

INCOME DIVERSIFICATION AND THE NON-FARM SECTOR IN RURAL MYANMAR:
EVIDENCE FROM A NATIONALLY REPRESENTATIVE SURVEY

by

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(Under the Direction of Mateusz Filipski)

ABSTRACT

Changes in rural Myanmar have been widely discussed by many researchers recently, but the work on the non-farm sector is limited. This paper empirically investigates the extent and the determinants of household diversification in the non-farm sector in rural Myanmar through a nationwide survey (MLCS 2016/17). We find evidence of households that participate significantly in non-farm activities. The key findings are as follows: First, more than half of rural households engage in diverse non-farm activities which contribute more than one-third of total household income. Despite generating large participation, the non-farm sector is informal and has yet to reach its full capacity. Second, diversification is broad-reaching from rich to poor; however, the rate of diversification differs with wealthier households dominating the non-farm sector. Third, land constraints, larger household size, education level, and gender of household head all appear to largely affect diversification.

INDEX WORDS: Non-farm, diversification, rural, Myanmar

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DEDICATION

Dedicated to my beloved parents and my sister.

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1 INTRODUCTION

Structural transformation is a key aspect of the long-term economic development of rural areas, and diversification is one of its' major drivers (Woldenhanna & Oskam, 2001). During the early 2000s, rural areas in Indonesia, Thailand and Vietnam were undergoing rapid transformation, but these transformative changes had lagged behind in rural Myanmar due to political and economic isolation (Awaliyyah et al., 2020; Dapice, 2003; Rubiyanto & Hirota, 2021; Tarp, 2017; UNDP, 2011a; Vos, 2018). The decades of isolation were lifted in 2011, and until 2021, when military coup halted the transition, Myanmar was going through social, political, and economic reforms (Henley, 2014) opening the pathway for the rural economy to rapidly shift from its reliance on agriculture to diversified livelihood strategies (Phyo et al., 2016; Pritchard et al., 2019). However, some others argue that rural Myanmar is still stagnant (World Bank, 2016), and the people in Myanmar are heavily involved in the agriculture sector, which is a low return activity (Haggblade et al., 2014). Nevertheless, an increasing recognition of the dynamism of the economy in rural Myanmar has occurred recently (see, Belton et al., 2017; Belton & Filipski, 2019; Chambers et al., 2018; Phyo et al., 2016; Simpson & Farrelly, 2020).

Agriculture is still the dominant livelihood in Myanmar and contributes about 37% of the national GDP (FAO & WFP, 2021). The opening of the economy in 2011 has clearly brought changes in the social functioning in rural Myanmar (Belton, Win, et al., 2021), but the pattern of rural livelihood is unclear. In addition, rural Myanmar has a prevalence of very high landlessness (45%) (Aung et al., 2019; Boutry et al., 2017; LIFT, 2012), which is significantly higher compared to that of neighboring countries (Mellac & Castellanet, 2015; Phan et al., 2019). Building on these observations, the question of how the rural sector provides opportunities for activities outside

agriculture, and whether it may continue to do so, is of particular relevance. The paper tries to fill in some empirical details about the rural household dynamics by focusing on diversification into non-agricultural activities.

Diversification is defined as the increasing participation of rural households in non-farm activities (Abdulai & CroleRees, 2001; Agyeman et al., 2014; Le & Le, 2020; Lewis, 1954; Woldenhanna & Oskam, 2001). The main motive of diversification for most is to reduce risk by using their wealth or assets in various activities that are primarily driven by push factors, such as land constraints, population pressure, lack of market, liquidity constraints, diminishing factor return, climatic uncertainty (Barrett et al., 2001; Woldenhanna & Oskam, 2001). Another motive is to earn a higher return that is driven by pull factors, such as agricultural development, proximity to urban areas and development of skill or education (Ellis, 2000; Reardon et al., 2001). Although diversification in most cases brings structural development, diversification does not always lead to supposed rural economic growth (Losch et al., 2012). Rural households could remain trapped in poverty even after diversifying if they are motivated only by the push factors. Most of the studies in rural Africa have found that wealthier households that have enough capital and skills enter into high return non-agricultural activities which lead to better standing for the households, but the same is not true for poor households (Barrett et al., 2001; Haggblade et al., 2007). This difference further leads to another worry which maintains that the resource-poor rural households will not be able to cover the entry barrier to engage in higher investment activities; instead, they might engage in low-paying agricultural wage employment that could further trap the poor in the low-income zone.

While a handful of evidence exists on the changes in the economy of rural Myanmar, the literature suffers from several limitations. For example, studies have documented trends in

mechanization (Belton, Win, Zhang, & Filipski, 2017) and migration (Filipski et al., 2020; World Bank, 2017) to explain the ongoing structural transformation in rural Myanmar; however, dynamics of the rural non-agricultural sector, which is a potentially instrumental aspect of rural development processes is understudied. Further, a few studies on the non-agricultural sector is mostly described based on local or regional data (Aung et al., 2019; Htun, 2016; Zu et al., 2017), which are not an accurate representation of the nationwide context. In addition, while these studies address non-agricultural employment in general, they neither further distinguish wage employment and non-farm businesses sectors nor study them in-depth (Phyo et al., 2016). The studies about the factors affecting income diversification in rural Myanmar have received very little attention in the literature. The existing literature on income diversification in rural Myanmar only provides a regional picture. Aung (2019), for instance, focuses on the diversification in the Bago and Sagaing regions, and Soe et al. (2020) focus on the Bago region only, so we have an incomplete picture. This extant gap in the literature warrants further investigation to clear up the extent of diversification in rural Myanmar particularly in terms of households' choices in participation in non-farm businesses and wage employment. We use data from a recent nationwide survey (MLCS 2016/17) to address this lacuna and to identify the factors that affect diversification in the second half of the transformational decade (2011-2021).

According to Barrett and Reardon (2000), income, which is a welfare outcome, is commonly used to measure diversification. In this paper too we describe diversification based on income and to measure income diversification, we use three measures: the number of income-generating activities a household is engaged in, the nonfarm income shares in total household income, and Simpson's Index of diversification (SID). The SID has the advantage of estimating both the

number of household income sources and the contribution of each income source to total household income (Agyeman et al., 2014; Etea et al., 2019; Johny et al., 2017).

We find that rural households are diversifying their income sources substantially by participating in non-farm businesses and wage employment. Members of almost one-half of rural households are involved in non-agricultural activities, and participation in non-agricultural activities is higher in the wealthier households. Wage employment has the highest share in the income of the households with non-agricultural wages contributing higher overall. Likewise, landless households are more likely to carry out non-farm businesses or wage employment activities. The informal nature of wage employment as well as the non-farm businesses sector has two implications. It could mean the sectors are in early stages and are yet to realize their full potential. Or these activities are not exactly a high investment and high return sector, unable to bring reform in the rural poverty in Myanmar. Better education, land constraints, higher household size, and gender are among the important variables that are associated with diversification. This study is unable to encompass the infrastructure, credit and risk variables which could have explained the type of diversification more clearly, our results hint at poor households' participation in distress diversification and the wealthier ones in the accumulative type. These findings contrast with the bleak portrayal of rural Myanmar and show signs of diversification that are consistent with active rural transformation and growth.

The structure of the rest of the paper is as follows. In Section 2, the data and methods that are used in the analysis are briefly explained. It will then go on to present the results in the Section 3. Lastly, Section 4, presents the discussion, conclusions as well as avenues for future work.

2 DATA AND METHODS

2.1 Nationally representative survey data

The Myanmar Living Condition Survey (MLCS) 2016/2017 is a nationally representative survey, which is designed to provide a comprehensive source of living conditions information. The MLCS 2016/2017 reached a total of 13,730 households, of which 8,388 households were rural.¹ This dataset provides detailed information on household occupation and income, which we use to analyse the economy in the rural area: the activities conducted there, and the income generated from those activities. The qualitative and quantitative information of the dataset provides us with a good opportunity to analyse the changes in rural non-farm economy emphasizing non-farm businesses, agricultural wage employment, and non-agricultural wage employment.

Based on Barrett et al. (2001), we define agricultural work as any activities directly conducted on a farm (owned or not, and including wage work). Non-agricultural work includes non-farm businesses and non-agricultural wage employment. Passive income sources are those which do not require the active participation of households for income generation. In our study, we classify remittance (income from a migrant household members), rent income from assets owned by households and public transfer income as passive sources. We exclude passive sources from non-agricultural activities as they are not generated because of the active participation of the household. The terms “non-farm work” and “non-agricultural work” are synonymously used in our study.²

¹ We obtained access to this dataset through IFPRI.

² “Off-farm” work, on the other hand, refers to any work that is not on one’s farm. Agricultural wage work would be considered “off-farm work”, but not “non-farm work”. For clarity we avoid using the concept of “off-farm” work.

Table 1 Rural livelihood classification

Livelihoods	Agricultural	Non-agricultural	
Self-employment	Crop production Livestock sales Aquaculture	Non-farm businesses	Non-agricultural work OR Non-farm work
Wage employment	Agricultural wage	Non-agricultural wage	
Passive sources		Remittance Rent Public transfers	

We further define non-farm businesses as any income-generating economic activity other than the sale of own crop, livestock, aquaculture, fishing, or hunting products (i.e., all activities except farming, livestock and fishing). Trading of purchased agricultural products is included. We define wage employment as any salaried or paid job under contract (written or not) to another person, organization, or enterprise in both the formal and informal economy. It involves member-level as well as household-level analysis. At the member level, 4687 individuals are working for wage occupations which comprise 18% of the working-age group (12-64) rural population. We are also almost exclusively looking at home-based wage occupations. 4% of them are migrants, but the vast majority are working locally in these wage occupations. We further excluded the children below 12-year age, who said they were doing wage employment. These children below 12, were mainly engaged in agriculture (78%) and construction (6%) industries.

In much of the analysis, we partition the country into four agro-ecological regions: “Delta”, “Coastal”, “Central Dry”, and “Hills and Mountains”. We also present results by landholding terciles as well as income quintile to see the heterogeneity among poor and richer households based on capital (physical and financial).

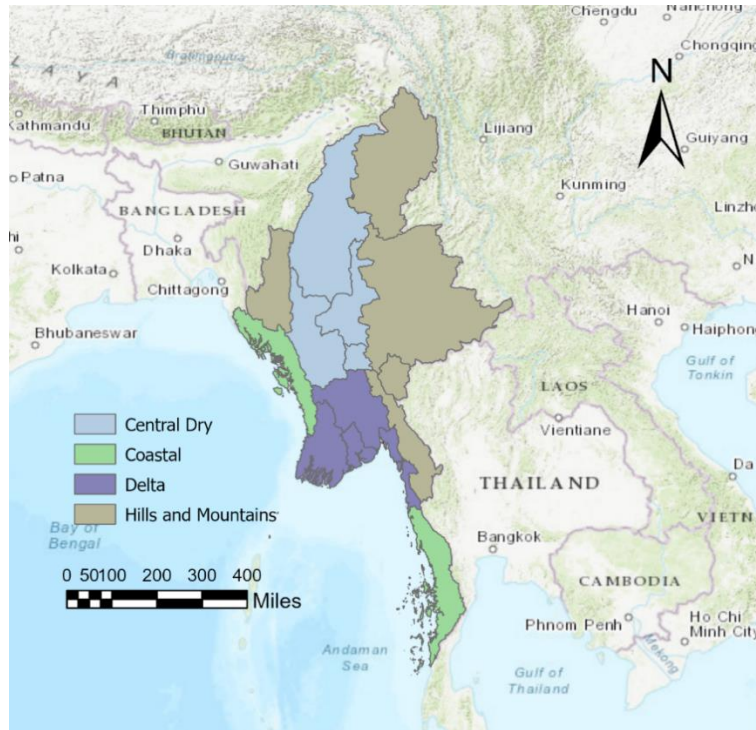


Figure 1 Map of Myanmar

2.2 Methods of analysis

Our study is based on a statistical analysis of the sample. Most of this analysis is based on sample means of variables in the dataset, but we compute other measures when necessary, such as to evaluate income diversification.

2.2.1 Measurement of dependent variables

Our key dependent variables are non-farm participation, income, and income diversification means as described below.

2.2.1.1 Participation

Participation in various income-generating activities is a binary variable, which is zero for the household that does not participate and 1 for those who participate (meaning at least one household member has participated in that activity during the past 12 months). We use household participation in non-farm businesses, non-agricultural wage employment and non-agricultural

wage work in the analysis. Further, we classify households into three categories based on their participation in livelihood strategies as follows:

1. Farm only
2. Farm and Off-farm
3. Off-farm only

2.2.1.2 Income

We also use income variables particularly of non-farm businesses, to see the factors affecting the income. We use log transformation in the income because of the reason that the sensitiveness to change at lower income levels is higher than at higher income levels. Similar models on total household income have been widely used in the literature (Corral & Reardon, 2001; deJanvry & Sadoulet, 2001). As our data has zero income too, we add 1 to the household income before doing the transformation. Negative income from various activities reported by households was dropped before calculating the total household income.

2.2.1.3 Non-farm income share

We used the Mean of Income Share approach to estimate the non-farm income shares of the households in rural Myanmar (as used by Agyeman et al., 2014; Davis et al., 2008). At first, we calculate the total income at the household level from various income-generating activities by adding up the income from all the sources.³ Then the share for each income-generating activity is given by the formula:

$$\text{IncomeShare}_{ih} = \frac{y_{ih}}{Y_h} \quad (1)$$

where, i =income source, y = income from the source, Y = total income, h = household.

