SOUTHMOD

Country report

Ghana

GHAMOD v2.0

2013-19

Kwabena Adu-Ababio, Robert Darko Osei, Jukka Pirttilä,
and Pia Rattenhuber

June 2020

ISSER
University of Ghana
Knowledge for Development

University of Essex

UNITED NATIONS
UNIVERSITY
UNU-WIDER

Acknowledgements

Please cite as

Adu-Ababio, Kwabena, Robert Darko Osei, Jukka Pirttilä, and Pia Rattenhuber (2020). *UNU-WIDER SOUTHMOD Country Report: GHAMOD v2.0, 2013-19*, UNU-WIDER SOUTHMOD Country Report Series. Helsinki: UNU-WIDER.

About the project

SOUTHMOD – simulating tax and benefit policies for development

SOUTHMOD is a joint project between the United Nations University World Institute for Development Economics Research (UNU-WIDER), the European Union Tax–Benefit Microsimulation Model (EUROMOD) team at the Institute for Social and Economic Research (ISER) at the University of Essex, and Southern African Social Policy Research Insights (SASPRI) in which tax–benefit microsimulation models for selected developing countries are being built. These models enable researchers and policy analysts to calculate, in a comparable manner, the effects of taxes and benefits on household incomes and work incentives for the population of each country.

SOUTHMOD models are currently available for Ecuador (ECUAMOD), Ethiopia (ETMOD), Ghana (GHAMOD), Mozambique (MOZMOD), Namibia (NAMOD), Vietnam (VNMOD), South Africa (SAMOD), Tanzania (TAZMOD), Uganda (UGAMOD), and Zambia (MicroZAMOD). SOUTHMOD models are updated to recent policy systems using national household survey data. This report documents GHAMOD, the SOUTHMOD model developed for Ghana. This work was carried out by the Institute of Statistical, Social and Economic Research (ISSER) at the University of Ghana in collaboration with the project partners.

The results presented in this report are derived using GHAMOD version 2.0 running on EUROMOD software. The report describes the different tax–benefit policies in place, how the microsimulation model picks up these different provisions, and the database on which the model runs. It concludes with a validation of GHAMOD results against external data sources. For further information on access to GHAMOD and other SOUTHMOD models see the SOUTHMOD page.

The GHAMOD model and its documentation in this country report has been prepared within the UNU-WIDER project on 'SOUTHMOD—simulating tax and benefit policies for development', which is part of a larger research project on 'The economics and politics of taxation and social protection'. For more information, see the SOUTHMOD project page.

The 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 Denmark, Finland, Sweden, and the United Kingdom.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

Contents

Tables

Acronyms

CPI	Consumer price index
EU-SILC	European Union Statistics on Income and Living Conditions
GLSS-6	Ghana Living Standards Survey, version 6
GLSS-7	Ghana Living Standards Survey, version 7
GSFP	Ghana School Feeding Programme
GSS	Ghana Statistical Service
IRS	Internal Revenue Service
LEAP	Livelihood Empowerment against Poverty
NGO	Non-governmental organization
NHIL	National health insurance levy
PAYE	Pay-as-you-earn
PIT	Personal income tax
PMT	Proxy means test
SHS	Senior high school
SSNIT	Social Security and National Insurance Trust
VAT	Value-added tax
VFRS	VAT flat-rate scheme

1 Basic Information

Ghana has been one of the rapidly growing economies in Sub-Saharan Africa, with growth reaching 7 per cent in 2019. Recent years have seen some macroeconomic turmoil, with growth declining to 4.4 per cent in 2014. According to the World Bank (n.d.), Ghana attained the lower middle-income status in 2011, and growth is projected to remain strong over the medium-term future. This is a continuation of steady growth at an average annual rate of 4.2 per cent between 1991 and 2002 and 6.3 per cent between 2003 and 2010.

The rapid growth has also been reflected in successful poverty reduction. The official headcount poverty rate has dropped from 52 per cent in 1991–92 to 24 per cent in 2012–13. [1] Since then, the pace of poverty reduction has declined somewhat, and in 2016–17 the headcount rate stood at 23 per cent (Ghana Statistical Service 2018). However, inequality has risen over the same period, as a result of which poverty reduction has not been as fast as it would have been without increased inequality.

1.1 Basic information about the tax–benefit system

The Income Tax Act of 2015 regulates taxation in Ghana. There is no distinction in tax regulations on the basis of region or municipality, although rules may be different by resident or non-resident status. Moreover, Ghana is not a federation, so the national taxes and levies apply in all ten regions of the country. Taxes consist of income taxes administered by the Internal Revenue Service (IRS), customs and excise duties administered by the Customs, Excise and Preventive Service, and the sales and service taxes administered by the Value-Added Tax (VAT) Service.

The (fiscal) year of assessment for a person is the calendar year from 1 January to 31 December. However, in the case of a company or a body of persons, it is the accounting year of the company or body. For example, all companies have to file returns four months after their accounting year.

The compulsory retirement age of a public officer as per the Pensions Act is 60 years.

Regarding income splitting in taxation, when a person attempts to split income with another person, the tax authority (the Commissioner) may adjust the chargeable income of both persons to prevent a reduction in the tax payable as a result of the splitting of income.

The assessable income of each individual is determined separately.

The assessable income of an individual for a year of assessment is reduced by a specific amount if the individual has a dependant spouse or children, is disabled, is elderly (i.e. 60 years and above), or is in training.

Various income sources are taxed differently; earnings and other labour income are taxed according to personal income schedule and investment income is taxed according to capital gains tax.

In Ghana, the law requires all income earners to file their taxes three months after the fiscal year. However, this is not the practice in reality as most people do not file their taxes.

1.2 Social benefits

Benefit 1 (*Livelihood Empowerment against Poverty, LEAP*): One important social protection strategy being implemented in Ghana is the LEAP programme. The intention is to provide a cushion for poor households to encourage them to seek capacity development and other empowering objectives. Households in this regard are not just going to be handed cash payments and then be left on their own. The target population may be described as dangerously poor, given their experience of chronic food shortages and general lack of capacity to engage in social risk mitigation. The benefit amounts are based on a careful consideration of the issues of acceptability, affordability, and adequacy.

---

1 Ghana's poverty analysis is based on consumption poverty that classifies the poor as those who lack command over basic consumption needs, including food and non-food components.

Benefit 2 (*School feeding*): This is a national feeding programme introduced in the 2005–06 academic year for pupils in primary public institutions. The Ghana School Feeding Programme (GSFP) is a pilot project to provide food to children at school. It is run by the GSFP Secretariat in partnership with international agencies and national organizations, including the Canadian International Development Agency, the United States Agency for International Development, and the Dutch embassy. Each pupil under the scheme was covered by a feeding grant of GH¢ 0.30 a day as at 2008. From the point of view of the households, it is an in-kind transfer.

Benefit 3 (*Pension benefits*): This benefit, run by a restructured Social Security and National Insurance Trust (SSNIT), is available for Ghanaian retirees. The new and improved three-tier concept of the reform is meant to provide more options for people to plan for their retirement. The objectives of the Pensions Act are to provide pension benefits to ensure retirement income security for all categories of workers in the country. It is also to ensure that workers receive retirement and related benefits as and when they are due, and to establish a uniform set of rules, regulations, and standards for the administration and payment of retirement benefits for workers, in both public and private companies and institutions. The three tiers of social contributions are explained in Section 1.3.

Benefit 4 (*Free senior high school, SHS*): This benefit is fairly new as it began in the latter months of 2017. It is run by the government through its Ministry of Education and the Ghana Education Service. It may be described as a step up to the existing school feeding programme on a larger scale with wider beneficial coverage. It is fully funded by the government with the aim of lessening the burdens of guardians whose wards are in an SHS. The policy dictates that at this level of education most of the related cost components are absorbed by the government and not the guardian irrespective of income level. This policy is to ensure that households do not spend significant amounts of their consumption expenditure on the educational needs of their wards. In effect, this has the potential of equally promoting better livelihoods in the medium to long term. On average, beneficiary households are able to save GH¢ 825 each academic year. Benefit amounts depend on student status and includes a careful breakdown of scholarly costs that are taken care of.

1.3 Social contributions

Social contribution 1 (*First tier*): This is a mandatory occupational scheme run by a restructured SSNIT. Contributions are 5.5 per cent of gross salary. Retirement benefits will be in the form of monthly income, or in the instance of death, in the form of invalidity benefits should a contributor die before retirement. SSNIT will no longer pay the one-off lump sum benefit at retirement. It is a defined benefit scheme, which means the level of pension benefits would depend on the quantum of contribution, the level of income during active working years, and the number of years one contributed for.

Social contribution 2 (*Second tier*): This is also a mandatory occupational scheme currently run by approved trustees licenced by the regulatory body but managed by private fund managers. Contributions to the scheme would be 5 per cent of the employee's gross salary. Benefits would be lump-sum payments that are expected to be higher than presently under SSNIT. Being a defined contribution scheme, the level of benefits would depend on the level of contribution and the returns on investments. Proceeds could be used to purchase annuities to enhance the monthly benefits or to fulfil any other financial objectives set by the individual.

