

SOUTHMOD

Country report

Ghana

GHAMOD v2.7

2013–2023

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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](#)), Southern African Social Policy Research Insights ([SASPRI](#)), and the International Inequalities Institute at the London School of Economics and Political Science ([LSE](#)) 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 Bolivia (BOLMOD), Colombia (COLMOD), Ecuador (ECUAMOD), Ethiopia (ETMOD), Ghana (GHAMOD), Mozambique (MOZMOD), Peru (PERUMOD), Rwanda (RWAMOD), Mainland Tanzania (TAZMOD), Uganda (UGAMOD), Viet Nam (VNMOD), Zambia (MicroZAMOD), and Zanzibar (ZANMOD). 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 2.7, which is part of the SOUTHMOD bundle (SOUTHMOD_A2.0) and runs 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 results against external data sources. For further information on access to GHAMOD and other SOUTHMOD models, see the [SOUTHMOD page](#), [SOUTHMOD Modelling Conventions](#), and [SOUTHMOD User Manual](#) (UNU-WIDER 2024a; 2024b).

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Acronyms

CPI	Consumer price index
COVID-19 HRL	COVID-19 Health Recovery Levy
ESRL	Energy Sector Recovery Levy
EU-SILC	European Union Statistics on Income and Living Conditions
GH¢	Ghanaian cedi
GLSS-6	Ghana Living Standards Survey, version 6
GLSS-7	Ghana Living Standards Survey, version 7
GRA	Ghana Revenue Authority
GSFP	Ghana School Feeding Programme
GSS	Ghana Statistical Service
IRS	Internal Revenue Service
LEAP	Livelihood Empowerment against Poverty
LPG	Liquified petroleum gas
NGO	Non-governmental organization
NHIL	National health insurance levy
OVC	Orphan and vulnerable children
PAYE	Pay-as-you-earn
PIT	Personal income tax
PMT	Proxy means test
SPL	Sanitation and Pollution Levy
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 challenges, 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. Similar to many countries, the COVID-19 pandemic severely affected the growth of the economy, leading to a fall in growth to 0.4 per cent in 2020.

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 based on 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 (CEPS), the sales and service taxes administered by the Value-Added Tax Service (VATS). There is also the Revenue Agencies Governing Board (RAGB) in accordance with the Ghana Revenue Authority Act 2009 (Act 791).

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 must 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 an 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.

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.

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. During the COVID-19 pandemic, lockdown measures imposed by the government led to further challenges for the welfare of vulnerable populations. In order to reduce this burden, LEAP was expanded to provide meals and other necessities for existing beneficiaries.

Benefit 2 (*School feeding, SFP*): This is a national feeding programme introduced in the 2005–06 academic year for pupils in selected primary public institutions. The Ghana School Feeding Programme (GSFP) is a 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 of 2008. From the point of view of the households, it is an in-kind transfer. The programme targets only pupils at the pre-secondary school level.²

During the COVID-19 pandemic, this policy was truncated in the middle of the school term as schools were closed as part of the lockdown measures introduced in mid-March 2020.

When schools were partially opened again for second-year junior high school (JHS) and senior high school (SHS) students in October 2020, school feeding was again provided to students. Prior to this, and as a means to safeguard the continuity of the programme, final-year JHS students were fed for a month until they successfully completed their final exams in September 2020. The second-year JHS and SHS students were fed until December 2020, the end of the first school term. Under this feeding grant scheme, each student was entitled to GH¢ 3.50 a day worth of food.

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 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 scaled-up version of the existing school feeding programme, that is, on a larger scale and 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

² Pre-secondary education comprises two (academic) years of kindergarten and six years of primary school. Secondary education, on the other hand, is made up of three years of junior high school and another three years of senior high school. Each year is split into three terms. An academic year usually begins in September and ends in July.

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 can save GH¢ 825 each academic year. Benefit amounts depend on student status and include a careful breakdown of scholarly costs that are taken care of.

Benefit 5 (*Utility tariff relief*): To provide income support to households during the COVID-19 pandemic, the Government of Ghana rolled out a number of social intervention policies. One major policy initiative was the subsidization of utility tariffs. From March until the end of 2020, both households and firms were allowed to pay for only half (50 per cent) of their electricity bill and nothing for water. The decision to fully subsidize water bills stemmed from the need to follow good hygienic practices to effectively fight the pandemic. For lifeline consumers of electricity, the relief policy dictated that all costs were to be borne by the government. These relief measures were discontinued in December 2020.

Benefit 6 (*Business and enterprise support*): As evidenced by the utility tariff policies, the Government of Ghana relied on the assumption that not only households but also firms were affected by the pandemic. Building on this assumption, certain relief policies were commissioned that aimed to promote business growth and entrepreneurial development. Such policies were funded using revenue from the Coronavirus Alleviation Program (CAP) fund. One of these initiatives was the CAP-BuSS programme, which provided business support to formal and informal micro-, small-, and medium-sized enterprises (MSMEs) with support from the Mastercard Foundation and the National Board for Small Scale Industries (NBSSI). Another initiative was the COVID-19 Alleviation and Revitalisation of Enterprises Support (CARES) programme, which acted as a stabilization mechanism for existing firms facing difficulties due to the pandemic. These support schemes were discontinued in December 2020.

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). Indirect taxes include import duties, duties on cocoa exports, VAT, the National Health Insurance Levy (NHIL), the Ghana Education Trust (GET) Fund Levy, and a variety of excise duties, 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 amount of levies in Ghana continue to grow as compared to previous fiscal years when the only notable national levies in the country were 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. Currently, there is the 2.5 per cent Ghana Education Trust (GET) Fund Levy and a 1 per cent COVID-19 Health Recovery Levy. The Energy Sector Recovery Levies (ESRL) on specific petroleum products as well as the Sanitation and Pollution levy also related to petroleum products.

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. Beginning from 2012, mining companies were 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 Ghana Revenue Authority (GRA) 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 30 per cent depending on the year of taxation and whether earnings are taxed monthly or annually.

Tax 6 (Fringe benefits tax): Except for 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 (Electronic transfer levy): This is a tax on electronic transfers which is popularly referred to as the e-levy. The levy was introduced as a means to raise domestic revenue from the rising demand for mobile wallet and FinTech services. Legislatively backed by The Electronic Transfer Levy Act 2022 (Act 1075) and Electronic Transfer Levy (Amendment) Act 2022 (ACT 1089), it imposes a levy of 1 per cent on electronic transfers at the time of transfer. The GRA is mandated to collect and direct revenue from this tax into the Consolidated Fund.