More specifically, for the non-farm income share we use the following formula:

³ Note, we exclude the income from passive sources (remittance, rent and transfers)

$$NFS = \sum \left(\frac{BI}{THI} + \frac{NW}{THI} \right) \quad (2)$$

where, THI = total household income, BI= household income from non-farm businesses and NW = household income from non-agricultural wage employment.

2.2.1.4 Simpsons Index of Diversification (SID)

We use the Simpsons Index of Diversification (SID) to estimate the degree of income diversification among the households as SID considers both the number of income sources as well as how evenly the distributions of the income between the different sources are (Agyeman et al., 2014). The SID ranges between zero (0) and one (1). Thus, 0 denotes specialization and 1 is the extremity of diversification. The more the SID value is closer to one, the more diversified the household is.

The SID general formula is given as:

$$SID = 1 - \sum_{i=1}^n P_i^2 \quad (3)$$

where, P_i is the proportion of income coming from the source i and n is the total number of sources of income. The sources of income used are crop income, livestock income and aquaculture and fishing income, non-farm businesses income, agricultural wage income, and non-agricultural wage income.

Table 2 Summary Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Dependent variables					
Non-farm businesses participation	8388	0.29	0.45	0	1
Non-farm business income (1000 KYAT)	8388	741.06	3152.15	0	124000
Non-ag participation	8115	0.52	0.50	0	1
Passive participation	8388	0.33	0.47	0	1
Non-ag wage participation	4515	0.65	0.48	0	1
Number of income sources (NIS)	8115	2.15	0.87	1	5
Non-farm income share (NFS)	8388	0.38	0.43	0	1
Simpson's Index of diversification (SID)	8388	0.17	0.21	0	0.72
Strategy					
Farm only	8388	0.22	0.42	0	1
Farm and Off-farm	8388	0.54	0.50	0	1
Off-farm only	8388	0.24	0.43	0	1
Explanatory variables					
Age	8388	49.94	14.60	16	99
Gender	8388	0.20	0.40	0	1
Marital Status	8388	0.76	0.43	0	1
Education level	8388	0.30	0.46	0	1
Adult equivalent	8388	4.25	1.90	1	17.29
Has migrant	8388	0.26	0.44	0	1
Area (ha)	8388	1.45	5.26	0	240.2
Asset index	8388	0.37	1.14	0	19
Agro ecological regions					
Delta	8388	0.28	0.45	0	1
Coastal	8388	0.14	0.35	0	1
Central dry	8388	0.26	0.44	0	1
Hills and mountains	8388	0.33	0.47	0	1

2.2.2 Methodology used in empirical analysis in detail

OLS regression model

To determine the factors affecting income, we use ordinary least square (OLS) to estimate the linear model:

$$Y = X\beta + \mu = \beta_0 + \beta_1x_1 + \dots + \beta_kx_k + \mu \quad (4)$$

where, Y is the income variable or income share or diversification index, X is the matrix of all explanatory variables and μ is the error term.

Logit model (Binary and multinomial)

We use the logit model to find the factors that affect household participation in various activities because the participation variable is binary in nature. Now the expected value of the dependent variable is given by:

$$Y = G(X\beta) \quad (5)$$

where, G is the specified binomial distribution, X is the matrix of coefficients and Y is a dichotomous variable (0,1).

Following Cramer (2003) and Greene (2003), the general form of binary logit model is given by:

$$P(Y = 1) = \frac{e^{X\beta}}{1+e^{X\beta}} \quad (6)$$

where, P is the probability of the occurrence of the event, X is the matrix of the independent variables and β is the vector of coefficients estimated using standard maximum likelihood methods.

Interpretation of logit coefficient is not straightforward, and hence marginal effects are calculated which give how the dependent variables change with the change in independent variables. The marginal effect for dummy independent variable (x_k) is given by (Long & Freese, 2006):

$$ME(x_k) = P(Y = m|X, x_k = 1) - Pr(Y=m|X, x_k = 0) \quad (7)$$

Further, for the continuous independent variable, marginal effect is given by (Greene, 2003):

$$ME = \frac{\partial G(X\beta)}{\partial X} = G(X\beta)[1 - G(X\beta)]\beta \quad (8)$$

where, β is vector of coefficients in the logit model, X is matrix of independent variables and G denotes logistic function.

For our strategy variable, which is categorical and unordered, we use the multinomial logit model, which is the most commonly used model in this situation (Demie & Zeray, 2015). The regression model can be specified as:

$$\text{strategy}_i = \beta X + \varepsilon_i \quad (9)$$

where, strategy is the outcome variable for household i, it has three categories: farm only, farm and off-farm both and off-farm only, X is a matrix of independent variables, and ε an error term.

Poisson regression

For the variable number of income source (NIS), which is a count variable, we employ the Poisson regression model (Babatunde & Qaim, 2009; Greene, 2003; Senadza, 2012). Suppose Y_i is the number of income sources of a household i. The variable Y_i is drawn from a Poisson distribution with mean λ and X is the matrix of independent variables for the regression model.

Following Greene (2003), the density function of the variable Y_i is given by:

$$f(Y_i | X_i) = \frac{e^{-\lambda_i} \lambda_i^{Y_i}}{Y_i!} Y_i = 0, 1, 2, \dots \quad (10)$$

Now, with mean, the function is specified as:

$$E[Y_i | X_i] = \lambda_i = \exp(X\beta) = \exp(\beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki}) \quad (11)$$

The regression model is then specified as follows:

$$Y_i = \exp(X\beta) + \varepsilon_i = \exp(\beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki}) + \varepsilon_i \quad (12)$$

where all the variables are as defined above.

Zeros in the data

In the analysis of activity incomes, we distinguish five different activities: crop production, livestock sales, aquaculture, non-farm businesses, agricultural wage employment and non-agricultural wage employment. Not all households take part in all the activities and hence we have

a lot of zeros in the income/ income share and diversification index variable. The presence of zero makes the estimation through OLS biased. In such other selection model- Tobit or Heckman selection should be used. According to Humphrey (2013), when the zeros in the data exist because of the choice made by an individual (real zeros), Tobit model is appropriate. In the presence of zero which is due to inappropriate question (no-observable response), the Heckman selection model is appropriate. Further, another assumption of Tobit is that the two step of decision should be made simultaneously, while the double hurdle model is similar to Tobit, but allows for the decision to be made differently. Both Heckman (Lanjouw, 2001) and Tobit model (Agyeman et al., 2014; deJanvry & Sadoulet, 2001) are used in the analysis of income and diversification data.

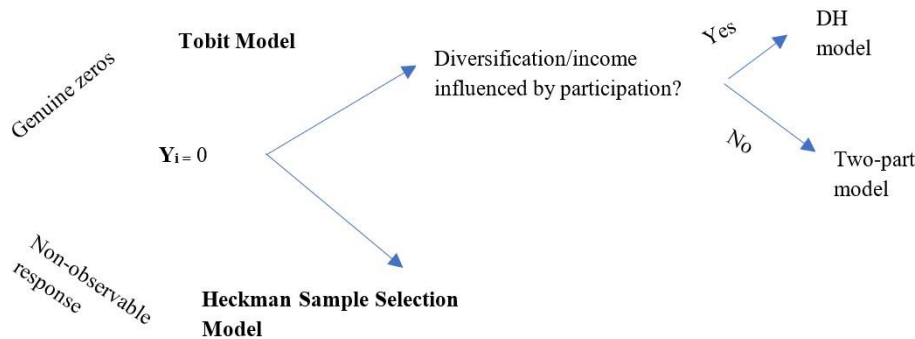


Figure 2 Selection of model (Humphrey, 2013)

Humphrey (2013) provides guidance on the selection of appropriate model in the presence of genuine zeros and missing values separately but unfortunately has no solution for the data which has both type of zeros at the same time. Each model has its own advantages and disadvantages and hence we use all three models along with the OLS model and compare the coefficients for the robustness check.

Heckman Selection Model

The Heckman procedure is a two-stage model. First, a probit model for the probability of participation is applied. In the second stage, predicted individual probabilities are added as an explanatory variable to the model equation and estimated with OLS. If errors in the participation equation are correlated with the errors in the model equation, the estimates without correction (in an OLS model) would be biased.

The estimated function under the selection corrected Heckman model is:

$$Y_i = X\beta + \rho\sigma_\varepsilon\lambda_i + \varepsilon_i^* \text{ where, } \lambda_i = \frac{\varphi(Vy)}{\Phi(Vy)} \quad (13)$$

X includes all explanatory variables of the equation, φ and Φ signifies standard normal density and distribution functions, respectively, V represents the vector of explanatory variables of the participation equation that should differ from the one included in the model equation, ρ is the correlation coefficient of the model and participation equations and σ_ε is the standard deviation.

In our study, we present the result in two steps, the selection equation (first step) to show if participation occurs or not, modeled as:

$$S = X\alpha + \mu \quad (14)$$

where, S is the selection variable (participation in non-farm work/diversification/non-farm businesses), and X is the matrix of independent variables which would affect the selection.

And the outcome equation (second step) to estimate the effect of participation, modeled as:

$$Y = V\beta + \varepsilon \quad (15)$$

where, Y is the outcome variable (non-farm income share/SID/non-farm business income), and V is the matrix of independent variables which would affect the model.

Tobit and Double-Hurdle Model

A Tobit regression model is commonly used when data has lots of zeros (Agyeman et al., 2014; deJanvry & Sadoulet, 2001). The model is specified as:

$$y_i^* = \beta X + \varepsilon_i \quad (16)$$

$$y_i = \begin{cases} y_i^* & \text{if } y_L < y_i^* < y_U \\ y_L & \text{if } y_i^* \leq y_L \\ y_U & \text{if } y_i^* \geq y_U \end{cases} \quad (17)$$

Here, y_i^* is the truncated variable of the Simpson Diversity Index (SID)/non-farm income share/non-farm businesses income, β is the parameter to be estimated, X is a vector of explanatory variables and ε is the error term. The lower limit is 0 and the upper limit is 1 in the above truncation.

The **double hurdle model** differs from the Tobit model in that the decision passes through the two hurdles. The first hurdle is to choose a positive or zero value of the dependent variable and the second hurdle is to decide on the level of the dependent variable (diversification index). The main feature of the double-hurdle model is that participation and diversification decisions are assumed to stem from two separate individual choices and the associates of the two decisions are allowed to differ.

In the double-hurdle model, in the first step, we examine the estimates related to the decision of willingness to participate in non-farm businesses or diversification or non-farm work. The probit model is used in this step as follows:

$$Z^* = V\gamma + \varepsilon \quad (18)$$

$$\text{where, } Z = \begin{cases} 1, & \text{if } Z^* > 0 \\ 0, & \text{if } Z^* \leq 0 \end{cases} \quad (19)$$

Z is a binary variable that takes the value of 1 if the respondent is a participant and 0 otherwise, V is a matrix of all explanatory variables, α denotes a vector of parameters, and ε is the error term.

The second equation in the double-hurdle, also known as the model equation, relates to the extent of diversification of the households. The second hurdle equation can be estimated using a regression truncated at zero (similar to a Tobit model) as follows:

$$Y^* = X\beta + \mu \quad (20)$$

$$\text{where, } Y = \begin{cases} Y^*, & \text{if } Y^* > 0 \\ 0, & \text{if } Y^* \leq 0 \end{cases} \quad (21)$$

where, Y represents the observed diversification extent which depends on the latent variable Y^* being greater than zero, X denotes a vector of explanatory variables, β represents a vector of parameters to be estimated, and μ is a random error term.

Table 3 Summary of the dependent variables and the model used

Dependent variables	Empirical model
Non-farm businesses participation	Logit Model
Non-ag wage participation	Logit Model
Non-farm participation	Logit Model
Passive income participation	Logit Model
Non-farm business income	OLS, Heckman Selection, Tobit
Number of income sources (NIS)	Poisson
Non-farm income share (NFS)	OLS, Heckman Selection, Tobit
Simpson's Index of Diversification (SID)	OLS, Heckman Selection, Double Hurdle, Tobit
Strategy	Multinomial logit
a. Farm only	
b. Farm and Off-farm	
c. Off-farm only	

3 RESULTS AND DISCUSSION

3.1 Rural income-generating activities

To better understand the structure of the rural economy, we in this section describe the household participation in rural income-generating activities and their share in the total household income. This helps us to descriptively understand the diversification of income sources over various agro-ecological regions in rural Myanmar.

3.1.1 Participation in income-generating activities

Agriculture remains the major livelihood activity in rural Myanmar with on average 75% of the total rural household's participation (Figure 3). However, the non-agricultural participation has also increased largely compared to the lower participation during the 2000s (Dapice, 2003). Agricultural participation comes from either through on-farm activities or wage labor on other's field. The participation is high overall, peaking in the hilly region, which is poorer than other regions in terms of infrastructure access and other opportunities. Non-agriculture activities are supposedly more skill requiring and infrastructure requiring (Barrett et al., 2001; Dercon & Krishnan, 1996; Woldenhanna & Oskam, 2001). The lower productivity of the land in the region could be another reason for the higher participation in agricultural activities, to secure the households from food insecurity.

