-1.493	.0171	7611.431	1	0.000	4.302	4.600
husedu0	.000[b]						
husedu1	.032	.0260	1.532	1	.216	.920	1.019
husedu2	.013	.0233	.304	1	.581	.943	1.033
husedu3	-.037	.0308	1.413	1	.235	.976	1.102
husedu4	-.170	.0369	21.367	1	.000	1.103	1.275
wifedu0	.000[b]						
wifedu1	.145	.0244	35.506	1	.000	.824	.907
wifedu2	-.024	.0226	1.092	1	.296	.979	1.070
wifedu3	-.063	.0300	4.360	1	.037	1.004	1.129
wifedu4	-.723	.0498	210.829	1	0.000	1.869	2.273
Agricultural resources							
land	.208	.0131	395.735	1	0.000	.795	.829
water	.156	.0097	141.767	1	0.000	.834	.878
animal	.224	.0108	529.903	1	0.000	.784	.814

Schemes of Program 135-Phase II							
bank	-1.385	.0101	18751.743	1	0.000	1.482	1.546
ante	.037	.0225	2.762	1	.097	.828	.957
immu	-.170	.0464	13.461	1	.000	1.083	1.299
phealth	-.228	.0207	121.613	1	0.567	.764	.829
medicine	.091	.0389	5.461	1	.019	1.015	1.182
cvac	-.218	.0093	543.986	1	0.000	1.221	1.266
vitA	-.543	.0197	755.523	1	0.259	.559	.604
boatmot	-.188	.0142	173.800	1	0.126	.806	.852
trac	-.213	.0185	132.576	1	0.000	1.193	1.283
Regions							
reg1	-.570	.0138	1709.266	1	0.000	.133	.174
reg2	.256	.0127	407.234	1	0.000	.165	.205
reg3	.139	.0129	115.537	1	0.000	.260	.304
reg4	-.013	.0125	1.163	1	.281	.441	.490
reg5	-.886	.0148	3593.628	1	0.000	2.537	2.669
reg6	.000[b]						
(Scale)	1[c]						

Appendix C: Results of probit regression (with interaction effects)

(Dependent variables: International Wealth Index (IWI), cut-off value =69.5)

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	-1.924	.5007	-2.905	-.942	14.761	1	.000
Household characteristics							
agehead	.003	.0004	.003	.004	81.506	1	.000
hhsize	.170	.0178	.135	.205	91.550	1	.000
hhsex	.316	.0351	.247	.385	81.144	1	.000
marstat1	M-.062	.0105	.041	.082	34.764	1	.000
nw15_49	-.131	.0165	-.163	-.098	62.640	1	.000
nch05	.096	.0189	-.133	-.059	25.676	1	.000
cdeprat5	.131	.0443	.044	.217	8.689	1	.003
nch018	.129	.0176	-.164	-.095	53.675	1	.000
cdeprat18	-.019	.0228	-.064	.026	.685	1	.408
nadult	-.074	.0172	-.108	-.040	18.511	1	.000
nadultm	m-.013	.0118	-.010	.036	1.264	1	.261
nadultw	.000[b]						
rural	.036	.2124	-.452	.380	.029	1	.866
ethnic1	M-1.801	.4799	.861	2.742	14.088	1	.000
Education level							
hedu0	.000[b]						
hedu1	1.119	.4986	.142	2.096	5.035	1	.025
hedu2	1.391	.4985	.414	2.369	7.790	1	.005
hedu3	M-1.572	.4986	.594	2.549	9.934	1	.002
hedu4	M-2.030	.5006	1.049	3.011	16.446	1	.000
husedu0	.000[b]						
husedu1	.010	.0285	-.045	.066	.133	1	.715
husedu2	.027	.0248	-.022	.075	1.182	1	.277
husedu3	M-.090	.0295	.032	.148	9.331	1	.002
husedu4	M-.096	.0379	.022	.170	6.403	1	.011
wifedu0	.000[b]						
wifedu1	.149	.0293	-.207	-.092	25.914	1	.000
wifedu2	.075	.0265	.023	.127	8.061	1	.005
wifedu3	m-.170	.0325	.106	.233	27.188	1	.000
wifedu4	M-.336	.0567	.225	.447	35.162	1	.000
Agricultural resources							
land	.403	.0344	-.470	-.336	137.119	1	.000
water	.000	.0420	-.082	.082	.000	1	.997
animal	.133	.0312	-.194	-.072	18.103	1	.000