Social contribution 3 (*Third tier*): This is a voluntary, fully funded provident fund and personal pension scheme managed by private fund managers; it is an optional scheme for everyone to either top-up their pensions or to use as a sole pension provision.

1.4 Taxes

The main direct tax in Ghana is personal income tax (PIT) whereas indirect taxes in the country include import duties, duties on cocoa exports, VAT, the national health insurance levy (NHIL), and a variety of excise, including on petroleum products, alcoholic beverages, soft drinks, bottled water, tobacco products, and communications services. Households do not pay these taxes explicitly, but they are reflected in the prices they pay for taxed goods and services.

Tax 1 (*PIT*): This is a progressive regime covering employees, sole proprietorships, and partnerships. Entrepreneurs in this category are required to add profits earned to wages and other income in computing their taxable income. Individuals are required to pay tax on gains or profit from employment, business, or investment. A resident person is to pay tax on income accruing in, derived from, brought into, or received in Ghana, and a non-resident person on income accruing in, and derived from, Ghana regardless of whether the income is received in Ghana. An individual is considered resident if they have stayed in Ghana for an aggregate period of 183 days or more in any 12-month period. All incomes are aggregated and taxed after the various adjustments relating to the type of income earned are made. The aggregated income excludes capital gains, gifts, and rent income.

Tax 2 (*Levies*): The only notable national levies in the country are the NHIL of 2.5 per cent imposed on certain goods and services and the national fiscal stabilization levy of 5 per cent imposed on profit before tax of companies and institutions of certain listed sectors of the economy.

Tax 3 (*Capital gains tax*): This tax is payable by a person at the rate of 5 per cent of capital gains accruing to or derived by that person from the realization of a chargeable asset owned by that person. The income tax payable for a year of assessment shall be calculated by applying the rates of tax under the relevant part of the First Schedule of the Act to the chargeable income of that person for the year.

Tax 4 (*Corporate tax*): This is the tax paid by companies on their profits in the year. The tax rate is 25 per cent. There are different rates applicable to certain companies. From 2012, mining companies are required to pay corporate tax at a rate of 35 per cent. Moreover, a branch of any foreign company doing business in Ghana is taxed like any corporate entity in Ghana. With the aim of preventing tax avoidance schemes (such as transfer pricing, thin capitalization, and income-splitting), the Commissioner of the IRS is entitled to adjust chargeable income of the company branch on the basis of the turnover of the whole group. Where it repatriates its branch profit after tax, the company will be required to pay 10 per cent tax on the amount repatriated. This is in addition to any corporate tax paid.

Tax 5 (*Pay-as-you-earn*, PAYE): The PAYE contributions are withholdings from salaries of employees in order to satisfy their income tax responsibilities. The PAYE is computed with the PIT rates that range from 5 to 25 per cent depending on whether earnings are taxed monthly or annually.

Tax 6 (*Fringe benefits tax*): With the exception of dental, medical, and health insurance expenses, all fringe benefits derived from employment are taxable. Benefits relating to accommodation and cars have their own treatment specified in the tax law. For all other benefits, the open market value or a reasonable value is added to taxable income and subject to tax. For some services provided to employees (e.g. food offered in a canteen, office outings, transportation of employees, accident insurances, and payments to retirement funds), the employer has the option to pay the income tax on behalf of the employee.

Tax 7 (*Local taxes*): These are collected by the district, municipal, and metropolitan assemblies (authorities) from persons doing business within their localities. They are also responsible for the collection of property taxes.

Tax 8 (*Gift tax*): Subject to certain exemptions, gift tax is payable by every person on the total value of taxable gifts received by the person by way of gifts within a year of assessment. The rate ranges from 5 to 15 per cent.

Tax 9 (*Stamp duty*): Stamp duty is paid at various rates by a person who undertakes certain transactions, including conveyance or transfer on the sale of any property, appointment of a new trustee, and natural resource lease or license (e.g. mining and timber).

Tax 10 (*Mineral royalties*): Holders of mining leases are required to pay royalties at specified rates to the government on a monthly basis.

Tax 11 (*Communication service tax*): This is a tax on communication service providers based on turnover. The coverage of this tax has been extended to include public/corporate data operators, providers of radio broadcasting services, and providers of free-to-air television services.

Tax 12 (*Tax stamp*): This is a tax imposed on operators in the informal sector. The amount paid is based on turnover and nature of product but not on the profit in the fiscal year.

Tax 13 (*Vehicle income tax*): This is a tax imposed on commercial vehicles. It is paid quarterly.

Tax 14 (*Airport tax*): This is a tax imposed on both domestic and international travels. It varies depending on the passenger class and the place of destination.

Tax 15 (*Windfall tax*): Mining companies pay a windfall tax of 10 per cent.

Tax 16 (*VAT/Presumptive tax*): VAT is an indirect tax paid by consumers on some goods and services to the state through registered individuals or businesses. The rate is 15 per cent for businesses and individuals whose turnover for a 12-month period is GH¢ 120,000 or above on the value of goods and services. This excludes the NHIL of 2.5 per cent. There are exemptions specified in the VAT law. Exempt supplies include agricultural products and inputs, printed matter, approved medical and pharmaceutical supplies, transport, financial services, land, building, and construction.

Businesses and individuals whose turnover (thus sales) for a 12-month period falls below GH¢ 120,000 are to pay the so-called presumptive tax of 3 per cent of their turnover. Paying the presumptive tax in turn frees the firms from other tax obligations, such as VAT.

Tax reliefs are granted by the government in the scope of the labour income tax to encourage certain forms of behaviour and actions, such as the education of children and care for the elderly. They are granted to individuals as a means of reducing their tax burden by reducing the assessable incomes of entitled individuals.

The three main categories of tax reliefs applicable in the labour income tax system are the following.

Tax relief 1 (*Personal reliefs*): These are granted to individuals who satisfy one or more conditions as stated by the law. The assessable incomes of employees who qualify are reduced by fixed sums. Personal reliefs are of two main categories: those granted upfront and those granted upon the filing of returns. Reliefs for marriage, children's education, the disabled, and the elderly are granted upfront whereas those for elderly dependants, apprenticeship training, and life insurance are granted upon filing of returns.

Tax relief 2 (*Relief from double taxation*): This relief is granted to individuals who may be earning from both local and foreign sources in a bid to avoid them from paying two different taxes on the same assessable income. A typical example is a situation where a person's assessable income, for which that person is entitled to a foreign tax credit, would be increased by the amount of the foreign tax credit.

Tax relief 3 (*Rollover relief*): This relief is enjoyed by a person (partnership included) or an associate disposing of an asset to another associate. Some conditions of residential status, procedures of application, and exemptions must be satisfied.

2   Simulation of taxes and benefits in GHAMOD

2.1   Scope of simulation

Not all the taxes and benefits mentioned in the previous section are simulated by GHAMOD. First, some are beyond its scope entirely and are neither included in the GHAMOD database nor included in its output income variables. Second, some are not possible to simulate accurately with the available, underpinning, data. They are included in the database and may be chosen as components of output variables, but the rules governing them may not be changed by the model. For example, fringe benefits are included but we expect that these are not taxed in principle, and, hence, we leave them out of simulations. Finally, other benefits contain complicated rules and/or available data does not provide enough information to be able to simulate the benefit in all detail. Tables 2.1 and 2.2 classify each of the tax–benefit instruments into groups and provide a brief explanation as to why the instrument is not fully simulated if this is the case. There were no changes in the order of the simulations model over the period 2013–17.

Table 2.1: Simulation of benefits in GHAMOD

	Variable name(s)	Treatment in GHAMOD							Comments
		2013	2014	2015	2016	2017	2018	2019	
LEAP transfer programme	*bsa_s*	S	S	S	S	S	S	S	Microdata contains beneficiaries for the pilot programme
State pension	*poa*	I	I	I	I	I	S	S	No contribution history, but counterfactual policy simulated in system 2013_ref
School capitation grant	*bed01_s*	S	S	S	S	S	S	S	An in-kind benefit, it is simulated but not included in disposable income
Free SHS policy	*bedes_s*	—	—	—	—	—	S	S	Although this policy starts in the latter part of 2017, we introduce its simulation in 2018

Notes: SHS, senior high school. 'S' policy is *simulated* although some minor or very specific rules may not be simulated; 'I' policy is included in the microdata but not simulated; '— 'policy did not exist in that year.

Source: Authors' compilation.

