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Spousal Effects on Operators Labour Allocation to Non-Farm Activities in Southwestern Nigeria

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Abstract

The study investigated effect of spouse participation on operators' labour allocation to non-farm activities in southwestern Nigeria. Multistage sampling technique was used to select 396 respondents and data were gathered on socio-economic, non-farm and locational characteristics and other variables. Data analysis was carried out using descriptive statistics and endogenous switching regression model (ESR). The results showed that, the mean age of respondents was 47.4±9.7 years, 64.5 percent were male and non-farm activities engaged in included carpentry, petty trading, agency banking (POS), sales of herbs and second-hand clothes. The probit model of the selection equation revealed that, age, age squared, education, remittances were the significant variables influencing participation in non-farm activities. The full information maximum likelihood estimates (FIML) of the ESR model showed that spouse participation decisions on operator's labour allocation to non-farm activities is influenced by age, age of household heads, spouse education and non-farm income while for operators whose wife did not participate is impacted by age, age squared, education, remittances, cultivated land size and non-farm income. The study revealed that, spouse participation plays significant role on operators' labour allocation to non-farm activities. Moreover, operators whose spouses engaged or participated in non-farm activities tend to increase their non-farm labor supply with access to cultivable land area. Farming households with both operator and spouse participating in non-farm activities are better off due to hierarchical sorting into activities. It was recommended that spouse should be given access to education, cultivable land and remittances and cottage industries should be established to increase non-farm income.

Keywords: Endogenous Switching Regression, Non-Farm Activities, Spouse Participation, Operator, Southwestern

Introduction

Farming constitutes the major livelihood activity of the rural farming households. Farming household is made up of individuals; the husband, wife, children and extended family members as the case may be who form the primary sources of labour. The decision of a member of farming household to allocate labour to activities may have an interdependent relationship on the decisions of other members of the households (Zeng, 2005) [24]. Several studies have focused on the labour allocation of the household heads (Zhou *et al*., 2019) [25]. However, there are limited studies on the labour supply of other household members which may not be unconnected with limited available data on other members of the households (Kimhi, 2004) [17].

Literatures (Babatunde and Qaim, 2009; Amsalu *et al*., 2013 [3]; Zeesham and Giri, 2019 [23]) have documented on determinants of household decision to diversify into non-farm activities without recourse to other members of the farming households. Given this perspective, it makes it difficult to suggest policies that promote spousal effects on operators' labour allocation into non-farm activities among farming household couples as a measure of improving the economic wellbeing of farm households. Household labour supply differs from individual due to the fact that each member of the household may base decisions not only on his or her own wage, but also on the wage of the spouse (Baldwin *et al*., 2011) [6]. But, accounting for the difference in the interactive decisions, most studies treat each spouse's labour allocation decision as independent of the other spouse with separate elasticity estimates for men and women (Baldwin *et al*., 2011) [6]. The decision to treat men and women separately is typically explained by the differences in the economic characteristics of both men and women (Lundberg, 1988).

Studies on non-farm work participation decisions focused only on household heads as decision-maker (Zhou *et al*., 2019) [25] with limited information on other household members (Kimhi, 2004) [17]. Several studies on joint non-farm work participation decisions of farm couples and reported that husbands and wives are making non-farm work decisions jointly (Huffman and

Lange, 1989; Chang *et al*., 2017) [14, 10]. Abdulai and Delgado (1999) [1] noted that off-farm work participation and hours of work decisions of husbands and wives are non-independent of one another. However, spouses and operators could act as separate individuals with labour supply and work hours determined separately (Baldwin *et al*., 2011) [6]. Despite the interactions in husbands and spouses labour allocation, most studies tend to treat them as separate of other spouse (Baldwin *et al*., 2011) [6]. However, distinguishing between husbands and wives labour allocation and hours of work decision in farming households using empirical evidence has been inconclusive.