Schemes of Program 135- Phase II							
bank	M-1.119	.2873	.556	1.682	15.166	1	.000
phealth	-.170	.0678	-.302	-.037	6.249	1	.012
medicine	-.010	.0930	-.192	.172	.012	1	.914
ante	-.109	.1184	-.341	.123	.850	1	.357
immu	-.260	.1612	-.056	.576	2.593	1	.107
cvac	M-.182	.0264	.131	.234	47.760	1	.000
vitA	-.543	.0197	-.581	-.504	755.523	1	.259
trac	-.304	.3332	-.957	.349	.834	1	.361
boatmot	.174	.6142	-.030	2.378	3.655	1	.056
Regions							
reg1	M-.493	.0186	.456	.529	702.065	1	.000
reg2	.131	.0189	.094	.168	48.349	1	.000
reg3	.113	.0173	.079	.146	42.454	1	.000
reg4	.157	.0180	.122	.192	75.763	1	.000
reg5	M-.686	.0191	.648	.723	1288.688	1	.000
reg6	.000[b]						

Appendix C cont.- Interaction effects

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
Interaction effects of household characteristics							
fhead_rural	.155	.0213	-.197	-.113	53.229	1	.000
fhead_ethnic	.212	.0328	-.276	-.148	41.723	1	.000
fhead_bank	-.043	.0240	-.090	.004	3.219	1	.073
fhead_ante	.032	.0880	-.141	.204	.131	1	.717
fhead_immu	M-.027	.1138	-.196	.251	.058	1	.809
fhead_phealth	.112	.0425	.028	.195	6.891	1	.009
fhead_medicine	-.043	.0936	-.227	.140	.214	1	.643
fhead_cvac	-.109	.0224	-.153	-.065	23.730	1	.000
fhead_vitA	.000[a]						
nw15.49_rural	-.136	.0112	.114	.158	148.729	1	.000
nw15.49_ethnic	-.177	.0141	.149	.204	156.307	1	.000
nw15.49_ante	-.039	.0538	-.144	.067	.518	1	.472
nw15.49_immu	-.041	.0703	-.179	.097	.337	1	.561
nch05_cvac	-.009	.0130	-.035	.016	.495	1	.482
nch05_vitA	.000[a]						
Interaction effects of household head's education level							
hedu1_rural	.498	.2148	-.919	-.077	5.369	1	.021
hedu1_ethnic	M-1.192	.4793	-2.132	-.253	6.188	1	.013

hedu1_bank	-.128	.2892	-.695	.439	.197	1	.657
hedu1_trac	.690	.3316	.040	1.340	4.329	1	.037
hedu1_boatmot	.946	.6202	-2.162	.269	2.329	1	.127
hedu2_rural	.740	.2124	-1.157	-.324	12.149	1	.000
hedu2_ethnic	-1.244	.4787	-2.182	-.306	6.753	1	.009
hedu2_bank	-.277	.2839	-.833	.280	.951	1	.330
hedu2_trac	.796	.3297	.149	1.442	5.822	1	.016
hedu2_boatmot	-.699	.6154	-1.905	.508	1.289	1	.256
hedu3_rural	-.668	.6157	-1.875	.538	1.178	1	.009
hedu3_ethnic	-.740	.2120	-1.156	-.325	12.197	1	.000
hedu3_bank	-1.212	.4786	-2.150	-.274	6.417	1	.011
hedu3_trac	-.448	.2833	-1.003	.107	2.501	1	.114
hedu3_boatmot	.982	.3299	.335	1.629	8.859	1	.273
hedu4_rural	-.559	.2138	-.978	-.140	6.845	1	.009
hedu4_ethnic	-1.552	.4806	-2.494	-.611	10.435	1	.001
hedu4_bank	-.614	.2844	-1.171	-.056	4.659	1	.031
hedu4_trac	1.125	.3664	.407	1.844	9.433	1	.002
hedu4_boatmot	-.948	.6229	-2.169	.273	2.317	1	.128
Interaction effects of wife's education level							
wedu1_bank	-.191	.1623	-.509	.127	1.387	1	.239
wedu1_ante	.192	.6795	-1.140	1.524	.080	1	.778
wedu1_immu	-.412	.8557	-2.089	1.265	.232	1	.630
wedu1_cvac	-.153	.0552	-.261	-.045	7.654	1	.006
wedu1_vitA	-.294	.0257	-.345	-.244	130.799	1	.000
wedu2_bank	-.102	.0552	-.210	.006	3.412	1	.065
wedu2_ante	.476	.5035	-.511	1.463	.894	1	.344
wedu2_immu	-.916	1.0783	-3.029	1.198	.721	1	.396
wedu2_cvac	.053	.0341	-.013	.120	2.446	1	.118
wedu2_vitA	-.785	.0494	-.882	-.688	251.985	1	.555
wedu3_bank	-.080	.0286	-.136	-.024	7.772	1	.005
wedu3_ante	.667	.5380	-.388	1.721	1.535	1	.215
wedu3_immu	-.232	.9875	-2.168	1.703	.055	1	.814
wedu3_cvac	.010	.0259	-.041	.061	.143	1	.706
wedu3_vitA	.212	.0141	.184	.239	225.298	1	.528
wedu4_bank	-.222	.0552	-.330	-.113	16.110	1	.000
wedu4_ante	.000[a]						
wedu4_immu	.000[a]						
wedu4_cvac	-.064	.0534	-.168	.041	1.422	1	.233
wedu4_vitA	.000[a]						
Interaction effects of living area							
rural_land	.053	.0213	.011	.095	6.222	1	.013
rural_water	.124	.0355	-.193	-.054	12.194	1	.509
rural_animal	.003	.0204	-.037	.043	.017	1	.897