Tax 13 (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 14 (Vehicle income tax): This is a tax imposed on commercial vehicles. It is paid quarterly.

Tax 15 (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 16 (Windfall tax): Mining companies pay a windfall tax of 10 per cent.

Tax 17 (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 a standard 12.5 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 as well as the GET Fund Levy of 2.5 per cent, which are also charged on standard-rated goods. Additionally, a new parliamentary act introduced in 2021 mandates a 1 per cent levy on the value of taxable goods. This COVID-19 Health Recovery Levy is applicable to both standard rate and VAT flat rate registered persons. 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 VAT flat rate or 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 18 (Customs and excise duties): The imposition of customs and excise duties depends on the origin of goods at the Ghanaian port of entry and also on certain manufactured goods in Ghana. Specific rates of excise duties apply on the ex-factory price. The excise duty payable on malt drinks, beer, and stout, other than indigenous beer, is determined by the percentage of local raw materials used (excluding water). In accordance with the Excise Tax Stamp Act 2013 (Act 873), qualifying excisable products that are imported or locally manufactured are required to be affixed with tax stamps specified and supplied by the GRA before they are delivered ex-factory, cleared from any port of entry,

or sold at any commercial level. Affected products are discussed in the report. In addition, the Special Import Levy Act imposes a levy of 2 per cent on the cost, insurance, and freight (CIF) value of certain imported goods. The African Union Import Levy Act 2017 (Act 952) also imposes a levy of 0.2 per cent on the CIF value of eligible imports from non-African Union countries.

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 do 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. In addition to the 2023 policy system, GHAMOD v2.7 entails selected changes in policies and the order of simulation in the model over the period 2013–22. This mainly entails the inclusion of specific income lists that were previously absent. Moreover, GHAMOD v2.7 keeps the COVID-related labour market adjustments and policies which were present in previous iterations of the model.

Table 2.1: Simulation of benefits in GHAMOD

	Variable name	Years				Comments
		2013–17	2018–19	2020	2021–23	
LEAP transfer programme	<i>bsa_s</i>	S	S	S	S	Microdata contains beneficiaries for the pilot and actual roll-out
Food rations for LEAP households	<i>bsa00_s</i>	—	—	S	—	A COVID-19 policy, in place during lockdowns from 9 April 2020 until 5 June
State pension	<i>poa</i>	I	I	I	I	No contribution history
School feeding	<i>bed_s</i>	S	S	S	S	An in-kind benefit, it is simulated but not included in standard disposable income
Final year high school food ration	<i>bed01_s</i>	—	—	S	—	COVID-19 policy in place during the month of August 2020
High school food ration	<i>bed02_s</i>	—	—	S	—	COVID-19 policy in place for three months from October to December 2020
Free SHS policy	<i>bedes_s</i>	—	S	S	S	
Utility tariffs relief	<i>bho_s</i>	—	—	S	—	COVID-19 policy lasting for nine months from April to December 2020

Notes: '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. 'PS': policy is partially simulated as some of its relevant rules are not simulated.

Source: Authors' compilation.

The policy systems provided in GHAMOD v2.7 capture policies as they were in place as of 1st January of that specific year reflective of the fiscal year in the country. Each system thus provides a 'snapshot' of the situation of the tax-benefit system at the cut-off date. Usually, tax and benefit policies are not changed monthly. Often changes happen on a yearly basis as amendments of existing policies if at all. The standard 'snapshot' policy systems modelled for the years 2013 and 2017 through 2019, 2021 and 2022 should nevertheless provide a comprehensive picture of the main features of the tax-benefit system despite this 'point-in-time' perspective. For 2020, GHAMOD v2.7 deviates from the point-in-time perspective due to the emergence of the COVID-19 pandemic. The related full-year-adjustments of COVID-related policies is described in Section 2.3, while COVID-related income adjustments are described in Section 3.2.

Table 2.2: Simulation of taxes and social contributions in GHAMOD

	Variable name	Treatment in GHAMOD									Comments
		2013	2014	2015	2016	2017	2018	2019	2020	2021–23	
<i>Direct taxes</i>											
Labour income tax	<i>tin_s</i>	S	S	S	S	S	S	S	S	S	This is the same as PIT and PAYE
NHIL	<i>tscee_s</i>	S	S	S	S	S	S	S	S	S	This is simulated as part of social insurance contributions for employees
NHIL	<i>tva01_s</i>	E	E	E	E	E	E	S	S	S	This is simulated as part of VAT on standard-rated items; it was decoupled from VAT in 2018
Fringe benefit tax		E	E	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	E	E	This tax was in force starting from the 2016 fiscal year
Property tax		—	—	—	—	—	—	—	—	—	Legislation for such tax is currently being discussed
Capital gains and rent tax	<i>tinny_s</i>	S	S	S	S	S	S	S	S	S	Capital gains by firms and corporations are not simulated
Presumptive tax	<i>tinbs_s</i>	S	S	S	S	S	S	S	S	S	
<i>Indirect taxes</i>											
VAT	<i>tva_s</i>	S	S	S	S	S	S	S	S	S	Only part of the tax base is captured by the consumption data to which we have access
GET Fund Levy	<i>tva02_s</i>	—	—	—	—	—	—	S	S	S	Policy came into effect in 2019
COVID-19 HRL	<i>tva03_s</i>	—	—	—	—	—	—	—	—	S	Policy came into effect in 2021
<i>Other indirect taxes</i>											
Tax on beer	<i>tv104/05</i>	S	S	S	S	S	S	S	S	S	
Tax on akpeteshie	<i>tv102</i>	S	S	S	S	S	S	S	S	S	
Tax on wine	<i>tv103</i>	S	S	S	S	S	S	S	S	S	
Tax on spirits	<i>tv101</i>	S	S	S	S	S	S	S	S	S	
Tobacco tax	<i>tv107</i>	S	S	S	S	S	S	S	S	S	
Tax on gasoline	<i>texsx01</i>	S	S	S	S	S	S	S	S	S	
ESRL on gasoline	<i>texsx04</i>	—	—	—	—	—	—	—	—	S	Policy came into effect in 2021
SPL on gasoline	<i>texsx06</i>	—	—	—	—	—	—	—	—	S	Policy came into effect in 2021
Tax on diesel	<i>texsx02</i>	S	S	S	S	S	S	S	S	S	
ESRL on diesel	<i>texsx05</i>	—	—	—	—	—	—	—	—	S	Policy came into effect in 2021
SPL on diesel	<i>texsx07</i>	—	—	—	—	—	—	—	—	S	Policy came into effect in 2021
Subsidy on kerosene	<i>texsx03</i>	S	S	S	S	S	S	S	S	S	
Tax on LPG	<i>texry01</i>	E	E	E	E	S	S	S	S	S	Impossible to simulate for earlier years as policy rules came into effect in 2016
ESRL on LPG	<i>texry02</i>	—	—	—	—	—	—	—	—	S	Policy came into effect in 2021
Stamp duty		E	E	E	E	E	E	E	E	E	Impossible to simulate because policy rules are not clearly defined for the years concerned
Vehicle income tax		E	E	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	E	E	Although this exists in tax acts, it does not exist in reality
Electronic Transfer Levy		—	—	—	—	—	—	—	—	E	Impossible to simulate due to the nature of survey data underpinning the model
<i>Social contributions (SICs)</i>											
Employee SICs	<i>tscee_s</i>	S	S	S	S	S	S	S	S	S	
Employer SICs	<i>tscer_s</i>	S	S	S	S	S	S	S	S	S	

