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Bringing Rigour and Evidence to Economic Policy Making in Africa

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List of abbreviations and acronyms

COVID-19	Corona Virus Disease 2019
EAs	Enumeration Areas
EGC	Economic Growth Center
GDP	Gross Domestic Product
GLSS	Ghana Living Standard Surveys
GoG	Government of Ghana
GSPS	Ghana Socioeconomic Panel Surveys
GSS	Ghana Statistical Service
ISSER	Institute of Statistical Social and Economic Research
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
SSA	Sub-Saharan Africa

Abstract

This article examines poverty dynamics in Ghana using the Ghana Socioeconomic Panel Surveys (GSPS) and a synthetic panel based on repeated cross-sectional data (the Ghana Living Standard Surveys (GLSS). It provides insight into the extent of poverty mobility and persistence in Ghana, and the factors that explain poverty transitions. The results show that upward mobility has been a key feature of Ghana's poverty transitions between 2006 and 2019. However, there are still high probabilities of poverty persistence and downward mobility among initially poor and non-poor households, respectively. Furthermore, notable heterogeneities exist in poverty transitions across socioeconomic groups. Poverty is more chronic in rural areas and the northern parts of Ghana compared with urban and southern regions, respectively, and among households headed by persons from opportunity-deprived backgrounds. Other characteristics such as the gender of the household head, his/her occupation, and level of education, as well as the number of dependents, are important correlates of poverty persistence and downward mobility in Ghana. Hence, addressing chronic poverty requires targeted policies that foster more inclusive and sustainable growth in rural areas and northern parts of Ghana, and improved access to opportunities for people from disadvantaged backgrounds, the unemployed, and those in vulnerable employment.

Key words: Poverty dynamics; Synthetic panel; Africa.
JEL classification codes: D63; I32.

1. Introduction

In sub-Saharan Africa (SSA), Ghana has been among the best-performing countries in terms of economic growth over the last three decades. Since the 1990s, the country's per capita GDP[1] has been constantly above the SSA median (World Bank, 2021). Between 1991/1992 and 2016/17, headcount poverty fell from 51.1% to 23.4%, suggesting a reduction by about 27.7 percentage points over 25 years, a feat largely attributed to sustained economic growth. This average national progress on poverty reduction, however, hides large differences across geographical locations (regions) and amongst socioeconomic groups (Teal, 2001; Annim et al., 2012; Coulombe & Wodon, 2007).

In many parts of the country, households are exposed to various shocks, particularly those deriving their income from traditional farming and low-productivity informal sectors. In rural locations, for example, the seasonality of agriculture, precipitation, and climate change shocks influence consumption, threatening the livelihoods of poor households as well as those near the poverty line (Senadza, 2012). The underdeveloped credit and insurance markets and existing market imperfections prevent consumption smoothing and limit human capital and productive investments for the most vulnerable, with adverse effects on future income growth. This situation is further exacerbated by the COVID-19 pandemic, and its negative effects on businesses, the labour market, and household income (Ghana Statistical Service [GSS], 2020). Many non-poor households have become vulnerable and more likely to fall into poverty, while poor households would likely witness poverty persistence. For policy making, therefore, understanding welfare dynamics among households and across regions in Ghana as well as its underlying factors has become critical for future poverty reduction and improvements in wellbeing.

Also relevant in the Ghanaian context, is the importance of providing equal access to development opportunities for all. As shown by Brunori et al. (2015), between 14% and 29% of existing inequalities in Ghana are explained by disparities in opportunities. When circumstances (e.g., social origin or gender) account for differences in outcomes between individuals, there is a position of unfairness where capabilities, access to productive resources and employment opportunities, and chances to escape poverty are unequal. Such a situation would likely lead to poverty traps and the persistence of inequality (World Bank, 2005; Marrero & Rodríguez, 2013). Hence, while analysing poverty dynamics is key, providing evidence on its correlates and on the importance

1 GDP per capita (PPP constant 2011 international US$).

of disparities in opportunity for poverty persistence and transitions would give a better picture of the mechanisms through which long-term patterns of poverty and inequality are generated (Bourguignon et al., 2007; Checchi & Peragine, 2010; Fleurbaey & Peragine, 2013).

The aim of this study is to first examine the dynamics of poverty in Ghana using the actual panel and synthetic panel approaches. Second, the paper investigates the importance of household characteristics and opportunity deprivation in shaping households' transitions in and out of poverty. Until recently, analyses of poverty dynamics in many developing countries have been scant mainly due to the lack of longitudinal data and methodological limitations, which prevented the use of existing cross-sectional surveys in analysing poverty dynamics. In Ghana, the welfare dynamics literature is scant. Existing poverty studies provided only snapshots of the state of poverty in a given year and used the available cross-sectional surveys to examine the country's progress on poverty and inequality (McKay et al., 2016; Cooke et al., 2016). The only exception is Dang and Dabalen (2019), which analysed poverty dynamics in Africa and reported Ghana's poverty transition estimates for the period 1998/99–2005/06 based on a synthetic panel method using the Ghana Living Standards Surveys (GLSS) data. The present study, therefore, contributes to the existing literature by providing a more recent, broader and more robust picture of poverty dynamics in Ghana. It covers the period 2006–2019 and employs three rounds of the GLSS data (2005/06, 2012/13, and 2016/2017) and three waves of the more recent Ghana Socioeconomic Panel Surveys (GSPS) (2009/2010, 2013/2014, and 2018/19). Using both data sets helps to confirm the robustness of the trends observed over time. Also, by linking opportunity deprivation with poverty transitions, this research adds to existing knowledge on the role of inequality of opportunity in explaining poverty traps, as evidence on the importance of disparity of opportunities for poverty dynamics has so far been absent from the existing literature.

Furthermore, following the recent methodological advances in the poverty dynamics literature (the use of synthetic panels proposed by Dang et al. (2014), Dang and Lanjouw (2013), and Dang et al. (2021)), a growing body of literature endeavoured to validate the reliability of such approaches in both developed and developing countries. These earlier studies, however, yielded mixed findings, thus beckoning further investigations, especially in the latter (Cruces et al., 2015; Herault & Jenkins, 2019). The paper, therefore, complements the validation literature surrounding the application of Dang et al. (2014), Dang and Lanjouw (2013) and Dang et al. (2021) synthetic panel approaches. The validation exercise conducted by comparing estimates based on actual panel data to their synthetic panel counterparts aims to provide insights into the reliability of the latter in the absence of the former.

The rest of the paper is organized as follows. Section 2 presents the recent literature and measurement approaches used in assessing poverty dynamics. Section 3 describes the methodology and the data used, while Section 4 discusses the trend in poverty in Ghana between 2006 and 2019. Section 5 presents a discussion of the results. Section 6 concludes the paper.

2. Empirical literature review

For many years, analysing poverty dynamics solely depends on panel data (Calvo & Dercon, 2012; Clark et al., 2016). However, such data are not always available in developing countries, and when they are available, researchers often face issues such as small sample size, sample attrition, and measurement error (Perez, 2015; Moreno et al., 2021). In the absence of longitudinal data, synthetic or pseudo-panels have been widely used to understand income mobility in developing countries (Deaton, 1985; Bourguignon et al., 2004; Cuesta et al., 2011; Salvucci & Tarp, 2021). Although pseudo-panel methods are known to yield precise estimates of poverty transitions (Cuesta et al., 2011; Perez, 2015; Moreno et al., 2021; Ribas, 2022), the use of synthetic panels constructed using data from repeated cross-sections to analyse poverty dynamics is rapidly growing (Hérault & Jenkins, 2019; Dang et al., 2021; Mekasha & Tarp, 2021; Garcés-Urzainqui et al., 2021).

Novel approaches to estimating poverty immobility and transitions using synthetic panel data were recently introduced by Dang et al. (2014) and Dang & Lanjouw (2013). Unlike the usual way of constructing a pseudo-panel using the cohort-level averages, this methodology proposed the use of time-invariant household or community-level characteristics observed in each round of the surveys to predict household welfare for the year where the actual observation is missing. Hence, while each household is observed once, its predicted welfare in the second period, for example, can be computed using the estimated coefficients on time-invariant characteristics from the welfare model. The poverty dynamics estimates can then be calculated using the national poverty line and the synthetic panel data obtained.

The bounds method of Dang et al. (2014) was refined by Dang & Lanjouw (2013) and Dang et al. (2021), which derived point estimates of poverty probabilities rather than bounds. The authors demonstrated that by observing movements in the intertemporal correlation of incomes or consumption, conclusions on poverty transitions can be drawn. However, they stressed the necessity to present additional, separate panel data evidence to support the intertemporal correlation of incomes or the error components from income models. Thus, progressing from bounds to point estimates was rarely straightforward. In line with Dang & Lanjouw (2013)'s method, Bourguignon & Moreno (2018) proposed an alternative method for estimating the residuals' intertemporal correlation coefficient and relaxing the bivariate normality

assumption used in estimating the point estimates. Relying on data from Mexico, the study argued that point estimates obtained are more precise than the outcomes of Dang & Lanjouw (2013) and are generally consistent with actual panel estimates.

Assessing the Dang et al. (2014) bounds approach, Cruces et al. (2015) conducted a validation exercise by analysing intra-generational poverty mobility using cross-sectional data between two periods in Chile, Nicaragua, and Peru. Through a series of robustness and sensitivity tests, and after comparing the true joint probabilities to the bound estimates, the authors showed positive performance of the synthetic panel bound estimates. The findings showed that the true estimates of poverty transitions lie within the lower-upper bound intervals obtained using the synthetic panel approach in all three-country contexts, particularly with rich model specifications. Working with the Chilean panel data, Fields & Viollaz (2013), however, argued that although the probability estimates mostly fall between the estimated bounds, the Dang et al. (2014) method only provides partial information on poverty transitions in the country. According to the authors, the bound estimates of the conditional probabilities based on Dang et al. (2014)'s approach are slightly less accurate with wider bounds compared to joint probability estimates.

Garcés-Urzainqui (2017) sought to validate Dang & Lanjouw (2013) and Bouguignon & Moreno (2018) approaches for estimating point estimates of poverty transitions based on a synthetic panel. Using data from Thailand, the study concluded that the general patterns of mobility described by synthetic panel estimates are well in line with the true dynamics when the autocorrelation parameter of the income residuals is well-estimated using the mean-based cohort approach. The author further shows that while Bourguignon & Moreno (2018) method is less sensitive to model specification, the approach of Dang & Lanjouw (2013) is simpler and performs well with an optimal income or expenditure model.

Using the Dang et al. (2014) bounds approach and the refinement proposed by Dang & Lanjouw (2013), Herault & Jenkins (2019) also attempted to test the accuracy of synthetic panel procedures relative to benchmarks based on estimates derived from actual household panel data in the context of developed countries. Employing data from Australia and Britain, the authors examined the sensitivity of results to changes in the age group, survey periods, poverty line and cohorts' definition for the estimation of the residuals' autocorrelation coefficient. The findings showed that Dang & Lanjouw's (2013) point estimates approach performs poorly in the context of the two developed countries compared with earlier validation exercises in middle- and low-income countries. Also, the true estimates of poverty transitions fall within intervals defined by the bound estimates derived from Dang et al. (2014), but the intervals are often wide. Salvucci & Tarp (2021) also provided a comparison between the synthetic panel estimates of poverty transitions with actual estimates using quarterly data from Mozambique. The authors demonstrated that the novel technique convincingly yields estimates of conditional and joint probabilities that are similar to the true estimates.