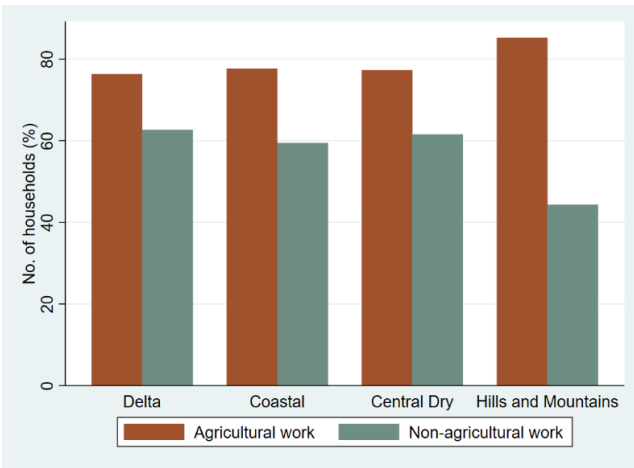


Figure 3 Participation in agricultural work vs non-agricultural work⁴

Figure 4 presents the same household participation information as depicted in Figure 3, now broken into types of agricultural and non-agricultural works. Several points stand out. First, within non-agricultural work, we see a large share of households engaging in non-farm businesses, which is quite surprising given the nature of the activity requiring capital and managerial skills (Woldenhanna & Oskam, 2001). Secondly, looking into wage labor, we can see that households doing non-ag wage labor are higher than the household involving only in farm wage. This finding is in contrast with those of previous studies, where authors have stated rural households mostly diversify as farm wage labor, which is a low paying activity (Le & Le, 2020). The result further shows that rural households in Myanmar are moving out of their reliance on agriculture only.

⁴ Households can participate in more than one work

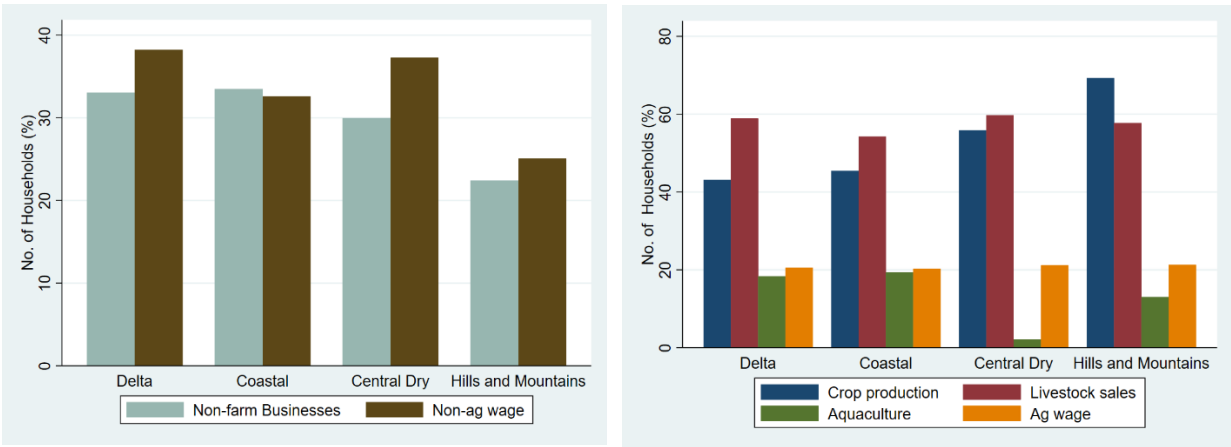


Figure 4 Participation rate among non-ag works (left) and agricultural works (right)

Third, in the case of aquaculture which is a very specific job requiring a certain kind of geography, the participation rate is not much but is nevertheless significant (11% overall). The share is substantially lower in a central dry region and higher in the delta and coastal region, which possibly stems of the reason that whether the place has connection with the sea or ocean or not. Fourth, we find a significant proportion of households deriving their income from rent, public transfer, and other income sources (see Appendix 4). We see a very high proportion in all three regions, the participation is slightly smaller in hills and mountains which emphasizes the role of these income sources in sustaining the rural economy.

3.1.2 Income shares from income-generating activities

Farming is the predominant livelihood activity in the rural areas however, the households also engage in other activities because in rural areas much of the farming job is seasonal (Ellis, 2000). In rural Myanmar too, households engage in other activities apart from agriculture and they contribute to a very significant share of household income. These findings support the views of Okoye (1995) and Oladeji (2007) who stated that even though farming was the predominant activity in most rural areas, farmers usually engage in supplementary or complementary activities during off-season periods in sub-Saharan Africa.

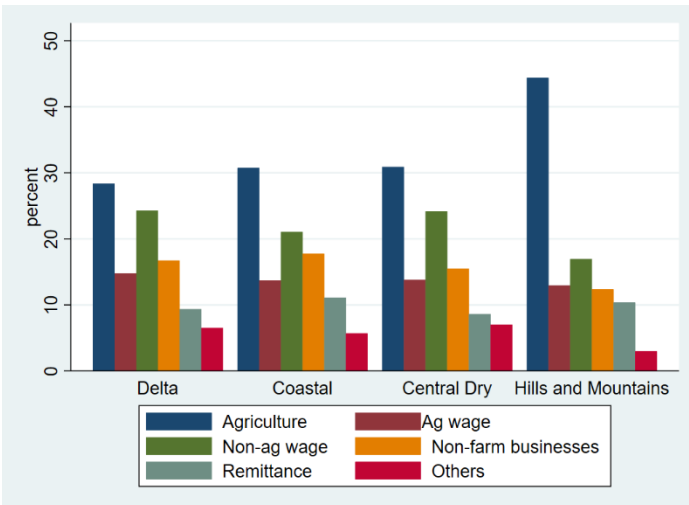


Figure 5 Household income share from various activities

Figure 5 presents the share of rural livelihoods in total household income. We see a relatively lower share of income coming from agriculture when compared with its highest share in participation. Rigg et al. (2012) found a similar trend in Southeast Asia, where the importance of agriculture in rural economies is decreasing and the diversity of activities is growing. The figure is higher in the hills and mountain region, perhaps reflecting the lower landlessness rate in the region causing the higher direct participation in the agricultural activities. The other regions with relatively higher landlessness, deriving a lower share of income from agricultural activities also supports our earlier assumption about the activities in the hilly region.

It is not possible to say with confidence whether all the regions are moving out of the agrarian reliance, but we can strongly presume that a bulk of rural areas are already diversifying their livelihood sources into non-agricultural activities and the importance of non-agricultural activities is increasing (Dapice, 2003). Even if we see the lower participation and share in the hilly region compared to other regions, this does not necessarily mean they are not increasing their diversification. The lower share might be coming from the very poor involvement in non-agriculture to start with.

3.2 Non-ag activities and Poverty

Here, we describe the non-ag participation as well as household wealth status for rural households. For rural households in developing countries, the land is one of the most important wealth assets as a large share of income comes from agriculture (Aryeetey, 2004; Belton, Cho, et al., 2021). Land ownership however differs in different countries, somewhere it is land sharing; somewhere very different, for instance, in Vietnam, the land is owned by the state (Tria Kerkvliet, 2006), but in the majority of countries, the land is owned privately. In Myanmar, the land is owned privately but the landlessness rate is very high (Figure 6). Rates of landlessness vary among agro-ecological zones but are nevertheless high overall (45%). The Hills and Mountains region has a relatively higher percentage of households owning land (70%). Landless or near landless may be unable to generate income using the land. Thus, these land poor households may either need to work as farm labor or diversify their collective sources of livelihood into the non-farm sector if they are to make ends meet (Rammohan & Pritchard, 2014). Landlessness causes diversification of the household, but the type would be majorly survival diversification which is only transient and cannot ensure the sustainable development of the rural area (Dzanku, 2015).

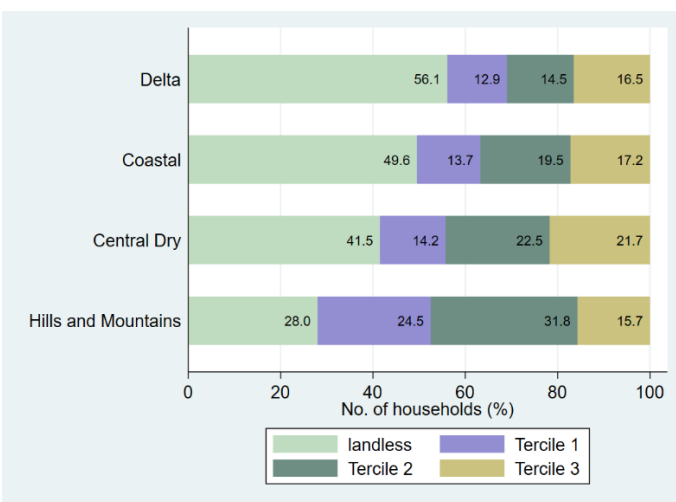


Figure 6 Landownership in various regions

Despite considerable fluctuations across regions and land quintiles, overall, we find sizable participation in agricultural work regardless of household access to land, with participation rates of around 50% even for landless households (Figure 7). Further, among the land-owning households, the ample participation in farming indicates the dependency of the rural economy on the farm sector. The second picture again confirms the importance of agriculture at all the wealth levels. Figure 7 gives a glimpse of rural Myanmar, where people consider agricultural work as the attractive option of livelihood.

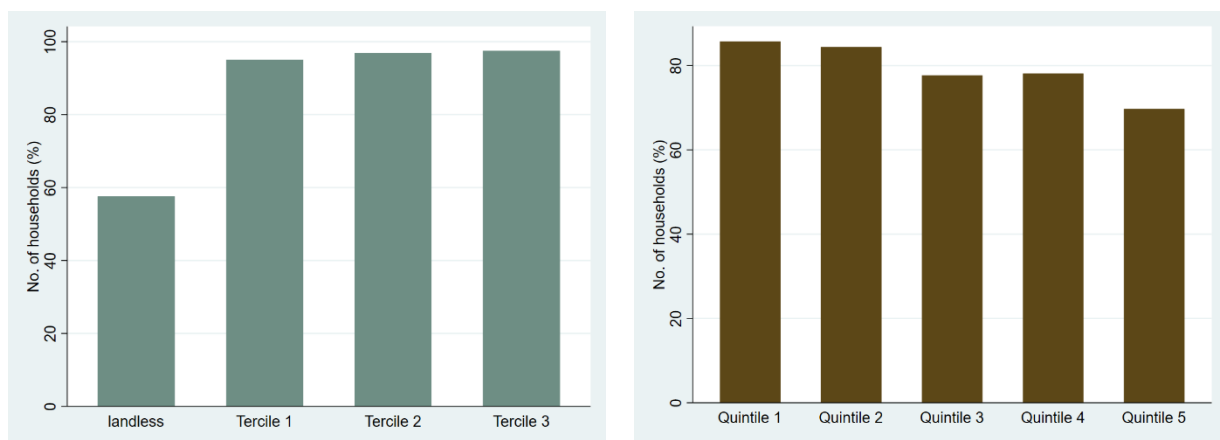


Figure 7 Land holding, household income and agricultural participation

At the same time, Figure 8 shows non-farm employment too has a significant role in the livelihoods of households in all income classes and is of particular importance for wealthier households. We do not see a pattern here but the higher participation rate of landless households and fairly similar participation rate in landed households is clearly seen. Participation in non-farm activities rises with the income quintile, thus non-farm activities are superior activities in rural Myanmar. However, the finding should not be misinterpreted as all the wealthier households move out to the non-farm sector. Figure 7 backs up this interpretation where we see considerable participation in agriculture sector too by wealthy households. Additionally, the steep rise in the participation from poorer to richer households is most likely reflecting two situations, either non-

agricultural activities are high investment activities providing more opportunities to richer households or the households which carry out these activities are richer because of their higher return. This could be an interesting area to further explore.

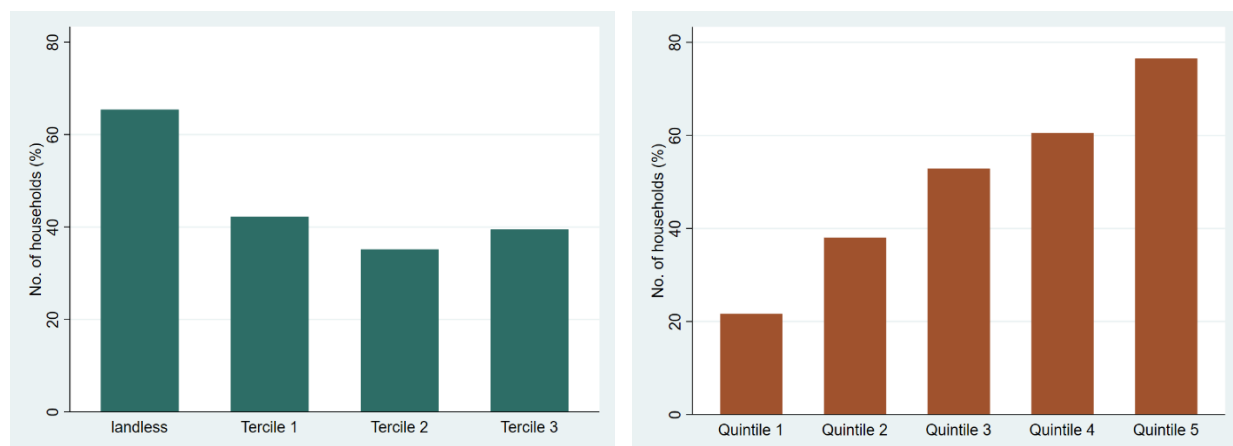


Figure 8 Land holding, household income and non-ag work participation

The next two sub-sections move on to discuss the non-farm businesses and wage employment sectors of rural Myanmar in detail.