Notes: 'S': policy is *simulated* although some minor or specific rules may not be simulated; 'E': policy is excluded from the model as it is not 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 and from 2021 to 2023. In 2020, however, there were some changes regarding social protection. The government sought to protect livelihoods by providing additional income insurance to citizens due to the economic shock caused by COVID-19. These new benefit packages, which were introduced in 2020 and discontinued by the end of the year, are also simulated in the 2020 policy system in GHAMOD v2.7.

Table 2.3: GHAMOD spine: Order of simulation

Policy	2013	2014–17	2018–19	2020	2021–23	Description of the instrument and main output
SetDefault_gh	On	On	On	On	On	Default settings for variables not included in the input data
uprate_gh	On	On	On	On	On	Uprating factors defined
lma_gh	Off	Off	Off	On	On	Adjusting labour market variables during COVID
ConstDef_gh	On	On	On	On	On	Constants defined
ilsdef_gh	On	On	On	On	On	Standard Income lists defined
ildef_gh	On	On	On	On	On	Model Specific Income lists defined
ildef_stats_gh	On	On	On	On	On	Stats Presenter Income lists defined
ildef_exp_gh	On	On	On	On	On	Expenditure Income lists defined
tundef_gh	On	On	On	On	On	Tax units defined
neg_gh	On	On	On	On	On	Negative self-employment income recoded to zero; output variable— <i>yse</i> (overwrite)
ses_gh	On	On	On	On	On	Choice of equivalence scale
spl_gh	On	On	On	On	On	Poverty lines defined
random_gh	On	On	On	On	On	Random number generator to dampen turnover tax
tscer_gh	On	On	On	On	On	Employer's social security contributions simulated; output variable— <i>tscer_s</i>
tscee_gh	On	On	On	On	On	Employee's social security contributions simulated; output variable— <i>tscee_s</i>
bsa_gh	On	On	On	On	On	LEAP transfer benefit programme; output variable— <i>bsa_s</i>
bsa00_gh	Off	Off	Off	On	Off	Food rations for LEAP households— <i>bsa00_s</i>
bed_gh	On	On	On	On	On	School capitation grant simulated; output variable— <i>bed_s</i>
bed01_gh	Off	Off	Off	On	Off	Final year high school food ration— <i>bed01_s</i>
bed02_gh	Off	Off	Off	On	Off	High school food ration— <i>bed02_s</i>
bedes_gh	Off	Off	On	On	On	Free SHS policy— <i>bedes_s</i>
bho_gh	Off	Off	Off	On	Off	Utility tariffs relief— <i>bho_s</i>
tinkt_gh	On	On	On	On	On	Capital income tax simulated; output variable— <i>tinny_s</i>
tin_gh	On	On	On	On	On	Labour income tax simulated; output variable— <i>tin_s</i>
ttn_gh	On	On	On	On	On	Presumptive tax— <i>tinbs_s</i>
tva_gh	On	On	On	On	On	VAT payments on expenditure simulated; output variable— <i>tva_s</i>
tex_gh	On	On	On	On	On	Other indirect taxes— <i>tex_s</i>
xhhadj_gh	On	On	On	On	On	Adjustment of consumption to new disposable income— <i>xhh_s</i>
tva_tex_cbs_gh	switch	switch	switch	switch	switch	VAT and excise duty: constant budget shares
output_std_gh	On	On	On	On	On	Standard EUROMOD output calculated on individual level
output_std_hh_gh	Off	Off	Off	Off	Off	Standard EUROMOD output calculated on household level (off in the baseline)

Source: Authors' compilation.

We start with definitional policies by setting default values for some variables, then we uprate the monetary variables from the input data. Uprating is based on an income reference period of 2018, which is applied to each system year's income period using consumer price index (CPI) data (see Tables 3.3 and 3.4 for uprating factors). Next, we define constants, income lists (standard, model specific, Statistics Presenter, expenditure), tax (assessment) units, recode of negative income (employment/self-employment, net non-farm and agricultural) to zero. The latter is done to prevent incorrect calculation of taxes, social contributions, and means-tested benefits for persons with losses in the income reference period. There are several individuals with negative self-employment and non-farm income in the Ghanaian input data. For subsequent definitional policies, the choice of equivalent scales is specified, followed by definitions on poverty lines, after which a random number generator switch is defined to dampen turnover tax.

Tax-benefit policies follow definitional policies; we simulate employer social security contributions and employee social insurance contributions. Next, the LEAP transfer, school capitation grants, and the free senior high school benefit policies are simulated, including selected COVID-19 relief policies in 2020. Simulation of other indirect taxes and VAT follows. Then, direct taxes (capital and labour income tax and the presumptive tax on small businesses) are simulated. The next policy adjusts the levels of reported consumption by absolute changes in disposable income from the base year to the policy year (see Section 3.4). Finally, before the standard output policies, we simulate VAT payments and indirect taxes. Due to the way in which indirect taxes are modelled in GHAMOD (constant budget shares), the policy for consumption adjustment (*xhhadj_gh*) is placed before the indirect tax policies. Indirect tax simulation based on the constant budget shares approach is modelled as a switch in GHAMOD v2.7.

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). Examples of switches in GHAMOD are *spL_gh* and *tva_tex_cbs_gh*. They define the poverty lines employed during simulations and the choice of simulating indirect taxes using constant budget shares, respectively.

2.3.1 Full-year adjustment of COVID-related policies

The COVID-19-related policies modelled in the 2020 policy system in GHAMOD, including school food rations and utility tariff reliefs, were in place only for a limited period during the year. GHAMOD however generally simulates policies at a specific point in time, which is problematic when considering policies of limited duration. Using the standard point-in-time approach, only those policies that were in place at the specific cut-off date (1 July 2020) would be considered and effectively assumed to be available for the entire calendar year.

