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Poverty dynamics for Ghana during 2005/06–2016/17: An investigation using synthetic panels

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ABSTRACT

Ghana has consistently kept its poverty rate lower than the regional average over the past 25 years, but this positive trend has slowed down recently. Without actual panel data, it would be next to impossible to probe into the dynamic patterns beneath this trend. We offer the first study that examines the dynamics of overall, moderate, and extreme poverty in Ghana during 2005/06–2016/17, addressing the lack of actual panel data by constructing synthetic panel data from three nationally representative cross-sectional rounds of the Ghana Living Standards Surveys (GLSSs).

We present a well-defined decomposition framework, which allows us to examine a rich profile of the dynamics among different population groups. Beyond poverty analysis, we further investigate the dynamics of the full consumption expenditure distribution. Although we find considerable conditional chronic (extreme) poverty rates hovering around 50–60%, there was more upward mobility than downward mobility during this period. Poor households were also more likely to have stronger consumption expenditure growth. The findings suggest that factors such as educational attainment, female household headship, urban residence, and nonagricultural work are positively correlated with poverty reduction. Compared to all other correlates, educational attainment appears to be the most effective in pushing households out of poverty and keeping them from falling into poverty. These results contribute to the growing literature on poverty dynamics in developing countries in general and provide new and relevant inputs for policy advice in Ghana in particular, especially since policies that address chronic poverty typically differ from those that tackle transient poverty.

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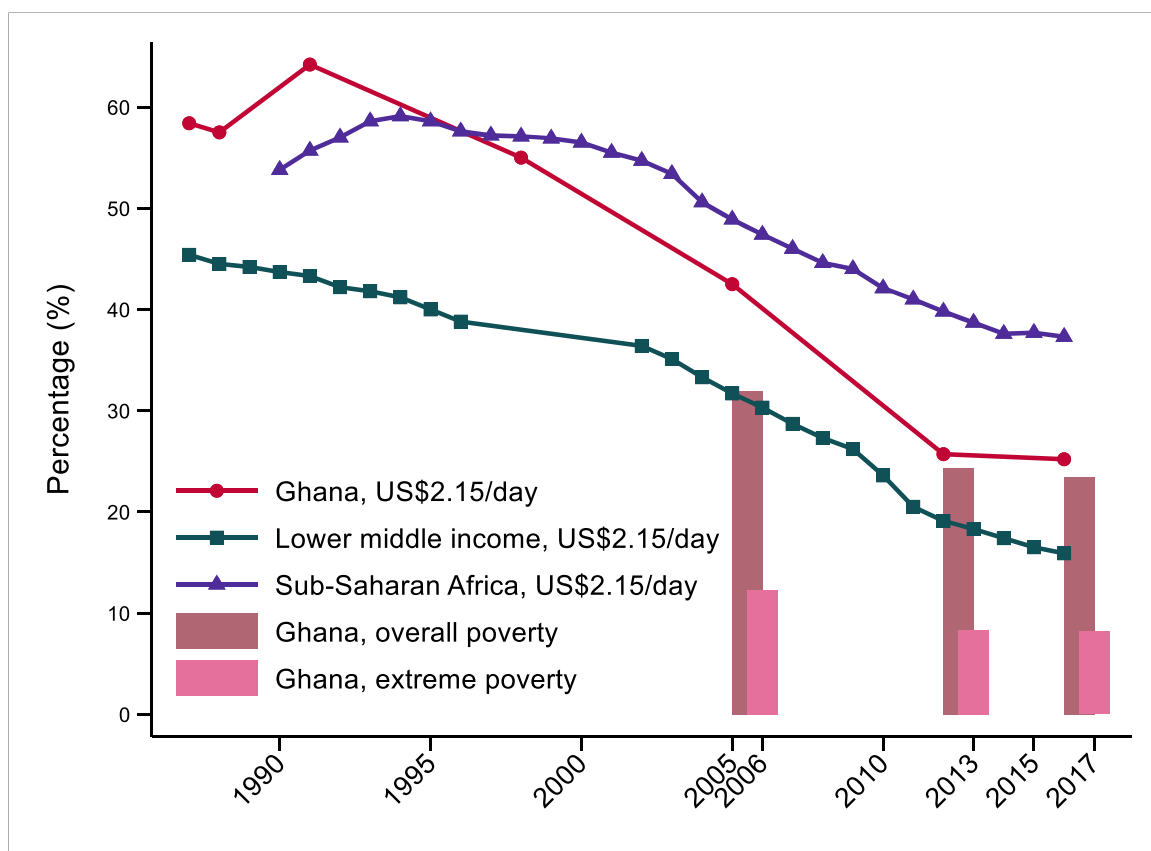


Fig. 1. Trends in poverty, Ghana, 1987–2017

Data sources: World Development Indicators database, World Bank; GLSS 2005/06; GLSS 2012/13; GLSS 2016/17.

Note: The international global poverty line of \$2.15 per person per day reflects the typical national poverty line of low-income countries in 2017 prices. Purchasing power parity was used to convert values in local currency to equivalent purchasing power measured in US dollars. The national overall poverty line of 1314 cedis and the national extreme poverty line of 792 cedis are expressed in 2013 prices. Consumption expenditure data are expressed in 2013 prices. The Ghana Living Standards Surveys (GLSSs) were administered in 2005/06, 2012/13, and 2016/17.

Introduction

Ghana, a lower-middle-income country, is one of the most successful countries in Sub-Saharan Africa in terms of reducing poverty. It has consistently kept its poverty rate lower than the regional average over the past 25 years (Fig. 1). The country's poverty rate is even slightly lower than that of other lower-middle-income countries as a whole. Using the latest nationally representative household consumption surveys from Ghana, our analysis shows that between 2005/06 and 2012/13, the overall poverty rate fell by one-fourth, from 32 to 24%. Moreover, the extreme poverty rate fell by one-third, from 12 to 8%, during this period.

Yet, this trend slowed sharply between 2012/13 and 2016/17, when the country's poverty rates remained almost unchanged. During this period, the overall and extreme poverty rates decreased slightly, by less than 1 percentage point. This lackluster performance was likely caused by the country's reduced rate of growth in national income (measured by the gross domestic product) after 2013. More importantly, it raises concern that a considerable proportion of households might have fallen into poverty. It is also likely that a number of households might have been caught in chronic poverty during the whole period.

A challenge that hinders a deeper understanding of these poverty dynamics is the absence of nationally representative household panel surveys that collect consumption data during this period in Ghana. Without panel survey data, we cannot tell whether the 8% of households that remained poor in 2016/17 consisted of the same poor households in 2012/13, or if they represented households that newly fell into poverty in 2016/17, or any combination of these two extreme cases (for example, whether 5% of the households remained poor and 3% newly fell into poverty in 2016/17, or no households were chronically poor and all the poor households in 2016/17 were the newly poor). A similar absence of actual panel data affects insights into the poverty dynamics in many other developing countries [1]. This data challenge impairs effective poverty reduction policies, since policies that aim to address chronic poverty are generally different from those that aim to address transient poverty [2,3].

We find that (conditional) upward mobility out of poverty was more than three times higher than downward mobility into poverty in all three periods (namely, subperiods 1 and 2 and the full sample period). Further disaggregating poverty into extreme and moderate poverty, upward mobility could range from about 20% more to almost eight times more than downward mobility. Yet, (conditional)

chronic poverty and chronic extreme poverty still remained high at around 60 and 50%, respectively. Mobility also slowed during subperiod 2, compared to subperiod 1. We also find pro-poor growth in Ghana in all the considered periods: annual consumption expenditure growth rates for the extreme poor and the moderate poor reached 2, 3% during subperiod 1 and 0.5–1.2% during subperiod 2 (and 0.5–1% during the full sample period).

Factors that were positively associated with higher-than-average probabilities of exiting poverty include female household headship, higher educational attainment, urban residence, migration, and wage employment and self-employment in non-agriculture sectors. In particular, attaining the highest level of education (tertiary education) was strongly associated with upward mobility: 70% of the moderate poor and 35–40% of the extreme poor with tertiary education exited poverty. These factors are also associated with less downward mobility.

We make multiple new contributions in this study. First, we contribute new evidence to the small but growing literature on poverty dynamics and, in particular, to the literature that focuses on developing countries.² Specifically, we offer the first study to investigate these poverty dynamics for Ghana during the period 2005/06–2016/17. We address the absence of panel data by constructing new synthetic panels from three nationally representative cross-sectional rounds of the Ghana Living Standards Surveys (GLSSs). To enrich the analysis, we examine two shorter time segments, subperiod 1 (2005/06 to 2012/13) and subperiod 2 (2012/13 to 2016/17), along with the full sample period (2005/06 to 2016/17).

Beyond the need for better understanding the dynamics of overall poverty in Ghana, it is also useful to investigate the country's dynamics of extreme poverty for various reasons. Firstly, the country's extreme poverty rate of more than 20% appears relatively large and can be further disaggregated for a more refined analysis. Secondly, since extreme poverty represents a more severe form of poverty, it may be even more important to understand the dynamics of extreme poverty for better policy formulation. In particular, the country's relatively low poverty mobility rates could hide harmful dynamics among its "poorest of the poor," the extreme poor. Few studies offer analysis of both overall and extreme poverty dynamics as we do in this paper.³

Second, we employ a well-defined decomposition framework to guide our analysis and an interpretation of unconditional and conditional measures of dynamics (with the latter being our preferred measure), which appears not to have been applied in the previous literature. Finally, we offer a richer study than most existing studies on poverty dynamics by examining two aspects of the population. We investigate a rich profile of the dynamics among different population groups (which could provide more granular inputs for policy formulation) and we further investigate the dynamics of the full consumption expenditure distribution (beyond poverty analysis).

Our results are consistent with recent studies that construct synthetic panels to overcome the lack of actual panel data and investigate poverty dynamics in other developing countries. Salvucci and Tarp (2021) [11] observe a high degree of poverty immobility in Mozambique, especially in rural areas in the northern and central regions and among low-educated people. Mekasha and Tarp (2021) [12] find that in Ethiopia, households where the household head is less educated, engaged in the service sector, self-employed, or a domestic worker are population segments with more downward mobility. Analyzing synthetic panels spanning the past two decades in the Arab Republic of Egypt, Iraq, Jordan, Mauritania, Tunisia, and the West Bank and Gaza, AlAzzawi et al. (2023) [13] find that most types of female-headed households are less poor compared to male-headed households, and female-headed households are more likely to escape poverty than households more generally. An earlier study of Ghana by Dang and Dabalen (2019) [14] investigated poverty mobility during 1998–2005 and found much higher upward mobility than downward mobility.⁴

The remainder of the paper comprises four sections. We discuss the analytical framework in the next section, before describing the data in the third section. In the fourth section, we present the empirical estimates of the overall poverty dynamics, extreme poverty dynamics, profiling of the population, and dynamics of the full consumption expenditure distribution. We conclude and discuss policy implications in the last section.

² See also [4] and [5] for reviews of studies on poverty mobility in developing countries.

³ Our analysis of poverty and consumption expenditure dynamics contributes to a growing literature on different aspects of poverty in Ghana. For example, analyzing the GLSSs spanning 1991/92 to 2012/13, Clementi, Molini, and Schettino (2018) [6] reveal a persistent trend of increased polarization in Ghana's household consumption expenditure distribution. This polarization is characterized by a concentration of households in both the highest and lowest deciles, indicating a widening income gap and deeper concerns about enduring chronic poverty. Awuni et al. (2023) [7] study a panel survey in Ghana that covers 2009/10–2012/13. They call for more attention on struggling households, which form a considerable proportion of the transient poor and whose characteristics differ from those of other vulnerable groups. Other studies focus on dynamics related to vulnerability to food poverty, including [8,9] and [10].

⁴ Several important features set our study apart from [14]. Specifically, we analyze more data (three GLSS rounds) and a more recent and longer period (2005/06 to 2016/17), whereas Dang and Dabalen (2019) [14] analyze two GLSS rounds during 1998–2005. We also offer a more granular country study of Ghana (including country-specific analysis based on national poverty lines), while Dang and Dabalen (2019) [14] provide a regional, comparative analysis for 21 Sub-Saharan African countries including Ghana (based on international poverty lines). The topics of analysis also differ: we focus more on poorer population groups, with some discussion of the whole consumption expenditure distribution, while Dang and Dabalen (2019) [14] study poverty dynamics and vulnerability among richer population groups.

Analytical framework

We apply statistical methods developed by Dang et al. (2014) [15] and Dang and Lanjouw (2023b) [16] to construct synthetic panel data from repeated cross-sections. Researchers have performed validations and applications of synthetic panel methods for different country and regional contexts, ranging from Africa to Latin America, the Middle East, and Europe [11,13,17–22].⁵ These methods essentially estimate the change in poverty (or welfare) using two sets of characteristics: one, time-invariant individual characteristics (for example, ethnicity, religion, place of birth, or completed education), and, two, unobserved time-varying factors (for example, unexpected shocks to household consumption). Certain deterministic variables, such as age, can also be included in the first set since given its value in one survey round, age can be determined by the time interval between the two rounds. Similarly, time-varying household characteristics can also fall under the first set if retrospective questions about the values of such characteristics in the first survey round are asked in the second round. We present a more detailed discussion of these methods in Appendix A. Here we focus on presenting the decomposition of the different dimensions of poverty dynamics.

Let y_{ij} and z_j denote household i 's consumption expenditure (or income) and the poverty line in survey round j , $j = 1$ or 2 , respectively. We are interested in knowing such quantities as

$$P(y_{i1} < z_1 \text{ and } y_{i2} > z_2), \quad (1)$$

which represents the percentage of households that are poor in the first survey round (year) but nonpoor in the second survey round, or

$$P(y_{i2} > z_2 | y_{i1} < z_1), \quad (2)$$

which represents the percentage of poor households in the first round that exit poverty in the second round. Quantities (1) and (2), respectively, represent the probability that household i is poor in the first survey round (year) but nonpoor in the second survey round, and the probability that poor household i (in the first round) exits poverty in the second round. At the population level, these quantities can also be interpreted as percentages of the population groups of interest. For the average household, quantity (1) provides the joint (unconditional) probability of household poverty status in both years, and quantity (2) provides the conditional probability of household poverty status in the second year given its poverty status in the first year. For convenience, we also refer to (1)-type quantities and (2)-type quantities, respectively, as unconditional and conditional measures of poverty mobility.

Next, we present a decomposition of poverty mobility that can be analyzed using synthetic panels. Although these decomposition formulas are simple, they can help to fix ideas for better clarity. In addition, to our knowledge, they appear not to have been clearly laid out in the previous literature.

The following equality holds for the unconditional probabilities:

$$P(y_{i1} < z_1 \text{ and } y_{i2} < z_2) + P(y_{i1} < z_1 \text{ and } y_{i2} > z_2) = P(y_{i1} < z_1), \quad (3)$$

where the first and second terms on the left-hand side, respectively, represent chronic poverty (the percentage of households that are poor in both years) and upward mobility (the percentage of households that are poor in the first year but exit poverty in the second year). These two terms together make up the percentage of the population that is poor in the first year (which is the poverty rate in the first year). Thus, given the same poverty rate in the first year, Eq. (3) implies an inverse relationship between chronic poverty (the first term on the left-hand side) and upward mobility (the second term on the left-hand side) since they sum to the same total.

We create a similar decomposition for the poverty rate in the second period by reversing the inequality signs in the second term on the left-hand side, which results in the following:

$$P(y_{i1} < z_1 \text{ and } y_{i2} < z_2) + P(y_{i1} > z_1 \text{ and } y_{i2} < z_2) = P(y_{i2} < z_2). \quad (4)$$

The second term on the left-hand side now represents downward mobility (the percentage of households that are nonpoor in the first year but fall into poverty in the second year), which together with chronic poverty (the first term on the left-hand side) sums to the poverty rate in the second period. Similar to Eq. (3), Eq. (4) also implies that for the same poverty rate in the second year, an inverse relationship exists between chronic poverty and downward mobility.

A key result from Eqs. (3) and (4) is that although the chronic poverty rate is always less than or equal to the poverty rate (in the first or second year), there can be *no* correlation between the former and the latter. Put differently, analyzing poverty rates using cross-sectional data may not reveal useful information on poverty dynamics that can be obtained with panel data.

Eqs. (3) and (4) provide the unconditional versions of poverty mobility, which do not take into account the information offered by a household's poverty status in any given year. Additional information on the household's past poverty status is highly relevant for policy formulation. For example, policy makers are typically interested in understanding what share of the poor exit poverty, and whether these dynamics can be attributed to certain anti-poverty or development policies that they have implemented. Consequently, although we present both the unconditional and conditional measures of poverty dynamics, the conditional measure is our preferred measure for interpretation. Hereafter, unless noted otherwise, we refer to chronic poverty and upward (downward) mobility as

⁵ Other alternatives to panel data include collecting retrospective data on household poverty status over the recent past or using a household asset index to measure household wealth transitions [23,24]. While these approaches are useful, studies point to several unsettled challenges, such as the difficulty of collecting accurate recall data [19] or interpreting asset indexes [25].

conditional quantities.

Dividing all the terms in Eqs. (3) and (4) by the right-hand side, we have the conditional versions of these equalities:

$$P(y_{11} < z_1 \text{ and } y_{12} < z_2 | y_{11} < z_1) + P(y_{11} < z_1 \text{ and } y_{12} > z_2 | y_{11} < z_1) = 1, \tag{5}$$

$$P(y_{11} < z_1 \text{ and } y_{12} < z_2 | y_{12} < z_2) + P(y_{11} > z_1 \text{ and } y_{12} < z_2 | y_{12} < z_2) = 1. \tag{6}$$

Several remarks are in order. First, similar to the unconditional quantities in Eqs. (3) and (4), since the two terms on the right-hand side of Eqs. (5) and (6) sum to 1, an inverse relationship exists between conditional chronic poverty and conditional upward mobility or conditional downward mobility. However, due to the different denominators, the conditional quantities on the left-hand side in Eqs. (5) and (6) can be quite different from the unconditional quantities in Eqs. (3) and (4).

Second, while the first terms on the left-hand side of Eqs. (5) and (6) share the same common numerator (the probability of being poor in both periods), they have different denominators (the probability of being poor in the first period in Eq. (5) or the probability of being poor in the second period in Eq. (6)). Consequently, the conditional chronic poverty rate in the first period (the first term on the left-hand side in Eq. (5)) is not the same as the conditional chronic poverty rate in the second period (the first term on the left-hand side in Eq. (6)). However, this difference does not exist with the unconditional probabilities in Eqs. (3) and (4). Consequently, unlike unconditional chronic poverty, when referring to conditional chronic poverty, we need to be clear about the time period under consideration.