Other applications in the developing world include Bierbaum & Gassmann (2012) and Ferreira et al. (2021) which used a synthetic panel based on repeated cross-sections to investigate poverty persistence and dynamics in Kyrgyz Republic and Myanmar,

respectively. For example, Ferreira et al. (2021), in assessing the dynamics of poverty for the period 2015 to 2017, relied on the synthetic panel approach to understand the transitions of poverty and vulnerability, as well as their association with households' socioeconomic characteristics. The results show that overall, there is a likelihood of poverty escape among the poor over the period, though the progress varies across regional boundaries and the probability of falling into the vulnerable group remains high. The state-level differences in poverty transitions are underpinned by household characteristics such as the education of the household head and area of residence.

In the context of Africa, Dang & Dabalen (2019) used synthetic panel data proposed by Dang et al. (2014) and Dang & Lanjouw (2013) to evaluate poverty transitions between two periods in 20 African countries. A vulnerability analysis revealed that most countries have experienced upward mobility, yet chronic poverty remained high, and a considerable proportion of the population remains vulnerable to poverty. The findings further show that post-secondary education, female headship, and urban location are strongly associated with higher upward mobility and less with downward mobility. For the period 1998–2005 in Ghana, for example, joint probabilities of chronic and downward mobility were estimated to be 20.4% and 5.7%, respectively.

Country-specific studies such as Mekasha & Tarp (2021) adopted a similar approach using Ethiopian cross-sectional data and an existing panel data set in a validation exercise. The findings showed that poverty was highly chronic in the country between 2011 and 2016, even though many households experienced upward mobility. By estimating poverty transitions across socioeconomic groups, the study also revealed that the area of residence, the level of education of the household head, as well as his/her employment characteristics, shape household consumption mobility in the country. Similar findings were obtained by Salvucci & Tarp (2021) in the case of Mozambique. The paper used synthetic panels based on annual cross-sectional surveys as well as an intra-year actual panel data set and showed high probabilities of poverty persistence, albeit with regional differences. Furthermore, the results show that non-poor households face a high risk of downward mobility and vulnerability due to intra-year seasonal shocks, and there are substantial heterogeneities in the association between household socio-demographic characteristics and vulnerability and poverty transitions in Mozambique.

Broader literature provides evidence of key factors explaining poverty dynamics worldwide. These include access to education and health (Schotte et al., 2018), labour market outcomes such as employment opportunities (Bigsten & Shimeles, 2008), and labour market shocks including job losses and wage reductions (Bayudan-Dacuycuy & Lim, 2013). In Indonesia, Dartanto and Nurkholis (2013) showed that educational attainment, the number of household members, physical assets, employment status, health shocks, microcredit programme, access to electricity, and changes in the employment sector are the key determinants of poverty dynamics. Muyanga et al. (2013) used 1997–2007 panel data for Kenya and showed that fluctuation in household welfare is connected with various unforeseen shocks, such as the passing of a family member, persistent health issues, demographic factors, accessibility to infrastructure,

and the transfer of wealth between generations. In Malawi, based on nationally representative panel data for 1998 and 2002, Bokosi (2007) used the bivariate probit model to estimate poverty dynamics. The results indicate that household poverty in 2002 is considerably associated with the education level of the household head, the amount of land cultivated per person, and the changes in household size. These factors remain significant regardless of the household's poverty status in 1998. For households that were poor in 1998, the likelihood of being poor in 2002 was mainly affected by household size, the value of livestock owned, and the average time taken to access services. In contrast, residing in the Northern region was a crucial factor in determining the likelihood of being poor in 2002 for households that were not poor in 1998.

Clearly, the empirical literature on poverty dynamics in developing countries, including in Africa, is rapidly evolving with the use of new estimation techniques to address the paucity of panel data sets in low- and middle-income countries. Also, many studies have highlighted the importance of household socioeconomic characteristics in influencing poverty mobility and immobility. Meanwhile, it is unclear how opportunity deprivation is shaping households' transitions in and out of poverty in developing countries. Amidst the dearth of poverty dynamics literature in Ghana, the current study analyses poverty dynamics over the period 2006–2019 and also provides some evidence on the reliability of the synthetic panel approaches in examining poverty transitions. In addition, we provide evidence on the importance of opportunity deprivation in poverty transitions.

3. Methodology and data

Methodology

Analysing poverty dynamics

To evaluate poverty dynamics using synthetic panel data, this study adopts two approaches. First, the upper and lower bound estimates of poverty dynamics, developed by Dang et al. (2014) are computed using the non-parametric approach. Second, the parametric approach is used to compute point estimates of measures of chronic and transient poverty following Dang & Lanjouw (2013, 2018) and Dang et al. (2021). The latter, unlike the former, assumes bivariate normality of the joint error distribution in the underlying models.

As a first step under the synthetic panel approach, a linear projection of aggregate welfare is done using time-invariant household or community-level characteristics (time-varying characteristics can also be used if the households observed in the two rounds can easily recall them). For example, based on Equation 1, linking the welfare outcomes to the time-invariant observed characteristics in time 1, the vector of coefficients, β_1', is estimated. The model is specified as:

$$C^1{}_{i1} = \beta_1' X^1{}_{i1} + \varepsilon^1{}_{i1} \quad (1)$$

Where: $C^1{}_{i1}$ and $X^1{}_{i1}$ represent the consumption expenditure of households and the time-invariant variables at time 1 for observations in the first round, respectively, $\varepsilon^1{}_{i1}$ is the error terms. The estimated coefficients are then applied to impute the values of the welfare variable at time 1 for households in round 2, such that:

$$\hat{C}^2{}_{i1} = \hat{\beta}_1' X^2{}_{i1} + \tilde{\varepsilon}^2{}_{i1} \quad (2)$$

Where: $\hat{C}^2{}_{i1}$ denotes the retroactively predicted consumption expenditure of households at time 1 for households observed in the second round, and $\tilde{\varepsilon}^2{}_{i1}$ represents the error terms derived based on a set of assumptions discussed below. $X^2{}_{i1}$ denotes the set of covariates for households observed at time 2, and $\hat{\beta}_1$ are the parameters estimated using ordinary least squares (OLS).

The estimates of the degree of mobility in and out of poverty are then computed using the imputed values at time 1 and the observed welfare for households in round two. Estimates of poverty dynamics, mainly unconditional and conditional

probabilities of poverty persistence, entry or exit are calculated. For example, the proportion of non-poor households at time 1 that are poor at time 2 (conditional probability of downward mobility) is given as:

$$\Pr\left(\hat{C}^2{}_{i1} > Z \middle| C_{i2}^2 < Z\right) \quad (3)$$

While proportion of households that are non-poor at time 1 but are poor at time 2 (joint or unconditional probability) is given as:

$$\Pr(\hat{C}^2{}_{i1} > Z \; and \; C_{i2}^2 < Z) \quad (4)$$

The computation of the non-parametric and parametric estimates relies on a set of assumptions. Mainly, the errors are assumed to be positively correlated. The bounds estimates proposed by Dang et al. (2014) use the extreme cases of no and perfect correlation between rounds for the upper bound and lower bound, respectively. The parametric point estimates assume a bivariate normal distribution of the error terms, with correlation coefficient, ρ, which could be estimated using the cohort level correlation between the rounds or obtained from an auxiliary actual panel data set. The synthetic panel approach also relies on the assumption that the cross-sectional surveys used comprise samples that are drawn from the same populations. Thus, such analysis requires the comparability of the data across surveys and that the sample used in each survey is representative of the larger population.

To provide robust analysis of poverty dynamics in the Ghanaian context, in addition to the analysis of poverty dynamics based on the synthetic panel, the study estimates the measures of poverty mobility or immobility using actual panel data (the three waves of the GSPS). The use of household panel data helps provide further detailed assessment of poverty dynamics and validate the findings from the synthetic panel analysis. Furthermore, although conditional probabilities tend to provide a better reflection of the extent of chronic poverty, upward mobility and downward mobility (Fields & Viollaz, 2013) by taking household's poverty status at time 1, both conditional and joint probabilities are reported to provide a full picture of poverty transition.

Poverty dynamic profile: Inequality of opportunity and other correlates of poverty dynamics

To provide insights on the importance of household 'opportunity deprivation' status as well as other socioeconomic characteristics in households' poverty dynamics, the study computes conditional transition probabilities across various household characteristics using the GSPS. The sub-groups that are considered include the sex of the household head, location (rural/urban), and the 'opportunity deprivation' status of the household head. The latter will provide important insights on the relation between opportunity deprivation and poverty transition in Ghana. The 'opportunity deprivation' status of the household head is defined based on the household head's parental characteristics (education and occupation).

Identifying the opportunity-deprived (OD) group

In order to identify the 'opportunity-deprived' or the 'least advantaged group', Ferreira and Gignoux (2011) proposed the use of opportunity profiles. An opportunity profile is obtained by first partitioning the population into types—a type being a group of individuals with the same set of circumstances—and then ranking the type-mean (or other moments) of the distribution of outcome in ascending order. Given that the measure of inequality of opportunity is the between-type inequality, obtained after smoothing the distribution of outcome within groups by replacing the individuals' outcome with the type-mean, a ranking of these type-means provides valuable information on the groups that have relatively low or high chances of achieving an outcome. The types with the lowest rank in the opportunity profile can, therefore, be considered the least advantaged groups (since they have the lowest mean outcome).

Explaining poverty dynamics: Regression analysis

Furthermore, the study evaluates the correlates of poverty transitions using a multivariate regression approach developed by Cappellari and Jenkins (2004, 2008), following Schotte et al. (2018). The model explicitly allows for possible feedback effects from past poverty experiences and takes into account the potential endogeneity of initial conditions, unobserved heterogeneity, and non-random panel dropout, which may lead to biases in poverty risk estimates. Specifically, the multivariate probit model jointly estimates a system of three equations: (1) a first-order Markov process of poverty mobility between the two consecutive waves (to shed lights on poverty persistence); (2) an equation for the household's initial poverty status (poverty status in the last period) which would help account for potential endogeneity of initial conditions; and (3) a sample retention equation accounting for possible non-random attrition (e.g., households with more (less) favourable characteristics will be more likely to leave (remain in) the sample). Such modelling of poverty transition, which follows the standard Heckman (1976) approach, allows the covariates of the current poverty status to differ based on the initial poverty status of the household by accounting for state dependence. Past poverty experiences would likely increase the risks of future poverty due to factors such as risk aversion, behaviour and investment choices including in human capital, as well as observable characteristics which tend to reduce the chances of poverty escape (Schotte et al., 2018; Bigsten and Shimeles, 2008). Additionally, sample iteration would likely be non-random as chronically poor households may tend to be more stable participants in each survey. A non-random panel retention (attrition)—households with certain favourable characteristics are more or less likely to remain (leave) in the sample—would lead to biases in the poverty risk estimates.

