

SPATIAL PATTERNS AND SOCIO-DEMOGRAPHIC DETERMINANTS OF THE DECISION MAKER ON LARGE HOUSEHOLD PURCHASES IN NIGERIA: A BAYESIAN SEMI-PARAMETRIC GEO-ADDITIVE MODEL

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ABSTRACT: The member of family who makes final decision on household purchases is a phenomenon that may pose a psychological problem for a potential father and mother in Nigerian households. This paper examines the possible relationship between the decision maker, socio-demographic features of the couples and geographical variations. Data used for this analysis came from the 2013 Nigerian Demographic and Health Survey (NDHS). Conventional parametric regression models are not flexible enough to cope with possibly nonlinear effects of the continuous covariates and cannot flexibly model favourably spatial influences. As a result, a semi-parametric model using the Bayesian approach was adopted to evaluate the relationship of covariates of different types and possible spatial variation. Binomial probit model for 2-category responses and unordered multinomial probit model for 4-category responses were considered. Findings reveal some spatial variations with distinct high significant outcome in favour of the fathers as final decision makers in some states in the south-west, north-central, north-east and south-south zones of Nigeria. The effect of father's and mother's age was nonlinear. Regions, educational level, and couple's income contribute significantly. Results also show that most fathers who have final say on household purchases are between ages of 25 and 80 after which a sharp drop is noticed, while a wife's drops slowly before the age of 25. There is need to empower more women in the regions where the man as the father is the decision maker on household purchases in the area of provision of quality education and good employment.

KEYWORDS: Household purchases, Spatial, Nigeria, Binomial probit, Multinomial probit, Bayesian.

1. INTRODUCTION

The socio-cultural context conditions the relationship of women's individual-level characteristics to decision-making, and autonomy is a key intervening mediator between women's status and reproductive outcomes ([Jej00]). Evidence from other developing countries show that women's age and family structure are the strongest determinants of women's authority in decision making ([SS00]). Women have little autonomy in many cultures, so it is important to get a better understanding of the

determinants of their decision-making autonomy and variations across regions and socio-cultural contexts in the same country. Previous work has shown that women who have a significant say in reproductive matters tend to be more educated, spend more time on household economic activities and marry later ([Jin95]). Several other studies have also shown that the poor tend to be sicker and they utilize care facilities less frequently than their better-off counterparts ([Gwa05], [N+06]).

An African study highlights that ethnicity plays a very important role in shaping a wife's decision-making authority and is even more important than other individual-level characteristics as a determinant of authority ([KA99]).

Another study emphasizes that compared to their husbands' report, wives tend to under-report their household decision-making power. However, educated and employed partners are more likely to participate in the final decisions ([BFS06]). The aim of this study is to determine the determinants of household purchases, while the specific objectives are to find out the role(s) of wives in large household purchases decisions, to examine wives' demographic, socio-cultural and economic factors in their involvement in large household purchases decisions. The source of the data is Demographic and Health Survey (DHS), which can be at <https://www.dhsprogram.com>

2. MATERIALS AND METHODS

We assume a probit model. Conditional on the covariates and the parameters, y_i follows a Bernoulli distribution i.e. $y_i \sim B(1, \mu_i)$ with conditional mean

$$\mu_i = \Phi(\eta_i) \quad (1)$$

where Φ is the cumulative distribution function of a standard normal distribution. Introducing latent variables

$$L_i = \eta_i + \varepsilon_i \quad (2)$$

With $\varepsilon_i \sim N(0,1)$, we can equivalently define the binary probit model by $y_i = 1$ if $L_i > 0$ and $y_i = 0$ if $L_i < 0$.

The advantage of defining a probit model through the latent variables L_i is that the full conditionals for the regression parameters β_j (and γ) are again Gaussian with precision matrix and mean given by

$$P_j = X_j' X_j + \frac{1}{r_j^2} K_j, \quad (3)$$

$$m_j = P_j^{-1} X_j' (L - \bar{\eta}), \quad (4)$$

Hence, the efficient and fast sampling schemes for Gaussian responses can be used with slight modifications.

