An Empirical Analysis of Factors Determining Choices between Different Subcategories of Off-farm Activities in Rural Cambodia

Introduction

The majority of Cambodia's poorest and most vulnerable people live in rural areas where most of them depend on agriculture for their livelihoods. Despite drastic agricultural transformation over the last 15 years, the sector can neither absorb the rural workforce nor create enough jobs. It currently employs less than 60 percent of the rural labour force (CDRI 2013).

The main challenges facing the agriculture sector are low productivity, limited extension services, poor market integration of smallholders, weather-dependent production, climate change and increasing landlessness. In addition, agricultural seasonality means that farmers have to find jobs outside of their farms during the off-season. Agriculture-based livelihoods that are already vulnerable are therefore even more unreliable and risky during slack periods.

To reduce livelihood vulnerabilities and survive agricultural risks, many rural people, especially smallholders and landless families, have to participate in off-farm income generation activities (wage- and/or self-employment) in either agricultural or non-agricultural sectors. Yet, due to the absence of local small and medium-sized enterprises (SMEs), largely as a result of sluggish rural economic growth, there are limited local employment opportunities. This situation pushes rural people to migrate to urban centres and overseas to seek work. On the other hand, high returns to labour in non-agricultural sectors may attract rural households to engage in non-farm income activities.

Households' off-farm work decisions then, may depend on various push and pull factors such as location, skills and wealth. Low-income households generally face higher levels of risk and have limited capacity to cope with income shocks. The off-farm income sources of poorer households are therefore expected to be more diversified than those of richer households.

Off-farm income-generating activities have gradually become a significant feature of strategy aimed at supplementing and diversifying rural livelihoods, improving rural welfare and, importantly, reducing agricultural risks. Rural household income diversification now receives great attention from policymakers. Better policies for creating off-farm jobs and improving agricultural risk management will require better understanding of the various push–pull factors and relative importance of those factors in influencing households' decisions to participate in off-farm activities.

The objective of this study, therefore, is to examine which factors determine off-farm participation choices in rural Cambodia. We briefly describe the data collection and analysis techniques used and the basic features of the data collected, and then discuss the estimation results for each variable separately. A summary of the key findings concludes.

Methodology

Data collection

This study uses data from a farm survey conducted in 2015 for a research project on off-farm income generation activities (FAO 2015). The survey was carried out in eight villages in Battambang, Kampot, Prey Veng and Kratie provinces, representing the Tonle Sap, coastal, Mekong plain, and plateau/mountain agroecological zones, respectively. In each village, 40 households (20 IDPoor and 20 non-IDPoor) were randomly selected for interview, giving a total sample of 320 farm households.

Variable selection

The dependent variable is participation in different types of off-farm activities. To account for its polychotomous (i.e. having more than two values) nature, the variable takes the value

of zero if household members participate in no off-farm activities at all, 1 for agricultural employment only, 2 for non-agricultural employment only, 3 for both agricultural and non-agricultural employment, 4 for self-employment only, and 5 for both self-employment and wage employment. The literature about off-farm work participation decisions highlights the influence of basic household characteristics, household demographic and human capital characteristics, farm characteristics, non-labour income and local economic conditions. We therefore include these as independent variables.

Modelling off-farm labour supply

The off-farm labour supply of rural households can be expressed as a function of various independent variables including household characteristics, household head human capital characteristics, farm characteristics, non-labour income and local economic conditions. In line with Haile Abraha, Peerlings and Gardebroek (2008), this can be specified as:

$$\begin{cases} H^0 = f\left(P_q, P_x, \bar{A}, \bar{Y}, K, Z\right) & \text{if} \quad w > w^r \\ H^0 = 0 & \text{if} \quad w \leq w^r \end{cases}$$

When the off-farm wage (w) is greater than the reservation wage (w^r), farmers will participate in off-farm activities.

Modelling off-farm work participation

We use the off-farm labour supply function to model off-farm work participation, expressed in the following equation:

$$P(I = 1|x) = F(x'\beta)$$

where x is the vector of independent variables that are hypothesised to influence household off-farm participation, F is the cumulative distribution function, and β is the vector of coefficients.