Cappellari and Jenkins (2004, 2008) proposed a trivariate probit model of poverty transition between years $t-1$ and t with a system of three main equations. The first equation models the latent poverty propensity of individual i $(i = 1, 2, \ldots, n)$ at $t-1$. It is given as:

$$p_{t-1}^{*} = \beta' Z_{it-1} + \pi_{it-1} \quad (5)$$

$$P_{t-1} = I(p_{t-1}^{*} > 0) \; with \; P_{it-1} = 1 \; if \; poor \; at \; t-1 \; and \; 0 \; otherwise$$

$$\pi_{it-1} = \sigma_i + \varphi_{it-1} \sim N(0, 1)$$

In the second equation, r^{*} is latent propensity of retention between period $t-1$ and $r_{it}^{*} = \varphi' W_{it-1} + \vartheta_{it}$ hat those households with consumption expenditure observed in period $t-1$ also have expenditure observed at period t.

$$r_{it}^{*} = \varphi' W_{it-1} + \vartheta_{it}$$

$$r_{it}^{*} = \varphi' W_{it-1} + \vartheta_{it} \quad (6)$$

$$R_{it} = I(r_{it}^{*} > 0) \; with \; R_{it} = 1$$

if the expenditure is observed in period t and 0 otherwise

$$\vartheta_{it} = \tau_i + \theta_{it} \sim N(0,1)$$

The equation for poverty transitions, with p_{it}^{*} being the latent propensity of poverty, can be specified as:

$$p_{it}^{*} = [(P_{it-1})\delta_1' + (1 - P_{it-1})\delta_2'] * X_{it-1} + \mu_{it} \quad (7)$$

$$P_t = I(p_t^{*} > 0) \; with \; P_{it} = 1$$

if poor at *t* and *0* otherwise

$$\mu_{it} = \epsilon_i + \varepsilon_{it} \sim N(0, 1)$$

Where: $\pi_{it-1}, \vartheta_{it} \; and \; \mu_{it}$ are the sum of individual-specific effects σ_i, τ_i and ϵ_i and idiosyncratic normal orthogonal errors φ_{it-1}, θ_{it} and ε_{it}, respectively. P_{it} and P_{it-1} are binary variables summarizing the individual's poverty status at time t and $t-1$, respectively. R_{it} represents a binary indicator of individual's expenditure retention. Where $\delta_1, \delta_2, \varphi, \beta, Z_{it-1}$, $X_{it-1} \; and \; W_{it-1}$ are column vectors, ϵ_i is a normal individual specific effect and μ_{it} normal orthogonal white noise error. Z_{it-1}, X_{it-1}, $and \; W_{it-1}$ comprise variables selected based on existing literature and data availability. For exclusion restrictions, at least one variable must belong to W_{it-1} or Z_{it-1} and affect current poverty status only through initial poverty status or retention.

The joint distribution of the error terms $\pi_{it-1}, \vartheta_{it} \; and \; \mu_{it}$ is assumed to be a trivariate standard normal and characterized by three correlation coefficients to be estimated. These are: (1) correlation between the error terms in Equation 6 and Equation 7, i.e., ρ_1, and a negative coefficient implying that individuals with a high tendency to be poor at $t-1$ are less likely to have observed consumption expenditure at t. The second correlation coefficient is between the error terms of the equations of poverty transition and initial poverty status—Equation 6 and Equation 8, i.e., ρ_2 –

testing the exogeneity of the poverty status at $t-1$. A positive coefficient suggests that individuals who were poor in the initial period have a high tendency to remain in poverty. Lastly, the correlation coefficient between the unobservables affecting retention and the conditional current poverty status, i.e., ρ_3. A negative sign indicates that individuals that are present in both periods are less likely to fall or remain into poverty at time t compared with those that have unobserved expenditure at *t*. Hence if $\rho_3 = 0 = \rho_1$, sample attrition is ignorable and a bivariate probit model with sample selection would provide unbiased estimates of the correlates of poverty transition. If $\rho_3 = \rho_2 = 0 = \rho_1$, then both state dependence and sample attrition are ignorable. In addition to the estimates of the trivariate model, results obtained from the bivariate probit model with endogenous sample selection were also reported.

Data

The study employs the GLSS, which is a nationally representative household living standard survey, and the Ghana Socioeconomic Panel Survey data for the analysis. Seven (7) rounds of the GLSS data are available: Round 1 (GLSS 1), Round 2 (GLSS 2), Round 3 (GLSS 3), Round 4 (GLSS 4), Round 5 (GLSS 5), Round 6 (GLSS 6), and Round 7 (GLSS 7). The surveys were conducted in 1986/87, 1988/89, 1991/92, 1998/1999, 2004/05, 2012/13, and 2016/2017, respectively. However, due to important changes in the questionnaires between round 2 and 3, it is difficult to compare the first three surveys and the four recent ones (Coulombe & Wodon, 2007). This analysis focuses on the three most recent rounds, namely the GLSS 5, 6, and 7 (Table A1 in the appendix). Similar to the GLSS, the GSPS—collected through the collaboration of University of Ghana, Yale University, and Northwestern University—are nationally and regionally representative and comprise data on household expenditure as well as other socioeconomic characteristics. So far, three waves of the survey are available from 2010 to 2019 (Table A2 in the appendix). These surveys comprise data on households' income and expenditure, employment, health, education, housing, migration, as well as individuals' characteristics.

The time-invariant household characteristics considered in the synthetic panel analysis are the characteristics of the household head, namely years of education and its squared values, sex, region of birth, parental education and occupation, as well as location (urban/ rural and northern Ghana/southern Ghana). Following earlier studies, the estimation sample is restricted to household heads aged 25 to 55 in the first cross-section. The age range is then adjusted accordingly in the following survey rounds. This approach aims to reduce spurious changes resulting from household welfare and certain variables (i.e., education of household head) over time (Dang et al., 2014; Salvucci & Tarp, 2021). The welfare indicator is the real annual consumption expenditure per adult equivalent. The variable is computed using information on household consumption expenditure and the equivalence scale in the GLSS and GSPS data sets (spatial and time differences in the cost of living are controlled for). For the

cross-sectional data, the national poverty lines of GHC 1,760.86 for GLSS 7 and GHC 1,314 for GLSS 6 and 5[2] are used in the estimations. With respect to the panel data, the poverty line of GHC 1,314 is used for the waves 1 and 2 conducted in 2010 and 2013), while GHC 1,760.86 is used for wave 3 (2019).

Furthermore, the analysis of the correlates of poverty transition employed pairs of consecutive waves. Following Cappellari & Jenkins (2004, 2008) and Schotte et al. (2018), the estimation is based on a pooled sample of the transitions. The dependent variable and the explanatory variables are measured at the household level. These are the socio-demographic characteristics of the household (number of children, number of adults, number of elderly people, number of working household members, whether the household owns a land or a house, whether it receives remittances, and area and region of residence), and those of the household head (age, education level, sex, and type of employment). Time dummies were also included. The values of all explanatory variables are of those of the base year $t-1$, consistent with previous literature. Following previous studies, the highest education level attained by both parents (father and mother's) is used as instruments in equation (6), while the extent of the respondent's cooperation during the survey is used as an instrument in the retention equation (i.e., Equation 7). The cooperation variable is proxied by whether information on household characteristics such as lighting and cooking energy are available at time $t-1$. Given that information on household characteristics is provided by the most knowledgeable person in the household, a non-response is likely to reflect the level of cooperation of the respondent. Hence, the cooperation variable takes the value 1 if the data are not missing and zero otherwise.

2 In order to make the poverty estimates comparable between the GLSS 5 and 6, the data on household consumption expenditure (per adult equivalent) for the GLSS5 (2005/2006) survey was adjusted using the food and non-food deflators of 2.9 and 3.3, respectively, following Cooke et al. (2016) and GSS (2018), to obtain the variable in 2012/13 prices. The authors are grateful to Edgar Cooke for his guidance on this issue.

4. Poverty trends in Ghana

After decades of dismal economic performance, Ghana began recording sustained growth rates from 1984. The positive performance, which continued into the 1990s translated into a reduction in poverty over the years (Table 1). Overall, national headcount poverty fell from 31.9% in 2006 to 23.4% in 2017. Wide variations exist, however, in the incidence of poverty among the ten[3] administrative regions.

Five regions, namely Greater Accra, Western, Central, Eastern, and Ashanti have consistently recorded poverty headcount rates lower than the national average over the period 2006–2017, while the remainder of the regions have posted rates higher than the national average. The Greater Accra region has recorded the lowest poverty incidence over the period. Upper West region has the highest poverty rate among all the ten regions. In 2017, the poverty incidence of 2.5% in the Greater Accra region was about 21 percentage points lower than the national average, while that of the Upper West region was about 48 percentage points higher than the national average. Four regions, namely Western, Volta, Northern and Upper East regions experienced worsening poverty rates over the period 2013–2017.

Poverty in Ghana is largely a rural phenomenon. As Table 1 indicates, although rural poverty decreased by 5.8% between 2006 and 2013, it increased slightly over the period 2013–2017. Meanwhile, urban locations witnessed about 2 and 3 percentage points reductions in headcount poverty from 2006 to 2013 and from 2013 to 2017, respectively. The incidence of poverty has consistently been lower among female-headed households than among male-headed households. This finding is consistent with existing evidence on poverty in Ghana and is presumably attributable to the remittances received by female heads from a migrant spouse (Cooke et al., 2016; GSS, 2017). Yet, male-headed households experienced the greatest fall in poverty over time (9.1 points reduction vs. 4.5 points for female-headed households).

A north-south poverty divide is also noted, wherein northern Ghana, defined as the three northern-most regions (Northern, Upper East, and Upper West), seems to experience high poverty levels compared to the southern part of the country—comprising of the remaining seven regions (Table 1). The observed poverty incidence differences between the southern and northern parts of the country reflect the pattern of general inequality in Ghana, with a north-south dichotomy in levels of economic

3 Ghana had ten administrative regions at the time of the survey; however, there are currently 16 regions.

development and the general quality of life (Senadza, 2012). This divide is attributable to the uneven distribution of natural resources, social services, and infrastructure between the north and south[4] (Tsikata & Seini, 2004; Langer et al., 2007).

The general declining trend in headcount poverty is not observed for the depth and severity of poverty between 2006 and 2017. For Ghana as a whole, the depth of poverty declined from 11.0% in 2006 to 7.8% in 2013 before rising to 8.4% in 2017. Similar to the headcount poverty, variations exist in terms of the depth and severity of poverty in respect of the regions, location (rural-urban), sex of head of household, and the north-south divide (Table 1).

Using the opportunity profile, the *least-advantaged* or *most deprived* type (group) with respect to opportunities in Ghana—i.e., the group with the relatively higher chance of achieving low consumption expenditure as a result of its socioeconomic background—is identified as comprising people whose parents have been employed in the agriculture sector most of their lives, and whose father has at most primary education. As shown in Table A3 (in the appendix), this category records the lowest mean of household consumption expenditure per adult equivalent (Ferreira & Gignoux 2011). Meanwhile, the least-deprived group comprises individuals whose father has attained secondary education or more and has at least one parent who has been in services, production, professional or administrative work most of his or her life. As reported in Table 1, poverty incidence is roughly 30 times higher in the least-advantaged group compared with the least-deprived counterpart.

The findings based on the GSPS (Table 2) seem generally consistent with the trends observed in the GLSS data sets (Table 1). For example, the overall declining trend in headcount poverty in Ghana is also notable between 2010 and 2019 and regions such as Western and Greater Accra recorded the lowest incidence over time, while Brong Ahafo, Northern, Upper East, and Upper West regions experience the highest prevalence. Furthermore, the relatively higher poverty prevalence among male-headed households, households headed by persons from a deprived background, those living in rural dwellings and in the northern part of Ghana is also observed in the GSPS data (Table 2).

