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Impacts of off-farm employment on welfare, food security and poverty: Evidence from rural Vietnam

Duong P., Thanh P., Ancev T. Impacts of off-farm employment on welfare, food security and poverty: Evidence from rural Vietnam

How off-farm employment can enhance welfare in terms of food consumption and poverty alleviation is a critical question facing many developing countries. This study addressed that question by pursuing two objectives: (i) to quantify the impact of off-farm employment on rural households' welfare, food security and poverty; and (ii) to examine the factors that affect their decision to work off-farm. Using panel data, we estimated a difference-in-difference combined with a propensity score matching model. The findings show that off-farm employment improves income, ensures food security and contributes to poverty alleviation. The results also show that age, marital status, education, labour, financial capital, land, location, market access and losses from natural disasters are significant contributing factors to the decision to participate in off-farm employment. The findings suggest that to improve the welfare of rural households, the Vietnamese government should proceed with policies that enhance their opportunities for participation in off-farm employment.

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Rural households in Southeast Asian countries are vulnerable to severe climatic variations that exist in the region (e.g., typhoons, floods, droughts) and to unfavourable economic conditions (e.g., price instability, high levels of unemployment). A large proportion of rural households in the region are living below the poverty line, ranging from 1.6% (i.e., Malaysia) up to 47% (i.e., Timor-Leste) (World Bank, 2018). Coping with poverty and income shocks due to natural or economic crises is a key concern of every rural household. The strategies to which households in this region usually resort for income improvement and consumption smoothing have been investigated in the literature (Imai, Gaiha, & Thapa, 2015; Seng, 2015). In the context of developing countries, where there is only a minimal presence of an effective formal insurance market and social safety nets, rural households look to diversify their income sources as an effective strategy to mitigate income shocks. Some rural households recognise higher income and/or lower risk in off-farm employment activities compared with deriving income solely from farming (Reardon, Berdegué, Barrett, & Stamoulis, 2007). The literature has documented that rural households are motivated to engage in off-farm employment activities by both pull factors (e.g., better job opportunities, lower risk from off-farm activities) and push factors (e.g., agricultural land scarcity, risky agricultural environment, persistent insufficiency of income from farming) (Atamanov & Van den Berg, 2012; Barrett, Reardon, & Webb, 2001; Escobal, 2001; Reardon, Berdegué, & Escobar, 2001; Reardon, Taylor, Stamoulis, Lanjouw, & Balisacan, 2008).

A separate body of literature has investigated the welfare effects that stem from off-farm employment. Participation in off-farm activities improves household income, which contributes to poverty alleviation and greater equality in income distribution (de Janvry & Sadoulet, 2001; Reardon et al., 2001). Off-farm employment increases household income, allowing for higher food expenditure, thereby improving the household's nutrition status, food security and diet diversity (Owusu, Abdulai, & Abdul-Rahman, 2011; Reardon et al., 2001; Ruben & Van den berg, 2001). Supplementary off-farm income can improve farm productivity and income by relaxing capital constraints and promoting investment (Babatunde & Qaim, 2010). However, engaging in off-farm activities may also have adverse effects on food security and nutrition, as it may reduce household food availability due to the competition for household resources (e.g., labour) between farm and off-farm activities (Mabuza, Ortmann, Wale, & Mutenje, 2016; Pfeiffer, López-Feldman,

& Taylor, 2009). In addition, off-farm employment may affect inter-household inequality (Reardon et al., 2001). Specifically, low-income off-farm employment may reduce inequality while high-income off-farm employment tends to increase inequality (Scharf & Rahut, 2014).

Vietnam has made significant achievements in agricultural development over the past three decades. Agriculture has been the backbone for economic growth and has been an important export sector. However, as in other developing countries, rural households in Vietnam whose livelihoods greatly rely on agriculture face substantial income shocks due to climate change and market variability (Nguyen, Raabe, & Grote, 2015). In addition, there has been a lack of sufficient support from the government, and rural households have had only limited economic opportunities (Sohns & Revilla Diez, 2017). Rural households in Vietnam resort to savings, credit, private transfers (including remittances from abroad) and income diversification as coping strategies (Nguyen et al., 2015; Tran, 2015). Most of these strategies entail that some members of the household engage in off-farm employment.

Several empirical studies have investigated the effects of off-farm activities on household welfare in rural Vietnam. Significant association between off-farm employment and household welfare was found in studies by Hoang, Pham, and Ulubaşoğlu (2014), Imai et al. (2015), Oostendorp, Trung, and Tung (2009), Sohns and Revilla Diez (2017), Tran (2015) and van de Walle and Cratty (2004). In particular, van de Walle and Cratty (2004) noted that participation in off-farm self-employment activities reduces the probability of being poor for some, but not for all. Oostendorp et al. (2009) found that engagement in non-farm enterprises significantly increases income and reduces inequality. Hoang et al. (2014) noted that involvement in non-farm activity reduces the probability of poverty and increases household expenditure. Further, Tran (2015) examined the effect of off-farm employment on household income among ethnic minorities, and confirmed that households participating in wage- or self-employment off-farm, or both, have a higher per capita income than those that only work on farms. Most recently, Sohns and Revilla Diez (2017) concluded that self-employment increases the likelihood of the poor escaping from poverty in some economically advantaged regions.

While there have been studies showing that off-farm employment improves income, the question of whether off-farm income-generating activities necessarily lead to the improvement in certain aspects of welfare, such as asset accumulation, food security, food diversity and the reduction of poverty, remains open. To the best of our knowledge, there is only limited literature that has documented the impact of off-farm employment on these aspects of welfare in rural Vietnam. Also, no study has yet explicitly distinguished the impacts of the types of off-farm activities (i.e., self-employment and wage-employment) on various welfare indicators. The present study aimed to fill these gaps and contribute to the literature in several ways.

Firstly, we quantified the impact of off-farm activities on various welfare indicators such as income, asset accumulation, food security (measured by food consumption of various kinds of food, and food diversity expressed by several indices) and on several indicators of poverty (head count, poverty index, poverty severity). Secondly, we decomposed off-farm activities into self-employment and wage-employment for further investigation. There are some important differences between self- and wage-employment. Self-employment covers a wide and heterogeneous range of economic activities. The OECD has adopted a comprehensive definition: 'Self-employment is a form of employment in which people work in their own business, farm or professional practice and receive some economic benefit for their work, such as wages, profits, in-kind benefits or family gain (for family workers)' (OECD & The European Commission, 2014, p. 32). In this study, self-employment included such activities as manufacturing (food, beverage, furniture, textile, leather), wholesale and retail trade, construction, mining, services (food and beverage, repairing, accommodation, warehousing, transportation). These included off-farm agriculture-related activities, such as processing, distribution and sale of farm products. Wage-employment, on the other hand, included paid work in agricultural and non-agricultural sectors, in local, national and overseas labour markets.

In rural areas, some households might decide to specialise in either farm or off-farm activities, some might take part in both activities, while others might shift between farm and off-farm activities. It is therefore important to understand what drives rural people's decisions whether and in which way to engage in off-farm activities. Many studies have explored the factors that determine those decisions (Ali & Peerlings, 2012; Olale & Henson, 2013; Rahman & Akter, 2014; Tran, Vu, & Doan, 2016). The findings are mixed and varied across studies. For instance, some studies concluded that larger landholders have better access to off-farm opportunities, thereby fostering their participation (Abdulai & CroleRees, 2001; Escobal, 2001). Others found a negative relationship between large landholding and participation in off-farm employment (Hatlebakk, 2012; Mabuza et al., 2016; Tran et al., 2016). Similarly, varied findings are reported for other variables such as education, gender, access to credit, and savings. Accordingly, although the primary objective of this study was to quantify the economic impacts of participation in off-farm income-generating activities, we also investigated the factors that affect the rural

households' decision to work off-farm. Specifically, we examined the decision to engage in self- and/or wage-employment.

