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Non-Farm Activity, Household Expenditure, and Poverty Reduction in Rural Vietnam: 2002–2008

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Summary. — Diversifying into non-farm activities has been suggested as an effective way out of poverty for rural households in developing countries. Using the Vietnamese Household Living Standards Surveys of 2002, 2004, 2006, and 2008, we test this claim, and investigate the effect of non-farm sector involvement on poverty and expenditure growth. Our endogeneity-corrected estimates show that an additional household member involved with non-farm activity reduces the probability of poverty by 7–12% and increases the household expenditure by 14% over a two-year period. Our findings also indicate that non-farm involvement reduces the hours worked on farm but not the household agricultural income.

Key words — non-farm activity, poverty, expenditure, instrumental variable estimation, identification through heteroskedasticity, rural Vietnam

1. INTRODUCTION

Agricultural households derive their incomes from land, labor, and capital. However, in developing countries, rural households face small amounts of land per capita and constrained credit opportunities, resulting in a labor surplus in the sector and restricted access to the latest technology for capital investments. Moreover, the income from agriculture, and the prices of agricultural products, are variable and associated with risk and uncertainty. All these factors point to non-farm activities as an important instrument for generating rural welfare, reducing poverty, and absorbing the growing agricultural labor force (Kung & Lee, 2001; Lanjouw & Lanjouw, 2001; Mishra & Goodwin, 1997; Ranis & Stewart, 1993).

An expanding body of literature explores the role of rural diversification, together with the associated incentives and mechanisms, in poverty reduction in developing countries. Ferreira and Lanjouw (2001) argue that in Brazil diversifying into non-farm activities provides additional income for the poor, and acts as a self-insurance tool against negative shocks. In the case of Nigeria, Oseni and Winters (2009) find that participating in the non-farm economy helps agricultural households to overcome credit constraints and reduce risks. This, in turn, improves farm production and assists with consumption smoothing. Emran and Hou (2013) demonstrate that in the case of China, the poor's ability to access the broader market fosters poverty alleviation and economic development. However, the poor may face entry barriers to participating in non-farm activities. It has been argued for several developing countries that non-farm activity requires skilled labor or relatively high levels of education (Cherdchuchai & Otsuka, 2006; Kijima, Matsumoto, & Yamano, 2006; Lanjouw, 1999; Lanjouw & Murgai, 2009; Ruben & van den Berg, 2001). Thus, the poor's engagement in the non-farm economy may be characterized by low levels of labor productivity (Lanjouw, 2001).

The key objective of this paper is to investigate the suggested impact of non-farm activity on poverty and expenditure growth, using the Vietnamese Household Living Standards Surveys (VHLSSs) of 2002, 2004, 2006, and 2008. Our primary motivation is to exploit the strong variations observed in measured poverty, expenditure, and non-farm participation across rural households in Vietnam, which occurred following a series of useful policy reforms during the country's transition from a command to a market economy in the 2000s. To provide an abridged contextual background, the promulgation of the Enterprise Law in 2000 officially recognized the right to do business, eliminated over 100 license requirements in business, and simplified the registration procedures for new firms. Consequently, there was a significant increase in the number of private enterprise registrations, from 14,457 in 2000 to around 36,000 in 2004 (Hakkala & Kokko, 2007). Moreover, in 2001, all domestic enterprises in Vietnam were given the right to trade commodities freely (Decision 46/2001/QD-TTg). This decree led to a dramatic increase in the number of enterprises registered for international trading, from 2,400 in early 1998 to around 18,000 in early 2004 (Thanh, 2005, p. 77). Further, the Law on Foreign Investment in 1996 and its amendment in 2000 have generated significant employment. For example, employment in the FDI sector increased substantively, from 358,500 in 2000 to 1,694,400 in 2008 (General Statistics Office (GSO), 2012). Finally, the trade-liberalization drive that occurred in the same period reduced the tariffs and abolished the quotas, inducing transfer of some farm labor to the non-farm sector (Edmonds & Pavcnik, 2006). Overall, the ongoing transition from a centralized to a market economy, and the consequent departure of labor from agriculture to non-agricultural sectors in Vietnam, has meant new opportunities for rural households in the non-farm economy, and therefore, possible reductions in poverty and increases in expenditure. [1] These factors, together with the availability of rich household surveys that cover almost the entire decade of the 2000s, allow

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us to estimate and quantify the suggested impact of non-farm activities on poverty and expenditure growth in the case of Vietnam.

Our analysis features an important methodological advance over previous studies in that we address the endogeneity of non-farm participation that may arise due to reverse causality or omitted variables. Prior work categorically ignored this issue. We follow a two-pronged approach to address endogeneity: (i) the use of non-farm networks as an instrument for non-farm participation, and (ii) identification through heteroskedasticity, à la Lewbel (2012). Non-farm networks are defined as the share of households participating in non-farm activities at the village level in the previous survey period. This type of networks is prevalent in the context of Vietnam, where the feeling of identification and association with fellow villagers is exceptionally strong. Importantly, in the presence of widespread labor-market imperfections, workers access job-related information through these channels rather than by formal means (Brassard & Acharya, 2006; Emran & Shilpi, 2011; Tarp & Markussen, 2011). The size of non-farm networks also exhibits strong variations across villages, providing us with empirical leverage to argue, at least initially, for predictive power of non-farm networks in non-farm participation in Vietnam. We use both the level and the change in non-farm networks and an exhaustive set of controls to overcome identification issues that may arise due to the general equilibrium effects of non-farm network membership and poverty.

Our second identification strategy—identification through heteroskedasticity—relies on non-spherical disturbances in the residuals, rather than exclusion-restriction assumptions, in the first-stage regression of non-farm participation. This relatively new approach has experienced a growing number of applications because of its ability to provide identification when other exogenous sources, such as instrumental variables, are not available. In our case, the size of arable land owned by households yields the heteroskedastic residuals for non-farm participation required to address the endogeneity.

Our estimation results indicate that rural diversification through non-farm participation significantly helps the poor in Vietnam in their efforts to escape poverty and increase household expenditure. Our endogeneity-corrected estimates are economically meaningful. Having an additional household member partaking in the non-farm sector increases the average household's probability of escaping poverty over a two-year period by 7–12%, and by approximately 30% over a six-year period (2002–08). Likewise, an increase in the share of the total working hours spent on non-farm activities from 25% to 75% increases the probability of exiting poverty by 8–14% over a two-year period and by approximately 35% over the six-year period. Having an additional household member working in the non-farm sector increases the average household's expenditure by 14% over a two-year period, and by more than 50% over six years if that person remains in the non-farm economy throughout the period. These effects are moderately large.[2] For example, two additional members of the mean household working in the non-farm sector in some capacity over a decade are associated with roughly a 100% probability of escaping poverty. Considering that the average size of farm households in our sample was approximately four, such an escape is possible. Further, it seems that two additional household members working in the non-farm sector can double the expenditure of the average household in real terms over a decade. These findings suggest that diversifying into non-farm activities can be a significant instrument for poverty reduction for rural households.

A crucial question at this stage is: What drives the powerful effect of non-farm activity on poverty? Consistent with growing evidence,[3] our investigation shows that non-farm participation increases agricultural efficiency. We find that although additional non-farm hours worked significantly reduce the hours worked on the farm, they do not affect the household's agricultural income. This finding can arise when rural households release their surplus labor, which is redundant on the farm, to the non-farm sector. Thus, availability of non-farm jobs enables the economy to use its labor endowment more efficiently and paves the way for poverty reduction via the additional proceeds it helps to generate.

Taken together, our paper makes three key contributions to the literature. First, we address the endogeneity of non-farm participation in a model of poverty and expenditure, an issue ignored by previous studies. Second, we document that off-farm involvement increases agricultural efficiency through re-allocation of surplus labor to the non-farm economy. This finding contributes to the growing evidence of the positive role of non-farm activity in increased agricultural sector efficiency. Third, we contribute to the broader literature on transition economies by showing that rural households, especially the poor, benefit significantly from the transition to a more diversified rural economy. In this respect, we quantify the role and impact of non-farm engagement on poverty and expenditure.

The rest of the paper is organized as follows. Section 2 describes the theoretical and contextual background of non-farm participation. Section 3 discusses the measures of non-farm activity used in this study. Section 4 details the econometric approach. Section 5 reports the empirical results and Section 6 the robustness checks. Finally, Section 7 concludes.

