

SOUTHMOD

Country report

Ethiopia

ETMOD v3.1

2018–2023

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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 ETMOD, the SOUTHMOD model developed for Ethiopia. The first version of ETMOD and its respective country report were developed by the Ethiopian Development Research Institute (EDRI) in collaboration with the University of Essex and the Department of Economics at KU Leuven, with support from the project partners. The Ethiopian national team currently includes Adnan A. Shahir, Abas Mohammed Ali (Ministry of Planning and Development, Ethiopia), and Francesco Figari (University of Eastern Piedmont, Italy), who are responsible for the 2023 model update and this report.

The results presented in this report are derived using ETMOD version 3.1, 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 ETMOD 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
CSA	Central Statistical Agency
EA	Enumeration area
ESS	Ethiopia Socioeconomic Survey
ETB	Ethiopian Birr
FYA	Full year adjustment
GPS	Graduates Prediction System
HCES	Household Consumption Expenditure Survey
HDI	Household disposable income
IDA	International Development Association
KFSTF	Kebele Food Security Task Force
KTC	Ketenas Targeting Committees
MoFEC	Ministry of Finance and Economic Cooperation
MoFED	Ministry of Finance and Economic Development
MoF	Ministry of Finance
MUDC	Ministry of Urban Development and Construction
MoUI	Ministry of Urban and Infrastructure
PDC	Planning and Development Commission
PMT	Proxy means test
PPS	Probability proportional to size
PSNP	Productive Safety Net Programme
RPSNP	Rural Productive Safety Net Programme
RPSNP-DS	Rural Productive Safety Net Programme direct supports component
RPSNP-PW	Rural Productive Safety Net Programme public work component
SNNPR	Southern Nations, Nationalities and Peoples' Region
SRS	Simple random sampling
TOT	Turnover tax
UPSNP	Urban Productive Safety Net Programme
UPSNJP-DS	Urban Productive Safety Net and Jobs Project – direct supports component
UPSNJP-PW	Urban Productive Safety Net and Jobs Project – public work component
UPSNJP	Urban Productive Safety Net and Jobs Project
USD	US dollar
VAT	Value-added tax
WFSTF	Woreda Food Security Task Force

1 Basic information

1.1 Basic information about the tax–benefit system

In Ethiopia, the fiscal year runs from 8 July to 7 July. For budgetary reasons, tax and benefit policy reforms usually come into effect at the beginning of the fiscal year. The regional governments collect payroll tax, self-employment tax, and sole proprietor businesses profit tax. Although the regions are entitled to set their own rates for these taxes, all regions traditionally apply the same rates. The rates for all taxes not mentioned above are determined at federal level; the revenue from such taxes, including payroll tax on civil servants, is processed at federal level, with a portion of the proceeds given to regions.

At federal level, the social security system in Ethiopia includes pension, sickness, and disability benefits. Other benefit programmes, in both urban and rural areas, such as the Productive Safety Net Programme (PSNP), are administered by the regions. However, although PSNP is managed by the regions, which have full autonomy to identify beneficiaries, benefit levels and eligibility conditions are consistent across the regions. The benefit amount does not depend on family composition, such as lone parents or parents with dependent children.

For both genders, the official state pension age is 60 years, which applies to both private employees and civil servants who are not in the military or police forces. The retirement age for individuals serving the national army and police is determined by the legislation regulating the national defence and police forces. This defines three provisions based on a combination of age and number of years of service. Employees who have completed at least 10 years of service and retire upon attaining retirement age receive a retirement pension for life. If an employee terminates service after 20 years but has not yet reached retirement age, he or she will start receiving a pension at age 60. Employees who terminate service after at least 25 years but have not yet reached retirement age receive a retirement pension for life beginning five years before the retirement age.

Income taxes are levied on individuals, so that married couples are treated separately. Employment income tax rates are progressive. Employment income includes any gain in cash or kind from employment by individuals. Exempt from income tax are: employment income earned by casual workers (those who do not work for more than one month in a year for the same employer); pension contributions by employers; and employment income received from embassies. There is a large overlap between temporary workers and the informal economy typical in low-income countries, and around 13 per cent of casual workers are in formal employment (Bonnet et al. 2019).

Incomes from different sources are taxed at different rates. For example, interest on deposits and royalties is taxed at a rate of 5 per cent, dividends at 10 per cent, and rental income at 15 per cent. Employment income tax liability is assessed monthly and employees whose tax is withheld by their employer need not file a tax return at the end of the fiscal year. All others, whose income is derived from self-employment, rental of property, and so on, need to file a tax return annually as their tax liability is assessed on an annual basis.

The tax brackets and benefit amounts in the Ethiopian tax–benefit system are not regularly adjusted for inflation, except for the Rural PSNP (RPSNP). The benefit amount, for both conditional and unconditional recipients, under the RPSNP is adjusted to the food inflation rate in the market closest to the recipient's location. Entitlement to PSNP benefits is based on the poverty status of the household, which is assessed by a community committee. The assessment is verified using a proxy means test (PMT). Household members can decide not to participate in the programme and not take up the benefit even if they qualify for it.

1.2 Social benefits

1.2.1 Main benefits

A contributory social security system for public sector employees in Ethiopia started in the early 1960s. The current proclamation governing this system is Public Servants' Pension Proclamation 714/2011, which governs the public servants' pension funds (Civil Service Pension Fund and Military and Police Service Pension Fund). There was no coverage for private sector employees until 2011, when the Private Sector Employees' Pension Fund was established under Private Organization Employees' Pension Proclamation 715/2011. This provides private sector employees with the same benefit structure as civil servants.¹

More recently, the Ethiopian government introduced Public Servants' Pension (Amendment) Proclamation 907/2015. Unlike Proclamation 714/2011, which defines a public servant as a permanent public employee, the Amendment defines a public servant as a 'monthly salaried person employed permanently or for a definite period or piece of work in a public office, public enterprise or project or program carried out by government' (Proclamation 907/2015: 8287). The main purpose of the Amendment was to recognize temporary government employees, meaning those employed for at least 45 days, as public servants.