This article is structured as follows. The second section presents the background on income sources and employment in Vietnam. The third section discusses methodology and defines the variables used in the empirical analysis. The fourth section describes the data, and the fifth reports the empirical results. The sixth and last section concludes and discusses policy implications.

Income sources and employment in rural Vietnam

Vietnam has experienced rapid agricultural development since the economic reform in the mid-1980s. Farming has played an important role in defining the economic conditions of rural households, contributing to food security, income generation and poverty reduction. Agriculture has also been a significant source of export earnings and a driving force of the national economic growth (Hung & Duong, 2018).

However, many rural households have decided to leave their farms and to engage in off-farm activities. This trend has been very common in rural Vietnam. A large proportion of the rural labour force has been seeking off-farm employment opportunities in Vietnam (e.g., in manufacturing, trade, services, handicrafts) or abroad. A key reason is that the economic structure in Vietnam has evolved towards services and the manufacturing sector, mobilising many rural labourers out of agriculture. Another key reason is that net payoffs that individuals can receive from agricultural production are low compared with what they believe they can receive in the other sectors of the economy. Consequently, they might decide to become involved in a higher paying activity that promises a more stable income. In addition, those involved in agricultural production perceive farming as being increasingly risky due to climate change and market variability.

Table 1 presents a summary of the statistics on the share of household income sources and population's employment status, categorised by specific activities in rural Vietnam in the period 2002–2014. As the table shows, there has been a significant drop in the proportion of the rural population involved in agricultural employment in the period 2002–2014. The proportion of household income derived from agricultural employment has also decreased significantly over time.

Table 1 also shows the changes in the composition of off-farm employment, including wage- and self-employment, and how these components have contributed to household income. Off-farm income increased significantly over the period 2002–2014, where this growth can be mostly attributed to the relative increase in the proportion of off-farm workers deriving wage income. It is apparent that the role of wage-employment is more important than the role of self-employment. For instance, in 2014, some 40% of household income was generated from wage-employment off-farm, against 19.3% from self-employment off-farm.

Methodology

Off-farm employment decision

While the primary aim of this study was to evaluate the impact of off-farm employment on household welfare outcomes, it is important to understand the determinants of off-farm employment decisions amongst rural households in Vietnam, on which we report in this section. Participation in off-farm income-generating activities can be modelled as a binary choice decision. Accordingly, the probability of participation in off-farm activities by a household based on the observable characteristics can be estimated using a binary probit model, as follows:

$$Probit(D_{i,2014} = 1 | X_{i,2012}) = \alpha + \beta X_{i,2012} \quad (1)$$

where the $D_{i,2014}$ is an indicator variable that equals 1 if household i participated in off-farm activities in 2014, and zero otherwise. X_i is a vector of observable explanatory variables, including individual and household demographic, socio-economic, geographic and commune-specific factors. These factors should not be affected by the treatment (i.e., participation in off-farm activities). Therefore, in order to avoid potential

Table 1. Household income sources and employed population in rural Vietnam.

	Income sources (%)			Employed population[a] (%)		
	2002	2008	2014	2002	2008	2014
Agriculture	43.4	39.4	28.8	63.8	58.4	52.2
Off-farm employment	42.6	46.2	59.2	36.2	41.7	47.8
Wage-employment	24.8	28.4	39.9	22.1	27.4	33.6
Self-employment	17.8	17.8	19.3	14.1	14.3	14.2
Other activities	14.0	14.4	12.0			
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Compiled from the Vietnam Household Living Standards Surveys of 2002, 2008 and 2014 (VHLSS 2002, 2008 and 2014).

[a]Employed population aged 15 years and over in primary jobs.

Int J Soc Welfare 2021: **30**: 84–96

endogeneity due to reverse causality, these covariates use the information from the 2012 survey as instruments to explain the effect of the treatment. Regional dummies were also included to control for the effects of region-specific unobservable heterogeneities. Variables used in the empirical analysis are discussed in more detail further below.

Impact evaluation of off-farm employment

As we were interested in how the participation in off-farm employment activities affects the outcomes of the participating households, we sought to quantify the average treatment effect on the treated (ATT). In a randomised experimental design, ATT is the difference between the mean values of the outcomes of interest for the participating (treated) and the non-participating (control) groups. However, in our data set, the decision to become involved in off-farm employment activities was non-random but self-selected, and so we could not follow this approach. Therefore, we regarded the propensity score matching (PSM) method as a more appropriate technique. PSM can reduce the selection bias and can be used to construct a plausible counterfactual from the control group based on the observed characteristics (Dehejia & Wahba, 2002; Khandker, Koolwal, & Samad, 2009).

The first step of the PSM method is to select the variables to be included in the propensity score. Literature on PSM suggests that these variables should be correlated with the treatment and outcome variables (Garrido, Kelley, Paris, Roza, Meier et al., 2014). A common strategy to compute the propensity scores is to use logit or probit regression with the treatment being the dependent variable. In this study, we generated the propensity score for each household using the off-farm participation decision model (Equation 1).

Prior to matching, the common support region needed to be specified. That is, some households in either groups needed to be dropped out of the sample because their propensity scores were too different from the other households. Therefore, only households in the common support region were retained for matching. Meeting the common support condition is an important requirement of the PSM method and a violation of this condition may cause a large bias due to the pairing of incomparable households between two comparison groups (Heckman, Ichimura, & Todd, 1998). Another requirement of PSM is that the balancing property test needs to be satisfied. The purpose of this test is to ensure that there is no significant difference in the mean of the explanatory covariates between the comparison groups in matched samples (Dehejia & Wahba, 2002).

The next step was to match each treated household (those that participated in off-farm income-generating activities) with one or more households in the control group based on their most similar propensity score. There are various matching techniques, but nearest-neighbour and kernel matching are the most commonly used methods (Bernard, Taffesse, & Gabre-Madhin, 2008; Faltermeier & Abdulai, 2009). Here we used the kernel matching method as it is more flexible than the nearest-neighbour method with respect to the specification of the propensity score (Mendola, 2007). In addition, kernel matching has the lowest overall mean standardised bias after matching compared with other matching methods (Gitonga, De Groote, Kassie, & Tefera, 2013; Kassie, Shiferaw, & Muricho, 2011; Powell-Jackson & Hanson, 2012).

The Average Treatment effect on the Treated (ATT) using standard PSM can be estimated using equation (2):

$$\begin{aligned} \text{ATT} \quad &= E\left\{(Y_{1i,2014}|D_{i,2014}=1, P(X_{i,2012})\right\} \\ &\quad -E\left\{(Y_{0i,2014}|D_{i,2014}=0, P(X_{i,2012})\right\} \end{aligned} \tag{2}$$

where D_i is the off-farm activities status, equal to 1 if a household participates in any off-farm income-generating activity in the 2014 survey, and 0 otherwise. Y_{1i} and Y_{0i} denote the outcomes for the ith household in the treatment and control groups, respectively. X_i is a vector of pre-treatment covariates (i.e., information in the 2012 survey). The definition and descriptive statistics of the variables for empirical analysis are presented below and in Supporting Appendix Tables A1–A3.