2. THEORETICAL AND CONTEXTUAL BACKGROUND

(a) *Theoretical underpinnings of non-farm participation*

The economic theories of non-farm employment relate closely to theories of development of the agrarian economy and labor re-allocation from the traditional agricultural sector to the non-agricultural sector. In the celebrated model of Hymer and Resnick (1969), rural households are assumed to participate in not only agricultural production but also non-agricultural non-leisure activities. Non-agricultural output, which is referred to as Z-goods, is not traded and its production can only use rural labor that remains after the society's food needs have been met. As the economy becomes more integrated into the world, the resulting increase in food prices gives birth to agricultural food production for exports and consumption of imported manufactured goods. According to Hymer and Resnick (1969), the re-allocation of rural labor from Z-goods production to agricultural food production in exchange for imported manufactured goods is likely to occur because imported manufactured goods are more complementary to food than Z-goods.

Observing that the non-agricultural sector and Z-goods production was developing in countries like Taiwan, Ranis and Stewart (1993) depart from the theoretical framework of Hymer and Resnick (1969), and argue that as the rural economy becomes more integrated into the world economy, the Z-goods production may actually expand. The reasons for this expansion are as follows. First, non-agricultural production consists of not only traditional but also non-traditional and modern products with enhanced productivity. Second, productivity-raising technology is introduced into the traditional

agricultural food sector. Increased productivity in the food sector allows more labor and land to be released. The released labor is re-allocated to Z-goods production and especially to the production of modern Z-goods. The production of Z-goods expands because its output can be substituted for manufactured imports.

From the outset, our results provide strong support for Ranis and Stewart's (1993) model. The Vietnamese economy in the 2000s features several similarities with the Ranis and Stewart set-up (rather than with Hymer and Resnick's (1969) model) in that the non-farm sector comprises both traditional and modern employment in rural industry and services.

(b) *Non-farm economy in developing countries*

Non-farm involvement of rural households is common in the transition economies of Eastern Europe and Russia. For example, rural households of Central and Eastern Europe drew 30–50% of their incomes from non-farm sources in the early years of transition (Davis & Gaburici, 1999). According to Davis and Pearce (2000), households involved in non-farm activities accounted for approximately 7% of total households in Poland but 65% in Slovenia during the said period.[4] As for Russia, Lerman, Serova, and Zvyagintsev (2008) show that non-farm income accounted for 41% of the total rural family income in 2006. They argue that diversification of income sources is common in rural Russia; two-thirds of families report income from at least three or four sources. In India, which lies outside the transition world, rural non-farm employment accounted for approximately 20% of total employment, or approximately 70 million non-farm employees, in 2000 (Mukherjee & Zhang, 2005), playing a substantial role in non-farm income and poverty reduction (Foster & Rosenzweig, 2004).

Perhaps the most salient case of non-agricultural involvement of rural households belongs to China (Bowlus & Terry, 2003; de Brauw, Huang, Scott, Zhang, & Zhang, 2002). de Brauw *et al.* (2002) estimate that the off-farm labor force increased significantly from approximately 15% (less than 40 million off-farm jobs) in 1981 to 32% (150 million off-farm jobs) in 1995. This rapid expansion of off-farm employment has absorbed the pool of surplus rural labor. Janvry, Sadoulet, and Zhu (2005) find that non-farm sources account for 36% of total household income on average, with 72% of rural households obtaining non-farm incomes. Households that participate in non-farm activities earn more than households that participate in farm activities only. Overall, off-farm employment has contributed significantly to improved standards of living and poverty reduction in rural China (Janvry *et al.*, 2005).[5,6]

The background to the Chinese success story involves economic reforms initiated in the late 1970s and characterized by two distinct stages: decollectivization during the period 1978–84, and the freeing up of the market, which began in 1985 and extended through the 1990s (de Brauw, Huang, & Rozelle, 2000). The Household Responsibility System that was introduced during the initial stage of the reforms allowed rural households to make decisions about crop choices and production on their own (although agricultural land ownership remained vested in the village). Further, farmers were granted the right to keep residual outputs after delivering a certain quota of produce to the state (Benjamin & Brandt, 2002; Fan, 1991). The second stage of liberalization aimed to limit the scope of the government's market interventions and to buttress private sector development. This stage of the reforms cemented the afore-mentioned off-farm employment of rural households and boosted income and productivity in rural China. As the subsection below demonstrates, the Chinese and Vietnamese cases display important parallels in their reform paths during transition.[7]

(c) *Agrarian reforms under the Doi Moi policy and the non-farm economy in Vietnam*

Agrarian reforms were an integral component of Vietnam's radical reform drive known as Doi Moi, which was introduced in the late 1980s. As in the Chinese case, the reforms were characterized by two steps: abolishing collectivization and enacting land reforms, and liberalizing the agricultural markets. The 1988 Land Law allocated land to households with 10–15 years of secure tenure, during which households had the right to own the agricultural output after paying taxes and commissions to the collectives (Do & Iyer, 2008; Pingali & Vo-Tong, 1992). The next wave of land reforms, in 1993, was aimed at enhancing agricultural land-use rights. As per liberalization efforts, the country abolished control over market prices for agricultural products and for inputs into agricultural production. The sector also became engaged in international trade. These measures were aimed at expanding the market for agricultural products, complementing the reforms to land-use rights, and ensuring it was the market, not the centralized authority, that decided which crops would be grown and how much they would be sold for (Pingali & Vo-Tong, 1992; Ravallion & de Walle, 2003).

Agricultural reforms played a crucial role for Vietnam during its transition to a market economy and its development of the non-farm sector. Authors' calculations from available VHLSSs show that in 1993, the non-farm economy engaged 16.5% of rural households; by 2008, this figure had risen to 34%. Similarly, the share of households deriving income from non-farm activities was 42% in 2008, up from 29% in 1998. Table 1 decomposes non-farm employment during the period 2002–08 according to industry, economic sector, and skill level. It is clear that rural households are engaged in a diverse set of tasks in the non-farm sector. Most non-farm employment is generated by manufacturing (i.e., food and beverage production, wood processing, furniture, fur products, and non-metal mineral products), construction, and trading. In 2008, self-employment (including family business) constituted approximately 40% of non-farm employment. Jobs categorized as self-employment typically include work in handicrafts, trading, and family business. Wage employment in the private sector (mainly for other households), and to some extent in the state-owned and FDI sectors, represents another 53% of non-farm employment. Close to 90% of households are engaged in blue-collar work. Of this, some 50% require skills concomitant with complex processing tasks, while around 40% do not require any skill. The VHLSSs indicate that households are engaged with the non-farm economy both full-time and for shorter periods, implying that non-farm jobs can be permanent or temporary. Table 2 reports the average hourly wage in the non-farm sector by expenditure quintiles. It shows, importantly, that the poorest earn the lowest wage in the non-farm sector, suggesting that rural households need to own certain endowments to take full advantage of non-farm engagement. The endowments most likely to be related to higher-return non-farm activity are literacy and schooling.

3. DATA AND DESCRIPTIVE STATISTICS

Nationally representative, the VHLSSs of 2002, 2004, 2006, and 2008 include detailed information at both the household

Table 1. *Percentage of rural individuals participating in non-farm economy*

	2002	2004	2006	2008
Panel A: By industry				
Mining	2.26	2.19	2.05	1.79
Manufacturing	31.52	30.82	31.81	32.27
Construction	12.45	13.89	14.33	15.34
Trading	25.19	22.97	23.93	21.14
Hotel and transportation	11.1	11.55	10.42	10.49
Other services	17.48	18.59	17.46	18.96
Total	100	100	100	100
Panel B. By economic sector				
Self-employment				
Self-employed (including family business)	48.23	43.54	41.37	39.34
Wage employment				
For other households	28.4	27.1	27.46	30.38
State-owned enterprises	16.95	17.65	16.57	15.96
Collective sector	0.85	1.36	1.15	2.02
Private sector firms	3.98	7.76	9.58	8
Foreign direct investment	1.6	2.59	3.87	4.03
Total	100	100	100	100
Panel C: By skill				
White-collar	12.22	13.94	14.19	13.36
Blue-collar (skilled)	41.02	38.56	43.38	48.71
Blue-collar (unskilled)	46.76	47.5	42.43	37.93
Total	100	100	100	100

Notes:
Panel A: Manufacturing mainly includes food and beverage production; wood processing; furniture production; fur processing and fur products; non-metal mineral products; metal products; textile; and leather products (which together make up 90% of non-farm employment of rural households in manufacturing in 2006). Trading includes vehicle sales, maintenance and repair; retail sales of fuel wholesale and agent sales (excluding motor vehicles and motorbike); retail sales (excluding motor vehicles and motorbikes); and repair of family appliances.
Panel B: All sectors are non-farm sectors (i.e., information recorded once the respondent says 'yes' to the question "Do you work outside the farm?" in the VHLSSs).
Panel C: The VHLSSs define blue-collar (skilled) labor as those with the necessary knowledge and experience for implementing complicated jobs, and with an understanding of production means and production lines, including the characteristics of the final products. Blue-collar (unskilled) labor is defined as those with knowledge and experience in simple and monotonic jobs, using mostly physical strength to do the work. White-collar refers to those who work as CEO of private companies, as leaders in local governments at commune level, as party leaders at commune and district levels, and so on.
Source: Authors' calculations based on the VHLSSs.

