UNITED NATIONS UNIVERSITY
UNU-WIDER

WIDER Working Paper 2023/91

Differences in inequality measurement

Ghana case study

Richmond Atta-Ankomah,[1] Monica Lambon-Quayefio,[2] and Robert Darko Osei[1]

July 2023

United Nations University World Institute for Development Economics Research
wider.unu.edu

Abstract: Over the years, money-metric measures of inequality such as the Gini coefficient and the Palma Ratio, as frequently used in Ghana, have become useful in providing quantitative measures of welfare distribution that enable a better understanding of the extent and nature of inequality. From these measures, we know that inequality has been rising in Ghana despite high and stable growth and a decline in the poverty rate. Although rising, however, inequality is low in Ghana compared with other countries in the sub-region. In promoting the global understanding of inequality and the distribution of resources for effective policy-making and international cooperation, it is important to monitor and compare inequality across countries. The WIID project is designed to facilitate such a comparison by providing a standardized measure of inequality that is comparable across countries and over time for any given country. Focusing on Ghana, this paper aims to explore the extent to which estimates of Gini coefficients from the WIID Companion are consistent with and add to the prevailing understanding of inequality in Ghana. To this end, we review the primary source of data for the three main Gini series on Ghana (WIID Companion, Ghana Statistical Service, and PovcalNet) in order to highlight data quality issues that affect the comparability of inequality measures over time. We then compare the inequality estimates reported by the WIID Companion with the other two series, highlighting any similarities and interrogating any differences to make an informed commentary on the estimates from the WIID Companion.

Key words: Gini coefficient, inequality, income, WIID Companion, Ghana

JEL classification: C81, D31, D63, I32

Acknowledgements: This study was supported by UNU-WIDER and received technical backing from the ACEIR Secretariat at the University of Cape Town. The study benefited from joint discussions with ACEIR researchers stationed at the University of Ghana and the UCT, and from comments by Prof. Martin Wittenberg, Prof. Murray Leibbrandt, and the UNU-WIDER researchers. However, the authors are solely responsible for any errors herein.

[1] African Centre of Excellence for Inequality Research (ACEIR) and the Institute of Statistical, Social and Economic Research (ISSER), University of Ghana, Accra, Ghana; [2] ACEIR and the Department of Economics, University of Ghana, Accra, Ghana. Corresponding author: Robert Darko Osei: rdosei@ug.edu.gh / rdosei@yahoo.co.uk

This study has been prepared within the UNU-WIDER project World Income Inequality Database (WIID).

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9267-399-4

https://doi.org/10.35188/UNU-WIDER/2023/399-4

Typescript prepared by Joseph Laredo.

United Nations University World Institute for Development Economics Research provides economic analysis and policy advice with the aim of promoting sustainable and equitable development. The Institute began operations in 1985 in Helsinki, Finland, as the first research and training centre of the United Nations University. Today it is a unique blend of think tank, research institute, and UN agency—providing a range of services from policy advice to governments as well as freely available original research.

The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland and Sweden, as well as earmarked contributions for specific projects from a variety of donors.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

Accurately measuring inequality, particularly in developing countries, is critical for effective policy-making. However, for most developing countries, including those in Africa, there is often less reliable measurement of inequality. Also, the measurement of inequality is usually not carried out consistently over time in these countries, resulting in irregular intervals for inequality data series. These challenges affect monitoring changes in inequality over time and also undermine comparative analysis across countries and other geographies. In some cases, different inequality estimates are reported for the same country within the same time period. This is often because different data sources and different welfare concepts are used for the construction of inequality measures.

With the goal of making inequality data more available to researchers, the United Nations University World Institute for Development Economics Research (UNU-WIDER) has compiled the World Income Inequality Database (WIID) and, more recently, the WIID Companion, comprising comprehensive data on developed, developing, and transitioning countries. The WIID Companion (UNU-WIDER 2021)[1] is an attempt to provide a standardized measure of inequality that will apply both across countries and over time for any given country. Specifically, the WIID Companion seeks to address comparability issues regarding the use of different welfare concepts and datasets. While the WIID Companion is useful, in some years and for some countries including Ghana, the reported estimates are at variance with estimates from national statistical offices. Although some variances should be expected, it is key to know the extent of any variance and to understand the reasons for it. This paper represents an effort to address this issue by reflecting on the sources of data and the methodology the WIID Companion has used to compute inequality measures.

This paper focuses on Ghana, which is characterized by rising inequality in the presence of improved economic growth and decreasing poverty rates, exploring in detail the WIID Companion estimates of Gini coefficients for Ghana. The data points in the series of the Gini coefficients for Ghana provided by the WIID Companion were derived from estimates by PovcalNet, while PovcalNet in turn is based on a consumption aggregate at the household level obtained from the various Ghana Living Standard Surveys (GLSS). Indeed, it should be emphasized that in the case of Ghana, all the data points in the WIID Companion were computed using Gini coefficients estimated from the GLSS. We therefore review and highlight any changes in the surveys, particularly in relation to the welfare concept used in generating the estimates for the Gini coefficient or inequality measures. We compare the inequality estimates reported in the WIID Companion with those from PovcalNet and the Ghana Statistical Office (the national statistical office that produces the GLSS). More importantly, we highlight any similarities, interrogate differences in the reported estimates, and comment on whether the estimates from the WIID Companion are reliable.

[1] The version cited (31 May 2021) is the one we used in this study.

2 Inequality in Ghana—a summary of the narrative

Although there has been a reduction in Ghana's poverty rate over the years, inequality has been on the rise, particularly over the past two decades, suggesting that the benefits of the country's economic growth have not been equally distributed. Inequality estimates by Cooke et al. (2016) and the Ghana Statistical Service (GSS 2018) show that inequality increased from 0.37 in 1992 to 0.43 in 2017, the greatest increase occurring between 1999 and 2006, when it rose from 0.39 to 0.42. The coefficient stabilized in 2013, maintaining a value of 0.42, but increased marginally in 2017 to 0.43.

Using data from the last three waves of the GLSS (i.e. 2005/06, 2012/13, and 2016/17), Atta-Ankomah et al. (2020) report the dynamics at the regional level, inequality being seen to have increased in some regions but declined in other regions. Overall, they note that inequality is high in regions with a high incidence of poverty. Using data from the last three rounds, Atta-Ankomah et al. (2020) provide evidence that inequality in Ghana is higher within regions than between regions. For instance, using a Theil inequality coefficient, within-region inequality was estimated in 2005/06 to be 0.230 and increased to 0.246 and 0.260 in 2012/13 and 2016/17, respectively, while between-region inequality estimates were 0.05, 0.04, and 0.05, respectively, for the same period. As the between-region estimates were very stable, it is clear that within-region inequality has risen and driven an increase in overall inequality. Clearly, inequality is largely a within-region phenomenon in Ghana. In considering locality, inequality is higher in rural areas than in urban areas, suggesting that urban areas appear to have benefited from the improvement in economic growth more than rural areas.