4 For example, while the south is blessed with resources (such as minerals and forest resources) that, not only can be exploited directly, but also is a suitable environment for producing cash crops like cocoa, the north is less favoured with a shorter growing season and erratic rainfall reducing the variety of crops that can be grown (Tsikata & Seini, 2004). There are also broad differences between the north and the south in terms of social services and infrastructure for which historical explanations can be offered. The British colonial legacy manifested in heavy investments in infrastructure, education, and health in more endowed regions of the south may account for the observed spatial differences in poverty (Langer et al., 2007).

Table 1: Trends in poverty in Ghana: Cross-sectional data (GLSS) 2006–2017

	Headcount Ratio (P0) (%)			Poverty Gap (P1) (%)			Squared Poverty Gap (P2)		
	2006	2013	2017	2006	2013	2017	2006	2013	2017
Ghana	31.9	24.2	23.4	11.0	7.8	8.4	5.4	3.6	4.3
Region									
Western	22.9	20.9	21.1	5.4	5.7	4.9	1.9	2.3	1.7
Central	23.4	18.8	13.8	5.6	5.6	3.6	1.8	2.5	1.3
Greater Accra	13.5	5.6	2.5	3.7	1.6	0.5	1.4	0.6	0.1
Eastern	17.8	21.7	12.6	4.2	5.8	3.1	1.6	2.4	1.2
Volta	37.3	33.8	37.3	9.2	9.8	13.0	3.2	4.0	6.4
Ashanti	24.0	14.7	11.6	6.4	3.5	2.7	2.4	1.3	1.0
Brong Ahafo	34.0	27.9	26.8	9.5	7.4	8.8	3.7	2.9	4.2
Northern	55.7	50.4	61.1	23.0	19.3	26.7	12.0	9.8	14.9
Upper East	72.9	44.4	54.8	35.3	17.2	23.8	20.4	9.0	13.2
Upper West	89.1	70.7	70.9	50.7	33.2	37.6	32.8	18.8	24.6
Location (Urban-Rural)									
Rural	43.7	37.9	39.5	15.4	13.1	15.1	7.6	6.3	8.0
Urban	12.4	10.6	7.8	3.7	2.5	1.8	1.6	0.9	0.7
Sex									
Male	34.9	25.9	25.8	12.4	8.4	9.6	6.2	3.9	5.0
Female	22.1	19.1	17.6	6.4	5.7	5.3	2.7	2.5	2.4
North-South									
Northern Ghana	65.6	52.4	61.1	30.7	21.2	27.8	17.6	11.2	16.1
Southern Ghana	23.3	18.5	15.7	6.0	5.0	4.4	2.2	2.0	1.9
Deprivation Status									
Head from a deprived background	37.0	33.5	38.1	12.8	11.3	14.6	6.2	0.5	0.7
Head from the least deprived background	7.9	6.4	5.7	1.5	1.6	1.5	0.5	0.6	0.6

Note: Sampling weights and clustering are considered.
Source: Authors' computation using GLSS 5, 6, and 7 data sets.

Table 2: Trends in poverty in Ghana: Panel data (GSP) 2010-2019

	Headcount Ratio (P0) (%)			Poverty Gap (P1) (%)			Squared Poverty Gap (P2)		
	2010	2014	2019	2010	2014	2019	2010	2014	2019
Ghana	30.5	20.6	20.5	9.0	5.8	6.5	3.7	2.3	3.0
Region									
Western	25.4	7.9	6.5	6.2	1.6	1.3	1.9	0.4	0.4
Central	17.8	35.9	9.9	3.5	11.1	1.7	1.0	4.6	0.5
Greater Accra	5.1	3.7	4.7	1.3	0.9	1.0	0.6	0.3	0.3
Eastern	31.8	19.1	9.5	11.6	3.9	2.3	5.6	1.2	0.9
Volta	43.1	10.3	23.9	13.7	2.7	7.8	5.9	1.0	3.6
Ashanti	27.7	17.9	11.0	6.9	4.3	2.2	2.5	1.5	0.7
Brong Ahafo	37.9	23.6	31.6	10.9	6.4	10.7	4.4	2.3	4.9
Northern	49.3	34.6	61.1	15.4	9.7	23.7	6.2	4.2	12.1
Upper East	61.6	46.5	43.5	19.8	18.0	14.2	8.2	9.3	6.2
Upper West	66.1	42.5	47.6	24.9	12.8	18.0	12.1	5.2	8.5
Location (Urban-Rural)									
Rural	47.5	29.3	30.9	14.9	8.2	10.4	6.2	3.3	4.8
Urban	13.7	11.8	9.6	3.2	3.2	2.5	1.2	1.2	1.1
Sex									
Male	34.0	21.7	22.6	10.3	6.2	7.8	4.2	2.6	3.7
Female	22.0	18.5	16.3	6.0	4.8	4.2	2.4	1.8	1.6
North-South									
Northern Ghana	55.0	38.7	54.5	18.0	12.2	20.4	7.6	5.6	10.0
Southern Ghana	25.4	16.2	12.8	7.1	4.2	3.4	2.9	1.5	1.4
Deprivation Status									
Head from a deprived background	41.4	26.9	27.5	12.7	7.4	8.9	5.3	3.0	4.0
Head from the least deprived background	6.3	0.5	0.4	1.6	0.7	1.9	0.6	0.2	1.1

Notes: Authors' computation using waves 1, 2, and 3 of the Ghana Socioeconomic Panel Survey (GSPS). Sampling weights and clustering are considered.

5. Results and discussions

Poverty dynamics using cross-sectional data and the synthetic panel approach

Table 3 and Table 4 report estimates based on the synthetic panel approach using the GLSS data sets. The non-parametric bound estimates following the methodology of Dang et al. (2014) and the parametric point estimates proposed by Dang & Lanjouw (2013, 2018) are reported. The correlation coefficient between the error terms (ρ) used in the computation of the parametric point estimates are obtained from the auxiliary data set (as proposed by Dang & Lanjouw, 2013), i.e., the GSPS. The coefficients of 0.27 for the period 2010–2014, and 0.34 for the period 2014–2019 are applied to the periods 2006–2013 and 2013–2017, respectively. Joint and conditional probability estimates are respectively presented in Table 3 and Table 4. The joint probabilities consider both survey rounds in capturing the percentage of households in different poverty categories. Conditional probabilities are from the joint probabilities, and they provide insights on the likelihood of being poor or non-poor in the second round, conditional on the poverty status in the first round.

The bound estimates suggest that 4.7 - 11.3% (i.e., lower bound – upper bound) of households remained in poverty in 2006 and 2013, compared to 4.6 - 9.4% in 2013 and 2017 (Table 3). However, 6.1 - 12.6% and 5.8 - 10.5% escaped poverty in rounds 5 and 6, and rounds 6 and 7, respectively. As shown in Table 4, nearly 32.3 - 83.7% of the poor in 2006 remained in poverty in 2013. These estimates are similar to those obtained for the period 2013–2017, where about 28.9 - 84.4% remained poor in 2017, having been poor in 2013. Moreover, the conditional probabilities of falling into poverty were 7.1 - 14.8% over the period 2006–2013 and 6.5 - 12.5% over the period 2013–2017. Overall, the bounds estimates are quite wide, particularly when considering the probability estimates of upward mobility and the estimated bounds of conditional probability of poverty persistence; and thus do not provide clear evidence on the pattern of poverty transitions (Hérault & Jenkins, 2019; Salvucci & Tarp, 2021).

With respect to the point estimates, the results show that poverty has been transient rather than chronic in Ghana. Overall, for poor households, the likelihood of poverty exit is greater than the chances of poverty persistence. Furthermore, there have been marginal changes in the probabilities of poverty mobility or immobility over time.

Specifically, the findings suggest that between 2006 and 2013, poverty was chronic in about 7.8% of the population compared with 9.7% in 2013 and 2017. Furthermore, 14.9% (14.6%) of households slid into poverty in 2013 (2017), having been non-poor in 2006 (2013). Meanwhile 17.3% (16.1%) of the population in 2006 (2013) managed to escape poverty in 2013 (2017). Therefore, the net progress on poverty reduction is relatively lower over the period 2013–2017 than between 2006 and 2013.

As shown in Table 3, upward mobility has been a key feature of poverty transitions in Ghana between 2006 and 2017. At least 65% of the poor in 2006 and in 2013 exited poverty by 2013 and 2017, respectively. However, the chance of poverty entry for a non-poor individual remains high (22.4% between 2006 and 2017, and 21.3% over the period 2013–17). Furthermore, poverty has been more persistent among households between 2013 and 2017, compared to the period 2006–2013, with a lower degree of mobility over the period. Overall, these findings suggest that the slowdown in the progress on poverty reduction between 2013 and 2017 is attributable to higher poverty persistence and lower poverty exit across the population.

Table 3: Synthetic panel estimates of poverty dynamics from 2006 to 2017 – Joint probabilities (in %) based on cross-sectional data

	2006–2013			2013–2017		
	Non-parametric Bounds Estimates		Parametric Point Estimates	Non-parametric Bounds Estimates		Parametric Point Estimates
	Lower Bound	Upper Bound		Lower Bound	Upper Bound	
Poor, poor	11.3	4.7	7.8	9.4	4.6	9.7
Poor, non-poor	6.1	12.6	17.3	5.8	10.5	16.1
Non-poor, poor	2.2	9.9	14.9	1.7	11.3	14.6
Non-poor, non-poor	80.4	72.7	60	83.1	73.5	59.6
Obs.	7,389	7,389	7389	6,446	6,446	6446

Notes: Authors' computation using household consumption expenditure per adult equivalent and the extreme poverty line of GHC 900 for 1999 and 2006, and GHC 1,314 and GHC 1,760.9 for 2013 and 2017, respectively. The estimates account for sampling weights and clustering. The values reported are the fraction of population aged 25–55 years in each of the four states.

Table 4: Synthetic panel estimates of poverty dynamics from 2006 to 2017 – Conditional probabilities (in %) based on cross-sectional data (GLSS)

	2006–2013			2013–2017		
	Non-parametric Bounds Estimates		Parametric Point Estimates	Non-parametric Bounds Estimates		Parametric Point Estimates
	Lower Bound	Upper Bound		Lower Bound	Upper Bound	
Poor, poor	83.7	32.3	34.4	84.4	28.9	40.0
Poor, non-poor	16.3	67.7	65.6	15.6	71.1	60.0
Non-poor, poor	7.1	14.8	22.4	6.5	12.5	21.3
Non-poor, non-poor	92.9	85.2	77.6	93.5	87.5	78.7
Obs.	7,389	7,389	7,389	6,446	6,446	6,446

Notes: Authors' computation using household consumption expenditure per adult equivalent and the extreme poverty line of GHC 900 for 1999 and 2006, and GHC 1,314 and GHC 1,760.9 for 2013 and 2017, respectively. The estimates account for sampling weights and clustering. The values reported are the probability of each of the four states (e.g., poor in time t given poverty status in t-1) for the population aged 25–55 years.

Poverty dynamics using actual panel data

As shown in Table 5, the patterns of poverty dynamics based on the GSPS are generally consistent to those observed in the GLSS data using the synthetic panel approach, showing notable changes in the probabilities of poverty mobility or immobility across the two intervals considered (2006–2013 and 2013–2017). Although joint probability estimates show a decline in the share of households that remain in poverty over the two periods, the estimates of conditional probabilities provide evidence of higher poverty persistence in 2014–2019 compared with 2010–2014. Moreover, about 32.5% of the poor in 2010 remained in poverty in 2014, and this likelihood of poverty persistence increased by roughly six percentage points between 2014 and 2019 (Table 5).