Studies on effects of spouse participation on operators labour allocation to non-farm activities revealed that households characteristics such as; age, gender, education, ethnicity, non-farm income, access to credit, distance to labour and access to physical infrastructure and information affect participation in non-farm works (Weldegebriel, 2017; Seng, 2015 [21]). Olugbire *et al*. (2012) identified age, gender, household size and education, among others as drivers of spouse into non-farm activities. Zeeshan *et al*. (2019) [23] indicated that, education, household size, dependency ratio, access to credit, total livestock unit and membership of cooperative society are factors that drive participation in non-farm activities. Moreover, several empirical studies have been conducted on smallholder labour participation in non-farm activities in many rural areas of developed and developing countries (Seng, 2015 [21]; Anang, 2017 [4]; Emmanuel, 2019; Nkegbe *et al*., 2022 [19]), and impact of participation in non-farm activities on household food security, and well-being (Jabo *et al.*, 2014; Osarfo *et al.*, 2016) [16, 20]. However, most of these studies are limited to farming household heads and not necessarily on labour allocation of farm couples.

Moreover, the econometric techniques employed only accounted for selection bias leaving the endogeneity unaddressed. For instance, Jabo *et al.* (2014) [16] and Osarfo *et al*. (2016) [20] employed propensity score matching (PSM) technique and two stage least square regression. Although, the PSM method is widely used is literature, but limited by the fact that it does not account for unobservable characteristics unit of the variables (Dedehoaunou *et al*., 2018) [11]. Hence, the ESR technique is superior to PSM method because it accounts for the selection bias and endogeneity due to both observable and unobservable characteristics. In terms of policy perspective, findings of this study will contribute to literature by its specific focus on labour participation of farm couples using endogenous switching regression (ESR) model. It will also help in the designing and formulation of policy framework for labour market participation of farm couples within the households. Moreover, it will help to identify factors which drive labour allocation decisions of farm couples into nonfarm activities and the effects of spouse participation on husband or operators labour allocation to non-farm activities in rural areas of Nigeria and developing countries in general. Hence, this study seeks to examine determinants of spouse participation on operators labour allocation to non-farm activities among smallholder farming households in southwestern, Nigeria.

Materials and Methods

The study was conducted in southwest geo-political zone comprised six states; Ekiti, Lagos, Ogun, Ondo Osun and Oyo States. Southwest geo-political zone of Nigeria has an estimated population of 61,321, 124 people (National Population Commission (NPC, 2021) and covers about 77, 818 square kilometer (Idowu *et al*., 2013) [15]. The southwest region is situated on a bearing Latitude 60^0 to the North and Latitude 40^0 to the south and Longitude 40^0 to the West and 60^0 to the East of the equator. The study area is an agrarian zone and the major occupation in the study area is farming however, petty trading and livestock production are also practiced by the people. The study area is characterized by tropical climate with distinct dry and wet seasons. The annual rainfall varies from 1000mm to 3000mm with temperature range of between 21^0C and 34^0C (Idowu *et al*., 2013; Faleyimu *et al*., 2013) [15, 12]. Southwest zone is characterized by fresh water swamp and the mangrove swamp forests and with mineral resources such as gold, bitumen, granite and kaolin, among others.

The primary data for the study were collected through a cross-sectional survey of farming households using semi-structured questionnaire coupled with interview schedule which was used to elicit information from the respondents socio-economic, locational and institutional characteristics, farm and non-farm activities. Trained Village Extension Agents (VEAs) in Ondo and Osun States Agricultural Development Programme were employed as enumerators for the data collection. The multistage sampling technique was used to select respondents for the study. Stage one consisted of random selection of Ondo and Osun States out of five StatesIn stage two, the selection process employed the organization of farm communities by the classification of Agricultural Development Programmes (ADPs) into zones, blocks and cells. Selection of zones and blocks were based on probability proportionate to size of zones (ADPZ) and number of blocks. Stage four comprised the selection of 25% of the cells in the total number of blocks and 40% of smallholder farming households in the farming communities in the cells. Stage five consisted of random selection of smallholder farming households based on probability proportionate to size of farming communities (FOS, 1999) [13]. The population for the study was selected based on the estimates from the formula below;

$$n = \frac{q^*(1-q^*)z^2}{\varepsilon^2} \quad (1)$$

Where; n = sample size; z = represents number of standard error corresponding to 95% confidence interval (1.96); ε = margin of error (0.05) and q = indicates the estimated proportion of smallholder farmers (Kothari, 2014). A total of 302 respondents were used for the study. The SPSS software package (Version 22) and Stata 14 were used for data analysis. Descriptive statistics, t-test analysis and endogenous switching regression (ESR) were used for the analysis of objectives of the study. The descriptive statistics was used to profile smallholders farming households by non-farm activities while t-test analysis was employed to show differences between continuous variables of farming household characteristics and non-farm activities.The endogenous switching regression model (ESR) was employed to determine the effects of spouse participation on operator's labour allocation to non-farm activities in the study area. Assuming that we do observe operators' spouse participation or non-participation, as an index function can be specified with an unobserved variable.