Third, the framework above can be extended straightforwardly to allow investigation of extreme poverty dynamics together with poverty dynamics. That is, we can modify Eqs. (1) to (6) to add the dynamics of the additional category of extreme poverty. For example, let ez_j represent the extreme poverty line in survey round j , $j = 1$ or 2 . The decomposition of the unconditional poverty dynamics in Eqs. (3) and (4) can be extended to unconditional extreme poverty dynamics as follows:

$$P(y_{11} < ez_1 \text{ and } y_{12} < ez_2) + P(y_{11} < ez_1 \text{ and } ez_2 < y_{12} < z_2) + P(y_{11} < ez_1 \text{ and } y_{12} > z_2) = P(y_{11} < ez_1), \tag{7}$$

$$P(y_{11} < ez_1 \text{ and } y_{12} < ez_2) + P(ez_1 < y_{11} < z_1 \text{ and } y_{12} < ez_2) + P(y_{11} > z_1 \text{ and } y_{12} < ez_2) = P(y_{11} < ez_2). \tag{8}$$

Similarly, the decomposition of the conditional poverty dynamics in Eqs. (5) and (6) can be extended to conditional extreme poverty dynamics as follows:

$$P(y_{11} < ez_1 \text{ and } y_{12} < ez_2 | y_{11} < ez_1) + P(y_{11} < ez_1 \text{ and } ez_2 < y_{12} < z_2 | y_{11} < ez_1) + P(y_{11} < ez_1 \text{ and } y_{12} > z_2 | y_{11} < ez_1) = 1, \tag{9}$$

$$P(y_{11} < ez_1 \text{ and } y_{12} < ez_2 | y_{12} < ez_2) + P(ez_1 < y_{11} < z_1 \text{ and } y_{12} < ez_2 | y_{12} < ez_2) + P(y_{11} > z_1 \text{ and } y_{12} < ez_2 | y_{12} < ez_2) = 1. \tag{10}$$

The equations can be interpreted in a mostly similar manner as for the equations for poverty dynamics. For example, in Eq. (7), the first term on the left-hand side represents chronic extreme poverty (the percentage of households that are extremely poor in both years). The second and third terms on the left-hand side, respectively, represent upward mobility from extreme poverty to moderate poverty (the percentage of households that are extremely poor in the first year but move to moderate poverty in the second year) and movement out of poverty (the percentage of households that are extremely poor in the first year but move out of poverty in the second year).

Since upward mobility out of extreme poverty to non-poverty represents a stronger upward transition than upward mobility from extreme poverty to moderate poverty, the third term tends to be smaller than the second term in most contexts. However, since there are three terms on the left-hand side now, Eq. (7) indicates that there is an inverse relationship between chronic extreme poverty and the sum of the other two terms for upward mobility (and not necessarily either of these two terms separately). Similarly, as discussed with Eqs. (5) and (6), given the different probability denominators for the different periods, the chronic extreme poverty rate can vary for different periods and we should refer to it by the specific period under discussion.

Finally, to study the dynamics of the complete consumption expenditure distribution, a useful method is to employ growth incidence curves (GICs) [26], which trace the growth rates over time for the different percentiles along the full consumption expenditure distribution instead of several poverty categories. Consumption expenditure growth is naturally considered pro-poor if the poorer part of the consumption expenditure distribution, which can be delineated by the poverty line, grows faster than the richer part. By construction, the anonymous GIC (based on cross-sectional data) tends to underestimate growth for the poorer part of the consumption expenditure distribution, while overestimating that of the richer part. Consequently, our non-anonymous GIC (based on synthetic panels) can provide upper and lower bound estimates for consumption expenditure growth.

A simple example can help to illustrate this. Given some upward mobility, some households in the poorest consumption expenditure decile in the first year move to richer deciles in the second year. Thus, the cross-sectional growth (underlying the anonymous curve) for mean consumption expenditure of the poorest decile in the two survey rounds would not capture these upwardly mobile households and would underestimate consumption expenditure growth for this decile. A similar reasoning results in the cross-sectional growth of the richest overestimating consumption expenditure growth since some households move down instead. The (synthetic) panel growth (underlying the non-anonymous curve) can capture these households and provide better estimates of their consumption expenditure growth over time. (For example, Glewwe and Dang (2011) [27] provide a related discussion in the context of consumption expenditure growth in Viet Nam.) Thus, these two curves taken together can help to bound the true growth rates of the poorer and richer parts of the consumption expenditure distribution.

Data

We examine three rounds of the GLSS administered in 2005/06 (GLSS 5), 2012/13 (GLSS 6), and 2016/17 (GLSS 7). First administered in 1987/88 and then conducted periodically by the Ghana Statistical Service, the GLSSs provide the official data source for monitoring poverty in the country. As earlier surveys are not perfectly comparable with the later surveys, we analyze these three survey rounds.

All the survey rounds follow the same two-stage stratified sampling design (although the numbers of primary and secondary sampling units can differ across rounds). In the first stage, the GLSSs are stratified by regions and urban/rural areas, and the enumeration areas are selected based on probability proportional to population size to form primary sampling units. A complete listing of households in the selected primary sampling units is subsequently undertaken, from which a fixed number of households (secondary sampling units) are selected. All the survey rounds are representative at the national and region-by-area (urban/rural) levels.

For GLSS 6 and GLSS 7, the enumeration areas (along with their respective population and household sizes, used for determining the GLSS sampling weights) were obtained from Ghana's 2010 Population and Housing Census. GLSS 5 drew these data from Ghana's 2000 Population and Housing Census. GLSS 5 was conducted between September 2005 and September 2006 and interviewed 8687 households in 580 primary sampling units across the country. GLSS 6 was conducted between October 2012 and October 2013 and interviewed 16,772 households in 1200 primary sampling units across the country. GLSS 7 was conducted between October 2016 and October 2017 and interviewed 14,009 households in 1000 primary sampling units across the country. Although the various rounds of the GLSS gathered data through different types of questionnaires, the data used in this study come from the household questionnaire only.

Our poverty estimates are obtained using the country's official poverty lines. Ghana uses two poverty lines: an upper (or overall) poverty line below which an individual is considered unable to meet all their food and nonfood needs, and a lower (or extreme) poverty line below which an individual is considered unable even to meet their food needs. For 2013, the overall poverty line was set at 1314 cedis per adult equivalent per year, and the extreme poverty line was set at 792 cedis per adult equivalent per year.⁶ We define the moderate poor as households with consumption expenditure below the overall poverty line and above the extreme poverty line, and the extreme poor as households with consumption expenditure below the extreme poverty line. Consumption expenditure data are spatially and temporally deflated using January 2013 prices and adjusted for differences in need for different ages and economies of scale. The construction of the main explanatory variables used in the analysis is presented in [Appendix B](#).

We use a restricted sample that includes only household heads ages 25–55 in the first survey round, as the same cohort of individuals must be followed across time. In addition, restricting the household head's age to a specific range helps to keep the household composition stable over different periods. It is useful to check that the distributions of the time-invariant variables for the two survey rounds are similar across different periods, since the synthetic panel approach that we employ relies on the assumption that both surveys represent the same population. The time-invariant variables that we employ to construct the synthetic panels are the following: age, gender, birthplace, religion, language, educational attainment (in levels), parents' educational and occupational characteristics, and regional characteristics. [Table A.1](#) (in [Appendix A](#)) reports the summary statistics of the time-invariant characteristics for the three survey rounds. The table shows that household heads tend to be older and the share of female household heads increases over time. Moreover, the population tends to become more educated over time. Some characteristics associated with higher levels of household welfare (for example, household heads with tertiary education or urban residents) show a statistically significant improvement over time. Still, in general, these changes appear to be negligible, and most of the differences are not statistically significant.

Results

Overall poverty dynamics

Our estimation model (model 1) includes time-invariant characteristics of the household head, namely, age, gender, place of birth, religion, language, educational attainment, parents' occupational and educational characteristics, and the household's area of residence (which assumes the absence of internal rural-urban migration). Results from ordinary least squares regressions for each period (based on equation (A.1) in [Appendix A](#)) are reported in [Table A.2](#). Most of the estimated coefficients are highly significant and consistent over time. The adjusted R^2 statistic for these equations ranges from 0.37 to 0.40, indicating a good fit. These R^2 values are higher than those reported in many previous studies using synthetic panels for other developing countries (see [Table A.3](#), in [Appendix A](#)), which might be because of the inclusion of additional, highly significant regressors, such as parents' characteristics. Further adding additional regional controls to model 1 does not significantly increase the model's explanatory power, so we use this model for the analysis.

[Table 1](#) reports the estimation results for the unconditional poverty dynamics (based on [Eqs. \(3\) and \(4\)](#)) for subperiods 1 and 2 and the full sample period.⁷ There were relatively low levels of transition into and out of poverty during all these periods. Both upward and downward mobility rates hover close to 10%, with somewhat more upward mobility. Put differently, immobility was relatively high, with immobility rates reaching roughly more than 80% (the sums of the cells in the main diagonals of the matrixes).

⁶ The exchange rate between Ghanaian cedis and US dollars was 1.98 in 2013 [[28](#)].

⁷ We employ the second survey round as the base year for the main analysis. Estimation results based on the first survey round as the base year (see [Table a.4](#), in [Appendix A](#)) remain qualitatively similar.

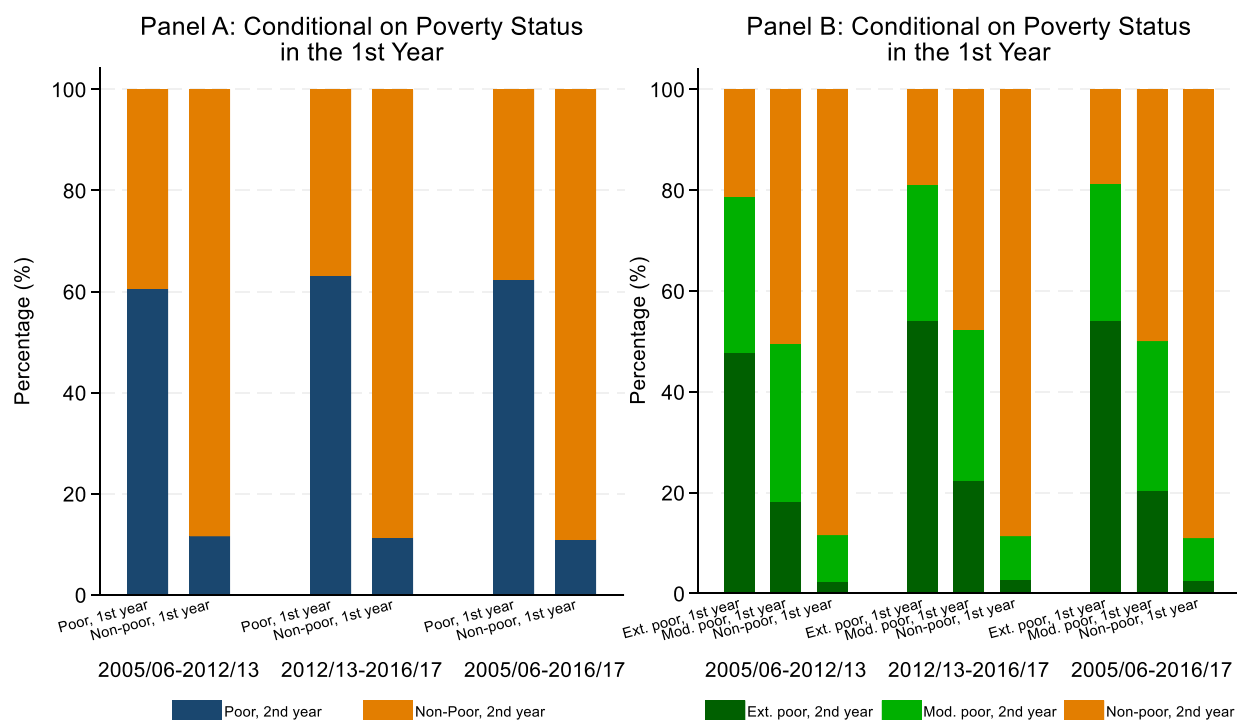


Fig. 2. Poverty dynamics, conditional on poverty status in the first year.

More specifically, panel A in Table 1 shows that for subperiod 1, 14.9% of the population remained in poverty (unconditional chronic poverty), 9.7% were poor in the first year but exited poverty in the second year (unconditional upward mobility), and 8.7% were not poor in the first year but fell into poverty in the second year (unconditional downward mobility). The dynamics remained similar for the other periods, although in subperiod 2, there was somewhat less upward mobility (8.4%), and unconditional upward mobility was also slightly lower than unconditional downward mobility for this subperiod. For the full sample period, the chronic poverty rate was slightly higher, at 16.3%.

Further probing our preferred conditional dynamics measures, panel A in Fig. 2 shows the estimated conditional poverty mobility rates (Eq. (6)), where each bar in the figure shows the decomposition of poverty status in the second year. In the figure, the colors blue and orange denote poverty and non-poverty, respectively. The bars are grouped by poverty status in the first year (the first and second bars show poverty and non-poverty in the first year, respectively). Table A.5, in Appendix A, reports the full estimation results. The (conditional) mobility rates tell a more positive story in which poor households had upward mobility rates that were more than three times the downward mobility rates of nonpoor households (upward mobility was 39.5, 36.8, and 37.6% in subperiod 1, subperiod 2, and the full sample period, respectively, compared with downward mobility of 11.6, 11.4, and 11% for the same periods, respectively). Put differently, seemingly similar unconditional upward mobility rates translate into higher conditional upward mobility rates for these periods. This result is due to the fact that the proportion of the population that was poor in the first year was lower than the proportion that was not poor in the same year, and is consistent with our earlier discussion of Eqs. (5) and (6).

Yet, Fig. 2 also shows that chronic poverty rates still remain high, at around 60% for the two subperiods and the full sample period. Defining the mobility rates using household poverty status in the second survey year produces similar estimates (Fig. A.1, in Appendix A). For comparison, Ghana's chronic poverty rate during the full sample period is lower than its rate of around 78% during 1998–2005 and the regional average chronic poverty rate of around 71% for 21 Sub-Saharan African countries spanning the early 2000s to the early 2010s [14]. However, Ghana's rate falls inside the chronic poverty range of 49 to 73% for India during 2004–11 [29].⁸

Extreme poverty dynamics

Table 2 disaggregates the poor households in Table 1 into two groups: those that are extreme poor (with consumption expenditure levels below the extreme poverty line) and those that are moderate poor (with consumption expenditure levels higher than the extreme poverty line but lower than the overall poverty line). The estimated unconditional poverty dynamics are broadly consistent with the

⁸ The other two studies use different poverty lines. Dang and Dabalen (2019) [14] use a somewhat higher poverty line of \$1.9 per day in 2011 purchasing power parity dollars, and Dang and Lanjouw (2018) [29] use an all-rural-India poverty line of 446.68 rupees per capita per month.

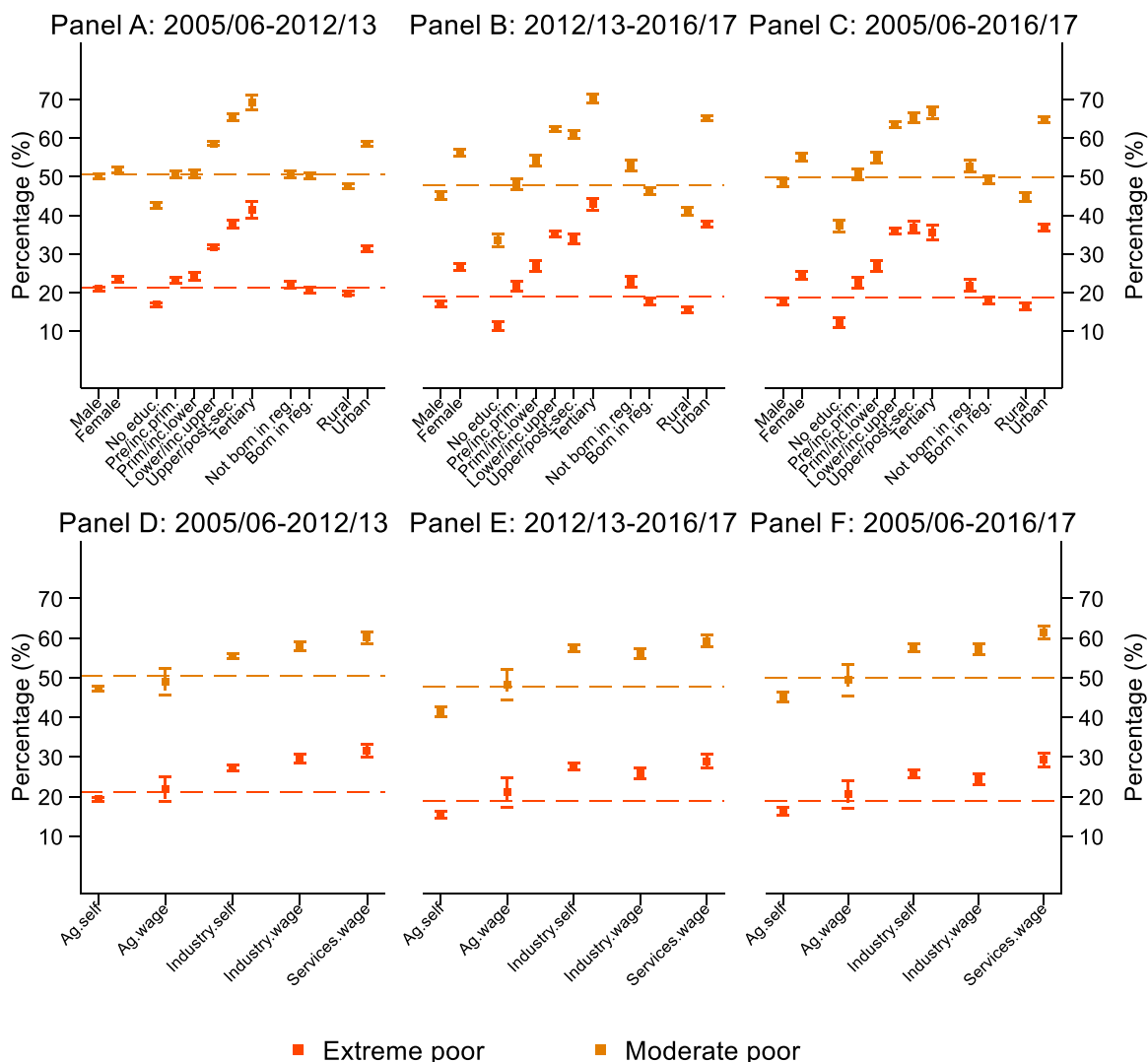


Fig. 3. Profile of the extreme and moderate poor population that exited poverty, conditional on being poor in the first year
Note: Dashed lines represent the national average for each period (21.2% for 2005/06–2012/13, 18.9% for 2012/13–2016/17, and 18.8% for 2005/06–2016/17 for the extreme poor, and 50.5% for 2005/06–2012/13, 47.7% for 2012/13–2016/17, and 49.9% for 2005/06–2016/17 for the moderate poor). Time-invariant and labor characteristics are measured in the second period.

trends in [Table 1](#). In all three periods, the unconditional immobility rates remain high at roughly 76–77% of the population (summing the proportions of the population in the three cells along the diagonal of the transition matrix). In other words, less than 25% of the population experienced mobility in these periods.