In this section, we present descriptions of the pension benefit systems that apply to civil servants as well as the military and police. To avoid repetition, description of the pension benefit system that applies to private sector employees is not presented in detail here, as in July 2011 it was reformed so that it became equivalent to the pension benefit system that governs civil servants.

Old-age/retirement pension and gratuity: In accordance with Proclamation 714/2011, the amount of retirement pension for a public servant is set at 30 per cent of the average salary for the last three years before retirement. For each additional year of service above the required 10 years of service, the retirement pension is increased by 1.25 per cent for a public servant and 1.65 per cent for members of the defence and police forces.²

Invalidity and incapacity pension and gratuity: Proclamation 714/2011 grants a public servant an invalidity pension payment (of a similar amount to an old-age/retirement pension) for life if (s)he leaves after 10 years of service but before the retirement age owing to health problems that prevent her/him from obtaining any other gainful employment. On the other hand, if a public servant leaves before completing 10 years of service owing to health-related problems that prevent her/him from obtaining any other gainful employment, (s)he is entitled to a lump sum invalidity gratuity payment.

Similarly, public servants who leave service following employment injury (i.e. injury at the workplace) of not less than 10 per cent capacity to work are entitled to an incapacity pension and gratuity payments according to Proclamation 714/2011 (pp. 5954–55).

Survivors' pension: If a public servant dies as a result of an employment injury or while receiving pension payments or after completing 10 years of service, her/his survivors are entitled to pension payments. Specifically, a widow or widower is entitled to 50 per cent of the pension the deceased was or would have been entitled to, and a surviving child below the age of 18 years is entitled to 20 per

¹ The texts of most proclamations referred to in this country report are available at: <https://www.lawethiopia.com/>.

² Pension benefits received, contributions collected, and profits earned from investment or pension funds are all exempt from taxes. For details of retirement pension payments for government officials and members of parliament as well as payments for retirement gratuity, see Proclamation 714/2011 (pp. 5952–53).

cent of the pension. Similarly, each parent of the deceased public servant is entitled to 15 per cent of the pension (Proclamation 714/2011: 5959–61).

Private sector employees' pension: As indicated earlier, Private Organization Employees' Pension Proclamation 715/2011 provides the same detailed arrangement regarding pension benefits and gratuities as the public pension scheme that applies to civil servants.

Sick leave benefits: According to Labour Proclamation 377/2003, in any 12-month period, civil servants are entitled to a maximum sick leave period of six months, conditional on presenting a medical certificate. Regarding payments during periods of sick leave, the proclamation further stipulates that a civil servant is entitled to 100 per cent of her/his salary for the first month and 50 per cent of her/his wage during the next two months of the sick leave period. The civil servant is required to take the remaining three months of sick leave without pay.

Maternity leave benefits: Proclamation 377/2003 also grants female civil servants maternity leave with full pay. Specifically, Article 88 of this proclamation states that a female worker is entitled to a paid leave period of 30 consecutive days before the due date of birth and a period of 60 consecutive days' leave after the birth of the child.

Medical and injury leave benefits: Proclamation 377/2003 grants civil servants medical benefits and paid leave periods if they sustain a workplace-related injury. If a civil servant sustains an employment injury, the government institution (as employer) is required to cover any medical expenses incurred in relation to the employment injury. In addition, the civil servant is entitled to paid injury leave until (s)he recovers and is able to resume work.

1.2.2 Benefits during the COVID-19 pandemic in 2020–21

During the COVID-19 pandemic in 2020, the Ethiopian capital (Addis Ababa) provided support to various social groups. Among other programmes, the Addis Ababa city administration implemented various student support programmes in public schools starting in September 2020, having delivered related benefits briefly in late 2019. The city suspended the programmes in their early stage following school closures. Although these programmes were planned long before and briefly implemented in 2019, we consider them COVID-19 response policies since a large-scale rollout was enacted in late 2020. The programmes include the provision of school uniforms, school meals, pens, notebooks, bags, and shoes. Due to lack of data, we currently simulate only school uniforms and school meals benefits.

1.2.3 Not strictly benefits: PSNP

Although Ethiopia has several non-contributory benefit schemes provided by non-governmental organizations, most are of a small scale and therefore not particularly fitting for a microsimulation model. A social protection transfer payments programme of interest to the microsimulation model at hand is the PSNP. The Ethiopian government launched the RPSNP, with substantial support from the World Bank, in 2005. After almost a decade of success in reducing poverty in rural areas through this benefit package, the government introduced the Urban PSNP (UPSNP) to improve the lives of the urban poor (defined as those belonging to the poorest 15 per cent of the population) in 2014. Both the RPSNP and the UPSNP comprise two components: public work (conditional benefit) and direct support (unconditional benefit). The public work and direct support components in both the urban and rural areas are mutually exclusive; a household can obtain only one of the two benefit packages.

RPSNP

The main objective of the RPSNP is to help chronically food-insecure rural households to develop the capacity to resist shocks, create assets, and become food self-sufficient. To this end, the programme

offers transfers in the form of food, cash, or a combination of the two, to food-insecure rural households through either employment in local public good provision or direct support components.

The programme covers rural households in the nine major regions of the country: Tigray, Amhara, Oromia, Southern, Nationalities and Peoples' Region (SNNPR), Afar, Somali, Harari, and Dire Dawa. Gambela and Benishangul-Gumuz are the only rural regions excluded from PSNP. These two regions are covered by other government benefit schemes. Beneficiaries of the RPSNP are households that live in *kebeles* or *woredas*³ that are considered by the government to be chronically food-insecure. Until 2005, the programme predominantly targeted *woredas*. The 2014 PSNP 'Programme Implementation Manual' lists the criteria used to classify *woredas* (and households) as chronically food-insecure as well as the eligibility criteria for participation in the programme (Ministry of Agriculture 2014).

According to Gilligan et al. (2009), the RPSNP in Ethiopia is the second-largest safety net programme in sub-Saharan Africa, next only to that of South Africa. The programme started with a coverage of 4.84 million food-insecure rural households, and in 2016/17 it was scaled up significantly to cover 8 million households. However, RPSNP so far supports less than half of households below the absolute poverty line (Ministry of Agriculture 2010; Endale et al. 2019). Public work beneficiaries represent over 86 per cent of the target households in rural areas.