$$I_i^* = \propto Z_i + \mu_i \quad (2)$$

$$I^* = \left\{ \begin{matrix} 1\ if I^* > 1 \\ 0\ \ otherwise \end{matrix} \right\}$$

$$I^* = 1 \quad if > 0$$

$$I^* = 0\ if \leq 0$$

Where (Z_i) is a vector of individual and household characteristics and (μ_i) is the error term. The I is indexed as operator's spouse work status defined in a linearized reducedProbit equation which contains the exogenous variables that determine spouse decisions to participate in non-farm activities.To account for selection biases we adopt an endogenous switching regression to model the two groups of operators whose spouse participate and did not participate in non-farm activities in two regimes;

Operator (spouse participates)

$$Y_{1_i} = \beta_1 Z_{1_i} + \gamma_1 I_{1i} + \varepsilon_{1_i} if I^* = 1 \quad (3)$$

Operator (spouse did not participate)

$$Y_{2_i} = \beta_2 Z_{1_i} + \gamma_2 I_{2i} + \varepsilon_{2_i} if I^* = 0 \quad (4)$$

In the two equations Y_{1_i} and Y_{2_i} are dependent variables (farm and non-farm operators spouse work hours), X_{1_i} and X_{2_i} are vectors of exogenous variables, $\beta_1$and $\beta_2$are parameters to be estimated while $\varepsilon_{1_i}$and ε_{2_i} are error terms. The independent variables (Xi) for the equation are;
X_1 =Age of spouse (years); X_2 =Age of spouse squared (years^2), X_3 = Age of household head (years); X_4 = Gender of household head (1 = male; 0 = otherwise),X_5 = Education of spouse (completed years of education).X_6= Adult children working non-farm activities (1 = yes; 0 = otherwise),X_7= Number of children under 10 years (number); X_8= Household Size (number.),X_9= Remittances (N); X_{10} = Land Ownership (1 = yes; 0 = Otherwise); X_{11} = Total cultivated farm size (ha.); X_{12}= Total non-farm income (N); X_{13}= Years of non-farm work experience (years); X_{14}= Distance to urban/market centre (km); X_{15}= Total farm income (N); X_{16}= Access to credit (1 = yes; 0 = otherwise).

Conditional Expectations of Spouse Participation, Treatment and Conditional Effects

ESR models was used to compare the expected returns on levels of operator's whose spouse participated in non-farm activities and operators' whose spouse did not participate (Anang, 2017; Nkegbe *et al*., 2022) [4, 19] and. The expected returns for operators' whose spouse participated and operators' whose spouse did not participate in the hypothetical case where they had participated were predicted as follows;

$$(Y_{1i}\,|P_i = 1) = \gamma_1 X_{1i} + \sigma_{1\epsilon}\lambda_{1i} \quad (6)$$

$$(Y_{2i}\,|P_i = 0) = \gamma_2 X_{2i} + \sigma_{2\epsilon}\lambda_{2i} \quad (7)$$

$$(Y_{2i}\,|P_i = 1) = \gamma_2 X_{1i} + \sigma_{2\epsilon}\lambda_{1i} \quad (8)$$

$$(Y_{1i}\,|Pi = 0) = \gamma_1 X_{2i} + \sigma_{1\epsilon}\lambda_{2i} \quad (9)$$

Treatment Effect on the Treated (TT), which represents the effect of spouse participation in the different farm and non-farm activities, can be computed from the difference between the expectations (7) and (9):

$$TT = (Y_{1i}\,|P_i = 1) - (Y_{2i}\,|P_i = 1) = X_{1i}\,(\gamma_1 - \gamma_2) + (\sigma_{1\epsilon} - \sigma_{2\epsilon})\,\varepsilon_{1i} \quad (10)$$