Specifically, during subperiod 1, the unconditional upward mobility rate was 12.6% (the proportion of the population that moved up one or two consumption expenditure categories, which equals the sum of the upper off-diagonal cells), which was slightly higher than the unconditional downward mobility rate of 11.5% (the proportion of the population that moved down one or two consumption expenditure categories, which equals the sum of the lower off-diagonal cells) over the same period (panel A in [Table 2](#)). However, during subperiod 2, the unconditional upward mobility rate was 10.7%, which was slightly lower than the unconditional downward mobility rate of 12% (panel B). Consistent with our theoretical discussion in section II, among those whose poverty status changed, a lower percentage of the population was associated with more than one jump across the consumption expenditure categories. For example, during subperiod 1, the unconditional downward mobility rate from non-poverty to moderate poverty was 7.0%, but the unconditional downward mobility rate from non-poverty to extreme poverty was only 1.8%.⁹

Panel C in [Table 2](#) shows consumption mobility over the full sample period. The patterns appear quite similar to the those in the two

⁹ We employ the second survey round as the base year for the main analysis. Estimation results based on the first survey round as the base year, reported in [Table A.6](#), in [Appendix A](#), remain qualitatively similar.

subperiods, where there was a similar significant degree of immobility (unconditional immobility rate of 76%) and somewhat higher upward mobility than downward mobility (12.7% versus 11.3%).

Turning next to our preferred conditional dynamics measure, panel B in Fig. 2 shows more clearly that mobility decreased during subperiod 2 compared to subperiod 1, with a growing number of the moderate poor transitioning downward into the category of extreme poverty and an increasing number of the extreme poor finding themselves stuck in chronic poverty. (Table A.7, in Appendix A, reports the full estimation results.) Specifically, the chronic extreme poverty rate remained sizable at 47.7% during subperiod 1 and 54.1% during both subperiod 2 and the full sample period. The upward mobility rate for the extreme poor was 52.3% during subperiod 1, but this rate decreased to 45.9% during subperiod 2. The upward mobility rate for the extreme poor out of poverty also decreased, from 21.2 to 18.9% across the two subperiods.

However, the increased mobility of the moderate poor is mainly explained by the downward mobility of the group falling into extreme poverty, from 18.2% in subperiod 1 to 22.4% in subperiod 2. Examining the full sample period also indicates that only about 20% of the extreme poor was able to exit poverty by the end of the period. The situation was better for the moderate poor—less than one-third of the moderate poor (29.7%) were chronically poor, and half of the group was able to exit poverty by the end of the period.

Still, there was more upward than downward mobility in the two subperiods and the full sample period. Compared to downward mobility, upward mobility ranged from about 20% more ($= 27.1/22.4$, when comparing upward mobility from extreme poverty to moderate poverty against downward mobility from moderate poverty to extreme poverty during subperiod 2) to almost eight times more ($= 21.2/2.4$, when comparing upward mobility from extreme poverty to non-poverty against downward mobility from non-poverty to extreme poverty during subperiod 1).

Profile of population groups

We further examine household heads' characteristics associated with (conditional) upward mobility out of poverty, for both the extreme poor and the moderate poor, and plot the results in Fig. 3. (Table A.8, in Appendix A, reports the full estimation results.) These characteristics include gender, educational attainment, place of birth, urban or rural area of residence, and occupational sector. Several main findings stand out from Fig. 3. First, consistent with our discussion of the general population, the moderate poor have a much higher chance of moving out of poverty than the extreme poor for all the population groups considered. Second, factors that are positively associated with higher-than-average probabilities of exiting poverty include female household headship, higher educational attainment, urban residence, migration (to some extent), and wage employment and self-employment in non-agriculture sectors. We further examine other similar factors and plot the results in Figs. A.2–A.5, in Appendix A. These figures provide supportive evidence that working in nonagricultural occupations or sectors and having a lower child dependency ratio, better market access, and electricity are associated with better upward mobility out of poverty. Residing in certain regions is also associated with more upward mobility (such as Greater Accra, Ashanti or Western regions) or less upward mobility (such as Northern, Upper East or Upper West regions). In contrast, Fig. A.5 shows that drought and higher temperatures are associated with lower upward mobility.

Female household headship, higher educational attainment, urban residence or residing in specific regions, migration, and wage employment and self-employment in non-agriculture sectors are also associated with less downward mobility (Figs. A.6–A.10, in Appendix A). Finally, while these results could vary for specific periods, overall they appear to be consistent for the two subperiods and the full sample period.

Among the specific population groups, female household heads were only slightly more likely to exit poverty than their male counterparts during subperiod 1 (panel A in Fig. 3). This difference was more pronounced during subperiod 2, with female-headed households experiencing a substantially higher transition out of poverty (panel b in Fig. 3). Migrated households also had stronger upward mobility during subperiod 2 compared to subperiod 1.

Comparing mobility over different levels of educational attainment, the population with the highest level of educational attainment (tertiary education) remained significantly more upwardly mobile in both subperiods (approximately 70% of the moderate poor and 35–40% of the extreme poor exited poverty). In addition, the population with complete lower or upper secondary education showed high levels of upward mobility (60–65% of the moderate poor and 33–37% of the extreme poor exited poverty). Households with uneducated household heads showed the lowest upward mobility rate compared to other educational attainment levels (only 33–43% of the moderate poor and less than 20% of the extreme poor exited poverty in both subperiods). Yet, while the disadvantage stemming from the lack of formal education appears to have increased over time, there may have been some diminishing returns to educational attainment at the upper secondary or post-secondary education levels, particularly during subperiod 2 and the full sample period.

Fig. 3 also shows that more households moved out of poverty in urban areas than in rural areas, particularly during subperiod 2. By the end of 2016/17, around 37% of the urban extreme poor and about 65% of the urban moderate poor had exited poverty (panel C).

Panels D to F in Fig. 3 illustrate the combined relationship between occupational sector (agriculture, industry, or services) and employment status (wage employment or self-employment). First, the results show that nonagricultural work was associated with a higher chance of moving out of both extreme and moderate poverty in subperiod 1 (panel D) and subperiod 2 (panel E). For example, the chance for workers in the service sector to move out of poverty in 2012/13, given that they were moderately poor in 2005/06, would be more than 10 percentage points higher than the chance for the self-employed in the agriculture sector. The corresponding figure for subperiod 2 climbed even higher, to a difference of almost 20 percentage points between these two types of workers in moderate poverty and a difference of about 15 percentage points for those in extreme poverty. Furthermore, the chances of self-employed agricultural workers exiting extreme and moderate poverty decreased significantly in subperiod 2 compared to subperiod 1. Second, there was an interactive effect between the occupational sector and employment status for those in agricultural work during subperiod 2, with wage-employed workers in agriculture being in a better welfare position than self-employed workers in agriculture.

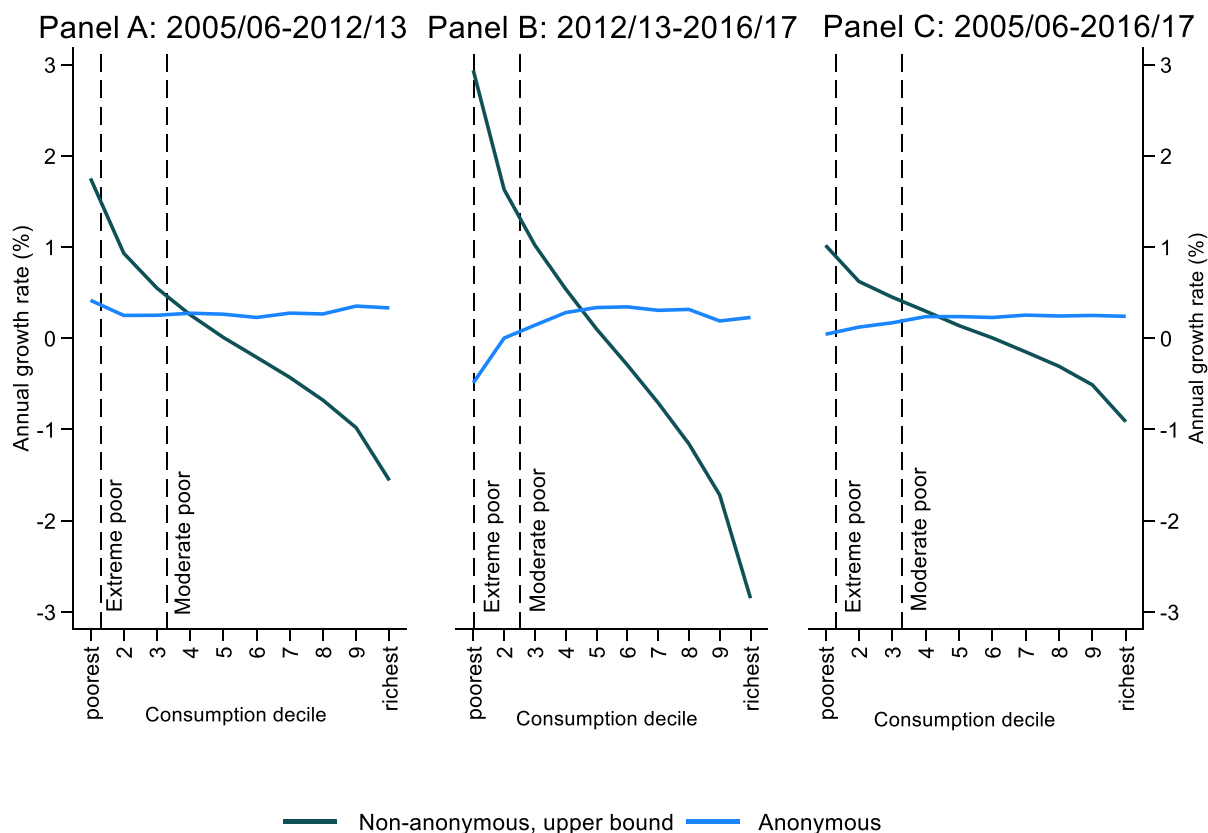


Fig. 4. Growth incidence curves, 2005/06–2016/17

Note: Growth rates (in percent) are based on household consumption expenditure per adult equivalent. Consumption expenditure data are converted to 2013 prices using Consumer Price Index deflators. All numbers are estimated with synthetic panel data and weighted with population weights, where the second survey round is used as the base year. The number of replications for the upper bound estimates is 500. Household heads' ages are restricted to 25–55 for the first survey round and adjusted accordingly for the second survey round.

Our results resonate strongly with those of recent studies of Ghana. In particular, Zereyesus et al. (2017) find that nonagricultural work significantly increases future expected food consumption, reducing vulnerability to food poverty in Ghana. While on-farm specialization leads to significant welfare costs and lower income poverty reduction for rural households, income diversification increases poverty reduction [30,31]. Furthermore, Dzanku (2020) [31] finds that educational attainment is significantly correlated with continued diversification. Awuni et al. (2023) [7] also find that the household head's gender and education and the household's urban or rural area of residence are key determinants of vulnerability to poverty.

Our finding on the important role of urban residence in reducing poverty and increasing upward mobility among the poor is consistent with Janz et al.'s (2023) findings for several other Sub-Saharan African countries. Yet, Janz et al. (2023) [32] also observe that not everyone equally experiences the positive impacts of urbanization in Sub-Saharan Africa. As an example, rural households have higher levels of energy poverty than urban households [33]. This could result in worsened poverty trends during times of crises.¹⁰

¹⁰ Indeed, the poor were particularly vulnerable during the recent coronavirus pandemic, during which economic damages to Ghana's gross domestic product significantly surpassed the economic impacts documented in comparable African countries [34], and as many as 3.8 million Ghanaians were estimated to fall into temporary poverty [35]. The low-income urban population and workers in informal self-employment were found to be severely affected by the coronavirus pandemic-induced partial lockdown, particularly in terms of earnings, job losses, and increased food prices [36,37]. Furthermore, rural households experienced a 22-percentage point higher increase in poverty compared to urban households [38]. Analysis of the welfare distribution of government utility subsidies in Ghana during the pandemic shows a disparity favoring nonpoor households, with nonpoor urban and rural households experiencing higher welfare gains from subsidies compared to their poor and very poor counterparts, a trend that was more pronounced before the pandemic [39]. As a solution to these challenges, Cuesta et al. (2021)[40] call for a variety of urban social assistance programs for Ghana that include adjusting cash benefits to align with urban costs of living and inflation, focusing on youth and women in job creation, and ensuring low-income residents' access to basic services, with poverty targeting based on proxy-means tests and other approaches.

Consumption expenditure dynamics

Fig. 4 plots two growth incidence curves (GICs), one for the cross-sectional data (lighter blue) and the other for the synthetic panel data (darker blue). These two GICs are also known as the anonymous curve and the non-anonymous curve, respectively, due to their different treatments of the longitudinal nature of the data. The non-anonymous curve is constructed based on the upper bound approach in [15] and, thus, provides an upper bound estimate of consumption expenditure mobility.

Both curves are graphed based on the changes in the median consumption expenditure levels of the consumption expenditure deciles. In Fig. 4, the anonymous curve is rather flat along the consumption expenditure distribution between 2005/06 and 2012/13, indicating that consumption expenditure growth was more equitable, with the poor experiencing almost the same positive consumption expenditure growth as the rich. Since 2012/13, the trend has reversed, with the poorest quintile experiencing negative consumption expenditure growth (below zero). During the full sample period, median consumption expenditure among the poorest decile did not change significantly, while the richest decile experienced modest positive consumption expenditure growth.

However, by construction, the anonymous curve tends to underestimate growth for the poorer part of the consumption expenditure distribution and overestimate that for the richer part (as discussed in section II). Our non-anonymous curve can better indicate the true picture of consumption expenditure growth through its upper bound. In Fig. 4, the non-anonymous curve shows higher consumption expenditure growth for the lower deciles of the initial consumption expenditure distribution and even negative growth for the richest four deciles, suggesting that growth was pro-poor in the two subperiods and the full sample period. These results are qualitatively similar to those based on comparable analysis for Senegal, where poorer households are also shown to have better consumption growth [41]. However, notably for Ghana, the poor had slightly more consumption expenditure growth during subperiod 2 compared to subperiod 1.

In particular, annual consumption expenditure growth rates for the extreme poor and the moderate poor could reach 2–3% during subperiod 1 and 0.5–1.2% during subperiod 2. For the full sample period, the corresponding maximal annual consumption expenditure growth rates for the two groups would be 0.5–1%. These growth rates are smaller than the average growth rates of 4–5% in Indonesia during 2000–14 [42]. Ghana's growth rates also appear to be smaller than similar growth rates in Cameroon during 1996–2006 and Senegal during 1994–2006, but larger than those in Tanzania during 2009–11 [43].

Conclusion

We offered new insights into the dynamics of overall poverty, extreme poverty, and the whole consumption expenditure distribution in Ghana during 2005/06 –2016/17. Applying new statistical methods developed by Dang and Lanjouw (2023b) [16] and Dang et al. (2014) [15], we constructed synthetic panel data from three rounds of GLSS cross-sections. In the absence of true panel household survey data, these synthetic panel data allow us to study these dynamics and profile the population that remained in poverty or moved out of or into poverty. We presented an explicit decomposition framework, which allows us to examine a rich profile of the dynamics among different population groups. We also went beyond poverty analysis and offered new findings for the dynamics of the full consumption expenditure distribution.

We uncovered findings that might have been masked by analysis based on cross-sectional data alone. On the one hand, there was a significant reduction of cross-sectional extreme poverty rates over the full sample period. Poor households were somewhat more likely to exit poverty than nonpoor households were likely to fall into poverty, and poor households were more likely to have enjoyed stronger consumption expenditure growth. Yet, our findings also point to considerable chronic poverty, with conditional chronic overall poverty and chronic extreme poverty hovering around 60 and 50%, respectively. Furthermore, less than half of the extreme poor moved up one or two consumption expenditure categories during the full sample period. A potential concern emerging from the patterns we observed is that further poverty reduction will become increasingly difficult to achieve if policies fail to address the structural factors that constrain upward mobility out of poverty.

Factors such as educational attainment, female household headship, urban residence (or residence in specific regions), wage employment, and nonagricultural work strongly correlate with poverty reduction. However, households with less education, rural residence, as well as working in agriculture (including the self-employed in agriculture) are markedly more likely to experience downward mobility. Compared to all the other correlates, educational attainment appears to be most effective in pushing households out of poverty and keeping them from falling into poverty. These results are consistent with those of recent studies of Ghana (discussed in section four, profile of population groups) and review studies on poverty mobility in other countries [1,4,5].

The findings have strong relevance for policy advice for Ghana. As a concrete example, our estimates (Fig. 3 and Table A.8, in Appendix A) suggest that the probability of moving from extreme poverty to non-poverty during the full sample period was 12% for household heads with no education. This probability more than doubled and more than tripled to 27 and 37%, respectively, for those with less than secondary education and those with complete upper secondary education. In comparison, the positive effects on extreme poverty reduction associated with achieving upper secondary education were comparable to those for urban residence (37%) and greater than those for working as a manager or in a professional position (34%). Put differently, the positive effects on escaping extreme poverty associated with changing from achieving no education to achieving upper secondary education (from 12 to 37%) were

almost comparable to those caused by a career change from working as an agricultural worker to working in a professional position (16 to 34%). These estimates of the poverty-reducing effects of education provide supportive evidence for the country's recent policy reform of offering free secondary education to all students [44–46].

As another example, consistent with earlier studies (discussed in section four, profile of population groups), our findings further underscore the importance of nonagricultural work and income diversification as routes out of poverty. The results suggest that working in the industrial sector could increase the probability of moving out of extreme poverty into non-poverty by around 7 percentage points (from around 18 to 25%) (Fig. 3 and Table A.8, in Appendix A). Working in the service sectors could further raise this probability by an additional 4 percentage points. While these increases appear smaller than the positive impacts associated with educational attainment, they represent substantial potential for poverty reduction.

These findings highlight the fact that addressing chronic poverty, especially chronic extreme poverty, might be most effectively achieved via a mix of interventions that lift long-term income prospects. The interventions can include measures that support increased educational attainment or promote economic growth in sectors where the poor are active, such as agriculture.

