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# Do the Poorest Ethnic Minorities Benefit from a Large-Scale Poverty Reduction Program? Evidence from Vietnam

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## Abstract

To increase the opportunities for poor ethnic minorities to benefit from economic growth the government of Vietnam implemented one of the biggest poverty reduction programs entitled ‘Socio-economic Development for the Communes Facing Greatest Hardships in the Ethnic Minority and Mountainous Areas’ during 2006 - 2010. This paper estimates the program’s impacts on households in the project areas. We find that the program had positive impacts on several important outcomes of the ethnic minority households, including productive asset ownership, household durables ownership, and rice productivity. Positive impacts were also recorded for agricultural income, household total income, and household per-capita income. A particularly important result is that poverty among minority households in treatment communes declined significantly more than it declined in comparison communes. Finally, ethnic minority households enjoyed a reduction in travel time to health facilities, relative to households in control communes.

Keywords: Poverty reduction, ethnic minority, household survey, Vietnam

JEL Classification: I38; H43; O11.

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## 1. Introduction

Vietnam is one of the most successful countries in the world in terms of poverty reduction and economic achievement over the past twenty years. The poverty rate fell from 58 percent in 1993 to around 14 percent by 2008.<sup>2</sup> However, the rate of poverty reduction has slowed down over time and the gap between the rich and poor is continuing to increase. Poor households in some regions gain much less from economic growth than better-off households. Most of the households which are still below the poverty line in Vietnam live in remote rural areas which are mainly populated by ethnic minorities. The share of ethnic minorities in the poorest 10 percent of the population has risen to 65 percent (World Bank, 2012).

To increase the opportunities for poor households of specific groups and regions to benefit from economic growth the government has introduced many targeted programs. The most important poverty reduction program for poor and ethnic minorities in the most remote and difficult areas is entitled ‘Socio-economic Development for the Communes Facing Greatest Hardships in the Ethnic Minority and Mountainous Areas,’ commonly known as Program 135 (P135). The first phase of the program was implemented during 2001-2005. The second phase of the program (P135-II) was implemented between 2006 and 2010. P135-II targeted 1,600 communes in poor and mountainous areas in 45 provinces; these areas are characterized by large proportions of ethnic minority households and they have persistently high poverty rates. The program delivers mainly public goods through four components: basic infrastructure development, improved and market-oriented agricultural production, improved socio-cultural lives through better access to social services, and capacity building for State officials. Moreover, the design of P135-II incorporated sound methodology for impact evaluation. The total budget of P135-II was approximately 1.1 billion USD. Program implementation involved several ministries, but The State Committee for Ethnic Minority Affairs (CEMA) was the standing organization which coordinated and supervised the program’s activities.

A large number of studies report impact evaluations of poverty reduction programs in Vietnam. For example, using Vietnam household surveys, Van de Walle (2002) and Van Den Berg and Nguyen (2011) measure the effects of social protection

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<sup>2</sup> Estimated from the 2008 Vietnam Household Living Standards Survey (VHLSS).

programs. They find that the social protection programs can help the beneficiaries to increase consumption and reduce poverty. Nguyen (2008) examines the effect of a micro-credit program on poverty, and find a positive effect of micro-credit on household consumption. The impact of free health insurance for the poor is assessed by Bales et al. (2007) and Wagstaff (2009). Van de Walle and Cratty (2002) and Mu and Van de Walle (2007) found that rural road rehabilitation projects improved local markets, small businesses, service availability, and trade activities in the project areas. Nguyen (2011) found that rural roads helped rural households increase income, consumption, and working hours of household members. Khandker et al. (2009) investigate the impact of a World Bank financed Rural Electrification project (REI) on welfare of households in project areas.. They find that grid electrification from the project has significant positive impacts on households' cash income, expenditure and educational outcomes.

Quantitative evidence on large-scale national poverty reduction programs in Vietnam is limited.<sup>3</sup> Efforts to conduct quantitative impact evaluation of large-scale poverty reduction programs may face several challenges. First, impact evaluation is often an after-thought and projects are launched and completed without baseline surveys having been conducted. Second, poverty reduction is a long-term objective, and long after project completion policy makers might have lost interest in evaluating the project or funding might not be available for conducting an evaluation. Third, project beneficiaries may not have been randomly selected or the method of selection may not have been documented at all. This may be especially damaging if political issues were at play in selecting beneficiaries: purposeful selection can bias estimated project impacts. Fourth, it is often the case that several development projects and programs simultaneously provide support for disadvantaged people in a given area. Some households and villages, both participants and non-participants in a given project, can participate in several other projects. Even households that do not participate in any projects may enjoy beneficial general equilibrium effects; households that participate in a few projects may benefit indirectly from spillover effects of projects in which they do not participate.

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<sup>3</sup> MOLISA (2004) and UNDP and MOLISA, (2009) conducted qualitative impact assessments of the two largest national projects on poverty reduction, the National Targeted Program for Poverty Reduction and P-135.

In this study we measure the effects of P135-II on economic outcomes of households in project areas, focusing mainly on poverty status, income, agricultural production, housing conditions, and access to basic public services. We are able to observe the selection criteria of most commune projects and to obtain high-quality panel data on treatment and control households. Our study contributes a case study to the literature on impact evaluation of large complex programs. Findings from the study are also useful to the government of Vietnam and to international organizations involved in designing the third phase of Program 135.

The paper includes six sections. The second section provides details of the data sets: the baseline and end-line surveys. The third section reviews P135-II and describes the poverty profiles and livelihoods of households in the project areas. The fourth section presents the methodology used to measure the program impacts. It analyses the implementation process and discusses issues that arose during implementation that could affect the methodology used for measuring the program impacts. Finally, section six concludes.

## **2. Data Sets**

This study relies on the 2007 Baseline Survey of P135-II (abbreviated as BLS 2007) and the 2012 End-line Survey of P135-II (abbreviated as BLS 2012). The two surveys covered communes and households in treatment and control communes before and after the implementation of P135-II.

A common challenge in impact evaluation is accounting for the actual sampling design of the control and treatment groups in cases where they were not randomly selected: many interventions deliberately target the most disadvantaged groups. The target communes of P135-II were the poorest and most remote communes and their selection was based on their poverty rates and lack of key infrastructure to support agricultural production. The quantifiable criteria for identifying P135-II communes were based on the following indicators. First, lack of at least 4 of 7 key items: roads suitable for cars to travel to central communes; at least 50% of agricultural land being irrigated; presence of a health center; presence of a school; presence of a market; availability of electricity; at least 50% of villages in the commune have access to clean water. Second, a commune-level poverty rate higher than 30% based on the poverty

line for the year 2000 or higher than 55% based on the poverty line of 2006. In practice, selection for treatment was based mainly on the poverty rate. From among 2,359 communes that were targeted by P135-I 1,632 communes were selected for P135-II.