In education, Senadza (2012) provides evidence of inequality in educational attainment, particularly along spatial and gender lines. Inequality in education is highest in the northern part of the country and for women. Other dimensions of inequality that have been examined include asset inequality as well as inequality in social services. Estimates of asset inequality by Atta-Ankomah et al. (2020) show an increase from 2005 to 2013 and then a decrease in 2017. A decomposition of asset inequality estimates across various socioeconomic groups shows that asset inequality is also higher within groups than between groups (Atta-Ankomah et al. 2020). Regional estimates by Atta-Ankomah et al. (2020) also indicate regional differences in asset inequality. Inequality in access to health, electricity, internet, water, and sanitation have also been explored by Atta-Ankomah et al. (2020), who indicate similar regional differences.

3 Data and approach used by GSS

3.1 Measures of inequality

To date, the GSS has relied on two main measures of inequality since it commenced its measurement and reporting of inequality in 1992. Until the last round of the GLSS, the Gini coefficient was the sole measure of inequality. The Palma Ratio was recently introduced as an additional measure for comparability given the limitations of the Gini coefficient.

The Gini coefficient is based on the Lorenz curve, a cumulative frequency curve that compares the distribution of either income or consumption estimates. The Gini coefficient has a lower bound of 0 and an upper bound of 1—where the lower bound represents perfect equality, indicating a situation where income is equally shared among members of society, and the upper bound represents a situation of perfect inequality where very few members of society receive all

the income. The Gini coefficient makes use of the entire data from the entire distribution and is not additively decomposable, preventing the sources of inequality from being decomposed.

The Palma Ratio, also known as the decile dispersion ratio, is a widely used measure of inequality; this may be due to the simplicity in its estimation. The ratio (or index) is obtained by dividing the average consumption or income of the richest 10 per cent of the population by the average income or consumption of the bottom or poorest 10 per cent of the distribution. The main disadvantage of the ratio as compared with the Gini coefficient is the fact that it does not use the entire distribution of data (i.e. income and consumption): it ignores the income or consumption expenditure estimates in the middle of the distribution.

Consumption expenditure has generally been used by the GSS in the measurement of inequality because the GLSS surveys do not collect information on income—except the 1991/1992 round, when reported inequality rates were based on both consumption expenditure and income measures; all subsequent years of the survey deferred to the use of the Gini coefficient and consumption expenditure. This presents a limitation for the comparison of inequality measures based on income across the different rounds of the survey. As acknowledged by the GSS, there is a greater spread in inequality measures based on income than in estimations based on consumption expenditure. For instance, the reported Gini coefficient for income was 0.48, while the estimate based on consumption expenditure was 0.35, using GLSS 3, where incomes were reported.

In the estimation of the Gini and the Palma Ratio, the statistical service makes use of expenditure per capita or income per capita (in the case where income was used). The consumption expenditure aggregate comprises actual and imputed expenditure on food and non-food items, expenditure on housing, and expenditure on remittances. The income aggregates comprise employment income, household agricultural income, non-farm self-employment income, rental income, income from remittances, and other sources of income.

3.2 Data—The Ghana Living Standard Survey (GLSS)

The GLSS remains the main source of data for measuring inequality in Ghana. Through a partnership with the World Bank and the GSS, the GLSS was launched in 1987 to provide data on the various aspects of Ghanaian households' economic and social activities and the interactions between these activities. The survey collects information on different dimensions of living conditions, including education, health, and employment, as well as expenditure on food and non-food items, and provides valuable insights into the living conditions of Ghanaians at any point in time. Data are collected at three levels: the individual level, the household level, and the community level. The survey was planned to be undertaken every five years after the first survey was conducted in 1987/88. However, this planned interval has not been followed exactly, so that the inequality estimates from the GLSS datasets do not have regular time intervals either.

For all the rounds of the survey,[2] the GLSS adopts a two-stage stratified random sampling design. The first stage involves the random selection of enumeration areas (EAs) from the various regions. The selection of the EAs is proportional to the population, to ensure representativeness at the locality level (i.e. rural and urban) as well as of the ecological zones in Ghana. In the second stage, 15 households are selected from each of the EAs. The total number of households for each round of the survey is based on the number of EAs used for that survey round.

[2] https://statsghana.gov.gh/gssdatadownloadspage.php provides a link to all rounds of the GLSS.

Over the years, the statistical service has implemented various changes with the objective of improving the consumption measurements. So, although there are seven rounds of the survey, the older rounds are not fully comparable because of changes in the questionnaires for each round. However, the last three rounds (GLSS 5, GLSS 6, and GLSS 7) are more comparable because of the nearly identical questionnaires that were used, and therefore allow a more direct comparison of results.

The subsections that follow discuss some of the key changes in data collection methods and the questionnaire used across GLSS 3–7 in order to assist us in highlighting what these changes might mean for data comparability over time and the implications for inequality measures based on the data.

Ghana Living Standard Survey 3 (1991/92)

This round of the survey was conducted almost a decade after Ghana went into the Economic Recovery Programme (ERP) and immediately prior to the country's reintroduction of democratic governance under the fourth republic (GSS 1995). Of the 407 EAs selected in the first stage of the multi-stage sampling, 15 households were selected in each urban cluster and 10 households in each rural cluster, achieving a total of 4,552 households with approximately 20,403 individuals.

In addition to collecting information on all aspects of living conditions of Ghanaians, including health, education, employment, housing, agricultural activities, operation of non-farm establishments, remittances, credit, assets, and savings, this round focused on collecting detailed information about household income and expenditure. Income and expenditure data for this round were considered to be of higher quality than information collected in the first two rounds. In GLSS 1 and 2, the recall period on expenditure on food and non-food items for participating households was two weeks and an attempt was made to estimate annual household expenditure on food and non-food items as well as to impute annual estimates of home-produced food items. In GLSS 3, however, more detailed information was collected through more frequent visits to each household. In total, households in rural clusters were visited eight times while urban clusters were visited 11 times. Urban households were provided with a special diary and requested to record all expenses incurred on a particular day on a page. This activity was to be undertaken by a literate member who had been identified during the 'listing' stage of the survey. In the case of households with no literate person, a supplementary interviewer visited the household and did the recording. As a result, the recall period was reduced significantly from two weeks to two or three days, thereby improving the household consumption and expenditure estimates.

Three types of questionnaires were used for GLSS 3: a household questionnaire, a community questionnaire, and a price questionnaire. The price questionnaire was particularly important, as it was used to collect information on prices from local markets. The information obtained was then used to compare prices in different parts of the country and to construct regional price indices and adjust household expenditures to a common base.

Due to a lack of consensus on what constituted a suitable adult equivalence scale in Ghana, GLSS 3 made use of expenditure per capita after all expenditure data had been adjusted to take account of inflation over the survey period.

Inequality in this round was estimated using the Gini coefficient based on both consumption expenditure and income per capita. A Gini of 0.48 and 0.35 was reported for income per capita and consumption expenditure per capita, respectively. Total household expenditure was based on food and non-food expenses, on expenditure on housing, and on remittances. Income also consisted of income from wage employment, agricultural income, non-farm self-employment

income, rental income, income from remittances, and other income (from scholarships and other sources).

Given the large difference in the inequality estimates, it must be questioned which measure should be used to better measure inequality—income or consumption. Due to the potential of households to under-report their income levels rather than their consumption, using income aggregates may not be a reliable estimate.