In previous versions of the model (see GHAMOD v2.6), this is accounted for by applying 'full-year adjustments' to the COVID-related policies. This ensures that average benefit amounts and tariffs are adjusted to reflect the number of months that the related programmes were in place during the 2020 calendar year. The adjustments are applied by incorporating an extension switch called 'Full Year Adjustment' (FYA) to these policies (see Gasior et al. 2021 for details). When the switch is set 'on' (the default setting in the 2020 policy system), benefit amounts and tariffs in the COVID-related policies are automatically adjusted downwards.

Note that income shocks from COVID in 2020 ('*lma_gh*' policy described in Section 3.2) and the FYA switch for COVID-related policy changes in 2020 should generally be switched either 'on' or 'off' together. When both are 'on', the model reflects the situation with economic shocks from COVID-19

and the impact of COVID-related policy changes, covering the entire calendar year of 2020. The user is free to use alternative modelling assumptions.

More details on the modelling of the COVID-related policy changes are available in Sections 1.2, 2.1, and 2.4. Section 3.2 describes the 'on-model' adjustment of incomes during the pandemic.

2.4 Social benefits

2.4.1 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 (in nominal terms) 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 threshold is thus defined at GH¢ 415.44. 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¢ 433.64.
- 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 one year, they are considered eligible. Children who work as house helps are classified as orphans and vulnerable children (OVCs) because they are involved in the worst forms of child labour per the Ghana National Plan of Action on the Elimination of Child Labour.³
- 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.

³ See page 12 of the National Plan of Action for Orphans and Vulnerable Children for Ghana's definition of OVCs (https://healtheducationresources.unesco.org/sites/default/files/resources/iiiep_ghanaovcnpa.pdf), as well as the Child and Family Welfare Policy (<http://www.ovcghana.org/docs/GHANASChildandFamilyWelfarePolicy1.pdf>).

- 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.

In 2020, the model simulates a COVID-19 relief measure directed at LEAP beneficiaries called *bsa00_gh*. For one month during the year, meals worth GH¢ 6 are provided to households that are existing beneficiaries. Additionally, households continue to receive the pre-existing monthly benefits in 2020. For 2021 and 2022, the minimum monthly benefits or cash amounts revert to previous amounts 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.

For 2023, the minimum monthly benefits/cash amounts received were increased as follows:

- A single beneficiary: GH¢ 128.00
- Two beneficiaries: GH¢ 152.00
- Three beneficiaries: GH¢ 176.00
- Four or more beneficiaries: GH¢ 212.00.

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.

2.4.2 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. The policy is only partly simulated in 2020 due to closure of schools following the lockdown measures imposed by the government.

In the same spirit, in 2020 GHAMOD simulates two variants of this policy, *bed01_gh* and *bed02_gh*, which are COVID-19-related school feeding policies targeting high school students. The policy *bed01_gh* allocates GH¢ 3.50 per labour day to all final year high school students for one month. The other policy, *bed02_gh*, allocates the same amount to continuing students for three months. It is worth noting that in 2020, the policy *bed_gh* was active for only three months as most public schools were closed down during the COVID-19 pandemic.

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 from 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, 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 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.
- Each final-year student received GH¢ 3.50 each school day for a month in 2020.
- Each child received GH¢ 1.20 each school day from 2021 to 2023.

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.

2.4.3 Free SHS policy (bedes_gh)

This benefit was instituted with the aim of increasing enrolment and retention of students in SHS. While in Ghana basic education is progressively free, poor households in the country were considered at a disadvantage to cover the additional expenses tied to SHS against competing consumption needs. The benefit shall support households to cover these various education-related expenses, such as admission fees, library fees, science centre fees, computer laboratory fees, examination fees, and utility fees. The policy was implemented starting with the 2017–18 academic year in all public senior high schools. The benefit is not means tested.

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 not means-tested.

Benefit amount

The full amount of the benefit is given to each student who meets the eligibility criteria in the 2017–2023 academic years. The amounts provided have not changed since the programme's inception.

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

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 considered 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 for 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 contribution schemes and are not captured to the full extent by the input dataset.

2.5.2 Employer social contributions (tsceer_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 13–22);
- 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. 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).
- **Lone parent relief:** This relief is granted to a single parent responsible for the upkeep of two or more dependent children. The tax allowance is of the same amount as for the marriage relief. It is commonly also referred to as marriage relief as it is often taken up by couples that are not civilly married.
- **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 (*yem00*);⁴
- Income from individual work or enterprise if it is not subject to enterprise tax (*yse*).

2.6.5 Tax schedule

In 2013–23, 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 2.4–2.10 as generated by the Ghana Revenue Authority (GRA)⁵ due to yearly adjustments that account for exchange rate depreciation and inflation.

The thresholds are adjusted occasionally due to inflation or government revenue targets. As of 2023, a person earning a minimum annual income of GH¢ 4,380 is exempted from PIT. Moreover, during the COVID pandemic, frontline and medical personnel paid this tax for four months in the year 2020.

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	Nil
Next 792	5	39.60	2,376	39.60
Next 1,104	10	110.40	3,480	150
Next 28,200	17.5	4,935.00	31,680	5,085
Exceeding 31,680	25			

Source: Authors' compilation.

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

⁵ See 'Income tax' on the GRA website: <https://gra.gov.gh/domestic-tax/domestic-tax-faq/>.

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	2,592	Nil
Next 1,296	5	64.80	3,888	64.80
Next 1,812	10	181.20	5,700	246
Next 33,180	17.5	5,806.50	38,880	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	Nil
Next 840	5	42	3,972	42
Next 1,200	10	120	5,712	162
Next 33,720	17.5	5,901	38,890	6,063
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	Nil
Next 1,200	5	60	4,656	60
Next 1,680	10	168	6,336	228
Next 36,000	17.5	6,300	42,336	6,528
Next 197,664	25	49,416	240,000	55,944
Exceeding 240,000	30			

Source: Authors' compilation.

Table 2.8: PIT rates, 2020–21

Chargeable income (GH¢)	Rate (%)	Tax (GH¢)	Cumulative chargeable income (GH¢)	Cumulative tax (GH¢)
First 3,828	Free	Nil	3,828	Nil
Next 1,200	5	60	5,028	60
Next 1,440	10	168	6,468	204
Next 36,000	17.5	6,300	42,468	6,504
Next 197,532	25	49,383	240,000	55,887
Exceeding 240,000	30			

Source: Authors' compilation.