Treatment Effect on the Untreated (TU), which corresponds to the effect of operators whose spouses' participated in non-farm activities on operators with non-participating spouse, which can be calculated as the difference between the expectations (10) and (8) as follows:

$$TU = (Y_{1i}\,|P_i = 0) - (Y_{2i}\,|P_i = 0) = (X_{1i} - X_{2i})_{1i} + \sigma_{1\epsilon}(\varepsilon_{1i} - \varepsilon_{2i}) \quad (11)$$

Heterogeneity Effects (HE) examined the differences due to the unobserved factors which can be estimated firstly, the effect of base heterogeneity for operator's whose spouse decides to participate in non-farm activities expressed as:

$$BH_1 = (Y_{1i}\,|P_i = 1) - (Y_{1i}\,|P_i = 0) = (X_{1i} - X_{2i})_{1i} + \sigma_{1\epsilon}(\varepsilon_{1i} - \varepsilon_{2i}) \quad (12)$$

The base heterogeneity for operators whose spouse decided not to participate in farm and non-farm activities is expressed as:

$$BH_2 = (Y_{2i}\,|P_i = 1) - (Y_{2i}\,|P_i = 0) = (X_{1i} - X_{2i})_{2i} + \sigma_{2\epsilon}(\varepsilon_{1i} - \varepsilon_{2i}) \quad (13)$$

The difference between the TT and the TU provides the transitional heterogeneity effect (TH), which allows for assessing whether the effect of operators whose spouse participate in non-farm activities is larger or smaller for operators whose spouse actually participated, with respect to the effect on operators with non-participating spouse in the counterfactual case where they would have participated.

Results and Discussion

Profiling Farming Household Socio-economic Characteristics by Non-Farm Activities

Table 1: Distribution of smallholder farmers by gender, age, marital status and household size by non-farm activities

Variables	Carpentry n = 41	Petty Trading n = 48	Agro-processing n = 60	Hair Dressing n = 37	Okada n = 46	Barbing n = 38	Bicycle Repairing n = 19	Brick Making n = 25	Selling of Herbs n = 23	Sells Second Clothes n = 34	POS n = 15	House Cleaning n = 10	Total Sample n =396
Gender													
Female	39.0	45.8	25.0	48.6	37.0	47.4	42.1	20.0	39.1	26.5	26.7	50.0	35.5
Male	61.0	54.2	75.0	51.4	63.0	52.6	57.0	80.0	60.9	73.5	73.7	50.0	64.5
Age													
< 31	-	-	1.7	-	6.5	-	5.3	12.0	4.3	5.9	-	-	4.4
31 – 40	14.6	4.2	5.0	5.4	15.2	23.7	15.8	12.0	4.3	26.5	33.3	30.0	13.3
41 – 50	56.1	39.6	60.0	59.5	54.3	42.1	52.6	56.0	65.2	41.2	46.7	70.0	51.7
51 – 60	22.0	41.7	20.0	35.1	23.9	34.2	15.8	20.0	26.2	17.6	13.3	-	26.6
>60	7.3	14.6	13.3	-	-	-	10.5	-	-	8.8	6.7	-	4.9
Mean/SD	**47.9±7.0**	51.9±8.4	48.7±7.3	47.7±5.5	45.9±7.7	46.9±6.1	47.1±10.1	44.8±7.9	47.3±7.9	45.5±9.4	44.7±8.7	44.1±4.8	47.4±9.7
Marital Status													
Single	4.9	6.3	11.7	10.8	17.4	13.2	15.8	16.0	21.7	8.8	20.0	20.0	15.8
Married	63.4	58.3	56.7	73.0	56.5	55.3	63.2	52.0	47.8	61.8	60.0	70.0	56.7
Widowed	19.5	12.5	10.0	8.1	8.7	21.1	10.5	16.0	4.3	8.8	6.7	10.0	10.8
Divorced/ Separated	12.2	22.9	21.7	8.1	17.4	10.5	10.5	16.0	26.2	20.6	13.3	-	16.7
Household Size													
<5	12.2	6.3	16.7	8.1	17.3	7.9	21.0	16.0	8.7	11.8	-	10.0	11.8
5 – 9	58.5	47.9	53.3	51.4	37.0	63.2	47.4	60.0	39.1	44.1	66.7	50.0	51.6
10 – 14	24.4	41.7	23.3	32.4	45.7	28.9	26.3	24.0	52.2	41.2	33.3	40.0	31.5
>14	4.9	4.2	6.7	8.1	-	-	5.3	-	-	2.9	-	-	5.1
Mean/SD	8.9±3.0	9.1±3.3	8.0±3.4	9.3±3.4	8.5±3.3	8.0±2.6	7.9±3.7	7.7±3.0	9.4±3.2	8.9±3.1	8.5±2.4	8.9±2.9	8.5±3.2