Table 2. *Mean wage per hour earned in non-farm sector by quintiles of per capita expenditure (rural Vietnam)*

Quintile	2002	2004	2006	2008
The poorest	2.58	2.98	4.11	5.14
The poor	3.00	3.26	4.32	5.97
The middle	3.18	3.77	4.95	6.53
The relatively rich	4.54	4.26	5.53	7.62
The rich	5.26	5.72	7.94	9.48

Source: Authors' calculations based on the VHLSSs. The figures are in 1000 VND and deflated by monthly regional CPIs.

and commune levels. These surveys were implemented by the Vietnamese General Statistics Office (GSO), with technical assistance from the World Bank, and funded by the United Nations Development Programme. The surveys covered 22,101 rural households in 2002, 6,500 in 2004, 6,828 in 2006, and 6,576 in 2008.

While the VHLSSs are comprehensive and methodologically sound, they do not observe the *same* households consistently over the period 2002–08. The VHLSSs of 2002 and 2004 form a panel dataset covering 4,092 households observed in both years, 2,954 of which lived in rural areas. Similarly, the VHLSSs of 2004 and 2006 generate a panel dataset including 4,277 households, 3,224 of which lived in rural areas. Finally, the VHLSSs of 2006 and 2008 create a panel dataset covering 4,090 households, 2,979 of which lived in rural areas. Further, the datasets of 2002, 2004, and 2006 jointly cover 1,952 households, 1,493 of which lived in rural areas. There are also 1,835 households jointly covered in 2004, 2006, and 2008, 1,375 of which were rural households. There are no common households between the surveys of 2002 and 2008.

We use the GSO poverty line to define poverty.[8] Our main variable of interest in this study, non-farm employment, is defined as any economic activity described in Table 1. Although our definition of non-farm employment includes employment due to seasonal migration, the latter does not drive non-farm engagement because non-farm employment in rural Vietnam takes place predominantly in local communities. Consequently, the scope of non-farm employment in this study is broader than that of seasonal migration.[9]

We utilize three measures of non-farm activity: (i) the number of household members participating in non-farm sector; (ii) the share of household members participating in non-farm economy in the household; and (iii) the share of the household's working hours on non-farm activities to their total working hours. The first measure enables us to consider the participation of household members in non-farm sector over the previous twelve months. However, if the household size is large, they would be more likely to send more of their members to work in the non-farm sector. Therefore, the second measure of non-farm activity allows us to consider the relative prevalence of non-farm employment in the household. These two measures do not distinguish the time periods that households spend in non-farm activities. For example, some households work in non-farm sector for three months in a year, while other households do such work for twelve months. Thus, we also utilize the share of households' hours spent in non-farm activities as a third measure. In summary, the use of three different measures of non-farm involvement allows us to consider its impact from different aspects, and to check the robustness of our results.

Another measurement issue is related to welfare. Binary poverty models are criticized for relying on arbitrary poverty lines (Deaton, 2005; Ravallion, 2003). Thus, we also adopt real expenditure per capita as a continuous measure. However, expenditure per capita may not be ideal for measuring household welfare because it ignores the fact that children consume less than adults. Further, there are economies of scale in household consumption (Deaton & Paxson, 1998). Therefore, we use the real expenditure per equivalent adult as another measure; adults are assigned a weight of 1 and children under age 14 are given a weight of 0.65 (see Litchfield & Justino, 2004).

Table 2 indicates that the wage per hour increases with expenditure. As noted, the poorest earn the lowest wage in non-farm activities. The table also shows that real wages doubled in just four years in Vietnam. Thus, it is hardly surprising that farmers choose to join the non-farm sector, and that once they do so, they may experience poverty reduction.

Table 3 presents the share of households participating in the non-farm economy across five quintiles of per capita

Table 3. *Percentages of rural households participating in non-farm economy by quintiles of per capita expenditure*

Quintile	2002	2004	2006	2008
The poorest	21.11	23.56	25.93	27.85
The poor	36.14	43.01	44.84	47.04
The middle	48.56	54.65	53.59	52.27
The relatively rich	55.35	59.01	60.54	61.38
The rich	65.08	65.9	66.5	65.03

Source: Authors' calculations based on the VHLSSs.

expenditure. The probability of participating in the non-farm sector increases with expenditure. The percentage share of non-farm households among the rich remained unchanged from 2002 to 2008, while among the relatively rich, this share increased modestly. In contrast, the percentage of non-farm households among the poor increased relatively dramatically during 2002-08, from 36.1% to 47%. Finally, the growth of non-farm participation was higher among the poor than among the poorest.

Table 4 shows that the mean per capita expenditure of non-farm households was greater than that of farm households in both 2002 and 2008. The *gap* in mean per capita expenditure between farm and non-farm households increased from 800,000 VND in 2002 to 1,656,000 VND in 2008. The average non-farm household size is larger than that of farm households, indicating that larger households are more likely to supply labor for non-farm activities.

4. ECONOMETRIC METHODOLOGY

(a) *Instrumental variable estimation*

To investigate the effects of non-farm activity on poverty, we use a probit model:

$$P_{it} = \beta_1 + \beta_2 R_{it} + \boldsymbol{X}\boldsymbol{\lambda} + \varepsilon_{it} \quad (1)$$

where i denotes a household, t = 1, 2 is the survey period, P is a dummy indicator for poverty status, R is a measure of non-farm activity, $\boldsymbol{\lambda}$ is a vector of coefficient estimates, **X** includes regional dummies (Red River Delta, North East, North West, South Central Coast, Central Highlands, South East, and Mekong River Delta); variables related to household characteristics (the amount of annual land, perennial crop land, forest land, and water surface land owned; sex, ethnicity, and age of household head; dummies indicating vocational education, upper-school, lower-school, and primary school education of household head and spouse; household size, number of household members aged over 55, and number of household members aged under six); and variables related to commune characteristics (dummies indicating the existence of a trading villages, a roadway, a lower secondary school, an upper secondary school, a post office, a market, and enterprises and factories within a 10-km radius, all for the commune). ε is the column vector of the error term.

The OLS estimation of Eqn. (1) is likely to suffer from omitted variables and reverse causality problems. Unobserved effects such as the ability, entrepreneurship, or risk-taking characteristics of the individuals may drive the omitted variables problem. These effects cannot be measured by the data but can affect both non-farm involvement and poverty status simultaneously. For instance, given two individuals with the same level of schooling, one may have an entrepreneurial trait acquired from his/her family, in which case s/he will be less likely to be poor and more likely to participate in non-farm activities. [10] However, the observable schooling information could not distinguish between these two individuals.

Reverse causality may work in two directions. On the one hand, an individual's poverty status or expenditure level may affect their probability of participating in the non-farm economy, especially when those activities require a certain level of endowment. On the other hand, poor households may have a greater incentive to leave their farms to seek the better and more stable incomes that might be secured via non-farm jobs.

Both omitted variables and reverse causality underlie the perennial problem of endogeneity. [11] The net direction of the bias here is also ambiguous. Omitted variables and reverse causality could each bias the estimated effect of non-farm involvement in either direction. For instance, individuals may have different levels of ability in non-farm and farm activities. Ability that is related to non-farm activities would result in $\mathrm{Cov}(R_i, \varepsilon_{it}) > 0$ in Eqn. (1), while ability associated with farm activities would lead to $\mathrm{Cov}(R_i, \varepsilon_{it}) < 0$. Other unobservables, such as entrepreneurship and the risk-taking characteristics of individuals, feature similar ambiguities in terms of the net direction of the bias. With respect to the direction of the bias due to reverse causation, consider the poverty equation: $P_i = \delta_0 + \delta_1 R_i + e_{1i}$, where $\delta_1 < 0$, because as non-farm activity R increases, poverty P decreases. Consider also the reverse

Table 4. *Characteristics of rural households by farm/non-farm involvement status*