The conditional transfer is made during periods of food shortage and the off-farming season. The programme provides benefits to recipients in terms of either cash or food. Significant numbers of households included in the programme prefer cash transfers over food. According to the 2014 PSNP 'Programme Implementation Manual', the daily wage rate of the cash transfer is calculated on the basis of the cost of buying 3 kg of cereal and 0.8 kg of pulses per week (15 kg of cereal and 4 kg of pulses per person per month) in the market. This benefit amount has been revised following the implementation of PSNP phase 5 in 2021. Accordingly, every client receives a payment equivalent to 15 kg of wheat per month. Wage rates paid in the programme vary across time and area at *woreda* level to reflect local food price variation and inflation. Food price surveys are conducted annually, and wage rates are ultimately determined by the price of the cheapest cereals and pulses on local markets.

Public work focus on integrated community-based watershed development, covering activities such as soil and water conservation measures, rangeland management (in pastoral areas), and the development of community assets such as roads, water infrastructure, schools, and clinics. Given that those eligible for the transfer often also have other sources of livelihood, the programme limits the number of days a recipient of conditional transfers is eligible to work. The maximum number of days of work per month covered by the public work scheme is set at five. Able-bodied household members can, however, work up to a maximum of 15 days per month to secure payments for other household members who are unable to supply labour.

The unconditional transfer sub-programme supports households that have no labour capacity as well as those who can only participate in public work programmes by renouncing their responsibility to care for children. Those eligible for unconditional transfers receive the same amount as those who receive the conditional transfer.

PSNP phase 5 will be financed by the government of Ethiopia and development partners. Over the course of its five-year life, from 2020/21 to 2024/25, a total budget of US\$2.381 billion is allocated to the fifth phase of the PSNP. Donors have devoted 65 per cent and the government of Ethiopia 25 per cent of the budget, leaving a 10 per cent financing gap. Additional funds will be raised to meet the resource gap.

³ Regions are divided into zones, which are sub-divided into *woredas* (districts), which are further divided into *kebeles* (municipalities—the smallest administrative unit).

UPSNP

Until 2014, the government focused on providing social protection to households in rural areas. It then approved the National Social Protection Policy, which aimed to move from a fragmented scheme to a more comprehensive social protection programme and to provide social protection at national level. To achieve the aims of the policy, the Urban Food Security and Job Creation Strategy was approved in 2015. The first policy instrument used to implement the strategy was the UPSNP. The UPSNP aims to support the urban poor to ensure food security and create jobs.

In the long run, the PSNP in urban areas is expected to provide support for more than 4.7 million people living in 972 cities and towns across the country through a gradual roll-out. The first phase of the programme (from 2016 to 2021) focused on cities with more than 100,000 people. Accordingly, 11 cities (one city from each region) were identified and a total of 604,000 beneficiaries (the poorest 12 per cent; that is, about 55 per cent of people living below the poverty line in these 11 cities) were targeted through a gradual roll-out plan.⁴ Given the size of Addis Ababa and its high poverty rate, about 75 per cent of the beneficiaries were from Addis Ababa. In general, this benefit programme has three components: safety net support, livelihood services,⁵ and institutional strengthening and project management.⁶ The safety net support in turn has two sub-segments, namely conditional and unconditional cash transfers.

In the first phase, the project's estimated expenditure for the initial five years of implementation is USD450 million. The International Development Association (IDA) agreed to provide USD300 million, with the Ethiopian government covering the remaining expenditure. The domestic contributions anticipated to gradually increase after 2017/18, with the goal of reaching 78.5 per cent of the total projected cost for 2019–20. (Endale et al. 2019)

The second phase of the project, which covers years 2021–25, is named the Urban Productive Safety Net and Jobs Project (UPSNJP). The programme extends its coverage by incorporating 72 new towns to the programme, expanding the total number of cities under UPSNJP to 83. In each regional state, towns are included in the programme based on indicators such as urban population size, unemployment rate, and poverty level.

Conditional cash transfers target able-bodied members of eligible households and require participation in public work, such as small-scale infrastructure, urban greenery development, environmental and other service provisions. The maximum number of household members that can receive a cash transfer per eligible household is four, and the maximum number of days each member can engage in public work is 60, 40, and 20 days in the first, second, and third year of receiving the benefit, respectively. Individuals are allowed to choose the days on which they will participate in public work to reduce the opportunity cost of participation. The daily conditional wage rate for eligible individual in the first phase of the program is ETB60 (USD2.91). Whereas, individual in an eligible household in the second phase of the program receives a conditional daily benefit ETB90. The wage rates are adjusted annually according to the food price situation in the respective city. The relatively low wage rate is also meant to encourage unskilled workers to find other job opportunities. Conditional cash transfer beneficiaries account for 84 per cent of total UPSNP beneficiaries (MUDC 2016).

⁴ The cities targeted for the first phase of the programme were Adama, Addis Ababa, Assayita, Asosa, Dessie, Dire Dawa, Gambela, Hawassa, Harari, Jijiga, and Mekelle.

⁵ Livelihood service includes counselling and life-skills development, technical skills, entrepreneurship opportunities, and training.

⁶ The last component supports the development of systems for targeting, monitoring, and evaluation of payments and citizens' engagement.

Unconditional cash transfers target those individuals who for various reasons are unable to perform work. This group includes the elderly, disabled, chronically ill, and urban destitute. It is estimated that beneficiaries receiving unconditional cash transfers constitute 16 per cent of the total beneficiaries of safety net support. In first phase, the benefit for unconditional transfer beneficiaries is set at ETB170 (USD8.25) per person per month. It is recognized that these individuals require not only a cash transfer but also housing, healthcare, and psycho-emotional counselling services. A transfer of ETB600 (USD29.12) per person per month for housing is also provided to beneficiaries in this category. A monthly unconditional transfer per eligible individual becomes ETB315 in the second phase.

1.3 Social contributions

According to Proclamation 715/2011, private sector employees are covered by the same contribution and benefit scheme as public sector employees. According to Proclamation 714/2011, a public servant pays 7 per cent of her/his salary as a contribution to the Public Sector Employees' Pension Fund, while the employing public office makes a contribution of 11 per cent towards the same fund. Similarly, a private sector employee and her/his employer contribute 7 and 11 per cent, respectively, of the employee's salary towards the Private Organization Employees' Pension Fund (Proclamation 715/2011). On the other hand, the respective contributions to the Military and Police Service Pension Fund are 25 per cent (employee contribution) and 7 per cent (employer contribution).