Table 2.9: PIT rates, 2022

Chargeable income (GH¢)	Rate (%)	Tax (GH¢)	Cumulative chargeable income (GH¢)	Cumulative tax (GH¢)
First 3,828	Free	Nil	4,380	Nil
Next 1,200	5	66	5,700	66
Next 1,440	10	156	7,260	222
Next 36,000	17.5	6,300	43,260	6,522
Next 197,532	25	49,185	240,000	55,707
Exceeding 240,000	30	72,000		

Source: Authors' compilation.

Table 2.10: PIT rates, 2023

Chargeable income (GH¢)	Rate (%)	Tax (GH¢)	Cumulative chargeable income (GH¢)	Cumulative tax (GH¢)
First 3,828	Free	Nil	4,380	Nil
Next 1,200	5	66	6,144	66
Next 1,440	10	156	7,704	222
Next 36,000	17.5	6,300	43,704	6,522
Next 197,532	25	49,185	240,444	55,707
Next 240,444	30	107,866.80	600,000	163,573.80
Exceeding 600,000	35	210,000		

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. In 2019, a new component of 2.5 per cent on the existing VAT rate was introduced to cater for the Ghana Education Trust Fund (GETFund). Thus, the policy amended the VAT rate of 15 per cent to 12.5 per cent and delinked the National Health Insurance Levy (NHIL) and Ghana Education Trust Fund (GETFund) from VAT. In 2021, a special tax was introduced to generate revenue to cater for expenditures relating to COVID-19. The COVID-19 levy is a 1 per cent tax on VAT-exclusive selling price of the goods supplied.

VAT, NHIL, GETFund, and COVID-19 levy cover 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 2.11 shows the rate structure of excise duties in Ghana.

Table 2.11: Excise duty rates in Ghana

Item	Rate (%) in 2013	Rate (%) in 2014–15	Rate (%) in 2016–20	Rate (%) in 2021–23
Mineral water, bottled water, and soft drinks	17.5	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	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	47.5, 30, 20, 10
Wine	22.5	22.5	22.5	22.5
Spirits, except akpeteshie	25	25	25	25
Akpeteshie	20	20	20	20
Cigarettes	150	150	150	150
Snuff and other tobacco	170.65	170.65	170.65	170.65
Gasoline	GH¢ 0.2193 per litre	GH¢ 0.2732 per litre	GH¢ 1.1137 per litre	GH¢ 1.1137 per litre
ESRL on gasoline	—	—	—	GH¢ 0.20 per litre
SPL on gasoline	—	—	—	GH¢ 0.10 per litre
Diesel	GH¢ 0.1325 per litre	GH¢ 0.1712 per litre	GH¢ 1.1022 per litre	
ESRL on diesel	—	—	—	GH¢ 0.20 per litre
SPL on diesel	—	—	—	GH¢ 0.10 per litre
Kerosene	GH¢ 0.371 per litre	GH¢ 0.371 per litre	GH¢ 0.371 per litre	
LPG	—	—	GH¢ 0.561 per kg	
ESRL on diesel	—	—	—	GH¢ 0.18 per kg

Notes: LPG, liquified petroleum gas. '—' represents non-existent legislation until 2016 or 2021 depending on the policy.

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 duty 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) for the years 2013–20. 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. In 2021, a new Energy Sector Levies Law, Act, 1064, amends the Energy Sector Levies Act, 2015, Act 899, to provide for an Energy Sector Recovery Levy (ESRL) and Sanitation and Pollution Levy (SPL) to be imposed on specified petroleum products and for related matters.

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 2013–23.

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

First, the input dataset does not allow to consider all the above-listed exemptions when simulating capital income tax. The exemptions relating to inheritance and divorce cannot be ascertained because of the scope of the input data. Second, the tax base used for the capital investment income variable (*y_{iy}*) includes incomes from interest and dividend (which is subject to tax) but also income from donations, as the GLSS questionnaire lumps these types of income together. Yet, donations from religious bodies and private transfers which use the gift for the benefit of the public or a section of the public and for charitable purposes are exempted from tax. As very few observations situated in the lowest part of the income distribution report this variable, we assume that the share of income from donations in the overall income from interest, dividends, and donations must be rather negligible.

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 2013–20. From 2021, the COVID-19 levy which is a 1 percent tax on VAT-exclusive selling price of the goods supplied, was introduced as an additional component of the VAT flat-rate scheme (VFRS) for small enterprises.

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_a8	GH_2017_a7
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

3.2.1 General data adjustments

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, the time window used for reporting on active participation in an economic activity is different across waves. 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 is 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 the labour force module of GLSS-7. Contrary to GLSS-6, individuals who indicate self-employment status in the labour force module are subsequently left out from responding to questions relating to how much they earn in that activity. However, both waves include modules on non-farm household enterprises, and GSS produces aggregates on gross and net non-farm business income based on these modules at the level of the household head. With this information, we work on harmonizing self-employment income across both waves. On one hand, for GLSS-6, self-employment income reported in the labour force module is used in the model, since this has been found to be more reliable for previous waves (Coulombe and McKay 2008). On the other hand, for GLSS-7, net non-farm household enterprise income is used instead, limiting the comparability of said variable across waves. In summary, for GLSS-7, we assign the GSS calculated net income from non-farm enterprise to the household head as self-employment income. This is contrary to what is done in GLSS 6 as we believe net income from non-farm enterprise captures self-employment income in GLSS-7. Although this method does not allow assigning any wages to contributing household members, we use gross non-farm income as tax base for turnover tax.

3.2.2 Income shocks resulting from the COVID-19 pandemic

Policy systems for years 2017–23 in GHAMOD v2.7 use data from the Ghana Living Standards Survey, version 7 (2016/17). This means that incomes in the 2020 and 2021 policy system are not adjusted downwards automatically despite the economic shock resulting from the COVID-19 pandemic.

For the courtesy of the user, GHAMOD v2.7 keeps the previously introduced definitional policy, *lma_gh*, that applies relevant shocks to incomes 'on-model' in 2020 and 2021. When the policy is set 'on' (default in the 2020 and 2021 policy systems), a portion of workers in each industry transition from paid employment to unemployment with no market income. Household consumption expenditures are adjusted downwards accordingly based on absolute reductions in disposable income (see Section 3.4).

The adjustment is achieved by applying the 'transition shares' listed in Table 3.2 to randomly selected workers in each sector. The transition shares are derived from changes in each industry's GDP from its counterfactual values in 2020 and 2021, computed based on the pre-pandemic (2017–19) linear trend (see Lastunen 2022 for details). Specifically, it is assumed that the size of the proportional GDP shock in a given sector is equivalent to the share of workers who transition to unemployment with zero market income. The reduction in output across the economy then approximates the loss of earned market income.