The standard PSM method using cross-sectional data would allow us to control for the observed covariates, but not for the unobservable characteristics that may affect off-farm employment decisions and outcome variables (Rosenbaum & Rubin, 1983). Given the availability of panel data, difference-in-difference combined with matching (PSM-DID or matched-DID) is a preferable method (Becker & Ichino, 2002; Khandker et al., 2009; Rosenbaum & Rubin, 1983). PSM-DID controls for not only observed covariates, but also for the time-invariant unobserved characteristics that may affect outcome variables (Smith & Todd, 2005). Consequently, the impact of off-farm employment on the changes in observed household outcomes (i.e., income or poverty) can be expressed as follows:

$$\begin{aligned} \text{ATT} &= E\left\{(Y_{1i,2014}-Y_{1i,2012})|D_{i,2014}=1, P(X_{i,2012})\right\} \\ &\quad -E\left\{(Y_{0i,2014}-Y_{0i,2012})|D_{i,2014}=0, P(X_{i,2012})\right\} \end{aligned} \tag{3}$$

where $(Y_{1i,2014}-Y_{1i,2012})$ and $(Y_{0i,2014}-Y_{0i,2012})$ denote the change in observed outcomes for the ith household in the treatment and control groups, respectively. The descriptive statistics of these outcome variables pre- and post-off-farm employment are presented in Supporting Appendix Table A3.

Equation (3) can be rewritten as follows:

$$\begin{aligned} \text{ATT} = & \left\{ \left[Y_{1i,2014} | D_{i,2014} = 1, P(X_{i,2012}) \right] - \left[Y_{0i,2014} | D_{i,2014} = 0, P(X_{i,2012}) \right] \right\} \\ & - \left\{ \left[Y_{1i,2012} | D_{i,2014} = 1, P(X_{i,2012}) \right] - \left[Y_{0i,2012} | D_{i,2014} = 0, P(X_{i,2012}) \right] \right\} \end{aligned} \quad (4)$$

To estimate equation (4), we applied the *diff* command for STATA developed by Villa (2016). This procedure combines DID estimation with kernel PSM using two-period panel data.

Variables used in the empirical analysis

Three sets of variables were needed for the PSM-DID estimation, including treatment, outcome, and determinants of treatment and outcome variables. This section discusses the variables used in the analysis (see the Supporting Appendix for more details). To ensure that the calculations are comparable over time, the variables measured in monetary value were expressed in real terms (in Vietnamese Dong – VND),[1] where the base year is set as 2012.

Treatments. We focused on the diversification of the off-farm income-generating activities. In particular, our primary treatment variables included engagement in off-farm self-employment, off-farm wage-employment and off-farm in general (i.e., either self- or wage-employment). These variables were given a value of 1 if at least one household member was involved in off-farm income-generating activities as recorded in the 2014 survey, and 0 otherwise. Table 2 provides the summary statistics for these treatment variables.

Table 2. Descriptive statistics of off-farm participation.

	Treated	Control	Total
Off-farm in general	425 (47.65)	467 (52.35)	892
Self-employment	71 (7.96)	821 (92.04)	892
Wage-employment	382 (42.83)	510 (57.17)	892
Both activities	28 (3.14)	864 (96.86)	892

Note: Percentage in parentheses.

Determinants. Based on data availability and on previous empirical work (Abdulai & CroleRees, 2001; Ali & Peerlings, 2012; Tran et al., 2016), we included the following covariates: household-specific demographic and resource endowment factors (access to credit, savings, dependency ratio, size of landholding, distance from home to sealed road, social capital, loss from agricultural-related income shocks, and commune-specific factors [market], and regional dummies). In Vietnam, a household consists of all members who live in the same domicile and are related by birth, marriage or adoption, and who pool their income and share resources. Therefore, the decisions made by the family members may be affected by the household head who has, traditionally, been the main decision-maker on economic activities in a household. Consequently, we also incorporated in the model some characteristics of the household head (education, age, marital status, gender). These variables were based on the information before treatment (i.e., in the 2012 survey). In addition, we included the information in the 2014 survey on whether the households were involved in wage- and/or self-employment. The variables described above were used to estimate the determinants of participation in off-farm income-generating activities and to construct the propensity score for each household. The definition and descriptive statistics of these variables are presented in Tables A1 and A2 in the Supporting Appendix.

Outcomes. Existing literature has utilised various indicators to measure rural household welfare (Imai et al., 2015; Nguyen et al., 2015; Nguyen & Winters, 2011; Oostendorp et al., 2009; Owusu et al., 2011). We also used a range of variables to elucidate the effect that off-farm income-generating activities have on welfare.

Income. This indicator was measured at the household level over a 12-month recall period. Two distinct variables were used: earned income (from agriculture, from self- or wage-employment, or from the use of common property resources [e.g., forests, rivers, fisheries]), and total income as a sum of earned and unearned income (e.g., private or public income transfer, sales of assets) within the past 12 months.

Durable asset accumulation. This indicator was measured by the value of all productive and non-productive durable assets currently possessed by a household at the time of survey.

Food consumption value. This indicator was expressed as a monetary value of the consumption of food items. It included the value of purchased food, exchanged food, own produced food for household consumption, and the value of the food received free of charge. Food consumption information was collected during a 4-weeks

[1] Exchange rate in 2012: $1 USD = 20,800 VND.

Int J Soc Welfare 2021: **30**: 84–96

recall period.[2] Total food consumption was computed by summing up the values of all consumed food items within the past 4 weeks. In this study, we categorised food items into eight groups: (i) seafood, (ii) meat, (iii) fruit, (iv) sweets, (iv) milk, (vi) alcohol, (vii) other beverages and (viii) food consumed away from home. This classification was based on the availability of data, and on established practices in the literature (Ng'endo, Bhagwat, & Keding, 2016; Nguyen & Winters, 2011; Romeo, Meerman, Demeke, Scognamillo, & Asfaw, 2016).

Food diversity indices. Along with food consumption value, we also examined food diversity. The literature documents several ways to measure food diversity. The most basic measure is the dietary diversity scores (DDS), computed by summing up the food groups consumed at the household level over the past 4 weeks. The DDSs in this study ranged between 0 and 8, in correspondence with the eight above-mentioned food groups. The DDS is a simple count of food groups consumed in a household's diet; it does not capture differences in the distribution of consumption, since all food groups are equally weighted regardless of the amount consumed. Higher DDSs can be more or less meaningful depending on the relative share of each food group consumed. To overcome this issue, we used two additional food diversity measures – the Simpson index (Simpson, 1949) and the Shannon index (Shannon, 1948). Both indices were computed using the number of foods consumed by a household, weighted by the relative abundance of each food, thereby capturing the differences in quantity of foods consumed. We measured the quantity based on the consumption value shares of the eight food groups defined above. Following Nguyen and Winters (2011), these indices were calculated as follows:

$$\text{Simpson} = 1 - \sum_i \left(\frac{c_i}{C}\right)^2 \tag{5}$$

$$\text{Shannon} = -\sum_i \frac{c_i}{C} \ln\left(\frac{c_i}{C}\right) \tag{6}$$

where $\frac{c_i}{C}$ is the consumption value share of food group i, and ln denotes natural logarithm.

The Simpson index ranges from zero to one, indicating that the higher the index, the more diversified the diet. Meanwhile, the Shannon index has values between zero and the value of the log of the number of food groups, in this case ln (8) = 2.09.