1.4 Taxes

As shown in Table 1.1, business profit tax and personal income tax are important direct taxes in Ethiopia, contributing 22.70 and 17.29 per cent, respectively, to the total tax revenue in the 2020/21 fiscal year. A significantly larger share of government tax revenue comes from VAT on domestic and imported goods. The share of indirect tax revenue from domestic and import sources showed a slight reduction from the year 2016/17 to 2020/21.

Table 1.1: Percentage contribution of the different taxes to total tax revenue in fiscal years 2016/17 to 2020/21

	2016/17	2017/18	2018/19	2019/20	2020/21
Direct taxes	38.51	39.27	44.10	42.41	45.37
Business profit tax	20.09	19.80	21.19	21.59	22.70
Personal income tax	13.11	13.57	15.33	15.02	17.29
Withholding income tax on imports	1.46	1.49	1.30	1.47	1.39
Rental income tax	0.89	0.74	0.88	0.87	0.87
Agricultural income tax	0.17	0.18	0.14	0.12	0.13
Other income tax	1.30	1.54	3.38	1.52	1.15
Urban land lease fee	0.86	1.29	1.05	0.86	0.87
Rural land use fee	0.17	0.17	0.14	0.12	0.12
Interest income tax	0.34	0.41	0.57	0.71	0.71
Capital gains tax	0.11	0.09	0.11	0.13	0.15
Domestic indirect taxes	29.65	29.29	29.04	27.36	25.46
VAT, TOT and excise taxes	28.83	28.59	28.13	26.31	24.52
Stamp duties	0.82	0.70	0.91	1.05	0.94
Import duties and taxes	31.84	31.44	26.87	30.23	29.17
VAT and excise taxes	14.79	14.52	12.43	14.26	13.42
Customs duties	10.94	10.90	9.16	10.14	10.01
Surtax on imports	6.12	6.02	5.28	5.83	5.74

Note: VAT = value-added tax; TOT = turnover tax.

Source: Authors' computation based on government revenue and expenditure data from MoF.

Employment income tax: Schedule 'A': Employment income tax is a tax on the earnings of an employee and is one of the major sources of revenue for the government. The tax base in this tax category is any payments or gains in cash or in kind received by an individual from employment, ongoing payments from former employment, and advance payments for prospective employment.

Exempted taxable employment income, as specified by Proclamation 286/2002 (pp. 1873–74), includes income from casual employment and gratuities. Other exemptions specified by Regulation 78/2002 include medical treatment of the employee paid by the employer, travel allowances, reimbursement of travelling expenses, and hardship allowance.

Different rates are applied to different levels of income. Specifically, there are seven tax rate bands. Table 1.2 shows the ranges of income and the tax rates applicable.

Table 1.2: Employment income tax (Schedule 'A'), 2002 onwards

Monthly income (ETB)		Tax rate
Between 2002 and July 2016	Since July 2016	
0–150	0–600	0 (exemption threshold)
151–650	601–1,650	10
651–1,400	1,651–3,200	15
1,401–2,350	3,201–5,250	20
2,351–3,550	5,251–7,800	25
3,551–5,000	7,801–10,900	30
Over 5,000	Over 10,900	35

Source: Income Tax Proclamation 286/2002 (p. 1873), Income Tax Proclamation 979/2016, and Ethiopian Legal Brief (2011–).

Tax on income from rental of buildings: Schedule 'B': As the name suggests, this tax is applied on income generated from the rental of buildings. The base for this tax is the total rental income with the following expenses eligible for deduction: cost of lease for sub-lesers, cost of lease (rent) of land; repairs and maintenance; depreciation of buildings, furniture, and equipment; interest on bank loans; and insurance premiums.

The tax rates applied on rental income are the same as those on personal income, as shown in Table 1.2, except that in this case the tax is levied on annual income as opposed to monthly income.

Business profit tax: Schedule 'C': Schedule 'C' tax refers to income tax on profits of both sole proprietorships and corporations, and the combined revenue from this tax accounted for 22.70 per cent of the total tax revenue for the fiscal year 2020/21 (see Table 1.1). For the current purpose, however, we focus on the business profit tax on sole proprietorships.

According to Proclamation 286/2002, the tax base for Schedule 'C' includes income on commercial, professional, or vocational activity or any other activity recognized as trade by the commercial code of Ethiopia and carried on by any person for profit. The annual business income derived by individual businesses is subject to tax at progressive rates ranging from 10 to 35 per cent⁷ in six bands that are identical to the top six bands for employment income tax shown in Table 1.2. However, an incorporated business is charged 30 per cent of its annual income.

Deductible expenses for business profit tax purposes are expenses incurred by the individual for the purpose of earning, securing, and maintaining a business, subject to proof that these expenses are

⁷ See Proclamation 286/2002 (p. 1876).

related to the specified business. Expenses incurred wholly and exclusively in the production of gross business income may also be deducted from income derived from the same source.

Certain expenses may not be deducted. A list of these can be found in Proclamation 286/2002 (p. 1876).

Presumptive business tax: Presumptive tax is to be paid by small businesses with an annual gross income below EHB500,000 (Category 'C' taxpayers). Tax liability is calculated using the schedule included in Income Tax Regulation 410/2017. The annual taxable income is determined by the maximum annual turnover in the income brackets within which the annual gross income of the taxpayers falls. Since the tax regulation does not oblige category 'C' taxpayers to present a comprehensive accounting record other than gross income, the tax authority uses the presumptive assessment to forecast the annual profit and thereby the amount of tax.

The presumptive tax includes 19 gross income schedules between EHB5,000 and 500,000. This tax applies to 99 business sectors. Income Tax Regulation 410/2017 also presents the presumed amount of profit and tax liability for each business sector across schedules.

Non-business capital gains tax: Schedule 'D': Capital gains tax is payable on gains on the realized transfer (sale or gift) of certain investment properties such as factories and other buildings used for business purposes and on the transfer of shares in companies.