Consistent with the results based on the GLSS data, significant transition out of poverty is also noted with at least 60% of poor people moving to non-poor status across waves, although the likelihood of poverty exit decreased over the period 2014–2019, and roughly 16% of households transitioning into poverty during both periods. Hence, while poverty has been a more transient phenomenon in the Ghanaian context, the likelihood of poverty escape has decreased over time while the likelihood of poverty persistence has increased, thereby explaining the observed trend of poverty incidence between 2010 and 2019.

Table 5: Poverty dynamics based on actual panel data – Joint and conditional probabilities (in %)

	Joint Probabilitiesa		Conditional Probabilitiesb	
	2010–2014	2014–2019	2010–2014	2014–2019
Poor, poor	10.5	8.3	32.5	38.6
	[8.8; 12.4]	[6.9; 10.0]	[28.4; 36.7]	[32.9; 44.2]
Poor, non-poor	21.8	13.2	67.5	61.4
	[19.5; 24.3]	[11.4; 15.3]	[63.3; 71.6]	[55.7; 67.0]
Non-poor, poor	11.0	13.0	16.3	16.6
	[9.5; 12.8]	[11.3; 14.9]	[13.9; 18.8]	[14.3; 18.9]
Non-poor, non-poor	56.6	65.4	83.7	83.4
	[54.8; 61.4]	[62.4; 68.3]	[81.2; 86.1]	[81.0; 85.7]
Obs.	3,407	3,407	3,407	3,407

Notes: Authors' computation using household consumption expenditure per adult equivalent and the extreme poverty line of GHC 1,314 for 2010 and 2014 and GHC 1,760.9 for 2019. The estimates are based on the entire sample and account for sampling weights and clustering. The lower and upper bounds for the 95% confidence intervals are reported in the brackets [].

1. The values reported are fractions of the population in each of the four states.
2. The values reported are the probability of each of the four states (e.g., poor in time t given poverty status in t-1) for the entire sample.

Validation of the synthetic panel approach

To validate the findings of the synthetic panel approach, we present the estimates of poverty transitions based on the GSPS. The true estimates based on the actual panel are compared with those obtained using the synthetic panel treating the waves as repeated cross-sections. The latter results are then compared with the former for the restricted sample considering the population aged 25 to 55 years (see the discussion in Section 3) to ascertain the accuracy of the bounds approach of Dang et al. (2014) and the point estimates of Dang & Lanjouw (2013) and Dang et al. (2021). Following existing literature, the correlation coefficient ρ is estimated using cohort level correlation between periods. The cohort is defined using the age of the household head and his/her region of birth. The estimated coefficients of 0.25 and 0.41 fall within the expected range of (0.2, 0.8) considered as adequate in previous application of the technique (Dang et al., 2014; Salvucci and Tarp, 2021) and are close to the actual coefficients of 0.27 and 0.34 for 2010–2014 and 2014–2019, respectively. The time-invariant household characteristics are consistent with those utilized for the cross-sectional GLSS data sets.

Overall, the Dang & Lanjouw (2013) and Dang et al. (2014) methods perform well in evaluating both the conditional and the joint probabilities of poverty transition (Table 6 and Table 7). Specifically, the true estimates of the conditional probability always fell within the interval defined by the lower and upper bounds of the synthetic panel. This finding also applies to the joint probability estimates, with the exception being the probabilities of remaining non-poor and experiencing an upward mobility in 2010 and 2014. Even in those cases, the difference between the true estimates and the upper bound is roughly four points, which is still a good performance. The estimated bounds are wide, however, particularly for the conditional probabilities. Thus, they provide unclear information on the pattern and trends in poverty dynamics over time, consistent with the findings in the earlier estimates using the cross-sectional GLSS data.

Similar to the Dang et al. (2014) approach, the Dang & Lanjouw (2013) technique of generating point estimates of the poverty transitions was impressively accurate in yielding estimates that are close to the true values. These estimates in most cases fall with the 95% confidence interval of the true estimates. In several instances, the difference between the synthetic panel and the true estimates is around two points or less, apart from the joint and conditional probability of downward mobility over the period 2010–2014, as well as the conditional probabilities of staying non-poor. In this case, the synthetic panel approach overestimated the likelihood of falling into poverty such that the decline in downward mobility observed over time in the point estimates of conditional probabilities seems to contrast the marginal increase shown in true estimates. Nevertheless, the evidence provided shows that the Dang & Lanjouw (2013) techniques performed well in the Ghanaian context similar to previous applications in other low- and middle-income countries.

Table 6: True versus synthetic panel estimates of poverty dynamics from 2010 to 2019 – Joint probabilities (in %) based on actual panel data (GSPS)

	2000–2014				2014–2019			
	Non-parametric Bounds Estimates		Parametric Point Estimates	True Estimates	Non-parametric Bounds Estimates		Parametric Point Estimates	True Estimates
	Lower Bound	Upper Bound			Lower Bound	Upper Bound		
Poor, poor	16.1	6.8	8.7	9.0 [7.2; 11.0]	15.6	6.5	8.4	7.5 [6.1; 9.3]
Poor, non-poor	11.8	15.6	17.6	19.7 [17.3; 22.4]	6.9	11.2	14.0	11.8 [10.0; 13.9]
Non-poor, poor	4.3	13.5	14.6	10.4 [8.9; 12.3]	4.6	13.6	12.0	12.5 [10.6; 14.7]
Non-poor, non-poor	67.9	64.1	59.1	60.9 [57.2; 64.6]	72.9	68.7	65.6	68.1 [64.8; 71.3]
Obs.	2,134	2,134	2,134	2,338	2,072	2,072	2,072	2,338

Notes: Authors' computation using household consumption expenditure per adult equivalent and the extreme poverty line of GHC 1,314 for 2010 and 2014 and GHC 1,760.9 for 2019. The estimates account for sampling weights and clustering. The values reported for the

non-parametric bounds and parametric point estimates are the fraction of population aged 25–55 years in each of the four states. The true estimates are based on the entire sample excluding households that attrited between waves. The lower and upper bounds for the 95% confidence intervals are reported in the brackets [].

Table 7: True versus synthetic panel estimates of poverty dynamics from 2010 to 2019 – Conditional probabilities (in %) based on actual panel data (GSPS)

	2000–2014				2014–2019			
	Non-parametric Bounds Estimates		Parametric Point Estimates	True Estimates	Non-parametric Bounds Estimates		Parametric Point Estimates	True Estimates
	Lower Bound	Upper Bound			Lower Bound	Upper Bound		
Poor, poor	57.6	30.3	32.9	31.3	69.2	36.7	37.6	38.9
				[26.7; 35.8]				[32.4; 45.5]
Poor, non-poor	42.4	69.7	67.1	68.7	30.8	63.3	62.4	61.1
				[64.2; 73.3]				[54.5; 67.6]
Non-poor, poor	5.9	17.4	19.8	14.6	5.9	16.6	15.4	15.5
				[12.1; 17.0]				[12.9; 18.1]
Non-poor, non-poor	94.1	82.6	80.2	85.4	94.1	83.4	84.6	84.5
				[83.0; 87.8]				[81.9; 87.1]
Obs.	2,134	2,134	2,134	2,338	2,072	2,072	2,072	2,338

Notes: Authors' computation using household consumption expenditure per adult equivalent and the extreme poverty line of GHC 1,314 for 2010 and 2014 and GHC 1,760.9 for 2019. The estimates account for sampling weights and clustering. The values reported are the probability of each of the four states (e.g., poor in time t given poverty status in t-1) for the population aged 25–55 years for the synthetic panel estimates. The true estimates are also based on the restricted population aged 25–55 years and exclude households that attrited between waves. The lower and upper bounds for the 95% confidence intervals are reported in the brackets [].

Estimates of poverty dynamics by sub-groups

To provide insights on the association between socioeconomic characteristics and poverty transition in Ghana, Table 7 reports the estimates of conditional probabilities across groups based on the gender of the household head, area and region of residence, and deprivation status. The estimates are based on the GSPS.

Poverty mobility/immobility by sex of household head

Poverty is more persistent in male-headed than in female-headed households, with a greater transition out of poverty in the latter compared to the former. For example, 28.9% of female-headed households that were poor in 2010 remained poor

in 2014 compared with 34.0% for male-headed households. Additionally, when the household head is female, the probability of escaping poverty is greater. While this finding is consistent across periods, the overall increase in the likelihood of being chronically poor as well as the decline in upward mobility between 2014 and 2019 are associated with male headship but not female. Additionally, male-headed households experienced an increase in downward mobility over time.

Table 8: Poverty dynamics by socioeconomic groups from 2010 to 2019 – Conditional probabilities (in %) based on actual panel (GSPS) data

	2010–2014	2014–2019	2010–2014	2014–2019
	Male		Female	
Poor, poor	34.0	44.5	28.9	26.4
Poor, non-poor	66.0	55.5	71.1	73.6
Non-poor, poor	16.8	18.1	16.6	13.6
Non-poor, non-poor	83.2	81.9	83.4	86.4
Obs.	2,113	2,071	970	1,118
	Urban		Rural	
Poor, poor	25.5	28.5	34.6	42.7
Poor, non-poor	89.3	71.5	65.4	57.3
Non-poor, poor	10.7	7.6	24.4	26.5
Non-poor, non-poor	74.5	92.4	75.6	73.5
Obs.	1,253	1,253	2,154	2,154
	South		North	
Poor, poor	25.5	25.3	46.3	62.3
Poor, non-poor	74.5	74.7	53.7	37.7
Non-poor, poor	14.3	10.5	29.3	49.2
Non-poor, non-poor	85.7	89.5	70.7	50.8
Obs.	2,612	2,612	795	795
	Most Deprived		Less Deprived	
Poor, poor	35.9	41.9	26.9	37.7
Poor, non-poor	64.1	58.1	73.1	62.5
Non-poor, poor	21.3	21.7	12.8	12.8
Non-poor, non-poor	78.7	78.3	87.2	87.2
Obs.	1,713	1,734	1,639	1,405
	Most Deprived in Northern Ghana		Most Deprived in Southern Ghana	
Poor, poor	44.8	66.4	31.1	28.8
Poor, non-poor	55.2	33.6	68.9	71.2
Non-poor, poor	31.1	53.4	19.8	14.2
Non-poor, non-poor	68.9	46.6	80.2	85.8
Obs.	443	473	1,270	1,261

Notes: Authors' computation using household consumption expenditure per adult equivalent and the extreme poverty line of GHC 1,314 for 2010 and 2014 and GHC 1,760.9 for 2019. The entire sample is considered for the estimations based on the GSPS. The estimates account for sampling weights and clustering.

Poverty mobility/immobility by area of residence

As shown in Table 8, the share of poor households in 2010 (2014) that remained poor in 2014 (2019) is higher for rural than urban, with lower probability of poverty escape and higher transition into poverty for the former than the latter (Table 7). Similarly, people in the northern part of Ghana are more likely to experience a downward

mobility compared to those in the southern part, with higher poverty persistence. In 2014–2019, the likelihood of chronic poverty is 62.3% in the latter compared with 25.3% in the former. Moreover, the increase in poverty persistence and downward mobility and the fall in upward mobility mainly occurred in the northern Ghana. For example, the chances of chronic poverty (downward mobility) increased by 16.0 (19.9) percentage points between 2010 and 2019 for northern households but stagnated (fell marginally) in the southern part of the country. These findings reflect the heterogeneity in the availability of high income-generating opportunities between these locations. Even though existing studies show that unemployment rates are higher in urban than rural Ghana employment in rural dwellings and in Northern Ghana is highly concentrated in agriculture and informal non-farm enterprises, characterized by low productivity and income (Baah-Boateng & Ewusi, 2013).

