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# Non-Farm Work and Food Security among Farm Households in Nigeria

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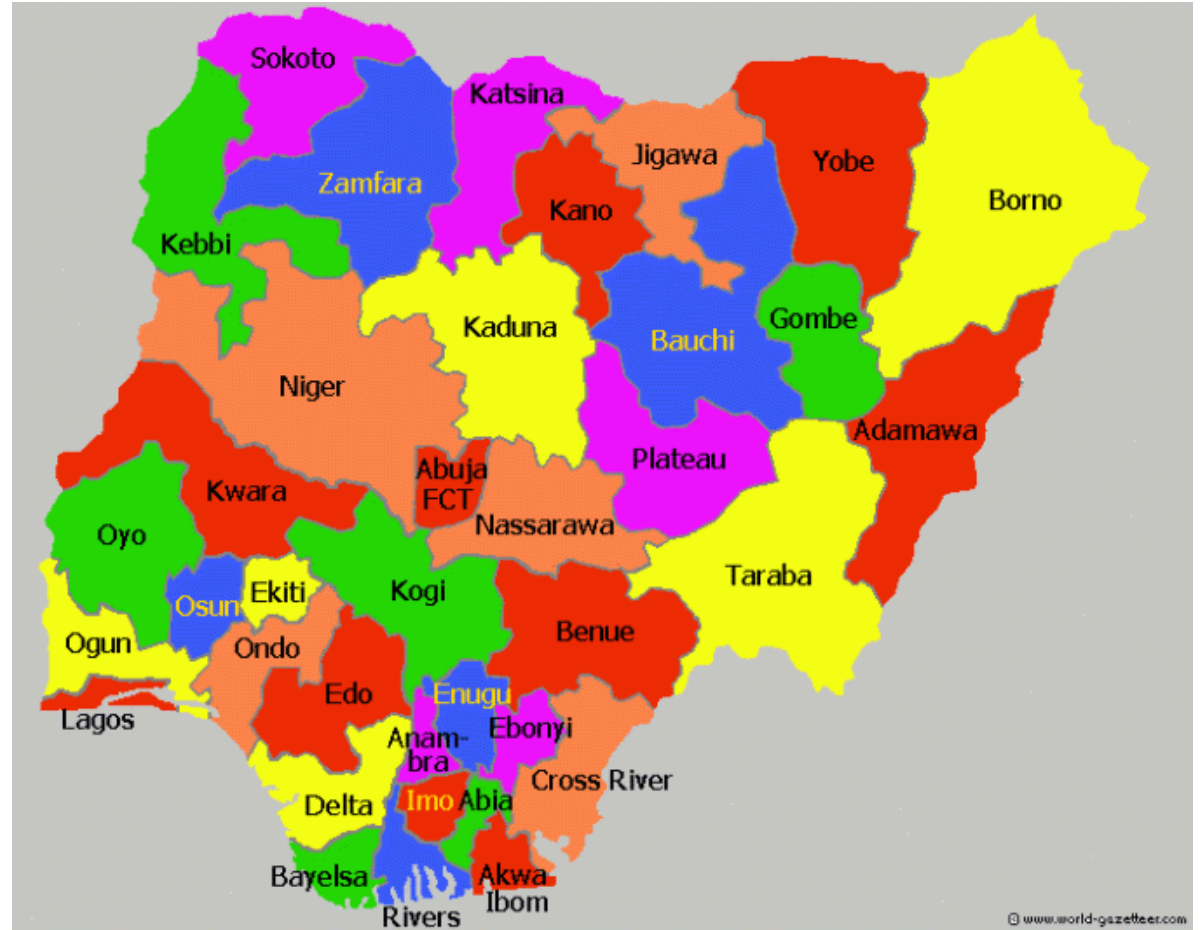
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# Outline

- Background
- Objectives
- Theoretical Framework
- Empirical Analysis
- Results
- Summary and Conclusions

# Background to the Study

- Nigeria is a country in West Africa and is divided into thirty-six states and a Federal Capital Territory, Abuja.
- There are three major income generating activities in Nigeria: wage employment, agriculture and non-farm enterprise operation.
- Non-farm activities are the broad range of activities that a household (or an individual) engages in but in an off-farm location. These include working in a non-farm enterprise and external wage employment.



# Background to the Study

- Agricultural activities dominate in rural areas while participation in non-farm enterprises and wage employment is predominantly seen in urban areas.
- For men, participation in agricultural activity was the most common activity (38.5%) followed by non-farm enterprise (17.9%) and wage employment (7.8%).
- For women, engaging in a household non-farm enterprise was the most common activity (25%) followed by agriculture (21.8%) and wage employment (4.0%)



# Previous studies...

- Owusu et. al (2011) examined the impact of non-farm work on household income and food security among farm households in Northern Ghana.
- Shehu and Sidique (2014) examined the effects of non-farm enterprise participation on household wellbeing among households in rural Nigeria.
- Seng (2015) examined the effect of non-farm activities on farm household's food consumption in rural Cambodia.

