

Gender Differentials of Time-Use Poverty and Sustainable Use of Time Resources by Farmers in South-West Nigeria

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ABSTRACT— Time-use poverty is a topical policy issue which requires urgent public discourse. Despite other natural resources endowments, agricultural households are facing competing claims and pressure on time allocation. And, given the paucity of studies on the analysis of the time-use for both agricultural and non-agricultural work related activities, and the time allocated for leisure, this study investigated if there an indication of time poverty among the farmers. This research relied on the data elicited from a random sample of 368 smallholder farmers in South-West Nigeria, by interrogating the gender differentials of time-use resource allocations to productive and non-productive activities by the smallholder farmers, using the Foster-Greer-Thorbecke (FGT) class poverty decomposition measures/indices, as well as the maximum likelihood estimation of heteroskedastic probit model. Findings indicated that women spent more time on work related activities, while men clearly spent marginally higher time on leisure related activities, suggesting that female farmers are disproportionately vulnerable to time poverty, comparatively. Given the FGT distributionally-sensitive measure of time poverty, there is a clear inequality among the time-poor population groups which violates the time transfer-sensitivity axiom. Findings from heteroskedastic probit model indicated gender, years of formal education, family size, involvement in secondary livelihood activity, and importantly, time spent on leisure are significant predictors of time poverty among the farmers. The study underscores the need to strike a balance between competing claims and leisure time, which has not been given attention by previous studies, and to develop appropriate gender-just policies for empowerment and global prosperity.

KEYWORDS: FGT, gendered-time resources, heteroskedastic-probit, Nigeria, farmers

1. INTRODUCTION

One of the notable progresses in the gendered poverty analysis is the incorporation of the time dimension to further understand the concept of poverty. This is because time is also an essential asset fundamentally required to escape from vicious cycle of poverty and to achieve a desirable level of well-being by individuals [29] in addition to the normal households' assets [22]. More importantly, time has been identified by policy and development experts as a notable dynamics influencing individuals' well-being and productivity. For instance, [25] noted that the time spent on leisure and rest by individuals has significant impact on the level of productivity, and by extension income streams and welfare; however, individuals regularly need to make tradeoffs among work and leisure because of the complementarities of other tasks and responsibilities [21]. This trade-off off may consequently bring about individuals being time poor. The approach behind time poverty is that it makes a distinction between poor individuals in terms of time-use, that is, those who do not have sufficient time for leisure and/or rest due to over burden of workloads and other activities [4], [10].

The inclusion of time dimension in the conceptualization of poverty is a clear indication of the relationship between income and time poverty, which also have impact on individuals' and family members' well-being, with emphasis on women and children [3], [28], [34]. In recent times, economic literatures have been committed to analyzing the importance of gender differential of time-use in poverty analysis, and time allocation among leisure and work vary among men and women. In fact, we have instances of feminization of some activities such as the household chores and care work (relatives) which are largely unpaid in nature; most of these activities are time demanding, and are carried out by female folks. This position is also affirmed by [10] who indicated in that compared with men, women are faced with competing claims and pressure on time allocation, with little or no time for rest and/or leisure. This experience is increasingly pathetic in the global south countries and especially in the rural sub-Saharan Africa, which also includes Nigeria.

1.1 Poverty, Time-Use and Development Challenges in Nigeria

The intertwined situation of the current unprecedented health issue and economic poverty, as well as the time-use allocation among myriads of competing activities among the farmers in Nigeria has attracted significant direct costs on human lives disproportionately among men and women, with severe economic and welfare consequences [32]. The impact of this unprecedented event has placed the country and the world at large in a vulnerable condition whose shock waves continue to increase, which urgently requires an adequate global response. More so, over-reliance of the Nigerian economy on crude oil for sustenance is also taking a different dimension because Nigeria is highly vulnerable to Covid-19 induced economic disruption which has been unprecedented due to oil price shock in the global market [33].

Already, close to half (about 83 million people) of the Nigerian population live below the poverty threshold, while about one-quarter (about 53 million) of the population (disproportionately spread among men and women, who are mostly affected) are vulnerable to poverty, and with all indications of falling into perpetual poverty because of the impact of Covid-19 pandemic and lack of enabling environment to build resilience against emergencies [33]. Consequently, there is a greater need for livelihood diversification by the citizens which necessitates judicious and efficient time allocation among the competing interests and options of activities available to increase income generation for people. At the moment, this and many more development challenges including the pre-existing structural challenge are confronting the nation, and making it difficult to escape from the vicious cycle of time-use deficit vis-à-vis time poverty.

The decision on the time-use and its allocation across many activities by individuals is governed by the size of income streams of individuals, as well as the family structure composition of each household. Considering the fact that only 24 hours exist daily, the idea is that each person is thought and believed to have the option to choose uninhibitedly the amount of time spent on work and leisure (recreation activities), and also giving consideration to the time spent on eating, dozing, washing, and other necessitated needs [3], [18], [29]. Importantly, individual is obliged to ensure complimentary allotment of time on these activities [14], [28]. It is of importance to stress that work time is expected to incorporate time spent on both paid and unpaid activities to support the household. At this point, there is a need to come to terms with the fact that not all goods and services are provided and paid for in the market. Be that as it may, [28] affirmed that, when incorporating the standard poverty measures into time-use analysis from a gendered perspective must acknowledge the existence of unpaid work, which is usually not accounted for in such analysis from previous similar studies.