3. DATA ANALYSIS

All data analyses were done using BayesX version 2.1, a Software for Bayesian Inference in Structured Additive Regression Models, R version 3.4.4 and STATA version 14. The response variable, *household purchases decision maker* is 4-category variable while the predictors are also categorical.

Table 1: Frequency distribution of large household purchases decision makers. Inserted in the parenthesis are the percentages

Variable	Decision maker on household purchases				No of respondents
	Wife alone	Wife & Husband	Husband alone	Someone Else	
Region					
North Central	1,177(10.56)	4,835(43.39)	5,127(46.01)	4(0.04)	11,143
North East	231(2.16)	2,944(27.57)	7462(69.88)	41(0.38)	10,678
North West	336(1.29)	3,536(13.62)	22,075(85.04)	10(0.04)	25,957
South East	627(8.85)	4,167(58.85)	2,259(31.90)	28(0.40)	7,081
South South	1,748(19.13)	4,720(51.65)	2,669(29.21)	1(0.01)	9,138
South West	1,567(14.03)	6,766(60.59)	2,819(25.25)	14(0.13)	11,166
Residence					
Urban	2,510(9.51)	12,255(46.43)	11,581(43.88)	47(0.18)	26,393
Rural	3,176(6.51)	14,713(30.17)	30,830(63.22)	51(0.10)	48,770
Education					
No-education	1,098(3.05)	7,044(19.55)	27,840(77.27)	48(0.13)	36,030
primary	2,060(11.36)	8,496(46.84)	7,560(41.68)	22(0.12)	18,137
Secondary	2,090(12.90)	8,521(52.60)	5,569(34.38)	20(0.12)	16,200
Higher	438(9.13)	2,908(60.63)	1,442(30.07)	8(0.17)	4,796
Religion					
Catholic	578(8.98)	3,737(58.06)	2,104(32.69)	17(0.26)	6,436
Christian	3,636(14.52)	14,050(56.12)	7,319(29.23)	31(0.12)	25,036
Islam	1,351(3.16)	8,803(20.59)	32,553(76.13)	50(0.12)	42,757
Traditional	121(13.22)	364(39.78)	430(46.99)	0(0.00)	915
Other	0(0.00)	14(73.68)	5(26.32)	0(0.00)	19
Working Status (Wife)					
No	103(5.79)	404(22.70)	1,264(71.01)	9(0.51)	1,780
Yes	5,583(7.61)	26,564(36.20)	41,147(56.07)	89(0.12)	73,383
Earning Status (Wife)					
More than him	704(20.95)	1,636(48.69)	1,007(29.97)	13(0.39)	3,360
Less than him	4,313(6.46)	21,782(32.62)	40,604(60.81)	73(0.11)	66,772
Same	557(12.62)	3,178(72.03)	676(15.32)	1(0.02)	4,412
Husband doesn't work	112(18.09)	372(60.10)	124(20.03)	11(1.78)	619
Earning Status (Husband)					
No	5,574(7.48)	26,596(35.68)	42,287(56.73)	87(0.12)	74,544
Yes	112(18.09)	372(60.10)	124(20.03)	11(1.78)	619

Table 2: Posterior means and 95% credible intervals for the fixed effects covariates