To illustrate the similarity and difference of these indices in more detail, we assumed that there were two households consuming only meat, fruit and sweets. More specifically, household *A* consumed 70% meat, 20% fruit and 10% sweets while household *B* consumed 50% meat, 30% fruit and 20% sweets. Since the food shares in household *B* were more equally distributed than those in household *A*, both Shannon and Simpson indices were greater for household *B* than for household *A*. Regarding the difference in these two indices, the Simpson index squares the food shares, thus the weight of foods with smaller shares is reduced relatively more than those with greater shares. Meanwhile, the Shannon index takes the logarithm of food shares so that the weight of foods with greater shares are reduced slightly relative to those with smaller shares (Romeo et al., 2016). Both indices were used to make comparison and increase the robustness of the analysis.

Poverty indicators. Poverty was measured by employing the FGT poverty index of Foster, Greer and Thorbecke (1984). Based on evidence from the literature (Chiputwa, Spielman, & Qaim, 2015; Foster, Greer, & Thorbecke, 2010; Jena, Chichaibelu, Stellmacher, & Grote, 2012; Khonje, Manda, Alene, & Kassie, 2015; Nguyen et al., 2015; Tsiboe, Zereyesus, & Osei, 2016), the FGT indices at the household level can be expressed using a general function as follows:

$$\text{FGT}_{\alpha,i} = \begin{cases} \left(\frac{Z - Y_i}{Z}\right)^{\alpha} & \text{if } Y_i < Z \\ 0 & \text{otherwise} \end{cases} \tag{7}$$

where Z is the poverty line, Y_i is the income of the household i below the poverty line and α is a parameter of poverty aversion. We calculated three measures: (i) the headcount index, when $\alpha = 0$; (ii) the poverty gap index, when $\alpha = 1$ and (iii) the poverty severity index, when $\alpha = 2$. We used the national poverty lines (adjusted for price changes) in the rural areas, as reported by the General Statistics Office of Vietnam (2016).

The households were defined as being poor if their monthly per capita income was below 530,000 VND and 605,000 VND (equivalent to $25.4 USD and $28.5 USD), as reported in the 2012 and 2014 surveys, respectively. We used per capita income (sum of both

[2] There is always a trade-off between accuracy and diversity when selecting a time-frame. While a shorter period might capture more accurate information collected, a longer time-frame might capture a wider variety of food consumed by a household. Since this study investigated the impact of off-farm activities on food consumption, a 4-week period was more appropriate than a 24-hour, 7-week or 12-month time-frame. This is because some income sources, for instance wage income, are normally generated on a monthly (or 4-week) basis, and the households have a tendency to improve the quality and variety of food around the time of the receipt of earnings.

earned and unearned income) to measure poverty due to the unavailability of data on consumption expenditure. The descriptive statistics of all outcome variables before and after engaging in off-farm employment are reported in the Appendix Table A3.

Data and descriptive statistics

We used panel data from the 2012 and 2014 rounds of the Vietnam Access to Resources Household Survey (VARHS), a longitudinal data set conducted biannually (CIEM, DOE, ILSSA, & IPSARD, 2013, 2015). The VARHS is a comprehensive large-scale national survey on rural households in the 12 provinces of Vietnam, designed to be representative of the rural households.

To avoid potential endogeneity, the PSM-DID method requires that households that were involved in any off-farm income-generating activities in the 2012 survey be dropped from the research sample. The final balanced panel data set consisted of 1,784 observations with 892 repeated observations (i.e., 892 households were surveyed in both 2012 and 2014 surveys). The summary statistics on rural households involved in off-farm activities are reported in Table 2. A large proportion of the households was found to have been involved in at least one off-farm activity, accounting for 47.65% of the sample. Only 7.96% of households participated in self-employment. Meanwhile, the proportion of households with wage-employment was quite large at 42.83%. Only a small proportion of households (3.14%) were involved in both self- and wage-employment activities. The descriptive statistics of the covariates and outcome variables are available in Supporting Appendix Tables A2 and A3, respectively.

The concentration curve was employed to examine the distribution of different income sources across the population, ordered by household-earned income (Jann, 2016; Nguyen & Tran, 2018). Figure 1 shows that farming income, as well as wage and off-farm self-employment income sources were more skewed towards high-income households than income derived from the use of common property resources (e.g., forests, rivers, fisheries and lakes). For instance, the top 20% of households received around 70% of off-farm self-employment income but only around 45% of common property resources income. In addition, the figure reveals that off-farm self-employment income sources tended to benefit the high-income households compared with farming and wage income sources.

Results and discussion

Explaining off-farm employment decisions

In this section, we present the results on the determinants of off-farm employment obtained from the first stage of PSM-DID method. Table 3 reports the estimation results based on the Probit model.

The 'age' variable was negative and significant, suggesting that households with older heads are less likely to participate in off-farm employment activities, especially wage-employment. These results are consistent with the findings reported elsewhere (Hatlebakk, 2012; Rahman & Akter, 2014). Also, the effect of the 'marital status' variable was found to be negative and significant which indicates that married household heads are less likely to work off-farm, including self-employment and wage-employment. Meanwhile, the 'education' variable had a negative and significant effect on the decision to work off-farm, which indicates that more educated household heads may choose not to work off-farm. The justification can be that due to lack of skill and knowhow, the less educated household heads are pushed to the less attractive (unskilled, seasonal) off-farm employment activities, while more educated household heads prefer to work as professional farmers.

The 'farm-size' variable was negative and significant for off-farm activities in general, as well as for the wage-employment model, suggesting that households with larger landholdings are less likely to work off-farm, especially in wage-employment. Our results are similar to the findings in Asia (Tran et al., 2016; Winters et al., 2009) and in Latin America (Davis et al., 2010; Reardon et al., 2001). Farm size, measured by total area of cultivation land that a rural household owns or manages, is a good proxy for the wealth of that household, as land is a main asset for agricultural production. Households with large landholdings are normally better off. They tend to persist with farming and enhance their income from agricultural activities by adopting new technologies (e.g., modern

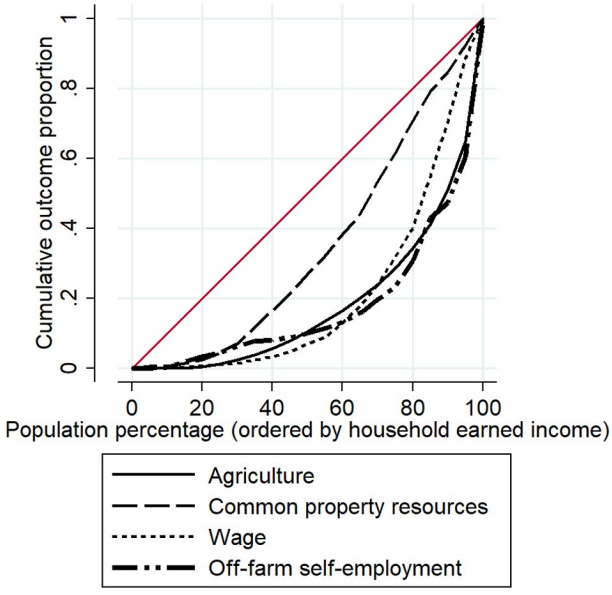

Figure 1. Concentration curves of earned income sources.

Int J Soc Welfare 2021: **30**: 84–96

Table 3. Determinants of off-farm participation.