Poverty mobility/immobility by deprivation status

With respect to the conditional probabilities for the *most-deprived* and *less-deprived* group, the results show that compared with the less-deprived categories, households that belong to the most-deprived group have a lower chance of escaping poverty and higher incidence of chronic poverty. For example, the likelihood of escaping poverty is 9.0 percentage points (4.2 percentage points) higher among those with the most-advantaged background than those with the least-advantaged background over the period 2010–2014 (2014–2019). In the context of Ghana, this finding is arguably attributable to the limited availability of highly remunerated employment opportunities outside the informal sector, creating a situation whereby individuals from a less-deprived background, who are more likely to be educated, have higher chances to access less vulnerable employment while those from a disadvantaged background are more likely to end up in vulnerable jobs with low earning, increasing their vulnerability to poverty and poverty persistence (Baah-Boateng & Ewusi, 2013). A north/south disaggregation of the poverty dynamic estimates among the most deprived group show that chronic poverty and downward mobility are highly endemic among the opportunity-deprived living in the northern part of the country. Specifically, about 66.4% of poor people in 2014 with a least-advantaged background remained in poverty in 2019, while over half of the non-poor who belong in this category fell into poverty between the two years.

Explaining poverty transitions

Table 9 presents the correlates of poverty transition based on the methodology described in Section 3. In addition to the trivariate probit estimations (taking into account sample retention and state dependence), we report results of the bivariate

probit with endogenous sample selection (in which sample attrition is ignored). The exogeneity of the initial conditions and sample retention are rejected at 5% significant level (Table 9). Specifically, individuals with expenditures observed in two successive periods were more likely to experience upward mobility compared to individuals who are likely to attrit. Also, those who were more likely to be initially poor are more likely to remain poor compared to the non-poor.

On the one hand, columns 1 and 3 show the average marginal effect of a change in the explanatory variables on the probability of poverty persistence, that is, the likelihood of a household being poor in both the previous and current survey periods. Columns 2 and 4, on the other hand, show the average marginal effects for poverty entry; the likelihood of a non-poor household in the previous survey period falling into poverty in the current survey period.[5]

In terms of household head characteristics, education is associated with a lower vulnerability to poverty persistence or entry. Specifically, households headed by a person with primary or secondary education (and more) are less likely to remain in or fall into poverty compared with those whose head has no formal education. The effect is greater for higher levels of education. While the occupation of the household head seems to have no significant effect on the likelihood of poverty persistence, it is an important determinant of poverty entry among non-poor households. This finding suggests that having an employed household head, especially one with an occupation other than vulnerable employment in the form of business and farm contributor is a safeguard against poverty entry, as the household tends to be more resilient to income shocks. In addition, female-headed households are less likely to experience chronic poverty compared with their male-headed counterparts.

After controlling for the number of employed individuals in the household, the larger the number of dependents or working age adults, the higher the risk of poverty persistence or entry. By contrast, ownership of assets plays a significant role in poverty exit or resilience, as households owning land or a house are less likely to remain in or fall into poverty. As expected, residing in an urban area lowers the likelihood of chronic poverty and the chances of poverty entry for initially non-poor households. Similarly, poor households initially residing in the Central, Brong Ahafo, Northern, Upper East, and Upper West regions are more likely to remain in poverty relative to those in the Greater Accra region. Moreover, non-poor households in all other regions except Western have a greater chance to slide into poverty compared with their counterparts in Greater Accra. Unsurprisingly, the relative effects are stronger for the three northernmost regions (Northern, Upper East, and Upper West), which also happen to be the three poorest.

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5 It is important to note that poverty persistence and poverty exit are mutually exclusive events. Thus, any variable that is estimated to increase (reduce) the likelihood of poverty persistence, will automatically reduce (increase) the chances of poverty exit to exactly the same extent. The same logic holds for the estimated chances of poverty entry as opposed to resilience to poverty.

Table 9: Multivariate probit model poverty transition estimates

	Bivariate Probit with endogenous selection (Conditional Probabilities)				Trivariate Probit with endogenous selection -- accounting for sample retention (Conditional probabilities)			
	Poverty Persistence		Poverty Entry		Poverty Persistence		Poverty Entry	
VARIABLES	Avg. marginal effects	t-stats	Avg. marginal effects	t-stats	Avg. marginal effects	t-stats	Avg. marginal effects	t-stats
CHARACTERISTICS OF THE HOUSEHOLD HEAD								
Female	-0.042	-1.372	0.015	0.841	-0.088**	-2.291	-0.002	-0.178
Age	-0.000	-0.117	0.001	0.200	0.004	0.715	0.001	0.623
Age squared	0.000	0.477	0.000	0.608	-0.000	-0.315	0.000	0.227
Education level (base = No education)								
Primary education	-0.057**	-2.477	-0.041***	-2.694	-0.055*	-1.733	-0.047***	-3.969
Secondary education and more	-0.114***	-2.981	-0.087***	-3.907	-0.084	-1.427	-0.100***	-5.842
Occupation (base = No occupation)								
Paid employees	-0.035	-0.650	-0.112***	-4.086	-0.017	-0.244	-0.071***	-3.131
Self-employed (Non-farm)	0.050	1.075	-0.060**	-2.141	0.111*	1.680	-0.014	-0.626
Self-employed (Farm)	0.015	0.431	-0.064**	-2.362	0.008	0.168	-0.024	-1.259
Business or Farm contributor	0.017	0.480	-0.001	-0.027	0.007	0.126	0.011	0.619
CHARACTERISTICS OF THE HOUSEHOLD								
No. of children (less than 18 years)	0.026***	3.895	0.013***	2.712	0.022**	2.382	0.014***	3.706
No. of adults (between 18 and 59 years)	0.034***	3.002	0.023**	2.328	-0.000	-0.019	0.021***	3.227
No. of elderly (more than 60 years)	0.004	0.164	0.020	0.974	-0.046	-1.526	0.002	0.151
No. of working household members	0.005	0.614	-0.002	-0.258	0.001	0.115	-0.003	-0.579
Household owns a land and/or a house	-0.017	-0.606	-0.046***	-2.866	-0.013	-0.321	-0.034***	-2.753
Household receipt of remittances (base = Regular)								
Not regular	0.008	0.180	-0.018	-0.787	-0.010	-0.165	-0.011	-0.598
Not at all	-0.041	-1.094	0.007	0.333	-0.067	-1.407	-0.012	-0.681
Resides in an urban area	-0.043	-1.542	-0.130***	-7.293	0.020	0.489	-0.096***	-6.369
Region of residence (base = Greater Accra)								
Western	-0.073	-1.067	0.012	0.300	-0.143	-1.374	-0.005	-0.140
Central	0.101*	1.699	0.184***	4.575	-0.010	-0.096	0.160***	4.934

Volta	0.040	0.704	0.089**	2.441	0.006	0.062	0.067**	2.084
Eastern	0.088	1.585	0.066*	1.711	0.019	0.204	0.070**	2.198
Ashanti	0.055	0.955	0.086***	2.634	-0.009	-0.101	0.079**	2.561
Brong Ahafo	0.136**	2.229	0.172***	5.179	0.072	0.703	0.157***	5.175
Northern	0.165***	2.906	0.237***	6.172	0.112	1.088	0.210***	6.424
Upper East	0.264***	4.282	0.175***	4.330	0.166*	1.688	0.197***	5.886
Upper West	0.222***	3.386	0.167***	4.077	0.107	0.988	0.187***	5.850
Time Effects	Yes		Yes		Yes		Yes	
Adjusted Wald test -- Exogeneity of selection equations [df. 323] (Prob > F)								
Exogenous initial conditions (rho)	19.46	0.000						
Exogenous initial conditions (rho3 = rho2=0)					19.84	0.000		
Exogenous sample retention (rho1 = rho3=0)					19.88	0.000		
Joint exogeneity (rho3 = rho2 = rho1=0)					18.03	0.000		
Correlation coefficients between unobservables								
Poverty status at t-1 & conditional poverty status at t (rho2)					0.446	0.037		
Sample retention and conditional poverty status at t (rho3)					-0.692	0.007		
Sample retention and poverty status at t-1 (rho1)					-0.910	0.000		
Observations	6,918				8,139			

Notes: *** p<0.01, ** p<0.05, * p<0.1. The estimates account for sampling weights and clustering.

6. Conclusion

Over the years, the Government of Ghana (GoG) implemented several socioeconomic interventions to foster inclusive and sustainable growth. Yet, the increase in income disparities across the population and its persistence over the years suggest that some categories of households or individuals have been unable to take advantage of whatever opportunities growth presents. This study provides an extended analysis of poverty dynamics in Ghana using a synthetic panel approach with cross-sectional data and actual panel data. It sheds light on the extent of poverty mobility and immobility in Ghana and on the role of household socioeconomic characteristics, including opportunity deprivation, in shaping poverty transitions.

While non-parametric bounds estimates failed to provide clear evidence on poverty dynamics in Ghana, the results from parametric point estimates suggest that between 2006 and 2017, upward mobility has been a key feature of poverty transitions in Ghana. However, there is still a high probability of poverty persistence among initially poor households and elevated chances of downward mobility for non-poor households. The study further revealed that the slowdown in the progress on poverty reduction between 2013 and 2017 is attributable to a marginally higher poverty persistence and lower poverty exit across the population over 2013–2017 compared with the period 2006–2013. These findings are confirmed by the estimates based on the panel data (GSPS data) over the period 2010–2019, implying robustness of the observed patterns of poverty dynamics.

The validation exercise using the GSPS data reveal a positive performance of the synthetic panel approaches proposed by Dang and Lanjouw (2013) and Dang et al. (2014) in providing accurate information on conditional and joint probabilities of poverty transition. These findings corroborate those of Salvucci and Tarp (2021) in the case of Mozambique. On the one hand, while the bounds estimates sandwiched the true values for almost all estimates, the intervals are too wide thus providing limited information on poverty transitions over time. These results are in line with previous studies such as Fields and Viollaz (2013), Garcés-Urzainqui (2017) and Herault and Jenckins (2019). On the other hand, the point estimates mostly fall within the 95% confidence interval of the true estimates with a difference of about two points or less from the true value. Hence, the Dang et al. (2014) and Dang & Lanjouw (2013) synthetic panel techniques would provide a reasonable substitute for actual panel data in cases where the latter are not available and/or reliable.

Additionally, the study provides insights on the association between socioeconomic characteristics and poverty transition in Ghana. The results suggest that poverty is more persistent among households headed by men compared with their female-headed counterparts, with higher upward mobility in the latter group (Dang & Dabalen, 2019; GSS, 2018; Kpoor, 2019). Furthermore male-headed households experienced an increase in downward mobility over time, while female-headed households witnessed a reduction in poverty immobility and a marginal improvement in upward mobility over time. This positive trend under female headship is presumably attributable to the substantial support provided to women in recent years in Ghana (Donkoh et al., 2014). Numerous governmental and non-governmental organizations have been actively involved in providing assistance and empowerment programmes targeting women, contributing to their enhanced wellbeing (Adjei et al., 2012).