Source: Field Survey, 2022

Table 1 shows that in the result 64.5 percent were male as against 35.5 percent female. This implies that more male were involved in non-farm activities. This is in agreement with finding by Beyene, (2008) [8]. Analysis on age of respondents by non-farm activities showed that, 51.7 percent, 26.6 percent, 13.3 percent, 4.9 percent and 4.4 percent were between 41 and 50 years, 51 and 60 years, 31 – 40 years, greater than 60 years and less than 31 years respectively. The mean age of respondents in non-farm activities was 47.4±9.7 years. Analysis of non-farm activities by marital status indicates that, 56.7 percent were married while 16.7 percent, 15.8 percent and 10.8 percent were divorced or separated, single and widowed, respectively. The finding showed that majority of the respondents participating in non-farm activities in the study area were married which is characteristics of the rural areas of the developing countries. The mean household size across the non-farm activities was consistently around 9 members per households. This is similar to the findings by Balogun (2011) [7] with mean household size of 8 members in southwest Nigeria. Educational attainment showed that 27.3 percent, 48.6 percent, 15.3 percent and 10.8 percent had no formal education, primary, secondary and tertiary education respectively. The years of experience revealed that 9.9 percent, 19.7 percent, 46.3 percent and 24.1 percent had less than 5 years, between 5 – 8 years, 9 – 12 years and greater than 12 years respectively. The mean years of experience across the activities varies on dependency ratio, 6.4 percent had dependency ratio less than 0.30 while 66.0 percent and 27.6 percent had dependency ration between 0.30 - 1.32 and greater than 1.32, respectively. This implies that households with higher dependency ratio require more sources or means of income to meet the needs of the family.

Factors Influencing Spouse Participation in Non-Farm Activities

Table 2 shows the result of ESR model using the full information maximum likelihood (FIML) estimates on the effect of spouse participation on operators' labour allocation on non-farm activities. The log-likelihood was -329.28; the probability chi-squared was (Prob> Chi^2) = 0.000 while the likelihood-ratio (LR) was 102.45 for the joint independence of three equations was significant at 1% level of significance indicating that the model equations were not jointly independent and should not be estimated separately. The covariance term (rho 1) for the operator whose spouses' participate in non-farm activities was negative and statistically significant at the 1% level, while the covariance term for the operator whose spouse did not participate in non-farm activities was positive and statistically significant at 1% level of significance. The result shows that the correlation coefficient (rho) in the two regimes has alternate and significant signs, which implies that there is self-selection in the decisions of the operators' spouse to participate in non-farm activities. While the rho being positive and significant for operators whose spouse participated in non-farm activities, it was negative and significant for operators whose spouse did not participate in non-farm activities. Hence, this portends that the decision for operators' spouse to participate in non-farm activities is contingent upon or based on comparative advantage (Enderis *et al*., 2021; Abdulai and Huffman, 2014). This implies that operators whose spouse participated in non-farm activities supply above-average hour's outcomes while operators whose spouse did not participate in non-farm activities supply below-average hours outcomes in non-farm activities. Moreover, the significance of the coefficient of rho for operators whose spouse participated in non-farm activities may be adduced to the presence of some unobservables characteristics which influence the hours supplied to non-farm activities. The difference between the covariance terms (sigma 1 and sigma 2) showed positive value, this suggests that operators' spouse participation in non-farm activities results in more hours supplied under self-selection than with random assignment or compared to operators whose spouse did not participate in non-farm activities.