	2002		2008	
	Farm households	Non-farm households	Farm households	Non-farm households
Mean per capita expenditure (1000 VND)	2363	3163	5587	7243
	(1491)	(1765)	(3839)	(4459)
Annual crop land (1000 m^2)	5.175	2.607	5.833	2.707
	(8.15)	(5.515)	(11.07)	(6.274)
Perennial crop land (1000 m^2)	1.695	0.757	1.758	1.03
	(5.285)	(3.572)	(8.636)	(6.35)
Forest land (1000 m^2)	2.401	0.563	2.257	0.904
	(12.939)	(4.97)	(14.299)	(11.166)
Water surface land (1000 m^2)	0.524	0.198	0.628	0.374
	(5.532)	(1.827)	(7.102)	(2.914)
Age of household head	47.6	46.6	50.4	48.7
	(15.3)	(13.3)	(14.9)	(12.4)
Household size	4.5	4.6	4.0	4.3
	(1.94)	(1.66)	(1.8)	(1.52)

Source: Authors' calculations based on the VHLSSs. Statistics in parentheses are standard deviations.

relationship: $R_i = \theta_0 + \theta_1 P_i + e_{2i}$, where θ_1 can be either greater or less than 0, which means that the way in which poverty P influences non-farm activities is not straightforward. For example, poor households may have greater incentives to participate in non-farm activities as a way of improving their living standards. However, if non-farm participation involves search costs, transport costs, and so on, then poverty is likely to be associated with a reduced likelihood of participation in non-farm activities. The reduced form of R_i shows that the sign of $\mathrm{Cov}(R_i, e_{1i})$ is the sign of $\theta_1/(1 - \delta_1\theta_1)$. Since the absolute values of δ_1 and θ_1 are less than 1, the sign of the correlation $\mathrm{Cov}(R_i, e_{1i})$ depends on the sign of θ_1. If $\mathrm{Cov}(R_i, e_{1i}) < 0$, then the OLS estimates will have a downward bias, and vice versa. [12]

We choose non-farm networks as an instrument for non-farm participation based on the migration literature. It is well known that older cohorts of migrants attract people from their native towns to their new homes. de Brauw and Harigaya (2007) exploit this fact in their study of the impact of seasonal migration on the welfare of rural households in Vietnam during the 1990s. (See also Banerjee, 1984; Du, Park, & Wang, 2005; McKenzie & Rapoport, 2007; Rozelle, Taylor, & de Brauw, 1999; Taylor, Rozelle, & de Brauw, 2003; Yap, 1977) In this vein, Kajisa (2007) refers to the crucial role of non-farm networks in helping individuals to find employment in the non-farm sector. This effect is specifically relevant in the case of Vietnam, where fellow villagers share strong bonds, have a keen desire to identify themselves with their village, and prioritize their fellow villagers. Rooted in Confucianism, individuals' feelings of attachment to people from their own village of origin in Vietnam have strengthened over time. [13] For instance, often, only fellow villagers (especially male fellow villagers) are taught how to make particular handicrafts to earn extra income or for their own use. Fellow employers also facilitate the networking of their employees when they live in cities, or employ their peers in business for a long period. Thus, the strong feelings of identification with place of origin, the close relationships between fellow villagers, villagers' habit of going back to the village on numerous festive occasions during the year, and so on, all help to explain why networks have strong contextual validity in our analysis. [14] Importantly, sizes of non-farm networks also exhibit strong variations across villages, yielding the statistical leverage to explain households' non-farm involvement.

Given this background, we argue for a predictive power, at least initially, of non-farm networks on non-farm engagement. The related measure is non-farm participation at the village level in the previous survey period (i.e., two years ago). The statistical validity of this effect is supported across all specifications with high F-statistics in the first stage (see Stock & Yogo, 2005, chap. 5). It remains to be established that non-farm networks do not have an effect on poverty and expenditure growth through channels other than non-farm participation. One possible channel is the general equilibrium effects, where the size of the village-level non-farm sector may influence agricultural wages, returns from cultivation, input and output prices, and so on. Alleviating these concerns is the fact that such general equilibrium effects are often determined at a much larger geographical scale, sometimes even at the national level or by the government. In Vietnam, villages are the smallest administrative units, ranked behind communes, districts, and provinces, and thus village-level non-farm networks are a relatively *local* phenomenon. Even similarly sized villages in close proximity may have their own distinct non-farm networks, which are of a different size, *and* members hardly mix with each other.

Another possible channel for the direct effect is economic shocks that affect both non-farm networks and income simultaneously. To address these concerns, we utilize an exhaustive set of controls, including commune-level infrastructure variables, such as whether the commune has a roadway, post office, market, secondary school, trading village, or enterprises in the surrounding area, which can absorb such shocks. Notwithstanding these precautions, we check thoroughly the robustness of non-farm networks as an IV in Section 6.

To specify our first-stage equation for non-farm participation explicitly, we have:

$$R_{it} = \alpha_1 + \alpha_2 M_{t-1} + \boldsymbol{X}\boldsymbol{\lambda} + u_{it} \tag{2}$$

where M_{t-1} is the village-level non-farm networks. Depending on the non-farm participation measure R, M is measured using the share of people participating in non-farm activities in relation to the total working population in the village, or the share of non-farm working hours to total working hours, again at the village level. Given the availability of panel data for households only over two survey periods (see Section 3), Eqn. (1) is then estimated with IV-probit in cross-sectional form (i.e., using the 2004, 2006, and 2008 datasets separately), with the instrument for each survey period coming from the previous survey period.

The analysis above only allows us to consider the statics of non-farm activity, ignoring the changes in households' living standards. Thus, we next explore the effect of *changes* in non-farm activity on the changes in household welfare. Consider first:

$$Y_{it} = \gamma_1 + \gamma_2 R_{it} + \boldsymbol{X}\boldsymbol{\delta} + e_{it} \tag{3}$$

where Y is the log expenditure per capita or per equivalent adult. We adopt the following variant of the differenced Eqn. (3):

$$\Delta Y_{it} = \gamma_2 \Delta R_{it} + \boldsymbol{X}_0\boldsymbol{\delta} + \Delta e_{it} \tag{4}$$

Note that differencing Eqn. (3) eliminates time-invariant covariates, such as regional dummies and the initial characteristics of households and communes, from the model. Given the possible correlation of these variables with changes in expenditure per capita or in non-farm activity, we control for their initial values $\boldsymbol{X}_0$ in the model (i.e., observations of the first survey period).

To manage possible reverse causality, we use the lagged *change* in non-farm networks as an instrument for change in non-farm activity. Thus, the first-stage of Eqn. (4) looks like:

$$\Delta R_{it} = \alpha_3 \Delta M_{t-1} + \boldsymbol{X}_0\boldsymbol{\varphi} + \Delta u \tag{5}$$

Change in non-farm networks has some additional advantages over levels in that it can bypass some long-term issues that might risk identification. Eqn. (5) yields the anticipated negative sign for α_3, indicating a 'convergence' effect. Given this background, we estimate Eqn. (4) with 2SLS using two different datasets, one covering the survey periods 2004 and 2006, and the other covering 2006 and 2008, with both using instruments from the previous survey periods (note again that the dataset becomes a cross-sectional in practice).

(b) *Identification through heteroskedasticity*

Although village-level non-farm networks appear to have a sound theoretical basis as an instrument, they may still reflect some unobserved factors that affect poverty or expenditure (for instance, entrepreneurial ability may be associated with larger non-farm networks). Moreover, non-farm networks in

the community may affect the economic wellbeing of households not participating in the non-farm activity in other ways. For example, informal risk sharing would result in a greater capacity to smooth consumption for all households in the larger non-farm network community, regardless of whether or not they participate in the non-farm sector. Consequently, we adopt an alternative identification approach—that is, identification through heteroskedasticity, à la Lewbel (2012). The major appeal of this identification method is that it bypasses some of the stringent conditions associated with standard IV estimation, such as excludability. Further, this method, relying on a second-order variation that is orthogonal to the exclusion-restriction assumptions, can facilitate statistically reliable over-identification tests, and hence, cross-checking of the validity of our standard IV (non-farm networks). However, the method has two shortcomings. First, because exogenous variation is obtained from a second-order relationship, the estimator is inefficient. Second, the method has been proven valid only for certain models, such as those with continuous dependent variables.

To provide an abridged general description, consider $Y = R\beta + \boldsymbol{X}\gamma + e$, where Y is the dependent variable, R is endogenous explanatory variable, and $\boldsymbol{X}$ is the vector of exogenous variables. Initially, a set of exogenous variable(s), $\boldsymbol{Z}$, where $\boldsymbol{Z} \epsilon \boldsymbol{X}$, or even $\boldsymbol{Z} = \boldsymbol{X}$, is identified. In the first-stage, the endogenous variable R is regressed on the $\boldsymbol{Z}$ vector, which is followed by the retrieval of the first-stage residuals, $\hat{v}$. Using these residuals, $(Z_i - \overline{Z}_i)\hat{v}$ is constructed for Z_i where $\overline{Z}_i$ is the mean of Z_i (and i now denotes the members of the $\boldsymbol{Z}$ vector). $(Z_i - \overline{Z}_i)\hat{v}$ can be used like standard instrumental variables in the second stage. The second-stage regression can be estimated by 2SLS or GMM. Lewbel's method requires that the error terms in the first-stage equation be non-spherical, and the coefficients be equal across the two groups (see below). Given that the method's validity has not been proven for a probit model, we use it only for the differenced expenditure regression (Eqn. (4)).