1.2 Underpinning Theoretical Perspectives on Time-Use Studies

Generally, time use research has been motivated by [5] theory. This theoretical research focuses on how a given individual/household allocates time between market work and leisure time as conceptualized by

production-oriented activities and consumption oriented activities respectively. The author argued that “households are utility-maximizing and distribute their time in generating income and unpaid activities, given a set of wage rate”.

Meanwhile, [11] noted that the framework as put forward by Becker focus mainly on household as a unit of analysis, and the author did not also consider the power of institutional bricolage that shapes individual’s decision dynamics. Becker literally excluded institutional inputs (in terms of the structure of the labor market, childcare resources, availability of social services, and social norms) in decision making process on time-use. Suffice it to say that, time allocation by individuals is a structural dynamic process which incorporates “bargaining of all sorts, support and assistance, as well as reciprocity among individuals. All these underscore the justification on the need to use individual level as a focal point in the time-use studies and analysis.

1.3 Factors Influencing Gender-differentiated Time-use Pattern

The discourse about the influence of time-use on the economic growth and development of many global south countries, including Nigeria keeps growing among the development experts. Many extant studies (for instance, [4], [16] have established the dependence of individual’s well-being not only on the consumption or income, but also on the time dynamics, which is a significant factor like income or consumption rate. According to [1], just like any productive resources, time is also a scarce resource, and its allocation to various economic and non-economic activities differs; and by extension, such allocation determines if individual is time poor or not.

For instance, different person may have the same level of income, but definitely such individuals will have different time resources in terms of its allocation to different activities; this disproportionately affect their well-being, and consequently, leads to time-use poverty situation. Suffice it to say that, when more time is devoted and/or allocated to paid/unpaid activities owing to excessive workloads, apparently, there will be less time to rest or for leisure; this invariably suggests time poverty condition [4]. According to [31], there are many push and pull dynamics dictating the time-use patterns among different gender; these are “household consumption and life cycle issues, seasonal and system of farming considerations, geographic and regional factors, ease of access to fuel and water, provision of infrastructural facilities, proximity to key institutional loaction”. In fact, the societal values, norms and cultural standings also play significant roles in defining households’ gendered roles and responsibilities [21].

Most importantly, in the areas of households’ chores and other informal activities such as fetching of firewood and water, preparation of food, care for the sick and vulnerable aged population, as well as processing of food crops, women invest a lot of effort and resources, including time to carry out all these alarming tasks which place them in a disproportionate position in terms of time allocation efficiency [31]. In many parts of Nigeria, men and women adapt differently to responsibilities which is not limited to farm and off-farm activities, and other livelihood activities. In particular, women are forced to make trade-offs between household chores and care work as well as tending to her livelihood activities [21]. This dilemma and contending claims on time-use by women may directly and indirectly influence the food and nutrition status of the household members, should a woman decide to invest chunk of her time on the child care [1].

Time poverty technique has been employed by many similar studies outside the shore of sub-Saharan Africa to interrogate how people experience time deficit, and to understand several underlining activities such as food gathering, work, as well as leisure, amongst many others, and the distribution of time allocation, which render many people vulnerable to time poverty [3], [6], [15], [18], [27], [34]. A time deficit suggests no or insufficient time to maintain and keep up with rest, leisure, as well as physical and mental well-being [29].

This is to say that time poverty vis-à-vis time-use deficit describes individuals’ time allocation on some contending claims of activities, and the trend of time allocation to different activities which determines the status of time deficit. Therefore, this study analyzed the gender differentials of time poverty among the farmers, estimated the gender disaggregated time-use distribution pattern, investigated the time poverty headcount (P_0), time poverty gap (P_1), and severity of time poverty (P_2), as well as estimated the predictors of time poverty status among the farmers in the study area.