Note that the GDP shocks capture not just the pandemic but also other industry-level economic developments that took place in 2020 and 2021 and deviated from pre-pandemic trends. Accordingly, the related labour market transitions and shocks apply to the entirety of years 2020 and 2021. It is therefore recommended that, when running the model with the 'lma_gh' policy turned 'on', the user also turns 'on' the full-year adjustment switch for the COVID-related policies in the 2020 system year (see Section 2.3). In this way, both the shocks and policies reflect the economic circumstances over the course of the whole year. When both are set 'off', the model reflects the point-in-time perspective for 2020 and 2021, not accounting for the pandemic or related policy changes during the year. The user is free to use alternative modelling assumptions.

Additional details of the derivation of the GDP shocks (sectoral transition shares) and the modelling of income and consumption shocks are available in a separate technical note by Lastunen (2022). It is

useful to emphasize that this particular method to modelling on-model shocks in GHAMOD is based on several assumptions, equivalent in all SOUTHMOD models, that the user is free to amend.⁶

The COVID adjustment policy is switched 'off' in the 2022 policy system due to lack of GDP data for 2022 at the time of writing, and because of more limited impact of COVID-19 in 2022 compared to previous years. Note that individual-level survey data will eventually become available that can be used to underpin the model, making it possible to account for the pandemic and any other external shocks without separate on-model adjustments.

Table 3.2: Unemployment transition shares during COVID-19, 2020–21

Industry no. (lindi01)	Industry	Transition shares	
		2020	2021
1	Crops	0	0
2	Livestock	0	0
3	Forestry and logging	0.1026	0.0633
4	Fishing	0	0
5	Mining and quarrying	0.2098	0.3809
6	Manufacturing	0.0245	0
7	Electricity	0	0
8	Water and sewerage	0	0
9	Construction	0	0
10	Trade; repair of vehicles, household goods	0.0564	0.0294
11	Hotels and restaurants	0.3932	0.3923
12	Transport and storage	0	0
13	Information and communication	0	0
14	Financial and insurance activities	0	0
15	Real estate	0	0
16	Professional, administrative and support services	0.0780	0.0218
17	Public administration and defence; social security	0	0
18	Education	0	0.0668
19	Health and social work	0.0732	0.1056
20	Other service activities	0.1949	0.1364

Source: Authors' compilation.

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.

⁶ Among other assumptions made in the current implementation of on-model shocks, only market income ('yem', 'yse', and 'yag', items that make up the 'earnings' income list) are reduced. Furthermore, farm income ('yag') is only reduced for formal workers in the agricultural sector who have other sources of earnings ('yem' or 'yse'). The user can change the related parameters or rely on alternative assumptions. Lastly, any sector-level positive shocks are not taken into account.

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.

3.3.3 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 Tables 3.3 and 3.4. As compared to previous version models, uprating factors have changed significantly. Currently, the GSS has amended the base year from 2012 to 2018. The current model uses a chain-linked version of the CPI based on 2018 prices.

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

Table 3.3: Raw indices for deriving GHAMOD uprating factors—values

Index	Constant name	Values of raw indices										
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
CPI food index	\$f_CPI_food	80.13	80.63	81.13	88.15	94.56	100.15	106.84	119.38	127.94	171.40	207.322
CPI non-food index	\$f_CPI_nonfood	63.17	64.28	65.41	80.04	91.96	100.03	107.55	116.66	125.54	133.96	144.02
CPI overall	\$f_CPI_total	68.48	69.40	70.34	82.62	92.84	100.09	107.24	117.84	126.58	146.92	165.93

Source: Authors' compilation. Base for all indices: 2018=100.

Table 3.4: Raw indices for deriving GHAMOD uprating factors—sources and uprated components

Index	Constant name	Source	Income components uprated by the index	Notes
CPI food index	\$f_CPI_food	Ghana Statistical Service (n.d.)	x01–x02	Expenditure on food items
CPI non-food index	\$f_CPI_nonfood	Ghana Statistical Service (n.d.)	x03–x13	Expenditure on non-food
CPI overall	\$f_CPI_total	Ghana Statistical Service (n.d.)	<i>yse, yem, kfb, ypa, ypr</i> , etc.	Income

Note: Base for all indices: 2018=100.

Source: Authors' compilation.

3.4 Consumption levels

Consumption levels are based on the original reported consumption levels in the input data (*xhh*). These levels are uprated from the base year to the policy year and adjusted by absolute changes in disposable income from the base year to the policy year.

The change in disposable income takes into account changes in market incomes (e.g. COVID-related decreases in earnings) as well as changes in benefits and contributions. The underlying assumption is that changes in disposable incomes lead to the same changes in consumption levels. In recognition of the fact that there may be some consumption of own-account produced food, in cases where the base year disposable income is higher than the disposable income in the policy year, a proportion of the original consumption is assumed to be unaffected. This proportion is assumed to be 25 per cent of the original consumption following Tschirley et al. (2015).

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 4.1 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 4.1, 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 2.7 million individuals in the GLSS-6 data received some labour income while about 3 million 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 and 2 million in 2013 and 2017, respectively. 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 and small-scale non-farm sectors, which are 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 4.2 in the Annex. All market income, including revenue from agricultural sales (livestock and crops), in the population was captured by both data waves. About 18,376 million and 38,818 million of it relates to income from dependent employment (*yem*) in 2013 and 2017, respectively. 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 47.68 million, respectively, in 2013. In 2017, same income indicators recorded 75,406 million and 1,840, 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 4.3 and 4.4 in the Annex provide a comparison of the benefits and taxes simulated in the model to external statistics.

In 2013–14 and in 2017–22, 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 as 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 A4 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. The case is not different in 2017, as we continue to underestimate VAT revenues by significant margins as done in 2013. This is also attributed to the limited scope of household data captured for VAT-related expenses.

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 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 equalized by the adult equivalence scale.⁷ 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 based on 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*), which is adjusted by absolute changes in disposable income from the base year to the policy year, as explained in Section 3.4 on consumption levels.

The headcount poverty rate recorded for the model for the 2013 policy year was 24.5 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 headcount in the model was 24.2 per cent, which was also overestimated 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 27.1

⁷ The number of equivalent adults is calculated based on the composition of the household, using a calorie-based scale (see National Research Council 1989).

per cent, whereas for households with elderly members, the poverty rate was 33.8 per cent in 2013. In 2017, the poverty rate for households with children stood at 27.2 per cent, while for households with elderly members, the poverty rate was 34.4 per cent. This shows a slight increase 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 40.9 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 41.8 compared with 43 by external statistics. This increase over the period in the two waves implies that the benefits of growth have not been evenly distributed and some groups have been left out as the population grew.