3.3 The Non-Farm Businesses Landscape

3.3.1 Sectoral and Regional Patterns

3.3.1.1 A significant number of rural households operate non-farm businesses.

Operating a non-farm business is the second most common occupation in the sample after agriculture. Nearly one-third (30%) of the rural households surveyed engage in some form of non-farm business (Figure 9). Also, nearly 24% of households doing non-farm businesses operate more than one business. Rural non-farm enterprise participation in Thailand is slightly higher (40%) (Chawanote, 2012) and slightly lower in the Philippines (22.3%) (Anabo, 2021). In sub-Saharan Africa, Nagler and Naudé (2017) found out non-farm enterprise participation is as low as 17% in Malawi and as high as 62% in Niger. Likewise, in Bangladesh participation rate was somewhat similar to that of our sample (32%)(Sen et al., 2021).

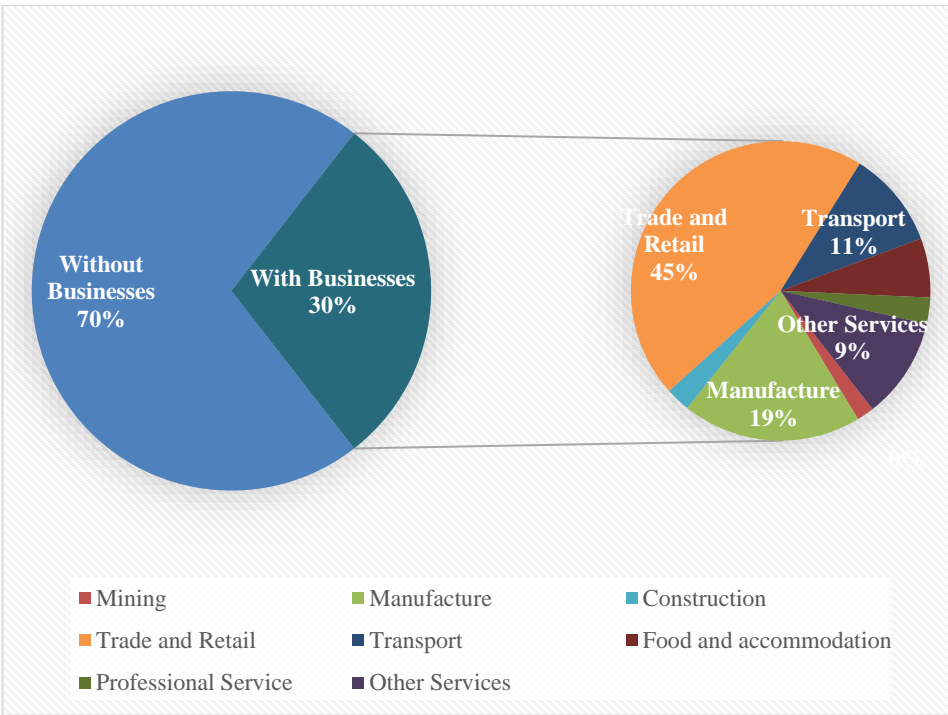


Figure 9 Share of households performing various types of non-farm businesses.

The types of businesses operating in the rural sector are diverse. The most common type, comprising 45% of answers, is trade and retail. This includes any wholesale or retail trade, from food to motor vehicles. Similar results were reported by Nagler and Naude (2017) and Tafesse et al. (2015) in sub-Saharan Africa. The next largest category is manufacturing (19%), which includes a diverse range of activities, the most common being food processing and textiles, but also includes refined petroleum, furniture, paper products, rubber, plastic products, etc. Transport services account for 11% of rural businesses. The remaining categories include mining, food and accommodation, construction, and professional services, as well as the catch-all “other services”. The businesses which are linked to the agricultural sector are spread over different subcategories, and overall, they constitute about 11% of the total non-farm businesses. This shows that the non-farm sector in rural Myanmar has moved beyond its reliance on agriculture.

3.3.1.2 Geographic patterns reveal regional specialization

Table 4 below presents how types of businesses are distributed across the four agro-ecological zones. While most businesses are distributed following the population distribution (provided in the last row of the table for comparison), certain patterns emerge. The Delta zone, which is home to 38.3% of the rural population and in proximity to the fast-growing Yangon metropolitan area, is home to a disproportionately high share of certain businesses, including transport, construction, and food and accommodation businesses. The Central Dry zone is home to about a third of the rural population but hosts more than half of manufacturers (57%) and mining enterprises (56.2%) in the country. Similarly, the Hills and Mountains region hosts a large share of mining businesses, consistently with its significant mineral reserves, but a low share of manufacturing, utilities, or professional services reflecting limited access to opportunities and infrastructure (Mohanty, et al., 2018).

Table 4 Agro-ecological distribution of non-farm businesses

Non-farm Businesses	Agro-ecological Zones (%)				Total
	Delta	Coastal	Central Dry	Hills and Mountains	
Mining	4.5	1.6	56.2	37.7	100.0
Manufacture	25.1	8.7	57.0	9.2	100.0
Construction	46.7	13.2	17.9	22.2	100.0
Trade and Retail	43.3	12.0	30.7	14.1	100.0
Transport	64.0	8.0	16.2	11.9	100.0
Food and accommodation	50.7	7.4	24.6	17.3	100.0
Professional Service	36.6	11.4	40.6	11.4	100.0
Other Services	47.4	9.7	27.6	15.4	100.0
Total	41.7	10.2	34.3	13.8	100.0
Population %	38.3	9.4	34.2	18.0	100.0

3.3.2 Businesses characteristics

3.3.2.1 Most non-farm businesses were established recently

Figure 10 reveals that most non-farm businesses in rural Myanmar are relatively new. While some businesses have been operating for decades (up to 80 years for the oldest), these are few in the sample.⁵ Of the businesses interviewed, 70% were less than 10 years old, and 60% were established after 2011 when economic reforms started. This suggests a rapid increase in the number of non-farm businesses in the recent past.⁶

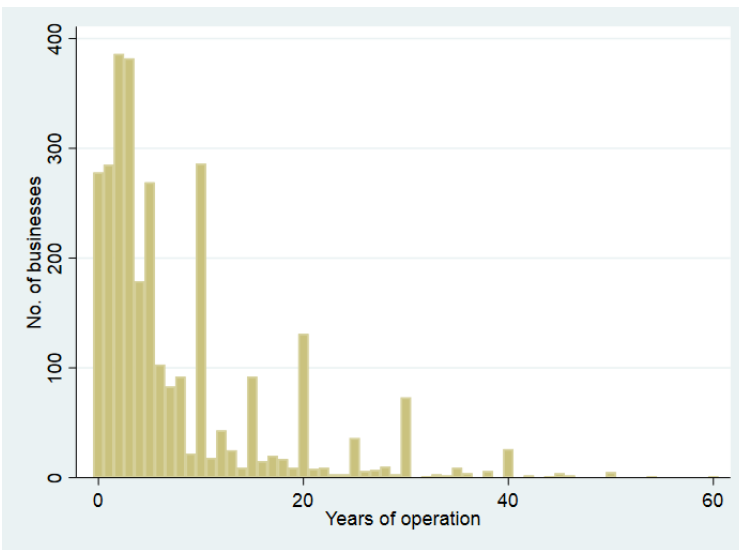


Figure 10 Distribution of the businesses based on years of operation.

3.3.2.2 Most businesses are informal and are one-person operations

The vast majority (93%) of the businesses in rural Myanmar were not registered either in the municipal council or township/city development committee. Of the 7% registered, the bulk is in transport businesses (19%). Though this could partly reflect the complexity of registration

⁵ We only show up to 60 years old in figure because of very small number of businesses above it

⁶ Due to lack of historical data, we cannot rule out that these new businesses are simply replacing other failed businesses, in which case the total number of businesses would not be increasing. However, anecdotal evidence points overwhelmingly to a rapid growth in the number of rural non-farm businesses.

procedures or lack of knowledge regarding legal obligations, it provides further evidence that most businesses are informal and small-scaled.

A large proportion of enterprises (67%) are micro-scaled, with only one worker involved including the owner and any family or hired help. The number of enterprises involving more than 10 people is negligible at only 1% overall. This figure is slightly higher for construction businesses, but even in those categories only 16% and 11% of businesses have more than ten workers, respectively. Likewise, none of the professional service enterprises in the sample has more than ten workers. In developing countries, most non-farm businesses are self-employed small-scaled enterprises without paid employees (Anabo, 2021; Chawanote, 2012; Haggblade et al., 2007). Consistent with those works, in rural Myanmar too, about 88% of businesses rely purely on family labor, meaning they do not hire any paid workers. Among the remaining 12% of businesses with at least one hired worker, the number ranges from 1 to 213. These evidence points much of these businesses are low investment businesses having lower entry barriers. Even the poor household can engage in this type of business.

Table 5 Percentage of households engaged in different businesses enterprises by income quintile

Businesses code (ISIC)	All HHs	Income Quintile				
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Mining	2.0	2.2	1.6	2.5	2.6	1.4
Manufacture	20.0	15.2	18.9	19.6	24.3	19.0
Construction	2.4	1.3	1.5	3.3	1.8	2.9
Trade and Retail	46.5	56.1	47.3	42.3	43.3	48.1
Transport	9.8	6.8	9.3	12.6	9.1	9.8
Food and accommodation	6.1	3.8	7.1	5.9	6.6	5.9
Professional Service	2.8	1.8	3.2	4.1	1.1	3.5
Other Services	10.5	12.9	11.2	9.9	11.4	9.5

Table 5 indicates the different types of enterprises that rural households are involved in. We see some interesting finds looking through different income quintiles. While trade and retail businesses are popular in all households, it is of the highest importance to the poorest household.

This could be because of the lower barrier to entering the retail trade businesses. We do not see a distinct pattern in other businesses participation but businesses like manufacturing, professional services and mining are more preferred by middle-income households (quintile 3 and quintile 4). The result certainly shows household diversification into non-farm businesses which covers poor to rich, but the motive of diversification seems different. While wealthier engaging in high return activities indicates the accumulative type of diversification, the poor are likely motivated for the survival purpose. If the diversification is taken for the coping purpose, livelihood diversification is not very stable (Haggblade et al., 2002). Haggblade et al. (2002) in their study in developing countries found out rural non-farm enterprises offer very diverse opportunities to poor and wealthy households, where the poor seek refuge in low-skilled nonfarm activities like retail trade while the rich engage in skill intensive high productivity activities like education sector and transportation sector. The finding is echoed in our result. While household engagement in low-return livelihood activities is very transient, more study is necessary to shed light on the welfare effect of transient and stable livelihood activities of poor and rich households.

3.3.3 Business-owner characteristics

3.3.3.1 Households with businesses differ only slightly on demographics

Table 6 compares two groups of households: those with and those without non-farm businesses. The t-tests show households with businesses are somewhat larger on average (4.6 members versus 4.3 on average), but their land owning is not significantly different. There is no significant difference in the mean age of the household head between the two groups, but household heads of the two groups differed statistically on all other features. The heads of households with businesses are somewhat less likely to be female, more likely to be married and to be self-employed. For education, households with businesses are more likely to have completed

primary school and they are also more likely to be literate. Gordon and Craig (2001) also reported that better-educated individuals are more likely to establish their own non-farm enterprises in sub-Saharan Africa. Overall, while these differences are statistically significant, they are not dramatic in magnitude.

Table 6 Demographic characteristics of the household or household head

Household characteristics	With Businesses	Without Businesses
Number of members (mean)	4.6	4.3***
Owned land (ha) (mean)	2.8	2.5
Household head characteristics		
Age (mean)	50.2	49.8
Female (%)	17.7	20.7***
Married (%)	79.1	74.6***
Self-employed (%)	68.8	50.3***
Education level higher than primary (%)	43.5	32.6***
Literate (%)	88.9	81.3***
Total Households	2393	5995

* significant at 10% probability level ** significant at 5% probability level and *** significant at 1% probability level. "Self-employed" without businesses refer to farmers, fishermen etc.

3.3.3.2 Landless households are more likely to engage in non-farm businesses.

Most business-owning households in the survey are landless. Figure 11 presents the distribution of household participation in the land terciles and income quintiles. It may be that land constraints push households to engage in non-farm enterprises, with the motive of earning a higher income. As land becomes scarce, the transition to the non-farm sector is essential to support the household economy. Or lack of opportunities in farming might be pushing people to abandon agriculture by selling the land. Interpreting this isn't straightforward, we can see the correlation between non-farm businesses and landlessness but cannot exactly pinpoint where it comes from. It however does indicate that poor landholding causes households to engage in non-farm businesses, making land constraints a push factor for diversification in rural Myanmar. The gradual

rise of non-farm businesses participation within the income quintile most likely reflects the businesses have an entry barrier, which poor households are less likely to cross.