Ghana Living Standard Survey 4 (1998/99)

The implementation of the Economic Recovery Program/Structural Adjustment Programs, which began in 1983 and involved cutting public sector employment, subsidies, and spending, as well as market deregulation and the privatization of state-owned enterprises, underscored the need to monitor labour market outcomes such as levels of employment, underemployment, and unemployment on a continuous basis. GLSS 4, which was conducted seven years after the third round, therefore had a special labour force module to capture the changes in the labour market indicators of interest for more focused policy-making.

We note some changes in the measurement of income between GLSS 3 and GLSS 4. In GLSS 3, the reference period for measuring income was one month and this was changed to 12 months in the 2012/13 round. This change was made to capture the seasonality in household incomes. There was also a change in the income sources. GLSS 3 focused on only two sources of income, namely (i) wages and salaries and (ii) self-employment. In GLSS 4, however, the income sources expanded to include remittances, property income, and transfers from social programmes. While these changes may have led to an improvement in the precision of income measures, it renders the inequality measures less comparable over time.

Using a multi-staged sampling technique similar to that for GLSS 3, GLSS 4 sampled a total of 5,998 households and 25,855 individuals from about 300 EAs, with 20 households selected per EA. The income and expenditure modules used in the third round of the survey were maintained for comparability. Detailed information on food expenditure was collected at five-day intervals over a period of 35 days in all the households surveyed. This indicates a doubling of the recall period from the third round of the survey. The change in the recall period has important implications for data quality, as noted by Schündeln (2018), who tested for differences in consumption based on the number of visits by enumerators to households. Beegle et al. (2012) also report important implications of recall period for data quality.

The Gini coefficient was the main measure of inequality and was based on expenditure and income per capita. The reported income inequality was 0.60, while the inequality measure obtained from consumption inequality was 0.43.

Ghana Living Standard Survey 5 (2005/06)

This survey round covered a sample of 8,687 households in 580 EAs, containing 37,128 individuals, and used the same sampling methodology as earlier rounds, but with an additional module Non-Farm Household Enterprises. The composition of total household expenditure followed the previous rounds, although the GSS adopted the UN statistical classification system, the Classification of Individual Consumption According to Purpose (COICOP), to improve the consumption expenditure classification by capturing it only under food and non-food consumption. As in the previous rounds, daily consumption and expenditure diaries were used to facilitate the interviews. Interviewers returned to participating households every third day to collect information on household consumption and expenditure.

Inequality estimates for GLSS 5 were based on consumption expenditure per capita and were reported to be 41.9 per cent (GSS 2014). Although information on household income was collected, inequality measures were not reported using this measure.

Ghana Living Standard Survey 6 (2012/13)

In contrast to previous rounds, GLSS 6 included a Labour Force Survey module with an additional section on Child Labour. In addition, the survey methodology was reviewed to account for the inclusion of additional indicators pertaining to the northern savannah ecological zone, where a major government initiative, the Savannah Accelerated Development project (SADA), had just been initiated. As a result, the number of EAs rose from 580 to 1,200, representing an increase of approximately 107 per cent. The number of successfully interviewed households also increased significantly, to 16,772. As before, a diary for recording daily consumption and expenditure was given to each household to accurately capture household expenditure. Households with no literate person were visited every day for 35 days by enumerators to record all expenditure in the household diary.

Compared with previous rounds of the GLSS, two key adjustments were made to allow for changes in consumption patterns. The first was the inclusion of the user values of VCD/DVD/ mp4 player/iPad, vacuum cleaner, rice cooker, toaster, electric kettle, water heater, tablet PC, and mobile phone in the calculation of consumption aggregates. The second was relaxing the cleaning procedure: replacing the values of expenditure items above five standard deviations with the mean for that locality (the previous surveys used three standard deviations).

The inequality measure computed in GLSS 6 was based on per capita consumption expenditure, which was reported to be 0.424, compared with 0.419 in GLSS 5 (2005/06). No inequality estimate was provided using income aggregates, although information on income was collected.

Ghana Living Standard Survey 7 (2016/17)

GLSS 7 used the new basket derived for the estimates in GLSS 6. No re-basing of the consumption basket was required as there was no significant change in the composition of consumption expenditure between the last round and the current round. Sampling methods used in GLSS 6 were maintained. From 1,000 EAs, a total of 14,009 households were successfully surveyed. Variations in the cost of living across regions as well as differences in household size and composition (children vs. adults and males vs. females) were considered in the construction of the consumption estimates. Two measures of inequality were computed using data from this round, i.e. the Gini coefficient and the Palma Ratio. For both measures the measure of standard of living used was consumption per adult equivalence. This was computed by dividing total household consumption by the number of adult equivalents in the household. For comparisons in consumption aggregates over time, periodic adjustments are required to reflect changes in household consumption patterns. No such adjustment was made in GLSS 7 since not many new consumer goods had entered the consumption basket of Ghanaian households since the previous round. Again, although information on household income was collected, the GSS did not compute inequality measures based on income.[3]

[3] We did not attempt to compute income for GLSS 7 because we could not obtain the metrics used by the GSS to compute income for the previous rounds of the GLSS.

A Gini coefficient estimate of 0.43 was reported for GLSS 7, which was based on per capita consumption expenditure. An estimate of the Palma Ratio using per capita consumption was reported for each of the 10 regions of Ghana.

3.3 Summary of key changes in GLSS methods and data

Table 1 shows the changes in sampling over the various rounds of the survey. As noted, the number of EAs used fluctuated over the years. Similarly, the number of households did not remain the same. These increased consistently over the survey rounds, unlike the EAs, which declined in some years and increased in others. The changes in EAs and sample sizes pose challenges that make comparability of the survey rounds difficult. For example, they may introduce coverage bias, whereby certain groups are under-represented or over-represented in the sample. This can affect the comparability of the estimates over time. Also, a smaller sample size may suffer from reduced precision of estimates, which makes it difficult for small changes over time to be detected.

Table 1: Sampling differences in the GLSS

Survey round/year	Enumeration areas	Households
GLSS 3: 1991/92	407	4,552
GLSS 4: 1998/99	300	5,998
GLSS 5: 2005/06	580	8,687
GLSS 6: 2012/13	1,200	16,772
GLSS 7: 2016/17	1,000	14,009

Source: authors' construction.

In addition to the changes in the number of EAs and households in the different rounds of the GLSS, there were changes in the ways in which the data were collected, which may raise concerns about the comparability of the surveys. These changes are documented in Table 2.

Table 2: Summary of data collection changes

Survey round	Consumption module	Recall period
GLSS 3	Expenditure consists of non-food, food, and (availability of) consumer items.	Expenditure data collected at 2-day intervals for 14 days (rural households); 3-day intervals for 30 days (urban households). Reference period is 3m/12m. Total of 8 visits made for rural households and 11 visits for urban households. Data collection supported by diary.
GLSS 4	Cash expenditure and consumption of home-produced food combined to arrive at total food consumption at the household level and on a per capita basis.	Food expenditure collected at 5-day intervals for 35 days in all households. Reference period is 3m/12m with a total of 7 visits to both rural and urban areas.
GLSS 5	Expenditure data based on the categorization of the UN Statistics Division: Classification of Individual Consumption According to Purpose (COICOP).	Data collected at 3-day intervals over a 33-day cycle. Interviewers visited all households a total of 11 times. Daily visits by interviewer to record daily expenditure in households with no literate person. Diary of daily consumption used to support interviews.
GLSS 6	Expenditure comprises items purchased by cash, items consumed from home production, and items received as gifts or payment in kind. The COICOP classification used to accurately capture consumption under food and non-food items. Inclusion of the user values of VCD/DVD/mp4 player/iPad, vacuum cleaner, rice cooker, toaster, electric kettle, water heater, tablet PC, and mobile phone in the calculation of consumption aggregates.	Interviewers visited every 6 days, with a total of 7 visits per household over the period. Diary of daily consumption used to support interviews.
GLSS 7	As GLSS 6	As GLSS 6

Source: authors' construction.