# Objectives

- The main objectives of this study was to examine the impact of non-farm work and non-farm entrepreneurial activities on household income and food security among a sample of farm households in Nigeria.
- The specific objective was to:
  - Estimate the Average Treatment Effect on the Treated (ATT) and the Average Treatment Effect (ATE) for female and male-headed households participating in non-farm work and non-farm entrepreneurial activities in order to account for gender differences.

# Propensity Score Matching

- Propensity score matching is an approach used to estimate causal treatment effects.
- Treatment effects are estimates about the impact of a treatment (e.g. participation in a program) on an outcome of interest (e.g. wages).
- Two important treatment effects are commonly estimated: The Average Treatment Effect (ATE) and the Average Treatment on the Treated (ATT).



# Propensity score matching methodology

- 1<sup>st</sup> stage: Using a binary variable, observations are assigned into two groups - participants and non-participants.
  - Participants are individuals and households that participated in non-farm work (non-farm entrepreneurship).
  - Non-participants are individuals and households that did not participate.
- 2<sup>nd</sup> stage: Using a probit model, predicted propensity scores are estimated. The scores indicate the propensity of observations to be assigned into the participating group given pre-participation characteristics ( $x$ ).
- 3<sup>rd</sup> stage: The predicted propensity scores are used to estimate treatment effects, ATE and ATT.
  - The Average Treatment Effect (ATE) captures the effect of participation on the entire sample.
  - The Average Treatment on the Treated (ATT) captures the impact of participation on participants (those who participated in non-farm work).

# Theoretical Framework

- The framework is based on the agricultural household model (Singh et al, 1986; Sadoulet & de Janvry, 1995).
- The agricultural household simultaneously integrates production, consumption and labor-supply decisions.
  - As a producer, the household maximizes profit through its production of agricultural products .
  - As a consumer, the household maximizes utility through its consumption decisions.
  - As a worker, the household maximizes utility from income and leisure time.

# Empirical Analysis

Propensity scores  $p(X_i)$  are obtained using:

- $p(X_i) = \Pr(D_i = 1|X_i) = E(D_i|X_i); \quad p(X_i) = F\{h(X_i)\}$ 
  - Where  $D_i$  is a binary dependent variable,  $X_i$ , a vector of pre-participation characteristics and  $F\{.\}$  is a normal or logistic cumulative distribution.
- Given the propensity scores, the ATE and ATT are estimated as follows:
  - $ATE = E[E\{Y_i(1), p(X_i)\} - E\{Y_i(0), p(X_i)\}]$
  - $ATT = E[E\{Y_i(1), p(X_i)\} - E\{Y_i(0), p(X_i)\} | D_i = 1 ]$

Table 1: Descriptive statistics for female-headed household's participation in non-farm entrepreneurial activities.

Variable	Participants		Non-participants		Difference in means
	N = 117 (34 %)		N = 230 (66 %)		
	Mean	S.D	Mean	S.D	
<i>Treatment variable</i>					
1 if household participates in non-farm enterprise, 0 otherwise					
Household Income(₦/thousand) (Outcome variable 1)	69.41	443.95	114.49	1345.93	45.09
Food security (1 if in the past 12 months household has faced a situation when it did not have enough food to feed the household (Outcome variable 2)	0.34	0.48	0.32	0.47	-0.02
<i>Independent Variables</i>					
Household characteristics					
Age of household head	58.35	11.70	59.06	12.50	0.71
Household size	4.53	2.58	3.78	2.61	-0.75**
1 if individual head can read and write, 0 otherwise	0.39	0.49	0.26	0.44	-0.13**
Highest qualification attained by the individual	1.76	2.13	1.91	2.29	0.15
Total value of owned equipment (₦)	3289.13	4596.14	3008.25	3580.81	-280.87
1 if household raised or owned local chicken (1/0)	0.38	0.49	0.43	0.50	0.05
Access to transportation	3.50	0.90	3.41	0.90	-0.09
Availability of commercial manufactured goods	3.57	1.09	3.69	1.02	0.12
Availability of electricity	3.02	1.48	3.46	1.49	0.45**
Availability of health care	3.79	0.81	3.93	0.72	0.14
Employment opportunities	2.19	0.93	2.29	0.99	0.11
Level of poverty in the community	2.70	0.99	2.65	0.95	-0.05
Access to non-agricultural business credit	3.03	1.32	3.39	1.52	0.36
1 if assets intentionally destroyed or seriously damaged	0.09	0.29	0.05	0.21	-0.05*
1 if dwelling burned down or destroyed or seriously damaged or occupied	0.10	0.30	0.06	0.23	-0.05**
1 if household is located in North Central zone, 0 otherwise	0.15	0.36	0.17	0.38	
1 if household is located in North East zone, 0 otherwise	0.02	0.16	0.02	0.14	
1 if household is located in North West zone, 0 otherwise	0.03	0.18	0.03	0.18	
1 if household is located in South East zone, 0 otherwise	0.42	0.50	0.49	0.50	
1 if household is located in South South zone, 0 otherwise	0.28	0.45	0.23	0.42	
1 if household is located in South West zone, 0 otherwise	0.09	0.29	0.05	0.22	

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Table 2: Descriptive statistics for male-headed household's participation in non-farm entrepreneurial activities.