Variable	Posterior mean	Credible Interval
Constant	-0.7194	(-1.2986, -0.2179)
Residence		
Urban (ref)	0	
Rural	0.0279	(0.0009, 0.0547)
Region		
South East (ref)	0	
North central	-0.3391	(-0.9845, 0.2633)
North East	0.3382	(-0.2439, 0.9903)
North West	1.1054	(0.5474, 1.6762)
South South	-0.0751	(-0.7485, 0.5961)
South West	-0.4585	(-1.0225, 0.1559)
Education		
Higher (ref)	0	
No-Education	0.3912	(0.3415, 0.4397)
Primary	0.1485	(0.1002, 0.1955)
Secondary	0.0818	(0.0337, 0.1288)
Religion		
Other (ref)		
Catholic	-0.167	(-0.7817, 0.4851)
Christian	-0.0963	(-0.7129, 0.5543)
Islam	0.4056	(-0.2119, 1.0611)
Traditional	-0.1809	(-0.8028, 0.4827)
Wife working Status		
Not Working (ref)	0	
Working	-0.603	(-1.4145, 0.1788)
Earning Status		
Husband not working (ref)	0	
Wife earns more	0.4711	(0.3292, 0.6146)
Husband earns more	0.9427	(-0.1063, 0.1854)
Same earning	0.0357	(-0.1063, 0.1854)

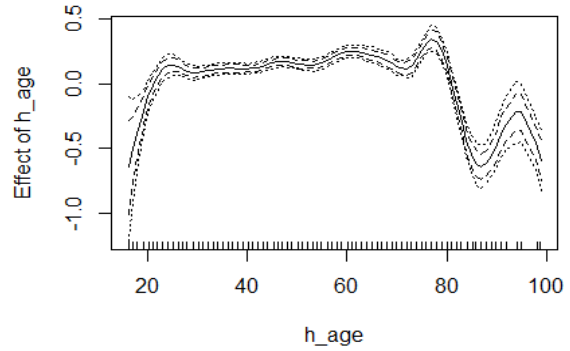


Fig. 2: Non-Linear Effect of Age of husband. Shown are the posterior means together with 95% and 80% pointwise credible intervals

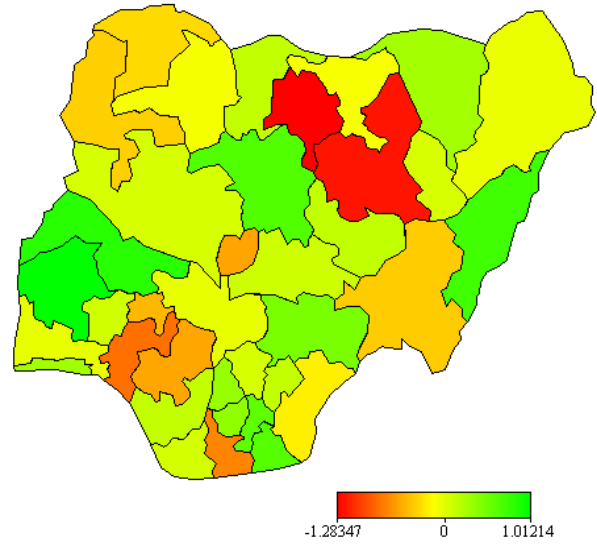


Fig. 3: Non-Linear Effect of states. Shown are the posterior means

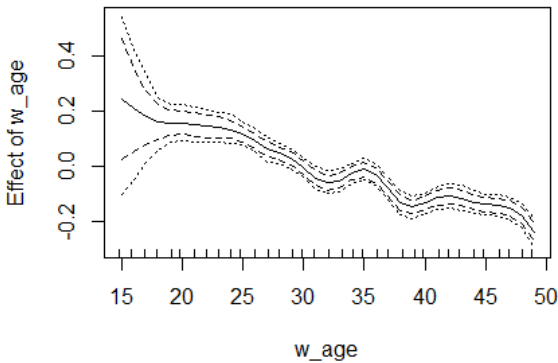


Fig. 1: Non-Linear Effect of Age of Wife. Shown are the posterior means together with 95% and 80% pointwise credible intervals