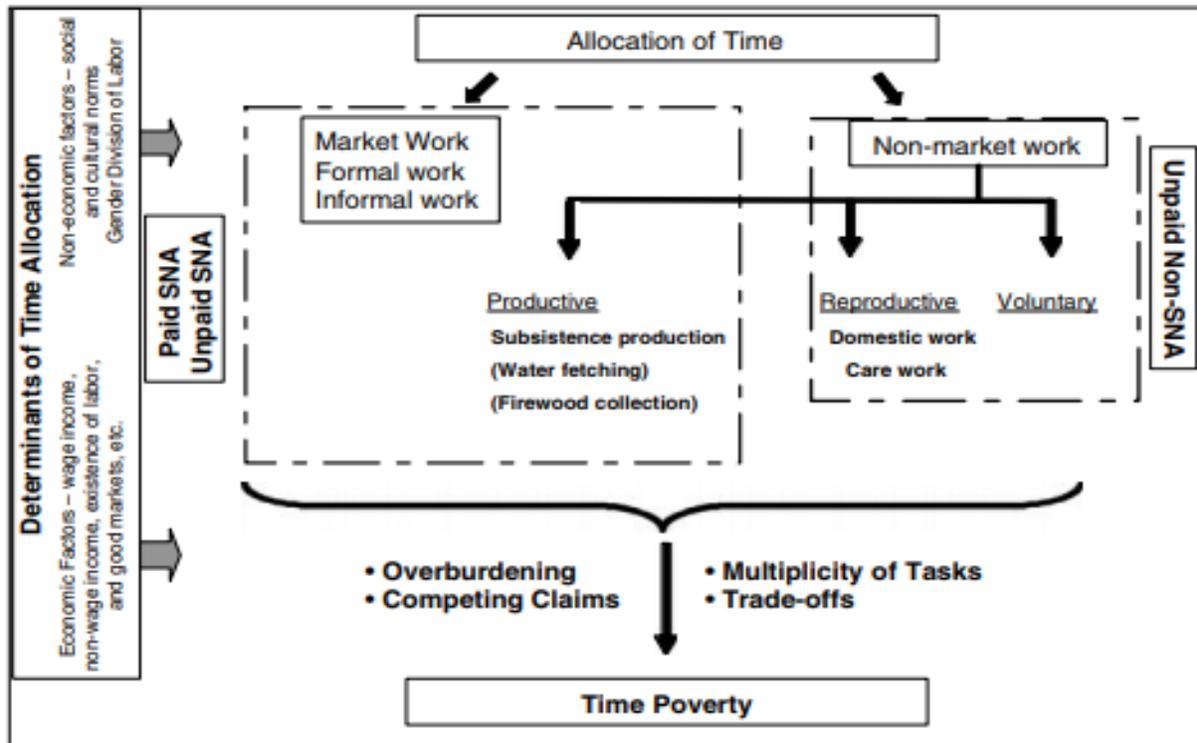


Fig. 1 Diagrammatic representation of the determinants of time poverty

Source: Adapted from [4]

2. Materials and Methods

2.1 Study Area, Sampling Technique, Research Design and Data Collection Procedure

This research was conducted in South-West region of Nigeria, because of the volatility of the known security threats and risks in the other parts of the country as at the time of conducting this research; a move considered appropriate, and which is in line with the ethical guidelines as contained in the Helsinki declaration of 1964. More so, there is a paucity of secondary data on the subject of interest, and the available secondary data on the topic has a lot of attritions may provide a misleading causal relationship among the variables of interest. In particular, this region comprises of six states namely: Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti States. Multistage random sampling technique was used to select the sample size for this research. In the first stage, three of the six States in South-West Nigeria were purposively chosen because of the reported high incidence of inequality and poverty (expressed by poverty head count, poverty gap, and severity of poverty) in these States [23]. The second stage made use of a simple random sampling technique to select two rural Local Government Areas (LGAs) each from the 3 States selected in the first stage. And, in the third stage, two villages were further selected through simple random sampling technique from each of the six rural LGAs previously sampled. Meanwhile, stratified random sampling technique was used in the fourth stage to select 15% of men and 15% of women farmers in each of the twelve villages previously selected. Based on these

gender strata, proportionality factor (the use of a random proportionate to size sampling technique) was used in the fifth stage to select 384 respondents used as sample size for this study; but, data from 368 farmers were found useful for the final analyses. Following [19], the three important points of consideration in the sample size determination are: the level of precision, confidence level and the degree of variability. Therefore, this research selected the final study's representative sample using the validated method for sample size determination for unknown population with the use of confidence level technique of Z-score [26], which is expressed as:

$$n_0 = \frac{z^2 \times p(q)}{e^2} \dots \dots \dots (1) \quad \text{where:}$$

n_0 = Sample size to be estimated

z^2 = Selected critical value of desired level of confidence or risk

p = Estimated proportion of an attribute that is present in the population or maximum variability of the population

$$q = 1 - p$$

e = error margin. For example, at 5% error margin, the sample size is calculated as:

$$n_0 = \frac{(1.96)^2 \times 0.5(1 - 0.5)}{(0.05)^2} = 384.16$$

Cross-sectional research design was used for this research. In particular, time-use data and other important information such as the personal and socio-economic characteristics were elicited from the respondents through the use of a well-structured interview schedule.

2.2 Data Analytical Techniques

Descriptive statistics such as cross-tabulation and mean values were used to profile the respondents' the time-use data (including its gender dimension/perspective), and other selected socio-economic characteristics based on gender groups. Using the same dataset, the technique applied by [4], as well as the [12] class poverty measures were applied to estimate the "time poverty line", and the time-use poverty class decomposition (that is, headcount index of time-poverty, time-poverty gap, and severity of time-poverty, which is the squared time-poverty gap).