	Off-farm in general		Self-employment		Wage-employment	
Variable	Coef.	*z*-stat	Coef.	*z*-stat	Coef.	*z*-stat
Age (years)	–0.019***	–4.90	–0.009	–1.55	–0.019***	–4.85
Marital status (1 = yes, 0 = no)	–0.344**	–1.99	–0.433*	–1.80	–0.351**	–2.02
Gender (1 = male, 0 = female)	0.216	1.23	0.318	1.26	0.188	1.07
Education (grade completed)	–0.024*	–1.72	0.021	1.01	–0.022	–1.58
Household size	0.026	0.58	0.038	0.61	0.025	0.55
Number of adults	0.204***	4.48	0.143**	2.19	0.180***	3.97
Number of males	–0.049	–0.77	–0.076	–0.82	–0.004	–0.07
Access to credit (1 = yes, 0 = no)	0.206**	2.02	–0.189	–1.22	0.272***	2.67
Saving (1 = yes, 0 = no)	–0.050	–0.44	–0.145	–0.93	–0.042	–0.36
Farm size (hectares)	–0.099***	–2.60	0.060	1.12	–0.125***	–3.16
Wage-employment (1 = yes, 0 = no)			–0.224	–1.58		
Self-employment (1 = yes, 0 = no)					–0.298*	–1.77
Distance to commune headquarter (km)	–0.050***	–2.82	0.020	0.77	–0.061***	–3.40
Distance to main road (km)	0.006	0.69	–0.018	–1.30	0.008	0.97
Social capital	–0.005	–0.65	–0.010	–0.80	–0.003	–0.40
Agricultural shock loss (1 = yes, 0 = no)	0.211**	2.03	–0.143	–0.93	0.250**	2.41
Market (1 = yes, 0 = no)	0.379***	3.57	0.260*	1.65	0.373***	3.48
Mekong River Delta is based						
Red River Delta (1 = yes, 0 = no)	0.004	0.02	0.727**	2.24	–0.341	–1.48
North Midlands and Mountains (1 = yes, 0 = no)	–0.017	–0.09	0.296	1.01	–0.121	–0.66
Central Coast (1 = yes, 0 = no)	–0.253	–1.20	0.306	0.94	–0.329	–1.55
Central Highlands (1 = yes, 0 = no)	–0.354*	–1.85	–0.530	–1.59	–0.327*	–1.70
Constant	0.766**	2.20	–1.353**	–2.54	0.721**	2.07
Observations	892		892		892	
Log likelihood	170.3		48.73		165.0	
LR Chi^2	–532.1		–223.4		–526.6	
Pseudo R^2	0.138		0.0983		0.135	
Prob > Chi^2	0.000		0.000		0.000	

***p<0.01; **p<0.05; *p<0.1.

rice varieties, new fertilisers, new farming practices) (Duong & Thanh, 2019). In contrast, small landholding or landless households are typically poor and thus are pushed into off-farm employment activities due to land scarcity (Davis et al., 2010; Reardon et al., 2001). However, our results contrast with the findings of studies conducted in rural Africa, where larger landholding households can obtain a high level of agricultural production or use land as collateral for loans to generate or accumulate capital for investment in off-farm employment activities (Abdulai & CroleRees, 2001; Reardon et al., 2008).

The 'credit' variable was positive and significant. In particular, credit was found to facilitate the decision to participate in off-farm wage-employment. These results are consistent with Escobal (2001) who found a positive effect of credit on off-farm employment. Capital constraints are a primary reason why poor households typically have less diversified income sources. In addition, rural residents may borrow to cover some of the costs involved in obtaining a wage job, for instance, travel to the provincial centre, a deposit fee at the employment centre, unofficial costs (commission, bribery), or the purchase of the means of transportation (bike) for working far from home.

Distance to the commune office was found to be significantly negative in the off-farm employment decision model. This result means that those who live further away from off-farm work opportunities are less likely to participate due to the transaction (transportation) cost. The 'market' variable was found to have a positive and statistically significant effect in explaining households' decision to participate in off-farm activities, including both self-employment and wage-employment. These results lend support to the notion that households with better access to the market are in a better position to overcome factor market constraints, thereby increasing their likelihood of starting an off-farm business (Abdulai & CroleRees, 2001; Ali & Peerlings, 2012). In addition, households with better access to the market can find jobs more easily as they have better information on recruitment in the labour market.

The 'agricultural shock loss' variable had a positive and significant effect on off-farm employment decisions, particularly wage-employment. Agricultural production is quite risky and much dependent on weather, and hence households who face any losses from agricultural income shocks tend to diversify their income by participating in off-farm employment in order to mitigate or cope with such shocks.

The variable representing labour endowment ('number of adults') was found to have a positive and significant effect on off-farm employment decisions. A

larger number of adults indicate a larger intra-household labour supply. This variable was significant in the three models, thereby indicating the important role of labour availability in fostering participation in off-farm employment. As shown in Table 3, the estimated coefficient on the 'self-employment' variable was negative and significant within the wage-employment decision model. However, the estimated coefficient on the wage-employment variable in the self-employment decision model, while negative, was not statistically significant. These estimates imply that self- and wage-employment are substitute activities since they compete for labour resources. Some regional dummies variables were found to have a significant effect on off-farm employment decisions. Other variables, such as household size, gender, savings and distance to main roads had an insignificant effect on participation in off-farm activities.

Specifying common support and testing for balancing property

The results reported in the section above were subsequently used to calculate propensity matching scores. In choosing kernel as matching strategy, it is important to determine how well the treated and control households are balanced in the matched samples in terms of observable characteristics (Garrido et al., 2014). A common method to test for the balance is to check whether there is a significant difference in the mean of the observed explanatory variables between the two groups (Dehejia & Wahba, 2002). After matching, no significant difference was found between the treated and control groups in terms of the covariates, indicating that they are well balanced (see Supporting Appendix Table A4). This was formally tested using a sample on the common support region. The bottom of Supporting Appendix Table A4 also reports on- and off-support sample for both the treated and control groups.

Evaluating the impact of off-farm employment

Table 4 presents the results for the impact of off-farm activities on the change in household welfare indicators over the 2012–2014 period. The results show that off-farm activities increase rural households' total earned income. Breaking the results down into wage-employment and self-employment, we found that households engaging in wage-employment had much lower income growth (14.1 million VND/year) than self-employment households (27.3 million VND/year). There were further significant differences between self- and wage-employment. A relatively small proportion of households can engage in self-employment (8%) because they need to have a clear business

Table 4. Estimates of impact of off-farm activities on household welfare.

	Off-farm in general		Self-employment		Wage-employment	
Variable	ATT	*t*-stat	ATT	*t*-stat	ATT	*t*-stat
Income						
Total earned income	18.443***	2.59	27.285***	2.92	14.074**	1.96
Durable asset accumulation						
All durables	7.611	1.53	34.414***	3.43	–1.314	–0.25
Productive	4.572	1.31	32.070***	3.91	–4.745	–1.24
Non-productive	3.039	1.01	2.344	0.54	3.431	1.12
Food consumption value						
All food	0.260***	3.06	0.366***	3.25	0.256***	2.95
Seafood	0.041***	2.68	–0.005	–0.26	0.043***	2.82
Meat	0.118***	3.81	0.068*	1.88	0.099***	3.17
Fruit	0.007	0.86	0.019*	1.79	0.006	0.75
Sweets	0.010**	2.06	0.003	0.57	0.011**	2.21
Milk	0.037**	2.47	0.130***	5.96	0.032**	2.17
Alcohol	0.015	1.37	0.002	0.16	0.023**	2.03
Other beverages	0.005	0.71	0.030***	3.60	–0.001	–0.16
Food away from home	0.027	0.59	0.118**	2.13	0.043	0.93
Food diversity						
Simpson index	0.023*	1.68	–0.019	–1.35	0.032**	2.34
Shannon index	0.101***	3.11	0.007	0.21	0.120***	3.66
Dietary diversity scores	0.618***	4.31	0.184	1.11	0.716***	4.95
Poverty index						
Headcount	–0.107**	–2.36	–0.000	–0.00	–0.109**	–2.40
Poverty gap	–0.070***	–3.39	–0.031	–1.46	–0.068***	–3.28
Poverty severity	–0.065***	–3.09	–0.034*	–1.89	–0.062***	–2.93

Note: Sample limited to common support region; ***p<0.01; **p<0.05; *p<0.1.