Beyond the country-specific challenges, our findings are strongly relevant to both the regional and global discourses on poverty reduction. In particular, our results offer useful inputs to policies aiming to achieve Africa's Union's Agenda 2063 Goals numbers 1 (i.e., a high standard of living, quality of life and well-being for all citizens. and number 2 (i.e., well educated citizens and skills revolution underpinned by science, technology and innovation).¹¹ These directly correspond to the Sustainable Development Goal (SDG) number 1 of ending poverty. Under this goal, the most relevant targets include target 1.1 (i.e., ending extreme poverty), target 1.2 (i.e., reduce at least by half the national poverty rates), and target 1.3 (i.e., implement nationally appropriate social protection systems and measures for all, especially the poor and the vulnerable). Our findings of the importance of education attainment and nonagricultural work and income diversification for reducing poverty are also related to several other SDGs, including SDG number 4, target 4.1 on education (i.e., ensuring that all girls and boys complete free, equitable and quality primary and secondary education) and SDG number 8, target 8.3 on income diversification (i.e., achieving higher levels of economic productivity through diversification, technological upgrading and innovation).¹²

Data availability

The datasets used and/or analysed during the current study are available (with corresponding author) on reasonable request.

CRedit authorship contribution statement

Hai-Anh H. Dang: Conceptualization, Formal analysis, Investigation, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing. **Dhushyanth Raju:** Conceptualization, Funding acquisition, Supervision, Investigation, Writing – review & editing. **Tomomi Tanaka:** Conceptualization, Funding acquisition, Supervision, Investigation. **Kseniya Abanokova:** Data curation, Formal analysis, Investigation, Methodology, Software.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Overview of Synthetic Panel Methods

In this appendix, we provide an overview of the methods to construct synthetic panels, developed by Dang et al. (2014) [15] and Dang and Lanjouw (2023b) [16]. Recent applications and further validation of synthetic panel methods have been implemented for data from various countries in Sub-Saharan Africa, as well as in the East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, South Asia, and Middle East and North Africa regions (see [1,47,48] for recent reviews).

Let x_{ij} be a vector of household characteristics observed in survey round j ($j = 1$ or 2) that are also observed in the other survey round for household i ($i = 1, \dots, N$). These household characteristics can include such time-invariant variables as ethnicity, religion, language, place of birth, parental educational attainment, and other time-varying household characteristics if retrospective questions about the first-round values of such characteristics are asked in the second-round survey. To reduce spurious changes due to changes in household composition over time, we usually restrict the estimation samples to household heads in a certain age range, say ages 25 to 55, in the first cross-section and adjust this age range accordingly in the second cross-section. This restriction also helps to ensure that certain variables, such as the household head's educational attainment, remain relatively stable over time (assuming that most household heads are finished with their schooling).¹³ This age range is usually used in traditional pseudo-panel analysis but can vary depending on cultural and economic factors in each specific setting. Population weights are then employed to provide estimates that represent the whole population.

¹¹ See the Africa Union's Agenda 2063 Goals at <https://au.int/agenda2063/goals>.

¹² See the SDGs at <https://sdgs.un.org/goals>.

¹³ While household heads may still increase their educational attainment in theory, this rarely happens in practice.

Then let y_{ij} represent household consumption or income in survey round j ($j = 1$ or 2). The linear projection of household consumption (or income) on household characteristics for each survey round is given by

$$y_{ij} = \beta_j'x_{ij} + \varepsilon_{ij}. \tag{A.1}$$

Let z_j be the poverty line in period j . We are interested in knowing the unconditional measures of poverty mobility such as

$$P(y_{i1} < z_1 \text{ and } y_{i2} > z_2), \tag{A.2}$$

which represents the percentage of households that are poor in the first survey round (year) but nonpoor in the second survey round, or the conditional measures such as

$$P(y_{i2} > z_2 | y_{i1} < z_1), \tag{A.3}$$

which represents the percentage of poor households in the first survey round that escape poverty in the second survey round.

If true panel data are available, we can straightforwardly estimate quantities (A.2) and (A.3). In the absence of such data, we can use synthetic panels to study mobility. To operationalize the framework, we make two standard assumptions. First, we assume that the underlying populations being sampled in the first and second survey rounds are identical such that their time-invariant characteristics remain the same over time. More specifically, combined with equation (A.1), this implies that the conditional distribution of consumption expenditure in a given period is identical whether it is conditional on given household characteristics in period 1 or period 2 (that is, $x_{i1} = x_{i2}$ implies that $y_{i1} | x_{i1}$ and $y_{i1} | x_{i2}$ have identical distributions). Second, we assume that ε_{i1} and ε_{i2} have a bivariate normal distribution with a positive correlation coefficient ρ and standard deviations σ_{ε_1} and σ_{ε_2} , respectively. Quantity (A.2) can be estimated by

$$P(y_{i1} < z_1 \text{ and } y_{i2} > z_2) = \Phi_2\left(\frac{z_1 - \beta_1'x_{i2}}{\sigma_{\varepsilon_1}}, -\frac{z_2 - \beta_2'x_{i2}}{\sigma_{\varepsilon_2}}, -\rho\right), \tag{A.4}$$

where $\Phi_2(\cdot)$ denotes the bivariate normal cumulative distribution function (and $\phi_2(\cdot)$ denotes the bivariate normal probability density function). In equation (A.4), the estimated parameters obtained from data in both survey rounds are applied to data from the second survey round (x_2) (or the base year) for prediction, but we can use data from the first survey round as the base year as well. It is then straightforward to estimate quantity (A.3) by dividing quantity (A.2) by $\Phi\left(\frac{z_1 - \beta_1'x_{i2}}{\sigma_{\varepsilon_1}}\right)$, where $\Phi(\cdot)$ denotes the univariate normal cumulative distribution function.

In equation (A.4), the parameters β_j and σ_{ε_j} are estimated from equation (A.1), and ρ can be estimated using an approximation of the correlation of the cohort-aggregated household consumption between the two surveys ($\rho_{y_{c1}y_{c2}}$). In particular, given an approximation of $\rho_{y_{c1}y_{c2}}$, where c indexes the cohorts constructed from the household survey data, the partial correlation coefficient ρ can be estimated by

$$\rho = \frac{\rho_{y_{i1}y_{i2}} \sqrt{\text{var}(y_{i1})\text{var}(y_{i2})} - \beta_1' \text{var}(x_i) \beta_2}{\sigma_{\varepsilon_1} \sigma_{\varepsilon_2}} \tag{A.5}$$

Dang and Lanjouw (2023b) [16] provide more discussion and alternative options for estimating ρ .

Equation (A.4) can be extended to incorporate the dynamics of extreme poverty. For example, we can estimate the unconditional upward mobility rate out of extreme poverty into poverty (the percentage of extreme poor households in the first period that exit extreme poverty but still remain poor in the second period) as

$$P(y_{i1} < ez_1 \text{ and } ez_2 < y_{i2} < z_2) = \Phi_2\left(\frac{ez_1 - \beta_1'x_{i2}}{\sigma_{\varepsilon_1}}, \frac{z_2 - \beta_2'x_{i2}}{\sigma_{\varepsilon_2}}, \rho\right) - \Phi_2\left(\frac{ez_1 - \beta_1'x_{i2}}{\sigma_{\varepsilon_1}}, \frac{ez_2 - \beta_2'x_{i2}}{\sigma_{\varepsilon_2}}, \rho\right), \tag{A.6}$$

where ez_1 and ez_2 denote the extreme poverty lines in period 1 and period 2, respectively. More detailed derivations are provided in the studies listed in the Additional References.

Appendix B. Description of the Main Variables

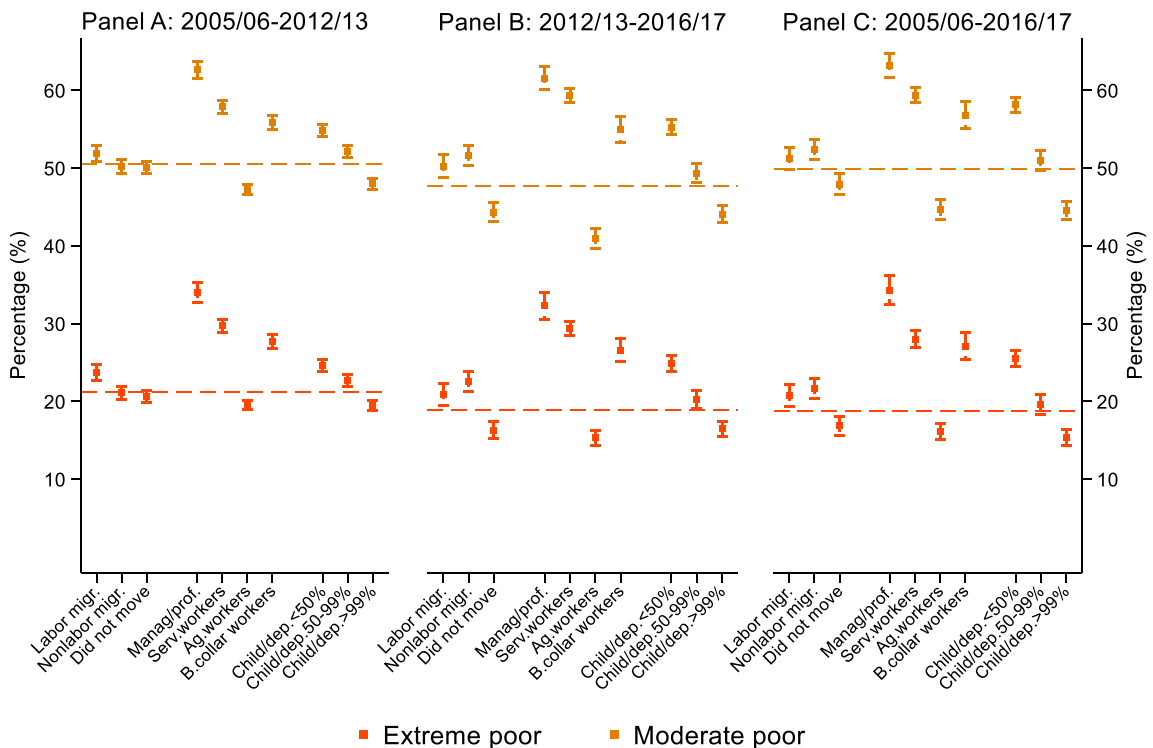
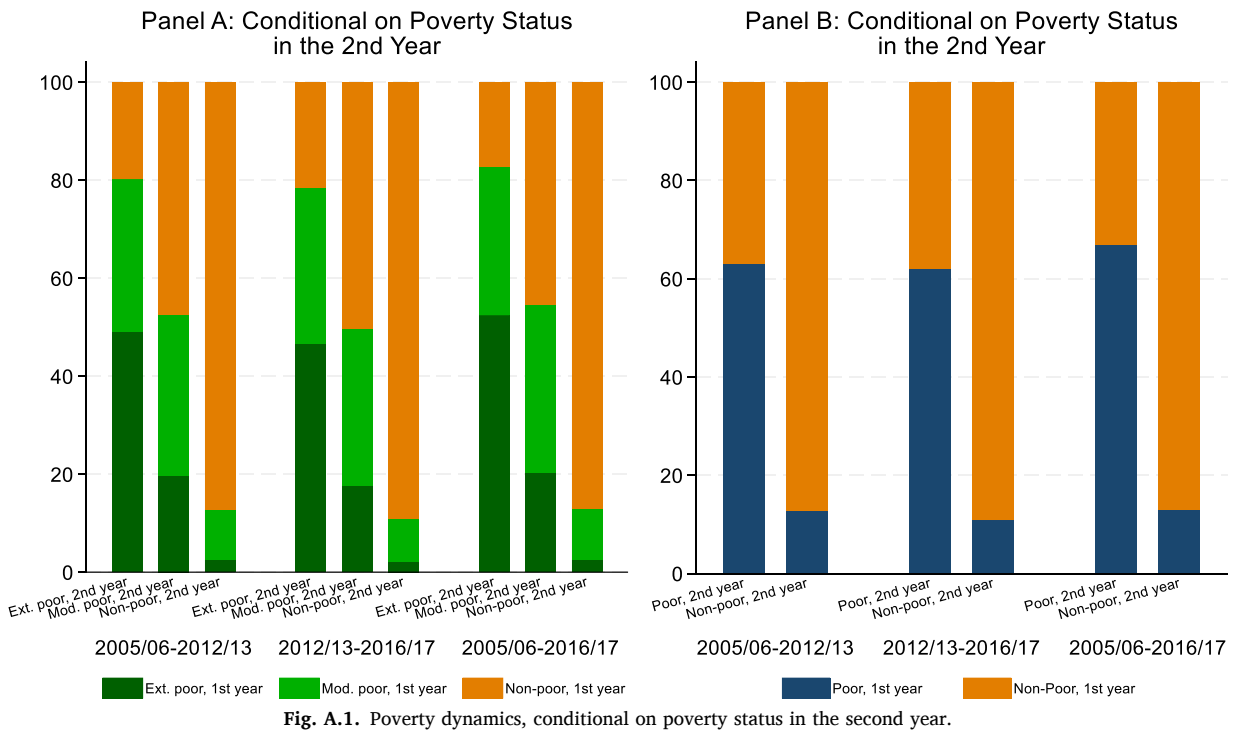


Fig. A.2. Profile of the extreme and moderate poor population that exited poverty, by household labor characteristics, conditional on being poor in the first year

Note: Dashed lines represent the national average for each period (21.2% for 2005/06–2012/13, 18.9% for 2012/13–2016/17, and 18.8% for 2005/

06–2016/17 for the extreme poor, and 50.5% for 2005/06–2012/13, 47.7% for 2012/13–2016/17, and 49.9% for 2005/06–2016/17 for the moderate poor). Time-variant characteristics are measured in the second period.

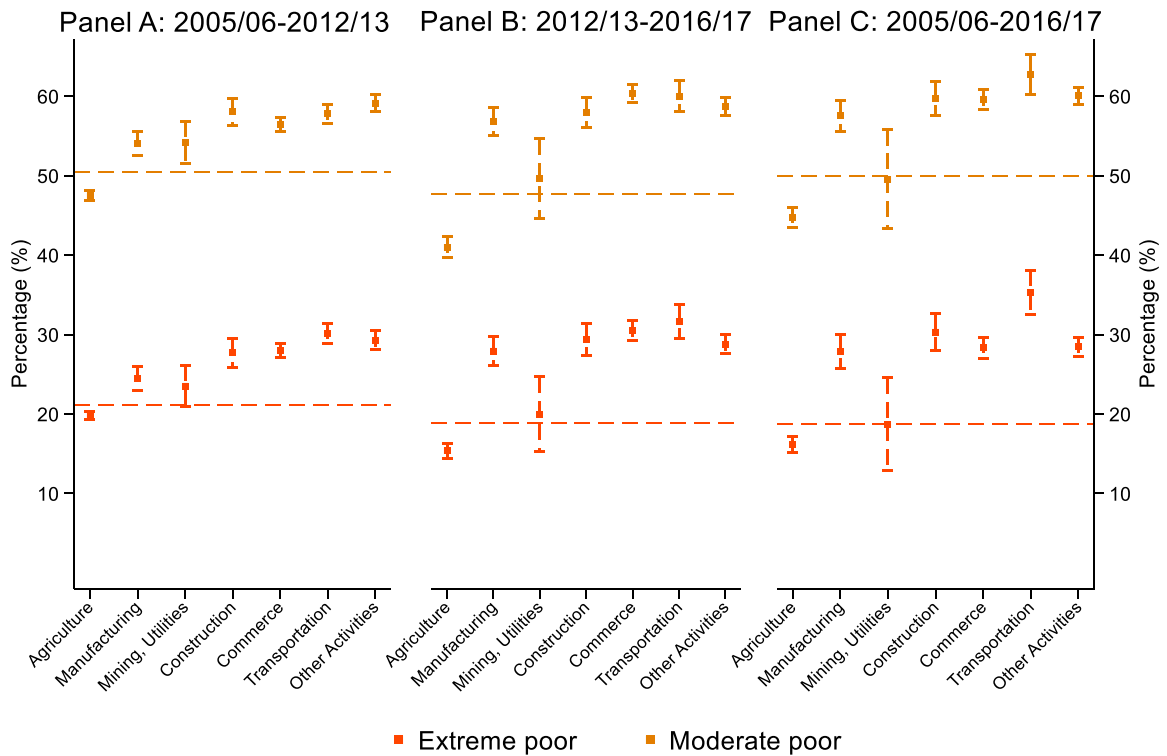


Fig. A.3. Profile of the extreme and moderate poor population that exited poverty, by occupational subsector, conditional on being poor in the First Year

Note: Dashed lines represent the national average for each period (21.2% for 2005/06–2012/13, 18.9% for 2012/13–2016/17, and 18.8% for 2005/06–2016/17 for the extreme poor, and 50.5% for 2005/06–2012/13, 47.7% for 2012/13–2016/17, and 49.9% for 2005/06–2016/17 for the moderate poor). Time-variant characteristics are measured in the second period.

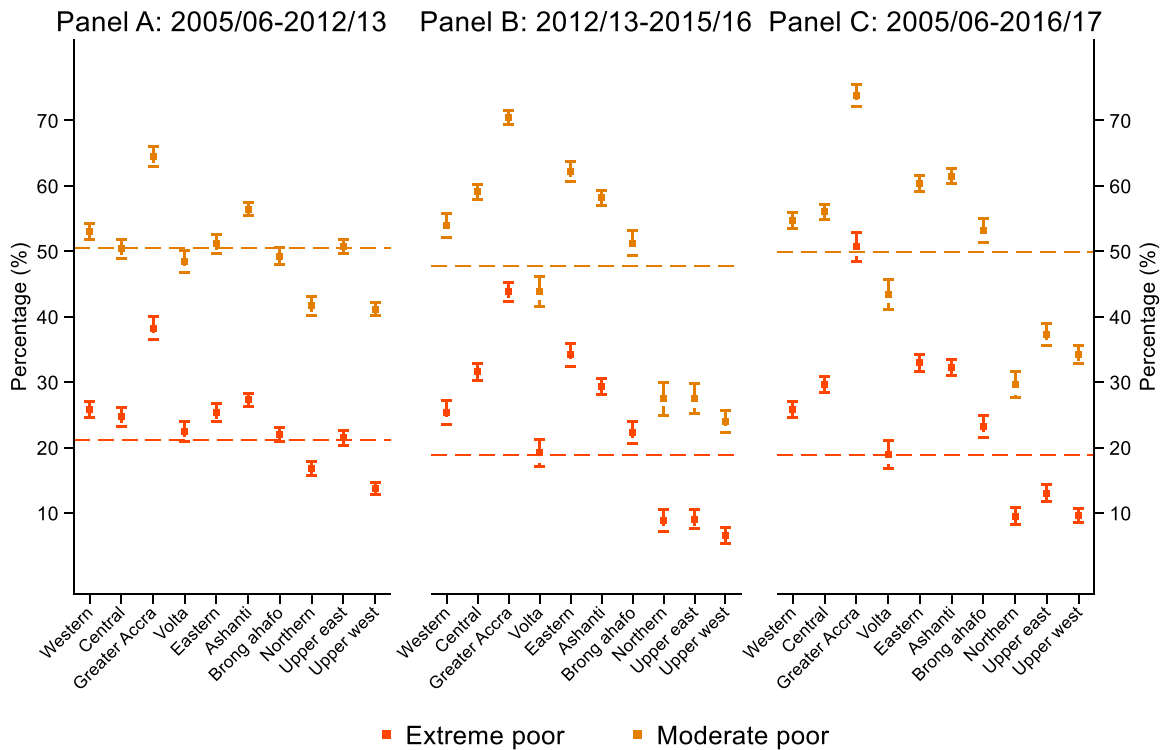


Fig. A.4. Profile of the extreme and moderate poor population that exited poverty, by region, conditional on being poor in the first Year
 Note: Dashed lines represent the national average for each period (21.2% for 2005/06–2012/13, 18.9% for 2012/13–2016/17, and 18.8% for 2005/06–2016/17 for the extreme poor, and 50.5% for 2005/06–2012/13, 47.7% for 2012/13–2016/17, and 49.9% for 2005/06–2016/17 for the moderate poor). Classification of regions is per Ghana’s 2010 Population and Housing Census. Time-variant characteristics are measured in the second period.