Based on the availability of resources and the data requirements for identifying and precisely estimating changes in key indicators (poverty and income), we determined that a sample of 6,000 households would be adequate. Sample households were selected from 400 communes, of which 266 were treatment communes and 134 were control communes. From the list of 1,632 communes in P135-II provided by CEMA, 266 treatment communes were randomly drawn. This selection process ensured that the sample treatment communes were selected from all over the provinces included in P135-II. In fact, 42 out of 45 P135-II provinces were included in the sample.<sup>4</sup>

The selection of control communes was rather more complicated. We needed to find communes which were as similar as possible to the sampled treatment communes, and to control for participation in the first phase of P135. Thus, we started with the 727 communes that had ‘graduated’ from P135 as the population of control communes from which the sample would be drawn.<sup>5</sup> Data for 727 graduated communes and the 266 treatment communes were pooled and a probit regression model was used to estimate the probability that each was selected for P135-II, based on key characteristics of each commune (poverty, key infrastructure, and population). The graduated communes with estimated selection probabilities higher than the average were identified as potential communes for the control group. From among these, 134 communes for the control group were selected randomly.

Simple t-tests were used to examine the quality of sample selection. As Table A1 in the appendix shows, the control and treatment communes displayed no significant differences in key indicators that had been used as the criteria for selection into P135-II, except for the presence of electricity. The distributions of commune households across Vietnam’s eight geographic/topographic regions are also similar. This provides evidence that the sampling design is good for measuring the impact of

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<sup>4</sup> Two treatment communes that were present for the 2007 BLS were not present for the 2012 ELS. They were relocated in a land clearance program for a hydropower project in Nghe An.

<sup>5</sup> ‘Graduated’ communes were the P135-I communes that had advanced sufficiently that they were not eligible for P135-II. Thus, our impact estimates are conditional on communes having participated in P135-I.

P135-II. Also of interest in Table A1 is the degree to which the sample communes are on average isolated from markets and the degree to which they lack evidence of official attention through culture houses, media stations, and peoples' committee houses.

The Agriculture Census of 2006 was used as the sampling frame for selecting the survey households. Using this data set ensured that we were working with the most current lists of households in the 400 selected communes. Survey households were selected in two steps. The first step was to select one sample village from each sample commune using the probability proportional to population sampling method (PPS). This selection method was applied for both control and treatment groups. The second step was to select sample households. To ensure that the survey covered 6,000 households, we first selected randomly 20 households from the list of all households in each selected village and then we selected randomly 15 households out of 20 households for official interviews. The five remaining households served as reserves for replacement in cases where the initially-selected households were not available for the official interview for any reason.

Two questionnaires were used in these surveys: one for the household and one for the commune. The household questionnaire collected detailed information about various aspects of each household's socio-economic conditions. It included demographic attributes, migration, education, health, agriculture, off-farm and non-farm employment, borrowing and saving, remittances, insurance and assets. Questions about P135-II were also included in a special module which was designed to collect information about program implementation at the grass-root level, including household awareness of elements of P135-II, household participation in the selection, supervision, and implementation of projects under P135-II, and the household's assessment of the quality of the P135-II projects.

Tablet PCs were used for data entry during the ELS 2012 interviews. This was the first time this technology had been applied for such a large and complicated survey in Vietnam. Using tablet computers minimized non-sampling errors normally associated with data entry and ensured very high-quality data. The tablet technology incorporated survey software applications, GPS, and internet capabilities to ensure that the data were collected in the most accurate possible fashion, in the shortest time, with the best quality control. The data were entered directly during the interview instead of using a paper questionnaire. With 3G-internet capability, the entered data was

transmitted directly back to an online server for immediate data checking. This procedure eliminated the data entry stage and increased the efficiency of data cleaning. Figure 1 shows the GPS-determined locations at which teams completed interviews from the beginning to the mid-point of the survey period.

We were able to construct panel data on 5,668 households. The attrition rate from BLS 2007 was about 5.2% after 5 years, which was much lower than the attrition rate experienced by VHLSS, partly reflecting the lower rates of migration in the remote areas and the careful logistical arrangements of the survey teams.

**Figure 1: Locations at of P135-II End-line Survey Areas**



*Source: Authors' preparation.*

### **3. Income and Poverty Profiles of P135-II Treatment Communes**

With the lessons learned from P135-I and other poverty reduction programs, and with the technical support of UNDP, P135-II was the first large, and most ambitious, program targeted on ethnic minorities and remote areas. The main objectives of P135-II were: (i) to reduce the commune-level poverty rates to below 30%; (ii) to ensure that more than 70% of each commune's households have annual income per capita higher than 3.5 million VND; (iii) to improve agricultural productivity of the main crops in each commune; (iv) to increase the net primary school enrollment rate to at least 95%; (v) to increase the net lower secondary school enrollment rate to at least 75%.



In order to achieve these objectives, P135- II included four major components: (i) agricultural production support through training in new production practices; (ii) support to develop local infrastructure and improve household access to that infrastructure; (iii) improvement of socio-cultural life and access to public services; (iv) capacity strengthening through training local government officials in administrative management, public investment management, and operations management.

Table 1 presents incomes and poverty rates of households in P135-II treatment communes. The first column of Table 1 shows the estimated population share of each group to provide context for the remaining columns in Table 1 and for the remaining tables in this section. Real per capita income of households in these communes increased by 21 percent during 2007-2012. This rate is lower than the income growth rate at the national level. According to VHLSS 2006 and 2010, real per capita income increased by 50 percent during 2006-2010; average per capita household income increased to 16.6 million VND by 2010.

Table 1: Per capita income and poverty rates of households in treatment communes.

Groups	% Share in Pop	Per capita income (thousand VND)			Poverty rate (%)		
		2007	2012	% Change	2007	2012	Change
All households	100	6,039	7,295	21	57.5	49.2	-8.2
<i>Ethnicity</i>							
Kinh	14.2	9,274	11,378	23	34.3	32.0	-2.3
Ethnic minorities	85.8	5,210	6,294	21	63.4	53.5	-10.0
<i>Ethnic minority groups</i>							
Tày	11.2	5,916	7,353	24	57.9	43.7	-14.3
Thái	9.7	5,181	5,102	-2	59.6	62.9	3.3
Mường	6.7	6,787	7,455	10	48.3	48.3	0.0
Nùng	5.5	5,801	7,723	33	59.8	41.5	-18.3
H'Mông	18.0	3,306	5,001	51	83.5	59.2	-24.3
Dao	11.8	5,022	5,776	15	63.0	55.9	-7.1
Other minorities	23.0	5,863	7,111	21	58.1	50.7	-7.3
<i>Gender of household head</i>							
Male	86.5	5,763	7,024	22	58.8	50.5	-8.4
Female	13.5	9,101	10,119	11	42.8	36.6	-6.1
<i>Age of household head</i>							
Below 25	8.6	5,891	6,667	13	71.7	56.9	-14.7
26-35	31.1	5,035	6,284	25	65.1	57.4	-7.7
35-45	29.2	5,684	7,308	29	56.2	45.3	-10.9
46-60	23.7	7,445	8,741	17	48.5	40.2	-8.4
Above 60	7.4	6,323	7,005	11	55.4	57.1	1.7
<i>Regions</i>							
North	63.1	5,084	6,551	29	65.2	50.7	-14.6
Central	30.5	6,132	7,284	19	56.1	54.3	-1.8