Int J Soc Welfare 2021: **30**: 84–96

plan (products or services they are going to offer to markets), as well as resource availability (especially land, capital and trained labour). In contrast, participation in wage-employment is less constrained. Those who engage in self-employment earn a much higher income than those who engage in wage-employment. This is because households engaging in self-employment activities normally invest capital and know-how in order to optimise their business performance, whereas household engaging in wage-employment simply supply unskilled labour. To better develop the rural economy, individuals or households with entrepreneurship skills and know-how should be encouraged to start self-employment activities. This finding implies that policymakers should design policies to support business start-up activities in rural areas by providing funding and removing market barriers. In particular, land, credit and tax policies, as well as administrative procedures, which are conducive to business start-up activities, should be enacted.

Regarding the impact that off-farm employment activities might have on the accumulation of durable assets, we found that only self-employment results in greater durable asset accumulation by households. Specifically, self-employment increases the accumulation of all durables and productive durables by 34.4 and 32.1 million VND (total assets possessed by the household at the time of survey), respectively. Obviously, self-employed households need to purchase productive durable assets to start their own businesses. While self-employed households were found to accumulate more durable productive assets, this is not the case for the households that engage in wage-employment for whom there is even a decreasing tendency for durable asset accumulation. The implication here is that the government should ease the capital constraints facing households engaging in start-ups by facilitating long-term lending.

We found that engaging in off-farm income-generating activities in general significantly increases households' monthly food consumption by 0.26 million VND. More specifically, off-farm employment was found to increase consumption of food items such as seafood (0.041 million VND), meat (0.118 million VND), sweets (0.01 million VND), and milk (0.037 million VND). As compared with off-farm employment activities in general, we also found that self-employment increases households' consumption of fruit (0.019 million VND), other beverages (0.03 million VND) and food away from home (0.118 million VND), while wage-employment increases the consumption of alcohol (0.023 million VND). These findings show that off-farm employment helps the well-being of rural dwellers. With more income derived from off-farm employment activities, rural households are less constrained in food spending and can improve nutrient intake. Furthermore, they can afford a wider variety of food, including some high-value/high-quality food. In other words, participating in off-farm activities helps to narrow the gap between the rich and the poor in terms of food consumption. This will bring positive effects on human capital in the long run.

Table 4 also reports estimates for food diversity indices. Participating in off-farm activities in general significantly increased all food diversity indices. Looking into greater details reveals that wage-employment results in higher food diversity indices while there is no evidence for the impact of self-employment on food diversity. As mentioned above, the self-employed are normally better-off households and they already consume more diverse foods. However, households engaging in self-employment activities were found to spend more on such high-value food items as 'eating outside' and 'other beverages' (e.g., imported bottled or canned beer), whereas those engaging in wage-employment consume traditional low-price alcohols. To sum up, it can be asserted that wage-employment leads to higher food diversity, whereas self-employment activities tend to induce the increased consumption of higher value food items.

As for the poverty indices, the effects of off-farm employment activities were negative and significant, suggesting that off-farm activities can help rural households escape from poverty and reduce poverty gap and severity. The estimates indicate that engaging in self-employment has a mitigating effect on poverty severity, but we did not find a statistically significant relationship between engagement in self-employment and a reduction in the poverty rate or the poverty gap. A possible reason for the lack of statistical significance is that most households that engage in self-employment activities are normally relatively high-income households, even before engaging in off-farm activities (Appendix Table A3). They tend to start their own businesses and may hire additional labourers, who normally come from the poor or landless households. The estimates for wage-employment indicate the poverty-reducing effects of such activity in terms of poverty rate, poverty gap and poverty severity. It is noted that the poor households in rural Vietnam typically find a pathway to escape poverty by seeking low-skilled wage-employment in the larger cities, and in industrial and regional centres, or even working for the better-off households in the same village.

Our findings confirm the important role of off-farm income-generating activities in poverty reduction. In the past, better farming helped Vietnam ensure national food security; however, in recent times off-farm employment has played its role in poverty alleviation and

the achievement of the Sustainable Development Goals (SDGs). It is common in rural areas that many people migrate to seek jobs in the big cities, regional centres or overseas labour markets, and then transfer part of their earnings to their family in the home village. These remittances may be used for investing in agricultural inputs and/or for family expenditures such as children's schooling fee, better nutrition, health treatment, or for the accumulation of durable assets. In that sense, off-farm employment has a positive impact on the welfare of rural dwellers in multidimensional aspects of poverty alleviation. The government should facilitate the mobility of workers by ongoing implementation of the vocational training policy, land and credit policies, as well as creating institutions conducive to the development of the labour market.

Conclusions

The salient features of rural Asia are high population density, abundant labour, a scarcity of cultivable land and a concentration of poverty, especially among ethnic minorities. Agriculture plays an important role in ensuring food security and the development of rural areas. Agricultural technology advancements together with policy reforms in recent years have helped many developing countries in Asia to escape from poverty, malnutrition and low-income status. However, rural dwellers are looking for better income opportunities outside the traditional agricultural sector. Using large-scale household surveys in Vietnam, we evaluated the impact of off-farm employment on household welfare, food security and poverty. The estimates show that off-farm income-generating activities significantly increase rural households' income, productive asset accumulation, food consumption and food diversity, as well as reduce poverty. We also investigated the determinants of participation in off-farm employment activities. The estimates show that age, marital status, education, labour, financial capital, land, location, loss from agricultural shocks and market availability are the key determinants of rural households' decision to work off farm.

The above findings carry important policy messages. It is noteworthy that off-farm employment significantly improves income, food security and the nutrition status of rural households. The government should focus more on creating environments that are conducive to a well-functioning labour market, training, extension and for removing barriers that inhibit the disadvantaged households from diversifying to off-farm opportunities. Policy actions to promote access to credit and other factor markets should also focus on enhancing poor people's opportunity to participate in off-farm self-employment. In addition, the infrastructure necessary to promote non-farm economy (e.g., road and communication networks) should be developed to improve market access.

Off-farm diversification is seemingly an inevitable trend in rural Asian economies that are finding themselves in the process of industrialisation and urbanisation. Migration for wage-employment in big cities or the overseas labour market has become a trend in China, Vietnam, Thailand and many other Asian countries. In addition to migration for wage-employment, a portion of rural residents start their own off-farm self-employment business. To aid this process, governments should create a legal framework for a well-functioning land market. This would enable farmers who choose to switch to off-farm jobs to sell their land at fair prices to other farmers and agri-businesses that are interested in consolidating land in order to improve the efficiency of their operations, enabling them to participate effectively in global value chains. Overall, the whole process could benefit rural households in off-farm employment in terms of income, food consumption and poverty reduction. However, even though off-farm employment may result in an overall increase in income, it does not necessarily improve the welfare of the rural people, given the social and psychological costs that rural out-migration might entail.