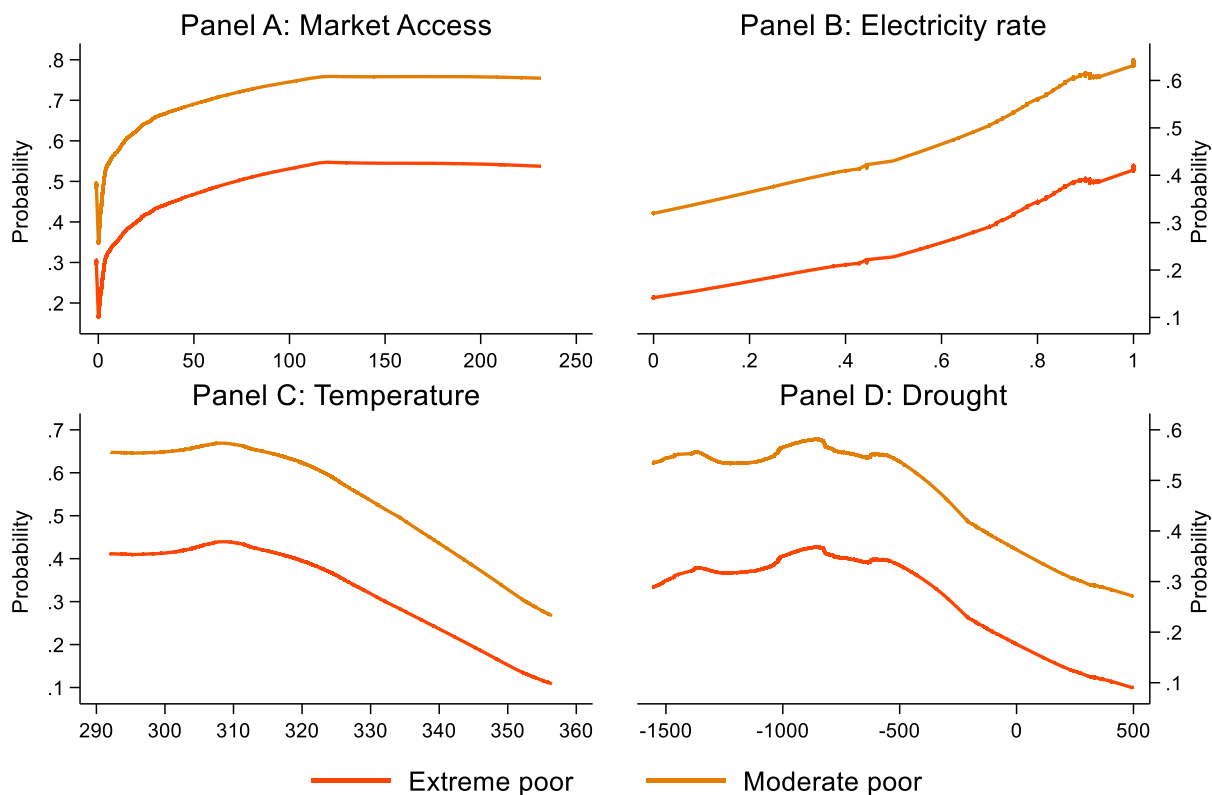


Fig. A.5. Correlation of the Probability That a Poor Household in 2012/13 Exited Poverty in 2016/17 with Market Access, Electricity, Temperature, and Drought, Conditional on Being Poor in the First Year

Note: The probability is averaged at the cluster level. Electricity, market access, and climate variables are measured in 2016/17.

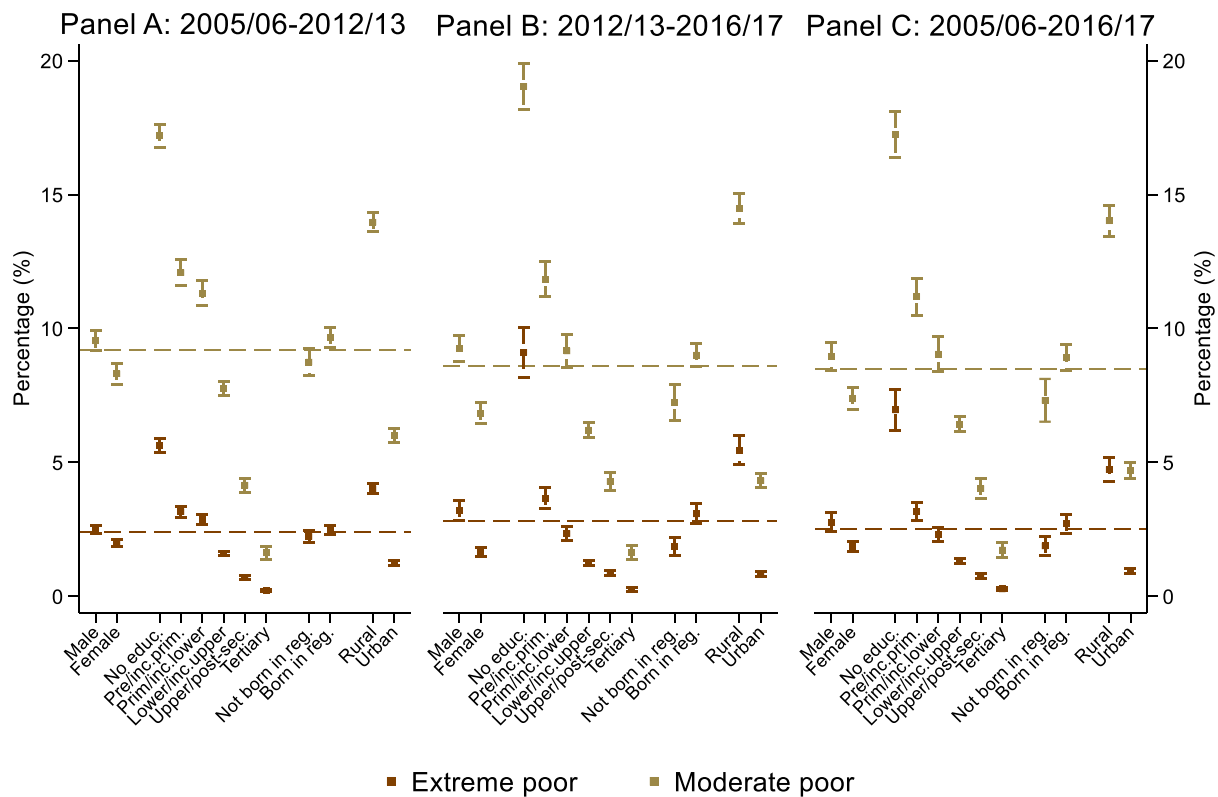


Fig. A.6. Profile of the Nonpoor Population That Fell into Extreme or Moderate Poverty, Conditional on Being Nonpoor in the First Year
 Note: Dashed lines represent the national average for each period (2.4% for 2005/06–2012/13, 2.8% for 2012/13–2016/17, and 2.5% for 2005/06–2016/17 for the extreme poor and 9.2% for 2005/06–2012/13, 8.6% for 2012/13–2016/17, and 8.5% for 2005/06–2016/17 for the moderate poor). Time-invariant characteristics are measured in the second year.

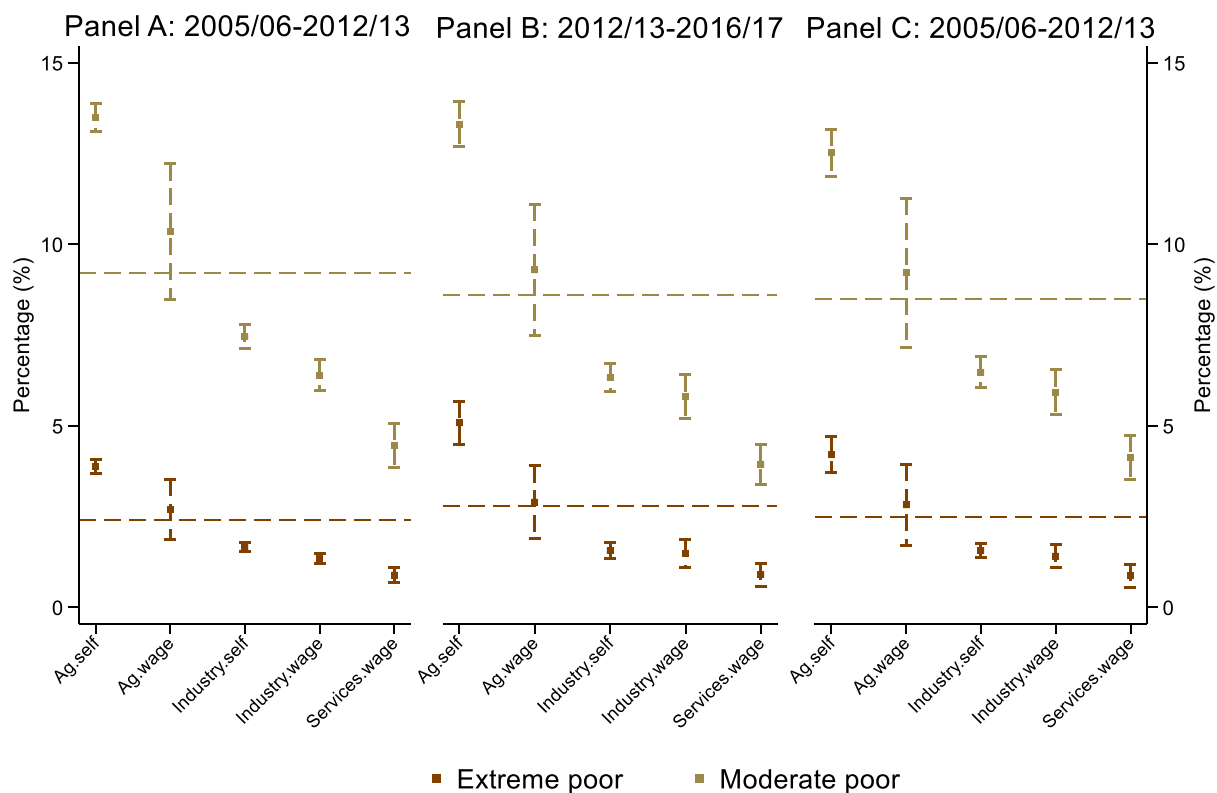


Fig. A.7. Profile of the Nonpoor Population That Fell into Extreme or Moderate Poverty, by Occupational Sector, Conditional on Being Nonpoor in the First Year

Note: Dashed lines represent the national average for each period (2.4% for 2005/06–2012/13, 2.8% for 2012/13–2016/17, and 2.5% for 2005/06–2016/17 for the extreme poor, and 9.2% for 2005/06–2012/13, 8.6% for 2012/13–2016/17, and 8.5% for 2005/06–2016/17 for the moderate poor). Occupational sector characteristics are measured in the second period.

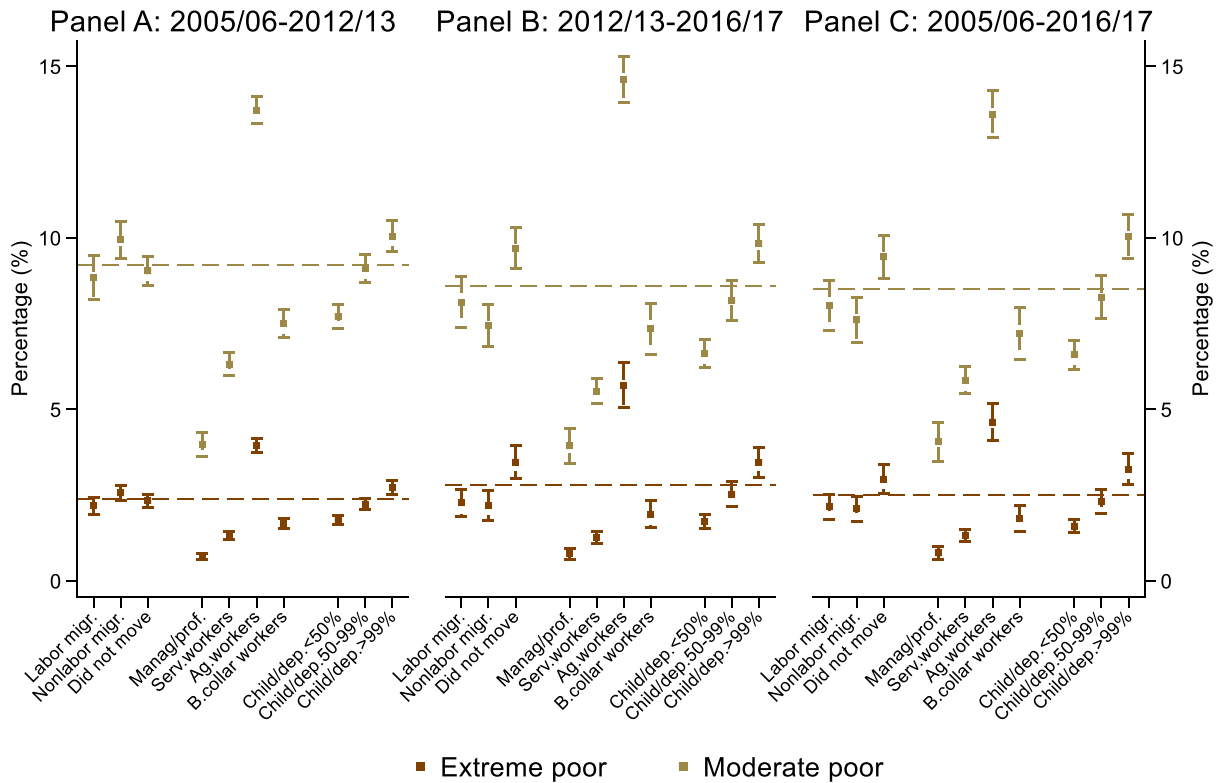


Fig. A.8. Profile of the Nonpoor Population That Fell into Extreme or Moderate Poverty, by Household Labor Characteristics, Conditional on Being Nonpoor in the First Year

Note: Dashed lines represent the national average for each period (2.4% for 2005/06–2012/13, 2.8% for 2012/13–2016/17, and 2.5% for 2005/06–2016/17 for the extreme poor, and 9.2% for 2005/06–2012/13, 8.6% for 2012/13–2016/17, and 8.5% for 2005/06–2016/17 for the moderate poor). Time-variant characteristics are measured in the second period.

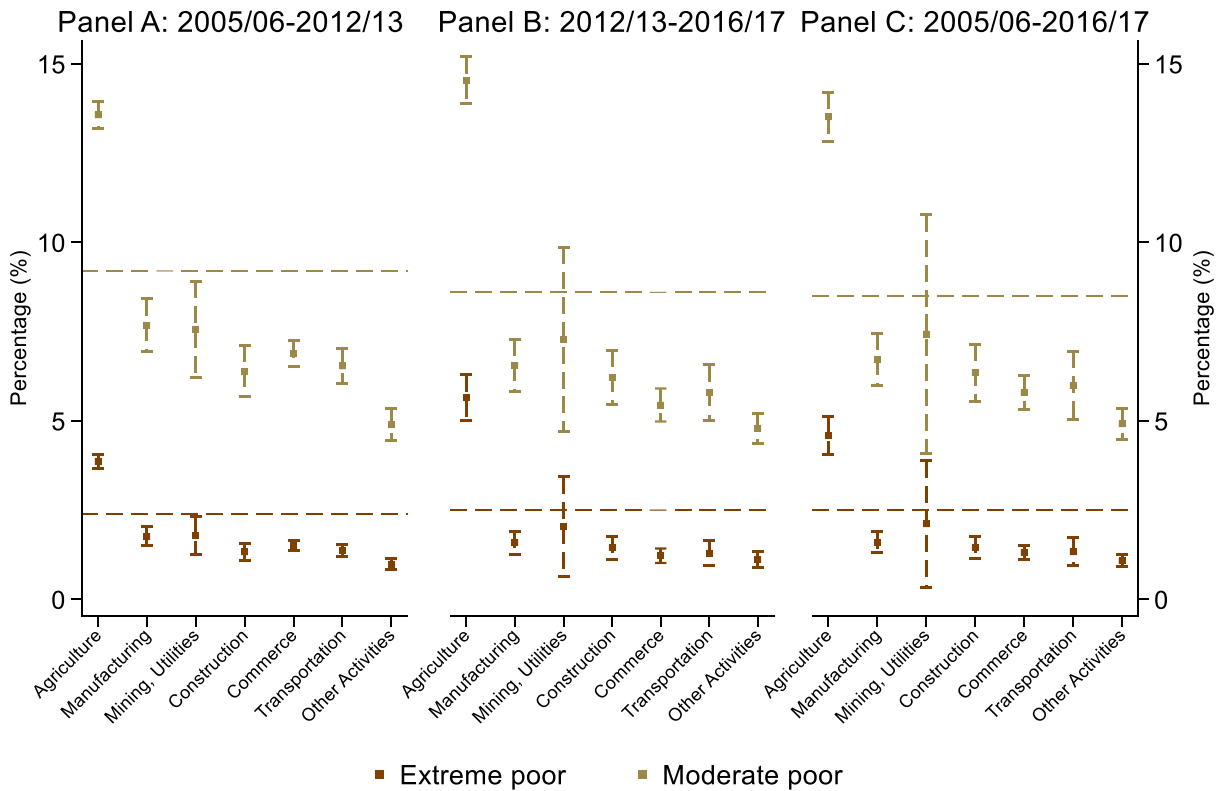


Fig. A.9. Profile of the Nonpoor Population That Fell into Extreme or Moderate Poverty, by Occupational Sector, Conditional on Being Nonpoor in the First Year

Note: Dashed lines represent the national average for each period (2.4% for 2005/06–2012/13, 2.8% for 2012/13–2016/17, and 2.5% for 2005/06–2016/17 for the extreme poor, and 9.2% for 2005/06–2012/13, 8.6% for 2012/13–2016/17, and 8.5% for 2005/06–2016/17 for the moderate poor). Time-variant characteristics are measured in the second period.