Table 2: FIML Estimates of Endogenous Switching Regression Model of spouse participation in non-farm activities in the study area

Variables	Participation (Selection Equation (1/0)		FIML Endogenous Switching Regression Model			
			Spouse Participation = 1		Spouse Participation= 0	
	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
Age of spouse (yrs)	0.330(0.335)	0.000***	-0.586(0.274)	0.033**	-0.516(0.223)	0.021**
Age of spouse squared (yrs)	0.027(0.175)	0.001***	-0.279(0.303)	0.354	-0.157(0.323)	0.115
Age of Household Head (yrs)	-0.455(0.242)	0.001***	-0.449(0.246)	0.008***	-0.832(0.258)	0.212
Gender (1 = male; 0 = otherwise)	-0.870(0.2170	0.000***	0.151(0.194)	0.437	1.410(0.323)	0.000***
Education of spouse (yrs)	0.424(0.160)	0.008***	0.504(0.245)	0.000***	-0.067(0.182)	0.713
No of adult children (working non-farm)	-0.177(0.118)	0.000***	1.149(0.274)	0.000***	0.573(0.325)	0.038*
Number of children (< 10yrs) (yrs)	0.536(0.297)	0.136	0.440(0.2710	0.105	-0.613(0.269)	0.023**
Household size (number)	-0.638(0.214)	0.003***	1.184(0.356)	0.001***	-0.134(242)	0.580
Remittances (₦)	0.293(0.145)	0.044**	0.787(0.657)	0.269	1.409(0.319)	0.000***
Land Ownership (1 = yes; 0 = no)	0.077(0.142)	0.588	0.979(0.347)	0.005***	-0.196(0.154)	0.202
Cultivated land size (hec)	0.486(0.140)	0.001***	0.154(0.255)	0.547	0.435(0.195)	0.026**
Total non-farm income (₦)	0.713(0.2345)	0.032**	0.516(0.245)	0.035**	0.437(0.168)	0.009***
Years of experience (yrs)	-0.084(0.164)	0.607	0.669(0.286)	0.019**	-0.377(0.268)	0.159
Distance (urban centre (km)	-0.430(0.159)	0.007***				
Total farm income (₦)	-0.124(0.129)	0.216	0.411(0.426)	0.335	-0.311(0.279)	0.265
Access to credit (1=yes; 0 otherwise)	0.027(0.175)	0.877	-0.453(0.226)	0.239	0.106(0.244)	0.036**
Constant	-9.260(2.531)	0.000***	-15.450(5.391)	0.004***	-2.372(2.320)	0.000*
Sigma1			0.665(0.031)	0.000***		
Sigma2					0.689(0.082)	0.038**
rho1			0.628(0.267)	0.000***		
rho2					-0.531(0.051)	0.442
LR		102.45		0.001		
Log Likelihood		-329.28				

Source: Author's Computation, 2022 ***and **significant at 1% and 5%

The result of the selection equation for the probit model for non-farm activities showed that, age of spouse, age squared, age of household, gender, education of spouse, number of children less than 10 years, household size, remittances, cultivated land size, total non-farm income and farm income and distance were the significant variables influencing the effects of spouse participation decisions on operator's labour allocation tonon-farm activities. Age of spouse, age of spouse squared followed the expected signs and significant. This implies that as age increases, participation in non-farm activities increased while the age of spouse squared followed the life-cycle pattern. This is in agreement with Kiel (2013) and Anang, (2017) [4]. However, age of household heads and gender had negative and significant coefficients. This indicates that as the age of household heads and being female increases, their participation in non-farm activities decreased. This conformed to *a priori* expectation. Number of adult children working non-farm and household size showed negatively statistically significant coefficients. This suggests that as the number of adult children working non-farm and household size increases, spouse participation in non-farm activities decreased. Remittances and cultivated land size had positive significant coefficients, thus implying that as remittances and cultivated land size increased, spouse participation in non-farm activities increases. Non-farm income showed a positive and statistically significant coefficient indicating that as non-farm income increased, participation in non-farm activities increased. This is in line with Kinuthia *et al.* (2018) [18].