Nevertheless, these overall findings in the female versus male-headed households should be interpreted with caution, as the better performance on expenditure-based welfare measures that is usually observed among female-headed households in the Ghanaian context often hides a different picture of livelihood variations across headship. As shown by Kpoor (2019), although female-headship is associated with higher consumption expenditure in Ghana, households headed by women have lower income, lower assets, lower human capital, and poorer livelihoods than male-headed counterparts.

With respect to deprivation status, the study shows that the background of the household head is associated with poverty mobility. Specifically, households that belong to the most-deprived group have a lower chance of escaping poverty, with a higher likelihood of downward mobility compared to the least-deprived categories. This suggests that socioeconomic background influences poverty outcomes in Ghana. In the context of Ghana, this finding is arguably attributable to the limited availability of highly remunerated employment opportunities outside the informal sector, creating a situation whereby individuals from least-deprived backgrounds (who are more likely to be educated), have higher chances to access less vulnerable employment, while those from a disadvantaged background are more likely to end up in vulnerable jobs with low earnings, thereby increasing their vulnerability to poverty and poverty persistence (Baah-Boateng & Ewusi, 2013). Poverty persistence and downward mobility are more endemic among the most-deprived category in northern Ghana.

Lastly, poverty is more chronic in rural areas and the northern part of Ghana compared with urban and southern regions, and the latter categories are also characterized by low probabilities of downward mobility compared to the former. Regarding the correlates of poverty transitions, the results suggest that a higher level of education of the household head, a lower number of dependents and adult members, land, or house ownership, and residing in an urban area is associated with a lower vulnerability to poverty persistence or entry. Also, the type of occupation is an important determinant of downward mobility in Ghana.

In Ghana, addressing chronic poverty necessitates targeted policies to address vulnerabilities in rural areas and the northern part of the country, for the unemployed, those in vulnerable employment, as well as providing more equal opportunities for individuals from most-deprived background. In this regard, priority should be given to programmes that aim at fostering productivity growth in small-scale farming and small and medium non-farm enterprises in rural areas and northern Ghana. Efforts targeted at productivity growth in the agriculture and informal sectors need to be accompanied by balanced investments that bridge the existing infrastructure gaps between northern and southern Ghana and between rural and urban dwellings without jeopardizing the needs of key economic sectors. In addition, the implementation of social programmes must focus on building the resilience of vulnerable households to shocks. Poverty reduction policy and implementation in Ghana need to be intentional about providing more equal access to productive potential and opportunities for individuals from disadvantaged backgrounds in terms of education and employment.

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Appendix

Table A1: Ghana Living Standard Surveys (GLSS): Overview – 1998/99 to 2012/13

Round	Number of Regions	Number of Households	Enumeration Areas (EAs)	Number of Individuals
Round 5 (2005/06)	10	8,687	580	37,128
Round 6 (2012/13)	10	16,772	12,000	72,372
Round 7 (2016/17)	10	14,009	1,000	59,864

Source: Ghana Statistical Service (GSS), 2006, 2013, 2017.

Table A2: EGC-ISSER Ghana socioeconomic panel surveys: Overview – 2009/10 to 2018/19

Waves	Number of Regions	Number of Households	Enumeration Areas (EAs)	Number of Individuals
Wave 1 (2009/10)	10	5,009	334	18,889
Wave 2 (2013/14)	10	4,774	334	16,356
Wave 3 (2018/19)	10	4,159	334	19,006

Source: ISSER and EGC, 2010, 2014, 2019.

Table A3: Opportunity profile

Rank	Parental Education	Parental Occupation	Mean of Consumption Exp. (GHC)	Std. Error	P-value	Obs.
	2006					
1	None has more than primary education	Both parents have been involved in agriculture activities most of their lives	1,880.5	51.8	0.00	4,086
2	None has more than primary education	At least one parent is in sales/elementary activities & none is in serv/prod.	2,302.4	77.9	0.00	1,149
3	None has more than primary education	At least one is in serv/ prod. activities, and one is in prof/admi/cl	2,623.4	134.3	0.00	675
4	At least one parent has secondary or tertiary education	Both parents have been involved in agriculture activities most of their lives	2,774.6	161.1	0.00	553
5	At least one parent has secondary or tertiary education	At least one parent is in sales/elementary activities & none is in serv/prod.	3,169.6	112.3	0.00	543
6	At least one parent has secondary or tertiary education	At least one is in serv/ prod. activities, and one is in prof/admi/cl	3,778.9	142.3	0.00	1,570
	2013					
1	None has more than primary education	Both parents have been involved in agriculture activities most of their lives	2,153.3	41.7	0.00	7,674
2	None has more than primary education	At least one parent is in sales/elementary activities & none is in serv/prod.	2,702.8	113.2	0.00	2,102
3	None has more than primary education	At least one is in serv/ prod. activities, and one is in prof/admi/cl	2,945.0	103.7	0.00	1,121
4	At least one parent has secondary or tertiary education	Both parents have been involved in agriculture activities most of their lives	2,991.1	129.1	0.00	1,152
5	At least one parent has secondary or tertiary education	At least one parent is in sales/elementary activities & none is in serv/prod.	3,851.8	119.2	0.00	1,243
6	At least one parent has secondary or tertiary education	At least one is in serv/ prod. activities, and one is in prof/admi/cl	4,357.7	120.0	0.00	3,194

	2017					
1	None has more than primary education	Both parents have been involved in agriculture activities most of their lives	2,892.5	69.7	0.00	6,164
2	None has more than primary education	At least one parent is in sales/elementary activities & none is in serv/prod.	3,900.2	176.4	0.00	1,897
3	At least one parent has secondary or tertiary education	Both parents have been involved in agriculture activities most of their lives	3,980.6	145.5	0.00	963
4	None has more than primary education	At least one is in serv/prod. activities, and one is in prof/admi/cl	4,489.8	206.1	0.00	934
5	At least one parent has secondary or tertiary education	At least one parent is in sales/elementary activities & none is in serv/prod.	5,449.6	167.0	0.00	965
6	At least one parent has secondary or tertiary education	At least one is in serv/prod. activities, and one is in prof/admi/cl	6,135.1	162.0	0.00	2,787

Notes: Sampling weights and clustering are considered.

Table A4: Descriptive statistics of variables used in the synthetic panel point estimates — Cross-sectional data

	2006	2013	2017
Real per adult equivalent annual expenditure (GHC)			
Mean	2,420.8	3,340.2	4,747.5
SD	2,372.2	2,936.0	4,447.7
Min	62.9	39.0	53.6
Max	11,1156.3	96,421.3	19,9643.0
HOUSEHOLD HEAD CHARACTERISTICS			
Years of education			
Mean	5.9	9.5	9.4
Std. Dev	5.2	3.6	3.6
Min	0.0	0.0	0.0
Max	18.0	19.0	19.0
Female			
male	76.8	76.9	73.1
female	23.2	23.1	26.9
Region of Birth			
Western	8.0	8.6	9.2
Central	10.6	11.9	11.3
Greater Accra	7.5	9.4	9.9
Volta	10.7	12.3	11.8

Eastern	13.9	15.2	14.4
Ashanti	15.6	22.1	22.4
Brong Ahafo	7.7	8.4	8.9
Northern	13.4	6.1	5.9
Upper East	6.4	3.1	3.2
Upper West	5.0	2.2	1.9
Outside Ghana	1.3	0.7	1.1
Parental Education			
None has more than primary education	72.9	53.7	52.3
At least one parent has secondary or tertiary education	27.1	46.3	47.7
Parental Occupation			
Both parents are in agriculture	56.9	43.2	41.0
At least one parent is in sales/ elementary occupation, and none is in serv/prod.	19.5	22.1	22.9
At least one parent is in serv/prod. or at least one in prof/admi/cl	23.6	34.7	36.1
HOUSEHOLD CHARACTERISTICS			
Urban			
No	62.6	42.8	43.1
Yes	37.4	57.2	56.9
Region of residence (Southern Ghana)			
No	20.6	7.8	7.7
Yes	79.4	92.2	92.3
Sample size	8,569.0	11,240.0	9,379.0

Notes: The reported statistics account for sampling weights and clustering.

Table A5: OLS estimation results based on cross-sectional data

VARIABLES	2006	2013	2017
Years of education	-0.015***	-0.018*	-0.002
	(-2.594)	(-1.917)	(-0.181)
Years of education squared	0.004***	0.003***	0.003***
	(8.947)	(6.647)	(5.210)
Region of Birth			
Greater Accra (Ref.)			
Western	0.047	-0.189***	-0.319***
	(0.650)	(-3.657)	(-6.218)
Central	0.085	-0.185***	-0.224***
	(1.439)	(-3.946)	(-4.658)
Volta	0.028	-0.221***	-0.429***
	(0.444)	(-5.013)	(-9.522)
Eastern	0.128**	-0.209***	-0.129***
	(2.182)	(-4.732)	(-3.322)
Ashanti	0.087	-0.114**	-0.142***
	(1.442)	(-2.459)	(-3.042)
Brong Ahafo	-0.005	-0.183***	-0.271***
	(-0.071)	(-3.949)	(-5.062)
Northern	0.129*	-0.149***	-0.260***

	(1.736)	(-2.802)	(-2.957)
Upper East	-0.059	-0.026	-0.273***
	(-0.694)	(-0.361)	(-3.362)
Upper West	-0.383***	-0.286***	-0.453***
	(-4.240)	(-4.335)	(-5.130)
Outside Ghana	0.084	-0.095	-0.347***
	(0.887)	(-1.138)	(-3.871)
Female	0.119***	0.052**	0.112***
	(5.949)	(2.334)	(5.641)
Urban	0.345***	0.339***	0.373***
	(9.582)	(10.103)	(11.129)
Southern Ghana	0.422***	0.288***	0.407***
	(6.459)	(5.746)	(5.555)
Parental education			
None has more than primary education			
At least one parent has secondary or tertiary education	0.123***	0.164***	0.088***
	(5.159)	(7.000)	(3.552)
Parental Occupation			
Both parents are in Agriculture			
At least one parent is in sales/ elementary occupation, and none is in serv/prod.	0.065**	0.102***	0.073***
	(2.368)	(3.336)	(2.854)
At least one parent is in serv/prod. or at least one in prof/admi/cl	0.087***	0.112***	0.144***
	(3.068)	(3.894)	(5.622)
Constant	6.769***	7.221***	7.417***
	(82.704)	(92.657)	(79.023)
Observations	8,569	11,240	9,379
R-squared	0.379	0.272	0.330

Notes: The dependent variable is the log of household expenditure per adult equivalent. t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Sampling weights and clustering are considered.