As shown in Table 2, the GSS adopted the United Nations Statistics Division classification of individual consumption only in the fifth round of the GLSS. This classification method was meant to improve the measurement of consumption expenditure, since it is easier to identify expenditure that is attributed to food only vs. non-food consumption. Although this may have led to improvements in the quality of the expenditure classification, it makes the last three rounds of the survey less comparable with GLSS 3 and GLSS 4, which did not use this classification method. We also note the introduction of new consumption items in GLSS 6, which were not present in the previous survey rounds. There is a possibility that the changes in the inequality estimates based on data from the survey rounds may be a result of advancement in classification methods rather than changes in welfare.

We also observe differences in the implementation of the survey. For instance, except for the last two rounds, data collection periods consistently fluctuated. In the 1991/92 data round, households in rural areas and urban areas had different data collection periods: enumerators visited urban areas more frequently than rural areas. In the 1998/99 survey, however, the recall period was increased to five days from the three days used in the previous round, although the number of days for the interview increased from 33 days to 35 days in the 1998/99 survey. For this survey there was no difference in the number of visits to urban and rural households: all households had a total of 7 visits, which was lower than the 1991/92 survey round. Although it is not clear what accounted for changes in the recall period and the number of days for enumerator visits during each survey period, these changes may have some implications on the quality of the data as well as on the comparability of the data, as shown by Beegle et al. (2012) and Schündeln (2018).

4 Estimating Gini coefficients: PovcalNet versus WIID Companion

Apart from the Gini coefficients reported by the GSS, there are estimates of Gini coefficients provided by the World Bank through PovcalNet (which has now been replaced by the Poverty and Inequality Platform (PIP)) and UNU-WIDER through the WIID (Companion) (UNU-WIDER 2021). Like the estimates reported by the GSS, the underlying welfare aggregate used by these other sources is per capita household consumption, derived from the various Ghana Living Standard Surveys, produced by the GSS. Consequently, inequality measures from these other sources tend to be available only for the years in which the GSS conducted the living standard surveys. However, there are some differences in the way the Gini coefficients are derived by these key sources.

Unlike the Gini series from the GSS, which is based on per capita consumption expenditure denominated in local currency, the Gini coefficient from PovcalNet is based on per capita consumption expressed in 2011 PPP-adjusted US$ (Aguilar et al. 2019). As is done for other countries, the PPP adjustment is carried out to allow comparison of welfare distribution across countries (Aguilar et al. 2019). Indeed, this adjustment should not affect the Gini coefficient but could rather affect poverty rates; hence, any observed difference in the Gini coefficient between the GSS and PovcalNet may arise from factors other than the PPP adjustment and are expected to be negligible.

Although helpful for international comparison of welfare distribution, PovcalNet does not address the lack of comparability arising from the fact that, while some countries' welfare distributions are based on per capita (net/gross) income, others are based on per capita consumption (Gradín 2021). In addition, for some countries, the underlying surveys may differ significantly from one period to another, which will also affect comparability over time, even for the same country (Gradín 2021). In Ghana's case, for example, and as shown in Section 3 above, there were changes in the consumption modules of the GLSS as well as the recall period for the consumption modules. It is for these and related reasons that UNU-WIDER developed the WIID Companion, which attempts to address the issues related to limited comparability of series on inequality measures, particularly the Gini coefficient, over time and across countries, where the target welfare concept or aggregate is per capita net income.

Generally, the procedure used by the WIID Companion has two stages—adjustment and conversion—but both stages were not used for every country. Adjustment involves integration of various series into one within each country. This was applied to countries where different series were available, but the different series were from the same income concept or aggregate and each series was specific to a particular period. The series that overlapped by at least one year were interlinked, generally by adjusting the older series upwards or downwards to match the more recent one in the overlapping year(s). According to Gradín (2021: 4): 'This implicitly corrects the levels of the older series for differences in methods, coverage, etc. with respect to the next one, while keeping the information about its trend.' The adjustment procedure was not applied to Ghana. This was because the available Gini series for Ghana came from the same data source (that is, the GLSS) and was available only for the year in which the GSS conducted the living standards survey, as noted earlier. Indeed, the source of Gini data for the WIID Companion with regard to Ghana is the PovcalNet Gini series, which is based on the various living standard surveys conducted by the GSS. However, although there was no need for the adjustment procedure to be applied to Ghana, the welfare aggregate on which the available Gini series on Ghana was based was per capita consumption expenditure, measured at the household level. This makes it difficult to make a comparison with countries where other welfare aggregates such as net income have been used.

The conversion stage of the procedure adopted by the WIID Companion, which was applied to Ghana, essentially involves a process of standardization. In this standardization process, the series for countries where the welfare aggregate is not per capita net income and/or is on a different scale such as an equivalence scale are converted to reflect the distribution of per capita net income. The WIID Companion preference for a net income concept for consumption is based on the idea that inequality in consumption distribution tends to be lower than the inequality in income distribution (Gradín 2021). This standardization process is based on estimated parameters from cross-country regression models that relate Gini coefficients from different welfare concepts using the Luxembourg Income Survey (LIS) sample (Gradín 2021). Specifically, the net income Gini series for countries in the LIS sample were regressed on the Gini series from per capita consumption, with dummies capturing sub-regional and income-group-fixed effects. Parameter estimates from the regression that are relevant for a given country were then used to predict the values for net income Gini series for that country. Thus, the WIID Companion builds on the PovcalNet estimates by converting them to reflect what the Gini series would have been if it had been computed using per capita net income.