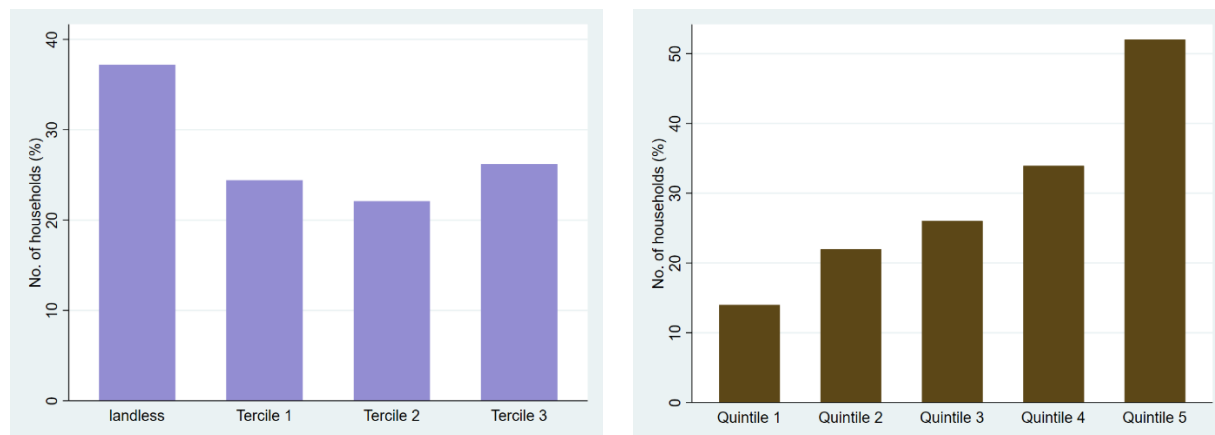


Figure 11 Land holding, household income and non-farm businesses participation

3.4 The role of wage employment

3.4.1 Sectoral and regional patterns

3.4.1.1 High share of wage employment comes from non-agriculture

Figure 12 shows that almost half (45%) of wage occupation comes from the non-agricultural sector. Despite the agricultural wage labor contributing the highest, large non-agricultural contribution shows rural Myanmar is moving out of the agrarian economy. Manufacture and construction industries are the largest shareholder in the non-agricultural wage generation (24%). Other major non-agricultural wages employing industries in rural Myanmar are professional service (16%) and trade and retail (11%). If we look at the division among wage-employed households, almost 39% of households are engaged in agricultural wage employment only and the rest are engaged in non-agricultural wage employment too (Figure 4).

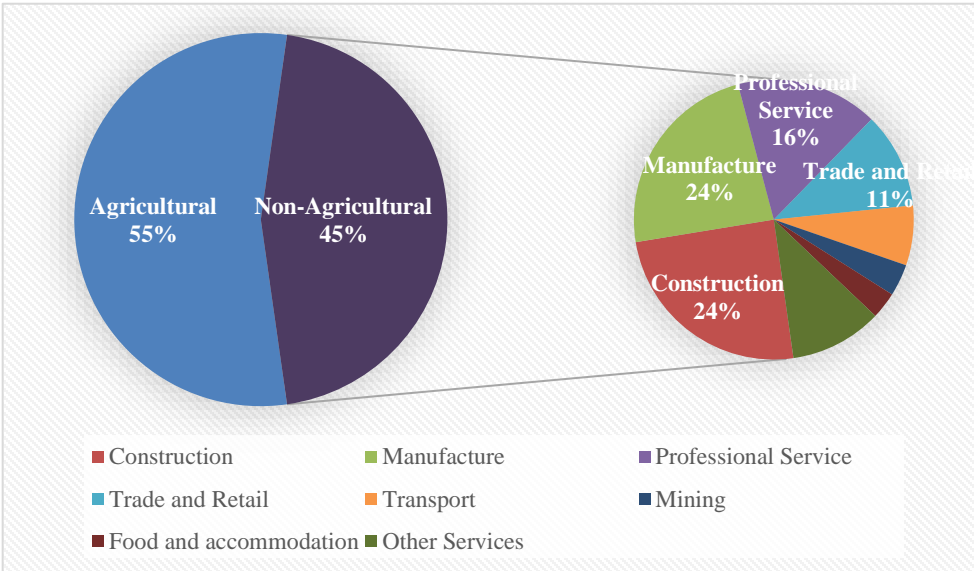


Figure 12 Sectoral division of the wage occupation

3.4.1.2 Employment tends to be year-round, but informal

Most of the wage occupations are carried out throughout the year. About 60% of wage occupations are done for 9 months and more. Likewise, seasonal employment for less than six months is only about a quarter. In addition to the main job, 35% of wage workers carry out the second job too. These secondary wage occupations, however, are more seasonal. Around 57% of these are seasonally operated (less than six months), and the yearly jobs comprise a small proportion (23%).

The wage employment sector in rural Myanmar is largely informal. An almost insignificant number of wage employees are employed under written contract (5%). About 10% of wage-employed individuals are supposed to get a pension from the employer, and a currently similar percentage of wage workers get paid annual leave. About 85% of wage-workers are employed by any private individual. Half of the remaining (7%) work under the government as a government employee and the other half (7%) under some private organization. This also supports the informal nature of the employment. Further, 10% of wage-working people are actively searching for

additional work. In addition, around 60% of people desire to do more work if any opportunities are available suggesting that although wage employment is important in the rural economy, it is still far from being at full capacity.

While the informal nature and low hours available in wage work creates doubt on wage activity to be just a temporary thing, the high share of year-round wage occupation tells us that these wage works are not the labor diversification only in the off-season where they cannot work in their farm. Wage employment must be their major source of income not just a secondary, free time employment opportunity.

3.4.2 Wage worker characteristics

3.4.2.1 Wage workers are similar to the population average

Table 7 compares two groups of people: wage working and not wage working. The t-test shows wage-employed individuals are somewhat having higher education levels (39.4 versus 44.2). There is no significant difference between wage-employed and wage unemployed in gender and marital status. They are different in all other characteristics such as age, literacy, position in the family, household size, and land size. However, for most measures, the magnitudes of these differences are not large despite being significant, suggesting the wage employed are not dramatically different from the population average.

Table 7 Demographic characteristics of the individual or households doing wage occupation

Demographic characteristics	Wage Employed	Others
Individual Characteristics		
Age (mean)	35.9	37.7***
Female (%)	52.6	53.3
Education above primary (%)	44.2	39.4***
Head of the family (%)	31.9	29.1***
Married (%)	54.4	54.6
Literate (%)	91.0	83.1***
Household characteristics		
Total household member (mean)	4.8	5.2***
Land owned (ha)	1.2	1.7***
Total	4687	23628

* significant at 10% probability level ** significant at 5% probability level and *** significant at 1% probability level.

3.4.2.2 Wage employment decreases gradually with wealth

Figure 13 shows the negative correlation between wage employment and landholding. 72% of landless households are involved in wage employment. This share decreases in each successive landholding tercile with only 31% in tercile 3. We also found a somewhat less dramatic positive correlation between wage employment and household income (right panel). Wage labor is generally thought of low productivity work, and better-off households tend to engage in trade and industry where they could earn higher incomes (Gordon & Craig, 2001). However, here we find that the wealthier are more likely to engage in wage work. This suggests that the earnings potential from wage work can remain attractive in this rural economy. This result is most likely driven by the large share of non-agricultural wage work within wage employment, which positively affects the wealthier household participation.

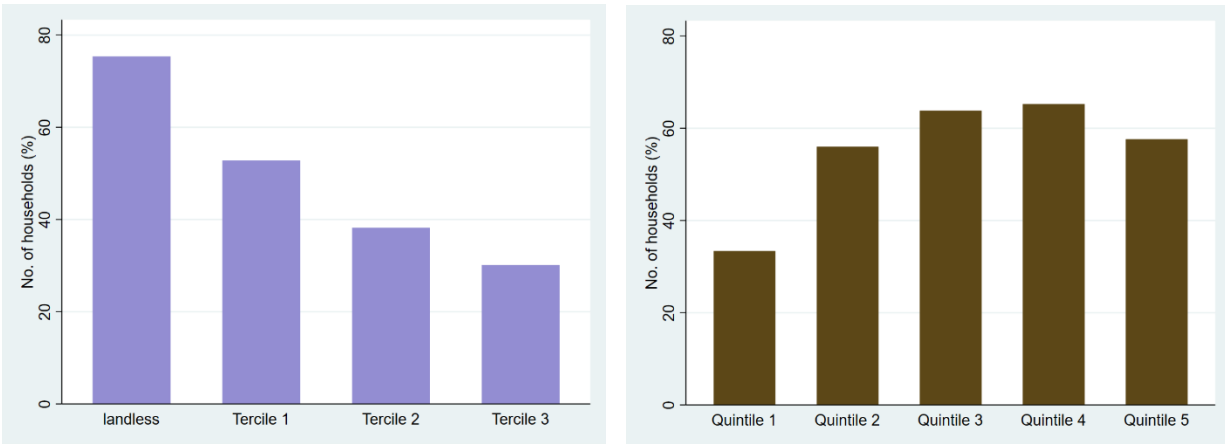


Figure 13 Household participation in wage employment by land tercile (left) and income quintile (right)

3.5 Income Diversification Patterns and the Associates

3.5.1 Geographical specialization in livelihood strategies of rural households

Rural household participation in farm-only livelihood strategy is the highest in the case of Shan state, which is in accord with the higher land ownership in the hilly and mountain region (Figure 14). We can see a relatively higher participation in agriculture in the other states too which lie on the hills and mountain region. On the other hand, the lowest participation is seen in the Nay pyi daw, which is the capital state and the Mon state which is one of the most developed regions in the country in terms of economy. In the case of participation in off-farm activities only, we find the largest concentration in the delta region comprising Yangon and Mon state, which are more dynamic and developed in terms of infrastructure. As we also saw higher landlessness in those regions, land constraints could likely be the other reason for higher off-farm participation.

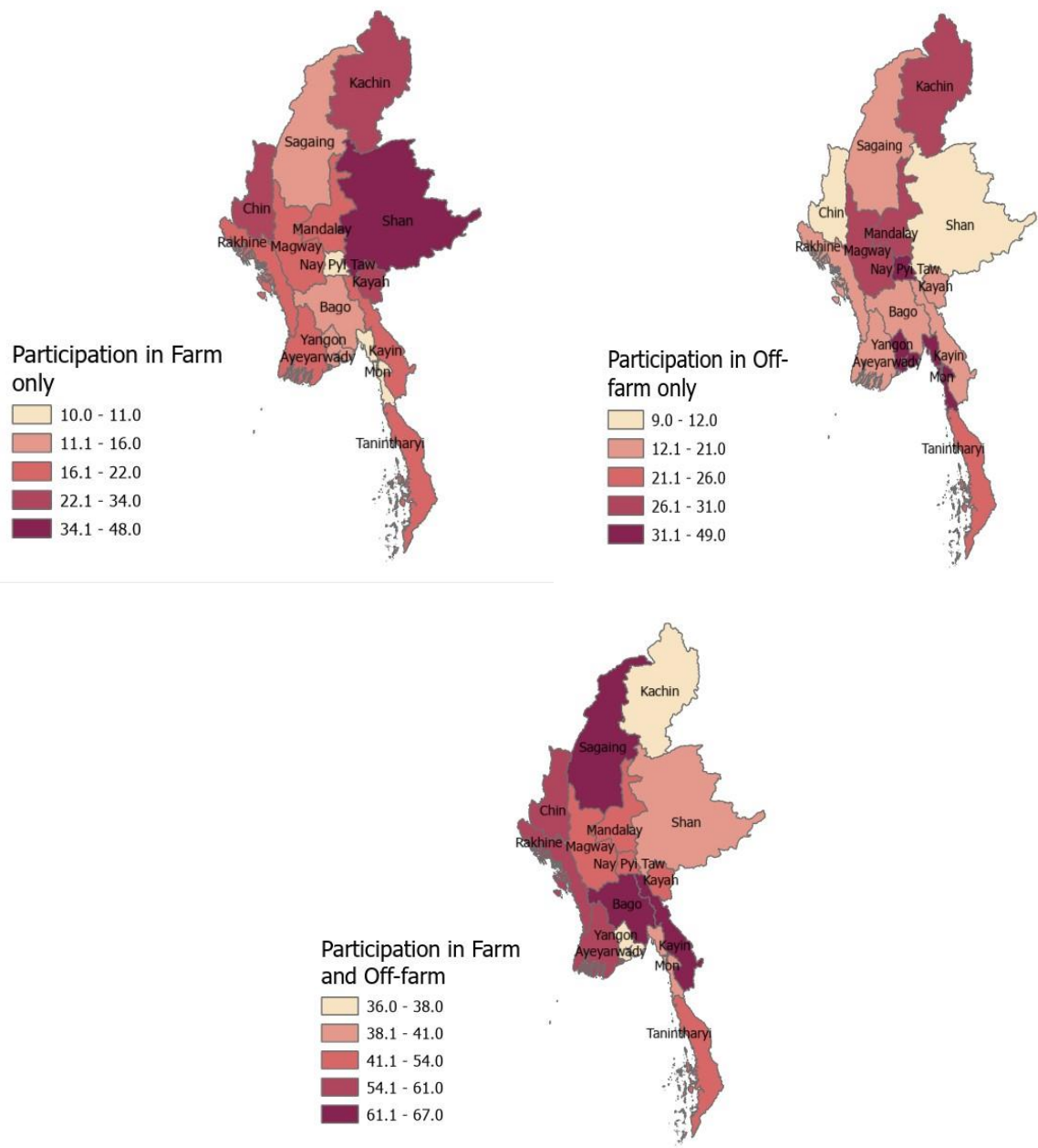


Figure 14 Geographical pattern in income diversification

In terms of participation in both on-farm and off-farm activities, we see that Sagaing, Bago, and Kayin regions are most diversified. The proximity of Bago and Kayin regions to Yangon is likely the main reason of the higher diversification, but the highest diversification in the Sagaing region is quite surprising. According to Reardon (1997), diversification is also driven by

differences in relative return in different agro-climatic zones. Building on this, the rocky hilly terrain with dry climate could be the reason for lower return from agriculture and to overcome this households could be diversifying in the Sagaing region. This likely indicates the push driven diversification, which does not promise sustainable rural economic growth. At the same time, the other two regions, which are near to the urban center are better in terms of geography and climate are most probably diversifying because of the comparative advantage of off-farm activities. A more detailed study is necessary for a clear assertion.