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 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.

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Annex: Validation

Table A1: Market income in GHAMOD—number of recipients

		GHAMOD system year 2013	GHAMOD system year 2017
<i>yem</i>	Employment income	2,898,500	3,240,587
<i>yem00</i>	Income from main job	2,704,616	3,098,668
<i>yse</i>	Self-employment income	4,896,825	2,044,820
<i>ypt</i>	Private transfers	2,125,978	8,099,742
<i>ypr</i>	Rent income	41,353	176,205
<i>yiy</i>	Investment income	16,156	101,237
<i>kfb</i>	Non-cash employment income	167,673	278,948
<i>yag</i>	Net agricultural Income	2,741,715	1,944,320
<i>xhh</i>	Total household expenditure	6,601,484	7,299,925
<i>ytn</i>	Non-farm gross sales income	2,870,336	3,083,132
<i>paact</i>	Old-age pensions	89,824	121,333

Source: Authors' compilation.

Table A2: Market income in GHAMOD—annual amounts (in million)

		GHAMOD system year										
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<i>av_yem</i>	Average employment income	6,340	6,425	6,512	7,649	11,979	12,915	13,837	15,142	16,034	18,957	21,410
<i>yem</i>	Employment income	18,376	18,624	18,875	22,169	38,820	41,851	44,841	46,831	48,869	61,431	69,380
<i>yse</i>	Self-employment income	24,840	25,175	25,515	29,968	75,406	81,294	87,101	87,330	95,981	119,327	134,766
<i>ypt</i>	Private transfers	1,804	1,828	1,853	2,176	11,196	12,070	12,933	14,211	15,265	17,717	20,010
<i>ypr</i>	Rent income	47.7	48.3	49.0	57.5	1,840	1,984	2,126	2,336	2,509	2,912	3,289
<i>yiy</i>	Investment income	12.9	13.1	13.3	15.6	7.4	7.9	8.5	9.4	10.0	11.7	13.2
<i>kfb</i>	Non-cash employment income	250	253	257	302	580	625	670	736	790	917	1,036
<i>yag</i>	Net Agricultural income	8,457	8,571	8,687	10,203	9,304	10,031	10,748	11,565	12,378	14,724	16,629
<i>xhh</i>	Total household expenditure	59,506	60,307	61,121	71,790	89,886	96,905	103,827	114,093	122,555	142,241	160,645
<i>ynt</i>	Net income	35,777	36,258	36,748	43,162	169,114	182,320	195,344	—	—	—	-
<i>ytn</i>	Non-farm gross sales income	52,289	52,993	53,709	63,083	182,320	196,557	210,598	231,421	248,586	288,515	325,846
<i>yem00</i>	Income from main job	17,818	18,058	18,302	21,496	37,404	40,325	43,206	47,478	50,999	59,191	66,850
<i>paact</i>	Old-age pension	632	640	649	762	986	1,063	1,139	1,252	1,345	1,561	1,763

Source: Authors' compilation.

Table A3: Tax–benefit instruments simulated in GHAMOD—number of recipients and payers

		GHAMOD system years										
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Benefits												
bed	Education benefits	2,104,369	2,104,369	2,104,369	2,104,369	2,037,131	2,037,131	2,037,131	2,037,131	2,037,131	2,037,131	2,037,131
bed01	Food rations for Final year	—	—	—	—	—	—	—	774,864	—	—	—
bed02	Food rations for cont. students	—	—	—	—	—	—	—	922,333	—	—	—
bsa	Social assistance (LEAP)	24,755	24,755	27,829	27,829	31,143	31,143	31,143	31,143	31,143	31,143	31,143
bsa00	Food rations (LEAP)	—	—	—	—	—	—	—	31,143	—	—	—
bedes	Free SHS programme	—	—	—	—	—	927,019	927,019	1,560,942	1,560,942	1,560,942	1,560,942
bho	Utility tariffs relief	—	—	—	—	—	—	—	151,954	—	—	—
Taxes and social insurance contributions												
tin	Labour income tax	1,058,948	1,061,570	1,064,419	933745.3	1,152,696	1,147,949	1,141,947	1,100,841	1,086,787	1,157,664	1,160,949
tinkt	Capital income tax	9,905	9,905	9,905	47,922	203,644	203,644	203,644	204,997	204,997	204,997	206,538
ttn	Presumptive tax	895,895	906,697	914,869	1,019,810	1,521,766	1,552,164	1,578,562	1,628,976	1,650,067	1,718,954	1,741,243
tva	VAT	6,598,983	6,598,983	6,598,983	6,598,983	7,244,381	7,244,205	7,244,299	7,244,422	7,243,899	7,243,858	7,244,285
tva01	NHIL	—	—	—	—	—	—	7,240,868	7,240,061	7,240,063	7,240,483	7,241,940
tva02	GET Fund Levy	—	—	—	—	—	—	7,240,868	7,240,061	7,240,063	7,240,483	7,241,940
tva03	COVID-19 Levy	—	—	—	—	—	—	—	—	7,234,173	7,234,840	7,237,704
tvI01	Excise paid on spirits	493,556	493,801	493,859	497,854	426,253	428,091	428,360	429,152	430,425	431,262	431,262
tvI02	Excise paid on akpeteshie	847,280	847,993	848,307	849,960	545,518	545,518	545,518	544,749	545,411	546,449	548,199
tvI03	Excise paid on wine	43,759	43,759	43,759	43,912	18,950	18,950	18,950	18,950	19,017	19,017	19,017
tvI04	Excise paid on imported beer	373,892	373,892	374,257.1	374,629	183,770	183,770	183,770	183,770	183,770	183,770	183,770
tvI05	Excise paid on local beer	301,099	301,099	301,099	301,099	400,803	400,803	400,803	400,320	400,320	400,803	400,803
tvI06	Excise paid on cigarettes	228,006	228,006	228,006	228,750	122,020	122,020	122,539	122,539	122,539	122,539	122,539
tvI07	Excise paid on tobacco	113,243	113,243	113,243	114,552	272,857	273,015	273,516	273,516	273,516	273,516	273,516
texsx01	Excise paid on petrol	521,280	527,059	527,437	557,353	71,878	718,78.29	71,878	71,878	71,878	71,878	71,878
texsx04	ESRL paid on petrol	—	—	—	—	—	—	—	—	71,878	71,878	71,878
texsx06	SPL paid on petrol	—	—	—	—	—	—	—	—	71,878	71,878	71,878
texsx02	Excise paid on diesel	44,919	45,932	45,932	48,841	6,612	6,612	6,612	6,612	6,612	6,612	6,612
texsx05	ESRL paid on diesel	—	—	—	—	—	—	—	—	6,612	6,612	6,612
texsx07	SPL paid on diesel	—	—	—	—	—	—	—	—	6,612	6,612	6,612
texsx03	Excise paid on kerosene	1,541	1,547	1,547	1,578	905	907	902	863	864	878	873
texry01	Excise paid on LPG	—	—	—	1,922,886	127,939	127,939	127,939	127,939	127,939	127,939	127,939
texry02	ESRL paid on LPG	—	—	—	—	—	—	—	—	114,653	114,653	115,204
tex	All excise	1,995,963	2,001,150	2,001,528	3,356,010	1,489,221	1,489,219	1,489,228	1,488,699	1,490,546	1,492,217	1,493,978
tscee	Employee social insurance contributions	920,815	920,815	920,815	920,815	930,276	930,276	930,276	896,175	873,983	930,276	930,276
tscer	Employer social insurance contributions	864,898	864,898	864,898	864,898	930,276	930,276	930,276	896,175	873,983	930,276	930,276