Table A6: Descriptive statistics of variables used in the synthetic panel estimates — Panel data (GSPS)

	2010	2014	2019
Real per adult equivalent monthly expenditure (GHC)			
Mean	215.66	243.55	315.06
SD	177.04	190.54	213.31
Min	30.64	29.52	33.43
Max	969.61	1,252.76	1,260.83
HOUSEHOLD HEAD CHARACTERISTICS			
Years of education			
Mean	6.30	6.13	6.20
Std. Dev	4.82	5.01	4.96
Min	0.00	0.00	0.00
Max	18.00	18.00	18.00
Female			
male	71.4	67.8	65.1
female	28.6	32.2	34.9
Region of Birth			
Western	9.3	8.6	8.4
Central	11.6	11	11
Greater Accra	9.9	8	9.8
Volta	10.1	9	9.2
Eastern	11	11.5	11.3

Ashanti	16.5	16.7	17.1
Brong Ahafo	8.2	8.3	8
Northern	12.5	14	13.9
Upper East	5.5	5.7	5.6
Upper West	4.6	4.5	4.7
Outside Ghana	0.6	2.6	1
Parental Education			
None has more than primary education	93.1	93	90.9
At least one parent has secondary or tertiary education	6.9	7	9.1
Parental Occupation			
Both parents are in agriculture/At least one has been into agriculture	54.7	59	56.8
At least one parent is in sales/elementary occupation and in serv/prod.	33.7	27	31.1
At least one parent is in prof/admi/cl	11.7	14	12.1
HOUSEHOLD CHARACTERISTICS			
Urban			
No	52.8	53.8	54
Yes	47.2	46.2	46
Region of residence (Southern Ghana)			
No	20	21.6	21.4
Yes	80	78.4	78.6
Sample size	3,342	3,141	3,869.0

Notes: Sampling weights and clustering are considered.

Table A7: OLS estimation results based on panel data

VARIABLES	2010	2014	2019
Years of education	0.023**	-0.003	0.002
	(2.080)	(-0.309)	(0.319)
Years of education squared	0.000	0.002***	0.002***
	(0.313)	(3.771)	(4.807)
Region of Birth			
Greater Accra (Ref.)			
Western	-0.006	-0.107	0.163***
	(-0.069)	(-1.441)	(2.798)
Central	0.034	-0.447***	0.021
	(0.382)	(-4.990)	(0.446)
Volta	-0.165**	-0.199***	-0.064
	(-2.081)	(-2.830)	(-1.117)
Eastern	-0.085	-0.260***	0.050
	(-0.829)	(-3.390)	(0.926)
Ashanti	-0.067	-0.211**	-0.001
	(-0.706)	(-2.360)	(-0.010)
Brong Ahafo	-0.222***	-0.261***	-0.262***
	(-2.616)	(-3.342)	(-3.614)
Northern	-0.166	-0.194**	-0.274***
	(-1.533)	(-2.039)	(-3.081)
Upper East	-0.244**	-0.291***	-0.051
	(-2.301)	(-2.658)	(-0.604)
Upper West	-0.373***	-0.309***	-0.035
	(-3.480)	(-3.058)	(-0.348)
Outside Ghana	-0.152	-0.073	-0.143

	(-1.080)	(-0.642)	(-1.041)
Female	0.165***	0.104***	0.069**
	(5.275)	(3.274)	(2.420)
Urban	0.458***	0.193***	0.228***
	(8.030)	(4.390)	(5.189)
Southern Ghana	0.035	0.270***	0.351***
	(0.473)	(3.639)	(4.584)
Parental education			
None has more than primary education (Ref.)	0.115*	0.204***	0.036
At least one parent has secondary or tertiary education	(1.832)	(3.285)	(0.674)
Parental Occupation			
Both parents are in Agriculture			
At least one parent is in sales/ elementary occupation, and none is in serv/prod.	0.112**	0.137***	0.084***
	(2.512)	(3.762)	(2.843)
At least one parent is in serv/prod. or at least one in prof/admi/cl	0.104	0.122**	0.077*
	(1.508)	(2.321)	(1.693)
Constant	4.690***	4.934***	4.965***
	(44.038)	(49.477)	(62.316)
Observations	3,342	3,141	3,191
R-squared	0.292	0.232	0.322

Notes: The dependent variable is the log of household expenditure per adult equivalent. t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Sampling weights and clustering are considered.

Table A8: Poverty dynamics by socioeconomic groups from 2006 to 2019 – Joint probabilities (in %) based on actual panel (GSPS) data

	2010–2014	2014–2019	2010-–2014	2014–2019
	Male		Female	
Poor, poor	11.7	9.9	6.9	5.2
Poor, non-poor	22.8	12.3	17.1	14.5
Non-poor, poor	11.0	14.1	12.6	10.9
Non-poor, non-poor	54.5	63.7	63.4	69.4
Obs.	2,113	2,071	970	1,118
	Urban		Rural	
Poor, poor	4.0	3.7	16.3	12.5
Poor, non-poor	11.7	9.3	30.9	16.7
Non-poor, poor	9.0	6.6	12.9	18.8
Non-poor, non-poor	75.3	80.4	39.9	52.0

Obs.	1,253	1,253	2,154	2,154
	South		North	
Poor, poor	6.9	4.4	24.9	24.0
Poor, non-poor	20.0	12.9	28.8	14.5
Non-poor, poor	10.4	8.7	13.5	30.2
Non-poor, non-poor	62.7	74.0	32.7	31.3
Obs.	2,612	2,612	795	795
	Deprived		Less Deprived	
Poor, poor	15.1	11.3	6.1	6.1
Poor, non-poor	27.1	15.7	16.8	10.2
Non-poor, poor	12.3	15.9	9.9	10.7
Non-poor, non-poor	45.5	57.1	67.2	73.0
Obs.	1,713	1,734	1,603	1,405
	Deprived North		Deprived South	
Poor, poor	29.2	26.7	11.0	6.6
Poor, non-poor	36.0	13.5	24.4	16.3
Non-poor, poor	10.8	31.9	12.7	11.0
Non-poor, non-poor	24.0	27.9	51.8	66.1
Obs.	443	473	1,270	1,261

Table A9: Descriptive Statistics of variables used in the multivariate probit regressions

Variable	Statistic	Variable	Statistic
Age in years		No. of children	
Mean	49.2	Mean	2.3
SD	14.6	SD	2.0
Min	15.0	Min	0.0
Max	109.0	Max	15.0
No. of adults		No. of elderly	
Mean	2.0	Mean	0.3
SD	1.2	SD	0.6
Min	0.0	Min	0.0
Max	10.0	Max	5.0
No. of working household members		Parental occupation (%)	
Mean	2.0	1. both are in agriculture	48.6
SD	1.7	2. AL 1 in sales/serv/prod n in prof	37.4
Min	0.0	3. AL 1 in prof/admi/cl	14.0
Max	17.0	Household owns a land and/or a house (%)	
Poverty status at t (sample size: 7252) (%)		No	74.3
Non-poor	79.1	Yes	25.7
Poor	20.9	Household receipt of remittances (%)	
Poverty status at t-1 (%)		Not regular	22.0
Non-poor	74.2	Regular	14.9
Poor	25.8	Not at all	63.0
Occupation (%)		Female	
paid employee	18.7	No	68.7
Self-employed Non-farm	15.1	Yes	31.3
Self-employed farm	19.7	Retained (%)	
Business/farm contributor	24.8	No	13.9
no occupation	21.7	Yes	86.1
Urban (%)		Cooperative (%)	
No	50.4	No	0.8
Yes	49.6	Yes	99.2
Father's education (%)		Region of residence (%)	

No education	69.7	Western	9.7
Primary	23.1	Central	9.2
Secondary or more	7.2	Greater Accra	15.5
Mother's education (%)		Volta	8.4
No education	84.2	Eastern	10.1
Primary	14.0	Ashanti	19.0
Secondary or more	1.8	Brong Ahafo	9.8
Educational attainment (%)		Northern	11.1
No education	43.1	Upper East	4.2
Primary	35.6	Upper West	3.0
Secondary or more	21.3		
Sample size	8,517	Sample size	8,517

Notes: Sampling weights and clustering are considered.

Table A10: Multivariate probit regressions: Correlates of initial poverty and sample retention

	Bivariate Probit with Endogenous Selection		Trivariate Probit with Endogenous Selection — Accounting for Sample Retention			
	Poverty Status at Time t-1		Poverty Status at Time t-1		Retention Equation	
VARIABLES	Coefficients	t-stats	Coefficients	t-stats	Coefficients	t-stats
CHARACTERISTICS OF THE HOUSEHOLD HEAD AT T-1						
Female	0.087	1.243	0.042	0.779	0.090*	1.680
Age	-0.006	-0.67	-0.003	-0.376	-0.014*	-1.700
Age squared	0.000	0.974	0.000	0.981	0.000	0.841
Education level (base = No education)						
Primary education	-0.236***	-3.875	-0.199***	-3.787	0.005	0.099
Secondary education and more	-0.533***	-6.882	-0.353***	-4.904	-0.143**	-2.050
Occupation (base = No occupation)						
Paid employees	-0.314***	-3.17	-0.271***	-3.228	0.095	1.107
Self-employed (non-farm)	-0.587***	-5.88	-0.530***	-6.234	0.171*	1.771
Self-employed (farm)	-0.033	-0.351	-0.092	-1.168	0.180*	1.887
Business or farm contributor	-0.111	-1.168	-0.195**	-2.378	0.325***	3.780
HOUSEHOLD CHARACTERISTICS AT T-1						
No. of children (less than 18 years)	0.069***	4.463	0.056***	3.922	-0.002	-0.158
No. of adults (between 18 and 59 years)	0.257***	7.64	0.199***	6.703	0.049	1.465
No. of elderly (more than 60 years)	0.280***	4.123	0.216***	3.578	0.054	0.813

No. of working household members	0.020	0.803	0.035	1.605	-0.031	-1.250
Household owns a land and/or a house	-0.345***	-5.637	-0.327***	-6.412	0.159***	3.270
Household receipt of remittances (base = Regular)						
Not regular	-0.010	-0.126	-0.085	-1.179	0.163**	2.243
Not at all	0.059	0.751	0.000	0.001	0.088	1.342
Resides in an urban area	-0.548***	-7.165	-0.379***	-5.772	-0.122**	-2.284
Region of residence (base = Greater Accra)						
Western	0.484***	2.654	0.278*	1.967	0.058	0.525
Central	0.984***	5.768	0.546***	3.827	0.322***	2.805
Volta	0.808***	4.701	0.568***	4.127	-0.128	-1.058
Eastern	0.801***	4.316	0.495***	3.484	0.116	1.008
Ashanti	0.861***	4.418	0.555***	3.747	0.049	0.440
Brong Ahafo	0.877***	5.407	0.515***	3.847	0.190*	1.875
Northern	0.579***	3.304	0.191	1.307	0.509***	3.561
Upper East	1.097***	5.422	0.664***	3.419	0.382**	2.492
Upper West	1.053***	5.484	0.592***	3.549	0.731***	3.473
PARENTAL CHARACTERISTICS AT T-1						
Father's education (base = Father has secondary education or more)						
Father has primary education	0.217**	2.13	0.061	0.634		
Father has no formal education	0.149	1.455	-0.000	-0.005		
Mother's education (base = Mother has secondary education or more)						
Mother has primary education	1.513***	3.798	0.892***	3.056		
Mother has no education	1.720***	4.396	1.073***	3.656		
Parental education (base = both parents have been into agriculture)						
At least one parent is in sales/ elementary occupation, and none is in serv/prod.	-0.088**	-2.064	-0.051	-1.207		
At least one parent is in serv/prod. or at least one in prof/admi/cl	-0.084	-1.086	-0.077	-0.972		
Household was cooperative during the interview					0.503**	2.534

Time Effects	Yes		Yes		
Constant	-3.644***	-7.262	-2.201***	-5.558	
Observations	6,918		8,517		8,517

Notes: *** p<0.01, ** p<0.05, * p<0.1. The estimates account for sampling weights and clustering.

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