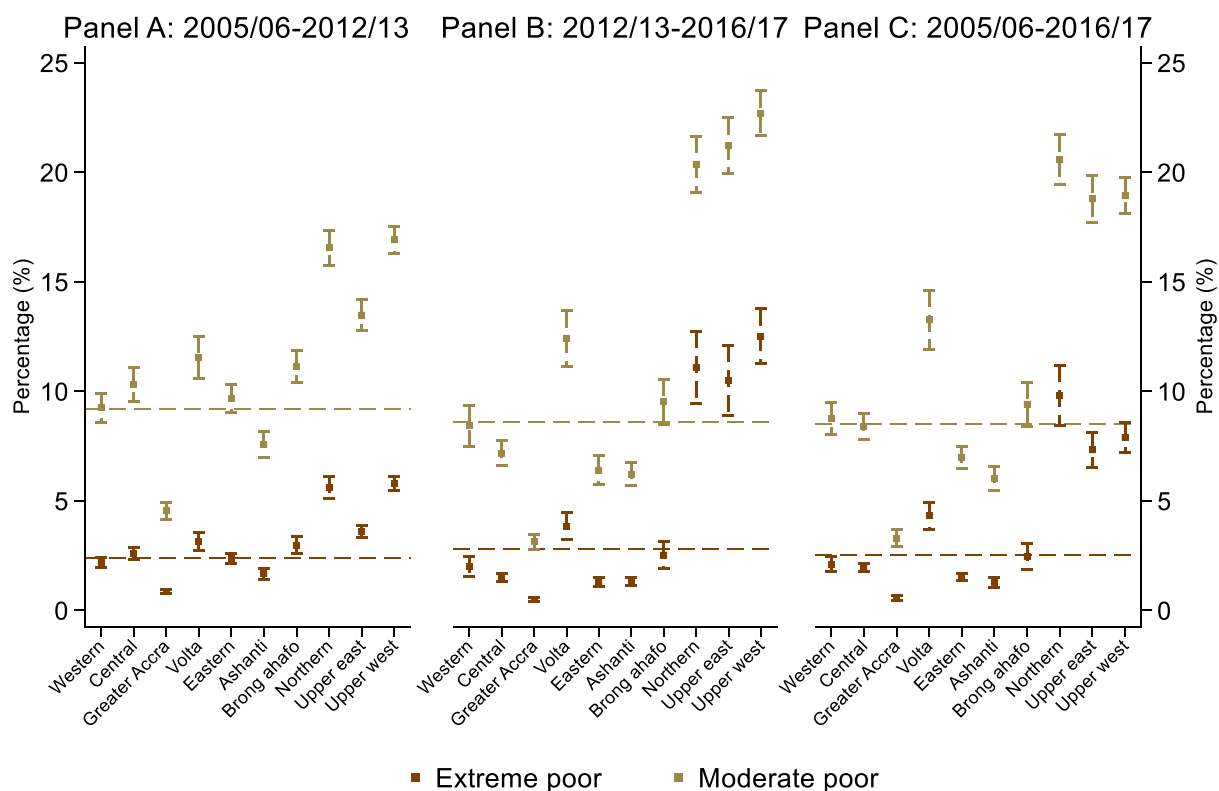


Fig. A.10. Profile of the Nonpoor Population That Fell into Extreme or Moderate Poverty, by Region, Conditional on Being Nonpoor in the First Year
Note: Dashed lines represent the national average for each period (2.4% for 2005/06–2012/13, 2.8% for 2012/13–2016/17, and 2.5% for 2005/06–2016/17 for the extreme poor and 9.2% for 2005/06–2012/13, 8.6% for 2012/13–2016/17, and 8.5% for 2005/06–2016/17 for the moderate poor). Classification of regions is per Ghana’s 2010 Population and Housing Census. Time-variant characteristics are measured in the second period.

Table 1
 Poverty dynamics, synthetic panel analysis, unconditional probabilities (percent).

Panel A: 2005/06–2012/13		2012/13		
		Poor	Nonpoor	Total
2005/06	Poor	14.92 (0.39)	9.72 (0.16)	24.64 (0.53)
	Nonpoor	8.73 (0.11)	66.63 (0.59)	75.36 (0.53)
	Total	23.65 (0.45)	76.35 (0.45)	100
Panel B: 2012/13–2016/17		2016/17		
		Poor	Nonpoor	Total
2012/13	Poor	14.37 (0.36)	8.37 (0.10)	22.74 (0.41)
	Nonpoor	8.78 (0.14)	68.48 (0.52)	77.26 (0.41)
	Total	23.16 (0.48)	76.84 (0.48)	100
Panel C: 2005/06–2016/17		2016/17		
		Poor	Nonpoor	Total
2005/06	Poor	16.34 (0.48)	9.86 (0.15)	26.20 (0.56)
	Nonpoor	8.10 (0.12)	65.70 (0.64)	73.80 (0.56)
	Total	24.44 (0.56)	75.56 (0.56)	100

Note: Poverty rates (in percent) are based on household consumption expenditure per adult equivalent. Consumption expenditure data are converted to 2013 prices using Consumer Price Index deflators. The poverty line is set at 1314 cedis per adult equivalent per year in 2013 prices. All numbers are estimated with synthetic panel data, with population weights, and where the second survey round is used as the base year. Household heads' ages are restricted to 25–55 for the first survey round and adjusted accordingly for the second survey round. Bootstrapped standard errors, based on 1000 replications, are reported in parentheses.

Table 2

Extreme and moderate poverty dynamics, synthetic panel analysis, unconditional probabilities (percent).

Panel A: 2005/06–2012/13		2012/13			
		Extreme poor	Moderate poor	Nonpoor	Total
2005/06	Extreme poor	4.42 (0.17)	2.88 (0.09)	1.97 (0.05)	9.27 (0.30)
	Moderate poor	2.80 (0.07)	4.81 (0.09)	7.75 (0.12)	15.37 (0.26)
	Nonpoor	1.78 (0.03)	6.95 (0.08)	66.63 (0.59)	75.36 (0.53)
	Total	9.00 (0.24)	14.65 (0.22)	76.35 (0.45)	100
Panel B: 2012/13–2016/17		2016/17			
		Extreme poor	Moderate poor	Nonpoor	Total
2012/13	Extreme poor	4.65 (0.17)	2.33 (0.05)	1.62 (0.03)	8.60 (0.23)
	Moderate poor	3.16 (0.09)	4.23 (0.07)	6.75 (0.08)	14.14 (0.19)
	Nonpoor	2.15 (0.06)	6.64 (0.09)	68.48 (0.52)	77.26 (0.41)
	Total	9.96 (0.31)	13.20 (0.19)	76.84 (0.48)	100
Panel C: 2005/06–2016/17		2016/17			
		Extreme poor	Moderate poor	Nonpoor	Total
2005/06	Extreme poor	5.59 (0.24)	2.81 (0.08)	1.94 (0.04)	10.34 (0.34)
	Moderate poor	3.24 (0.10)	4.70 (0.09)	7.92 (0.11)	15.86 (0.26)
	Nonpoor	1.83 (0.05)	6.26 (0.08)	65.70 (0.64)	73.80 (0.56)
	Total	10.66 (0.36)	13.78 (0.22)	75.56 (0.56)	100

Note: Poverty rates (in percent) are based on household consumption expenditure per adult equivalent. Consumption expenditure data are converted to 2013 prices using Consumer Price Index deflators. Overall and extreme poverty lines are set at 1314 and 792 cedis per adult equivalent per year in 2013 prices, respectively. Extreme poor is the population with per adult equivalent consumption expenditure below the extreme poverty line, and moderate poor is the population with per adult equivalent consumption expenditure between the overall and extreme poverty lines. All numbers are estimated with synthetic panel data, with population weights, and where the second survey round is used as the base year. Household heads' ages are restricted to 25–55 for the first survey round and adjusted accordingly for the second survey round. Bootstrapped standard errors, based on 1000 replications, are reported in parentheses.

Table A.1

Summary statistics.

Characteristics of household head	Period		Difference (2)–(1)	Period		Difference (5)–(4)
	2005/06 (1)	2012/13 (2)		2012/13 (4)	2016/17 (5)	
Age (in years)	41.07 (0.14)	45.22 (0.12)	4.15*** (0.19)	40.93 (0.10)	43.39 (0.12)	2.47*** (0.16)
Female	21.37 (0.77)	23.93 (0.62)	2.56** (1.06)	23.00 (0.61)	26.36 (0.63)	3.35*** (0.93)
<i>Birthplace (region/country)</i>						
Western	7.92 (0.69)	7.34 (0.56)	–0.58 (1.32)	7.57 (0.56)	8.19 (0.70)	0.62 (1.22)
Central	10.72 (0.65)	11.47 (0.61)	0.75 (1.44)	11.00 (0.59)	9.97 (0.51)	–1.04 (1.15)

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Table A.1 (continued)

Characteristics of household head	Period		Difference	Period		Difference
	2005/06 (1)	2012/13 (2)	(2)–(1) (3)	2012/13 (4)	2016/17 (5)	(5)–(4) (6)
Greater	8.12 (0.62)	8.32 (0.61)	0.20 (1.20)	8.66 (0.63)	8.95 (0.59)	0.29 (1.17)
Eastern	10.15 (0.56)	11.39 (0.55)	1.23 (1.28)	11.10 (0.57)	10.34 (0.66)	–0.76 (1.24)
Volta	13.73 (0.73)	12.65 (0.57)	–1.08 (1.58)	12.41 (0.56)	12.39 (0.64)	–0.01 (1.29)
Ashanti	16.66 (0.72)	18.88 (0.91)	2.22 (1.90)	18.85 (0.88)	19.58 (1.08)	0.73 (2.09)
Brong-Ahafo	7.58 (0.53)	8.20 (0.57)	0.62 (1.23)	8.15 (0.55)	8.54 (0.60)	0.39 (1.18)
Northern	13.41 (1.00)	12.06 (0.69)	–1.35 (1.98)	12.46 (0.69)	11.74 (0.64)	–0.71 (1.49)
Upper West	6.09 (0.53)	4.89 (0.31)	–1.19 (0.93)	5.05 (0.36)	4.91 (0.34)	–0.15 (0.69)
Upper East	4.53 (0.38)	3.88 (0.29)	–0.65 (0.73)	3.91 (0.30)	3.87 (0.29)	–0.04 (0.55)
Other country	1.09 (0.18)	0.92 (0.15)	–0.17 (0.23)	0.85 (0.11)	1.52 (0.17)	0.67*** (0.20)
<i>Religion</i>						
Muslim	17.54 (1.19)	18.19 (0.92)	0.65 (1.76)	18.51 (0.92)	18.79 (1.05)	0.28 (1.58)
Catholic	13.15 (0.74)	12.03 (0.59)	–1.13 (0.98)	11.36 (0.57)	10.21 (0.52)	–1.15 (0.80)
Protestant	34.82 (1.12)	47.65 (0.88)	12.83*** (1.69)	48.05 (0.90)	47.58 (1.11)	–0.47 (1.61)
Other Christian	15.83 (0.81)	10.92 (0.58)	–4.91*** (1.04)	11.14 (0.59)	12.58 (0.66)	1.44 (0.92)
Animist/Traditional	11.32 (1.02)	4.57 (0.42)	–6.75*** (1.21)	4.26 (0.40)	4.46 (0.42)	0.20 (0.65)
Other	7.33 (0.52)	6.64 (0.52)	–0.69 (0.75)	6.68 (0.44)	6.39 (0.46)	–0.30 (0.65)
<i>Language</i>						
English	6.77 (0.64)	10.06 (0.80)	3.28*** (1.09)	10.32 (0.80)	9.40 (0.58)	–0.92 (1.08)
Akan	66.91 (1.33)	73.05 (1.04)	6.14*** (2.34)	72.95 (1.05)	74.52 (0.98)	1.58 (1.90)
Ewe	5.57 (0.59)	5.38 (0.50)	–0.18 (1.09)	5.24 (0.51)	5.46 (0.53)	0.22 (0.98)
Ga-adagbe	4.51 (0.61)	3.00 (0.46)	–1.50* (0.88)	2.87 (0.44)	2.33 (0.37)	–0.54 (0.62)
Dagbani	6.82 (0.92)	4.51 (0.56)	–2.32 (1.41)	4.63 (0.57)	2.81 (0.54)	–1.82** (0.92)
Other	9.42 (0.89)	4.01 (0.44)	–5.42*** (1.22)	3.99 (0.48)	5.47 (0.54)	1.48* (0.84)
<i>Educational attainment</i>						
No formal education	29.13 (1.09)	24.12 (0.80)	–5.01*** (1.82)	22.47 (0.79)	21.53 (0.78)	–0.93 (1.40)
Preschool or incomplete primary	10.18 (0.52)	9.45 (0.44)	–0.73 (0.70)	9.39 (0.44)	13.14 (0.52)	3.74*** (0.70)
Completed primary or incomplete lower secondary	11.48 (0.54)	10.64 (0.42)	–0.85 (0.72)	11.19 (0.42)	11.10 (0.54)	–0.08 (0.70)
Completed lower secondary or incomplete upper secondary	34.60 (1.00)	38.26 (0.84)	3.66** (1.51)	37.88 (0.81)	34.82 (0.87)	–3.06** (1.31)
Completed upper sec. or vocational or post-sec. tech. education	10.70 (0.57)	11.89 (0.50)	1.18 (0.85)	13.46 (0.52)	12.03 (0.58)	–1.44* (0.84)
Tertiary	3.91 (0.41)	5.65 (0.42)	1.74*** (0.62)	5.61 (0.41)	7.38 (0.45)	1.77*** (0.65)
<i>Parents` characteristics</i>						
Father has not formal education	69.57 (0.90)	66.77 (0.94)	–2.79* (1.59)	62.41 (0.99)	59.48 (1.03)	–2.93* (1.65)
Father has formal education	30.43 (0.90)	33.23 (0.94)	2.79* (1.59)	37.59 (0.99)	40.52 (1.03)	2.93* (1.65)
Mother has not formal education	85.37 (0.69)	81.40 (0.74)	–3.97*** (1.14)	77.69 (0.80)	75.89 (0.87)	–1.80 (1.30)
Mother has formal education	14.63 (0.69)	18.60 (0.74)	3.97*** (1.14)	22.31 (0.80)	24.11 (0.87)	1.80 (1.30)
Father is not farmer	30.61	34.60	4.00**	36.82	36.80	–0.02

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Table A.1 (continued)

Characteristics of household head	Period		Difference	Period		Difference
	2005/06	2012/13	(2)–(1)	2012/13	2016/17	(5)–(4)
	(1)	(2)	(3)	(4)	(5)	(6)
	(0.93)	(0.90)	(1.61)	(0.92)	(0.86)	(1.50)
Father is farmer	69.39	65.40	–4.00**	63.18	63.20	0.02
	(0.93)	(0.90)	(1.61)	(0.92)	(0.86)	(1.50)
Mother is not farmer	36.17	40.53	4.35**	42.66	46.22	3.56**
	(1.17)	(0.98)	(1.91)	(0.94)	(1.01)	(1.73)
Mother is farmer	63.83	59.47	–4.35**	57.34	53.78	–3.56**
	(1.17)	(0.98)	(1.91)	(0.94)	(1.01)	(1.73)
<i>Type of locality</i>						
Rural	61.36	48.31	–13.05***	48.14	47.89	–0.26
	(1.05)	(1.20)	(3.01)	(1.21)	(1.21)	(2.87)
Urban	38.64	51.69	13.05***	51.86	52.11	0.26
	(1.05)	(1.20)	(3.01)	(1.21)	(1.21)	(2.87)
<i>Region</i>						
Western	10.46	9.30	–1.16	9.48	10.75	1.27
	(0.69)	(0.68)	(1.83)	(0.69)	(0.90)	(1.74)
Central	8.43	9.11	0.68	8.79	8.46	–0.33
	(0.49)	(0.67)	(1.67)	(0.59)	(0.49)	(1.39)
Greater Accra	14.76	17.39	2.63	17.92	17.11	–0.81
	(0.94)	(1.29)	(2.53)	(1.36)	(1.00)	(2.59)
Eastern	6.91	8.33	1.41	8.25	8.11	–0.14
	(0.45)	(0.47)	(1.39)	(0.51)	(0.61)	(1.36)
Volta	13.26	9.99	–3.27	9.80	10.24	0.44
	(0.77)	(0.51)	(1.99)	(0.52)	(0.63)	(1.52)
Ashanti	17.32	20.22	2.89	20.19	19.93	–0.26
	(0.65)	(1.06)	(2.45)	(1.01)	(1.18)	(2.64)
Brong Ahafo	8.95	9.73	0.78	9.50	9.14	–0.35
	(0.52)	(0.55)	(1.65)	(0.55)	(0.60)	(1.48)
Nothern	12.31	9.57	–2.74	9.65	9.76	0.11
	(0.84)	(0.56)	(2.04)	(0.57)	(0.54)	(1.50)
Upper East	4.45	3.56	–0.89	3.74	3.86	0.12
	(0.42)	(0.26)	(0.92)	(0.33)	(0.31)	(0.71)
Upper West	3.14	2.80	–0.34	2.68	2.63	–0.05
	(0.22)	(0.20)	(0.68)	(0.21)	(0.16)	(0.48)
<i>Ecological zone</i>						
Coastal	28.70	26.74	–1.96	27.36	29.86	2.51
	(1.52)	(1.42)	(2.84)	(1.47)	(1.27)	(2.73)
Forest	43.12	48.71	5.59*	48.01	47.47	–0.54
	(1.76)	(1.46)	(3.06)	(1.46)	(1.51)	(2.89)
Savannah	28.18	24.55	–3.63	24.63	22.67	–1.97
	(1.40)	(1.06)	(2.62)	(1.08)	(1.08)	(2.17)

Note: The classification of regions is per Ghana's 2010 Population and Housing Census. All estimates are obtained from cross-sectional data for each year, using population weights. In columns (1), (2), (4), and (5), standard deviations are reported in parentheses; in columns (3) and (6), standard errors are reported in parentheses. Household heads' ages are restricted to 25–55 in the first survey round and adjusted accordingly in the second survey round. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A.2

Household consumption models.