Table 2.2: Simulation of taxes and social contributions in GHAMOD

	Variable name(s)	Treatment in GHAMOD							Comments
		2013	2014	2015	2016	2017	2018	2019	
Direct taxes									
Labour income tax	*tinna_s*	S	S	S	S	S	S	S	
NHIL	*tscee_s*	S	S	S	S	S	S	S	This is simulated as part of social insurance contributions for employees
Fringe benefit tax		E	E	E	E	E	E	E	Although there are fringe benefits, most of these earnings are not recorded in the microdata
Gift tax		—	—	—	E	E	E	E	This tax will be in force starting from the 2016 fiscal year
Property tax		—	—	—	—	—	—	—	Legislation for such tax is currently being discussed
Capital gains and rent tax	*tiniy_s*	S	S	S	S	S	S	S	Capital gains by firms and corporations are not simulated
Presumptive tax	*tinbs_s*	S	S	S	S	S	S	S	
Indirect taxes									
VAT	*tva01_s*	S	S	S	S	S	S	S	Only part of the tax base is captured by the consumption data that we have access to
Other indirect taxes		S	S	S	S	S	S	S	
Tax on beer	*tvl04/05*	S	S	S	S	S	S	S	
Tax on akpeteshie	*tvl02*	S	S	S	S	S	S	S	
Tax on wine	*tvl03*	S	S	S	S	S	S	S	
Tax on spirits	*tvl01*	S	S	S	S	S	S	S	
Tobacco tax	*tvl07*	S	S	S	S	S	S	S	
Tax on gasoline	*texsx01*								
Tax on diesel	*texsx02*								
Subsidy on kerosene	*texsx03*								
Tax on LPG	*texry01*	E	E	E	E	S	S	S	Impossible to simulate for earlier years as policy rules started in 2016
Stamp duty		E	E	E	E	E	E	E	Impossible to simulate since policy rules are not clearly defined for years concerned
Vehicle income tax		E	E	E	E	E	E	E	Some exemptions and types of vehicles are impossible to identify and simulate
TV licence fee		E	E	E	E	E	E	E	Although this exists in tax acts, it does not exist in reality
Social contributions									
Employee social security contributions	*tscee_s*	S	S	S	S	S	S	S	
Employer social security contributions	*tscer_s*	S	S	S	S	S	S	S	

Notes: 'S' policy is *simulated* although some minor or very specific rules may not be simulated; 'E' policy is excluded from the model as it is neither included in the microdata nor simulated; '—' policy did not exist in that year.

Source: Authors' compilation.

2.2   Order of simulation and interdependencies

Table 2.3 presents taxes and benefits that are simulated in GHAMOD. The order of simulation is the same in all policy years, as no structural changes took place over 2013–19. We start by setting default values for some variables, then we uprate the monetary variables from 2013 to

2019 using consumer price index (CPI) data (see Table 3.2 for uprating factors).[2] Next, we define constants, income lists, tax (assessment) units, and poverty lines, after which negative self-employment income is recoded to zero. The subsequent policies deal with merging expenditure variables, defining auxiliary variables for the calculations of indirect taxes, and calculating the tax on fuel. Then, employer social security contributions are simulated, followed by employee social insurance contributions. Simulation of other indirect taxes and VAT follows. Next, the LEAP transfer and school capitation grants are simulated. Finally, direct taxes (capital and labour income tax and the presumptive tax on small businesses) are simulated.

Table 2.3: GHAMOD spine: Order of simulation

Policy	2013	2013_ref	2014–17	2018–19	Description of the instrument and main output
SetDefault_gh	On	On	On	On	Default settings for variables not included in the input data
uprate_gh	On	On	On	On	Uprating factors defined
ConstDef_gh	On	On	On	On	Constants defined
ildef_gh	On	On	On	On	Income lists defined
tudef_gh	On	On	On	On	Tax units defined
poverty_lines_gh	On	On	On	On	Poverty lines defined
neg_gh	On	On	On	On	Negative self-employment income recoded to zero; output variable—yse (overwrite)
tscer_gh	On	On	On	On	Employer's social security contributions simulated; output variable—$tscer\_s$
tscee_gh	On	On	On	On	Employee's social security contributions simulated; output variable—$tscee\_s$
poa01_gh	Off	On	Off	Off	Hypothetical universal old-age pension reform; output variable—$poa01\_s$
bsa_gh	On	On	On	On	LEAP transfer benefit programme; output variable—bsa_s
bed_gh	On	On	On	On	School capitation grant simulated (in kind); output variable—$bed01\_s$
bedes_gh	Off	Off	Off	On	Free senior high school (SHS) policy; output variable—$bedes\_s$
tiniy_gh	On	On	On	On	Capital income tax simulated; output variable—$tiniy\_s$
tin_gh	On	On	On	On	Labour income tax simulated; output variable—tin_s
tinbs_gh	On	On	On	On	Presumptive tax—$tinbs\_s$
vat_gh	On	On	On	On	VAT payments on expenditure simulated; output variable—$tva01\_s$
indtax_gh	On	On	On	On	Other indirect taxes
output_std_gh	On	On	On	On	Standard EUROMOD output calculated on individual level
output_std_hh_gh	Off	Off	Off	Off	Standard EUROMOD output calculated on household level (Off in the baseline)

Source: Authors' compilation.

2.2.1 Counterfactual simulations

GHAMOD includes a scenario that does not exist in practice, to see the effects of a counterfactual policy scenario on the Ghanaian economy. In this case, a 'universal old-age pension' reform that does not exist in practice but in theory was chosen for counterfactual analysis. The choice of a universal old-age pension was mainly due to the fact that although pensions exist, they are restricted uniquely to the formal sector with just a few individuals subscribing to private pension schemes. Moreover, introducing the universal pension and matching the current LEAP rates as

---

2   A forecast from the Ghana Statistical Service (GSS) (2018) is used for 2019.

benefit packages to eligible citizens throws more light on how much of the elderly population in the country can be lifted out of extreme poverty as a result of its adoption.

This counterfactual simulation is represented by *poa01_gh* in the policy spine(see Table 2.3). (See policy reform scenario *GH_2013_ref*.)

Another counterfactual policy is the readiness to simulate levying VAT on goods subject to other indirect taxes (such as alcohol). This policy (*vat_on_exc_gh*) is turned off for baseline simulations but it can be turned on by the user.

2.3 Policy switches

Usually, policy switches are clearly marked in the policy spine. They have the word 'switch' for the years when they are defined and 'n/a' otherwise. Switchable policies can be turned 'on' or 'off' through the run dialog box without changing the model itself. In the baseline, a switchable policy is set to its default (on or off).

2.4 Social benefits

2.4.1 Recoding negative self-employment income to zero

The first policy that is run before simulation of social benefits is recoding of negative self-employment income to zero. This is done to prevent incorrect calculation of taxes, social contributions, and means-tested benefits for self-employed persons with losses in the income reference period. There are a number of individuals with negative self-employment income in the Ghanaian input data.

2.4.2 LEAP transfer programme (bsa_gh)

This benefit is a cash transfer programme for the poorest households in Ghana. The intention is to provide a cushion for poor households to encourage them to seek capacity development and other empowering objectives. Households in this regard are not just going to be handed cash payments and then left on their own. This programme was piloted in 2013 and benefit amounts have more than quadrupled by 2017. Non-governmental organization (NGO) staff or government officials with the support of a community focal person visit selected communities to collect data to assess the poverty status of families [using a proxy means test (PMT)] and prepare a list of selected families.

Definitions

The benefit is assessed and assigned at the household level.

Eligibility conditions

- First, a person must be extremely poor. Since obtaining reliable information on income/consumption is hard in practice, the eligibility is evaluated using a PMT by the authorities. However, in the absence of the exact information about the test, we use an extreme poverty condition instead. This is motivated by the fact that the PMT is supposed to find those households that would fall below the expenditure threshold, where expenditure information is available.

  The Ghana Living Standards Survey, version 6 (GLSS-6) identifies individuals who fall below the upper- and lower-bound poverty lines. Lower-bound poverty is GH¢ 792.05 on an annual basis. As the LEAP PMT is supposed to identify the bottom 20 per cent of the extremely poor (thus those below the lower-bound poverty line), GHAMOD instead defines LEAP eligibility based on the income line that divides the bottom 20 per cent of the extremely poor from the rest of the distribution. That cut-off line is thus defined at GH¢ 446.30. The Ghana Living Standards Survey, version 7 (GLSS-7) has similar calculations. However, lower-bound poverty is now GH¢ 982.20 on an annual basis. The current cut-off for the bottom 20 per cent is defined at GH¢ 553.44[3].

- Second, an eligible person must be an orphan or vulnerable child. In case there is a caregiver of such a person or an infant below a year, they are considered eligible.

---

3 This is subject to change pending discussions on equivalent scales with GSS.

- Third, an elderly person with limited economic capacity is also eligible. Specifically, the person should be 65 years or older. Limited economic capacity can be a result of unemployment or low income from employment.
- Fourth, pregnant women are also eligible. This criterion was included in the 2015–16 policy year and took effect from that period.
- Finally, severely disabled people with limited capacity to work are eligible. There is information on individuals with disability in the input dataset although severity cannot be ascertained.

Income test

The benefit is means-tested in the way it is implemented. It is tested using household expenditure.