3.5.2 Determinants of non-farm participation, income and diversification measures

3.5.2.1 Non-agricultural activities

We now look deeply into the factors that are associated with households participation in rural non-agricultural activities. Table 8 presents the marginals of the logistic regression of the household participation in non-farm businesses and the various sectors with non-farm businesses. Several statistically significant estimates emerge. First, a household with an older head is more likely to participate in non-farm businesses but the individual sectors show that younger household heads are more likely to take up mining businesses and trade businesses. On the contrary, older household heads tend to gravitate more towards the professional service businesses. While mining is labor-intensive work, younger heads are more attracted to, at the same time professional service which has certain skill barrier to enter, households with older more experienced head are more likely to participate in the business.

Second, the results indicate that the education level of the household head has a significant influence on household participation in non-farm businesses. Upon sectoral division, we don't see the significance of education level except for professional services. The result of this study is in

consonance with *a priori* expectation: education improves human capital and hence the likelihood to engage in high-paying nonagricultural jobs.

Third, land scarcity which makes the household unable to engage in agricultural activities might be encouraging the trading of agricultural labor for non-farm businesses participation. This is also seen in the negative coefficient of area owned variable. From the result, we can infer that non-farm businesses are considered an alternative to farming for poor landholders. While farming is more popular among large landholders, non-farm businesses are popular among small landholders. In this case, the businesses must require low investment as the poor household can easily transition when they lack the physical capital to invest in agriculture. Lanjouw et al. (2001) found a similar result in the study that was conducted in Tanzania.

Another surprising finding is that the presence of migrants in the household decreases the engagement in non-farm businesses. This finding could be because most of the non-farm businesses are very small scaled with no high returns, which encourages households to depend on remittance which leads to lower participation in non-farm businesses. This finding is in fact the opposite of what we expected because remittance typically increases liquidity in the household which increases the likelihood of participation in non-farm businesses or other non-agricultural activities. This finding suggests the possibility that the households were not lured into non-farm businesses but instead were pushed because of their lack of physical capital to invest in agriculture.

Table 8 Factors associated with non-farm businesses participation along with the sectoral division

Participation	(1) Non-farm business	(2) Mining	(3) Manufac ture	(4) Constructi on	(5) Trade	(6) Transpor t	(7) Accomod ation	(8) Prof service	(9) Others
Household head characteristics									
age	0.001* (0.000)	-0.001* (0.000)	0.001 (0.001)	-0.000 (0.000)	0.000 (0.001)	-0.002*** (0.001)	0.000 (0.000)	0.001* (0.000)	0.000 (0.000)
gender	0.013 (0.020)	-0.037** (0.014)	0.010 (0.033)	-0.039* (0.018)	0.130** (0.043)	-0.069* (0.029)	0.021 (0.020)	-0.016 (0.015)	-0.019 (0.025)
marital status	0.055** (0.019)	-0.034** (0.011)	0.020 (0.033)	-0.008 (0.014)	0.069 (0.042)	-0.035 (0.026)	0.000 (0.020)	0.005 (0.014)	-0.004 (0.024)
education level	0.116*** (0.010)	-0.008 (0.007)	0.002 (0.016)	-0.004 (0.007)	-0.020 (0.021)	0.000 (0.012)	0.001 (0.010)	0.014* (0.007)	0.016 (0.012)
Household characteristics									
adult equiv.	0.016*** (0.003)	0.001 (0.002)	0.007 (0.004)	0.004* (0.002)	-0.012* (0.006)	0.008* (0.004)	-0.001 (0.003)	-0.006* (0.002)	-0.001 (0.003)
has migrant	-0.032** (0.012)	-0.002 (0.009)	0.036* (0.018)	0.005 (0.008)	-0.044 (0.024)	-0.020 (0.016)	-0.007 (0.012)	0.011 (0.008)	0.014 (0.013)
area (ha)	-0.009*** (0.002)	0.001 (0.001)	-0.001 (0.003)	-0.004 (0.002)	0.006 (0.004)	-0.000 (0.003)	-0.004 (0.003)	-0.002 (0.002)	-0.002 (0.002)
asset index	-0.006 (0.005)	-0.012 (0.007)	0.001 (0.008)	-0.003 (0.005)	-0.006 (0.010)	-0.006 (0.006)	-0.006 (0.007)	0.001 (0.004)	0.014** (0.005)
Agro-ecological regions									
coastal	0.014 (0.017)	0.002 (0.004)	0.056* (0.024)	0.013 (0.011)	0.045 (0.031)	-0.078*** (0.019)	-0.021 (0.015)	0.006 (0.011)	-0.022 (0.018)
central dry	-0.050*** (0.014)	0.028*** (0.007)	0.161*** (0.023)	-0.012 (0.007)	-0.030 (0.027)	-0.095*** (0.017)	-0.030* (0.013)	0.004 (0.009)	-0.028 (0.016)
hills & mountain	-0.127*** (0.013)	0.063*** (0.010)	-0.004 (0.019)	0.016 (0.010)	-0.021 (0.028)	-0.070*** (0.018)	0.020 (0.016)	0.011 (0.010)	-0.016 (0.016)
Log likelihood	-4858.32	-254.08	-1134.36	-290.1	-1640.35	-741.99	-573.70	-325.02	-713.3
Wald $\chi^2(10)$	313.37	88.81	82.32	31.05	23.88	74.94	22.02	17.01	19.56
P > χ^2	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.07	0.03
Pseudo-R sq	0.03	0.15	0.04	0.05	0.01	0.05	0.02	0.03	0.01
Obs.	8388.0	2393.0	2393.0	2393.0	2393.0	2393.0	2393.0	2393.0	2393.0

Standard error in the parenthesis

* significant at 10% probability level ** significant at 5% probability level and *** significant at 1% probability level.

Turning now to the factors that are associated with non-farm businesses income which we explore through three models (Table 9). In all three models (OLS regression, the Heckman selection model and the Tobit model), we find similar signs of the estimates of the variables.

The most important takeaway from the table is that a strong education component connects to the non-farm businesses income. The education level of the household head is positively significant in determining the non-farm businesses income in all of the models. The positive

correlation is consistent with those of Estudillo and Otsuka (1999) as cited by Phillippo (2008) in their studies of off-farm employment among farm households in central Luzon, Philippines, and they observed that the farmers who had greater educational attainment also had higher returns from off-farm employment.

The other important variables to note here are the households' characteristics; the number of adult, and land area that is owned by the household. As the size of a household increases, the income of the household tends to increase as well which likely reflects the home-based non-farm businesses in rural areas that majorly involve household workers, that is consistent with our previous findings.

As in the previous result, a significant negative correlation existed between the amount of area that was owned by a household and the non-farm businesses income. A possible reason could be the higher share of non-farm participation that comes from landless households which tends to result in a negative association with income. The Heckman model shows that the area is associated negatively with the participation in non-farm businesses but is positively associated with income after selection in participation. This result partly reflects the requirement of capital for the investment in non-farm businesses which likely can be afforded only by wealthier households to get a higher return, and poor households are discouraged from participation because of capital barriers. This interpretation supported the results that we found in Figure 8 and Figure 11.

In addition, the signs and significance of agro-ecological variables suggest that income is higher in more dynamic regions. Rural households in the delta region, which is near Yangon, a hub of economic activities, have higher incomes compared to those of other regions.

Table 9 Associates of non-farm businesses income

Log of non-farm businesses income	(1)	(2)	(3)		(4)
	OLS full sample	OLS truncated	Heckman Model equation	Selection equation	Tobit
Household head characteristics					
age	0.012* (0.005)	-0.005 (0.005)	-0.008 (0.006)	0.002* (0.001)	0.053** (0.018)
gender	-0.013 (0.269)	-0.226 (0.273)	-0.272 (0.275)	0.043 (0.059)	-0.157 (0.974)
marital status	0.740** (0.259)	0.015 (0.262)	-0.105 (0.364)	0.168** (0.058)	2.550** (0.939)
education level	1.721*** (0.150)	0.213 (0.131)	-0.040 (0.560)	0.347*** (0.032)	5.067*** (0.510)
Household characteristics					
adult equiv.	0.266*** (0.039)	0.093** (0.036)	0.024 (0.083)	0.048*** (0.008)	0.746*** (0.135)
has migrant	-0.354* (0.162)	-0.137 (0.154)		-0.095** (0.035)	-1.940*** (0.571)
area (ha)	-0.084*** (0.020)	-0.048 (0.028)	-0.010 (0.046)	-0.023*** (0.006)	-0.437*** (0.104)
asset index	-0.111 (0.058)	0.025 (0.060)	0.003 (0.069)	-0.016 (0.015)	-0.055 (0.219)
Agro-ecological regions					
coastal	0.046 (0.253)	0.186 (0.224)	0.067 (0.204)	0.038 (0.047)	-4.596*** (0.866)
central dry	-0.423** (0.163)	0.535*** (0.151)	0.542* (0.269)	-0.140*** (0.040)	-1.295* (0.561)
hills and mountains	-1.439*** (0.194)	-0.039 (0.199)	0.272 (0.639)	-0.389*** (0.039)	-11.237*** (0.757)
cons	1.873*** (0.402)	12.953*** (0.405)	14.824*** (3.134)	-0.922*** (0.090)	
/mills lambda			-1.131 (2.151)		
R-squared	0.04	0.02			
Log likelihood					-13109.89
Wald $\chi^2(11)$			15.25		467.57
P > χ^2			0.12		0.00
Selected			2393		
Non-selected			5995		
Left censored					6096
Right censored					0
Uncensored					2292
Obs.	8388.000	2393.000	8388.000		8388.000

Standard error in the parenthesis

* significant at 10% probability level ** significant at 5% probability level and *** significant at 1% probability level.

We now examine the estimates for household participation in types of wage employment (Table 10). The variable that stands out in the table below is the education of the head of the household. A positive correlation was found between education and non-agricultural wage participation. As indicated by Barrett et al. (2001), education creates opportunities for farm households to participate in higher-return nonfarm activities. Less-educated farmers may not have the required skills and technical know-how which may hinder their participation in high-paying nonagricultural wage employment. Babatunde and Qaim (2010) in their study of off-farm labor market participation in rural Nigeria showed that education enhances the employment of rural people in higher-paying nonfarm activities. Lack of education may create barriers to entry for certain non-farm employment opportunities (Reardon et al., 2000) that could lead a situation referred to as labor market dualism (Deininger & Olinto, 2001; Woldenhanna & Oskam, 2001) in which individuals who have higher educational attainment find employment in relatively high-paying jobs while those individuals who have lower educational attainment tend to find relatively low-paying jobs. Wiggins et al. (2015) also reported that more highly educated people have better connections and find more opportunities outside the agriculture sector in their study in rural Asia.

Table 10 Factors associated with household participation in non-ag wage employment

	(1) Non-ag wage participation
Household head characteristics	
age	0.000 (0.001)
gender	0.002 (0.029)
marital status	0.046 (0.028)
education level	0.211*** (0.017)
Household characteristics	
adult equiv.	0.033*** (0.004)
has migrant	0.030 (0.017)
area (ha)	-0.003 (0.002)
asset index	0.014 (0.011)
Agroecological regions	
coastal	-0.054* (0.024)
central dry	-0.041* (0.019)
hills and mountains	-0.031 (0.019)
Log likelihood	-2809.43
Wald $\chi^2(10)$	256.43
P > χ^2	0.00
Pseudo-R sq	0.04
Obs.	4515.0

Standard error in the parenthesis

* significant at 10% probability level ** significant at 5% probability level and *** significant at 1% probability level.

Table 11 gives the logit marginals for the household participation in non-farm activities as well as participation in passive income sources. Households with the younger heads are more likely to engage in non-farm activities, but the converse is true for the household participation in passive income sources. Similar to previous results, education has a positive and significant association with non-farm work participation but no effect on the household participation in passive income sources.

Households that have a migrant are negatively associated with non-farm participation. The area that is owned by households is negatively associated with participation in non-farm activities. The finding is consistent with the argument that lower landholding is the push factor for the households to move into a non-agriculture economy.

Table 11 Factors associated with the household participation in various non-agricultural activities

	(1) Non-ag work part ⁷	(2) Passive source part
Household head characteristics		
age	-0.001** (0.000)	0.003*** (0.000)
gender	0.040 (0.022)	0.030 (0.018)
marital status	0.019 (0.021)	-0.010 (0.018)
education level	0.175*** (0.012)	0.001 (0.010)
Household characteristics		
adult equiv.	0.030*** (0.003)	-0.011*** (0.003)
has migrant	0.005 (0.013)	0.542*** (0.010)
area (ha)	-0.023*** (0.003)	-0.000 (0.001)
asset index	-0.026*** (0.006)	-0.012** (0.004)
Agro-ecological regions		
coastal	-0.038* (0.018)	-0.015 (0.016)
central dry	-0.053*** (0.015)	0.056*** (0.013)
hills and mountains	-0.159*** (0.014)	-0.096*** (0.012)
Log likelihood	-5356.96	-5545.04
Wald $\chi^2(10)$	524.40	523.88
P > χ^2	0.00	0.00
Pseudo-R sq	0.05	0.05
Obs.	8115.0	8388.0

Standard error in the parenthesis

* significant at 10% probability level ** significant at 5% probability level and *** significant at 1% probability level.