We find that in Eqn. (4), the size of arable land owned by households generates the heteroskedastic residuals required to address the endogeneity of non-farm participation. As Figure 1 indicates, relatively smaller landholdings are associated with a larger residual variance of non-farm participation, while relatively larger landholdings are associated with a smaller residual variance.[15] This finding is not surprising given that landholders with larger holdings are likely to be more strongly attached to their land compared to landholders with smaller holdings, who would have higher variations in their affinities with their land.[16]

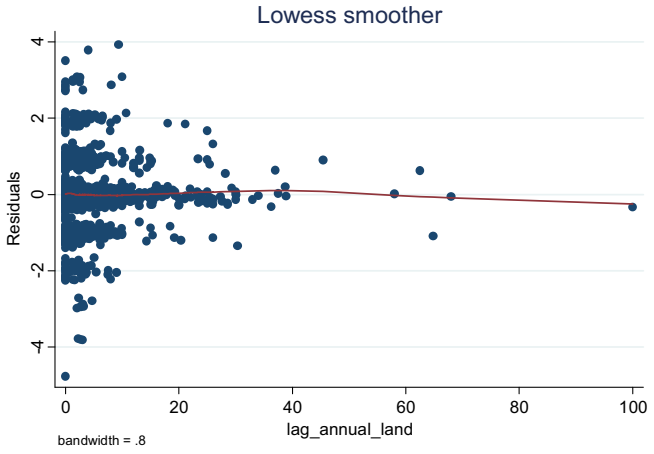

Figure 1. *Size of arable land and heteroskedastic residuals.*

One concern here is whether there is a selectivity issue associated with arable land. The poor may own larger pieces of land while the non-poor own smaller pieces, or vice versa. However, this is unlikely to constitute a problem. First, the difference in the average amounts of arable land between the poor and the non-poor was economically insignificant in 2002 and subsequent years.[17] Second, the amount of arable land available for villagers varies across villages, because the land re-allocations carried out after 1989 were based on the total available land area of a village. Thus, some villages have smaller populations but larger land areas, implying a relatively larger amount of arable land per capita than in other villages.[18]

What remains to be discussed is the assumption of equal coefficients. How plausible is it that the contribution of non-farm activity to household income is identical for "land-rich" *vs*. "land-poor" households? While heteroskedasticity classifies the households into land-rich and land-poor, this is largely because one group is endowed with *relatively* more land than the other. In the context of Vietnam, both groups can be considered subject to limited land in *absolute* terms, characterizing the agricultural households in both categories by a labor surplus. In this case, it is not unreasonable to believe that releasing the surplus labor to the non-farm sector would have a reasonably similar effect on household income in both groups.[19] To qualify this argument formally, we test the difference in land size between the poorest and the richest household for each of the four years of the VHLSS. The tests, reported only for 2006 to save space in the Appendix (Table 10), confirm that there is no statistically significant difference in land size between the poorest and the richest households.

5. EMPIRICAL ANALYSIS AND RESULTS

(a) *Instrumental variable estimation of non-farm participation and poverty*

Eqn. (1) is estimated both with and without the instrumental variable method, using the three measures of non-farm activity as defined in Section 4a. The results for the three cross-sectional datasets of 2004, 2006, and 2008 are reported in Table 5. Panel A indicates that, ignoring the endogeneity problem and using a simple probit estimation, an additional household member working in the non-farm sector increased the probability of the household being non-poor by 8.2%, 6.5%, and 3.9% over a two-year period in 2004, 2006, and 2008, respectively, at the *mean* level of non-farm involvement. However, using the IV-Probit estimation, the same effect is estimated to be larger: 12.1%, 9.5%, and 7% in 2004, 2006, and 2008, respectively.[20] Given that these figures are at the mean level of non-farm participation, they will be higher for those above the mean. Nevertheless, for an average household, an additional member would imply approximately a 35% higher likelihood of escaping poverty, if that member remains in the non-farm economy over a six-year period.[21]

Panel B reports the results relating to the second measure of non-farm involvement. A simple probit estimation shows that a 10% increase in the share of household members working in the non-farm sector increased the likelihood of being non-poor by 3.25%, 2.65%, and 1.36% in 2004, 2006, and 2008, respectively. Using IV-Probit, the effects are again larger. In

particular, a 10% increase in the share of members participating in non-farm activities increased the probability of the household being non-poor by 4.82%, 4.16%, and 2.81% in 2004, 2006, and 2008, respectively.[22]

Similarly, panel C presents the estimation results using the share of non-farm working hours to total working hours of the household as the non-farm activity measure. Ignoring endogeneity, a 10% increase in the share of non-farm hours increased a household's likelihood of escaping poverty by 1.99%, 1.55%, and 1.09% in 2004, 2006, and 2008, respectively. Consistent with the findings above, the IV estimation shows that the estimated effects are greater with instrumentation:[23] 2.78%, 2.17%, and 1.66% in 2004, 2006, and 2008, respectively. These coefficients suggest that an increase in the share of non-farm hours worked from 25% to 75% of total hours increases the probability of exiting poverty by 8–14% over a two-year period.

Given the possible directions of biases discussed in Section 4a, either reverse causality (i.e., the difficulties associated with the participation of the poor in the non-farm economy) and/or the ability, entrepreneurship, and risk-taking features of individuals that lead to better farming performance are likely to be behind the bias, resulting in $\mathrm{Cov}(R_i, e_{1i}) < 0$ in the regression. The importance of endowments for participation in non-farm activities suggests that in this setting, it is most probably reverse causality that is the dominant factor, driving endogeneity.

Another finding that arises from our coefficient estimates is that the role of non-farm participation in poverty alleviation weakens from the first to the third period of analysis. This finding is consistent across the three different measures of non-farm activity. There exist two potential explanations for this finding. First, a poverty trap—a common and well-documented problem in developing countries (Sachs *et al.*, 2004)—might exist for the poorest. In the presence of a poverty trap, a marginal increase in non-farm participation is unlikely to help those who are further below the poverty line. This is consistent with Table 2, which documents that the non-farm wages are the lowest for the poorest. The second explanation might be related to the global financial crisis of the late 2000s. With the adoption of an export-oriented growth policy, the Vietnamese economy has become more vulnerable to external shocks. If the global financial crisis affected non-farm jobs more than other sectors, non-farm participation would be likely to have a weakening effect on poverty.

(b) *Instrumental Variable Estimation of Non-farm Participation and Expenditure*

Table 6 reports the estimation results of Eqn. (4) across the three measures of non-farm involvement and using two different datasets, 2002–04–06 and 2004–06–08. Strictly speaking, these datasets become cross-sectional datasets during the estimation because differencing results in loss of one period and the use of a lagged instrument causes loss of another period. OLS estimation finds a statistically insignificant effect using the 2002–04–06 dataset (column 1 of panel A) and a significant but unexpectedly negative coefficient using the 2004–06–08 dataset (column 3 of panel A). However, estimations with 2SLS find that an additional household member working in the non-farm sector has a positive and highly significant effect on expenditure growth using the 2002–04–06 dataset (column 2 of panel A) and a positive but insignificant effect using the 2004–06–08 dataset (column 4 of panel A). Specifically, an additional household member participating in the non-farm sector leads to an *average* expenditure growth of 14.1% over a two-year period in 2002–04–06.[24] If this effect is extrapolated to the whole decade, it can be reasonably argued that two additional household members might double household expenditure in real terms.