Effects of Spouse Participation on Operators Labour Allocation to Non-Farm Activities

Table 3: Distribution of smallholder farmers by educational attainment, years of experience and dependency ratio by non-farm activities

Variables	Carpentry n= 41	Petty Trading n= 48	Agro-processing n= 60	Hair Dressing n = 37	Okada n= 46	Barbing n= 38	Bicycle Repairing n= 19	Brick Making n= 25	Selling of Herbs n= 23	Sells Second Clothes n= 34	POS n= 15	House Cleaning n= 10	Total Sample n = 396
Educational Attainment													
No formal Educ.	19.5	27.1	20.0	16.3	15.2	26.3	26.3	20.0	21.7	35.3	20.0	10.0	27.3
Primary Educ.	53.7	45.8	63.3	48.6	45.7	47.4	52.6	48.0	56.5	38.2	60.0	40.0	48.6
Secondary Educ.	19.5	12.5	13.3	21.6	28.3	15.8	10.5	24.0	13.0	8.8	13.3	30.0	15.3
Tertiary Educ.	7.3	14.6	3.3	13.5	10.9	10.5	10.5	8.0	8.7	17.6	6.7	20.0	10.8
Years of Experience													
<5	9.8	10.4	8.3	2.7	10.9	7.9	21.1	-	17.4	11.8	20.0	30.0	9.9
5 – 8	17.1	18.8	26.7	24.3	28.3	10.5	36.8	16.0	8.7	11.8	60.0	40.0	19.7
9 – 12	51.2	41.7	48.3	56.8	43.5	52.6	26.3	48.0	47.8	32.4	20.0	30.0	46.3
>12	22.0	29.2	17.7	16.2	17.4	28.9	15.8	36.0	26.1	44.1	-	-	24.1
Mean/SD	10.3±3.5	10.1±3.6	9.6±3.6	9.8±2.4	9.2±3.9	10.8±3.2	8.0±4.0	11.6±3.2	10.0±3.9	11.4±3.7	9.9±3.9	7.2±2.9	10.0±3.6
Dependency Ratio													
<0.30	7.3	6.3	3.3	5.4	2.2	15.8	10.5	8.0	6.7	11.8	-	-	6.4
0.30 – 1.32	65.9	58.3	75.0	73.0	65.2	65.8	57.9	48.0	47.8	61.8	80.0	50.0	66.0
>1.32	26.8	35.4	21.7	21.6	32.6	18.4	31.6	44.0	43.5	26.5	20.0	50.0	27.6
Mean/SD	1.0±0.6	1.1±0.6	1.1±0.6	1.1±0.6	1.2±0.8	0.8±0.6	1.1±0.6	1.3±0.8	1.4±0.9	1.1±0.7	1.0±0.7	1.5±1.0	1.1±0.7

Source: Field Survey, 2022

Table 3 shows the results of the endogenous switching regression (ESR) model on the effect of spouse's participation decisions on operators' labour allocation to non-farm activities in the study area. Age, age of spouse, education of spouse, number of adult children working non-farm and children less than 10 years, household size, land ownership, total non-farm income, years of experience and access to credit were the significant variables influencing spouse participation in non-farm activities. However, for operators whose spouse did not participate in non-farm activities showed that age, gender, number of adult children working non-farm and children less than 10 years, remittances, total non-farm income and access to credit were the significant variables influencing operators whose spouse did not participate in non-farm activities.

The coefficient of age of spouse for spouse who participated and those who did not participate in non-farm activities showed negative and significant coefficients. This indicates that as age of spouse increased, participation in non-farm activities by operators for both farming households decreased. This may be due to loss of strength for non-farm activities. This is in line with Zeng (2005) [24]. Moreover, the age of household heads was significant and negative for operators whose spouse participated in non-farm activities but insignificant for operators whose spouse did not participate in non-farm activities. Gender was found to have negative and significant coefficient for operators whose spouse participated in non-farm activities. This supports the fact that being female and participate in non-farm activities increase operators labour hours allocated to non-farm activities. This is in line with Adjognon *et al*. (2016) that despite the fact of women involvement in domestic chores their participation in non-farm activities contributes more to operators' labour allocation in non-farm activities. The coefficient of number of adult children working non-farm activities was significantly positive for both regimes. This indicates that increase in the number of adult children for operators' whose spouse participated and did not participate increases participation in non-farm activities. This may be squalled to the need to earn more income to meet the need of the family and other exigencies.