Benefit amount

The full amount of the benefit is determined by the number of eligible beneficiaries in a household. As at 2013, the minimum benefits/cash amounts received are as follows:

- A single beneficiary: GH¢ 8.00
- Two beneficiaries: GH¢ 10.00
- Three beneficiaries: GH¢ 12.00
- Four or more beneficiaries: GH¢ 15.00.

As at 2014, the minimum monthly benefits/cash amounts received are as follows:

- A single beneficiary: GH¢ 32.00
- Two beneficiaries: GH¢ 38.00
- Three beneficiaries: GH¢ 44.00
- Four or more beneficiaries: GH¢ 53.00.

For 2015–16, the minimum monthly benefits/cash amounts received are as follows:

- A single beneficiary: GH¢ 48.00
- Two beneficiaries: GH¢ 60.00
- Three beneficiaries: GH¢ 72.00
- Four or more beneficiaries: GH¢ 90.00.

For 2017–19, the minimum monthly benefits/cash amounts received are as follows:

- A single beneficiary: GH¢ 64.00
- Two beneficiaries: GH¢ 76.00
- Three beneficiaries: GH¢ 88.00
- Four or more beneficiaries: GH¢ 106.00.

GHAMOD notes

Not every extremely poor household with one or more person fulfilling the additional entitlement criteria regarding age, pregnancy, disability, or other vulnerability is simulated as entitled in GHAMOD. Households are treated as entitled if meeting all necessary criteria at the time of data collection. Some households may become poor after data collection occurred or other poor households may move into the community later and will therefore not be captured by the simulations. The LEAP programme is in expansion and coverage will increase in the future.

2.4.3 School capitation grant (bed_gh)

This benefit is an intervention aimed at lessening the burden of the numerous levies and fees charged at the school level that are thought to prevent a considerable number of parents from enrolling their children in school, especially in the rural deprived areas. Introduced in 2004, it features various programme components aimed at reducing the costs of and associated with primary education. GHAMOD models the public school feeding programme under the larger

capitation grant programme. This benefit is a non-cash in-kind benefit in the form of school lunches and amounts to a value assigned by the state.

Definitions

The unit of analysis is the individual.

Eligibility conditions

- First, the person must be in education, that is, formal education. Individuals who are home-schooled or in informal education are not considered eligible.
- Second, the person must be a minor. This means 2 years or older but less than 12 years of age, because, usually, this is the age that most Ghanaian children should be in primary school. These years may vary from one community to another as well as one region to another, but the model sticks to what the policy specifies as eligibility.
- Finally, the person must be in a public primary school regulated by the government. In Ghana, private schools are considered expensive and it is therefore assumed that citizens who can afford private schooling are likely less in need of such benefits in order to educate their children. The input data set allows to identify whether a child is enrolled in a public or private primary school and entitlement to the school feeding programme is modelled accordingly.

Income test

The benefit is not means-tested.

Benefit amount

The full amount of the benefit is given to each child who meets the eligibility criteria since 2008.

- Each child received GH¢ 0.30 each school day in 2013.
- Each child received GH¢ 0.40 each school day in 2014.
- Each child received GH¢ 0.45 each school day in 2015.
- Each child received GH¢ 0.54 each school day in 2016.
- Each child received GH¢ 0.80 each school day in 2017.
- Each child received GH¢ 1.20 each school day in 2018 and 2019.

GHAMOD notes

It should be noted that the benefit is for labour days only (i.e. five days per week) but is assumed to be paid throughout the year, thus disregarding school holidays.

2.4.4 Free SHS policy (bedes_gh)

This benefit intervention was instituted with the aim of increasing enrolment and retention in SHS. Although in Ghana basic education is progressively free, the case for second-cycle education was different until 2017 when policymakers felt that majority of the poor households in the country were at a disadvantage because of the high scholarly expenses they had to bear in the midst of other competing consumption needs. With free SHS, the 2017/18 academic year begins with a reform where the government absorbs second-cycle educational expenses such as admission fees, library fees, science centre fees, computer laboratory fees, examination fees, and utility fees. This benefit is non-discriminatory and does not depend on where the guardian stands on the income distribution scale.

Definitions

The unit of analysis is the individual.

Eligibility conditions

- First, the person must be in education, that is, formal education. Individuals who are home-schooled or in informal education are not considered eligible.

- Second, because benefit amounts differ based on residence status, the individual must be classified as a resident or non-resident student. Having resident status means the student spends zero time going to and from the school compound or premises in addition to the notion that educational expenses related to board and lodging are paid directly to school authorities for this service to be offered or not offered by the household or household head. Having non-resident status means the student spends some time going to and from the school compound or premises in addition to the fact that educational expenses related to food, board and lodging are directly borne by the household or household head.
- Finally, the person must be in a public SHS regulated by the government. In Ghana, private schools are considered expensive and it is therefore assumed that citizens who can afford private schooling are likely less in need of such benefits in order to educate their children. The input dataset allows to identify whether a child is enrolled in a public or private school and entitlement to the free SHS programme is modelled accordingly.

Income test

The benefit is means-tested.

Benefit amount

The full amount of the benefit is given to each student who meets the eligibility criteria in the 2017–18 academic year. This did not change for the 2018–19 academic year

- Each resident student received GH¢ 1,002.47 annually in 2018.
- Each non-resident student received GH¢ 648.47 annually in 2018.

- Each resident student received GH¢ 1,002.47 annually in 2019.
- Each non-resident student received GH¢ 648.47 annually in 2019.

GHAMOD notes

For the avoidance of all doubt, we do not consider household members who claim they spend some time travelling to and from school and yet pay for expenses related to food, board and lodging directly to school authorities into the eligibility bracket. Moreover, household members who state that they spend zero time travelling to school and also do not pay for expenses related to board and lodging are taken out of the eligibility bracket.

2.5   Social security contributions

Social contributions are mandatory for all employees and entrepreneurs in the formal sector but not those in the informal sector and self-employed persons or persons on post-retirement contracts. The contribution rate is flat and in case of public employment it is split between an employee and an employer.

The total contribution rate may vary, depending on the insured person's employment status as well as the tier subscribed to.

2.5.1   Employee social contributions (tscee_gh)

Liability to contributions

All formal sector employees aged between 15 and 45 years are liable to social security contributions. Some employees offering contractual services to a formal agency or organization may not be mandated to pay such contributions (this cannot be taken into account in the model).

Income base used to calculate contributions

Social security payments are calculated based on gross income from employment (variable *yem* in the data) and self-employment income (yse) of people in the formal sector. Formality is approximated based on the information regarding the sector where the income is generated.

Specifically, those working in the government sector and the formal private sector (including paid apprentices), for a parastatal employer, an NGO (local and international), a cooperative or by international organizations and diplomatic missions are considered to be in the formal sector.

Contribution rates

A person below the retirement age faced a social security contribution rate of 3 per cent of gross wage in 2013–16 (referred to as 'general component of SSNIT rate' in the model). In addition, there is an extra 2.5 per cent contribution that ensures against health liability for workers (referred to as 'NHIL component of SSNIT rate' in the model). Unlike those who do not contribute to the scheme, workers contributing to the NHIL scheme do not have to pay a premium or other enrolment fees in order to receive health benefits.

GHAMOD notes

In the actual social contributions in Ghana, a three-tiered contribution scheme is available to all formal sector employees as discussed in Section 1.3. However, GHAMOD just considers the first tier that is composed of social contributions of 3 per cent and NHIL of 2.5 per cent. The second and third tiers are more akin to private contributions schemes and not captured to the full extent by the input dataset.

2.5.2 Employer social contributions (tscer_gh)

Liability to contributions

All employers in public/private firms in the formal sector are liable for paying social security contributions on behalf of employees who are aged between 15 and 45 years.

Income base used to calculate contributions

Social security payments are calculated based on gross income from employment (*yem*).

Contribution rates

An employer in a public/private organization in the formal sector pays social security contributions on behalf of an employee below the upper threshold age required for contributions to the amount of 13 per cent of the gross wage in 2013–17.

GHAMOD notes

The employer social contributions held by the SSNIT constitute the first tier of social contributions. The third tier is not simulated because the amount involved is not contributed by employers.

2.6 Labour income tax (tin_gh)

2.6.1 Tax unit

Taxation in Ghana is at the individual level; thus, it is dependent on the assessable income of an individual. However, for tax allowance purposes an extended family unit is defined. It includes all other household members. We consider all household members in the simulation even if they are not first-degree family.

2.6.2 Exemptions

The following income is exempted from taxation but cannot be identified in the data. This is the total amount of deductions allowed to a person for the fiscal year under the Internal Revenue Act 2000 (Act 592). Incomes exempted relate to:

- general and specific deductions (sections 13 to 22),
- reliefs (section 39),
- life insurance (section 57), and
- contributions to retirement funds (section 60).