The model can be rewritten in regression form as:

$$Y_i = \beta_i + \beta_{1i}X_1 + \beta_{2i}X_2 + \beta_{3i}X_3 + \beta_{3i}X_4 + \beta_{3i}X_5 + \varepsilon_i$$

where Y_i is the polychotomous dependent variable representing participation of a household in off-farm activities i, X_1 is the vector of household

characteristics, X_2 is the vector of household head human capital characteristics, X_3 is the vector of farm characteristics, X_4 is non-labour income, X_5 is the vector of local economic conditions, $\beta_i, \beta_{1i}, \beta_{2i}, \beta_{3i}, \beta_{4i}, \beta_{5i}$ are the coefficients to be estimated, and ε_i is an error term with standard properties.

We use multinomial probit regression for analysis of household participation in different types of off-farm activities, the results of which are presented in Table 2. The multinomial probit model is theoretically more appropriate than the multinomial logit model because probit does not assume the independence of irrelevant alternatives (Chang and Mishra 2008).

Descriptive statistics

Both farm and off-farm incomes are important for the majority of rural households, and account for about 90 percent of total household income (FAO 2015). Three types of off-farm activities are identified as the main sources of off-farm income: agricultural employment, non-agricultural employment and self-employment.

Agricultural employment consists mainly of support activities to agriculture and post-harvest crop activities,[1] and partly of fishing, rice cultivation, perennial crop production, forestry and logging. Non-agricultural employment mostly entails jobs in clothing/garment manufacturing, grain mill products manufacturing, and construction. Self-employment mainly involves retail sales, services such as transport, and recreation; only a few make and sell handicrafts.

As Table 1 shows, 76 percent of all surveyed households had at least one member participating in off-farm activities. The participation rate in Kratie province is high (82.5 percent), whereas it is relatively low (70.2 percent) in Prey Veng province. Cash crop (rubber, pepper, cassava) farms are the engine of agricultural wage employment in Kratie, providing a source of income for 36.3 percent of households in the province. By contrast, in Prey Veng province, only 6.3 percent of households work in the agriculture sector; at 36.3 percent, the

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1 Includes activities incidental to agricultural production and not undertaken for production purposes (e.g. field preparation, harvesting and pest control), support activities for animal production, and seed processing for propagation.

Table 1: Percentages of households with members involved in different types of off-farm activities by
province and poverty status

	Battambang	Kampot	Kratie	Prey Veng	Poor	Non-poor	Total
No off-farm activities	24.9	23.8	17.4	29.8	20.01	27.65	24.1
Off-farm employment	75.1	76.3	82.6	70.2	79.99	72.35	75.9
Agricultural employment only	17.5	10.0	36.3	6.3	25.33	10.59	17.5
Non-agricultural employment only	22.5	30.0	12.5	36.3	21.33	28.82	25.3
Both agri and non-agri employment	7.5	5.0	11.3	10.0	13.33	4.12	8.4
Self-employment only	16.3	11.3	12.5	11.3	9.33	15.88	12.8
Both self- and wage employment	11.3	20.0	10.0	6.3	10.67	12.94	11.9

Source: Farm household survey 2015

biggest share of wage employment is in the non-agricultural sector.

About 34 percent[2] of surveyed households participate in non-agricultural activities (Table 1), the main type of off-farm employment in this study. The next most important type of off-farm activity for about 26 percent of households is agricultural employment. Agricultural jobs are mainly available within the village and province, and most are seasonal. Those employed in non-agricultural sectors work outside the village, either in the same or a different province.

Eighty percent of poor households and 72 percent of non-poor households engage in off-farm work. There are some notable differences between the types of off-farm activities they undertake. Agricultural activities are the main kind of off-farm work performed by poor households (39 percent), while non-poor households concentrate on non-agricultural work and self-employment.

Estimation results
This section discusses the regression results for household participation in off-farm activities, as presented in Table 2.

Household characteristics
We find that poverty has a significant negative impact on agricultural employment. This is consistent to some extent with the finding of Shi, Heerink and Qu (2007), that poor households are eager to find alternative sources of income. However, our model implies that poor smallholders and landless workers are only able to get jobs (both agricultural and non-agricultural) in rural areas. This might be due to the high dependency ratio of 0.9 and a lack of economically active household members to find work in towns or other areas.[3]

Asset-rich households have more opportunities for starting a business and becoming self-employed, or of finding non-agricultural work outside of their localities. In our model, the dummy variable for household poverty status (poor=0, non-poor=1) is not statistically significant for self-employment or non-agricultural employment. This indicates that poor and non-poor households are unlikely to be self-employed or employed in non-farm wage labour.

Household size has a significant positive effect on the probability of participation in off-farm activities for households that are able to participate in both agricultural and non-agricultural employment. This result is consistent with that of Leeuwen and Dekkers (2013): as the number of household members increases, the likelihood of households' participation in both agricultural and non-agricultural off-farm activities increases. Rural households need additional income to complement insufficient farm income.