Groups	% Share in Pop	Per capita income (thousand VND)			Poverty rate (%)		
		2007	2012	% Change	2007	2012	Change
South	6.4	8,713	9,608	10	36.7	38.2	1.5

*Note: Real income per capita is measured at January 2012 prices; the price indices used were regional price indices provided by the General Statistics Office.*

*Source: Authors' calculations based on the BLS 2007 and ELS 2012.*

*All estimates account for complex sample design.*

Among the households in P135-II treatment communes, Kinh households have substantially higher incomes than ethnic minorities have, which is consistent with the large income gaps found between the Kinh and ethnic minorities in most studies on poverty in Vietnam (e.g., World Bank, 2012). Except for Thai and Muong, the ethnic minorities in P135-II treatment communes experienced increases in per capita income. The two ethnic minorities with the lowest per-capita incomes in 2012 were the H'Mong and Thai. The H'Mong experienced a very high rate of income growth, but the Thai incomes actually declined.

In this study, poverty is defined based on per capita income compared to the official income poverty line, which was 2.4 million VND per person per year in 2006 prices. We adjusted this poverty line to 2007 and 2012 prices for the calculations shown in Table 1. Table 1 shows that the overall poverty rate decreased from 57.5 percent to 49.2 percent during the study period, with the largest declines among ethnic minorities, though the Muong and Thai showed no improvement.

Table 1 also shows income and poverty rates by gender of the household head, by age group of the household head, and by broad geographic region within Vietnam.<sup>6</sup> While it may at first be surprising that female-headed households enjoyed higher incomes and lower poverty rates than male-headed households, this is often explained by the fact that working-age males migrated to urban areas or foreign countries and contributed remittances to the households. Adult women who have stayed behind claim "household head" status for purposes of the survey. Income generally increased and the poverty rate generally decreased with age of the household head, except for the youngest and oldest age groups. Finally, moving from the North to the South of Vietnam we see large income increases and sharp decreases in the poverty rates.

<sup>6</sup> It is often desirable to estimate welfare using consumption expenditures. However, the data set does not include expenditure data. The income data were constructed from information on income, remittances, household enterprise revenue and cost, and very detailed information on costs and revenues associated with crop and livestock production. The sampled households are not subject to income taxation so there is no incentive to under-report for this reason.

While the poverty rate simply records the proportion of households living below a given poverty line, the poverty gap index and the poverty severity index measure the *intensity* of poverty.<sup>7</sup> The poverty gap and severity indexes presented in Table 2 give a more in-depth picture of the poverty experienced by the sampled households. According to Table 2 there was substantial variation in the poverty gap and poverty severity among ethnic minorities. Table 2 indicates some large changes in these poverty indexes during the period 2007-2012 including substantial increases for Thai and Muong households. For Thai and Muong households poverty became more severe, with their poor households living even farther below the poverty line in 2012 than in 2007. On the other hand, the gap between poor H'Mong households and the poverty line had narrowed by 2012.

Table 2: Poverty gap and severity indexes by demographics and region.

Groups	Poverty gap index (%)			Poverty severity index (%)		
	2007	2012	Change	2007	2012	Change
All households	23.5	22.4	-1.1	12.5	13.4	0.9
<i>Ethnicity</i>						
Kinh	11.7	13.3	1.5	6.0	8.0	2.1
Ethnic minorities	26.5	24.6	-1.9	14.2	14.7	0.5
<i>Ethnic minority groups</i>						
Tày	22.3	18.1	-4.3	11.5	10.2	-1.3
Thái	26.0	32.1	6.1	14.2	20.9	6.7
Mường	16.8	23.5	6.7	7.4	15.2	7.9
Nùng	22.2	17.8	-4.4	10.9	9.9	-1.0
H'Mông	37.8	26.0	-11.8	20.4	14.5	-5.9
Dao	22.7	24.0	1.2	11.4	13.5	2.1
Other ethnic minorities	24.9	23.8	-1.1	14.0	14.4	0.4
<i>Gender of household head</i>						
Male	23.9	23.0	-0.9	12.7	13.8	1.2
Female	18.5	15.3	-3.3	10.5	8.7	-1.8
<i>Age of household head</i>						
Below 25	30.0	26.4	-3.5	15.8	15.1	-0.8
26-35	27.2	25.5	-1.7	14.5	15.4	0.9
35-45	23.8	21.0	-2.7	12.8	12.3	-0.5
46-60	18.5	17.8	-0.8	9.6	10.7	1.1
Above 60	21.0	27.6	6.5	11.5	17.8	6.3

<sup>7</sup> We report the most widely used poverty measures, which are known as Foster-Greer-Thorbecke indexes: the headcount poverty rate, the poverty gap index, and the poverty severity index. The poverty gap index measures the extent to which individuals fall below the poverty line as a proportion of the poverty line. The poverty severity index averages the squares of the poverty gaps relative to poverty line (Introduction to Poverty Analysis, World Bank, 2005).

Groups	Poverty gap index (%)			Poverty severity index (%)		
	2007	2012	Change	2007	2012	Change
<i>Regions</i>						
North	27.1	22.0	-5.1	14.4	12.5	-1.9
Central	23.5	27.3	3.8	12.7	17.5	4.7
South	12.9	17.0	4.0	6.8	10.8	4.0

*Note: Income per capita is measured in the price of January 2012.*

*Source: Authors' calculations based on the BLS 2007 and ELS 2012.*

*All estimates account for complex sample design.*

In Table 2 patterns related to gender and age of the household head mimic those in Table 1: female-headed households are better-off than male-headed households and the intensity of poverty generally diminishes as the age of the household head rises, except for the very highest age groups. The indexes seem to indicate that the North has seen more progress in ameliorating the severity of poverty than has been the case in the Central or Southern parts of the country.

Possession of productive assets and income diversification play important roles in sustainable poverty reduction. Table 3 shows that households in P135-II areas rely largely on agricultural income; crops and livestock are the main contributors (see Table 4). However, there does seem to be an incipient transition from farm to wage activities: the share of agriculture in household income decreased from 64% in 2007 to 57% in 2012, while the share of wage income increased from 20% to 24%.

Table 3: Household income structure.

Household Income	Household income (thousand VND/year)			Income share (%)		
	2007	2012	Change	2007	2012	Change
Total	29,443	34,096	4,653	100	100	0.00
Wage income	6,403	10,000	3,597	20	24	4
Agriculture	16,688	17,464	776	64	57	-6
Non-farm, non-wage	2,707	2,521	-186	5	5	0
Others	3,645	4,110	465	12	14	2

*Note: Income per capita is measured in the price of January 2012.*

*Source: Authors' calculations based on the BLS 2007 and ELS 2012.*

*All estimates account for complex sample design.*

Table 4: Shares of income from agriculture, forestry and aquaculture (%).