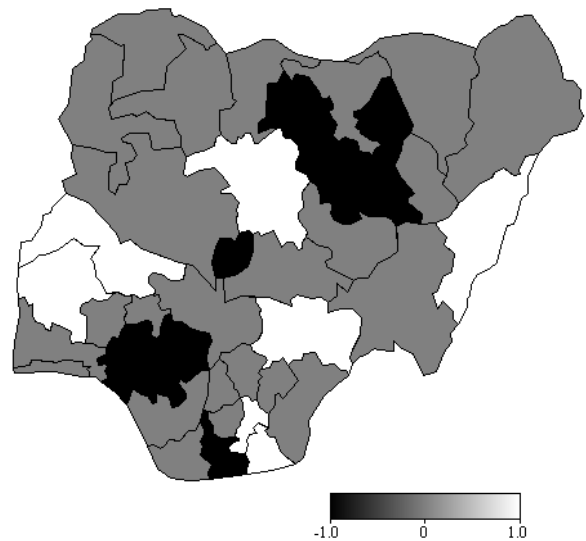


Fig. 4: Non-linear Effect of states. Posterior probabilities for a nominal level of 95%. Black denotes regions with strictly negative credible intervals, white denotes regions with strictly positive credible intervals

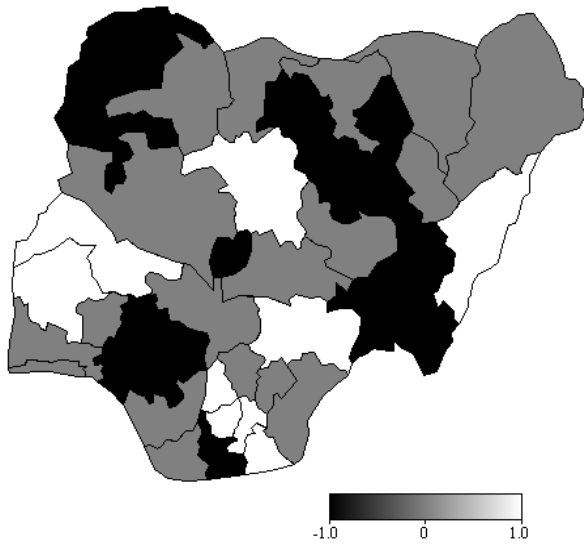


Fig. 5: Non-linear Effect of states. Posterior probabilities for a nominal level of 80%. Black denotes regions with strictly negative credible intervals, white denotes regions with strictly positive credible intervals

4. DISCUSSION OF RESULTS

Table 1 shows the descriptive statistics while table 2 shows the inferential. From table 1, it can be discovered that women in the South region of Nigeria have the highest percentage (19.13%) of where wives are the household decision maker of large purchases considering the six geo political zones in the country. The least proportion comes from the North West which is 1.29%. Women in Urban areas have higher tendencies than those in the rural centres in making decision on large household purchases. Women with secondary education have greater impacts than those with no education. In table 2, since zero is not contained in the interval considering residence (0.0009, 0.0547), it is therefore said that the “rural” is statistically significant as a contributing factor to large household decision maker and higher than that of urban which is having mean zero. It is more pronounced in the North West than South East. The tendencies are higher in women with no education, having primary, and having secondary education than women having higher education. None of the categories of religion has any significant impact on the response variable. It is also significant among women earning more than the husbands when compared with husband not working.

Figures 1 and 2 show the non-linear effects of wives and husbands ages on the large household purchases decision maker. It has an inverse relation for wives but the effect is constant for husbands between ages 20 and 70 before it drops at 75 while a wife’s drops slowly before the age of 25.

Figures 2 – 5 present the results for the spatial effects. Fig. 2 shows the maps of posterior means while the others show the maps of the credible intervals used in assessing the significance of the estimates. Taking the map of the posterior intervals, black colour depicts significantly lower cases of where women take decision on large household purchases, while white implies higher significance. Gray colour tells us that the estimates are not significant in such regions of the country under study.

5. CONCLUSION AND RECOMMENDATION

It can be concluded that large household purchases decision maker is determined largely the education status of the individual, other influencing factors are the earning status, region, and place of residence. It is observed that religion has no effect at 95% credible interval. There is need to empower more women in the regions where the man as the father is the decision maker on household purchases in the area of provision of quality education and good employment.

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