The number of years households have lived in their village is statistically significant for self-employment, while the other kinds of off-farm activities have negative signs. Farmers are therefore strongly attached to farming activities, and farm income is very important for them. This suggests that off-farm income complements rather than competes with expected farm income.

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2 Agricultural employment only (25.3 percent) plus both agricultural and non-agricultural employment (8.4 percent).

3 Household dependency ratio is calculated as the number of household members younger than 15 and older than 64 divided by the number of working household members aged 15-64 years.

Demographic and human capital characteristics

Household head age has a significant positive effect on agricultural employment, and lifecycle effects (age-squared) has a significant negative effect. Age is strongly and positively correlated with the probability of participation in off-farm agricultural employment. But as household members get older, the probability of participating in agricultural wage labour decreases significantly. Our finding is consistent with Haile Abraha, Peerlings and Gardebroek (2008), that younger household heads are more likely to need and be able to work off-farm.

Household head gender does not have a significant impact on smallholders' and landless workers' participation in off-farm activities.

Household head education does not have a significant impact on agricultural employment, which is consistent with evidence in the literature of a weak relationship between education and agricultural employment. Education has a positive though not statistically significant effect on self-employment, and a statistically significant positive effect on both self- and wage employment at the 10 percent level. Household heads with higher education are usually more productive and able to do business or find more off-farm work.

Training also has a significant positive effect on self-employment. Those who have received vocational training are more likely to be able to run a business or become self-employed, but those who have no special skills are unlikely to do so. A lack of skills was reported to be a primary barrier to self-employment; as a result, households end up choosing to engage in off-farm activities.

Farm characteristics

Household productive assets, specifically cultivated land/farm size, is another important push factor behind households' participation in off-farm activities. Farm size has a significant negative effect on non-agricultural employment and both self- and wage employment at the 5 and 1 percent levels, respectively.

Because income from crop production is not enough to cover their daily living needs, smallholders and landless farm workers are likely to participate in non-agricultural employment only or both agricultural and non-agricultural employment. Farm income from livestock, fishing and forestry also has a significant negative effect on participation in off-farm activities. This confirms similar results commonly found in the literature, that increases in income from farming activities are likely to reduce participation in off-farm activities.

Local economic conditions

Economic push and pull factors play an important role in households' off-farm work decisions. Paddy price, the proxy for a perfect agricultural output market, has a significant negative effect on non-agricultural employment at the 5 percent level. Higher income from wet season rice crops due to higher paddy prices decreased the probability of households' participation in non-agricultural employment. This indicates that market prices play a significant role in determining households' participation in off-farm activities.

Furthermore, the financial market variable, using loan interest rate as a proxy, is not significantly associated with any of the five types of off-farm activities. Although not statistically significant, the sign of the effect of loan interest rate is very interesting. We find a negative effect on self-employment, suggesting the higher the interest rate the lower the probability of households setting up a business or becoming self-employed. In contrast, we find a positive association with non-agricultural employment.

This result could imply that an increase in loan interest rate might increase the probability of participation in non-agricultural activities. Because most rural farmers use credit to finance investments in agricultural production, an increase in loan interest rate would reduce farm profits, in turn forcing households to find alternative sources of income from non-farm wage employment. Also, some 58 percent of surveyed households said they cannot become self-employed or start a business because they lack investment capital.

Village-level factors and location

The estimated coefficient of the location dummy variable for Kratie is positive and statistically significant for agricultural employment only and non-agricultural employment only. This implies that village-level factors such as market access and economic development contribute to the relatively high probability of participation in agricultural

Table 2: Multinomial probit regression results of household participation in different types of off-farm activities