Source	2007	2012	Change
Agriculture	100	100	

Crops	64	68	4
Livestock	16	16	-0.15
Agricultural services	0.13	0.21	0.08
Forestry	15	12	-3.70
Aquaculture	4	4	-0.39

*Note : Income per capita is measured in the price of January 2012.*

*Source: Authors' calculations based on the BLS 2007 and ELS 2012.*

*All estimates account for complex sample design.*

Table 5 examines wage income in more detail. The proportion of households having wages (from either long-term or short-term work) increased from 47.7 percent in 2007 to 53.7 percent in 2012; wage income of the poor mainly comes mainly from short-term or seasonal work. Kinh and non-poor households are more likely to have wages than ethnic minority and poor households. However, this gap is relatively small. Although the proportion of households having wage income was rather high for most ethnic minority groups, the share of wages in total income remained low for some, such as Tay, H'Mong, and Dao. Moving from North to South both the share of households earning wage income and the shares of wage income in total income increase sharply.

Table 5: Wage income.

Groups	Households having wage income (%)			Share of wage income in total income (%)		
	2007	2012	Change	2007	2012	Change
Total	47.7	53.7	6.0	19.5	23.9	4.4
<i>Poor/Non-poor</i>						
Poor	41.0	51.4	10.4	14.9	22.4	7.5
Non-poor	55.2	56.2	1.0	24.9	26.5	1.6
<i>Ethnicity</i>						
Kinh	56.5	63.8	7.3	27.7	35.7	8.0
Ethnic minorities	44.9	50.5	5.5	17.1	20.9	3.7
<i>Ethnic minorities</i>						
Tày	47.7	46.8	-0.9	14.4	16.3	1.9
Thái	35.8	50.4	14.7	11.4	20.2	8.8
Mường	59.2	55.3	-3.9	23.2	25.2	2.0
Nùng	48.6	47.6	-1.0	14.2	17.8	3.6
H'Mông	26.3	44.1	17.8	5.4	8.3	2.9
Dao	36.9	40.4	3.4	8.1	14.6	6.5
Others	57.0	58.2	1.2	30.1	32.4	2.3
<i>Regions</i>						
North	38.5	46.1	7.6	11.2	15.7	4.5
Central	48.1	55.8	7.7	19.2	24.2	5.0
South	69.6	69.5	-0.1	41.1	46.4	5.3

*Income per capita is measured in the price of January 2012.*

*Source: Authors' calculations based on the BLS 2007 and ELS 2012.*

*All estimates account for complex sample design.*

Since opportunities for long-term wage employment are limited in the poor areas, non-farm activities can be an important way to increase in productivity and income and reduce poverty. Non-farm production has been found to be an effective way to increase income and reduce poverty for rural households in developing countries (e.g., Lanjouw and Lanjouw 1995; Lanjouw 1998, Ruben and Van Den Berg 2001). In Vietnam, 35 percent of households had income from non-farm activities (excluding wages) in 2010 (according the 2010 VHLSS). Yet, in P135-II communes, the proportion of households having non-farm income decreased from 23.6 percent in 2007 to 13.6 percent in 2012. The poor and ethnic minorities derive very little income from non-farm production. The share of non-farm non-wage income in total income was only 5 percent.

Table 6: Nonfarm income (excluding wages).

Groups	Households having nonfarm income (%)			Share of nonfarm income in total income (%)		
	2007	2012	Change	2007	2012	Change
Total	23.6	13.6	-10.1	5.3	4.7	-0.6
<i>Poor/Non-poor</i>						
Poor	15.6	6.7	-8.9	2.2	1.6	-0.6
Non-poor	32.6	21.2	-11.4	8.9	8.4	-0.5
<i>Ethnicity</i>						
Kinh	31.4	28.0	-3.4	11.3	12.7	1.3
Ethnic minorities	21.2	9.0	-12.2	3.5	2.5	-1.1
<i>Ethnic minorities</i>						
Tày	24.2	6.2	-18.0	3.8	1.7	-2.1
Thái	19.6	9.5	-10.1	3.3	1.6	-1.7
Mường	19.3	12.2	-7.1	3.9	3.8	-0.1
Nùng	21.5	4.1	-17.4	3.8	1.5	-2.3
H'Mông	24.7	4.2	-20.6	2.1	0.4	-1.6
Dao	33.6	3.6	-30.0	2.4	0.8	-1.6
Others	15.3	14.6	-0.7	4.6	4.7	0.1
<i>Regions</i>						
North	25.9	7.2	-18.7	3.5	1.7	-1.8
Central	13.0	11.0	-2.0	3.7	2.9	-0.7
South	30.4	31.9	1.4	11.9	15.0	3.1

Note: Income per capita is measured in the price of January 2012.

Source: Authors' calculations based on the BLS 2007 and ELS 2012.

All estimates account for complex sample design.

## 4. Impact Evaluation Methodology

In this section we discuss the treatment and control communes, examine their program and non-program budget allocations, and describe our household-level impact estimation strategy. As noted in the introduction the treatment consists of public goods development at the commune level so our methodology delivers estimates of Intention to Treat (ITT) effects rather than Average Treatment Effects (ATE) at the household level.

### 4.1. Definitions of treatment and control groups

Commune eligibility for P135-II was initially determined in 2006. However, between 2006 and 2012 some communes that had originally been among the control communes were brought into the program and others that had been in the program advanced sufficiently to be graduated from it at various points during the study period. Changes in treatment status introduce ambiguity into the definitions of treatment and control groups for use in impact analysis. We experimented with three mechanisms to deal with that ambiguity. First we used each commune's initial status in 2006; second, we used each commune's final status in 2012; finally, we dropped all 53 communes that ever experienced a change in status. Preliminary analysis indicated the three approaches yield similar results, so we opted for the third, which is conceptually the cleanest.

As discussed in the introduction, a given commune may host more than one poverty reduction program. The potential impact of any given program may depend on the degree to which it is enhanced by the availability of other programs. However, in the present case a rather different issue came to light. The possibility that authorities shifted non-P135 funds away from P135-II communes and allocated them to non-P135-II communes to compensate the latter for exclusion from P135 was raised by individuals in the field; our data provide some indirect evidence on this possibility.

The 2007 and 2012 commune questionnaires solicited data on commune economic development projects and their funding. Comparison and treatment communes all received some P135 funding (keep in mind that our control and treatment communes had *all* participated in P135-I). The data do not distinguish between P135-I and P135-II, but projects undertaken in more recent years are likely to have been

funded by P135-II, thus we focus on projects undertaken during 2006 – 2012. We calculated cumulative net funding for 2006 – 2012; funds for projects ending after 2012 were pro-rated to estimate the expenditures up to 2012.<sup>8</sup> Average cumulative funding across communes is displayed in Table 7.

While the treatment communes did receive substantially more P135 funds than comparison communes, they also received less non-P135 funds. The averages of funds received by comparison and treatment communes from all sources are statistically indistinguishable. This pattern is consistent with the hypothesis of compensatory reallocation of non-P135 funds by the authorities. The majority of projects recorded for section 5 of the commune questionnaire are infrastructure projects.