2.6.3 Tax allowances

Tax reliefs are granted by the government to encourage certain forms of behaviour and actions, such as the education of children and care for the elderly. Reliefs are granted to individuals or entities as a means of reducing their tax burden. This is done through a reduction in the assessable incomes of those who qualify.

The following tax allowances are simulated in GHAMOD:

- Marriage relief: This relief is granted to only one of two married persons with a dependant spouse or a single parent responsible for the upkeep of two or more dependant children. Individuals who qualify upon certification by their employer have their assessable income reduced by GH¢ 30.00 per annum (GH¢ 200 in 2016 and 2017).
- Children's education: Individuals who qualify for this relief are entitled to a reduction in their assessable income by GH¢ 30.00 per child per annum up to a maximum of three children (GH¢ 200 in 2016 and 2017). To qualify for this relief, the children/wards should be in recognized registered educational institutions in Ghana. Only one of two parents may apply through the employer for this relief.
- Disability relief: This relief serves as an incentive to individuals who in spite of their disabilities are in gainful employment. It is granted to disabled individuals who earn income from any business or employment. They are entitled to a reduction in their assessable incomes of 25 per cent on application through their employers. This is usually 25 per cent of the individual's assessable income.
- Aged relief: Individuals who are 60 years of age and earn incomes during the year from an employment or business are entitled to this relief of GH¢ 30.00 per annum (GH¢ 200 in 2016 and 2017).
- Age-dependent relief: This relief is meant to serve as an incentive to individuals responsible for the upkeep of their elderly relatives. Relief of GH¢ 25.00 per annum (GH¢ 100 in 2016 and 2017) is granted to an individual with a dependant relative who is 60 years of age or more. This relief can only be claimed for a maximum of two dependant elderly. Where two or more persons (e.g. a husband and wife taking care of their elderly parents) qualify in respect of the same relative, only one relief is granted.

2.6.4 Tax base

Income from the following sources is included in taxable income:

- Income from main employment, including wage premiums, systematic or one-time compensations, and other work-related income for formal sector workers (*yemoo*),[4]
- Income from individual work or enterprise if it is not subject to enterprise tax (*yse*).

2.6.5 Tax schedule

In 2013–17, the tax rate (for income from both regular employment and self-employment) depended on the band of assessable earnings that a person accrued for the year.

All tax schedules are shown in Tables 2.4–2.7.

The thresholds are adjusted occasionally due to inflation or government revenue targets. As of 2013, a person earning a minimum income of GH¢ 1584 is exempted from PIT.

---

4 Only income from main employment enters the tax base, since taxes are not necessarily paid from income from secondary jobs.

Table 2.4: Personal income tax (PIT) rates, 2013–15

Chargeable income (GH¢)	Rate (%)	Tax (GH¢)	Cumulative chargeable income (GH¢)	Cumulative tax (GH¢)
First 1,584	Free	Nil	1,584.00	Nil
Next 792	5	39.60	2,376.00	39.60
Next 1,104	10	110.40	3,480.00	150.00
Next 28,200	17.5	4,935.00	31,680.00	5,085.00
Exceeding 31,680	25			

Source: Authors' compilation.

Table 2.5: PIT rates, 2016-17

Chargeable income (GH¢)	Rate (%)	Tax (GH¢)	Cumulative chargeable income (GH¢)	Cumulative tax (GH¢)
First 2,592	Free	Nil	2592.00	Nil
Next 1,296	5	64.80	3888.00	64.80
Next 1,812	10	181.20	5700.00	246.00
Next 33,180	17.5	5,806.50	38,880.00	6,052.50
Exceeding 38,880	25			

Source: Authors' compilation.

Table 2.6: PIT rates, 2017–18

Chargeable income (GH¢)	Rate (%)	Tax (GH¢)	Cumulative chargeable income (GH¢)	Cumulative tax (GH¢)
First 3,132	Free	Nil	3,132.00	Nil
Next 840	5	42.00	3,972.00	42.00
Next 1,200	10	120.00	5,172.00	162.00
Next 33,720	17.5	5,901.00	38,890.00	6,063.00
Exceeding 38,880	25			

Source: Authors' compilation.

Table 2.7: PIT rates, 2018–19

Chargeable income (GH¢)	Rate (%)	Tax (GH¢)	Cumulative chargeable income (GH¢)	Cumulative tax (GH¢)
First 3,456	Free	Nil	3,456.00	Nil
Next 1,200	5	60.00	4,656.00	60.00
Next 1,680	10	168.00	6,336.00	228.00
Next 36,000	17.5	6,300.00	42,336.00	6,528.00
Next 197,664	25	49,416	240,000	55,944
Exceeding 240,000	30			

Source: Authors' compilation.

GHAMOD notes

The input dataset used for simulating PIT, reports net incomes but not gross incomes in many cases. Whenever incomes are identified as net income in the data, they are grossed up using the applicable social security and labour income tax schedules. If gross income is available, the values are used unaltered. All income tax simulations are thus based on gross earnings.

Furthermore, labour income tax is simulated only for those working in the formal sector (see Section 2.6 for more information).

2.7   Indirect taxes

VAT in Ghana is a tax applied on the value added to goods and services at each stage in the production and distribution chain. It forms part of the final price the consumer pays for goods

or services. In 2013, the rate was 15 per cent. Since 2014, the NHIL is imposed on top of the VAT rate. This increased the effective VAT rate in 2014. The NHIL is a levy on goods and services supplied in or imported into Ghana. All goods and services are subject to the levy unless they are exempt. The levy is charged at a rate of 2.5 per cent on the VAT-exclusive selling price of the goods supplied or services rendered.

VAT/NHIL covers the sale of goods and services that are not specifically exempted under the law. The exemptions granted include the following:

- Medical services and essential drugs approved by the Ministry of Health;
- Mosquito nets;
- Foodstuff produced in Ghana and sold in raw state (e.g. rice, millet, cassava, yam, guinea corn, plantain, vegetables, meat); the traditional forms of smoking, drying, frying, and cooling do not affect the expression 'raw state';
- Agricultural and fishing inputs specified in the law;
- Educational services approved by the Ministry of Education;
- Newspapers and books (this does not make paper used in producing these items exempt);
- Transportation fares—land, sea, and air (this does not make spare parts exempt);
- Petrol, diesel, and kerosene.

There are other indirect taxes such as import duties and a variety of excise duties on petroleum, alcoholic beverages, soft drinks, bottled water, and tobacco products. All these are simulated in GHAMOD. Table 2.8 shows the rate structure of excise duties in Ghana.

Table 2.8: Excise duty rates in Ghana

Item	Rate (%) in 2013	Rate (%) in 2014–15	Rate (%) in 2016–19
Mineral water, bottled water, and soft drinks	17.5	17.5	17.5
Malt drinks (0, 30, 50, 70 per cent local content)	17.5, 12.5, 7.5, 2.5	17.5, 12.5, 7.5, 2.5	17.5, 12.5, 7.5, 2.5
Beer and stout (0, 30, 50, 70 per cent local content)	47.5, 30, 20, 10	47.5, 30, 20, 10	47.5, 30, 20, 10
Wine	22.5	22.5	22.5
Spirits, except akpeteshie	25	25	25
Akpeteshie	20	20	20
Cigarettes	150	150	150
Snuff and other tobacco	170.65	170.65	170.65
Gasoline	GH¢ 0.2193 per litre	GH¢ 0.2732 per litre	GH¢ 1.1137 per litre
Diesel	GH¢ 0.1325 per litre	GH¢ 0.1712 per litre	GH¢ 1.1022 per litre
Kerosene	GH¢ 0.371 per litre	GH¢ 0.371 per litre	GH¢ 0.371 per litre
LPG	—	—	GH¢ 0.561 per litre

Notes: LPG, liquified petroleum gas. '—' represents non-existent legislation until 2016.

Source: Authors' compilation.

GHAMOD notes

In the input dataset, all the above-listed exemptions are modelled when constructing the VAT/NHIL tax base for simulations. It is important to note that the scope of VAT covered in GHAMOD is a portion of how far the tax extends. Payments such as port/freight charges, mineral royalties, and some duties payable attract VAT charges that are not captured in the input data and, hence, not simulated.

The VAT simulation is performed by assuming that whenever households receive more or less income, the expenditure shares of different consumption goods remain the same. This means that the household budget constraint (consumption equals income) is maintained even if there are changes in net income.

Excise duties for fuel taxes for fuel include all other levies (Energy Fund Levy, Road Fund Levy, Debt Recovery Fund Levy, and a cross-subsidy levy). Also, excise taxes on liquified petroleum gas (LPG) were only introduced in 2016 to cater for Energy Debt Recovery Levy and the price stabilization and recovery margin.

2.8 Capital income taxation (*tinkt_gh*)

Since 2000, there is a final withholding tax on capital with a flat tax rate of 10 per cent (15 per cent in 2016 and 2017). This rate applies to an individual's investment income and is charged on the capital gains accruing to or derived by a person from the realization of a chargeable asset owned by that person. In 2016, a tax on rental income (with a rate of 8 per cent) was introduced.