Based on theoretical understanding and statistical evidence of relationships, maximum likelihood estimation of heteroskedastic probit model was applied to investigate the predictors and/or correlates of time poverty in the study area. The use of this model is necessitated because heteroskedastic poses a significant issue in the maximum likelihood estimation compared to the usual ordinary least square estimation. More particularly, heteroscedasticity can lead to incorrect standard errors, as well as biased and inconsistent parameters. To avoid this, it is very important to account for non-constant variance which normally distorts inferences and predictions in social and economic studies [13].

2.3 Analysis of Time-use: Measuring techniques

Conceptually, in the analysis and measurement of time-use, there is a need to emphasis that time poverty describes a situation where some people do not have sufficient amount of time for leisure and/or rest, given consideration to the time spent on working either in the formal or informal sectors [4]. This is to say that, the more/higher the time allocated for or spent on both paid and unpaid works, the lesser the time spent will be

on ‘rest or leisure’ activities, hence, the manifestation of vulnerability to time poverty. Apparently, measurement of the traditional poverty for deciphering households’ welfare of different family structure may present a seemingly difficult approach, perhaps owing to varying needs and consumption in terms of economies of scale. This observation on difference in needs and economies of scale requirements also holds for the measurement of time use vis-à-vis time poverty. However, unlike the traditional poverty analysis, this does not present any problem at all because individual’s working hours are observed in the time poverty analysis, as also established by [4].

Therefore, the framework for the analysis of time poverty in this study was guided by two approaches. First, the study followed [4] procedures where two alternative relative poverty lines were constructed; that is, “a lower threshold which equals 1.5 times the median of the total individual weekly working hours distribution, while a higher threshold which equal 2 times the median of the total individual weekly working hours distribution.” Similarly, FGT technique was also used to construct the time poverty line, which is the two-third (2/3) of mean per capita weekly time-use (MPCT). The FGT time poverty line was also helpful in the estimation of the class decomposition of time poverty measures. Following [4], the headcount index of time-poverty is the share of the population that are time poor, that is, the proportion of the population that works a number of hours y that is above a *certain time poverty line* z . Supposed there is a population size of n where q individuals are time-poor, the *headcount index of time poverty* is expressed as:

$$H = \frac{q}{n} \dots \dots \dots (2)$$

The time poverty gap represents the *mean distance* separating the population from the time poverty line with the non-time poor apparently has a zero distance, by default. This describes the entire population’s time deficit. In particular, this measures the amount of time that will be required/needed to move all the time poor individuals beyond the poverty line, through a perfectly targeted “time transfers.” Mathematically, the *time poverty gap* is defined as follows:

$$PG = \frac{1}{n} \sum_{i=1}^q \left[\frac{y_i - z}{z} \right] \dots \dots \dots (3)$$

where: y_i is “total working hours” of i^{th} individual, and the *summation* is taken only among those individuals who are time poor. For instance, if the estimated time poverty gap is 0.20, this suggests that on the average, the perfectly-targeted transfer of time required for all the individuals who are time-poor to escape time poverty represents about 20 percent of the time poverty line.

On the other hand, if after accounting for a minimum amount of time devoted to rest, the total time available is about the double of the time poverty line; then, the perfectly-targeted time transfer that would be needed to eradicate time poverty represents about 10 percent of the total time available. This explanation appears meaningful, and can perfectly communicate the degree of the time transfer that will be required by the time-poor population to escape from the time poverty in an intuitive manner. The time poverty gap can also be expressed as the product of the headcount index of time poverty by the time gap ratio I , i.e. $PG = H \cdot I$, with I itself defined as:

$$I = \frac{y_q - z}{z} \quad \text{where } y_q = \frac{1}{q} \sum_{i=1}^q y_i \text{ is the mean working hours of the time poor ... (4)}$$

However, as established in many poverty related studies, the time gap ratio I may not present a representation of poverty alone simply because the time gap ratio may be reduced over time, in the case where individual decides to cut down his number of working hours. Then, while the time poverty gap addresses the distance of the time poor population from the time poverty line, the squared time poverty gap is the square of that distance of the population who are time poor from the time poverty line. Said differently, the *squared poverty gap* (*time poverty severity*) takes into account the inequality among the time poor. This is expressed as:

$$SPG = \frac{1}{n} \sum_{i=1}^q \left[\frac{y_i - z}{z} \right]^2 \dots \dots \dots (5)$$

More so, the headcount (P_0), poverty gap (P_1), and squared poverty gap (severity) (P_2) are the FGT decomposition class of poverty measures whose formula includes a parameter α taking a value of zero (0) for the headcount, one (1) for the poverty gap and two (2) for the severity of time poverty, as indicated in the following expression:

$$P\alpha = \frac{1}{n} \sum_{i=1}^q \left[\frac{y_i - z}{z} \right]^\alpha \dots \dots \dots (6)$$

2.4 Heteroskedastic Probit: Model Specification

Probit model is usually associated with biased and inconsistent estimates, especially when the disturbances are heteroskedastic, which apparently is problematic. The heteroskedastic probit model presents an alternative option to address this issue. The model is a generalization of the probit model because it allows the scale of the inverse link function to vary from observation to observation as a function of the independent variables [7]. [8] also noted that, heteroskedastic probit model can be estimated by maximum likelihood just as it operates with the normal like probit model; therefore, the log-likelihood function for the heteroskedastic probit model is given as:

$$\ln L = \sum_{j \in S} \omega_j \ln \Phi \{ x_j \beta / \exp(z_j \gamma) \} + \sum_{j \in S} \omega_j \ln [1 - \Phi \{ x_j \beta / \exp(z_j \gamma) \}] \dots \dots \dots (7)$$

where S is the set of all observations j such that $y_i \neq 0$ and w_j is the optional weights.