The base used to calculate capital gains tax, as specified in Regulation 78/2002, is the gain over the inflation-adjusted historical cost of the capital asset or the par value of the share.

Exemptions, as specified in Regulation 78/2002, are aggregate annual gains of less than ETB10,000 realized upon the sale of a capital asset. For individuals, gains obtained from the transfer of residential buildings are exempted.

The rates applied for capital gains tax are specified in Proclamation 286/2002 as follows: 15 per cent for buildings used for business purposes and 30 per cent for shares.

Tax on interest income on deposits: Schedule 'D': As specified in Proclamation 286/2002, every person deriving income from interest on deposits is liable for tax at the rate of 5 per cent.

Dividend income tax: Schedule 'D': As specified in Proclamation 286/2002, income derived from dividends from a corporation and withdrawals of profits from a private limited company are subject to tax at the rate of 10 per cent. The withholding agent is required to withhold or collect the tax and account to the tax authority. This tax is a final tax in lieu of income tax.

Tax on income from royalties: Schedule 'D': Proclamation 286/2002 (p. 1880) defines a royalty as follows:

The term 'royalty' means a payment of any kind received as a consideration for the use of, or the right to use, any copyright of literary, artistic or scientific work, including cinematography films, and films or tapes for radio or television broadcasting, any patent, trade work, design or model, plan, secret formula or process, or for the use or for the right to use of any industrial, commercial or scientific equipment, or for information concerning industrial, commercial or scientific experience.

Royalties are taxed at a flat rate of 5 per cent.

Tax on income from games of chance: Schedule 'D': As specified in Proclamation 286/2002, any income derived from winnings on games of chance (e.g. lotteries, tombola) is subject to tax at the rate of 15 per cent, except for winnings of less than ETB100.

Tax on income from rental of property: Schedule 'D': As specified in Proclamation 286/2002, taxable income in this category refers to income derived from the casual rental of property (including any land, building, or moveable asset) not related to a business activity. This type of income is subject to tax at a flat rate of 15 per cent of the annual gross income.

Tax on income from rendering of technical services outside Ethiopia: Schedule 'D': Proclamation 286/2002 stipulates that all payments made in consideration of any kind of technical service rendered outside Ethiopia to resident persons in any form are liable to tax at a flat rate of 10 per cent, which shall be withheld and paid to the tax authority by the payer. According to Proclamation 286/2002 (p. 1880), the term 'technical service' refers to 'any kind of expert advice or technological service rendered'.

Land use and agricultural income tax: As mentioned in Section 2.1, Article 97 of the Ethiopian Constitution stipulates that regions shall levy taxes on the incomes of private farmers and farmers incorporated in co-operative associations. Accordingly, agricultural income tax is administered by and payable to the regional governments. Although the regional governments are in the process of harmonizing the rates for agricultural income tax, the rates currently levied by the regions vary.

Similarly, according to Article 97, regional governments are given the power to determine and collect fees for land usufructuary rights. Accordingly, each region levies the land use tax according to the size of holdings, and some regions also take into account the fertility of landholdings.

Customs duty: As shown in Table 1.1, trade tax, and in particular customs duty, is a major component of tax revenue for the Ethiopian government. For example, in the fiscal year 2020/21, revenue from customs duty accounted for 35.68 per cent of the total revenue from foreign trade taxes. During the same period, the share of customs duty in total tax revenue was 10.01 per cent (see Table 1.1).

The latest applicable proclamation in Ethiopia on customs duties is Proclamation 622/2009, which stipulates as follows:

- (i) **Export tax:** There is no export tax in Ethiopia except on semi-prepared hides and skins of animals, such as wet blue skin of oxen, wet blue hides of sheep and goat, and pickled hides of sheep. The tax is 150 percent of the selling price of the hides and skins to be exported. This tax was introduced on 19 February 2008 by Proclamation No. 567/2008 (see also Law Ethiopia, no date).
- (ii) **Import tax:** The customs tariff applies to all imports, which are grouped into 97 categories based on the Harmonized System of Tariffs Classification Code.

Customs duty for imported goods in Ethiopia is applied on the actual cost of goods up to the first entry point to the customs territory of Ethiopia. In other words, the CIF (cost + insurance + freight) value of the good is the base for import duty (see Customs Proclamation 622/2009: 4624).

Regarding rates, customs duty has six bands (0, 5, 10, 20, 30, and 35 per cent), which are applied to four tariff categories. The first category includes items such as fertilizer, inputs for manufacturing exports (using duty drawback and voucher schemes), and aircraft, which can be imported duty free. The second category includes items, raw materials, and machinery for manufacturing industries, which can be imported at an import duty rate of 5 to 10 per cent. In the third category are items 'used for productive purposes' such as cardboard boxes, envelopes, sacks, and bags, thread, synthetic and artificial filaments, yarn and fibres, which are liable to up to 20 per cent import duty. The fourth

category includes 'non-productive' or 'luxury' items, such as perfumes, soaps, tiles, ornaments, silk, cotton, jewellery, footwear, motor vehicles and parts, textiles, and toys, which fall in the 30–35 per cent bands.

However, as Ethiopia is a member of the Common Market for Eastern and Southern Africa, tariffs applied on imports from other member states of the common market are reduced by 10 percentage points from the normal levels (see ERCA no date). Specific items are also eligible for customs duty waiver and different rules apply to goods temporarily imported or exported. Details can be found in Customs Proclamation 622/2009.

Import surtax: A surtax on imported goods was introduced in Ethiopia in 2007 with the aim of providing subsidies for mitigating the damaging effects of price hikes. In the fiscal year 2020/21, surtax on imported goods accounted for 5.74 per cent of the total tax revenue (see Table 1.1).

Under Regulation 133/2007, a 10 per cent surtax is levied on all goods imported into Ethiopia except those exempted under Article 5 of the regulation. The list of exempted goods includes investment goods, fertilizers, petroleum and lubricants, aircraft, spacecraft and parts thereof, motor vehicles for freight and passengers, special-purpose motor vehicles, and certain medicines and raw materials. The exemption also applies to imports by persons or organizations that are themselves exempt from customs duty.

The basis for the computation of surtax payable under these regulations is the sum of the CIF value, customs duty, excise tax, and VAT payable on the goods.