For the second measure of non-farm activity, the share of household members working in non-farm activities, the OLS results show that non-farm activity is statistically significant at the 10% level over the period 2002–04–06 (column 1 of panel B) and statistically insignificant over the period 2004–06–08 (column 3 of panel B). Adopting 2SLS, the results suggest that the change in the share of household members partaking in non-farm activity is statistically significant at the 5% level for the 2002–04–06 dataset (column 2 of panel B) and nearly significant at the 10% level (p-value equals 0.13) in 2004–06–08 (column 4 of panel B). A 10% increase in the share of household members participating in non-farm activities increased the two-year expenditure growth by 4.7% in 2002–04–06 and by 4.9% in 2004–06–08.[25]

Regarding the final measure of non-farm involvement, the share of households' working hours in non-farm activities in

Table 5. *Marginal effects of non-farm participation on poverty. (The dependent variable is 1 if the household is poor and 0 otherwise) Mean dependent variable: 0.24, 0.18, and 0.175 in 2004, 2006, and 2008, respectively*

	Dataset 2002–04		Dataset 2004–06		Dataset 2006–08	
	Probit	IV-Probit	Probit	IV-Probit	Probit	IV-Probit
Panel A						
Number of household members working in non-farm economy	−0.082***	−0.121***	−0.065***	−0.095***	−0.039***	−0.07***
Wald test of endogeneity (p-value)	0.01		0.04		0.05	
Panel B						
Share of household members working in non-farm economy	−0.325***	−0.482***	−0.265***	−0.416***	−0.136***	−0.281***
Wald test of endogeneity (p-value)	0.01		0.02		0.02	
Panel C						
Share of non-farm hours to total working hours of household	−0.199***	−0.278***	−0.155***	−0.217***	−0.109***	−0.166***
Wald test of endogeneity (p-value)	0.03		0.09		0.14	
Number of observations	2954	2954	3224	3224	2979	2979

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. All regional, household and commune-level variables as described in Section 4a are included in the models in each panel. All standard errors are corrected for commune clustering. IV: Non-farm networks in the previous period. For the dataset 2002–04, for instance, the probit regression is run with observations from 2004 but non-farm networks observations from 2002.

Table 6. *Effect of changes in non-farm participation on changes in expenditure. Dependent variable: Δ log (expenditure per capita). Mean dependent variable: 0.31 in 2002–04–06 and 0.31 in 2004–06–08.*

	Dataset 2002–04–06		Dataset 2004–06–08	
	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)
Panel A				
Change in the number of household members working in non-farm economy	0.008	0.141**	−0.026*	0.149
Hausman test for endogeneity (*p*-value)		0.01		0.06
Panel B				
Change in the share of household members working in non-farm economy	0.092*	0.466**	0.063	0.49 (*p*-value = 0.13)
Hausman test for endogeneity (*p*-value)		0.03		0.16
Panel C				
Change in the share of the household's working hours in non-farm economy	−0.005	0.333**	0.017	0.392*
Hausman test for endogeneity (*p*-value)		0.01		0.07
Number of observations	1493	1493	1375	1375

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. In the dataset 2002–04–06, the dependent variable is the change in the log of expenditure per capita during 2004–06. IV: Lagged change in non-farm network size, i.e., the change during 2002–04. Initial characteristics of households, communes, and regional dummies are of 2004. In the dataset 2004–06–08, the dependent variable is the change in the log of expenditure per capita during 2006–08. IV: Lagged change in non-farm network size, i.e., the change during 2004–06. Initial characteristics of households, communes, and regional dummies are of 2006. All of the standard errors are corrected for commune clustering.

total working hours, an OLS estimation finds a statistically insignificant effect in both datasets, 2002–04–06 (column 1 of panel C) and 2004–06–08 (column 3 of panel C). However, 2SLS estimations show that non-farm activity had a positive and statistically significant impact on expenditure growth in both 2002–04–06 (column 2 of panel C) and 2004–06–08 (column 4 of panel C). That is, a 10% increase in the share of households' working hours in non-farm activities increased the average expenditure growth by 3.33% and 3.92% over a two-year period, respectively, in the two datasets.

These results are in concordance with the findings in the preceding sub-section, where endogeneity biases the estimated effects toward zero, resulting in greater estimated coefficients with the IV approach.[26] The IV results using the expenditure per equivalent adult are much the same (unreported).

(c) *Non-farm activity and expenditure: identification through heteroskedasticity*

As noted, identification through heteroskedasticity à la Lewbel (2012) has been proven to work for models with continuous dependent variables, and hence, we are able to utilize it for the expenditure equation. Our implementation of the method, using $(Z_i - \overline{Z}_i)\hat{v}$ as the *only* instrument, generally yields insignificant coefficient estimates for non-farm activity. This is not particularly surprising, given that, as has been mentioned, the exogenous variation in this method is obtained from a second-order relationship. In fact, Lewbel (2012) describes a 5% significance level as something one would be "lucky" to obtain. Thus, we use $(Z_i - \overline{Z}_i)\hat{v}$ along with our standard IV (non-farm networks). This naturally raises the question whether the estimates in this exercise truly represent an alternative set of estimates for the effect of non-farm activity on expenditure. While this is an issue, remember that insignificance in the case of $(Z_i - \overline{Z}_i)\hat{v}$ alone is primarily a result of the inefficiency of the estimator (i.e., the effect is there, but the standard error of the estimate is high).

Table 7 reports our results using this approach for the 2002–04–06 and 2004–06–08 datasets. Most of the Breusch–Pagan test results for heteroskedasticity are significant at the 1% level in the first-stage regression. Concerning the second-stage regression, the Sargan tests suggest that our over-identification restriction is valid. Given that $(Z_i - \overline{Z}_i)\hat{v}$ is free from exclusion-restriction concerns, non-farm networks seem to be statistically reliable as IV.

Panel A shows that an additional household member working in the non-farm sector increases the two-year expenditure by 11.7% in the dataset 2002–04–06 (column 1). This coefficient is slightly smaller than when non-farm networks only are used as IV (14.1%). Using the change in expenditure per equivalent adult, we find that an additional member working in the non-farm economy is associated with 11.3% higher expenditure (column 2). However, for 2004–06–08, the coefficients are positive though statistically insignificant.

For the second measure of non-farm activity, panel B shows that expenditure per capita is significant at the 5% level for the dataset 2002–04–06 (column 1) and at the 10% level for the dataset 2004–06–08 (column 3). The results are statistically significant for both datasets using the expenditure per equivalent adult. In relation to the third measure of non-farm activity, panel C indicates significant results at the 5% level for both 2002–04–06 and 2004–06–08, using both expenditure per capita and expenditure per equivalent adult.

Panels A, B, and C of Table 7 show that the difference in the estimated coefficient magnitudes using expenditure per capita and expenditure per equivalent adult is generally small. Compared to the case of non-farm networks as the *only* IV, this identification approach yields relatively lower yet similar coefficients. Our confidence is boosted by the fact that our two identification strategies generate relatively consistent and mutually supportive results and that our non-farm participation-expenditure estimates are broadly plausible.

Comparing our estimates with those of de Brauw and Harigaya (2007) on seasonal migration helps to put our results into perspective. de Brauw and Harigaya find that an additional seasonal migrant increases expenditure growth by 5.2% over a five-year period. This magnitude is far lower than our average 14.1% found for the two-year periods, at least for the earlier years of the decade. This outcome is consistent with the fact that non-farm employment has a broader coverage

Table 7. *Effect of changes in non-farm activity on changes in expenditure (IV estimation à la Lewbel, 2012). Dependent variable: Δ log (expenditure per capita). Mean of dependent variables for expenditure per capita and expenditure per equivalent adult are 0.31 and 0.29, respectively in the dataset 2002–04–06. Mean of dependent variables for expenditure per capita and expenditure per equivalent adult are 0.31 and 0.30, respectively in the dataset 2004–06–08*

	Dataset 2002–04–06		Dataset 2004–06–08	
	Expenditure per capita (1)	Expenditure per equivalent adult (2)	Expenditure per capita (3)	Expenditure per equivalent adult (4)
Panel A				
Change in the number of household members working in non-farm economy	0.117**	0.113**	0.151 (p-value = 0.14)	0.146 (p-value = 0.14)
Sargan test (p-value)	0.53	0.64	0.93	0.94
Breusch–Pagan test for heterosk (p-value)	0.00	0.00	0.00	0.00
Panel B				
Change in the share of household members working in non-farm economy	0.311**	0.291**	0.446* (p-value = 0.051)	0.431* (p-value = 0.057)
Sargan test (p-value)	0.26	0.31	0.79	0.78
Breusch–Pagan test for heterosk (p-value)	0.00	0.00	0.00	0.00
Panel C				
Change in the share of the household's working hours in non-farm economy	0.224**	0.214*	0.345**	0.337**
Sargan test (p-value)	0.16	0.19	0.69	0.71
Breusch–Pagan test for heterosk (p-value)	0.025	0.025	0.00	0.00
Number of Observations	1493	1493	1375	1375

See the notes to Table 6. IV: Non-farm networks and the Lewbel (2012) IV are jointly employed as instrument in the second stage. Sargan test for whether the over identification restriction is rejected in the second stage. Breusch–Pagan tests for whether size of arable land generates heteroskedastic residuals in non-farm activity in the first stage. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

than seasonal migration, and that seasonal migrants may need to bear a migration cost whereas non-farm participants do not have to bear such a cost.