⁷ This regression does not include 273 households that derived income from only the passive sources

3.5.2.2 Measures of Income Diversification

Using various econometric modeling we investigate the different factors associated with diversification (see methodology section). First, we look for the factors associated with diversification into multiple income sources. This is measured by the number of income sources for each household. Secondly, we look for factors influencing diversification out of the agricultural sector. This is measured by the share of non-agricultural income, both from non-farm businesses and non-agricultural wage employment, in total household non-transfer income. Additionally, we investigate the factors associated with the income diversification index measured by Simpson's diversification index introduced in section 2.2.2.

In all regressions, we use the same set of explanatory variables, whose descriptive statistics are shown in section 2 Table 2. The dependent variable in the first model is the count variable and Poisson regression is used to find the associates, we report the marginals in Table 12. For the second and third models, dependent variables are continuous variables but with a limited range between zero and 1 and zero and 0.72, respectively (see Table 2). Moreover, in both cases, there is a large share of observations with zero values meaning that households do not participate in non-farm activities and that they derive their income from one source only. Therefore, we use various models to validate our findings. We compare the results from OLS truncated, Heckman selection, double hurdle and Tobit models, which have been originally developed for censored data, but which are also used for corner solution models (Wooldridge, 2015). deJanvry and Sadoulet (2001) and Woldenhanna and Oskam (2001) for example use Tobit models in similar settings. The results are fairly similar in all the models with a few exceptions.

Most households in rural Myanmar have more than one income sources and richer households tend to be more diversified than poorer ones (see Appendix 7). However, the results in

the appendix were descriptive in nature, so that factors associated with diversification could not be established properly. This is done now with econometric models. As explained above, to examine determinants, we use models where we take the three measures of income diversification as dependent variables. As explanatory variables, we use typical household heads and household characteristics along with regional dummies. The estimation results are shown in Table 12, Table 13 and Table 14.

Table 12 Associates of number of income sources

	NIS
Household head characteristics	
age	-0.005*** (0.001)
gender	-0.204** (0.064)
marital status	0.064 (0.061)
education level	-0.030 (0.034)
Household characteristics	
adult equiv.	0.132*** (0.008)
has migrant	-0.120** (0.037)
area (ha)	0.003 (0.003)
asset index	0.070*** (0.012)
Agro-ecological regions	
coastal	-0.063 (0.051)
central dry	-0.037 (0.044)
hills and mountains	-0.021 (0.041)
Log likelihood	-11851.05
Wald $\chi^2(10)$	254.12
P > χ^2	0.00
Pseudo-R sq	0.01
Obs.	8115.0

Standard error in the parenthesis

* significant at 10% probability level ** significant at 5% probability level and *** significant at 1% probability level.

Household heads being female is negatively associated with the number of income sources. This is not surprising as female-headed households are usually capital constrained being mostly single parent household, and the poor economy does not allow the household to invest in multiple income sources. Another interesting result is the positive and significant relationship between household agricultural assets and the number of income sources. Household agricultural assets, which is a proxy for household wealth is likely to increase the income sources in which household would take part. Surprisingly, we do not find any association of land owned with the number of income sources.

If we now turn to the factors associated with non-farm income share (Table 13), as expected, education influences in a positive and significant way. This is in line with previous studies that have highlighted the important role of education for off-farm income diversification in south America (Lanjouw, 2001). Likewise, household agricultural assets and the land ownership decrease the non-farm income share. A possible explanation for this result may be that these factors facilitate household engagement in the farm economy and might be causing the increase in farm income share indirectly causing a decrease in non-farm income share.

Table 13 Associates of Non-farm income share

NFS	(1) OLS	(2) Heckman Selection		(3) Tobit
		Outcome equation	Selection equation	
Household head characteristics				
age	-0.002*** (0.000)	-0.006 (0.003)	-0.004** (0.001)	-0.008*** (0.001)
gender	0.034 (0.019)	0.162 (0.142)	0.089 (0.057)	0.111 (0.073)
marital status	0.013 (0.018)	0.081 (0.132)	0.063 (0.055)	0.032 (0.070)
education level	0.146*** (0.011)	0.667* (0.331)	0.456*** (0.031)	0.541*** (0.040)
Household characteristics				
adult equiv.	0.027*** (0.003)	0.103 (0.059)	0.077*** (0.008)	0.096*** (0.010)
has migrant	0.009 (0.011)		0.023 (0.033)	-0.020 (0.043)
area (ha)	-0.016*** (0.001)	-0.065* (0.029)	-0.029*** (0.005)	-0.094*** (0.008)
asset index	-0.047*** (0.004)	-0.172** (0.063)	-0.073*** (0.014)	-0.108*** (0.017)
Agro-ecological regions				
coastal	-0.044* (0.018)	-0.140 (0.121)	-0.097* (0.047)	-0.254*** (0.067)
central dry	-0.045*** (0.011)	-0.239 (0.137)	-0.154*** (0.040)	-0.121** (0.043)
hills and mountains	-0.154*** (0.014)	-0.597* (0.292)	-0.387*** (0.038)	-0.712*** (0.055)
cons		-1.045 (1.019)	-0.063 (0.086)	
/mills lambda			2.416* (1.184)	
R-squared	0.09			
Log likelihood				8674.29
Wald χ^2		13.56		780.93
Selected		4210		
Non-selected		3905		
Pseudo R-sq				0.043
Left censored				4243
Right censored				2106
Uncensored				2039
Obs.	8388.0	8115.0		8388.000

Standard error in the parenthesis

* significant at 10% probability level ** significant at 5% probability level and *** significant at 1% probability level.

The SID model largely confirms the results of the other two models (Table 14). One noteworthy point is that the results reveal that younger household heads are more likely to take part in diversification. The double hurdle and Tobit model further show that male-headed households are more likely to diversify their income sources. A possible explanation for this could be that females have lower access to opportunities confining female headed households in a fewer income source. Interestingly though, we do not see any effect of education level of household heads in the extent of diversification.

Likewise, another important variable affecting diversification is agricultural asset. We see a significant positive correlation between agricultural assets and the diversification index. The observed correlation most likely supports our previous assumption of the existence of entry barriers for the poor. Households equipped with assets can cover the barrier and engage in various income-generating activities.

Table 14 Factors associated with income diversification index.

SID	(1)	(2)		(3)		(4)
	OLS	Heckman		Double Hurdle		Tobit
		Model equation	Selection equation	Outcome equation	Hurdle equation	
Household head characteristics						
age	-0.001*** (0.000)	-0.001** (0.000)	0.001 (0.001)	0.000 (0.000)	-0.005*** (0.001)	-0.001*** (0.000)
gender	-0.023** (0.009)	-0.027** (0.010)	-0.069 (0.066)	0.008 (0.017)	-0.190*** (0.055)	-0.057*** (0.016)
marital status	0.004 (0.008)	0.004 (0.010)	0.091 (0.064)	0.009 (0.016)	0.004 (0.053)	0.006 (0.016)
education level	-0.002 (0.005)	0.004 (0.006)	-0.069 (0.038)	0.005 (0.008)	-0.007 (0.031)	-0.006 (0.009)
Household characteristics						
adult equiv.	0.022*** (0.001)	0.025*** (0.002)	0.134*** (0.011)	0.007*** (0.002)	0.159*** (0.008)	0.042*** (0.002)
has migrant	0.006 (0.005)		0.862*** (0.051)		-0.087** (0.033)	-0.005 (0.010)
area (ha)	0.002* (0.001)	0.000 (0.001)	0.006 (0.004)	0.002 (0.001)	-0.001 (0.003)	0.003* (0.001)
asset index	0.008*** (0.002)	0.011*** (0.002)	0.070*** (0.019)	0.004 (0.003)	0.066*** (0.014)	0.014*** (0.003)
Agro-ecological regions						
coastal	-0.005 (0.009)	-0.003 (0.009)	-0.046 (0.058)	-0.000 (0.013)	-0.039 (0.046)	-0.059*** (0.015)
central dry	0.009 (0.006)	0.007 (0.007)	0.095* (0.048)	0.044*** (0.011)	-0.106** (0.039)	0.001 (0.009)
hills and mountain	-0.004 (0.007)	0.001 (0.007)	-0.140** (0.045)	-0.005 (0.010)	0.009 (0.037)	-0.050*** (0.011)
cons		0.076*** (0.021)	0.193 (0.100)	0.210*** (0.025)	-0.310*** (0.084)	
/mills lambda			0.151*** (0.023)			
R-squared	0.05					
Log likelihood					-3953.72	-5048.65
Wald χ^2		333.23			682.84	569.29
Selected		7046				
Non-selected		1342				
Left censored						3983
Right censored						0
Uncensored						4405
Obs.	8388.0	8388			8388.0	8388.0

Standard error in the parenthesis

* significant at 10% probability level ** significant at 5% probability level and *** significant at 1% probability level.

3.5.2.3 Rural household livelihood strategies

Table 15 presents the average marginal effects for the three livelihood strategies. In this study, the age of the head of the household was found to be negatively associated with household's participation in farm and off-farm activities but was positively associated with farm only and not associated with off-farm only. This suggests that younger household heads are more likely to rely on multiple sources of income for their livelihoods. Likewise, female-headed households are more likely to take part in off-farm only and are less likely to participate in the farm only strategy. The finding is plausible as off-farm activities provide more flexibility in timing and location because females are often engaged in domestic chores and non-agricultural activities are appropriate for their situations.

Another important variable of interest is the education level of the head of the household, which is negatively associated with households that engage in agriculture only and is positively associated with other activities. This result is consistent with the findings in the other regressions, and the explanation is also most likely the same: a more highly educated person likely has better opportunities to engage in high return non-farm activities. This positive correlation could also be because of the social stigma which maintains that farm work is considered to be an unskilled job; also, more highly educated people tend to prefer to. Winters et al. (2010), found a similar result in their cross-country analysis.

Table 15 Associates of livelihood strategies

Variables	Livelihood strategies (marginals)		
	Farm only	Farm + Off-farm	Off-farm only
Household head characteristics			
age	-.000 (.000)	-.001*** (.000)	.001*** (.000)
gender	-.038** (.017)	-.004 (.020)	.041*** (.015)
marital status	-.016 (.016)	.0291 (.019)	-.013 (.015)
education level	-.075*** (.009)	.003 (.011)	.072*** (.009)
Household characteristics			
adult equiv.	-.008*** (.002)	.026*** (.003)	-.018*** (.002)
has migrant	-.487*** (.027)	.408*** (.022)	.079*** (.011)
area (ha)	.049*** (.002)	.142*** (.005)	-.191*** (.007)
asset index	.097*** (.009)	.241*** (.025)	-.338*** (.033)
Agro-ecological regions			
coastal	.030* (.016)	-.024 (.018)	-.006 (.015)
central dry	.008 (.009)	-.043*** (.012)	.034*** (.009)
hills and mountains	.198*** (.013)	-.145*** (.014)	-.053*** (.011)
Log likelihood		-7024.70	
P > χ^2		0.00	
Pseudo-R sq		0.99	
Observations		8388	

Standard error in the parenthesis

* significant at 10% probability level ** significant at 5% probability level and *** significant at 1% probability level.

4 DISCUSSION AND CONCLUSION

The study gave us a unique opportunity to look deeply at the non-agricultural sector of rural Myanmar in terms of two specific aspects: non-farm businesses and wage employment. In this study, we examined the extent of diversification and diagnosed the factors associated through a complete dataset that is nationally representative. First, we looked at the various livelihood activities that the rural communities are engaged in and found that the areas are quite diversified with high levels of business engagement and a high level of wage employment. Although agricultural labor comprises the largest share of wage employment, non-agricultural wages make up nearly one-half of wage labor participation, which is a significant indication of diversification out of agriculture. Along with participation, the income share from the non-agriculture sector is also quite high: more than one-third of the total household income, except for the hilly region where a higher share of household income is derived from agricultural activities.

Second, the business sectors and wage employment industries in rural Myanmar were found to be very heterogeneous, ranging from high returns such as professional services and mining to very low return retail trade. Despite the difference in rate of participation, we found that participation in the diversification is remarkably broad, including the poorest households to the wealthiest. However, the poor have little choice but to diversify into less attractive non-farm activities like agricultural wages and retail businesses while the wealthier have better options to choose from attractive activities like mining and professional services. We can assume that the differential welfare effect of diversification between the rich and poor from these findings. The narration that appears from our result is that households that have better economic standing are able to take better advantage of opportunities in the rural non-farm sector in Myanmar.

Third, we looked at the factors that are associated with diversification. We see that participation and income in non-agricultural activities were significantly affected by capacity variables like human capital, landholding, and agricultural asset holding. Households' endowment with better education and proximity to urban areas appear to increase the probability of participating in non-farm activities. With a few exceptions, we found in most of the estimations that the delta region was more diversified and had better income from non-farm activities. The strong negative linkage found in landholding and diversification paints a picture of need-based diversification in rural Myanmar. The households that diversify because of land constraints and capital constraints most likely engage in risk coping diversification which is not sustainable. We also see that as the number of adults in a household increase, the household's likelihood of engaging in and receiving income from non-agricultural activities also increases. Household size could again be a push factor, which increases diversification because of the household fearing food insecurity and pushing itself to non-farm activities for the reason of survival. Another important variable of interest is the gender variable. Female-headed households are less likely to diversify into various income sources and are more likely to engage in non-agricultural activities only. The negative association partly reflects the time constraint females face as they engage in household chores and are compelled to participate in non-farm activities which demand fewer hours compared to agriculture. Or the association it might be showing the female headed household have lesser access to land compelling them to engage in non-agriculture.