Period:	2005/06–2012/13				2012/13–2016/17			
	2005/06		2012/13		2012/13		2016/17	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Dependent var: Log of per adult equivalent consumption expenditure</i>								
Age (in years)	–0.010***	–0.010***	0.000	0.000	–0.007***	–0.007***	–0.001	–0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Female	0.173***	0.174***	0.104***	0.108***	0.094***	0.100***	0.134***	0.136***
	(0.022)	(0.021)	(0.019)	(0.019)	(0.018)	(0.018)	(0.019)	(0.018)
<i>Birthplace (reference region: Ashanti)</i>								
Western	–0.001	–0.131**	–0.071*	–0.117**	–0.077*	–0.108**	–0.068	–0.015
	(0.050)	(0.060)	(0.041)	(0.051)	(0.041)	(0.049)	(0.053)	(0.051)
Central	0.044	–0.083*	–0.095**	–0.093**	–0.107***	–0.071*	–0.070	–0.135***
	(0.043)	(0.044)	(0.040)	(0.045)	(0.041)	(0.043)	(0.044)	(0.044)
Greater Accra	–0.034	–0.016	0.040	0.032	0.014	0.018	0.182***	0.049
	(0.051)	(0.051)	(0.045)	(0.047)	(0.042)	(0.043)	(0.044)	(0.044)

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Table A.2 (continued)

Period: <i>Dependent var:</i> Log of per adult equivalent consumption expenditure	2005/06–2012/13				2012/13–2016/17			
	2005/06		2012/13		2012/13		2016/17	
	Model 1 (1)	Model 2 (2)	Model 1 (3)	Model 2 (4)	Model 1 (5)	Model 2 (6)	Model 1 (7)	Model 2 (8)
Eastern	-0.079 (0.050)	-0.064 (0.051)	-0.130*** (0.047)	-0.070 (0.044)	-0.138*** (0.045)	-0.079* (0.042)	-0.102** (0.049)	-0.051 (0.046)
Volta	0.067* (0.039)	0.063 (0.042)	-0.100*** (0.038)	-0.030 (0.044)	-0.131*** (0.038)	-0.052 (0.042)	0.010 (0.042)	0.010 (0.040)
Brong-Ahafo	-0.062 (0.046)	-0.069 (0.046)	-0.109** (0.043)	-0.026 (0.046)	-0.123*** (0.042)	-0.047 (0.043)	-0.099** (0.050)	0.030 (0.051)
Northern	-0.134** (0.068)	-0.167** (0.067)	-0.409*** (0.054)	-0.070 (0.052)	-0.358*** (0.054)	-0.062 (0.049)	-0.320*** (0.059)	-0.172*** (0.060)
U/West	-0.309*** (0.071)	-0.130** (0.056)	-0.282*** (0.054)	-0.140** (0.058)	-0.289*** (0.053)	-0.115** (0.052)	-0.409*** (0.058)	-0.104* (0.058)
U/East	-0.558*** (0.078)	-0.268*** (0.073)	-0.586*** (0.058)	-0.159*** (0.061)	-0.541*** (0.057)	-0.187*** (0.055)	-0.599*** (0.063)	-0.220*** (0.064)
Other country	-0.111 (0.097)	-0.077 (0.079)	-0.170 (0.109)	-0.077 (0.091)	-0.117 (0.086)	-0.054 (0.081)	-0.218*** (0.068)	-0.167*** (0.063)
<i>Religion (reference religion: Protestant)</i>								
Muslim	0.040 (0.038)	0.060 (0.037)	0.063* (0.034)	0.106*** (0.033)	0.041 (0.033)	0.080** (0.032)	0.076** (0.032)	0.130*** (0.032)
Catholic	-0.009 (0.030)	-0.009 (0.029)	-0.005 (0.029)	0.025 (0.028)	-0.024 (0.028)	0.008 (0.027)	-0.046 (0.030)	0.001 (0.029)
Other Christian	-0.075*** (0.028)	-0.088*** (0.027)	-0.078*** (0.028)	-0.078*** (0.028)	-0.096*** (0.027)	-0.096*** (0.027)	-0.052* (0.028)	-0.054** (0.027)
Animist/Traditional	-0.100** (0.046)	-0.062 (0.044)	-0.039 (0.041)	0.003 (0.041)	-0.043 (0.045)	0.002 (0.045)	-0.241*** (0.060)	-0.165*** (0.059)
Other	-0.102*** (0.037)	-0.119*** (0.035)	-0.019 (0.034)	-0.020 (0.034)	-0.048 (0.033)	-0.044 (0.032)	-0.107*** (0.037)	-0.094*** (0.036)
<i>Language (reference group: Akan)</i>								
English	0.066 (0.042)	0.156*** (0.044)	0.146*** (0.034)	0.224*** (0.036)	0.173*** (0.032)	0.249*** (0.033)	0.009 (0.033)	0.101*** (0.036)
Ewe	-0.003 (0.062)	0.049 (0.070)	-0.078 (0.055)	-0.048 (0.083)	-0.084 (0.052)	-0.068 (0.075)	-0.201*** (0.056)	-0.120* (0.070)
Ga-adagbe	-0.183** (0.081)	-0.112 (0.084)	0.029 (0.079)	0.010 (0.080)	0.054 (0.069)	0.036 (0.069)	0.130** (0.061)	0.041 (0.061)
Dagbani	-0.240** (0.097)	-0.134 (0.112)	0.083 (0.068)	0.285*** (0.075)	0.047 (0.065)	0.234*** (0.074)	-0.413*** (0.086)	-0.324*** (0.097)
Other	-0.414*** (0.068)	-0.177** (0.076)	-0.197*** (0.054)	-0.062 (0.057)	-0.183*** (0.056)	-0.052 (0.059)	-0.313*** (0.059)	-0.185*** (0.065)
<i>Educational attainment (reference level: no formal education)</i>								
Pre-school/primary not completed	0.105*** (0.031)	0.096*** (0.030)	0.134*** (0.028)	0.127*** (0.027)	0.124*** (0.028)	0.117*** (0.027)	0.154*** (0.030)	0.143*** (0.029)
Completed primary or incomplete lower secondary	0.148*** (0.034)	0.141*** (0.033)	0.162*** (0.028)	0.142*** (0.028)	0.161*** (0.028)	0.145*** (0.028)	0.207*** (0.034)	0.178*** (0.033)
Completed lower secondary or incomplete upper secondary	0.220*** (0.030)	0.222*** (0.029)	0.281*** (0.026)	0.258*** (0.025)	0.264*** (0.025)	0.242*** (0.024)	0.338*** (0.030)	0.305*** (0.028)
Completed upper secondary/vocational or post-secondary technical	0.420*** (0.037)	0.425*** (0.037)	0.499*** (0.034)	0.478*** (0.033)	0.502*** (0.031)	0.488*** (0.030)	0.501*** (0.035)	0.473*** (0.034)
University and higher	0.853*** (0.056)	0.858*** (0.058)	0.807*** (0.045)	0.776*** (0.043)	0.766*** (0.039)	0.745*** (0.038)	0.865*** (0.043)	0.826*** (0.042)
<i>Parents' characteristics</i>								
Father has formal education	0.078*** (0.023)	0.074*** (0.022)	0.103*** (0.022)	0.087*** (0.022)	0.099*** (0.020)	0.080*** (0.020)	0.060** (0.024)	0.039* (0.024)
Mother has formal education	0.078*** (0.025)	0.077*** (0.025)	0.072*** (0.024)	0.066*** (0.024)	0.079*** (0.021)	0.075*** (0.021)	0.058** (0.023)	0.048** (0.023)
Father is farmer	-0.037* (0.022)	-0.036 (0.022)	-0.075*** (0.020)	-0.080*** (0.020)	-0.084*** (0.018)	-0.091*** (0.018)	-0.056** (0.022)	-0.063*** (0.022)
Mother is farmer	-0.074*** (0.023)	-0.080*** (0.022)	-0.080*** (0.020)	-0.067*** (0.019)	-0.090*** (0.019)	-0.080*** (0.018)	-0.087*** (0.023)	-0.086*** (0.023)
<i>Type of locality (reference type: urban)</i>								
Rural	-0.375*** (0.033)	-0.375*** (0.035)	-0.301*** (0.028)	-0.266*** (0.029)	-0.323*** (0.027)	-0.289*** (0.028)	-0.387*** (0.030)	-0.333*** (0.030)
<i>Region (reference region: Greater Accra)</i>								
Western		0.245*** (0.086)		0.070 (0.065)		0.050 (0.067)		-0.365*** (0.068)
Central		0.294*** (0.072)		0.002 (0.060)		-0.049 (0.058)		-0.183*** (0.056)
Eastern		0.025		-0.098		-0.088		-0.429***

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Table A.2 (continued)

Period: Dependent var: Log of per adult equivalent consumption expenditure	2005/06–2012/13				2012/13–2016/17			
	2005/06		2012/13		2012/13		2016/17	
	Model 1 (1)	Model 2 (2)	Model 1 (3)	Model 2 (4)	Model 1 (5)	Model 2 (6)	Model 1 (7)	Model 2 (8)
Volta		(0.085)		(0.092)		(0.086)		(0.083)
		0.123		-0.065		-0.098		-0.358***
		(0.077)		(0.071)		(0.072)		(0.074)
Ashanti		0.140*		0.075		0.056		-0.275***
		(0.080)		(0.071)		(0.068)		(0.077)
Brong Ahafo		0.116		-0.023		-0.026		-0.376***
		(0.083)		(0.084)		(0.082)		(0.082)
Nothern		0.010		-0.465***		-0.415***		-0.410***
		(0.129)		(0.105)		(0.103)		(0.119)
Upper East		-0.345***		-0.159		-0.205*		-0.580***
		(0.123)		(0.118)		(0.110)		(0.114)
Upper West		-0.516***		-0.492***		-0.425***		-0.686***
		(0.145)		(0.115)		(0.110)		(0.117)
<i>Ecological zone (reference zone: forest)</i>								
Coastal		0.046		0.082*		0.044		-0.060
		(0.048)		(0.045)		(0.045)		(0.051)
Savannah		0.018		-0.085		-0.096		-0.224***
		(0.050)		(0.069)		(0.066)		(0.068)
Constant	8.221***	8.099***	7.825***	7.791***	8.188***	8.175***	7.940***	8.262***
	(0.069)	(0.096)	(0.058)	(0.082)	(0.055)	(0.077)	(0.071)	(0.091)
Adjusted R ² statistic	0.470	0.485	0.366	0.387	0.392	0.409	0.467	0.488
N	5659	5659	9524	9524	10,341	10,341	8403	8403

Note: Classification of regions is per Ghana's 2010 Population and Housing Census. Household heads' ages are restricted to 25–55 in the first survey round and adjusted accordingly in the second survey round. All estimates are obtained using cross-sectional (representative) data for each round. The variance inflation factor does not exceed the value of 3 in model 1. Standard errors, clustered at the primary sampling unit level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

Table A.3

Estimated R² statistics from previous studies.

No.	Country	Study source	Survey year	R-squared statistic
1	Bosnia and Herzegovina	[16]	2001 2004	0.08 0.08
2	Chile	[18]	1996	0.21–0.43
3	Colombia	[50]	2008 2010 2012 2014 2016	0.18 0.21 0.2 0.19 0.16
4	Côte d'Ivoire	[14]	2002 2008	0.2 0.18
5	Egypt, Arab Rep.	[51]	2004 2009	0.3 0.28
6	Egypt, Arab Rep.	[13]	2012 2015 2017 2020	0.23 0.24–0.25 0.16–0.17 0.21
7	Ethiopia	[12]	2011 2016	0.27 0.27
8	Jordan	[51]	2006 2008	0.16 0.21
9	Jordan	[13]	2010 2013	0.16 0.18
10	India	[29]	1987/88 1993/94	0.24 0.24–0.27

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Table A.3 (continued)

No.	Country	Study source	Survey year	R-squared statistic
			2004/05	0.31–0.25
			2011/12	0.22
11	Indonesia	[15]	2000	0.24–0.40
12	Iraq	[13]	2007	0.08
			2012	0.13
13	Lao PDR	[16]	2002/03	0.16
			2007/08	0.22
14	Malawi	[14]	2004	0.28
			2010	0.35
15	Mauritania	[13]	2004	0.18
			2008	0.32
			2014	0.16–0.18
			2019	0.18
16	Mozambique	[14]	2002	0.29
			2008	0.24
17	Mozambique	[11]	1996/97	0.16
			2002/03	0.19
			2008/09	0.13
			2014/15	0.25
18	Myanmar	[52]	2015	0.44
			2017	0.37
19	Nicaragua	[18]	2001	0.30–0.53
20	West Bank and Gaza	[51]	2005	0.09
			2009	0.11
21	West Bank and Gaza	[13]	2007	0.08
			2009	0.09
			2011	0.09
			2017	0.11
22	Peru	[16]	2004	0.41
			2005	0.44
			2006	0.46
23	Peru	[18]	2008	0.41–0.62
24	Peru	[53]	2003	0.45
			2004	0.44
			2005	0.45
			2006	0.47
			2007	0.47
			2008	0.44
			2009	0.45
			2010	0.42
			2011	0.39
25	Senegal	[15]	2006	0.36–0.44
			2011	0.33–0.41
26	Senegal	[14]	2005	0.28
			2011	0.26
27	Syria Arab Republic	[51]	1997	0.05
			2004	0.14
28	Togo	[14]	2006	0.43
			2011	0.34
29	Tanzania	[49]	2011/12	0.22
			2017/18	0.22
30	Tunisia	[51]	2005	0.34
			2010	0.34
31	Tunisia	[13]	2005	0.30
			2010	0.29
			2015	0.29
			2021	0.21
32	Viet Nam	[16]	2004	0.45
			2006	0.42
			2008	0.37
33	Viet Nam	[15]	2008	0.32–0.60
34	Viet Nam	[47]	2010	0.43–0.69
			2012	0.41–0.69
35	Yemen, Rep.	[51]	1998	0.13
			2006	0.19
36	Zambia	[14]	2006	0.47
			2010	0.46
	Mean			0.27–0.29

Table A.4
Poverty dynamics, synthetic panel analysis, unconditional probabilities (percent).

Panel A: 2005/06–2012/13		2012/13		
		Poor	Nonpoor	Total
2005/06	Poor	18.56 (0.50)	10.37 (0.15)	28.93 (0.60)
	Nonpoor	9.65 (0.15)	61.43 (0.67)	71.07 (0.60)
	Total	28.21 (0.58)	71.79 (0.58)	100
Panel B: 2012/13–2016/17		2016/17		
		Poor	Nonpoor	Total
2012/13	Poor	14.39 (0.41)	8.09 (0.11)	22.48 (0.46)
	Nonpoor	9.41 (0.19)	68.11 (0.63)	77.52 (0.46)
	Total	23.80 (0.58)	76.20 (0.58)	100
Panel C: 2005/06–2016/17		2016/17		
		Poor	Nonpoor	Total
2005/06	Poor	20.49 (0.57)	8.44 (0.12)	28.93 (0.60)
	Nonpoor	11.29 (0.20)	59.79 (0.73)	71.07 (0.60)
	Total	31.78 (0.70)	68.22 (0.70)	100

Note: Poverty rates (in percent) are based on household consumption expenditure per adult equivalent. Consumption expenditure data are converted to 2013 prices using Consumer Price Index deflators. The poverty line is set at 1314 cedis per adult equivalent per year in 2013 prices. All numbers are estimated with synthetic panel data, with population weights, and where the first round is used as the base year. Household heads' ages are restricted to 25–55 for the first survey round and adjusted accordingly for the second survey round. Bootstrapped standard errors, based on 1000 replications, are reported in parentheses.

Table A.5
Poverty dynamics, synthetic panel analysis, conditional probabilities (percent).

Panel A: 2005/06–2012/13		2012/13		
		Poor	Nonpoor	Total
2005/06	Poor	60.55 (0.34)	39.45 (0.34)	100
	Nonpoor	11.59 (0.24)	88.41 (0.24)	100
Panel B: 2012/13–2016/17		2016/17		
		Poor	Nonpoor	Total
2012/13	Poor	63.21 (0.44)	36.79 (0.44)	100
	Nonpoor	11.37 (0.34)	88.63 (0.34)	100
Panel C: 2005/06–2016/17		2016/17		
		Poor	Nonpoor	Total
2005/06	Poor	62.36 (0.48)	37.64 (0.48)	100
	Nonpoor	10.97 (0.35)	89.03 (0.35)	100

Note: Poverty rates (in percent) are based on household consumption expenditure per adult equivalent. Consumption expenditure data are converted to 2013 prices using Consumer Price Index deflators. The poverty line is set at 1314 cedis per adult equivalent per year in 2013 prices. All numbers are estimated with synthetic panel data, with population weights, and where the second survey round is used as the base year. Household heads' ages are restricted to 25–55 for the first survey round and adjusted accordingly for the second survey round. Conditional probabilities are calculated by conditioning individuals' movement on their poverty status in the first period. Bootstrapped standard errors, based on 1000 replications, are reported in parentheses.

Table A.6

Extreme and moderate poverty dynamics, synthetic panel analysis, unconditional probabilities (percent).

Panel A: 2005/06–2012/13		2012/13			
		Extreme poor	Moderate poor	Nonpoor	Total
2005/06	Extreme poor	6.07 (0.24)	3.59 (0.11)	2.26 (0.06)	11.92 (0.38)
	Moderate poor	3.41 (0.11)	5.49 (0.10)	8.10 (0.10)	17.00 (0.26)
	Nonpoor	2.07 (0.05)	7.57 (0.10)	61.43 (0.67)	71.07 (0.60)
	Total	11.55 (0.36)	16.66 (0.24)	71.79 (0.58)	100
Panel B: 2012/13–2016/17		2016/17			
		Extreme poor	Moderate poor	Nonpoor	Total
2012/13	Extreme poor	4.54 (0.18)	2.26 (0.06)	1.54 (0.03)	8.34 (0.24)
	Moderate poor	3.32 (0.11)	4.27 (0.08)	6.55 (0.08)	14.14 (0.23)
	Nonpoor	2.39 (0.08)	7.02 (0.12)	68.11 (0.63)	77.52 (0.46)
	Total	10.25 (0.36)	13.55 (0.24)	76.20 (0.58)	100
Panel C: 2005/06–2016/17		2016/17			
		Extreme poor	Moderate poor	Nonpoor	Total
2005/06	Extreme poor	7.58 (0.31)	2.79 (0.08)	1.56 (0.03)	11.92 (0.38)
	Moderate poor	4.81 (0.16)	5.32 (0.10)	6.88 (0.09)	17.00 (0.26)
	Nonpoor	3.06 (0.09)	8.23 (0.12)	59.79 (0.73)	71.07 (0.60)
	Total	15.44 (0.50)	16.34 (0.25)	68.22 (0.70)	100

Note: Poverty rates (in percent) are based on household consumption expenditure per adult equivalent. Consumption expenditure data are converted to 2013 prices using Consumer Price Index deflators. Overall and extreme poverty lines are set at 1314 and 792 cedis per adult equivalent per year in 2013 prices, respectively. Extreme poor is the population with per adult equivalent consumption expenditure below the extreme poverty line, and moderate poor is the population with per adult equivalent consumption expenditure between the overall and extreme poverty lines. All numbers are estimated with synthetic panel data, with population weights, and where the first survey round is used as the base year. Household heads' ages are restricted to 25–55 for the first survey round and adjusted accordingly for the second survey round. Bootstrapped standard errors, based on 1000 replications, are reported in parentheses.