Table 7: Budget allocations of control and treatment communes.

Fund Source	Control Communes Average		Treatment Communes Average	
	000 VND	n	000 VND	n
P135	2,047,862	98	3,322,755	245
Other	5,845,986	98	4,586,976	245
All Sources	7,983,848	98	7,909,731	245
Population	3,863	98	4,025	245

*Source: Authors' calculations based on 2007 and 2012 commune surveys. The average populations are not statistically significantly different ( $p$ -value = 0.68). Total populations in our control and treatment communes were 378,614 and 994,163, respectively.*

Under the assumption that the impact of infrastructure funding is independent of funding source, statistically identifying the impact of P135-II on household response variables may be difficult. However, as we see below, we are able to attribute statistically significant impacts to P135-II.

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<sup>8</sup> Amounts were net of local contributions; ten outliers were omitted.

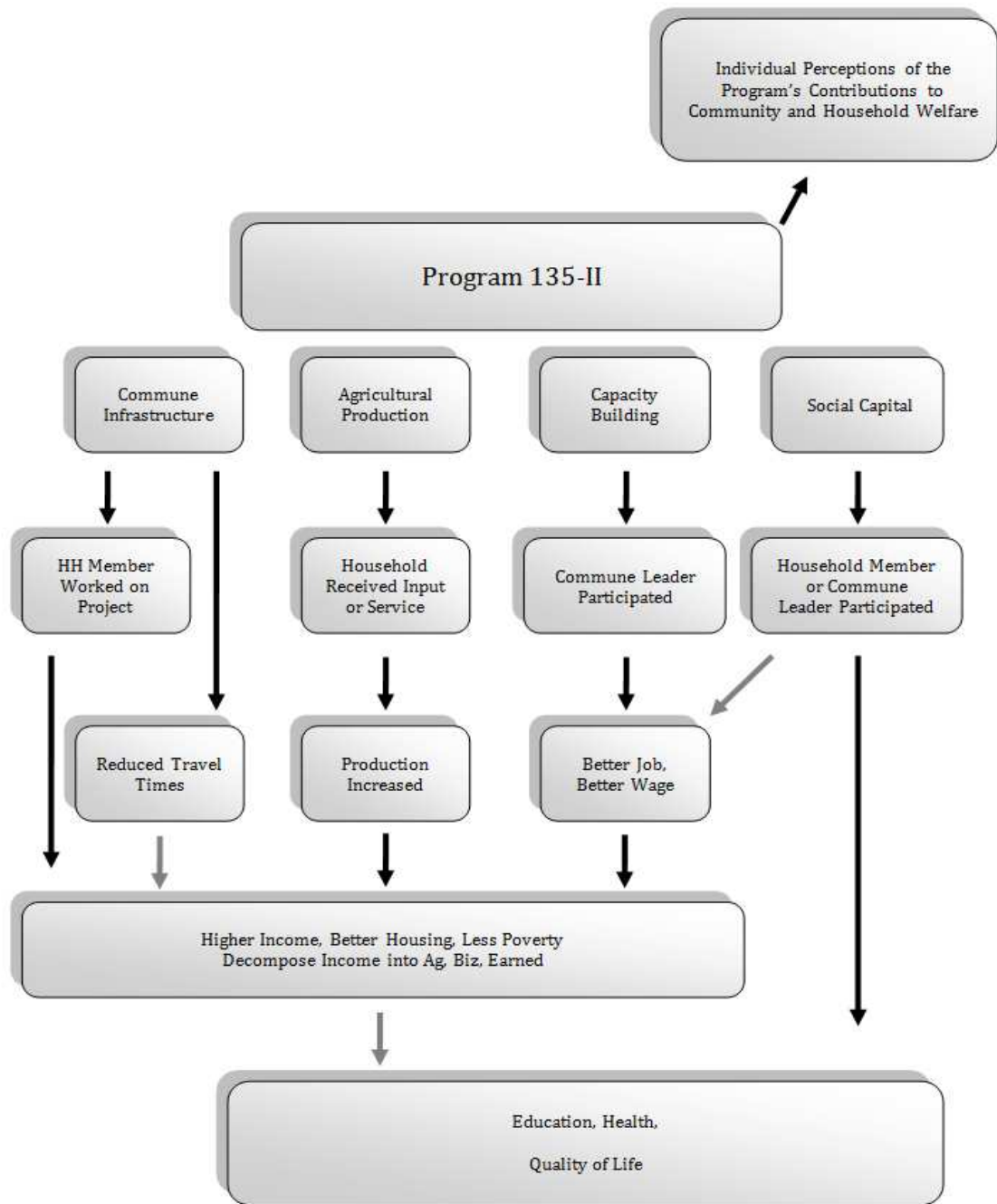


#### 4.2 *Methodology to measure impacts*

Some elements of the impact evaluation framework are illustrated by the simple causal chain hypothesis given in Figure 2 on the next page. Clearly, outcomes like household income and the educations of household members are determined by much more complex mechanisms than are indicated here. Nonetheless, the simple causal chain helps organize our work.

Commune leader and household member perceptions are readily available from the commune and household surveys. Four elements of P135-II are given in the third row of the figure: commune infrastructure, agricultural production, capacity building, and social capital. Linking impacts to those inputs is straightforward because the questionnaires follow up on household members' employment on infrastructure projects, household receipt of agricultural inputs or services, participation of commune leaders in capacity building exercises, and individuals' participation in social capital building exercises. For example, in 2007 49% of households in treatment communes participated in community meetings to select infrastructure projects; this rate rose to 74% in the 2012 survey.

#### **Figure 2: Causal Chain Hypothesis**



Source: Authors.

While many households provide volunteer labor for infrastructure projects, the projects also provide opportunities for earning wages. Over the study period the

proportion of households earning wages for work on commune infrastructure projects increased from 4.4% to 9.1%. Finally, households reported whether they directly benefitted from infrastructure projects. The proportion indicating “yes” increased from 85% to 95% over the study period.

Higher-level outcomes like production, income, and education are driven by more complex mechanisms and are affected by a wide variety of commune and household-specific variables. For these outcomes we rely on econometric tools to identify and estimate program impacts. Econometric impact evaluation requires a model to link each outcome with a set of explanatory variables and an estimation strategy that exploits the panel data feature of the data set. We discuss our econometric models in the next sub-section.