As widely acknowledged, the interpretation of probit models coefficients is not advisable, hence, the need to estimate for the marginal effect coefficients [30], [8]. A cursory look at the marginal effects brings to fore the areas where substantive differences are between the two given models, while with the estimation of marginal effects, all explanatory factors except one are usually set equal to their means, and the changes in the other factors which influence the likelihood of occurrence of each possible outcome can be observed [30]. Thus, the marginal effect for the heteroskedastic probit model is: expressed as:

$$\frac{\partial Pr(y_i = 1)}{\partial X_k} = \phi \left(\frac{X_i \beta}{\exp(z_i \gamma)} \right) \left(\frac{\widehat{\beta}_k}{\exp(z_i \gamma)} \right) \dots \dots \dots (8)$$

3. Results and Discussion

3.1 Average Count of Weekly Hours Spent on Various Activities by Gender

Table 1 presents the data on the total time-use pattern disaggregated by gender among the smallholder farmers in the study area. On the average, the findings indicated that female spent more time than the male counterpart on care works and activities which span across care for the child, old, and sick and other vulnerable individuals; this result is in tandem with what [10] reported on time-use in Mozambique. Conversely, the mean total time-use on all domestic household chores (works) by the male is slightly higher than that of the female folks. This result is with mixed feelings owing to the fact that female are traditionally known to do most of the general household chores, but a plausible explanation to this could be as a result of the disproportionate population distribution of male and female individuals in the study area. In terms of involvement in labour market works outside the house, female individuals significantly spend more time on the average, compared to the male counterparts.

As evident from the table 1, this could be as a result of intense participation of women in formal wage paid employment compared to the male counterparts who are more involved in informal wage self-employment through vocational activities (artisanship). On both counts (total time-use definitions 1 and 2), the result indicated that female individuals significantly spent more time on various activities (be it in cash or kind) than the male counterparts in the study area. An examination of the pooled data also revealed that the average weekly time spent on various activities by the sampled respondents stood at 15.9 hours and 17.8 hours in line with the total time-use definitions 1 and 2 respectively. Conversely, while women spent more time on various activities in line with the total time-use definitions 1 and 2, the amount of time spent on leisure is higher for the male counterparts. This is as expected owing to the traditional customary practices of African settings which relegate women to household chores.

As established by [4], the higher the time allocated for or spent on both paid and unpaid works, the lesser the time spent will be on ‘rest or leisure’ activities, which is an indication of time-use poverty, the findings apparently indicated that women spent more time on work related activities throughout the distribution of time-use, while men clearly spent slightly higher time on leisure related activities. This suggested that female smallholder farmers are disproportionately vulnerable to time poverty compared to the male smallholder farmers in the study area, which definitely violates the gender-just society theme in development economics.

Table 1 Average Count of Weekly Hours Spent on Different Activities (by Gender)

Activities	Men (238)	Women (130)	Pooled
a. Child care	1.2	1.4	1.3
b. Caring for old/sick/vulnerable persons	0.1	0.1	0.1
c. Care work (<i>sum of a - b</i>)	1.3	1.5	1.4
d. Food cooking/processing	1.0	0.8	0.9
e. Hunting for food	1.1	0.1	0.1
f. Fetching of water	0.8	0.3	0.6
g. House cleaning/laundry/ironing	0.9	1.0	0.9
h. Gathering of firewood	0.1	0.1	0.1

i. Buying food from the market	0.8	0.9	0.8
j. Construction/maintenance/repair	0.02	0.01	0.01
k. Voluntary work/Aid to other persons	0.4	0.3	0.4
<i>l. Domestic work (sum of d - k)</i>	4.1	3.6	3.9
<i>m. All domestic chores (sum of c and l)</i>	5.4	5.1	5.3
n. Farm work	2.8	2.7	2.8
o. Formal wage paid employment	1.8	5.6	3.2
p. Informal wage self employment	5.4	4.6	5.1
q. Participation in community/collective action initiatives	1.6	1.2	1.5
<i>r. Labour market works outside the house (sum of n - q)</i>	11.6	14.2	12.5
s. Praying/worshipping/meditating	3.4	3.4	3.4
t. Watching television/radio	1.7	1.6	1.6
u. Nap/resting	1.5	1.6	1.6
v. Gymnastic/exercise	0.2	0.2	0.2
w. Socializing	5.1	4.9	5.0
<i>x. Leisure (sum of s - w)</i>	11.9	11.6	11.8
y. Total time-use (definition 1)	15.0	17.8	15.9
z. Total time-use (definition 2)	17.0	19.3	17.8

Note that: Total time-use (definition 1) is the sum total of mean time-use on All domestic chores (except aid to other persons), and labour market works (except participation in community/collective action initiatives) [4].