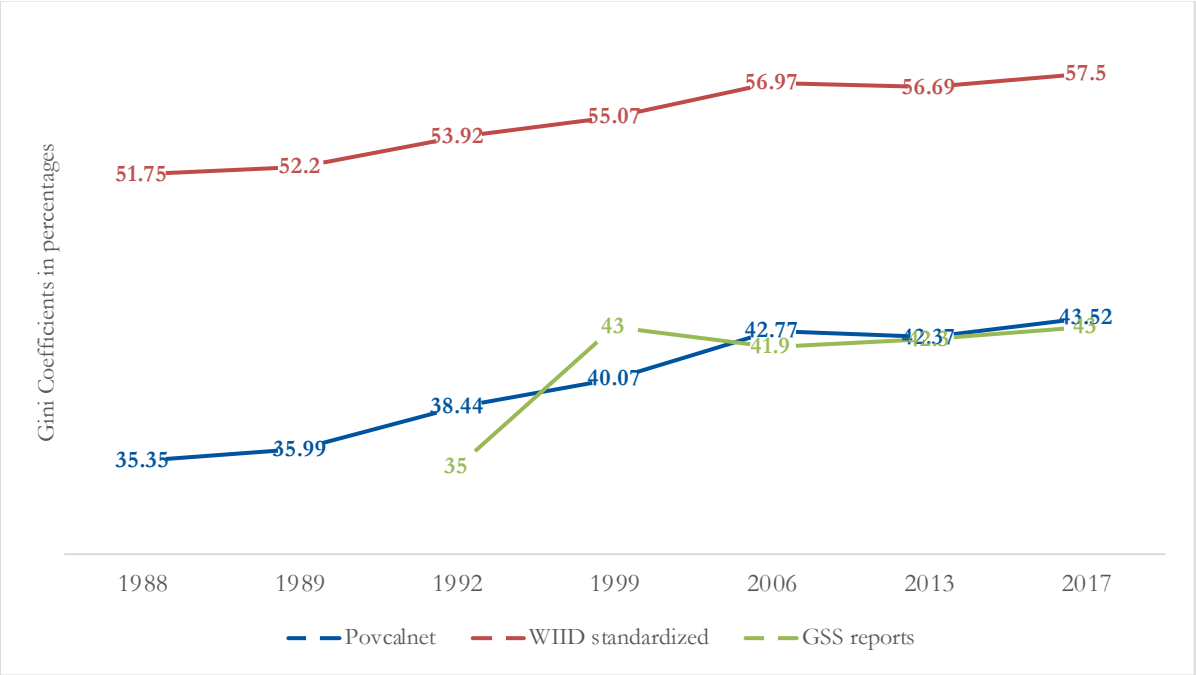
So, what are the implications of this standardization process in terms of measuring inequality, particularly in the context of Ghana? In the next section, we attempt to answer this question. We do this by comparing the series from the WIID Companion with those from PovcalNet and the GSS and interrogate the deviations between the WIID Companion on the one hand and the series from PovcalNet and the GSS on the other. This aims to provide an informed judgement about the extent to which the standardization procedure may be helpful in measuring inequality in Ghana. Additionally, we compare the WIID series with our own estimated Gini series using per capita income data provided by the GSS.

5 Comparative and evaluative discussion

5.1 Gini series from the WIID Companion, PovcalNet, and the GSS

Figure 1 presents line graphs for the three sources (WIID Companion, PovcalNet, and GSS) discussed above. Overall, we observe similar trends in the three series over the period considered, all pointing to a steady rise in inequality over time. With respect to the size of the Gini coefficients, however, we observe significant differences between the Gini series and, on the one hand, the WIID Companion Sand, on the other, PovcalNet and the GSS.

Figure1: Gini coefficients by source



Source: authors' construction.

The series from the WIID Companion and PovcalNet (and GSS) are parallel to each other, suggesting a similar rate of increase in inequality over the years, but the Gini coefficients from the WIID Companion are consistently higher than the PovcalNet (and GSS) estimates. This implies that the conversion process used by the WIID to obtain the net income Gini series is tantamount to a shifting of the consumption Gini series. Machemedze and Wittenberg (forthcoming) show that the effect of the conversion in the case of Ghana is to raise overall inequality by around 15 basis points. The higher inequality measure from the conversion is generally consistent with the existing literature, which suggests that consumption-based inequality measures tend to be lower than income-based inequality measures (see Jappelli and Pistaferri 2010; Noghanibehambari and Rahnamamoghadam 2020). We note also that the net income Gini series appears to be a bit smoother than the consumption Gini series, which is at variance with the literature (see Deaton and Grosh 2000; Smeeding and Latner 2015), suggesting that income tends to be more volatile than consumption; hence, we should expect the series from the WIID Companion to be less smooth than the Gini series from consumption expenditure.

The parallel nature of the estimates from PovcalNet and the WIID Companion is largely a consequence of the method used for converting the PovcalNet series into a new series measuring inequality in per capita net income. As mentioned earlier, the conversion is based on projections from a cross-country regression model, which unfortunately do not capture the nuances of country contexts. Indeed, Ghana did not feature in the regression, as the sample was limited to countries in the LIS, although the regression did include sub-regional and income-group-fixed effects. The PovcalNet estimates for Ghana were therefore converted using the estimated parameters for the sub-region and income group for Ghana. Hence, it is highly likely that there is a significant bias associated with the (net income) Gini series estimated by the WIID Companion. In other words, projecting income Gini estimates from a largely heterogeneous sub-region onto individual countries may lead to an over- or under-estimation of the level of inequality in net income for each country within the sub-region. While using the LIS for the estimation of the parameters required for the conversion is laudable, given that it may be the most comprehensive harmonized income survey, it is still limited for this purpose, especially with regard to sub-Saharan African countries,

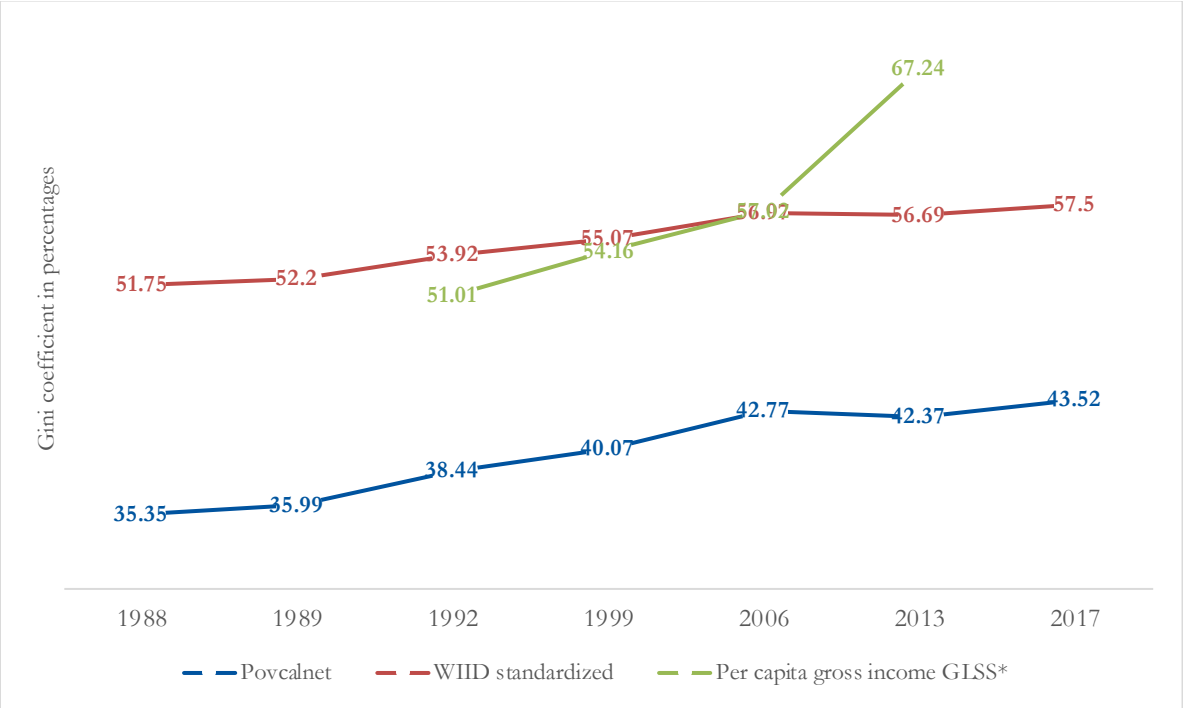
where the majority are not covered by the LIS. Hence, to improve the estimates for countries such as Ghana or enhance users' confidence in the estimates, it is important that the LIS cover Ghana and/or many other countries whose socioeconomic contexts are like that of Ghana.