For developing countries such as Vietnam, further development will necessitate diversification of the income of rural households while maintaining productivity in agriculture. Accordingly, developing countries can achieve multifaceted development goals, that is, economic growth, food security and poverty alleviation.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

Abdulai, A. & CroleRees, A. (2001). Determinants of income diversification amongst rural households in Southern Mali. *Food Policy*, *26*(4), 437–452. https://doi.org/10.1016/S0306-9192(01)00013-6

Ali, M. & Peerlings, J. (2012). Farm households and nonfarm activities in Ethiopia: Does clustering influence entry and exit? *Agricultural Economics*, *43*(3), 253–266. https://doi.org/10.1111/j.1574-0862.2012.00580.x

Atamanov, A. & Van den Berg, M. (2012). Participation and returns in rural nonfarm activities: Evidence from the Kyrgyz Republic. *Agricultural Economics*, *43*(4), 459–471. https://doi.org/10.1111/j.1574-0862.2012.00596.x

Babatunde, R. O. & Qaim, M. (2010). Impact of off-farm income on food security and nutrition in Nigeria. *Food Policy*, *35*(4), 303–311. https://doi.org/10.1016/j.foodpol.2010.01.006

Barrett, C. B., Reardon, T., & Webb, P. (2001). Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications. *Food Policy*, *26*(4), 315–331. https://doi.org/10.1016/S0306-9192(01)00014-8

Becker, S. O. & Ichino, A. (2002). Estimation of average treatment effects based on propensity scores. *The Stata Journal*, *2*(4), 358–377. https://doi.org/10.1177/1536867X0200200403

Bernard, T., Taffesse, A. S., & Gabre-Madhin, E. (2008). Impact of cooperatives on smallholders' commercialization behavior: Evidence from Ethiopia. *Agricultural Economics*, *39*(2), 147–161. https://doi.org/10.1111/j.1574-0862.2008.00324.x

Chiputwa, B., Spielman, D. J., & Qaim, M. (2015). Food standards, certification, and poverty among coffee farmers in Uganda. *World Development*, *66*, 400–412. https://doi.org/10.1016/j.worlddev.2014.09.006

CIEM, DOE, ILSSA, & IPSARD. (2013). *Vietnam access to resources household survey*. Retrieved from http://www.ciem.org.vn

CIEM, DOE, ILSSA, & IPSARD. (2015). *Vietnam access to resources household survey*. Retrieved from http://www.ciem.org.vn

Davis, B., Winters, P., Carletto, G., Covarrubias, K., Quiñones, E. J., Zezza, A., … DiGiuseppe, S. (2010). A cross-country comparison of rural income generating activities. *World Development*, *38*(1), 48–63. https://doi.org/10.1016/j.worlddev.2009.01.003

de Janvry, A. & Sadoulet, E. (2001). Income strategies among rural households in Mexico: The role of off-farm activities. *World Development*, *29*(3), 467–480. https://doi.org/10.1016/S0305-750X(00)00113-3

Dehejia, R. H. & Wahba, S. (2002). Propensity score-matching methods for nonexperimental causal studies. *Review of Economics and Statistics*, *84*(1), 151–161. https://doi.org/10.1162/003465302317331982

Duong, P. B. & Thanh, P. T. (2019). Adoption and effects of modern rice varieties in Vietnam: Micro-econometric analysis of household surveys. *Economic Analysis and Policy*, *64*, 282–292. https://doi.org/10.1016/j.eap.2019.09.006

Escobal, J. (2001). The determinants of nonfarm income diversification in rural Peru. *World Development*, *29*(3), 497–508. https://doi.org/10.1016/S0305-750X(00)00104-2

Faltermeier, L. & Abdulai, A. (2009). The impact of water conservation and intensification technologies: Empirical evidence for rice farmers in Ghana. *Agricultural Economics*, *40*(3), 365–379. https://doi.org/10.1111/j.1574-0862.2009.00383.x

Foster, J., Greer, J., & Thorbecke, E. (1984). A class of decomposable poverty measures. *Econometrica*, *52*(3), 761. https://doi.org/10.2307/1913475

Foster, J., Greer, J., & Thorbecke, E. (2010). The Foster–Greer–Thorbecke (FGT) poverty measures: 25 years later. *The Journal of Economic Inequality*, *8*(4), 491–524. https://doi.org/10.1007/s10888-010-9136-1

Garrido, M. M., Kelley, A. S., Paris, J., Roza, K., Meier, D. E., Morrison, R. S., & Aldridge, M. D. (2014). Methods for constructing and assessing propensity scores. *Health Services Research*, *49*(5), 1701–1720. https://doi.org/10.1111/1475-6773.12182

General Statistics Office of Vietnam. (2016). *Result of the Vietnam household living standards survey 2014*. Ha Noi: Statistical Publishing House.

Gitonga, Z. M., De Groote, H., Kassie, M., & Tefera, T. (2013). Impact of metal silos on households' maize storage, storage losses and food security: An application of a propensity score matching. *Food Policy*, *43*, 44–55. https://doi.org/10.1016/j.foodpol.2013.08.005

Hatlebakk, M. (2012). Regional variation in livelihood strategies in Malawi. *South African Journal of Economics*, *80*(1), 62–76. https://doi.org/10.1111/j.1813-6982.2011.01301.x

Heckman, J. J., Ichimura, H., & Todd, P. (1998). Matching as an econometric evaluation estimator. *Review of Economic Studies*, *65*(2), 261–294. https://doi.org/10.1111/1467-937X.00044

Hoang, T. X., Pham, C. S., & Ulubaşoğlu, M. A. (2014). Nonfarm activity, household expenditure, and poverty reduction in rural Vietnam: 2002–2008. *World Development*, *64*, 554–568. https://doi.org/10.1016/j.worlddev.2014.06.027

Hung, P. V. & Duong, P. B. (2018). Agricultural and rural policies in Vietnam. In W. H. Meyers & T. Johnson (Eds.), *Handbook of international food and agricultural policies volume I: Policies for agricultural markets and rural economic activity* (Vol. 1, pp. 415–432). Singapore: World Scientific. https://doi.org/10.1142/10606-vol1

Imai, K. S., Gaiha, R., & Thapa, G. (2015). Does non-farm sector employment reduce rural poverty and vulnerability? Evidence from Vietnam and India. *Journal of Asian Economics*, *36*, 47–61. https://doi.org/10.1016/j.asieco.2015.01.001

Jann, B. (2016). Estimating Lorenz and concentration curves. *The Stata Journal: Promoting Communications on Statistics and Stata*, *16*(4), 837–866. https://doi.org/10.1177/1536867X1601600403

Jena, P. R., Chichaibelu, B. B., Stellmacher, T., & Grote, U. (2012). The impact of coffee certification on small-scale producers' livelihoods: A case study from the Jimma Zone, Ethiopia. *Agricultural Economics*, *43*(4), 429–440. https://doi.org/10.1111/j.1574-0862.2012.00594.x

Kassie, M., Shiferaw, B., & Muricho, G. (2011). Agricultural technology, crop income, and poverty alleviation in Uganda. *World Development*, *39*(10), 1784–1795. https://doi.org/10.1016/j.worlddev.2011.04.023

Khandker, S., Koolwal, G. B., & Samad, H. (2009). *Handbook on impact evaluation: Quantitative methods and practices*. Washington, DC: World Bank. https://doi.org/10.1596/978-0-8213-8028-4

Khonje, M., Manda, J., Alene, A. D., & Kassie, M. (2015). Analysis of adoption and impacts of improved maize varieties in Eastern Zambia. *World Development*, *66*, 695–706. https://doi.org/10.1016/j.worlddev.2014.09.008

Mabuza, M. L., Ortmann, G. F., Wale, E., & Mutenje, M. J. (2016). The effect of major income sources on rural household food (in)security: Evidence from Swaziland and implications for policy. *Ecology of Food and Nutrition*, *55*(2), 209–230. https://doi.org/10.1080/03670244.2015.1121482