Total time-use (definition 2) is the sum of total mean time-use (as in definition 1), aid to other persons, and participation in community/collective action initiatives [4].

Source: Data analysis, 2021

3.2 Decomposition of Farmers' Time Poverty Measures

The table 2 revealed the decomposition of poverty indices among the respondents in the study area. Considering the lower-threshold time poverty line, the estimate of time poverty headcount index which measures the proportion of female and male population that are time poor are 0.7846 and 0.8823 respectively. Meanwhile, as a cautionary note, this does not in any way speak to how poor the poor are for each group (in terms of gender) of the population. Further, the time poverty gap index estimates which mirror the extent to which individuals fall below the time poverty line (that is, the distance of the time poor population from the time poverty line) indicated only 28.88%, 30.66% and 30% of the time poor population for female and male group, as well as the whole population in that order. The sum of these poverty gaps gives the minimum time required to escape from time poverty, through a perfectly targeted "time transfers. It is important to also note that, this poverty measure does not indicate changes in disparity among the time poor individuals across the gender groups.

In terms of the severity of time poverty, which in other words indicates the distributionally-sensitive measure of time poverty, the findings revealed that inequality among the time poor population is expressed as 12.61% and 12.81% for female and male groups respectively. This pointed to the need for efficient allocation of time resources of the time poorest individuals (for each group) owing to the fact that they are those for whom the initial time resource allocation gap is largest. This measure satisfies the caveat of time transfer axiom, but not the time transfer-sensitivity axiom which is outside the scope of this study. To satisfy this caveat, the time poverty gap may not be expressed in a squared power form, but raised to a higher power-cubed. The power

raise apparently adds and satisfies the time transfer-sensitivity axiom caveat, which provides a seemingly appealing revelation. However, this action is not without a shortcoming as it assigns “very heavy, and too great a weight” on the welfare of the time poorest in a social calculus [17], [20]. The pattern of findings so far also holds for both higher-threshold time-use poverty line, and the FGT time-use poverty line; interestingly, the result also agrees with the findings made by [24] on gender gap time-use poverty in Egypt and Tunisia.

Apparently, looking at the parameters across the three decomposed measures of time poverty, men appeared to be very marginally more time poor compared to the female counterparts; although, women are also time poor, given the statistics. In fact, these findings are clear, suggestive, and with mixed feelings, but not sufficient enough to make definitive inferences and conclusion about the gendered time poverty status in the study area. Further inferential investigation and analysis are indeed required, and will provide sufficient evidence.

Table 2 Decomposition of Farmers’ Time Poverty Measures by Gender

Poverty Measures	Lower-threshold Time poverty line	Higher-threshold Time poverty line	FGT Time poverty line
Time Poverty Headcount (P_0)			
<i>Female</i>	0.7846	0.8384	0.6692
<i>Male</i>	0.8823	0.9243	0.7058
<i>Pooled</i>	0.8478	0.8940	0.6929
Time Poverty Gap (P_1)			
<i>Female</i>	0.2888	0.4241	0.1844
<i>Male</i>	0.3066	0.4568	0.1868
<i>Pooled</i>	0.3003	0.4453	0.1859
Time Poverty Severity (P_2)			
<i>Female</i>	0.1261	0.2310	0.0652
<i>Male</i>	0.1281	0.2435	0.0626
<i>Pooled</i>	0.1274	0.2390	0.0635

Lower-threshold time poverty line: 1.5 times the median of the total working hours (22.1 hours)

Higher-threshold time poverty line: 2 times the median of the total working hours (29.5 hours)

FGT Time poverty line: 2/3 MPCT (17.84 hours)

Source: Data analysis, 2021

3.3 Predictors of Time-Poverty among the Smallholder Farmers

Heteroskedastic probit model was applied to examine the predictors of time poverty among the respondents in the study area. The model is suitable to eliminate the biased and inconsistent parameters, as well as to correct the unequal variance associated with discrete outcomes which the normal probit and/or logit models may not be able to address. The results obtained from the heteroskedastic probit model are presented in two panels; that is, the mean function panel and the variance function panel. Following the literature, all relevant variables were included in the mean function, while only the suitable ones that directly explain the variation in time-use were considered and estimated in the variance function. The findings presented in Table 3 indicated that four out of all the estimated coefficients for the mean equation are statistically significant at

varying probability levels with the expected direction of movement, while all the estimated coefficients (with the exception of variable- primary livelihood) for the variance equation are also statistically significant, with the expected signs at different confidence interval. Interestingly, a notable observation from both the mean equation and the variance equation of the heteroskedastic probit model is that the signs of the coefficients are uniform on both counts; however, exception is made for variable “leisure time” where it has direct sign with the mean equation, and inverse sign with the variance equation.