Figure 1 further shows that the differences between the estimates from the GSS and PovcalNet are largely negligible. That PovcalNet and the GSS have near identical values is not surprising given that both series are estimated on the basis of per capita consumption expenditure data from the living standard surveys. We observe, however, relatively higher deviations between PovcalNet and the GSS estimates for 1992 and 1999 than for later years. While we do not know what accounts for this, it is important to reiterate the point made earlier about changes that occurred in the data collection method over the years. For example, the recall period used for collecting information on food expenditure in 1999 was twice that used in 1992, although the Expenditure modules of the survey questionnaire were not changed. We believe that these changes may have affected the inequality measure, which in turn is a potential explanation for the spike in the Gini coefficient from the GSS between 1992 and 1999. We do not know, however, whether the PovcalNet estimates are based on consumption series that have been harmonized or standardized across the various survey years beyond the PPP adjustments.

5.2 WIID Gini series and our calculated (gross) income Gini

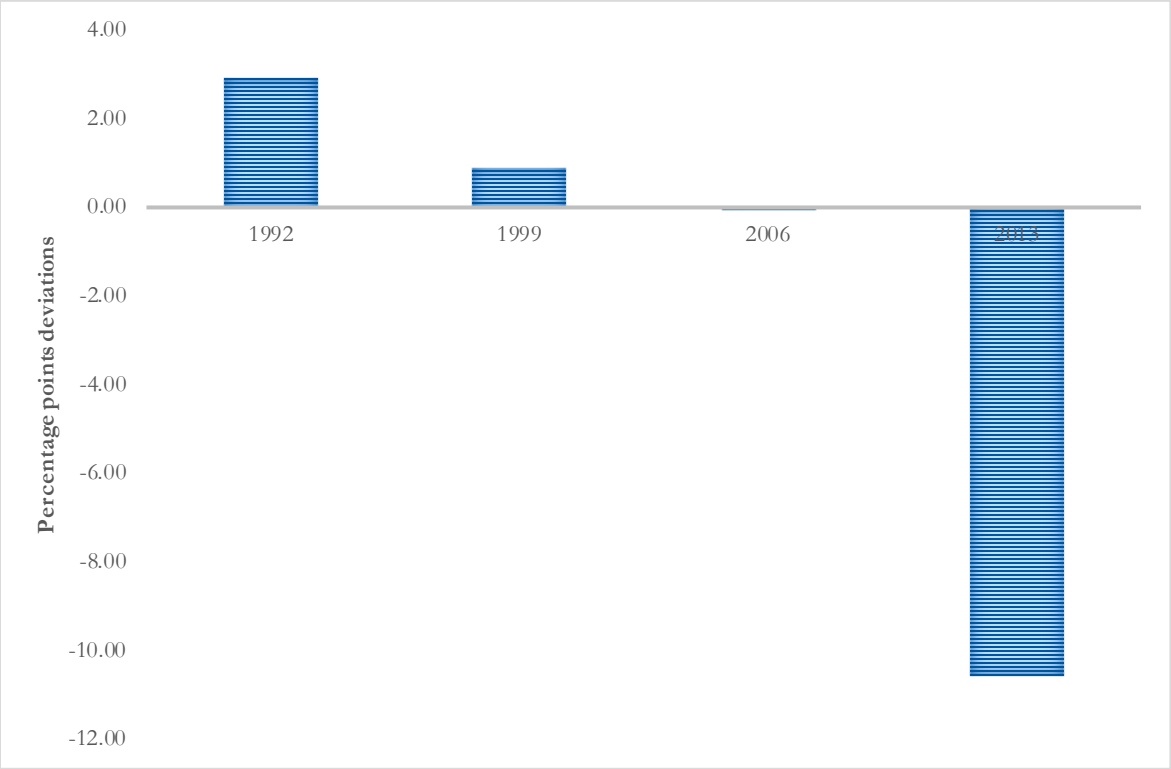
The GSS provided estimates of household income in the datasets of GLSS 3–6. However, incomes are usually not used for welfare analysis regarding poverty and inequality in Ghana for reasons well articulated in the literature (see Meyer and Sullivan 2003). We computed Gini coefficients based on the income variable obtained from the GLSS datasets, including that for GLSS 6, and the results are plotted in Figure 2, together with the Gini series from PovcalNet and the standardized income series from the WIID Companion. Unlike the previous rounds, and as noted earlier, the GLSS 7 dataset provided by the GSS does not include computed household income and we were unable to obtain information from the GSS on how they computed the income variable for the previous rounds of the survey. Another important point is that, whereas in GLSS 6 there was clear information indicating that the income variable represents gross income, there was no such information for the income variables found in the preceding three rounds of the survey. Despite these limitations, the plot in Figure 2 provides a number of insights worth highlighting. The computed Gini coefficients based on the income variable from the GLSS are generally close to the standardized (or income) Gini from the WIID Companion for Ghana except in 2013 (i.e. with GLSS 6), where we observe a relatively large deviation between the income Gini we have estimated and the income Gini from the WIID Companion (Figure 3). Indeed, Figure 3 shows that the deviations were consistently reduced until 2013.

Figure 2: Comparing Gini coefficients from different sources



Source: authors' construction.

Figure 3: Deviation between standardized Gini and (gross) income Gini



Source: authors' construction.

Generally, the closeness of the two series may suggest the following: first, the conversion by the WIID from a per capita consumption Gini to an income Gini may not be far from being a good way of converting consumption Gini to income Gini for Ghana—especially if one can assume

that the income variables in the GLSS 3, 4, and 5 datasets were net income. On the other hand, if one can assume that the income variable reported in the GLSS 3, 4, and 5 datasets was gross income, as was reported in GLSS 6, then one would need to be more cautious about judging the estimates from the WIID Companion to be fairly accurate; adjustment of gross income to net income could change the inequality estimates.