Variable	Participants		Non-participants		Difference in means
	N = 972 (52 %)		N = 910 (48%)		
	Mean	S.D	Mean	S.D	
<i>Treatment variable</i>					
1 if household participates in non-farm enterprise, 0 otherwise					
Household Income(₦/thousand) (Outcome variable 1)	231.00	3563.91	64.31	376.05	-166.69
Food security (1 if in the past 12 months household has faced a situation when it did not have enough food to feed the household (Outcome variable 2)	0.23	0.42	0.21	0.41	-0.02
<i>Independent Variables</i>					
Household characteristics					
Age of household head	51.92	13.46	53.18	15.06	1.26*
Household size	7.23	3.14	6.25	3.13	-0.98**
1 if individual head can read and write, 0 otherwise	0.65	0.48	0.54	0.50	-0.11**
Highest qualification attained by the individual	2.66	2.86	2.83	2.86	0.17
Total value of owned equipment (₦)	2380.99	3479.99	2760.44	4997.00	379.46*
1 if household raised or owned local chicken (1/0)	0.48	0.50	0.48	0.50	0.00
Access to transportation	3.40	0.88	3.27	0.94	-0.14**
Availability of commercial manufactured goods	3.48	0.90	3.48	0.99	0.00
Availability of electricity	3.43	1.48	3.64	1.58	0.21**
Availability of health care	3.78	0.84	3.79	0.85	0.01
Employment opportunities	2.48	1.16	2.44	1.12	-0.03
Level of poverty in the community	2.82	0.98	2.73	0.97	-0.09**
Access to non-agricultural business credit	3.31	1.40	3.36	1.52	0.05
1 if assets intentionally destroyed or seriously damaged	0.05	0.22	0.06	0.24	0.01
1 if dwelling burned down or destroyed or seriously damaged or occupied	0.07	0.25	0.07	0.26	0.00
1 if household is located in urban sector, 0 otherwise	0.16	0.37	0.08	0.27	
1 if household is located in North Central zone, 0 otherwise	0.13	0.34	0.21	0.41	
1 if household is located in North East zone, 0 otherwise	0.15	0.35	0.14	0.35	
1 if household is located in North West zone, 0 otherwise	0.35	0.48	0.24	0.43	
1 if household is located in South East zone, 0 otherwise	0.13	0.34	0.19	0.39	
1 if household is located in South South zone, 0 otherwise	0.13	0.34	0.14	0.35	
1 if household is located in South West zone, 0 otherwise	0.11	0.31	0.08	0.27	

Table 3: Descriptive statistics for female-headed household's participation in non-farm work.

Variable definition	Participants		Non-participants		Difference in Means
	N = 130 (37 %)		N = 217 (63 %)		
	Mean	S.D	Mean	S.D	
<i>Treatment variable</i>					
1 if household participates in non-farm work, 0 otherwise					
Household Income(₦/thousand) (Outcome variable 1)	236.56	1811.30	14.69	105.97	-221.86*
Food security (1 if in the past 12 months household has faced a situation when it did not have enough food to feed the household (Outcome variable 2)	0.39	0.49	0.29	0.45	-0.10*
<i>Independent Variables</i>					
Household characteristics					
Age of household head	56.66	12.00	60.14	12.21	3.48**
Household size	4.86	2.55	3.52	2.53	-1.34**
1 if individual head can read and write, 0 otherwise	0.41	0.49	0.24	0.43	-0.18**
Highest qualification attained by the individual	2.22	2.49	1.48	1.87	-0.74**
Total value of owned equipment (₦)	3173.46	4548.31	3060.54	3546.48	-112.92
1 if household raised or owned local chicken	0.39	0.49	0.42	0.49	0.03
Access to transportation	3.55	0.84	3.38	0.93	-0.18*
Availability of commercial manufactured goods	3.49	0.96	3.75	1.09	0.26**
Availability of electricity	2.92	1.34	3.55	1.54	0.64**
Availability of health care	3.77	0.78	3.94	0.73	0.18**
Employment opportunities	2.15	0.94	2.32	0.98	0.17
Level of poverty in the community	2.60	0.94	2.71	0.98	0.11
Access to non-agricultural business credit	2.97	1.26	3.44	1.55	0.47**
1 if assets intentionally destroyed or seriously damaged	0.04	0.19	0.08	0.27	0.04
1 if dwelling burned down or destroyed or seriously damaged or occupied	0.06	0.24	0.08	0.27	0.02
1 if household is located in urban sector, 0 otherwise	0.17	0.38	0.13	0.34	
1 if household is located in North Central zone, 0 otherwise	0.10	0.30	0.21	0.41	
1 if household is located in North East zone, 0 otherwise	0.03	0.17	0.02	0.13	
1 if household is located in North West zone, 0 otherwise	0.04	0.21	0.03	0.16	
1 if household is located in South East zone, 0 otherwise	0.41	0.49	0.50	0.50	
1 if household is located in South South zone, 0 otherwise	0.33	0.47	0.19	0.40	
1 if household is located in South West zone, 0 otherwise	0.09	0.28	0.05	0.22	