Mendola, M. (2007). Agricultural technology adoption and poverty reduction: A propensity-score matching analysis for rural Bangladesh. *Food Policy*, *32*(3), 372–393. https://doi.org/10.1016/j.foodpol.2006.07.003

Ng'endo, M., Bhagwat, S., & Keding, G. B. (2016). Influence of seasonal on-farm diversity on dietary diversity: A case study of smallholder farming households in Western Kenya. *Ecology of Food and Nutrition*, *55*(5), 403–427. https://doi.org/10.1080/03670244.2016.1200037

Nguyen, L. D., Raabe, K., & Grote, U. (2015). Rural-urban migration, household vulnerability, and welfare in Vietnam. *World Development*, *71*, 79–93. https://doi.org/10.1016/j.worlddev.2013.11.002

Nguyen, M. C. & Winters, P. (2011). The impact of migration on food consumption patterns: The case of Vietnam. *Food Policy*, *36*(1), 71–87. https://doi.org/10.1016/j.foodpol.2010.11.001

Nguyen, T. V. & Tran, T. Q. (2018). Forestland and rural household livelihoods in the North Central Provinces. *Vietnam. Land Use Policy*, *79*, 10–19. https://doi.org/10.1016/j.landusepol.2018.07.046

OECD & The European Commission. (2014). *The missing entrepreneurs 2014: Policies for inclusive entrepreneurship in Europe*. Paris: OECD Publishing. https://doi.org/10.1787/9789264213593-en

Olale, E. & Henson, S. (2013). The impact of income diversification among fishing communities in Western Kenya.

Food Policy, *43*, 90–99. https://doi.org/10.1016/j.foodpol.2013.08.008
Oostendorp, R. H., Trung, T. Q., & Tung, N. T. (2009). The changing role of non-farm household enterprises in Vietnam. *World Development*, *37*(3), 632–644. https://doi.org/10.1016/j.worlddev.2008.07.007
Owusu, V., Abdulai, A., & Abdul-Rahman, S. (2011). Non-farm work and food security among farm households in Northern Ghana. *Food Policy*, *36*(2), 108–118. https://doi.org/10.1016/j.foodpol.2010.09.002
Pfeiffer, L., López-Feldman, A., & Taylor, J. E. (2009). Is off-farm income reforming the farm? *Evidence from Mexico. Agricultural Economics*, *40*(2), 125–138. https://doi.org/10.1111/j.1574-0862.2009.00365.x
Powell-Jackson, T. & Hanson, K. (2012). Financial incentives for maternal health: Impact of a national programme in Nepal. *Journal of Health Economics*, *31*(1), 271–284. https://doi.org/10.1016/j.jhealeco.2011.10.010
Rahman, S. & Akter, S. (2014). Determinants of livelihood choices: An empirical analysis from rural Bangladesh. *Journal of South Asian Development*, *9*(3), 287–308. https://doi.org/10.1177/0973174114549101
Reardon, T., Berdegué, J., Barrett, C. B., & Stamoulis, K. (2007). Household Income diversification into rural nonfarm activities. In S. Haggblade, P. B. R. Hazell, & T. Reardon (Eds.), *Transforming the rural nonfarm economy: Opportunities and threats in the developing world* (pp. 115–140). Baltimore: Johns Hopkins University Press.
Reardon, T., Berdegué, J., & Escobar, G. (2001). Rural nonfarm employment and incomes in Latin America: Overview and policy implications. *World Development*, *29*(3), 395–409. https://doi.org/10.1016/S0305-750X(00)00112-1
Reardon, T., Taylor, J. E., Stamoulis, K., Lanjouw, P., & Balisacan, A. (2008). Effects of non-farm employment on rural income inequality in developing countries: An investment perspective. *Journal of Agricultural Economics*, *51*(2), 266–288. https://doi.org/10.1111/j.1477-9552.2000.tb01228.x
Romeo, A., Meerman, J., Demeke, M., Scognamillo, A., & Asfaw, S. (2016). Linking farm diversification to household diet diversification: Evidence from a sample of Kenyan ultra-poor farmers. *Food Security*, *8*(6), 1069–1085. https://doi.org/10.1007/s12571-016-0617-3
Rosenbaum, P. R. & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, *70*(1), 41–55. https://doi.org/10.1093/biomet/70.1.41
Ruben, R. & Van den berg, M. (2001). Nonfarm employment and poverty alleviation of rural farm households in Honduras. *World Development*, *29*(3), 549–560. https://doi.org/10.1016/S0305-750X(00)00107-8
Scharf, M. M. & Rahut, D. B. (2014). Nonfarm employment and rural welfare: Evidence from the Himalayas. *American Journal of Agricultural Economics*, *96*(4), 1183–1197. https://doi.org/10.1093/ajae/aau040
Seng, K. (2015). The Effects of nonfarm activities on farm households' food consumption in rural Cambodia. *Development Studies Research*, *2*(1), 77–89. https://doi.org/10.1080/21665095.2015.1098554
Shannon, C. E. (1948). A mathematical theory of communication. *Bell System Technical Journal*, *27*(3), 379–423. https://doi.org/10.1002/j.1538-7305.1948.tb01338.x
Simpson, E. H. (1949). Measurement of diversity. *Nature*, *163*(4148), 688. https://doi.org/10.1038/163688a0
Smith, J. A., & Todd, P. E. (2005). Does matching overcome LaLonde's critique of nonexperimental estimators? *Journal of econometrics*, *125*(1–2), 305–353. https://doi.org/10.1016/j.jeconom.2004.04.011
Sohns, F. & Revilla Diez, J. (2017). Self-employment and its influence on the vulnerability to poverty of households in Rural Vietnam–A panel data analysis. *Geographical Review*, *107*(2), 336–359. https://doi.org/10.1111/j.1931-0846.2016.12206.x
Tran, T. Q. (2015). Nonfarm employment and household income among ethnic minorities in Vietnam. *Economic Research-Ekonomska Istraživanja*, *28*(1), 703–716. https://doi.org/10.1080/1331677X.2015.1087872
Tran, T. Q., Van Vu, H., & Doan, T. T. (2016). Factors affecting the intensity of nonfarm participation among ethnic minorities in Northwest Mountains, Vietnam. *International Journal of Social Economics*, *43*(4), 417–430. https://doi.org/10.1108/IJSE-10-2014-0217
Tsiboe, F., Zereyesus, Y. A., & Osei, E. (2016). Non-farm work, food poverty, and nutrient availability in northern Ghana. *Journal of Rural Studies*, *47*, 97–107. https://doi.org/10.1016/j.jrurstud.2016.07.027
van de Walle, D. & Cratty, D. (2004). Is the emerging non-farm market economy the route out of poverty in Vietnam? *The Economics of Transition*, *12*(2), 237–274. https://doi.org/10.1111/j.0967-0750.2004.00178.x
Villa, J. M. (2016). diff: Simplifying the estimation of difference-in-differences treatment effects. *The Stata Journal*, *16*(1), 52–71. https://doi.org/10.1177/1536867X1601600108
Winters, P., Davis, B., Carletto, G., Covarrubias, K., Quiñones, E. J., Zezza, A., … Stamoulis, K. (2009). Assets, activities and rural income generation: Evidence from a multicountry analysis. *World Development*, *37*(9), 1435–1452. https://doi.org/10.1016/j.worlddev.2009.01.010
World Bank. (2018). *The World Bank indicators database*. Retrieved from http://datatopics.worldbank.org/world-development-indicators/

Supporting Information

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Int J Soc Welfare 2021: **30**: 84–96