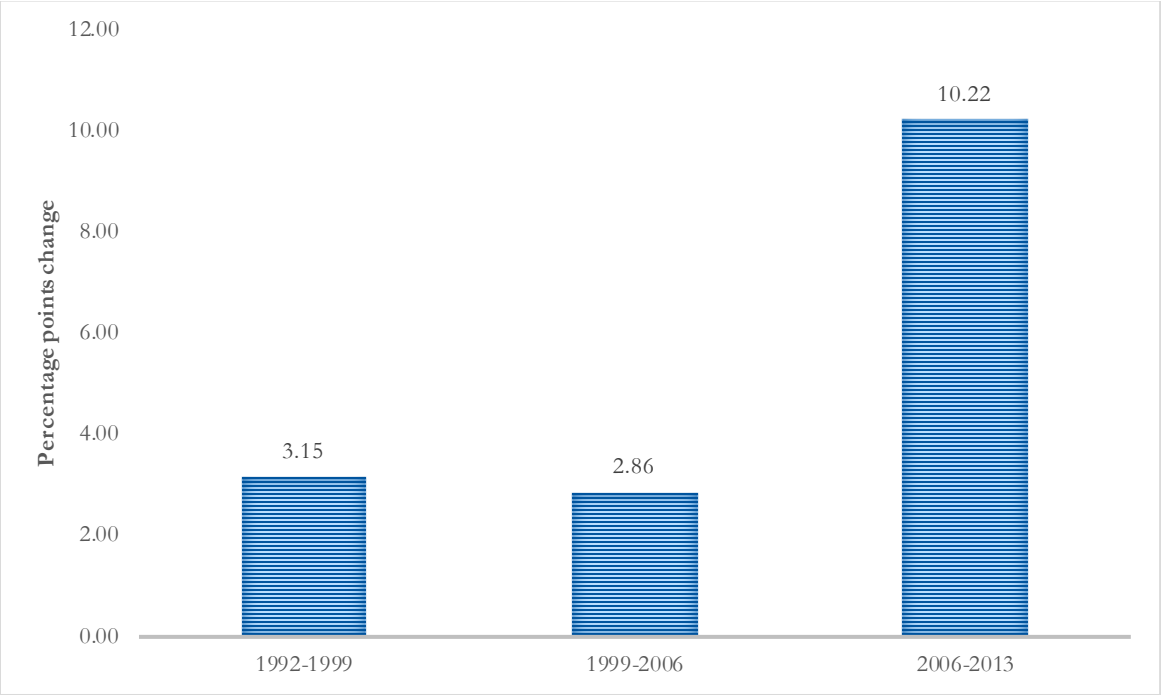
In Ghana, however, the prevalence of direct income taxes is low, with less than 10 per cent of the population of over 30 million paying income taxes (Citi Newsroom 2021)[4], although direct income taxes have been found to be progressive (Danso-Mensah et al. 2022; Younger et al. 2017). This means that the effect of direct taxes on income distribution may generally not be appreciable and, hence, the difference in the Gini coefficient for gross income and net income may be negligible. In fact, recent fiscal incidence analyses on Ghana using the Commitment to Equity (CEQ) framework show relatively small differences between the Gini coefficients for gross income and net income (Danso-Mensah et al. 2022; Younger et al. 2017).

Second, the income-based Gini for Ghana may not be as unreliable as income-based measures of poverty if one takes for granted that the income Gini from the WIID Companion is fairly accurate, as the earlier discussion suggested. This is particularly instructive given the generally low deviation between Gini coefficients from the income variable in the GLSS and the Gini coefficient from the WIID Companion. A key reason for reliance on consumption-based measures of poverty instead of income-based measures is the fact that a large of part of income is earned informally and, hence, may not be reported or may be underreported or concealed for tax avoidance. If these problems with income reporting in surveys happen randomly, with no regard to income classes in the society, then their impact on income distribution may be generally muted. However, the literature shows that it is highly unlikely for underreporting of income to be random; instead, income underreporting tends to be higher among richer households (see Carletto et al. 2022).

Figure 4 presents period-to-period deviations in the (gross) income Gini series derived from the income data in the GLSS datasets. It shows that the increase in the Gini coefficient between 1992 and 1999 is similar to the increase observed for the 1999–2006 period, while there was a relatively larger increase in the Gini coefficient between 2006 and 2013, i.e. nearly three times the value of what we observed for the previous periods. Thus, the change in the gross income Gini coefficient for the 2006–13 period is different not only when it is compared with the WIID standardized Gini but also when it is compared with the gross income Gini coefficients for the two periods preceding the period from 2006 to 2013. The key source of this anomaly is not known or not immediately perceptible, which raises questions about whether the metrics used for computing the income variable in GLSS 6 were different from those used for the preceding surveys, or whether the anomaly actually reflects some structural shocks to income distribution in Ghana between 2006 and 2013.

[4] https://citinewsroom.com/2021/11/less-than-10-of-ghanas-30-8m-population-is-paying-tax-ofori-atta-laments/

Figure 4: Period-to-period changes in Gini from GLSS (gross) income Gini series



Source: authors' construction.

A key factor that supports the latter potential explanation is that, between 2006 and 2013, Ghana discovered and started producing oil in commercial quantities, the oil economy subsequently becoming a major driver of economic growth in Ghana. Additionally, the latter half of this period witnessed an upsurge in the activities of small-scale gold miners—especially those of illegal small-scale miners, colloquially referred to as 'galamsey' in Ghana.[5] At the same time, Ghana went through a major power crisis from 2012 to 2016, which has been described as the worst power crisis in its history and negatively affected many economic sectors (especially manufacturing) that depend on power for production and, hence, incomes and livelihoods for those within these sectors. Of course, by their very nature, oil and small-scale gold mining activities were among the sectors least affected by the power crisis.

It thus appears reasonable to believe that the high deviation in the gross income Gini for 2013 may reflect a fundamental structural shock to income distribution in Ghana. And it is important to note that the WIID standardized Gini may not have captured this structural shock due to how the conversion was done. Let us remember that the conversion was broadly tantamount to a factor scaling of the consumption Gini series and, hence, would not capture deviations in income that do not largely or significantly translate into deviations in consumption. This perspective becomes more revealing in the light of the fact that consumption is generally known to be more stable than income (see Deaton and Grosh 2000; Smeeding and Latner 2015). And if we can take for granted that consumption is driven more by 'permanent income' than by actual (current) income (see Friedman 1957; Smeeding and Latner 2015), then deviations in actual or current income will not influence consumption significantly, especially in a contemporaneous sense. Indeed, it appears that the relationship between income (gross or net) Gini and consumption Gini may well be a dynamic

[5] Interestingly, both oil and small-scale mining activities are generally exclusive to a large segment of the population since they have become more capital intensive, involving the use of earth-moving equipment and chanfans. Hence, the poor cannot afford the necessary investment but can only provide labour, which is so arduous that only the youth are able to do it.

one; thus, estimating income Gini from consumption Gini may require a more detailed dynamic framework than that adopted for the WIID Companion.

6 Conclusion

Over the years, money-metric measures of inequality such as the Gini coefficient and the Palma Ratio, as frequently used in Ghana, have become useful as quantitative measures of the distribution of income for a better understanding of the extent and nature of inequality. From these measures, we know that inequality has been rising in Ghana despite high and stable growth and a decline in the poverty rate. Although rising, however, inequality is low in Ghana compared with other countries in the sub-region. In promoting the global understanding of inequality and the distribution of resources for effective policy-making and international cooperation, it is important to monitor and compare inequality among countries. The WIID project is designed to facilitate this comparison by providing a standardized measure of inequality that will apply across countries as well as over time for any given country.

Focusing on Ghana, this paper explored the extent to which inequality estimates from the WIID Companion are reasonable or suitable. This was done by first reviewing the primary sources of data for measuring inequality in Ghana (i.e. the Ghana Living Standard Surveys), highlighting any changes in the methods/questionnaires used in generating the welfare measure for inequality measurement. The review showed that the GSS has changed the way information on household consumption and incomes is collected through the survey. Specifically, we identified changes in recall periods and changes in what constitutes household consumption expenditure and income, over-sampling particularly in sixth round of the survey. These issues seem to affect the comparability of inequality measures over time in Ghana, but our review found no evidence of any attempt to address them when generating inequality measures for Ghana.