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**Table 4: Descriptive statistics for male-headed household's participation in non-farm work.**

Variable definition	Participants		Non-participants		Difference in Means
	N = 1,106 (57 %)		N = 819 (43 %)		
	Mean	S.D	Mean	S.D	
<i>Treatment variable</i>					
1 if household participates in non-farm work, 0 otherwise					
Household Income(₦/thousand) (Outcome variable 1)	218.49	3395.89	60.54	395.49	-157.94
Food security (1 if in the past 12 months household has faced a situation when it did not have enough food to feed the household (Outcome variable 2)	0.25	0.43	0.17	0.38	-0.08**
<i>Independent Variables</i>					
Household characteristics					
Age of household head	51.36	13.30	54.07	15.33	2.71**
Household size	7.15	3.17	6.23	3.09	-0.92**
1 if individual head can read and write, 0 otherwise	0.66	0.47	0.52	0.50	-0.14**
Highest qualification attained by the individual	3.10	3.00	2.17	2.52	-0.93**
Total value of owned equipment (₦)	2597.73	3851.64	2522.32	4796.39	-75.41
1 if household raised or owned local chicken	0.48	0.50	0.49	0.50	0.01
Access to transportation	3.38	0.88	3.28	0.95	-0.11**
Availability of commercial manufactured goods	3.45	0.93	3.53	0.97	0.07*
Availability of electricity	3.44	1.44	3.65	1.63	0.21**
Availability of health care	3.78	0.86	3.78	0.82	0.00
Employment opportunities	2.53	1.20	2.37	1.06	-0.15**
Level of poverty in the community	2.86	0.99	2.68	0.94	-0.18**
Access to non-agricultural business credit	3.32	1.40	3.35	1.52	0.03
1 if assets intentionally destroyed or seriously damaged	0.05	0.22	0.07	0.25	0.02
1 if dwelling burned down or destroyed or seriously damaged or occupied	0.06	0.24	0.08	0.27	0.01
1 if household is located in urban sector, 0 otherwise	0.16	0.37	0.09	0.28	
1 if household is located in North Central zone, 0 otherwise	0.11	0.32	0.22	0.42	
1 if household is located in North East zone, 0 otherwise	0.13	0.34	0.12	0.32	
1 if household is located in North West zone, 0 otherwise	0.36	0.48	0.16	0.37	
1 if household is located in South East zone, 0 otherwise	0.15	0.36	0.25	0.43	
1 if household is located in South South zone, 0 otherwise	0.14	0.34	0.17	0.37	
1 if household is located in South West zone, 0 otherwise	0.10	0.31	0.08	0.27	

Table 5: Results of Average Treatment Effects on the Treated (ATT) and the Average Treatment Effect (ATE): Non-farm entrepreneurial activity

Treatment	Outcome Indicators		Male		Female	
			ATT	ATE	ATT	ATE
Own Enterprise (1 vs 0)	Income	Coefficient	20.786	41.855	6.191	55.830
	Food security status	Coefficient	-0.020	-0.010	0.035	-0.017

Table 6: Results of Average Treatment Effects on the Treated (ATT) and the Average Treatment Effect (ATE): Non-farm Work

Treatment	Outcome Indicators		Male		Female	
			ATT	ATE	ATT	ATE
Non-farm Work (1 vs 0)	Income	Coefficient	55.879	48.558	212.040	0.113
	Food security status	Coefficient	0.025*	0.059	0.118	0.102*



# Summary and Conclusions

- The main objectives of this study was to examine the impact of non-farm work and non-farm entrepreneurial activities on household income and food security among a sample of farm households in Nigeria.
- We estimated the Average Treatment Effect on the Treated (ATT) and the Average Treatment Effect (ATE).
- Comparing the coefficients of the treatment effects suggests that participating in non-farm work improves food security .

THANK YOU