Value-added tax (VAT): VAT was introduced in Ethiopia in 2002 by Value-Added Tax Proclamation 285/2002 and the regulations partially amended in 2008 by Proclamation 609/2008.⁸

With the aim of reducing the compliance burden, the application of VAT is limited to businesses with an annual volume of trade exceeding ETB500,000. For businesses whose annual volume of trade does not reach this threshold, a turnover tax (TOT) was introduced along with VAT (see below). VAT is imposed on both imports and domestic transactions.

The tax base for VAT is (i) every taxable transaction by a registered person; (ii) every import of goods, other than an exempt import; and (iii) imports of services as provided in Article 23 of Proclamation 285/2002. Both VAT and TOT are indirectly paid by consumers; the seller is responsible for collecting the tax from the buyer on behalf of the tax authority.

To reduce the disincentive to consume goods and services deemed to have important social benefits, the proclamation also introduced zero rating and exemptions. The list of items that are zero-rated and exempt can be found in Proclamation 285/2002 (pp. 1838–41).

Turnover tax (TOT): TOT is charged under Turnover Tax Proclamation 308/2002, introduced on 1 January 2003. VAT and TOT are mutually exclusive, as TOT is imposed on persons not registered for VAT; i.e. it applies to transactions involving businesses with an annual gross income below ETB500,000.

Like VAT, TOT has gone through a minor amendment, by Proclamation 611/2008. As with VAT, the seller is responsible for collecting TOT from the buyer on behalf of the tax authority.

The tax base for TOT is the gross value of goods supplied and services rendered. A 2 per cent rate is applicable on the gross receipts of goods sold locally, while a 10 per cent rate is imposed on all

⁸ The revision encompasses penalties at different levels for violating the VAT regulations, such as the failure to use a sales register machine.

services except those of contractors and grain mills and those rendered using tractors and combine harvesters, which attract a 2 per cent TOT rate.

The proclamation also includes a list of exempt items similar to those for VAT (Proclamation 308/2002: 2026).

Excise tax: Excise tax in Ethiopia is imposed on selected imported as well as domestically produced goods. The latest proclamation applicable concerning excise tax in Ethiopia is Proclamation 1186/2020, which replaced Proclamation 307/2002 of 2002. The new proclamation introduced major increases in excise tax rates for different items, raising them to up to 500 per cent, which was the new rate for used cars. The motive for the stark increase in the excise tax rate for used cars was to discourage their import and thus reduce the number of car accidents involving old cars.

According to the federal government budget report, in the fiscal year 2014/15, an excise tax on imported goods and locally produced goods accounted for 5.4 and 3.7 per cent of the total tax revenue of the central government, respectively.

There is no preferential treatment of goods on the basis of their origin; an equivalent rate is applied to goods produced locally and imported from abroad. Nevertheless, the base for the computation of excise tax differs according to whether the good is locally produced or imported. For locally produced goods, the base of calculation is the ex-factory selling price excluding the trade and transport margin. This method replaced the cost-of-production approach, which prevailed for the previous two decades. For imported goods, the calculation base for excise tax is the sum of the CIF value and customs duty (see ERCA no date).

There are 12 bands of rates for excisable items, apart from motor vehicles, ranging from 5 per cent (on rubber tyres) to 100 per cent (on perfumes and other cosmetics as well as on fireworks). The bands are 5, 8, 10, 20, 25, 30, 35, 40, 50, 60, 80, and 100 per cent. Different rates are applied to motor vehicles according to the model, type of engine, and years of usage (see ERCA no date).

2 Simulation of taxes and benefits in ETMOD

2.1 Scope of simulation

We have not simulated all the taxes and benefits mentioned in the previous section in ETMOD. First, data availability limits our ability to simulate policies. Second, some policies do not pertain to the tax-benefit policies affecting households and are therefore not included. Table 2.1 lists the main benefit categories and indicates their treatment in ETMOD, and Table 2.2 does the same for social insurance contributions and taxes.

Table 2.1: Simulation of benefits in ETMOD

Benefit	Variable name	Treatment in ETMOD						Why not fully simulated?
		'18	'19	'20	'21	'22	'23	
Old-age pension, gratuity, and survivors' pension	<i>Poa</i>	I	I	I	I	I	I	No data on contribution history
Sickness and maternity benefits		E	E	E	E	E	E	No information on sick and maternity leave
Medical and injury leave		E	E	E	E	E	E	No information on medical leave
Rural PSNP: Direct support	<i>bsaur03_s</i>	S	S	S	S	S	S	
Rural PSNP: Public work	<i>bsaur02_s</i>	S	S	S	S	S	S	
Urban PSNP: Direct support	<i>bsaur01_s</i>	S	S	S	S	S	S	
Urban PSNP: Public work	<i>bsaur00_s</i>	S	S	S	S	S	S	
COVID-related: School meals	<i>bed01_s</i>	—	—	—	S	S	S	COVID not applicable before 2020
COVID-related: School uniform	<i>bed02_s</i>	—	—	—	S	S	S	COVID not applicable before 2020

Note: I = variables included in the microdata for which policy is not simulated; E = variables not included in the microdata, for which policy is not simulated; S = variables for which policy is simulated on the basis of relevant assumptions (some minor or very specific rules may not be simulated); — = variables that did not exist in that year.

Source: Authors' compilation.