We then compared trends in the Gini coefficient provided by the GSS, PovcalNet, and the WIID Companion and highlighted the key differences in how they arrived at the Gini series, particularly with regard to differences in the welfare concept they focused on. For this, we found that both the GSS and PovcalNet estimate the Gini coefficients for per capita household consumption expenditure, the key differences between the two being that the Gini series from the GSS is based on per capita consumption expenditure denominated in local currency, while the Gini coefficient from PovcalNet is based on per capita consumption expressed in 2011 PPP-adjusted US$. The estimates from the WIID Companion are not directly based on survey data but convert the estimates from PovcalNet using regression models to a new series with net income as the welfare measure; this is to allow comparison with Gini coefficients for other countries, where net income is used as the welfare measure.

Next, we studied the deviations between the three series and found the WIID Companion series estimates to be higher than the others in each period. There were significant deviations between the WIID Companion series on the one hand and the GSS and PovcalNet series on the other hand, while the deviations between the GSS and PovcalNet series were found to be minimal, particularly in recent years. In principle, this finding is unsurprising because inequalities in consumption-based welfare measures are known to be lower than inequalities in income-based welfare measures. This is particularly so in the Ghanaian context, where most direct and indirect taxes are progressive, affecting the poor less than the non-poor (see Danso-Mensah et al. 2022; Younger et al. 2017).

Finally, we computed Gini coefficients using an income variable provided in the GLSS dataset and compared them with the estimates from the WIID Companion. We found that, with the exception of 2013, where there were relatively high deviations, there was generally minimal deviation between our computed Gini coefficients and those of the WIID Companion. We note here that, while this may suggest that the estimates from the WIID Companion are fairly accurate, it still needs to be borne in mind that there may be measurement issues with the income variable in the GLSS datasets (particularly with regard to the potential under-reporting or over-reporting of income by survey respondents). Hence, using it to validate the estimates from the WIID Companion may be problematic unless one assumes that the under- or over-reporting of income happens randomly with no regard to income classes. On the other hand, it appears that the usually large deviation observed for 2013 may reflect a structural shock to income distribution in Ghana, which the WIID standardized Gini may have failed to capture due to some limitations associated with the standardization or conversion procedure.

In conclusion, inequality is rising in Ghana as per all available measures of inequality. While the available Gini series provide an important insight into the nature of inequality and its changes over time in Ghana, this paper has pointed to some important measurement challenges associated with the available series, including the series from the WIID Companion, and the need for these to be addressed.

References

Aguilar, R.A.C., C. Lakner, E.B. Prydz, J.S. Lopez, R. Wu, and Q. Zhao (2019). 'Estimating Global Poverty in Stata: the PovcalNet Command (No. 9)'. Washington, DC: World Bank.

Atta-Ankomah, R., et al. (2020). 'Inequality Diagnostics for Ghana.' African Center of Excellence for Inequality Research (ACEIR), University of Cape Town.

Beegle, K., J. De Weerdt, J. Friedman, and J. Gibson (2012). 'Methods of Household Consumption Measurement through Surveys: Experimental Results from Tanzania'. *Journal of Development Economics*, 98(1): 3–18. https://doi.org/10.1016/j.jdeveco.2011.11.001

Carletto, G., M. Tiberti, and A. Zezza (2022). 'Measure for Measure: Comparing Survey-Based Estimates of Income and Consumption for Rural Households'. *The World Bank Research Observer*, 37(1): 1–38. https://doi.org/10.1093/wbro/lkab009

Citi Newsroom (2021). 'Less than 10% of Ghana's 30.8m Population Is Paying Tax – Ofori-Atta Laments'. 30 June. Available at: https://citinewsroom.com/2021/11/less-than-10-of-ghanas-30-8m-population-is-paying-tax-ofori-atta-laments/ (accessed 25 March 2023).

Cooke, E., S. Hague, and A. McKay (2016). 'The Ghana Poverty and Inequality Report: Using the 6th Ghana Living Standard Survey.' Brighton: University of Sussex.

Danso-Mensah, K., R. Atta-Ankomah, R.D. Osei, and I. Osei-Akoto (2022). 'Fiscal Interventions and Welfare in Ghana: a CEQ Assessment using Ghana Living Standard Survey (Round 7)'. African Center of Excellence in Inequality Research (ACEIR), University of Cape Town.

Deaton, A., and M. Grosh (2000). 'Consumption in Designing Household Survey Questionnaires for Developing Countries'. In M. Grosh and P. Glewwe (eds), *Designing Household Survey Questionnaires for Developing Countries: Lessons from 15 Years of the Living Standards Measurement Study*, vol. 3. Washington, DC: World Bank.

Friedman, M. (1957). *A Theory of the Consumption Function*. Princeton, NJ: Princeton University Press.

GSS (1995). 'Ghana Living Standards Survey: Report on the Third Round (GLSS 3) 1991–1992'. Accra: Ghana Statistical Service.

GSS (2014). 'Poverty Profile in Ghana 2005–2013'. Accra: Ghana Statistical Service.

GSS (2018). 'Poverty Trends in Ghana (2005–2017): Ghana Living Standards Survey 7.' Accra: Ghana Statistical Service.

Gradín, C. (2021). 'WIID Companion (March 2021): Integrated and Standardized Series'. WIDER Technical Note 2021/5. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/WIN/2021-5

Jappelli, T., and L. Pistaferri (2010). 'Does Consumption Inequality Track Income Inequality in Italy?'. *Review of Economic Dynamics*, 13(1): 133–53. https://doi.org/10.1016/j.red.2009.11.001

Machemedze, T., and M. Wittenberg (forthcoming). 'Understanding the WIID and WIID Companion: the Case of South Africa, Ghana, and Kenya'. WIDER Working Paper Series. Helsinki: UN-WIDER.

Meyer, B.D., and J.X. Sullivan (2003). 'Measuring the Well-Being of the Poor Using Income and Consumption'. *Journal of Human Resources*, 38: 1180–220. https://doi.org/10.2307/3558985

Noghanibehambari, H., and M. Rahnamamoghadam (2020). 'Is Income Inequality Reflected in Consumption Inequality in Iran?'. *Middle East Development Journal*, 12(2): 284–303. https://doi.org/10.1080/17938120.2020.1770488

Schündeln, M. (2018). 'Multiple Visits and Data Quality in Household Surveys'. *Oxford Bulletin of Economics and Statistics*, 80(2): 380–405. https://doi.org/10.1111/obes.12196

Senadza, B. (2012), 'Education Inequality in Ghana: Gender and Spatial Dimensions'. *Journal of Economic Studies*, 39(6): 724–39. https://doi.org/10.1108/01443581211274647

Smeeding, T., and J.P. Latner (2015). 'PovcalNet, WDI and "All the Ginis": a Critical Review'. *The Journal of Economic Inequality*, 13: 603–28. https://doi.org/10.1007/s10888-015-9312-4

UNU-WIDER (2021). 'World Income Inequality Database (WIID) Companion Dataset (wiidcountry and/or wiidglobal)'. Version 31 May 2021 Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/WIIDcomp-310521

Younger, S.D., E. Osei-Assibey, and F. Oppong (2017). 'Fiscal Incidence in Ghana'. *Review of Development Economics*, 21(4): e47–e66. https://doi.org/10.1111/rode.12299