2.8.1 Tax unit

The tax unit for capital income taxation is the same as the unit for PIT, which is the individual level. This holds for all the years 2013–17.

2.8.2 Exemptions

There are several exemptions relating to capital income received by natural persons as opposed to legal persons. The latter may be a private (business entity or NGO) or public (government) organization. First, the capital income threshold that qualifies for paying the tax is above GH¢ 50.00 during the year of assessment. All capital incomes below this amount are exempted. Second, capital gains resulting from a transfer of ownership of the asset by a person to that person's spouse, child, parent, brother, sister, aunt, uncle, nephew, or niece are also exempted. Lastly, capital gains resulting from a transfer of ownership of the asset between former spouses as part of a divorce settlement or a genuine separation agreement are also exempted.

2.8.3 Tax base

The tax base is all income from capital. This is interest income from savings accounts or bonds, as well as from dividends and other payouts. Also gains from price arbitrage sales of assets—for example, when stocks are bought at a lower price than they are sold for—falls under capital income.

GHAMOD notes

In the input dataset, not all the above-listed exemptions are considered when simulating capital income tax. The exemptions relating to inheritance and divorce cannot be ascertained because of the scope of the input data.

2.9 Presumptive tax (*ttn_gh*)

In an emerging economy like Ghana with a low level of literacy and low recordkeeping capacities in the retail sector, the desired compliance requirements of the invoice-credit scheme that has hitherto been used in the administration of VAT in the retail sector have not sufficiently been met; hence, the need for a VAT flat-rate scheme (VFRS).

The so-called presumptive tax (effectively a tax on turnover) replaces the standard VAT and corporate income tax for small firms. The VFRS is a VAT collection/accounting mechanism that applies a marginal tax rate of 3 per cent, representing the net VAT payable on the value of taxable goods supplied. It is an alternative to the invoice-credit method (or standard VAT system) that charges a given percentage on sales (in this case 3 per cent) for each transaction without recourse to input tax deduction. The tax base is thus broader (sales) than in the standard VAT system.

In GHAMOD, the presumptive tax is simulated using the non-farm income component recorded by households. Most households in Ghana are in the retail business through petty trading, usually done in stalls and kiosks, in order to earn some income during the lean season or when agricultural activities are less profitable. Those with an annual turnover between GH¢ 10,000 and GH¢ 120,000 are liable to presumptive tax.

2.9.1 Tax unit

The tax unit for presumptive tax is the same as the unit for PIT, which is at the individual level. This holds for all the years 2013–18.

2.9.2 Exemptions

Individuals whose annual turnover from non-farm income is below GH¢ 10,000 are exempted.

2.9.3 Tax base

The tax base is all income from non-farm income recorded by households within the limits discussed above.

3 Data

3.1 General description

In this new GHAMOD version, database is derived from GLSS-6 and GLSS-7.

Both datasets are designed to provide nationally and regionally representative indicators on household wellbeing since 1995. The database is provided by the Ghana Statistical Service (GSS). The GHAMOD database is divided into two: input data for household variables and input data on household expenditure (Table 3.1).

Table 3.1: GHAMOD database description

Original name	GH_2013_a1 and GH_2013_e1	GH_2017_a1
Provider	Ghana Statistical Service	Ghana Statistical Service
Year of collection	2012–13	2016–17
Period of collection	October 2012–September 2013	October 2016–September 2017
Income reference period	2013	2017
Sample size	16,772 households	14,009 households
Response rate	72,372 individuals	59,864 individuals

Source: Authors' compilation.

3.2 Data adjustment

GHAMOD runs on the EUROMOD software and input data therefore need to be compatible with software requirements, including for example, variable names. Information on the GLSS-6 and GLSS-7 variables used, the construction of final variables, and their respective names is available from the authors upon request.

Although both datasets are produced by the GSS, modifications of questionnaires and variable lists slightly differ between GLSS-6 and GLSS-7. This does not change the nature of the input data used but variables are modified to be as similar to each other as possible to allow easy comparison in the model.

The major changes in the two waves were observed in the labour force module. First, was with the duration a respondent was observed to be actively participating in an economic activity. GLSS-6 observed economic activity not only for the past 7 days but also for the last 12 months. GLSS-7, on the other hand, observed economic activity only for the past 7 days. As a result of this discrepancy, the input data from GLSS-7 fails to capture income from seasonal economic activities. Second, income components of self-employment economic activity were not captured in GLSS-7. Contrary to what was done in the previous wave, these individuals who indicate self-employment status are left out from responding to questions relating to how much they earn. This makes it impossible for the model to accurately simulate self-employment income.

3.3 Imputations and assumptions

3.3.1 Time period

Socio-demographic characteristics of the respondents contained in GLSS-6 refer to the time of data collection, that is, October 2012–September 2013. Data collection for GLSS-7 is recent, with a reference period of October 2016–September 2017. Most economic and labour variables also refer to the time of the interview. Whenever possible, the corresponding demographic, labour, and socio-economic information in the GHAMOD database was based on GLSS-6 and GLSS-7 variables referring to the income reference period. Both datasets provide information on the number of periods a particular income was paid to a respondent. The case for the expenditure variables is different. The datasets do not give an average expenditure on durable and non-durable goods. Using a diary of consumption and expenditure, the data enumerate information on expenditure made over a one-month period. Using this information, average expenditure was calculated.

3.3.2 Gross incomes

In the datasets, gross and net employee cash or near-cash income is reported. Since a large portion of the respondents reported net incomes, gross incomes needed to be imputed for those observations inflating net values based on the applicable labour income and social security contribution schedules.

3.4 Updating

To account for any time inconsistencies between the input dataset and the policy year, uprating factors are used. Each monetary variable (i.e. each income component) is updated so as to account for changes in the non-simulated variables that have taken place between the year of the data collection and the year of the simulated tax–benefit system. Uprating factors are generally based on changes in the average value of an income component between the year of the data and the policy year.

In GHAMOD, uprating is done using compound rates of CPI generated by the GSS. GSS is the government institution on which rests the primary mandate for collecting data on the basis of which the CPI is generated. The use of the GSS series is also based on the fact that the input dataset (GLSS-6 and GLSS-7) in GHAMOD is compiled and aggregated by the GSS.

As a rule, uprating factors are provided for simulated and non-simulated income components present in the input dataset. However, in the case of simulated variables, the actual simulated amounts are used in the baseline rather than the uprated original variables in the dataset. Uprating factors for simulated variables are provided to facilitate the use of the model in cases when the user wishes to turn off the simulation of a particular variable. The list of uprating factors as well as the sources used to derive them can be found in Table 3.2. In addition, a forecast for the annual inflation for 2019 from the central bank was used to create an uprating factor for 2019.

The poverty lines, defined in the policy '*poverty_lines_gh*', are also uprated with CPI.

Table 3.2: Raw indices for deriving GHAMOD uprating factors

Index	Constant name	Values of raw indices							Source	Income components uprated by the index	Notes
		2013	2014	2015	2016	2017	2018	2019			
CPI food index (2002=100)	$f_CPI_food	106.8	114.1	123.2	135.1	145.9	158.6	167.4	Ghana Statistical Service (n.d.)	x01–x02	Expenditure on food items
CPI non-food index (2002=100)	$f_CPI_nonfood	124.3	154	189.8	224.5	255.1	280	297.7	Ghana Statistical Service (n.d.)	x03–x13	Expenditure on non-food
CPI overall (2002=100)	$f_CPI_total	116.6	136.4	160.6	185.3	207.2	226.7	240.5	Ghana Statistical Service (n.d.)	yse, yem, kfb, ypa, ypr, etc.	Income

Source: Authors' compilation.

4 Validation

4.1 Aggregate validation

GHAMOD results have been validated against some available external benchmarks. Detailed comparisons of the number of people receiving a given income component and total yearly amounts are shown in Annex 1. The main discrepancies between GHAMOD results and external benchmarks are discussed in the following sub-sections. Factors that may explain the observed differences are also discussed.

4.1.1 Descriptive statistics of inputted incomes

Table A1 in the Annex tabulates the number of recipients for each component of market income, as defined by the GSS for 2013 and 2017. However, there are no figures from external statistics for comparison. The number of recipients does not remain constant throughout all simulated years due to the availability of two input datasets. Thus, in Table A1, the number of recipients for the input database is displayed for 2013 and 2017.

The sum of all components of market income is defined as 'original (market) income' in GHAMOD. About 6,400 individuals in the GLSS-6 data received some market income while about 5,340 individuals in the GLSS-7 data received similar incomes. Using household weights, the numbers can be turned into the total number of income earners in the country. The

number of individuals receiving positive income from employment (*yem*) is 2.9 million in GHAMOD as well as in GLSS-6. In the recent wave, there were about 3.2 million individuals with similar status. Here too, there is no external source for comparison.