Taken together, these results suggest the profound regional differences in rural Myanmar; some regions are more agriculture-dependent, and others are non-agriculture oriented. Despite some differences, we see a common picture of households' engaging in various kinds of non-farm activities and a declining exclusive reliance on agriculture income throughout the country. The

contribution of this study has been to confirm that non-farm activities are increasing, and the rural economy is moving. The pace could be slow, and the change is in the very nascent stage, but the rural Myanmar is moving out of the agrarian economy. And, although the motive of rural households' engaging in diversification could be risk coping, the rural households benefit from diversification not as large as in progressive diversification, but some benefit is certain.

The study nevertheless has the limitation of not considering other important variables. One other variable which can be used in future studies is the credit dummy. If access to credit would increase the diversification, then we could more certainly say that the liquidity constraint is causing households not to diversify. Correspondingly, if the credit provision would decrease diversification, the situation likely means that the households are being pushed into diversification which is rather transitory and provides little help towards rural economic growth. The addition of infrastructure variables as well as risk variables with the same method that was used in our paper could be beneficial in identifying the type of diversification for future work. Whilst this study did not confirm the type of diversification, the study did partially substantiate the idea that the diversification in most of the households in rural Myanmar is mainly a push factor-driven coping method. Push factor-driven diversification often reflects the case of a household's declining real income; however, some studies have shown that push driven diversification can be beneficial sometimes as households are not further pushed down into poverty. While we see a vibrant picture of the non-farm sector in rural Myanmar, the avenue for future research could be to explore whether the ongoing change will enhance rural livelihood opportunities that will uplift the rural economy towards sustainable development or are only transient coping mechanisms without any long-term significant impact on the economy.

As we see that education has a positive association with diversification, which leads to higher income, a key policy priority should therefore be to plan for better educational opportunities for the people in the area. Although we find that poor households would derive better income from agricultural activities, because the non-farm sector has fewer opportunities for the poor with the existence of an entry barrier, policymakers should not try to move these households to farms. Instead, policymakers should search for ways to bring on pull factors that would lead the households to the non-agricultural sector as rural progress is only assured through a decreasing dependency on agriculture. The struggles for the poor could be addressed by establishing training centers through the provision of credit or infrastructural development in the area. And most importantly, policymakers should consider the existing differences between distress diversification and accumulative diversification and attempt to enhance accumulative diversification by promoting the pull factors that are associated with diversification.

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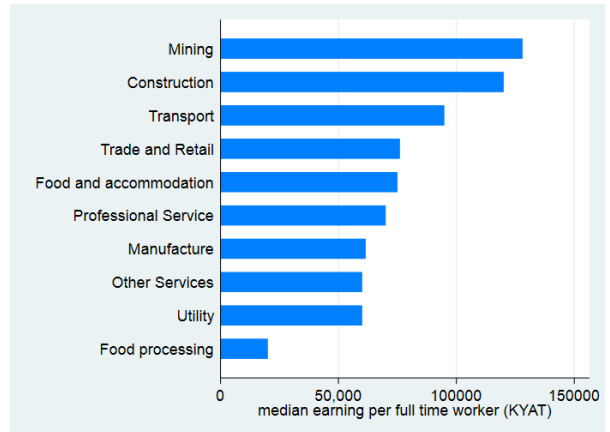
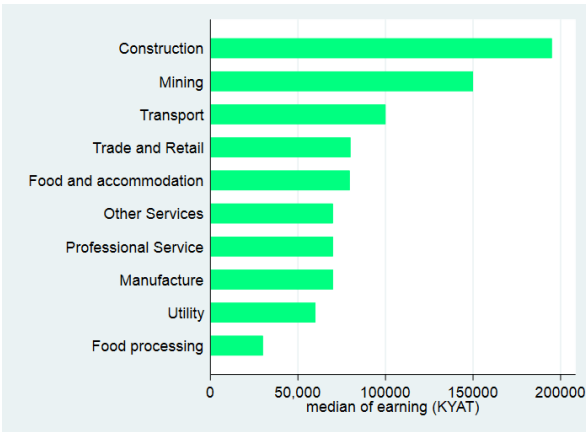
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APPENDICES

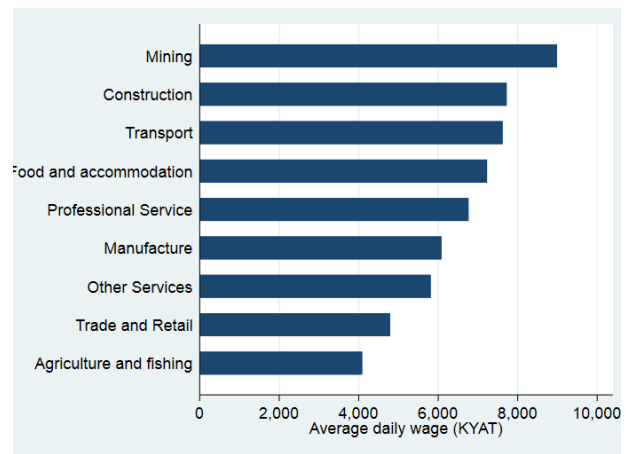
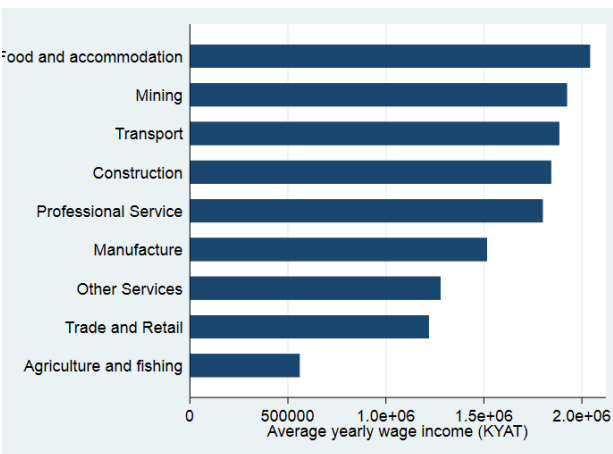
Appendix 1 Variable description

Variables	Type	Description
Dependent variables		
Non-farm businesses participation	Dummy	=1 if hh participation in non-farm businesses
Non-farm business income	Continuous	Non-farm businesses income (KYAT)
Non-ag part	Dummy	=1 if hh participate in non-agricultural work, =0 in agricultural works
Passive source part	Dummy	=1 if hh participation in passive income source
Non-ag wage participation	Dummy	=1 if hh participate in non-agricultural wage
NIS	Count	Number of income sources
NFS	Continuous	Non-farm income share in total household income
SID	Continuous	Simpson's Diversification Index
Strategy		Livelihood strategies
Farm only	Dummy	=1 if hh engage in farm only
Farm and Off-farm	Dummy	=1 if hh engage in farm and off-farm both
Off-farm only	Dummy	=1 if hh engage in off-farm only
Explanatory variables		
Age	Continuous	Age of the household head
Gender	Dummy	=1 if head is female
Marital Status	Dummy	=1 if head is married
Education level	Dummy	=1 if education level of head is above primary
Adult equivalent	Continuous	No. of adult in the hh
has migrant	Dummy	=1 if the hh has a migrant
Area (ha)	Continuous	Area owned by the hh (ha)
Asset Index	Count	Number of agricultural asset in hh
agro ecol		Agroecological regions
Delta	Dummy	=1 if the hh lies in delta region
Coastal	Dummy	=1 if the hh lies in coastal region
Central Dry	Dummy	=1 if the hh lies in central dry region
Hills and Mountains	Dummy	=1 if the hh lie in hills and mountains region

Appendix 2 Earnings from non-farm businesses



Appendix 3 Earnings from wage employment



Appendix 4 Livelihood and income composition by agro-ecological zones

Livelihood*	Agro-ecological Zones (%)				All HHs
	Delta	Coastal	Central Dry	Hills and Mountains	
Share of household engaged in activity, percent					
Crop production	43.1	45.4	55.8	69.3	52.5
Livestock	58.9	54.3	59.7	57.7	58.5
Aquaculture and Fishery	18.3	19.4	2.1	13.0	11.9
Wage labor	41.6	35.7	43.0	28.0	39.0
<i>a. Agricultural</i>	<i>16.5</i>	<i>8.5</i>	<i>17.4</i>	<i>11.6</i>	<i>15.7</i>
<i>b. Non-Agricultural</i>	<i>25.1</i>	<i>21.9</i>	<i>25.6</i>	<i>16.4</i>	<i>23.3</i>
Non-farm businesses	33.0	33.5	30.0	22.4	30.0
Remittance	20.0	24.8	18.9	19.0	19.8
Others	22.7	9.8	29.3	6.2	20.7
Share of household income from activity, percent					
Crop production	22	18.7	26.4	38.8	26.3
Livestock	2.7	2.5	3.6	4.2	3.2
Aquaculture and Fishery	3.5	9.2	0.6	0.7	2.5
Wage labor	38.8	34.4	37.6	29.4	36.2
<i>a. Agricultural</i>	<i>14.7</i>	<i>13.6</i>	<i>13.7</i>	<i>12.7</i>	<i>13.9</i>
<i>b. Non-Agricultural</i>	<i>24.1</i>	<i>20.8</i>	<i>23.9</i>	<i>16.7</i>	<i>22.3</i>
Non-farm businesses	16.6	17.6	15.3	12.2	15.4
Remittance	9.3	11	8.5	10.2	9.3
Others	6.5	5.6	7	2.9	5.9

*Households can engage in more than one activity

Appendix 5 Livelihood and income composition by income quintiles

Sources	All HHs	Income Quintile				
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Participation (%)						
Crop	52.4	62.5	53.2	48.2	50.2	49.5
Livestock	58.5	59.8	61.6	59	60.6	51.8
Aqua	11.89	11.2	13.7	12.6	12.4	9.4
Non-farm business	30.0	14	22	26	33.9	52
Wage	39.0	19.8	33.8	45.6	47.8	45.4
Remittance	19.9	11.2	16.5	19.2	23.6	27.5
Rent	3.5	4.1	2.7	3.2	3.4	4.3
Public Transfer	14.8	11.4	14.9	15	15.9	16.2
Other	20.7	19.5	18.3	20.9	21.9	22.7
Income share (%)						
Crop	26.3	35.7	29.2	23.9	22.5	21.6
Livestock	3.3	4.5	3.9	3.5	3.1	1.5
Aqua	2.5	3.1	3.2	2.7	2	1.6
Non-farm business	15.4	7.2	11.4	12.3	16.4	28.8
Wage	36.2	23.9	38.3	44.3	41.9	31.1
Remittance	9.3	7.2	8.5	9.4	10.3	11.1
Rent	0.8	2.2	0.9	0.6	0.5	0.4
Public Transfer	1.3	2.5	1.3	0.9	1.3	0.8
Other	3.6	8.3	3.2	2.3	2.1	3.2

Appendix 6 Share of non-farm businesses by landholding group

Non-farm Businesses	Land ownership				
	Landless	T1	T2	T3	Total
Mining	51.7	6.8	20.8	20.7	100.0
Manufacture	48.0	15.2	19.8	17.1	100.0
Construction	77.1	8.6	10.4	3.9	100.0
Trade and Retail	56.3	12.7	14.5	16.5	100.0
Transport	67.6	8.3	11.4	12.7	100.0
Food and accommodation	68.6	9.8	10.8	10.8	100.0
Professional Service	62.7	16.3	12.7	8.3	100.0
Other Services	49.3	13.9	16.1	20.7	100.0
Total	56.1	12.7	15.4	15.9	100.0
Population %	45.3	15.6	20.9	18.2	100.0

Appendix 7 Distribution of households by the number of income sources (NIS)

NIS	All HH	Income Quintile				
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
1	24.58	28.35	24.13	23.94	22.22	24.97
2	42.39	48.95	44.25	43.85	39.05	37.21
3	26.68	19.71	26.63	26.01	31.07	28.59
4	6.14	2.83	4.96	6.16	7.06	8.97
5	0.22	0.16	0.03	0.03	0.60	0.26
Total	100.0	100.0	100.0	100.0	100.0	100.0

Appendix 8 Mean measures of income diversification

	All HH	Income Quintile				
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Number of income sources (NIS)	2.06	1.83	2.06	2.07	2.18	2.17
Share of non-ag income (NFS)	0.37	0.14	0.28	0.41	0.46	0.57
Simpson Diversity Index (SID)	0.18	0.14	0.17	0.18	0.20	0.20

Appendix 9 Distribution of households by livelihood strategy and mean income levels

	All HHs	Income Quintile				
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Participation (%)						
Farm only	29.9	48.8	35.8	26.6	22.9	18.0
Farm+ Off-farm	22.6	13.8	17.4	21.6	27.3	31.5
Off-farm only	47.6	37.5	46.8	51.8	49.8	50.5
Mean income in KYAT/AE						
Farm only	539507.9	116635.8	298967.1	512295.3	799963.4	1708401
Farm + Off-farm	821366.6	114033.8	318911.5	476772.6	705801.4	1697844
Off-farm only	829620.3	176919.8	416161.9	620440.8	857434.5	1813475