Table A.7

Extreme and Moderate Poverty Dynamics, Synthetic Panel Analysis, Conditional Probabilities (Percent).

Panel A: 2005/06–2012/13		2012/13			
		Extreme poor	Moderate poor	Nonpoor	Total
2005/06	Extreme poor	47.69 (0.30)	31.07 (0.07)	21.24 (0.27)	100
	Moderate poor	18.22 (0.17)	31.33 (0.12)	50.45 (0.28)	100
	Nonpoor	2.36 (0.07)	9.22 (0.17)	88.41 (0.24)	100
Panel B: 2012/13–2016/17		2016/17			
		Extreme poor	Moderate poor	Nonpoor	Total
2012/13	Extreme poor	54.08 (0.42)	27.08 (0.13)	18.85 (0.37)	100
	Moderate poor	22.37 (0.30)	29.93 (0.15)	47.70 (0.41)	100
	Nonpoor	2.78 (0.15)	8.59 (0.20)	88.63 (0.34)	100
Panel C: 2005/06–2016/17		2016/17			

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Table A.7 (continued)

Panel C: 2005/06–2016/17		2016/17			
		Extreme poor	Moderate poor	Nonpoor	Total
		Extreme poor	Moderate poor	Nonpoor	Total
2005/06	Extreme poor	54.07 (0.44)	27.16 (0.12)	18.77 (0.40)	100
	Moderate poor	20.41 (0.29)	29.65 (0.16)	49.93 (0.43)	100
	Nonpoor	2.49 (0.14)	8.49 (0.22)	89.03 (0.35)	100

Note: Poverty rates (in percent) are based on household consumption expenditure per adult equivalent. Consumption expenditure data are converted to 2013 prices using Consumer Price Index deflators. Overall and extreme poverty lines are set at 1314 and 792 cedis per adult equivalent per year in 2013 prices, respectively. Extreme poor is the population with per adult equivalent consumption expenditure below the extreme poverty line, and moderate poor is the population with per adult equivalent consumption expenditure between the overall and extreme poverty lines. All numbers are estimated with synthetic panel data, with population weights, and where the second survey round is used as the base year. Household heads' ages are restricted to 25–55 for the first survey round and adjusted accordingly for the second survey round. Conditional probabilities are calculated by conditioning individuals' movement on their poverty status in the first period. Bootstrapped standard errors, based on 1000 replications, are reported in parentheses.

Table A.8

Characteristics associated with poverty mobility.

	Upward mobility				Downward mobility			
	Exited from extreme poverty to non-poverty		Exited from moderate poverty to non-poverty		Falling into extreme poverty from non-poverty		Falling into moderate poverty from non-poverty	
	%	SE	%	SE	%	SE	%	SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: 2005/06–2012/13								
<i>Gender of household head</i>								
Male	20.9	(0.3)	50.1	(0.3)	2.5	(0.1)	9.5	(0.2)
Female	23.4	(0.4)	51.9	(0.4)	2.0	(0.1)	8.3	(0.2)
<i>Education of household head</i>								
No education	16.9	(0.3)	42.5	(0.4)	5.6	(0.1)	17.2	(0.2)
Less than primary	23.2	(0.4)	50.5	(0.4)	3.2	(0.1)	12.1	(0.3)
Less than lower secondary	24.2	(0.5)	50.7	(0.5)	2.9	(0.1)	11.3	(0.2)
Less than upper secondary	31.8	(0.3)	58.6	(0.3)	1.6	(0.0)	7.7	(0.1)
Completed upper secondary	37.7	(0.5)	65.4	(0.5)	0.7	(0.0)	4.1	(0.1)
University and higher	41.5	(1.1)	69.2	(1.0)	0.2	(0.0)	1.6	(0.1)
<i>Place of birth</i>								
Not born in current region	22.1	(0.4)	50.6	(0.4)	2.2	(0.1)	8.7	(0.3)
Born in current region	20.6	(0.4)	50.3	(0.4)	2.5	(0.1)	9.7	(0.2)
<i>Location</i>								
Rural	19.8	(0.3)	47.6	(0.3)	4.0	(0.1)	14.0	(0.2)
Urban	31.4	(0.4)	58.5	(0.3)	1.2	(0.0)	6.0	(0.1)
<i>Sector</i>								
Agriculture, self-employed	19.4	(0.3)	47.2	(0.3)	3.9	(0.1)	13.5	(0.2)
Agriculture, wage-employed	21.9	(1.6)	49.0	(1.7)	2.7	(0.4)	10.4	(1.0)
Industry, self-employed	27.2	(0.4)	55.4	(0.3)	1.7	(0.1)	7.5	(0.2)
Industry, wage-employed	29.7	(0.6)	58.0	(0.5)	1.3	(0.1)	6.4	(0.2)
Services, wage-employed	31.6	(0.8)	60.1	(0.8)	0.9	(0.1)	4.5	(0.3)
<i>Migration</i>								
Labor-related migration	23.7	(0.5)	51.9	(0.5)	2.2	(0.1)	8.8	(0.3)
Non-labor-related migration	21.1	(0.4)	50.2	(0.5)	2.6	(0.1)	9.9	(0.3)
Did not move to current place	20.6	(0.4)	50.0	(0.4)	2.3	(0.1)	9.0	(0.2)
<i>Occupation</i>								
Managers/professionals	34.0	(0.7)	62.6	(0.6)	0.7	(0.0)	4.0	(0.2)
Service workers	29.7	(0.4)	57.9	(0.4)	1.3	(0.1)	6.3	(0.2)
Agricultural workers	19.6	(0.3)	47.3	(0.3)	3.9	(0.1)	13.7	(0.2)
Blue-collar workers	27.7	(0.5)	55.8	(0.5)	1.7	(0.1)	7.5	(0.2)
<i>Dependency ratio</i>								
Child dep.ratio <50 %	24.6	(0.4)	54.8	(0.4)	1.8	(0.1)	7.7	(0.2)
Child dep.ratio 50–99 %	22.7	(0.4)	52.1	(0.4)	2.2	(0.1)	9.1	(0.2)
Child dep.ratio >99 %	19.5	(0.3)	48.0	(0.3)	2.7	(0.1)	10.0	(0.2)
Panel B: 2012/13–2016/17								
<i>Gender of household head</i>								
Male	17.1	(0.4)	45.2	(0.5)	3.2	(0.2)	9.3	(0.2)

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Table A.8 (continued)

	Upward mobility				Downward mobility			
	Exited from extreme poverty to non-poverty		Exited from moderate poverty to non-poverty		Falling into extreme poverty from non-poverty		Falling into moderate poverty from non-poverty	
	% (1)	SE (2)	% (3)	SE (4)	% (5)	SE (6)	% (7)	SE (8)
Female	26.7	(0.5)	56.2	(0.4)	1.7	(0.1)	6.8	(0.2)
<i>Education of household head</i>								
No education	11.4	(0.6)	33.5	(0.9)	9.1	(0.5)	19.0	(0.4)
Less than primary	21.6	(0.6)	48.1	(0.7)	3.7	(0.2)	11.8	(0.3)
Less than lower secondary	26.9	(0.7)	54.2	(0.7)	2.3	(0.1)	9.2	(0.3)
Less than upper secondary	35.1	(0.4)	62.3	(0.4)	1.2	(0.0)	6.2	(0.1)
Completed upper secondary	33.9	(0.6)	61.0	(0.5)	0.9	(0.1)	4.3	(0.2)
University and higher	42.9	(0.8)	70.3	(0.6)	0.3	(0.0)	1.6	(0.1)
<i>Place of birth</i>								
Not born in present place	22.8	(0.7)	53.0	(0.7)	1.9	(0.2)	7.2	(0.3)
Born in present place	17.8	(0.4)	46.2	(0.5)	3.1	(0.2)	9.0	(0.2)
<i>Location</i>								
Rural	15.6	(0.4)	41.1	(0.5)	5.5	(0.3)	14.5	(0.3)
Urban	37.7	(0.4)	65.2	(0.4)	0.8	(0.1)	4.3	(0.1)
<i>Sector</i>								
Agriculture, self-employed	15.5	(0.5)	41.4	(0.6)	5.1	(0.3)	13.3	(0.3)
Agriculture, wage-employed	21.1	(1.9)	48.2	(2.0)	2.9	(0.5)	9.3	(0.9)
Industry, self-employed	27.6	(0.5)	57.4	(0.5)	1.6	(0.1)	6.3	(0.2)
Industry, wage-employed	25.8	(0.7)	56.0	(0.7)	1.5	(0.2)	5.8	(0.3)
Services, wage-employed	28.9	(0.9)	59.3	(0.8)	0.9	(0.2)	3.9	(0.3)
<i>Migration</i>								
Labor-related migration	20.9	(0.7)	50.2	(0.8)	2.3	(0.2)	8.1	(0.4)
Non-labor-related migration	22.6	(0.7)	51.6	(0.7)	2.2	(0.2)	7.4	(0.3)
Did not move to current place	16.3	(0.6)	44.4	(0.6)	3.5	(0.2)	9.7	(0.3)
<i>Occupation</i>								
Managers/professionals	32.3	(0.9)	61.5	(0.7)	0.8	(0.1)	3.9	(0.3)
Service workers	29.4	(0.5)	59.3	(0.5)	1.3	(0.1)	5.5	(0.2)
Agricultural workers	15.3	(0.5)	40.9	(0.7)	5.7	(0.3)	14.6	(0.3)
Blue-collar workers	26.6	(0.8)	55.0	(0.8)	1.9	(0.2)	7.3	(0.4)
<i>Dependency ratio</i>								
Child dep.ratio <50 %	24.9	(0.5)	55.2	(0.5)	1.7	(0.1)	6.6	(0.2)
Child dep.ratio 50–99 %	20.2	(0.6)	49.4	(0.6)	2.5	(0.2)	8.2	(0.3)
Child dep.ratio >99 %	16.5	(0.5)	44.1	(0.6)	3.4	(0.2)	9.8	(0.3)
Panel C: 2005/06–2016/17								
<i>Gender of household head</i>								
Male	17.7	(0.5)	48.5	(0.5)	2.8	(0.2)	9.0	(0.3)
Female	24.5	(0.5)	55.1	(0.5)	1.8	(0.1)	7.4	(0.2)
<i>Education of household head</i>								
No education	12.2	(0.6)	37.2	(0.8)	7.0	(0.4)	17.3	(0.4)
Less than primary	22.6	(0.7)	50.7	(0.7)	3.2	(0.2)	11.2	(0.3)
Less than lower secondary	26.8	(0.7)	55.0	(0.7)	2.3	(0.1)	9.0	(0.3)
Less than upper secondary	35.9	(0.4)	63.5	(0.4)	1.3	(0.0)	6.4	(0.1)
Completed upper secondary	36.9	(0.8)	65.3	(0.6)	0.8	(0.1)	4.0	(0.2)
University and higher	35.7	(1.0)	66.6	(0.8)	0.3	(0.0)	1.7	(0.1)
<i>Place of birth</i>								
Not born in present place	21.9	(0.8)	52.7	(0.8)	1.9	(0.2)	7.3	(0.4)
Born in present place	18.0	(0.5)	49.2	(0.5)	2.7	(0.2)	8.9	(0.2)
<i>Location</i>								
Rural	16.4	(0.4)	44.8	(0.6)	4.7	(0.2)	14.0	(0.3)
Urban	36.8	(0.4)	64.8	(0.4)	0.9	(0.1)	4.7	(0.1)
<i>Sector</i>								
Agriculture, self-employed	16.3	(0.5)	45.1	(0.6)	4.2	(0.3)	12.5	(0.3)
Agriculture, wage-employed	20.5	(1.8)	49.4	(2.0)	2.8	(0.6)	9.2	(1.0)
Industry, self-employed	25.7	(0.5)	57.5	(0.5)	1.6	(0.1)	6.5	(0.2)
Industry, wage-employed	24.4	(0.7)	57.1	(0.7)	1.4	(0.2)	5.9	(0.3)
Services, wage-employed	29.3	(0.9)	61.4	(0.8)	0.9	(0.2)	4.1	(0.3)
<i>Migration</i>								
Labor-related migration	20.7	(0.7)	51.3	(0.7)	2.2	(0.2)	8.0	(0.4)
Non-labor-related migration	21.7	(0.7)	52.4	(0.7)	2.1	(0.2)	7.6	(0.3)
Did not move to current place	16.9	(0.6)	48.0	(0.7)	3.0	(0.2)	9.4	(0.3)
<i>Occupation</i>								
Managers/professionals	34.3	(0.9)	63.2	(0.8)	0.8	(0.1)	4.1	(0.3)
Service workers	28.0	(0.5)	59.4	(0.5)	1.3	(0.1)	5.8	(0.2)
Agricultural workers	16.1	(0.5)	44.6	(0.7)	4.6	(0.3)	13.6	(0.3)

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Table A.8 (continued)

	Upward mobility				Downward mobility			
	Exited from extreme poverty to non-poverty		Exited from moderate poverty to non-poverty		Falling into extreme poverty from non-poverty		Falling into moderate poverty from non-poverty	
	%	SE	%	SE	%	SE	%	SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Blue-collar workers	27.1	(0.9)	56.8	(0.9)	1.8	(0.2)	7.2	(0.4)
<i>Dependency ratio</i>								
Child dep.ratio <50 %	25.5	(0.5)	58.1	(0.5)	1.6	(0.1)	6.6	(0.2)
Child dep.ratio 50–99 %	19.6	(0.7)	51.0	(0.7)	2.3	(0.2)	8.3	(0.3)
Child dep.ratio >99 %	15.3	(0.5)	44.5	(0.6)	3.3	(0.2)	10.0	(0.3)

Note: Conditional probabilities are calculated by conditioning individuals' movement on their poverty status in the first period. Bootstrapped standard errors, based on 1000 replications, are reported in parentheses. SE = standard error.

Variable	Definition
<i>Religion</i>	
Muslim	The individual answered "Islam" or "Moslem" for their religious denomination.
Catholic	The individual answered "Catholic" for their religious denomination.
Protestant	The individual answered "Protestant," "Anglican," "Presbyterian," "Methodist," or "Pentecostal (/Charismatic)" for their religious denomination.
Other Christian	The individual answered "Other Christian" for their religious denomination.
Animist/Traditional	The individual answered "Traditional" or "Spiritualist" for their religious denomination.
Other	The individual answered "No religion" or "Other" for their religious denomination.
<i>Language</i>	
English	The documented language used by respondent is English.
Akan	The documented language used by respondent is Akan.
Ewe	The documented language used by respondent is Ewe.
Ga-adagbe	The documented language used by respondent is Ga-Dangme.
Dagbani	The documented language used by respondent is Dagbani.
Other	The documented language used by respondent is Frara, Nzema, or other.
<i>Education</i>	
<i>An individual's highest level of education attained</i>	
No formal education	The individual answered no to whether they have ever attended school.
Preschool or incomplete primary	The individual answered yes to whether they have ever attended school and reported an education level lower than grade 6 at primary school for their highest grade completed.
Completed primary or incomplete lower secondary	The individual reported an education level between grade 6 at primary school and grade 2 at junior secondary school for their highest grade completed.
Completed lower secondary or incomplete upper secondary	The individual reported an education level between grade 3 at junior secondary school and grade 2 at senior secondary school for their highest grade completed.
Completed upper secondary or vocational or post-secondary technical education	The individual reported grade 3 at senior secondary school, teacher training, vocational training, or nursing for their highest grade completed.
Tertiary	The individual reported polytechnic, university, or other tertiary for their highest grade completed.
<i>Parents' characteristics</i>	
Father has no formal education	The individual reported that the highest level of education their father completed is "none" or "koranic"; or, in the case where the father lives in the same household, the father's self-reported level of education is no formal education.
Father has formal education	The individual reported that the highest level of education their father completed is anything but "don't know," "none," or "koranic"; or, in the case where the father lives in the same household, the father's self-reported level of education is anything between "preschool or incomplete primary" and "tertiary."
Mother has no formal education	The individual reported that the highest level of education their mother completed is "none" or "koranic"; or, in the case where the mother lives in the same household, the mother's self-reported level of education is no formal education.
Mother has formal education	The individual reported that the highest level of education their mother completed is anything but "don't know," "none," or "koranic"; or, in the case where the mother lives in the same household, the mother's self-reported level of education is anything between "preschool or incomplete primary" and "tertiary."
Father is not a farmer	The individual reported that the primary work done by their father is anything but agriculture/animal husbandry; or, in the case where the father lives in the same household, the father's self-reported employment is nonagricultural.
Father is a farmer	The individual reported that the primary work done by their father is agriculture/animal husbandry; or, in the case where the father lives in the same household, the father's self-reported employment is agricultural.
Mother is not a farmer	The individual reported that the primary work done by their mother is anything but agriculture/animal husbandry; or, in the case where the mother lives in the same household, the mother's self-reported employment is nonagricultural.

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Variable	Definition
Mother is a farmer	The individual reported that the primary work done by their mother is agriculture/animal husbandry; or in the case where the mother lives in the same household, the mother's self-reported employment is agricultural.
<i>Migration characteristics</i>	
Labor-related migration	The individual reported that the main reasons for moving to the current village/town were "job transfer," "seeking employment," "own business," or "spouse's employment."
Non-labor-related migration	The individual reported that the main reasons for moving to the current village/town were "accompanying parents," "marriage," "other family reasons," "political/religious reasons," "education," "war," "fire," "flood/famine/drought," or "other."
Did not move to current place	The individual reported that he/she never moved to the current village/town.
Not born in present region	The individual reported that he/she was born in a region different from the current one.
<i>Occupational characteristics</i>	
Managers/professionals	The individual reported that the occupation at their primary work is "manager," "professional," or "technicians and associate professionals."
Service workers	The individual reported that the occupation at the primary work is "clerical support" or "service and sales."
Agricultural workers	The individual reported that the occupation at the primary work is "skilled agricultural, forestry and fish."
Blue-collar workers	The individual reported that the occupation at the primary work is "craft and related trading" or "planting and machine operating and assembling or other elementary occupations."
<i>Household characteristics</i>	
Child dependency ratio	The number of children (ages 0–14) divided by the number of adults (ages 15–64) in a household.
Agriculture, self-employed	The majority of total hours worked in a household is in the agriculture sector and in self-employment. ^a
Agriculture, wage-employed	The majority of total hours worked in a household is in the agriculture sector and in wage employment. ^a
Industry, self-employed	The majority of total hours worked in a household is in the industrial sector and in self-employment. ^a
Industry, wage-employed	The majority of total hours worked in a household is in the industrial sector and in wage employment. ^a
Service, wage-employed	The majority of total hours worked in a household is in the service sector and in wage employment. ^a

a. When the hours are equal between wage employment and self-employment in a household, the household is defined as a "self-employed household"; and when the hours are equal between agricultural and industrial/services employment in a household, the household is defined as an "agricultural household."

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