(d) *Non-farm sector vs. farm sector*

Is non-farm employment a substitute for agricultural activities, or is it a supplement to farm income? The answer to this question is crucial to providing further insights into the effects of non-farm participation on poverty. Table 8 shows that a positive change in the number of non-farm hours worked is associated with a reduction in farm hours. Our estimates show that an additional household member participating in the non-farm economy reduces households' total farm hours by approximately 40%, on average. Importantly, Table 9 shows that this reduction does not come at the expense of agricultural income because the effect of increased non-farm participation on agricultural income is statistically and economically no different to zero. This outcome can arise when the agricultural sector is characterized by labor surplus. The main implication of this result is that when surplus agricultural labor is released to the non-farm sector, rural households are better off overall, with additional proceeds from non-farm activity contributing to higher expenditure and increased likelihood of escaping poverty.

6. FURTHER ROBUSTNESS CHECKS

We check the robustness of our key results in Sections 5a–d. Households living in provinces that are close to one of the three large cities—Hanoi, Danang, and Ho Chi Minh—are likely to have more opportunities to participate in the non-farm sector, and this proximity may affect the size of non-farm networks. In addition, changes over time in the population and demographic composition may affect non-farm activity at the household level. We address these concerns by including in all the models in Tables 5–8 the minimum distance between

Table 8. *Effect of non-farm hours on farm hours. Dependent variable: change in log of farming hours. Mean dependent variable: −0.041 in 2002–04–06 and −0.073 in 2004–06–08*

	2002–04–06			2004–06–08		
	(1)	(2)	(3)	4	5	6
Variables						
Change in the number of hhs members working in non-farm economy	−0.385***			−0.452***		
Change in the share of hhs members working in non-farm economy		−1.547***			−2.110***	
Change in the share of the hhs working hours in non-farm economy			−1.422***			−1.604***
Constant	−0.427	−0.429	−0.385	−0.301	−0.322	−0.263
Observations	1129	1129	1129	989	989	989
R-squared	0.053	0.093	0.188	0.066	0.081	0.225

2SLS estimation. IV: Lagged change in non-farm network size, i.e., the change during 2002–04 for columns (1) to (3) and change during 2006-06 for columns (4) to (6). Initial characteristics of households, communes, and regional dummies are of 2004 and 2006 for datasets 2002–04–06 and 2004–06–08, respectively. All of the standard errors are corrected for commune clustering.

$^{***}p < 0.01$.

Table 9. *Impact of non-farm activity on agricultural income. Dependent variable: change in log of agricultural income. Mean dependent variable: 0.416 in 200–04–06 and 0.102 in 2004–06–08*

	2002–04–06			2004–06–08		
	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Change in the number of household members working in non-farm economy	−0.036			0.051		
Change in the share of household members working in non-farm economy		−0.129			0.217	
Change in the share of the household's working hours in non-farm economy			0.029			0.178
Constant	0.080	0.076	0.074	0.074	0.090	0.088
Observations	1314	1314	1314	1180	1180	1180
R-squared	0.070	0.069	0.059	0.042	0.037	0.032

See the notes to Table 8.

the provinces and the three largest cities, and the number of people moving into and out of a commune. Our original results remain robust to this exercise (unreported). Further, we remove all households living in the three large cities from the sample, and find that the results change very little (unreported). Similarly, we add changes in household demographics—such as the number of members aged between 15 and 25, the number of members aged between 25 and 35, and the number of members aged between 35 and 45—to all the models, and the results remain unchanged (unreported).

We also revisit the exclusion-restrictions assumption in Section 4a. A potential threat is that natural disasters[27] could affect the group of people who participate in non-farm activities, and have direct and lasting impacts on the poverty or expenditure of rural households through destruction of their assets. Another issue is that entrepreneurial capability at the commune level may affect non-farm networks and the outcomes of interest. Further, access to rural credit can increase agricultural income, attract more people into farm activities, and lead to relatively fewer people participating in the non-farm economy. To address all of these concerns, we control for a host of commune-level variables in the poverty and expenditure regressions. These variables include all the natural disasters (i.e., fire, disease pandemics, flood, drought, and storm) that have occurred within the past three years; land per capita (as a proxy for entrepreneurial capacity,[28] as well as an indicator of access to credit); and the minimum distance between the commune and a credit organization. Our IV results remain much the same (unreported). As another check, we remove altogether the commune-level infrastructure variables from the poverty and expenditure models, with the result that the coefficients and significance of non-farm participation remain largely similar.

7. CONCLUSIONS

This paper uses the VHLSSs of 2002, 2004, 2006, and 2008 to test the claim that diversifying into non-farm activities is an effective way for households in developing countries to move out of poverty. The paper documents strong evidence that increased non-farm involvement of rural households following agrarian reforms and business-oriented changes in legislation, which occurred in parallel to several other transition economies of Central and Eastern Europe and China, boosted household expenditure and reduced poverty in rural Vietnam.

In contrast to many other studies in the literature, our study addresses the endogeneity of non-farm participation, which may arise due to omitted variables and reverse causality. Our two-pronged methodological approach exploits the large variations in non-farm network sizes across villages as an instrumental variable, as well as the heteroskedastic residuals in non-farm involvement arising as a result of differing degrees of affinity with land. While we do not claim to provide fully causal estimates, our identification strategies generate relatively consistent and mutually supportive results, an outcome that provides some confidence that our non-farm participation-expenditure estimates are broadly plausible. Our estimates imply that an increase in the share of non-farm working hours relative to total working hours from 25% to 75% increases the probability of exiting poverty by 8–14% over a two-year period. Likewise, an additional household member working in the non-farm economy increases household expenditure by 14% over a two-year period and by more than 50% over a six-year period (2002–08). Our investigation further documents that non-farm employment is a substitute for agricultural activities in that additional non-farm hours worked significantly reduce the hours worked on-farm; however, increased non-farm hours do not come at the expense of agricultural income. This outcome can arise when the non-farm sector absorbs the surplus labor in the rural economy, suggesting that the availability of non-farm jobs facilitates poverty reduction via the proceeds it helps to generate.

Our findings offer important policy implications. First, our results emphasize rural diversification as an important tool for alleviating poverty, increasing expenditure, boosting agricultural productivity, and absorbing the agricultural labor surplus. Second, large variations in the sizes of non-farm networks—the primary platform to access job-related information in Vietnam—imply that there is significant room for the government to allocate resources to alert rural households to the opportunities present in the non-farm economy. Third, despite its effectiveness, the non-farm economy may not benefit all rural households equally; in particular, the poorest may be left behind, given their lack of certain endowments, such as literacy and schooling. Members of this segment of society may need to be assisted by "big push" policies to help them rise above the poverty line. Our results, taken together, also suggest that while the market economy clearly played an important role in reducing poverty, it may be simplistic to consider it as a 'silver bullet' in terms of eradicating poverty. Since evidence exists of a poverty trap, the government needs to get actively involved in this cause. In this respect, poor families trapped in poverty can be assisted with short-lived but substantial financial transfers from the government; large public investments in irrigation and disaster forecasting; and easier access to a better system of agricultural insurance.

NOTES

1. There are also some "push" factors in rural labor's pursuit for jobs in non-farm sectors, such as land constraints. In 2006, 23.4% of the rural population owned agricultural land of under 0.2 ha, 37.7% of between 0.2 and 0.5 ha, and 17.2% of between 0.5 and 1 ha (Rural Census, see GSO, 2006, p. 180).

2. Differing econometric approaches prevent us from comparing our estimates with those of the previous studies.

3. Bezemer, Balcombe, Davis, and Fraser (2005) show that in the post-Soviet country of Georgia, participation in non-agricultural activities leads to higher technical efficiency and higher incomes in agriculture, and greater poverty reduction.

4. In some Central and Eastern European countries, in the early years of transition, between 30% and 45% of the population still lived in rural areas. According to the World Bank (1996), the figures were Bulgaria: 30%; Czech Republic: 35%; Hungary: 36%; Poland: 36%; Slovak Republic: 42%; and Romania: 45%.

5. However, not all farmers are likely to benefit equally from non-farm activity. For example, in India, non-farm employment growth was less effective in alleviating poverty in states with initially lower literacy, lower farm productivity, and greater landlessness (Micevska & Rahut, 2008; Ravallion & Datt, 2002).

6. In the case of developed countries, Shaw (1979) indicates that the contribution of off-farm income to total rural household incomes in Canada increased from approximately 12% in 1940 to 59% in 1970. The percentage of United States farmers working off-farm for more than 100 days per year increased from 62% in 1974 to over 83% in 1992 (Mishra & Goodwin, 1997).