Table 2.2: Simulation of taxes and social contributions in ETMOD

	Variable name	Treatment in ETMOD						Why not fully simulated?
		'18	'19	'20	'21	'22	'23	
Social contributions								
Employee social contribution	<i>tscee_s</i>	S	S	S	S	S	S	
Employer social contribution	<i>tscer_s</i>	S	S	S	S	S	S	
Taxes								
Employment income tax	<i>tin01_s</i>	S	S	S	S	S	S	
Business profit tax (self-employment)	<i>tin02_s</i>	S	S	S	S	S	S	
Presumptive business tax		E	E	E	E	E	E	The presence of 19 tax brackets hindered the simulation
Capital gains tax	—	E	E	E	E	E	E	Insufficient information provided in the data
Tax on interest income	—	E	E	E	E	E	E	Cannot be simulated as it is aggregated with other investment income
Tax on dividends	—	E	E	E	E	E	E	Dividend income is lumped together with other investment income in the data
Tax on royalties	—	E	E	E	E	E	E	No information on royalty income in the data
Tax on games of chance	—	E	E	E	E	E	E	Income on income from games of chance is lumped together with inheritance income in the data
Tax on income from rental of buildings or property	—	E	E	E	E	E	E	Rental income from buildings lumped together with other rental income but taxed differently
Tax on income from rendering of technical services outside Ethiopia	—	E	E	E	E	E	E	Insufficient information provided in the data
Land use and agricultural income tax	—	E	E	E	E	E	E	Tax rates vary across regions
Export tax	—	E	E	E	E	E	E	Data are not sufficiently disaggregated
Import surtax	—	E	E	E	E	E	E	Data are not sufficiently disaggregated
Excise tax	—	E	E	E	E	E	E	Data are not sufficiently disaggregated
VAT	<i>tva_s</i>	S	S	S	S	S	S	
TOT	—	S	S	S	S	S	S	No clarity from the survey whether the consumer made the transaction with a seller who is registered for VAT or TOT. Therefore, we simulated TOT by switching off VAT

Note: I = variables included in the microdata for which policy is not simulated; E = variables not included in the microdata, for which policy is not simulated; S = variables for which policy is simulated on the basis of strong assumptions (some minor or very specific rules may not be simulated).

Source: Authors' compilation.

The benefits simulated in ETMOD are the PSNP- and COVID-19-related student support programmes. Both urban and rural PSNP comprise direct support and public work components. The former has been active since 2005 but the latter has only been implemented since 2016. Hence, we have simulated direct support and public work components of the RPSNP, respectively abbreviated as RPSNP-DS and RPSNP-PW, starting in 2014, the first year of simulation. The direct support and public work components of the UPSNJP, respectively abbreviated as UPSNJP-DS and UPSNJP-PW, are incorporated into ETMOD starting in 2016. The simulations are based on the strong assumption that all poor households conforming to the eligibility criteria participate in the programme. The COVID-related benefits simulated in the current version of ETMOD include the provision of school meals and school uniforms.

Regarding the taxes simulated in ETMOD, a personal income reform came into effect in July 2016. Although the tax rates remained the same, the tax brackets for employment income and self-employment income changed. This policy change is simulated in ETMOD.

2.2 Order of simulation and interdependencies

Table 2.3 shows the order of policies simulated, also referred to as the spine. The uprating policy comprises multiple price indexes for the purpose of updating the benchmark consumption and income figures. ETMOD v3.1 also includes a facility (a separate policy) to impute shocks on unemployment and incomes resulting from the COVID-19 pandemic (see Section 3.3.2 for details). A definition of negative income is the other policy incorporated in the latest version of ETMOD. This allows flexibility on whether to remove or keep negative employment income, self-employment income, and farmer's income in the dataset used in the model.

Table 2.3: ETMOD spine: order of simulation

Policy	'18	'19	'20	'21	'22	'23	Description of the instrument and main output
<i>uprate_et</i>	On	On	On	On	On	On	Uprating factors
<i>DefConst_et</i>	On	On	On	On	On	On	Constant definitions
<i>lma_et</i>	n/a	n/a	n/a	On	Off	Off	COVID-related shocks on unemployment and incomes
<i>ilsdef_et</i>	On	On	On	On	On	On	Income lists definitions
<i>ildf_stats_et</i>	On	On	On	On	On	On	Income lists definitions for Statistics Presenter
<i>ildf_exp_et</i>	On	On	On	On	On	On	Income lists definitions for expenditure items
<i>tundef_et</i>	On	On	On	On	On	On	Tax unit definitions
<i>neg_et</i>	On	On	On	On	On	On	Recording negative income to zero; output variable— <i>yem</i> , <i>yse</i> , and <i>yfb</i>
<i>spl_et</i>	On	On	On	On	On	On	Poverty lines definition; output variable— <i>spl</i>
<i>ses_et</i>	On	On	On	On	On	On	Equivalence scale definitions; output variable— <i>ses</i>
<i>tscee_et</i>	On	On	On	On	On	On	Employee's social security contributions simulated; output variable— <i>tscee_s</i>
<i>tscer_et</i>	On	On	On	On	On	On	Employer's social security contributions simulated; output variable— <i>tscer_s</i>
<i>tin_et</i>	On	On	On	On	On	On	Income tax simulated; output variables— <i>tin01_s</i> and <i>tin02_s</i>
<i>tva_et</i>	On	On	On	On	On	On	Value added tax simulated; output variable— <i>tva_s</i>
<i>bsaur00_et</i>	On	On	On	On	On	On	Public work UPSNJP simulated; output variable— <i>bsaur00_s</i>
<i>bsaur01_et</i>	On	On	On	On	On	On	Direct support UPSNJP simulated; output variable— <i>bsaur01_s</i>
<i>bsaur02_et</i>	On	On	On	On	On	On	Public work RPSNP simulated; output variable— <i>bsaur02_s</i>
<i>bsaur03_et</i>	On	On	On	On	On	On	Direct support RPSNP simulated; output variable— <i>bsaur03_s</i>
<i>bed01_et</i>	n/a	n/a	n/a	On	On	On	COVID-related school meals benefit; output variable— <i>bed01_s</i>
<i>bed02_et</i>	n/a	n/a	n/a	On	On	On	COVID-related school uniform benefit; output variable— <i>bed02_s</i>
<i>xhhadj_et</i>	On	On	On	On	On	On	Consumption adjusted to new disposable income
<i>output_std_et</i>	On	On	On	On	On	On	Standard EUROMOD output calculated on individual level
<i>output_std_hh_et</i>	Off	Off	Off	Off	Off	Off	Standard EUROMOD output calculated on household level (off in the baseline)

Source: Authors' compilation.

ETMOD also offers flexibility to the user on the types of equivalence scales used in simulations. For transparency, the equivalence scale as defined nationally is modelled directly in ETMOD on the basis of the criteria presented in Table A10 in the appendix. The per-capita and square root equivalence scales are included in the input file and can be selected by the user within the model.