	Dependent variable: households' participation in off-farm activities									
	Agricultural employment		Non-agricultural employment		Both agri and non-agri employment		Self-employment		Both self- and wage employment	
	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z
Household characteristics										
hh_poor	-1.0450***	-3.41	0.1393	0.5	-0.8985***	-2.53	0.0444	0.15	-0.4783	-1.44
hh_size	0.0475	0.53	0.1032	1.27	0.3486***	3.54	-0.1389	-1.53	0.0909	1.04
hh_year_vil	-0.0130	-0.89	-0.0171	-1.31	-0.0057	-0.36	-0.0333*	-2.26	-0.0044	-0.3
Demographic and human capital characteristics										
hhhead_sex	0.3797	1.04	0.2619	0.8	0.6004	1.45	-0.0008	0	0.5000	1.24
hhhead_age	0.1557***	2.51	0.0655	1.14	0.0808	1.08	0.0830	1.44	0.2174***	2.84
hhhead_age2	-0.0018***	-2.97	-0.0008	-1.34	-0.0009	-1.25	-0.0009	-1.54	-0.0019***	-2.76
hhhead_edu	-0.0765	-1.56	-0.0225	-0.54	-0.1169**	-2.09	0.0059	0.13	0.0793*	1.61
hhhead_tvet	0.2053	0.48	0.0715	0.21	-0.5505	-0.88	0.7693**	2.14	0.8273***	2.09
Farm characteristics										
cultivated_land	0.0263	0.32	-0.2311**	-2.03	-0.3229*	-1.79	0.0121	0.15	-0.4687***	-3
tincome_livestock	0.0002	0.32	0.0002	0.28	0.0005	0.59	0.0009	1.18	0.0009	1.39
tincome_fisheries	-0.0001	-0.09	-0.0025*	-1.68	-0.0014	-1.03	-0.0011	-0.37	-0.0007	-0.38
tincome_forestry	-0.0052*	-1.66	-0.0021	-0.75	-0.0052*	-1.8	-0.0081***	-2.62	-0.0044	-1.43
Local economic conditions										
price_wetpaddy	-0.0010	-0.2	-0.0083**	-1.93	-0.0067	-1.35	-0.0035	-0.72	-0.0121**	-2.43
rate_loan	-0.0812	-0.84	0.0514	1.06	-0.1637	-1.4	-0.0734	-0.71	-0.0831	-0.62
Battambang	0.6252	1.46	-0.1410	-0.4	-0.2294	-0.5	0.3949	0.97	0.5329	1.19
Kampot	0.3139	0.43	0.7050	1.33	0.1126	0.17	0.2123	0.34	2.1248***	3.46
Kratie	1.4475***	2.7	-1.0022**	-1.93	-0.3322	-0.58	0.4890	0.84	0.0933	0.15
Constant	-1.6130	-0.37	6.7087	1.74	4.2204	0.85	3.0651	0.72	4.3444	0.9
No. of observations	320									
Wald chi2(85)	238.0									
Log pseudolikelihood	-452.1									

Note: Statistically significant at the *10%, **5% and ***1% level.

employment in Kratie province; these factors also have a significant but negative effect on non-agricultural employment. The two villages surveyed in Kratie province are relatively remote, and many industrial and cash crops (rubber, cassava, cashew nut, pepper and legumes) are grown in their vicinity. This explains why more households in Kratie province engage in farm employment than in non-farm employment.

The dummy coefficient for Kampot province has a significant positive effect on both self- and wage employment, suggesting a relatively high probability of both self- and wage employment.

Summary

Off-farm and farm work are the main sources of household income. Almost 76 percent of the households surveyed participate in some form of off-farm income-generating activity. Non-agricultural employment is the main source of off-farm income, followed by agricultural employment and self-employment.

Empirical analysis reveals that poor households are more likely to participate in agricultural employment or rural non-agricultural employment than non-poor households. This is probably because poor households have few economically active labourers, as indicated by the high dependency ratio, and therefore cannot access other types of off-farm activities especially outside of the village.

Non-poor households tend to engage in various types of off-farm employment or a combination of self- and off-farm wage employment. The negative sign for the correlation between how long households have lived in the village and off-farm employment suggests the strong attachment of rural households to farming activities. If farm income alone provides sufficient livelihood, rural households are more likely to focus on farming than off-farm activities: they prefer to live in their village rather than migrate to find work.

Of the household demographic and human capital characteristics, household head age and training have statistically significant effects on participation in off-farm activities. Training also plays a vital role in starting a business or going self-employed, and in gaining access to off-farm wage employment. Household wealth, especially cultivated land size, is an important determinant in households' off-farm employment decisions.

Smallholders and landless families are more likely to participate in non-farm employment.

Finally, local economic conditions such as market access, economic development and geographic location also influence (as pull factors) households' participation decisions in off-farm activities. Most importantly, we find a strong negative relationship between agricultural output markets and non-agricultural employment. A rise in the price of paddy rice increased income from crop production, which in turn decreased households' participation in non-agricultural employment. More agricultural jobs are available in areas where many industrial and cash crops are grown, for instance Kratie province. Similarly, locations where economic activities are concentrated, such as Kampot, are likely to offer more self-employment and business opportunities.

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