The coefficient for number of children less than 10 years was negative and significant relative to operators whose spouse did not participate in non-farm activities. This may not be unconnected with the fact that their non-participation could be to adequately cater for the children or it may be linked with religious practice for women to staying permanently at home without working. The coefficient of remittances was significant and positive foroperators whose spouse did not participate in non-farm activities but positive and insignificant for operators whose spouse participated in non-farm activities. This suggests that an increase in operators whose spouse did not participate in non-farm activities accessto receiving remittances increases, participation in non-farm activities increased. This indicates that remittances as source of income to the family have propelled them to engage in non-farm activities to generate more income to meet the needs of the family. Total non-farm income had positive and significant coefficient for both regimes of operators whose spouse participated in non-farm activities and did not. This is consistent with findings that non-farm income plays critical roles and as supplemental income to the family (Wang, 2017; Kinuthia*et al*., 2018) [22, 18]. Access to credit was found positive and statistically significant in relations tooperators whose spouse did not participate in non-farm activities. This implies that increase in access to credit for operators whose spouse did not participate in non-farm increases participation in non-farm activities. This may be connected to the fact that access to credit could guarantee means of survival for operators whose spouse did not participate in non-farm activities.

Conditional Expectations and Treatment Effects on Spouse Participation on Operators Labour Allocation to Non-Farm Activities

Table 4: Treatment and Heterogeneity Effects of Spouse participation in Non-farm Activities

Activity	Regimes	Decision Stage		Treatment Effects	t-Value
		Participants	Non-Participants		
Non-Farm Activity	Operator (spouse work non-farm) (ATT)	2987.65	2129.42	858.23	8.349***
	Operator (spouse did not work (ATU)	2491.29	1107.08	1384.21	11.527***
	Heterogeneity Effects (BH)	BH_1 = 496.36	BH_0 = 1022.34	TH = -525.98	

Source: Author's Computation, 2021; TT = Treatment on the Treated; TU = Treatment on the Untreated; BH_0 = Base Heterogeneity for operators whose wife did not participate; BH_1 = Base Heterogeneity for operators whose wife participated; TH = Transitional Heterogeneity

The result on Table 4 presents the conditional expectation of spouse participation, treatment effects and heterogeneity effects on spouse participation on operators' labour allocation to non-farm activities. The result showed the expected total hours supplied to the non-farm activities with the actual and counterfactual conditions. Cells (a) and (b) represented the actual expectations of total hours allocated to non-farm activities in the observed sample while (c) and (d) indicates the counterfactuals. The expected hours allocated to non-farm activities by operators whose spouse participated in non-farm activities was 2987.65 hours while it was 1087.08 hours for operator whose spouse did not participate in farm activities. However, it would be incorrect to conclude from this result here that 1900.57 hours (that is ((a) – (b) = 2987.65 – 1087.08) were allocated by operator's whose spouse participated in non-farm activities more than operators' whose spouse did not participate in non-farm activities without recourse to the counterfactuals. Hence, on the counterfactual case (c) the operators whose spouse participated in non-farm activities supplied about 858.23 hours (40.3%) to non-farm activities more than operators' whose spouse did not participate in non-farm activities. Further to scenario (d) for operators whose spouse did not participate in non-farm activities would have supplied 1804.29 hours (165.98%) more than operators' whose spouse did not participate in non-farm activities had they decided to participate. This suggests that operators whose spouse participated in non-farm activities allocated more hours to non-farm activities compared to operators whose spouse did not participate in non-farm activities.

The result of the transitional heterogeneity effect was negative; which indicates that the effect was smaller for

operators' whose spouse actually participated relative to operators whose spouse did not participate in non-farm activities. The heterogeneity of the sample indicates that spouse participation in non-farm activities tends to be better than above average whether they participated or not. However, they are better off when spouse participated than when they did not participate in non-farm activities compared to operator whose spouse did not participate in non-farm activities.

Conclusion and Recommendations

Findings from the study revealed that participation in non-farm activities was influenced by age, education of spouse, remittances, cultivated land size and distance while spouse participation in non-farm activities was influenced by education of spouse, land ownership, total non-farm income, years' of experience, among others. Based on the findings it was recommended that spouse should be given access to education to enhance their access to more lucrative non-farm activities. Migration of household member should be encouraged for more remittances in the farming households. Since total non-farm income influenced spouse participation in non-farm activities, hence, more cottage industries should be established for more non-farm opportunities in the study area.

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