For income from self-employment (*yse*), the number of recipients in GHAMOD is 4.9 million. This income stems primarily from the informal sector for which it is quite difficult to find external statistics. Income earners in this category are mainly in the agricultural sector, which is the least regulated in the country in terms of its income activities.

The respective aggregate amounts for the components of market income are displayed in Table A2 in the Annex. All market income, including revenue from agricultural sales (livestock and crops), in the population was captured by GLSS-6. About 18,376 million of it relates to income from dependent employment (*yem*). This figure cannot be properly matched to any external database in terms of aggregating formal and informal wages collected in a single year. Self-employment income (*yse*) and property/rental income also recorded 24,840 million and 367 million, respectively. The latter may be smaller than the actual figure because some survey

respondents may not want to reveal the exact amounts they earn from investments and/or property.

As external data are scarce, validation of the simulation results against other sources could in some cases only be carried out to a limited extent.

4.1.2 Validation of outputted (simulated) incomes

Tables A3 and A4 in the Annex provide a comparison of the benefits and taxes simulated in the model to external statistics.

In 2013–14 and also in 2017–18, the model to a large extent underestimates the number of LEAP recipients in comparison to the number of recipients in the underlying LEAP data. External figures show that it stood at around 64,000 in 2013 and at 213,000 in 2018. This discrepancy may relate to the fact that we were not provided with the PMT formula and instead had to resort to using a simple consumption-level test. Furthermore, LEAP recipients are considered to be the poorest among the poor, and, as such, external statistics may try as much as possible to include most people under this bracket. Moreover, comparing with pilot studies in the year makes it difficult to get an accurate number of recipients.

Some estimated tax receipts can be compared with external information received from the Ministry of Finance (see last two columns of Table 4.4 in the Annex). For 2013, GHAMOD underestimates the revenue from labour income tax, but only slightly. On the other hand, the total VAT was underestimated by a larger margin by the model in 2013. This did not come as a surprise as the scope of VAT far exceeds the scope of the input data used for the model. However, in 2017, we over-simulate VAT revenues by significant margins compared with 2013. This can be attributed to accurate household expenditure variables captured in the new wave.

The total state social security contribution is overestimated. In the input dataset, this benefit is expanded to cover a large group of people (formal sector workers and entrepreneurs) who in reality may not be paying social security contributions even though they fall into the formal category. Therefore, the difference between the data and the external statistics can result in a large difference in simulation results.

4.2 Income distribution and poverty

All income distribution results presented in Table A5 in the Annex are computed for the household simulated expenditure equivalized by the adult equivalence scale.[5] Simulated expenditures are calculated based on the following method.

In Ghana, poverty is measured using consumption, whereas the taxes and transfers calculated by the model feed into disposable income. Therefore, we report poverty rates calculated on the basis of disposable income and an amended consumption concept. The latter refers to the simulated consumption possibilities, which are equal to the observed consumption (the variable *xhh*) from which we subtract actual transfer received (denoted by income list *ils_bendata*), add taxes paid (*ils_tistn*), subtract simulated taxes (*ils_taxsim*) and social security contributions paid by the employees (*tscee_s*), and add simulated transfer received (*ils_bensim*). Since the underlying data do not capture taxes paid, those were calculated in the Stata .do file that generates the input data. Therefore, simulated consumption is given by *ils_exp*=(*xhh+ils_tistn–ils_taxsim–tscee_s-ils-ils_bendata+ils_bensim*).

The headcount poverty rate recorded for the model for the 2013 policy year was 24.9 per cent, and this was slightly overestimated compared with external statistics that recorded a rate of 24.2 per cent. In the 2017 policy year, the poverty head count in the model was 22.9 per cent, which was slightly underestimated compared with external statistics that recorded 23.4. Similar analysis was done for households with male and female heads. The model also analyses the poverty status for some other household types, including poverty rates for households with minors/children as well as households with elderly members. Our simulations show that for households with children, poverty stood at 27.5 per cent, whereas for households with elderly members, the poverty rate was 33.7 per cent in 2013. In 2017, the poverty rate for households

---

5 The number of equivalent adults is calculated based on the composition of the household, using a calorie-based scale (see National Research Council 1989).

stood at 25.6 per cent, while for households with elderly members, the poverty rate was 31.5 per cent. This shows a decrease in poverty rates between the two data waves.

The poverty and inequality calculations, as well as government revenues and expenses, can be accessed using the statistics calculator, which is included in the model.

The Gini coefficient recorded by the model in 2013 was 41.7 compared with 42.3 recorded by external statistics. This is because we use income to arrive at consumption using the above-mentioned formula and income data contain more variations than consumption data. In 2017, however, the model recorded a Gini of 44.7 compared with 43 by external statistics. This increase over the period implies that the benefits of growth have not been evenly distributed and some groups have been left out

Although baseline poverty deviates somewhat from official statistics, the main purpose of the model is to examine policy reforms. Therefore, what matters is how much poverty changes with a counterfactual scenario in the model in comparison to the baseline calculated by the model. This difference is unaffected by level differences in baseline poverty rates between model outcomes and official statistics.

4.3   Statistics Presenter

The Statistics Presenter provides an easy and quick way to access basic simulation results. It provides information on government taxes and spending as well as on poverty and inequality. The tool can calculate results for one or several systems at once, and it also includes a comparison template, where the idea is to provide results for two systems and the change in the indicator values between the systems (e.g. base and reform scenarios).

Government spending and revenues are calculated for the following aggregates (which are computed in GHAMOD through the income list policy (*ildef_gh*)):

- Direct taxes: All taxes levied directly that are included (simulated) in the model; these include PIT but also presumptive tax and capital income tax.
- Indirect taxes: All (simulated) indirect taxes included in the model. Indirect taxes include VAT and excise tax.
- Social security contributions (employer and employee): All simulated contributions collected from employees and employers included in the model.
- Child benefits: All child-related benefits included in the model; currently, this includes the simulated school capitation grant.
- Social assistance benefits: LEAP benefits are included under this category.
- Orphan, widow benefits: All benefits for orphans or widows included in the model; currently, no such benefit exists in GHAMOD.
- Disabled benefits: All benefits for the disabled included in the model; currently no such benefit exists in GHAMOD.
- Unemployment benefits: All benefits for the unemployed included in the model; currently no such benefit exists in GHAMOD.
- Pension benefits: All benefits for pensioners included (simulated) in the model (or as reported in the data).

As per poverty and inequality analysis, the figures can either be based on consumption possibilities (as defined in the previous sub-section) or disposable income (to which the value of home produce is added). The indicators include headcount and poverty gap indices, Gini coefficients, quintile upper bounds, and the p80/p20 rate (i.e. the share of income/consumption of those at the top 20 per cent versus those at the bottom 20 per cent).

4.4   Summary of 'health warnings'

This section summarizes particular aspects of GHAMOD or its database that should be borne in mind when planning appropriate uses of the model and interpreting its results.

- The GHAMOD input data are not adjusted for any demographic or labour market changes taking place in the period from 2013 to 2017 (except for updating of monetary incomes).

- Non-filing of tax returns is widespread in Ghana because of the large informal sector in the country. However, the model can take this into account only partially, by calculating direct taxes for those workers only who work in the formal sector. For those workers, in turn, we assume full compliance.

- The huge informal sector in the country also makes it difficult to obtain accurate income data. Gross income data used in GHAMOD were not directly obtained from input data but imputed using inverse calculations from net incomes recorded in the dataset.

- Thus, all simulation results should be compared with the baseline situation in the model, not with external data. To get ballpark estimates of external costs and revenue impacts, a recommended way is to calculate the proportional change of the policy reform in comparison to the model baseline scenario and to utilize the proportional changes when working with external data.

- The EUROMOD software, initially built for the European context, assumes monogamous relationships and returns warnings for households where more than one partner is found. By default, the software considers the first person identified as the partner and all other partners are ignored. Currently, no policy in Ghana, and therefore in GHAMOD, refers to several partners in polygamous relationships; taxes and benefits are either individual-based or based on household characteristics or other characteristics of household members, but not the number of partners. Therefore, the calculations of the model are currently not affected by the restriction of the software to monogamous relationships. That said, it is not possible though to implement a hypothetical policy that addresses several partners at the same time.

References

Ghana Statistical Service (n.d.). Economic Price Indices: Consumer Price Index. Available at: http://www.statsghana.gov.gh/nationalaccount_macros.php?Stats=MTE2MTIyMjQ5Ni41NjY=/webstats/7163p83s71 (accessed August 2019).

Ghana Statistical Service (2018). 'Ghana Living Standards Survey Round 7 (GLSS-7 Poverty Profile Report 2005–2017'. Available at: http://www2.statsghana.gov.gh/docfiles/publications/GLSS7/Poverty%20Profile%20Report_2005%20-%202017.pdf (accessed November 2019).

National Research Council (1989). *10th Edition of the Recommended Dietary Allowances*. Washington, DC: National Academy Press.

World Bank (n.d.). Ghana. Available at: http://data.worldbank.org/country/ghana (accessed May 2017).