#### *Econometric model*

The model is summarized by the equation given below. The subscripts designate the following:  $c$  = commune,  $i$  = household,  $t$  = time period. Notice that the treatment is at the commune level, not at the household level. The question of self-selection at the household level does not arise in this case. Self-selection might occur at the commune level if communes lobby for inclusion or embrace P135-II with varying degrees of enthusiasm. Certainly, we have non-random assignment of treatment at the commune level: if assignment to treatment were based on exogenous regressors (but not on unobservables), then that could easily be controlled by including those exogenous regressors.

$$Y_{cit} = \beta_0 + \alpha_1 T_{ct} + \beta X_{cit} + \gamma Z_{ct} + \mu_c + \mu_{ci} + \tau Year_t + \varepsilon_{cit} \quad (1)$$

where:

- $Y_{cit}$  Outcome variable
- $T_{ct}$  Treatment indicator
- $X_{cit}$  Vector of *time-varying* observable household characteristics
- $Z_{ct}$  Vector of *time-varying* observable commune characteristics
- $\mu_c$  *Time-invariant* commune characteristics (may include unobservables)
- $\mu_{ci}$  *Time-invariant* household characteristics (may include unobservables)
- $\tau$  *Time-specific* effect

- $\varepsilon_{cit}$  Idiosyncratic household deviations from expectation
- $\alpha_1$  Impact of Treatment on households with  $S_i = 0$

We estimated model (1) using household fixed effects regression to control for the non-time-varying unobservables in  $\mu_c$  and  $\mu_{ci}$ . The estimator  $\hat{\alpha}_1$  is the difference-in-differences estimator with controls.

The possibility exists that spillovers could flow from treatment communes to control communes. However, communes in poor and remote areas tend to have large areas, poor transportation, and low population densities. Thus we expect that the spillover effects would be negligible.

The assumption that  $T_{ct}$  is exogenous requires some discussion. While we know that the primary criterion for a commune’s assignment to treatment was its poverty rate, we also note that the poverty rate would be endogenous for most of the response variables we consider. Thus, we substitute determinants of the poverty rate (they are among the elements of  $X_{cit}$  and  $Z_{ct}$ ) and take equation (1) as a “partial” reduced form equation; “partial” in the sense that we have substituted exogenous determinants for the endogenous poverty rate, but we recognize that assignment to treatment may still be related to some unobservable productivity effects. If these unobservable productivity effects are negatively related to assignment to treatment, then assignment to treatment is endogenous. Furthermore, if the unobservable productivity effects are positively related to the response variables of interest, the estimated treatment effect will be downward biased. If this is the case, our estimated impacts may be considered as “conservative.” Potential endogeneity of assignment to treatment is the subject of ongoing work.

## 5. Impact Estimation Results

Higher level outcomes appear in the lower part of the causal chain illustration presented in Figure 2. In this section we define several key response variables and report the estimated impacts of P135-II on them. These include measures of agricultural production, household income, household poverty status, and so on. We focus heavily on measures of agricultural productivity because important elements of P135-II target

agricultural productivity. Detailed definitions of the key response variables are presented in the appendix

Control variables for the household income regressions include: education and education squared of the best-educated working-age member of the household; age, age squared, and gender of the household head; size of the household; total land area held by the household; annual remittances received by the household; an indicator for the number of negative shocks experienced by the household during the past few years; and a dummy variable for the year (2007 or 2012). Working age is defined as  $15 \leq \text{age} \leq 65$  for both men and women. We ran separate regressions for minority and non-minority households.

Estimation results are given in Table 8 below.<sup>9</sup> Estimated P135-II impact appears in columns headed by DID FE/X (difference-in-differences, fixed-effects, with controls). T-ratios for the hypothesis that the impact is no greater than zero are given, as are one-tail p-values for testing that hypothesis. Impacts are given for minority and non-minority households. The panels on the right-hand side of the table show the sample average values of the outcome variables, which are helpful for interpreting the estimated impacts.

It is essential to keep in mind the role of the counterfactual (control communes) for interpreting the estimated impacts. For example, the estimated impact on asset index for minorities is 0.38. However, the sample means show the following: between 2007 and 2012 the asset index among comparison households decreased from 2.43 to 2.09 (in 2007 households had 2.43 asset items, on average; this declined to 2.09 by 2012). Thus, the change over time was -0.34. Over the same time span asset items owned by households in treatment communes increased from 2.30 to 2.33, an increase of 0.03. Were we to use these data to calculate the difference-in-differences estimator, the calculation would be  $[(2.33 - 2.30) - (2.09 - 2.43)] = 0.37$ . Thus, the significant positive impact does not necessarily mean that households in the treatment area were much better off in 2012 than they were in 2007. The estimated impact in this case should be interpreted as follows: in the absence of treatment, the asset index of

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<sup>9</sup> Fixed-effects estimation was implemented via the xtreg command in STATA; estimation accounted for the complex sample design (stratification, clustering, and weighting). Outliers, defined as observations on the response variable with values greater than four standard deviations from the mean, were deleted prior to estimation.

treatment households *would have decreased* by the same amount as for the comparison households. Finally, we see in this case that the controls did not play a very important role: the estimated impact is quite close to the ordinary DID calculation.

For further illustration, examine the results for income from businesses for non-minorities. The large negative impact (-22,536) appears to indicate that households in the treatment communes are much worse off. Again, the key interpretation is relative: households in the treatment communes saw their incomes from businesses rise from 22,988 to 28,703 between 2007 and 2012. However, households in the comparison communes enjoyed a much larger average increase: from 21,912 to 48,759. Thus, business incomes of households in the treatment communes failed to grow as rapidly as business incomes of counterpart households in comparison communes.

Minority households recorded statistically significant positive impacts due to P135-II for several important variables: productive asset ownership, household durables ownership, and rice productivity. Among higher-order outcomes, they enjoyed positive impacts in income from agriculture, household total income, and household per-capita income. A particularly important result is that poverty among minority households in treatment communes declined significantly more than it declined in comparison communes. Specifically, for ethnic minority households, P135-II increased the rice productivity about 10%, agriculture income about 17%, total income of these households about 16%, and then reduce the poverty of ethnic minority about 10%. In addition, Program helps to reduce the travel time of ethnic minority households to health facilities about 12%.

In only two instances were estimated impacts for minority households negative. First, the value of their corn productivity among households in treatment communes increased less than that in comparison communes. but it did increase (from 770 VND per square meter to 1,590 VND per square meter compared to an increase from 0.94 VND per square meter to 1,940 VND per square meter). In this case we see not only did comparison households enjoy a larger increase in the value of their corn productivity, they started off at a higher value as well. A similar description is appropriate for the negative impact recorded for the share of land allocated to industrial crops.

Statistically significant positive impacts were recorded for non-minority households for their household durables index and for their corn, cassava, and industrial

crops productivities. While the industrial crop productivity increased, the share of land allocated to industrial crops decreased. Perhaps both results were driven by taking the least-productive land out of industrial crops production.

Non-minority households in treatment areas saw their agricultural incomes decline while those in comparison areas saw theirs increase: this contrast is reflected in the statistically significant impact on income from agriculture. The statistically significant impact on income from businesses was discussed above.

Finally, the measured travel time to health facilities in treatment communes increased. While it seems unlikely that travel times to specific facilities increased, this result could be driven by a shift in the mix of health facilities visited.

The right-hand panels of Table 8 support two important generalizations. First, in almost all measures the treatment communes were worse off in 2007 than the comparison communes. This is consistent with authorities directing P135-II resources to communes most in need.