7. In fact, Rozelle and Swinnen (2004) document that the transition economies of East Asia, and Central and Eastern Europe, all followed similar paths during their initial reform years. These paths included decollectivization, land reforms, and price liberalization.

8. The poverty line, in real terms, was 1,915,000 VND per person per year in January 2002; 2,077,000 VND in January 2004; 2,559,000 VND in January 2006; and 3,358,000 VND in January 2008.

9. The VHLSSs do not include clear information about seasonal migration. However, if we define a seasonal migrant broadly as a person who has been absent from home for a minimum of one month and a maximum of 11 months, then the VHLSSs show that 94% of household members were not seasonal migrants in 2004, 2006, and 2008. The VHLSS 2002 does not include the related information.

10. It may be possible to upgrade these entrepreneurial skills over time. In this case, such unobserved effects will not be eliminated even by traditional fixed effects or difference estimators.

11. Focusing on rural Vietnam in the 1990s, van de Walle and Cratty (2004) consider only the common factors that determine both poverty and non-farm participation. Studies of other countries, such as those of Corral and Reardon (2001), and Kijima *et al.* (2006), ignore endogeneity altogether.

12. The reduced form of R_i is solved as follows: $R_i = [(\theta_0 + \delta_0\theta_1)/(1 - \delta_1\theta_1)] + [\theta_1/(1 - \delta_1\theta_1)]e_{1i} + [e_{2i}/(1 - \delta_1\theta_1)]$.

13. Confucianism emphasizes the importance of five relationships or bonds: from ruler to ruled, from father to son, from husband to wife, from elder brother to younger brother, and from friend to friend. Confucianism also advocates that loyalty be shown where it is due. Since the father and his son(s), the husband and his wife, the brothers and the friends usually cohabit in the same village, the emphasis on the last four relationships *and* on loyalty explains an individual's close association and identification with people of his or her village.

14. Đồng hng, the concept denoting fellow villagers or fellow countrymen, is very popular in Vietnamese contemporary culture. Numerous *hội* đồng hng (associations of fellow villagers and countrymen created in big cities) facilitate networking among migrants, mostly for employment opportunities.

15. This pattern is robust to the removal of outliers from the regression.

16. For example, in the United States, the emergence of a mixed rural economy—light manufacturing (especially textiles and shoes) and now including electronic assembly—began after World War II and permitted smallholder farmers to remain in rural areas. In this regard, our finding of greater variance in non-farm activity among larger rather than smaller landowners is consistent with historical experience in other countries. We would like to thank a referee for pointing this out to us.

17. The mean arable land size is 0.5 *vs.* 0.6 hectares for non-poor and poor households respectively. An extra 0.1 hectare in that range is unlikely to make a difference to poverty status.

18. Meanwhile, another situation is also likely to help with identification in this setting: land was re-allocated equally in the North, because the North followed communism, but re-allocations were relatively unequal in the South, because the government returned collective lands to their original households in *some* provinces. Approximately 55% of the households in this study are from the North. Thus, in addition to other variations in arable land availability, our first-stage regression would also exploit this exogenous institutional difference.

19. Recall that we control for $\boldsymbol{X}$ in our first stage to address the unlikely but possible wedge between the coefficients of the two groups.

20. Table 11 in the Appendix shows that non-farm networks have a highly significant impact on the number of household members participating in non-farm activities for each dataset. High F-statistics indicate that our instrument is strong. Meanwhile, panel A of Table 5 suggests that the p-values of the Wald test for endogeneity are significant for all datasets.

21. The precise effect will vary across households and depend on who is involved with the non-farm sector in which year or who is poor/non-poor in which year.

22. Table 12 in the Appendix reports, as a background for the results in panel B of Table 5, that our instrument is strong and non-farm activity is endogenous.

23. Table 13 confirms the strong instrument and endogenous non-farm involvement using this measure.

24. Tables 14 and 15 in the Appendix show that our instrument is strong using this non-farm measure. In addition, panel A of Table 6 indicates that endogeneity is statistically significant in both the 2002–04–06 and the 2004–06–08 datasets.

25. Tables 14 and 15 in the Appendix show that our instrument is strong using this non-farm measure. In addition, panel B of Table 6 indicates significant endogeneity in 2002–04–06 but not in 2004–06–08.

26. Tables 14 and 15 in the Appendix also show that our instrument is strong. Panel C of Table 6 generally confirms the endogeneity between change in expenditure per capita and three measures of non-farm activity.

27. Vietnam is among the most exposed countries to natural disasters such as floods, typhoons, and drought.

28. Li, Yang, Yao, and Zhang (2009) argue that land scarcity and limited natural resources in rural areas motivate people to start their own businesses, and thus, entrepreneurs are more likely to appear in historically land-scarce areas.

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APPENDIX

Table 10. *Result of the test of the difference in land size of the poorest and richest household (VHLSS of 2006)*

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
The poorest (1)	1160	6.660537	0.270959	9.228516	6.128913	7.192161
The richest (5)	798	6.628944	0.429996	12.14692	5.784885	7.473003
Combined	1958	6.647661	0.237591	10.51322	6.181704	7.113618
Difference		0.031594	0.48364		−0.91691	0.980097
Difference = mean(1) − mean(5)						$t = 0.0653$
Ho: difference = 0				degrees of freedom = 1956		
Ha: difference < 0		Ha: difference > 0			Ha: difference > 0	
$Pr(T < t) = 0.5260$		$Pr(T > t) = 0.9479$			$Pr(T > t) = 0.4740$	

Table 11. *Results of the first stage regression. (Dependent variable: number of household members working in non-farm economy). Mean dependent variable: 0.81, 0.873 and 0.871 in 2004, 2006 and 2008*

	2002–04	2004–06	2006–08
Lag of the share of non-farm working people at the village level	1.917***	1.627***	1.690***
Number of observations	2,954	3,224	2,979
F-statistic of excluded instrument	404.70	581.75	556.48

Regressions include all exogenous variables. All standard errors are corrected for commune clustering.
*** $p < 0.01$.

Table 12. *Results of the first stage regression. (Dependent variable: share of household members partaking in non-farm economy). Mean dependent variable: 0.205, 0.211, and 0.231 in 2004, 2006, and 2008*

	2002–04	2004–06	2006–08
Lag of the share of non-farm working people at the village level	0.487***	0.407***	0.443***
Number of observations	2,954	3,224	2,979
F-statistic of excluded instrument	384.37	525.50	587.46

Regressions include all exogenous variables. All standard errors are corrected for commune clustering.
*** $p < 0.01$.

Table 13. *Results of the first stage regression. (Dependent variable: share of non-farm hours to total household working hours). Mean dependent variable: 0.344, 0.373 and 0.375 in 2004, 2006 and 2008*

	2002–04	2004–06	2006–08
Lag of the share of non-farm working hours to total working hours at the village level	0.716***	0.625***	0.632***
Number of Observations	2,954	3,224	2,979
F-statistic of excluded instrument	516.45	804.63	816.38

Regressions include all exogenous variables. All standard errors are corrected for commune clustering.
*** $p < 0.01$.

Table 14. *Results of the first stage for the 2002–04–06 dataset. Mean dependent variable: 0.049 (column 1), 0.004 (column 2), 0.023 (column 3)*

	(1)	(2)	(3)
Lagged change in the share of people working in non-farm economy at the village level	−1.103***	−0.334***	
Lagged change in the share of working hours in non-farm economy at the village level			−0.4***
Number of observations	1,493	1,493	1,493
F-statistic of excluded instrument	63.40	93.22	85.10

In column (1), the dependent variable is the change in the number of household members working in non-farm economy. In column (2), the dependent variable is the change in the share of household members working in non-farm economy. In column (3), the dependent variable is the change in the share of a household's working hours in non-farm economy. Regressions include all exogenous variables. All of the standard errors are corrected for commune clustering.
*** $p < 0.01$.

Table 15. *Results of the first stage for the 2004–06–08 dataset. Mean dependent variable. 0.018 (column 1), 0.025 (column 2), 0.007 (column 3)*

	(1)	(2)	(3)
Lagged change in the share of people working in non-farm economy at the village level	−0.736***	−0.222***	
Lagged change in the share of working hours in non-farm economy at the village level			−0.305***
Number of observations	1,375	1,375	1,375
F-statistic of excluded instrument	11.19	42.48	45.11

In column (1), the dependent variable is the change in the number of household members working in non-farm economy. In column (2), the dependent variable is the change in the share of household members working in non-farm economy. In column (3), the dependent variable is the change in the share of a household's working hours in non-farm economy. Regressions include all exogenous variables. All of the standard errors are corrected for commune clustering.
*** $p < 0.01$.