Going forward, the interpretation for this model rests on the marginal effect estimates which were computed as non-linear combination of the regression coefficients. Consequent on this, the findings as presented in Table 3 indicated that all else equal, one unit increase in the gender of the respondents, being a male causes an increase of 0.19% in the likelihood of being time-poor, given that all other variables were held constant. As expected, the result also indicated that an increase in the accumulation of human capital over time (years of formal education) lowers the chances of being time-poor, and this result agrees with [1] who also reported a similar effect of higher educational status on the probability of being time poor in Oyo and Osun States of Nigeria.

In line with a-priori expectations, while having a large household size increases the probability of being time-poor compared to those with small household size, increase in time allocation for leisure and rest was also found to reduce the likelihood of being time poor. Meanwhile, involvement in livelihood diversification (through engagement in secondary income generating activities) increases the chances of being time poor, all else equal. This result is expected because individuals tend to spend more time on activities that generate more earnings than having enough time to rest or for leisure.

In conclusion, the findings apparently established that there is a higher likelihood of being time poor if individuals experience the burden of excessive workloads, and without sufficient time to rest or for leisure, and this indirectly affects people’s livelihood activities, and the strive to attain a gender-just society as emphasized by [2].

Table 3 Heteroskedastic Probit Estimates: Predictors of Farmers’ Time-Poverty

Time Poverty	Heteroskedastic Probit Model Estimates		
	Mean function	Variance function	dy/dx
Age	0.0599 (0.0617)	-	0.0013 (0.0019)
Gender	0.5826** (0.2931)	0.0053*** (0.0012)	0.1932** (0.0927)
Years of formal education	-0.6684*** (0.2677)	-	-0.2194** (0.0975)
Primary livelihood	0.1539 (0.3292)	0.0480 (0.0297)	0.0510 (0.1089)
Family size	0.6640** (0.3083)	-	0.2217*** (0.0825)
Secondary livelihood	-0.6213* (0.3363)	0.0141* (0.0084)	0.0740* (0.0394)
Leisure time	0.1123 (0.1073)	-0.1818*** (0.0569)	-0.4806** (0.2226)
Constant	-2.8151*** (1.0480)	-	-

The values in parentheses are standard errors; Observations = 368;

Log-likelihood = -147.89; Wald test of $\ln\sigma^2=0$: $\chi^2(7) = 69.73$; $Prob>\chi^2 = 0.0000$

*, **, *** - $p<0.1$, $p<0.05$ and $p<0.01$ respectively

Source: Data analysis, 2021

4. Conclusion and Policy Statements

The importance of time-use analysis to the well-being of individuals, community and economic development cannot be over emphasized. In African settings, women have been identified to be disproportionately time poor owing to resource constraints, as well as societal values, customs and traditions on specific gendered roles and responsibilities associated with productive and non-productive activities, especially from the aspect of “care economy.” The rising demand in this aspect places individuals, especially women at a disadvantaged position with the burden of excessive workloads, and having no sufficient time for leisure. This situation holds in the study area given the findings; although, with mixed feelings on both counts (men and women) because both gender were observed to spend more time on work related activities than for leisure related activities. At this moment of historical importance when economic activities have been impacted with Covid-19 pandemic, there is a greater need to strike a balance between competing claims and pressure on time allocation as well as the time to rest and for leisure related activities through appropriate gender-just policies for empowerment, economic transformation, and to ensure global prosperity. This will help forge a peaceful, prosperous and equitable society through efficient utilization of time resources as well as other resources.

Conflict of interest

The authors declare that there are no conflicts of interest.

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5. References

- [1] Adeyonu, A.G., Oni, O.A. 2014. Gender time allocation and farming households’ poverty in Nigeria. *World Journal of Agricultural Sciences*, 2(5): 123-136.
- [2] Al-Amin, S., Rahman, M., Miah, M. 2012. Contributing variables for sustainable livelihood status of the Char Women in Bangladesh. *Journal of Agribusiness and Rural Development*, 1(23): 5-23.
- [3] Bardasi, E., Wodon, Q. 2010. Working long hours and having no choice: Time poverty in Guinea. *Feminist Economics*, 16(3): 45-78.
- [4] Bardasi, E., Wodon, Q. 2006. “Measuring Time Poverty and Analyzing Its Determinants: Concepts and Application to Guinea.” *Economics Bulletin*, 10(10): 1-7.
- [5] Becker, G.S. 1965. “A theory of the allocation of time. *Economic Journal*, 75: 493-517.
- [6] Bertrand, M., Schanzenbach, D. 2009. Time use and consumption. *American Economic Review*, 99(2): 170-176. DOI: 10.1257/aer.99.2.170
- [7] Blevins, J.R., Khan, S. 2013. Distribution-free estimation of heteroskedastic binary response models in Stata. *Stata Journal*, 13: 588-602.
- [8] Çağlayan, E. 2012. Heteroscedastic Probit Model: An Application of Home Ownership in Turkey. *Regional and Sectoral Economic Studies*, 12(2): 77-84.