Annex: Validation

Table A1: Market income in GHAMOD: Number of recipients

		GHAMOD year 2013	GHAMOD year 2017
yem	Employment income	2,898,500	3,240,587
yem00	Income from main job	2,704,615	3,098,668
yse	Self-employment income	4,896,825	1,584.3
ypt	Private transfers	7,093,204	8,099,742
ypr	Rent income	195,181.8	176,205.4
yiy	Investment income	75,956.08	101,236.5
kfb	Non-cash employment income	167,673.3	278,849
yag	Net agricultural income	2,741,715	1,944,320
xhh	Total household expenditure	6,601,485	7,299,925
ytn	Non-farm gross sales income	2,870,335	3,083,132
poa	Old-age pensions	64,359.18	121,105.1

Source: Authors' compilation.

Table A2: Market income in GHAMOD: Annual amounts (in million)

		GHAMOD year						
		2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Av_yem	Average employment income	6,339.884	7,416.467	8,732.293	10,075.3	11,978.76	13,106.09	13,903.91
yem	Employment income	18,376.16	21,496.63	25,310.55	29,203.27	38,818.2	42,471.44	45,056.85
yse	Self-employment income	24,840.44	29,058.61	34,214.19	39,476.27	27.0	29.53	31.32
ypt	Private transfers	5,732.242	6,705.631	7,895.367	9,109.632	11,196	12,249.7	12,995.38
ypr	Rent income	367.21	429.56	505.78	583.57	1,840.22	2,013.41	2135.98
yiy	Investment income	7.24	8.47	9.97	11.50	3.30	3.62	3.84
kfb	Non-cash employment income	250.03	292.49	344.38	397.35	579.73	634.30	672.91
yag	Net agricultural income	8,457.314	9,893.461	11,648.75	13,440.31	9,304.49	10,180.15	10,799.85
xhh	Total household expenditure	59,505.99	69,610.77	81,961.07	94,566.54	89,885.55	98,344.85	104,331.4
yni	Net income	63,988.63	74,854.62	88,135.28	101,690.3			
ytn	Non-farm gross sales income	52,289.47	61,168.81	72,021.34	83,098.1	182,320	199,478.5	211,621.50
yem00	Income from main job	17,652.37	20,649.94	24,542.22	28,316.77	37,402.53	40,922.54	43,414.66
poa	Old-age pension	530.67	620.78	730.92	843.33	90.29	98.79	104.80

Source: Authors' compilation.

Table A3: Tax–benefit instruments simulated in GHAMOD: Number of recipients/payers

		GHAMOD years						
		2013	2014	2015	2016	2017	2018	2019
Benefits								
bed	Education benefits	47,358.24	47,358.24	47,358.24	47,358.24	24,563.09	24,563.09	24,563.09
bsa	Social assistance (LEAP)	36,251.32	36,251.32	36,251.32	36,251.32	31,797.37	31,797.37	31,797.37
bedes	Free SHS programme	—	—	—	—	—	797,845	797,845
Taxes and social insurance contributions								
tin	Labour income tax	1,065,427	1,101,667	1,136,206	1,047,368	1,162,580	1,155,588	1,148,831
tinkt	Capital income tax	36,317.21	41,336.54	41,579.52	227,721.4	171,933.7	171933.7	171933.7
ttn	Presumptive tax	2,870,335	2,870,335	2,870,335	2,870,335	3,082,247	3,082,247	3,082,247
tva	VAT	6,265,819	6,128,147	6,037,318	5,839,522	3,810,000	4,170,000	4,420,000
tvl01	Excise paid on spirits	493,555.8	493,555.8	493,555.8	493,555.8	421,853.4	425,626	426,093.9
tvl02	Excise paid on akpeteshie	847,054.6	847,054.6	847,054.6	847,054.6	543,361.7	544,136	545,220.5
tvl03	Excise paid on wine	43,758.83	43,758.83	43,758.83	43,758.83	18,949.76	18,949.76	18,949.76
tvl04	Excise paid on imported beer	373,891.5	373,891.5	373,891.5	373,891.5	182,821.9	182,812.8	182,812.8
tvl05	Excise paid on local beer	300,917.5	300,917.5	300,917.5	300,917.5	397,980.1	397,845.4	397,748.2
tvl06	Excise paid on cigarettes	228,005.8	228,005.8	228,005.8	228,005.8	120,776.8	120,773.8	121,292.9
tvl07	Excise paid on tobacco	36,698.32	36,698.32	36,698.32	36,698.32	270,230.6	270,191.6	270,665.9
texsx01	Excise paid on petrol	397,474.2	397,474.2	397,474.2	397,474.2	61,812.54	61,788.70	61,812.54
texsx02	Excise paid on diesel	35,139.24	35,139.24	35,139.24	35,139.24	6,611.97	6,611.97	6,611.97
texsx03	Excise paid on kerosene	−1,093.2	−1,093.2	−1,093.2	−1,093.2	−1,212.74	−1,220.86	−1,220.86
texry01	Excise paid on LPG	—	—	—	—	126,560.2	126,560.2	126,560.2
tscee	Employee social insurance contributions	920,815.2	920,815.2	920,815.2	920,815.2	930,275.7	930,275.7	930,275.7
tscer	Employer social insurance contributions	864,897.9	864,897.9	864,897.9	864,897.9	930,275.7	930,275.7	930,275.7

Source: Authors' compilation.

Table A4: Tax–benefit instruments simulated in GHAMOD: Annual amounts (in million)

		GHAMOD years							External data	
		2013	2014	2015	2016	2017	2018	2019	2013	2017
Benefits										
bed	Education benefits	302.02	353.31	415.99	480.00	10,143.36	10,143.36	11,773.54		
bsa	Social assistance (LEAP)	3.34	12.93	23.28	23.28	27.18	27.18	27.18		
bedes	Free SHS programme	—	—	—	—	—	1,299.48	1,299.48	484.11[a]	2,429.26
Taxes and social insurance contributions										
tin	Labour income tax	2,059.78	2,497.98	3,046.10	3,286.81	2,683.80	2,991.72	3117.75	2,367	4,859
tinkt	Capital income tax	0.65	0.79	0.93	1.61	147.54	161.42	171.25		
ttn	Presumptive tax	1,568.69	1,835.06	2,160.64	2,492.94	5,469.61	5,984.35	6,348.64	182	
tva	VAT	1,774.08	3,297.35	3,878.14	3,289.85	166,861.3	184,503.3	195,738.5	3,317	8,549
tvl01	Excise paid on spirits	0.70	0.70	0.70	0.70	46.80	51.47	54.60		
tvl02	Excise paid on akpeteshie	0.96	0.96	0.96	0.96	78.57	86.87	92.11		
tvl03	Excise paid on wine	0.06	0.06	0.06	0.06	9.62	10.50	11.16		
tvl04	Excise paid on Imported beer	3.40	3.40	3.40	3.40	60.13	66.28	70.32		
tvl05	Excise paid on local beer	0.26	0.26	0.26	0.26	44.45	48.87	51.87		
tvl06	Excise paid on cigarettes	0.65	0.65	0.65	0.65	47.03	52.03	55.16		
tvl07	Excise paid on tobacco	0.05	0.05	0.05	0.05	73.29	81.28	86.14		
texsx01	Excise paid on petrol	1.84	1.84	1.84	1.84	2.23	2.25	2.25		
texsx02	Excise paid on diesel	0.21	0.21	0.21	0.21	0.22	0.22	0.22		
texsx03	Excise paid on kerosene	−0.013	−0.013	−0.013	−0.013	−0.015	−0.015	−0.015		
texry01	Excise paid on LPG	—	—	—	—	0.70	0.71	0.71		
tex	All excise	8.96	10.69	11.99	30.90	363.04	400.48	424.54	694	3,090
tscee	Employee social insurance contributions	485.59	568.04	668.82	771.69	750.10	820.69	870.65		
tscer	Employer social insurance contributions	1,066.536	1,247.651	1,469.004	1,694.93	1,772.97	1,939.83	2,057.93		
tscee+tscer	Total social insurance contributions	1,552.126	1,815.691	2,137.824	2,466.62	2,523.07	2,760.52	2,928.58		1,848
NHIL									159	1,376

Notes: '—' represents policy non-existence for these years. [a]This includes costs of infrastructure (e.g. furniture) which GHAMOD does not simulate.

Source: Authors' compilation.

Table A5: Poverty rates (%) by gender and age

	Simulated consumption (2013)	Disposable income (2013)	Simulated consumption (2017)	Disposable income (2017)	Official (2013)	Official (2017)
All	24.9	36.2	22.94	52.68	24.2	23.4
Male-headed households	26.6	34.2	25.44	52.19	32.6	37.4
Female-headed households	19.7	42.0	16.72	53.92	29.8	29.9
Households with children	27.5	37.0	25.59	54.74		
Households with elderly members	33.7	38.2	31.46	60.10		

Source: Authors' compilation.