Note: '—' represents policy non-existence for these years.

Source: Authors' compilation.

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

		GHAMOD system years											External data	
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2013	2017
Benefits														
bed_s	Education benefits	299	398	448	796	1,130	1,130	1,130	283	1,130	1,129.94	1,130	1,129.94	
bed01_s	Food rations for Final year	—	—	—	—	—	—	—	58.95	—	—	—	—	
bed02_s	Food rations for cont. students	—	—	—	—	—	—	—	210.40	—	—	—	—	
bsa_s	Social assistance (LEAP)	2.7	10.48	18.44	18.44	26.86	26.86	26.86	26.86	26.86	26.86	53.73	26.84	
bsa00_s	Food rations (LEAP)	—	—	—	—	—	—	—	5.68	—	—	—	—	
bedes_s	Free SHS programme	—	—	—	—	—	1,504.10	1,504.10	1,250.01	1,250.01	1,250.01	1,250.01	1,250.01	620 ^a
bho_s	Utility tariffs relief	—	—	—	—	—	—	—	38.75	—	—	—	—	
Taxes and social insurance contributions														
tin_s	Labour income tax	2,049	2,084	2,119	2,300	2,642	3,382	3,586	3,885	4,146	5,251	6,092	4,859	
tinkt_s	Capital income tax	1.28	1.30	1.32	6.92	148	160	171	188	202	235	265		
ttn_s	Presumptive tax	779	791	802	915	1,575	1,655	1,707	1,791	2,474	2,703	2,871		
tva_s	VAT	1,574	1,922	1,949	2,306	2,063	2,246	3,609	3,875	4,483	5,327	6,621	8,549	
tva01_s	NHIL	—	—	—	—	—	—	401	431	457	544	613	1,376	
tva02_s	GET Fund Levy	—	—	—	—	—	—	401	431	457	544	613		
tva03_s	COVID-19 HRL	—	—	—	—	—	—	—	183	217	245			
tvI01_s	Excise paid on spirits	0.72	0.73	0.74	0.88	0.43	0.46	0.5	0.54	0.58	0.67	0.76		
tvI02_s	Excise paid on akpeteshie	0.98	0.99	1	1.19	0.72	0.79	0.84	0.89	0.96	1.13	1.28		
tvI03_s	Excise paid on wine	0.07	0.07	0.07	0.08	0.09	0.1	0.11	0.12	0.12	0.15	0.17		
tvI04_s	Excise paid on Imported beer	3.53	3.58	3.63	4.28	0.53	0.58	0.62	0.67	0.71	0.84	0.94		
tvI05_s	Excise paid on local beer	0.26	0.27	0.27	0.32	0.43	0.47	0.5	0.53	0.57	0.67	0.76		
tvI06_s	Excise paid on cigarettes	0.75	0.76	0.77	0.92	0.42	0.46	0.49	0.53	0.57	0.67	0.75		
tvI07_s	Excise paid on tobacco	0.23	0.23	0.24	0.28	0.68	0.75	0.8	0.84	0.91	1.07	1.20		
texsx01_s	Excise paid on petrol	2.38	2.97	2.97	12.21	2.18	2.21	2.22	2.2	2.18	2.20	2.20		
texsx04_s	ESRL paid on petrol	—	—	—	—	—	—	—	—	0.39	0.40	0.39		
texsx06_s	SPL paid on petrol	—	—	—	—	—	—	—	—	0.39	0.40	0.39		
texsx02_s	Excise paid on diesel	0.27	0.35	0.35	2.29	0.22	0.22	0.22	0.22	0.19	0.22	0.21		
texsx05_s	ESRL paid on diesel	—	—	—	—	—	—	—	—	0.04	0.04	0.04		
texsx07_s	SPL paid on diesel	—	—	—	—	—	—	—	—	0.02	0.02	0.02		
texsx03_s	Excise paid on kerosene	0.018	0.019	0.019	0.019	-0.011	-0.011	-0.011	-0.010	-0.010	-0.011	-0.010		
texry01_s	Excise paid on LPG	—	—	—	6.79	0.64	0.65	0.65	0.62	0.58	0.65	0.64		
texry02_s	ESRL paid on LPG	—	—	—	—	—	—	—	—	0.19	0.21	0.21		
tex_s	All excise	9.17	9.94	10.04	29.23	6.34	6.68	6.93	7.15	8.39	9.31	9.96	3,090	
tscee_s	Employee SICs	486	492	499	586	750	809	867	923	951	1,187	1,341		
tscer_s	Employer SICs	1,067	1,081	1,095	1,287	1,773	1,912	2,048	2,181	2,248	2,806	3,169		
tscee+tscer	Total SICs	1,552	1,573	1,594	1,873	2,523	2,720	2,915	3,103	3,199	3,993	4,510	1,848	

Notes: '—' represents policy non-existence for these years. ^a The external estimate for the free SHS programme (2018) includes costs of infrastructure (e.g. furniture), which GHAMOD does not simulate.

Source: Authors' compilation.

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

	Based on simulated consumption (2013)	Based on disposable income (2013)	Based on simulated consumption (2017)	Based on disposable income (2017)	Consumption-based, official (2013)	Consumption-based, official (2017)
All	24.52	47.46	24.22	52.19	24.2	23.4
Male-headed households	26.15	44.76	26.47	51.69	32.6	37.4
Female-headed households	19.62	55.57	18.63	53.46	29.8	29.9
Households with children	27.07	49.85	27.23	54.41		
Households with elderly members	33.84	55.70	34.38	58.67		

Source: Authors' compilation