rural_bank	.348	.0218	.305	.391	255.676	1	.000
rural_phealth	.059	.0328	-.022	.106	1.634	1	.201
rural_trac	.071	.0430	-.014	.155	2.688	1	.101
rural_boatmot	-.030	.0511	-.131	.070	.352	1	.553
Interaction effects of ethnic groups							
ethnic_land	.187	.0333	.121	.252	31.406	1	.000
ethnic_water	.047	.0340	-.114	.020	1.911	1	.167
ethnic_animal	M-.115	.0296	-.173	-.057	15.143	1	.000
ethnic_bank	.332	.0450	-.421	-.244	54.609	1	.000
ethnic_ante	M-.0350	.0894	-.140	.210	.157	1	.692
ethnic_immu	-.060	.1292	-.314	.193	.218	1	.640
ethnic_phealth	-.114	.0520	-.216	-.012	4.811	1	.506
ethnic_med	.143	.1013	-.056	.341	1.979	1	.159
ethnic_cvac	M-.0773	.0265	.025	.129	8.475	1	.004
ethnic_vitA	1.167	.0188	1.130	1.204	3858.604	1	.479
ethnic_trac	-.074	.0443	-.161	.013	2.768	1	.096
ethnic_boatmot	.116	.0499	.019	.214	5.447	1	.196
Interaction effects of regions							
reg1_bank	-.214	.0351	-.283	-.145	37.200	1	.000
reg2_bank	.042	.0382	-.033	.117	1.228	1	.268
reg3_bank	.099	.0350	.031	.168	8.086	1	.004
reg4_bank	.068	.0355	-.001	.138	3.699	1	.054
reg5_bank	-.449	.0334	-.514	-.383	180.402	1	.000
reg6_bank	.000[b]						
reg1_phealth	.005	.0534	-.100	.110	.009	1	.925
reg2_phealth	-.013	.0535	-.118	.092	.058	1	.809
reg3_phealth	-.077	.0515	-.177	.024	2.211	1	.137
reg4_phealth	-.030	.0503	-.129	.068	.358	1	.550
reg5_phealth	.063	.0546	-.044	.170	1.343	1	.247
reg6_phealth	.000[b]						
reg1_boatmot	-.472	.1112	-.689	-.254	17.993	1	.222
reg2_boatmot	-.603	.0569	-.715	-.492	112.258	1	.256
reg3_boatmot	-.736	.0478	-.830	-.642	237.440	1	.149
reg4_boatmot	-.713	.0448	-.801	-.626	254.119	1	.845
reg5_boatmot	-.035	.1461	-.322	.251	.059	1	.809
reg6_boatmot	.000[b]						
reg1_trac	-.365	.1022	-.565	-.164	12.733	1	.359
reg2_trac	-.354	.0978	-.546	-.163	13.126	1	.291
reg3_trac	-.699	.1034	-.902	-.496	45.712	1	.137
reg4_trac	-.243	.0857	-.411	-.075	8.005	1	.466
reg5_trac	-.647	.1167	-.876	-.419	30.751	1	.293
reg6_trac	.000[b]						
(Scale)	1[c]						