- [9] Cochran, W.G. 1963. *Sampling Techniques*, 2nd Ed., New York: John Wiley and Sons, Inc.
- [10] Diksha, A. 2015. Gender Differences in Time-Poverty in Rural Mozambique. *Review of Social Economy*, 73(2): 196-221. DOI: 10.1080/00346764.2015.1035909
- [11] Folbre, N. 2004. "A Theory of the Missallocation of Time". In *Family Time: The Social Organization of Care*, Edited by: N. Folbre, N. and M. Bittman, M. 7-24. London: Routledge.
- [12] Foster, J.E., Greer, J., Thorbecke, E. 1984. "A Class of Decomposable Poverty Indices." *Econometrica*, 52: 761-766.
- [13] Frank, R. 2012. Interpretation, Interaction, and Heteroskedastic Probit. Lecture Note, Week 6, University of New Orleans.
- [14] Harvey, A.S., Mukhopadhyay, A.K. 2007. When twenty-four hours is not enough: Time poverty of working parents. *Social Indicators Research*, 82(1): 57-77.
- [15] Hobbes, M., de Groot, W.T., van der Voet, E., Sarkhel, S. 2011. Freely disposable time: A time and money integrated measure of poverty and freedom. *World Development*, 39(12): 2055-2068.
- [16] Ilahi, N. 2001. Gender and the Allocation of Adult Time: Evidence from the Peru LSMS Panel Data, Policy Research Working Paper Series No. 2744, World Bank.
- [17] International Labour Organization (ILO) 2005. Poverty Measures, Chapter 4, in the United Nations Handbook of Poverty Statistics. New York: United Nations. Retrieved from: https://www.ilo.org/wcmsp5/groups/public/presentation/wcms_304851.pdf
- [18] Kalenkoski, C.M. and Hamrick, K.S. 2013. How does time poverty affect behavior? A look at eating and physical activity. *Applied Economic Perspectives and Policy*, 35(1): 89-105.
- [19] Miaoulis, G., Michener, R.D. 1976. *An Introduction to Sampling*. Dubuque, Iowa: Kendall/Hunt Publishing Company.
- [20] Morduch, J. 2009. Poverty Measures, Chapter 3, in the United Nations Handbook of Poverty Statistics. New York: United Nations.
- [21] Mukaila, R., Falola, A., Akanbi, S. 2021. Socio-economic Determinants of Income among Rural Women in Enugu State, Nigeria: Implication for achieving first Sustainable Development Goal. *Journal of Agribusiness and Rural Development*, 4(62): 363-370.
- [22] Nadi, F., Nimoh, F., Antoh, E., Anaman, R. 2021. Gender Inequality in Livestock Asset Ownership: Implication for Food Security in the WA West District, Ghana. *Journal of Agribusiness and Rural Development*, 4(62): 447-455.
- [23] National Bureau of Statistics (NBS) 2020. 2019 Poverty and Inequality in Nigeria: Nigerian Living Standards Survey Report (NLSS). <https://nigerianstat.gov.ng/download/1092>

- [24] Nazier, H., Ezzat, A. 2018. Time Poverty in Egypt and Tunisia: Is there a Gender Gap? Working Paper No. 1220.
- [25] Saqib, N., Arif, G. 2012. Time Poverty, Work Status and Gender. Pakistan. Institute of Development Economics, Islamabad.
- [26] Shete, A., Shete, A., Dube, S., Dubewar, A. 2020. Sample size calculation in bio-statistics with special reference to unknown population. *International Journal for Innovative Research in Multidisciplinary Field*, 6(7): 236-238.
- [27] Spinney, J., Millward, H. 2010. Time and money: A new look at poverty and the barriers to physical activity in Canada. *Social Indicators Research*, 99(2): 341-356.
- [28] Vickery, C. 1977. The Time-Poor: A New Look at Poverty. *Journal of Human Resources*, 12(1): 27-48.
- [29] Williams, J., Tallis, H., Masuda, Y. 2015. A measure whose time has come: Formalizing time poverty. *Social Indicators Research*. DOI: 10.1007/s11205-015-1029-z
- [30] Williams, R. 2009. Using Heterogeneous Choice Models: To compare Logit and Probit Coefficients across Groups, University of Notre Dame.
- [31] World Bank 1999. "Africa Region Findings: Gender, Growth and Poverty Reduction". Washington, D.C. The World Bank.
- [32] World Bank 2020a. Reversals of Misfortune. Shared Prospective Poverty and Shared Prosperity in 2020. World Bank, Washington, D.C. The World Bank Group.
- [33] World Bank 2020b. The World Bank in Nigeria. World Bank Brief. Retrieved from: <https://www.worldbank.org/en/country/nigeria/overview>
- [34] Zacharias, A., Antonopoulous, R., Masterson, T. 2012. Why Time Deficits Matter: Implications for the measurement of poverty. Technical Report Levy Economics Institute of Bard College.



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