Second, non-minority households are better off than minority households in several very important respects. In particular they have lower incomes and lower school enrollments. For both of these, there is evidence of improvement. Incomes increased, but not as much as non-minorities. Enrollments also increased, and by larger percentages than for non-minorities.

Table 8: Impact estimation results

Response Variable							Sample Averages							
	Minorities			Non-Minorities			Minorities				Non-Minorities			
	DID FE/X	t- ratio	p- value	DID FE/X	t- ratio	p- value	Treatment		Control		Treatment		Control	
							2012	2007	2012	2007	2012	2007	2012	2007
Asset Index	0.38	2.33	0.0099	0.15	0.88	0.1894	2.33	2.30	2.09	2.43	2.04	1.90	2.14	2.16
Durables Index	1.18	7.42	0.0000	1.02	2.04	0.0207	7.45	6.58	8.80	9.14	10.90	9.83	11.08	10.78
House Quality Index	0.01	1.00	0.1587	0.02	1.05	0.1469	0.42	0.38	0.50	0.47	0.57	0.50	0.61	0.54
Rice Productivity (kg/sqm)	0.03	2.00	0.0228	0.002	0.07	0.4721	0.37	0.35	0.42	0.41	0.41	0.38	0.42	0.41
Rice Productivity (000 VND/sqm)	0.04	0.41	0.3409	-0.11	-0.48	0.3156	2.38	1.03	2.65	1.26	2.47	1.13	2.69	1.29
Corn Productivity (kg/sqm)	0.01	1.10	0.1357	0.03	1.44	0.0749	0.18	0.16	0.16	0.16	0.12	0.12	0.12	0.13
Corn Productivity (000 VND/sqm)	-0.18	-2.12	0.0170	0.003	0.02	0.4920	1.59	0.77	1.94	0.94	1.99	0.87	2.16	0.94
Cassava Productivity (kg/sqm)	-0.13	-1.01	0.1562	0.54	2.35	0.0094	1.14	1.26	1.26	1.35	1.64	1.22	1.27	1.21
Cassava Productivity (000 VND/sqm)	-0.16	-0.86	0.1949	0.45	1.69	0.0455	1.43	0.74	1.64	0.83	1.94	0.75	1.69	0.82
Industrial Crop Productivity (kg/sqm)	-0.01	0.10	0.4602	0.43	1.02	0.1539	0.54	0.51	0.53	0.60	1.58	4.42	1.01	1.43
Industrial Crop Prod (000 VND/sqm)	0.03	0.02	0.4920	12.54	2.41	0.0080	5.47	2.73	4.06	2.95	17.71	11.20	5.85	4.04
Share of Land in Industrial Crops	-0.04	-1.32	0.0934	-0.11	-1.91	0.0281	0.18	0.18	0.29	0.21	0.28	0.30	0.23	0.22
Income from Wages & Salaries	634	0.19	0.4247	2,985	1.10	0.1357	14,541	11,535	19,578	15,770	25,512	18,596	23,573	18,542
Income from Agriculture	3,230	3.27	0.0005	-3,285	-1.54	0.0618	19,224	17,446	18,632	18,584	17,039	17,954	16,724	14,774
Income from Businesses	2,104	0.52	0.3015	-22,536	-2.90	0.0019	14,012	7,597	22,268	12,676	28,703	22,988	48,759	21,912
Household Total Income	3,479	2.14	0.0162	-1,644	-0.41	0.3409	31,309	26,634	36,687	33,648	45,123	39,740	45,460	39,460
Household Per-Capita Income	1,118	2.51	0.0060	121	0.11	0.4562	7,047	5,739	8,174	7,722	12,193	9,829	12,083	9,832
Poverty	-0.10	-2.72	0.0033	-0.01	-0.17	0.4325	0.49	0.59	0.40	0.42	0.29	0.32	0.33	0.34
Enrollment: Primary	0.04	0.97	0.1660	0.04	0.50	0.3085	0.83	0.83	0.93	0.92	0.98	0.92	0.95	0.92
Enrollment: Lower Secondary	0.02	0.50	0.3085	0.10	0.96	0.1685	0.60	0.58	0.77	0.72	0.78	0.74	0.90	0.89
Enrollment: Upper Secondary	0.03	0.63	0.2643	-0.03	-0.32	0.3745	0.28	0.24	0.43	0.38	0.53	0.55	0.66	0.68
Travel Time to Health Facilities	-5.82	-1.69	0.0455	9.67	1.41	0.0793	46.13	43.48	39.09	28.48	48.64	37.11	37.25	62.36



Finally, the fact that we found a number of statistically significant impacts despite the fact that overall budget allocations to treatment communes were no different on average than those to control communes suggests that the design of P135-II made it more effective than other infrastructure support. We conjecture P135-II's focus on capacity building and community participation enhanced its effectiveness.

## **6. Conclusions**

This paper aims to evaluate the effectiveness of P135-II. We report the estimated impacts of P135-II on several measures of household production and welfare. In particular, we report the impacts on poverty status, income, agricultural production, housing conditions, and access to basic public services. Our analysis is based on the baseline survey conducted in 2007 and the end-line survey conducted in 2012. These surveys constitute the most comprehensive and reliable panel data set focusing on ethnic minorities in Vietnam.

P135-II is the first large government program in Vietnam to adopt a systematic and well-designed impact evaluation procedure. During the implementation of P135-II, some communes in the treatment group graduated from the program and some communes from the control group were brought into the treatment group. These reassignments were not part of the original program design and they complicated the impact evaluation task. We were compelled to omit communes that had been reassigned; this reduced the sample size, reduced the precision of the estimated impacts, and reduced the power of the necessary statistical tests. In addition, we found that the budget allocations of P135-II communes and comparison communes were not statistically different. While the treatment communes did receive substantially more P135 funds than the control communes received, they also received substantially less non-P135 support. This pattern is consistent with the hypothesis of compensatory reallocation of non-P135 funds by the local authorities (district and province), which has been confirmed by a recent study.<sup>10</sup> The potential impact of P135-II depends on the degree to which it enhances resource availability to target communes. The

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<sup>10</sup> Effectiveness of Targeted Budget Support in Program 135 Phase II- An Aid Effectiveness Evaluation Report. Indochina Research and Consulting, 2011.

reallocation non-P135 funds from P135 communes to non-P135 communes to compensate the latter because they were not included in P135 created a major difficulty for identifying P135 impacts and very likely resulted in underestimating the program impacts. The fact that the P135-II communes actually did not receive more funding than other communes undermined the goals of P135: to reduce the widening gap between P135-II communes and other communes, the gap between poor and non-poor households, and the gap between ethnic minorities and Kinh households. These issues should be addressed and monitored in future programs, especially P135-III, to ensure that the allocation of funds to target groups does not affect the decisions of local authorities on other resource allocations.

The estimated impacts on key response variables for minority households are on balance positive. The most important results are the large and statistically significant impacts on total income, per-capita household income, and poverty status. Results for non-minority households appear mixed, but impacts on the most important measures (total income, per-capita income, and poverty status), are neither large nor statistically significant.

School enrollment is critically important to households and their communities. Enrollment rates of minority children are lower than those of non-minorities, especially for upper-secondary school. However, enrollments improved among households in treatment and in comparison communes. In all cases but one, enrollments in treatment communes increased more than in comparison communes, but the impacts were not statistically significant.

## References

- Bales, S., J. Knowles, H. Axelson, P. D. Minh, D. H. Luong, and T. T. M. Oanh (2007), “The Early Impact of Decision 139 in Vietnam: An Application of Propensity Score Matching”, Report to the Ministry of Health of Vietnam.
- Foster, J., J. Greer, E. Thorbecke (1984), “A Class of Decomposable Poverty Measures”, *Econometrica*, 52, 761-765.
- Khandker, S., Barnes, D., Samad, H., and Nguyen, M. (2009), “Welfare impacts of rural electrification : evidence from Vietnam”, Policy Research Working Paper no. WPS 5057, The World Bank.
- Lanjouw, J. O. and P. Lanjouw. 1995. Rural nonfarm employment: A survey. Policy Research Working Paper, 1463. The World Bank.
- Lanjouw, P. 1998. Ecuador’s rural nonfarm sector as a route out of poverty. Policy Research Working Paper, 1094. The World Bank.
- Mu, R. and Van de Walle, D. (2007), “Rural Roads and Local Market Development in Vietnam”, Policy Research Working Paper, No. 4340, The World Bank.
- Nguyen, V. C. (2011), “Estimation of the Impact of Rural Roads on Household Welfare in Vietnam”, *Asia-Pacific Development Journal*, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), vol. 18(2), pages 105-135.
- Nguyen, V. C., (2008), “Is a Governmental Micro-Credit Program for the Poor Really Pro-Poor: Evidence from Vietnam”, *The Developing Economies*, Vol. XLVI-2, pp. 151-187.
- Ruben R and M. van den Berg. 2001. Nonfarm employment and poverty alleviation of rural farm households in Honduras. *World Development* 29(3): 549-560.
- Van de Walle Dominique (2002), “The Static and Dynamic Incidence of Vietnam’s Public Safety Net”, Policy Research Working Paper Series, No. 2791, The World Bank, Washington D.C.
- Van de Walle, D. and D. Cratty (2002), “Impact Evaluation of a Rural Road Rehabilitation Project”, Unpublished manuscript.
- Van Den Berg, M. and Nguyen, V. C. (2011) “Impact of Public and Private Transfers on Poverty and Inequality: Evidence from Vietnam”, *Development Policy Review*, 29 (6): 689-728.
- Wagstaff, A. (2009), “Estimating Health Insurance Impacts under Unobserved Heterogeneity: the Case of Vietnam’s Health Insurance for the Poor”, *Health Economics*, DOI: 10.1002/hec.1466.
- Wooldridge J. M. (2001). *Econometric Analysis of Cross Section and Panel Data*. The MIT Press, Cambridge, Massachusetts London, England.
- World Bank (2012), “Well Begun, Not Yet Done: Vietnam's Remarkable Progress on Poverty Reduction and the Emerging Challenges”, The Work Bank.

## Appendix

### Definitions of Key Response Variables

#### *Household Assets*

- ❖ Household Productive Assets Index:

$$PAI = \frac{1}{K} \sum_{i=1}^K a_i ,$$

$a_i = 1$  if household has at least one of asset  $i$ , and 0 otherwise;  
assets are listed in Section 5 of the questionnaire.

- ❖ Household Consumer Durables Index:

$$CDI = \frac{1}{J} \sum_{i=1}^J d_i ,$$

$d_i = 1$  if household has at least one of durable  $i$ , and 0 otherwise;  
durables are listed in Section 5 of the questionnaire.

- ❖ Housing Quality Index:

$$HQI = (10 - (h\text{type} + w\text{type} + t\text{type}))/7, \text{ where:}$$

*h*type:        1 = permanent house  
                  2 = semi-permanent house  
                  3 = temporary house

*w*type:        1 = piped water  
                  2 = clean water source  
                  3 = other

*t*type:        1 = flush toilet  
                  2 = other toilet  
                  3 = no toilet

HQI ranges from 1/7 to 1; higher scores indicate “better” houses.

### ***Agricultural Productivity***

- ❖ Productivity (rice):
  - kilograms per square meter of land allocated to rice production;
  - value of rice produced per square meter of land allocated to rice production.
- ❖ Productivity (corn):
  - kilograms per square meter of land allocated to corn production;
  - value of corn produced per square meter of land allocated to corn production.
- ❖ Productivity (cassava):
  - kilograms per square meter of land allocated to cassava production;
  - value of cassava produced per square meter of land allocated to cassava production.
- ❖ Productivity (industrial crops):
  - kilograms per square meter of land allocated to industrial crops production;
  - value of industrial crops produced per square meter of land allocated to industrial crops production.
- ❖ Share of land allocated to industrial crops.

### ***Household Income<sup>11</sup>***

- ❖ Income from wages & salaries, thousands of VND per year.
- ❖ Income from agricultural activities, thousands of VND per year.
- ❖ Income from household enterprises, thousands of VND per year.<sup>12</sup>
- ❖ Household income from all sources, thousands of VND per year.
- ❖ Household income per-capita, thousands of VND per year.

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<sup>11</sup> Real values were computed using province-specific deflators to make 2007 and 2012 values comparable.

<sup>12</sup>This variable has too few observations for analysis.

- ❖ Indicator for household poverty status; the indicator = 1 if real per-capita household income was below the rural poverty line; 0 otherwise.

### *Other Indicators*

- ❖ Primary school enrollment rate: the proportion of household's primary-aged children enrolled in school.
- ❖ Lower secondary school enrollment rate: the proportion of household's lower secondary-aged children enrolled in school.
- ❖ Upper secondary school enrollment rate: the proportion of household's upper secondary-aged children enrolled in school.
- ❖ Travel times to schools.<sup>13</sup>
- ❖ Travel times to health facilities: weighted average of travel times to various facilities, with weights proportional to the numbers of visits by household members to each type of facility.

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<sup>13</sup> These variables had insufficient numbers of observations for analysis.

**Table A1: Differences in P135 Selection Criteria for Control and Treatment Communes.**

Variable	Means		t-statistic for Mean Difference	p-value
	Control	Treatment		
Population	3,649	3,454	0.75	0.45
Poverty Rate	0.60	0.61	-0.56	0.58
Electricity Available?	0.96	0.85	3.07	0.00
Market Available?	0.21	0.24	-0.71	0.48
Irrigation Available?	0.59	0.61	-0.45	0.65
Road Available?	0.93	0.93	-0.26	0.80
Culture House Present?	0.24	0.23	0.13	0.90
Media Station Present?	0.37	0.39	-0.27	0.79
People's Committee House Present?	0.57	0.53	0.77	0.44
Test for distributions of treatment and control communes across Vietnam's 8 topographic regions.			$\chi^2_{(7)} = 9.18$	0.24

Source: Authors' calculations.