The first tax policy that we simulate is the pension contribution, which includes the employee pension contribution (*tscee_s*) and employer pension contribution (*tscer_s*) for employment in the formal sectors. Then we simulate income tax, which is called *tin_et*. It covers tax on income from formal employment as well as from self-employment.

An informality variable is included in the input micro dataset. A job is considered as formal employment for those working in corporations, state-owned enterprises, political parties, general government, and private enterprises with more than five employees. Considering the large share of informality in the Ethiopian economy, keeping only formal employment is relevant for a realistic reflection of the actual number of taxpayers and income tax revenue as well as social insurance contributions in ETMOD simulations compared with external sources (see also Section 4).

Employment income and business profit income tax are simulated separately, as employment income tax is in most cases withheld by the employer on a monthly basis and not calculated on an annual basis. Income tax from self-employment (business profit tax on sole proprietors) is, however, settled on an annual basis and is therefore treated differently.

The income tax proclamation does not exempt employee pension contributions from income tax but employer pension contributions are exempted. Since employer pension contributions are deductible, we first simulate the pension contribution policy. For self-employment income, the tax base is defined by deducting *tscer_s* from business profit income, while no adjustment is required for employment income.

Following the income tax policy simulations, VAT is then simulated in the policy *tva_et*.

The next set of simulated policies are benefits from social assistance. We first simulate UPSNJP, though the order is not important since UPSNJP does not overlap with RPSNP. We simulate social assistance for poor households that engage in public work in urban areas (*bsaur00_et*). Next, we simulate social assistance for urban households that have no able-bodied members. Specifically, we simulate the UPSNJP-DS component that covers households whose members are chronically ill, disabled, and/or elderly (referred to as *bsaur01_et*). Then we simulate social benefits for rural poor households, RPSNP-PW and RPSNP-DS, in the policy *bsaur02_et* and *bsaur03_et*, respectively. Finally, ETMOD simulates school meals (*bed01_et*) and school uniform (*bed02_et*) benefits, which were launched at full scale in public schools in Addis Ababa following the outbreak of COVID-19. Finally, consumption is adjusted to new disposable income (*xhhadj_et*); see Section 3.5 for details.

2.3 Policy switches

2.3.1 Choosing between VAT and TOT

The underpinning survey data used in ETMOD do not make it possible to distinguish whether a consumer has bought a given commodity from a seller registered for value-added tax (VAT) or turnover tax (TOT). For this reason, ETMOD allows only one of VAT or TOT to be simulated at once, with the selection made using a relevant policy switch.

2.3.2 Full year adjustment of COVID-related policies

The first COVID-19-related benefit package modelled in ETMOD, the delivery of school uniforms, can be simulated without further adjustments since it was delivered to students just once in 2020.

The COVID-related school meals benefit modelled in the 2020 and 2021 policy systems were in turn in place only for a limited period—four months in 2020, from September to December, and ten months in 2021. ETMOD, 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 (8 July 2020) would be considered. This was not the case for the school meals benefit, namely food rations delivered under the programme. In ETMOD v3.1, this is accounted for by applying an extension switch called ‘full year adjustment’ (FYA) to this benefit (see Gasior et al. 2021 for details). When the switch is set to ‘on’ (the default setting in the 2020 and 2021 policy systems), average benefit amounts in the school meals programme are automatically adjusted downwards. When the switch is set to ‘off’, the policy is not modelled, since it was not in place at the cut-off date. This ensures that average benefit amounts are adjusted to reflect the number of months that the programme was in operation during the 2020 and 2021 calendar years.

Note that income shocks from COVID (the *Ima_et* policy described in Section 3.3.2) and the FYA switch for the COVID-related school meals policy 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 mitigating impact of COVID-related policies covering the entire calendar years of 2020 and 2021. When both are ‘off’, the model reflects the standard point-in-time perspective for 2020 and 2021, without the labour market shocks caused by the pandemic or related policy changes. The user is free to apply alternative modelling assumptions.

More details on the modelling of the COVID-related policies are available in the dedicated sub-sections (1.2.2, 2.4.3, and 2.4.4). Section 3.3.2 describes the ‘on-model’ adjustment of incomes during the pandemic.

2.4 Social benefits

2.4.1 UPSNJP

The programme targeted the poorest *woredas* (*kebeles* outside of Addis Ababa) in its first year in 2016. As of 2021, the programme covers all *woredas/kebeles* in 11 cities in Ethiopia, following a gradual roll-out from 2016 onwards. Moreover, the programme has been expanded to 72 additional towns as of 2021.

Although the *woreda/kebele* is the lowest administrative unit with a clear boundary and structure, it is too large for a workable ranking and selection of households. In each *woreda/kebele*, there are community structures called *ketenas*. These are not formal administrative structures but are the basis for ranking and selecting households for the programme. Ketas Targeting Committees (KTCs) rank and select households within the *ketena* boundaries. *Woreda* officers coordinate KTCs, ensuring that there is no overlap.

The KTCs first update the registered households (with names, ages, and genders), recording unregistered households and unregistered members of registered households. They then rank households from poorest to richest and select households for the programme on the basis of the number of beneficiaries assigned for the *woreda*. The number of beneficiaries for the *woreda* is based on the population of each *woreda* at the time of the programme implementation and the 2016 poverty rate. In the first phase of the program, KTCs used a proxy means test (PMT) model to validate the selection process. Households from a list identified by the KTC were randomly selected and requested to fill in a questionnaire designed to obtain data for computing the PMT score. If the PMT score indicates an inclusion error of more than 20 per cent, beneficiaries in the *woreda* will be re-targeted. The PMT procedure becomes a more relevant tool in targeting beneficiaries in the second phase of UPSNJP. Community targeting is combined with PMT to identify beneficiaries. The process requires KTC to propose a pre-selection list, which is roughly twice the quota, based on community targeting

criteria. Then PMT rules are applied to identify potential beneficiaries. However, a final list of clients should be approved by the community.

In our simulation, we considered all targeted towns, apart from Areka, Holeta, Kemise, and Togo Wuchale that are not identified by the underpinning micro data. The simulation covers all sub-cities (*woredas/kebeles*) in the dataset. Eventually, ETMOD allocates the benefit to households that satisfy the eligibility criteria, as discussed above. All relevant cities (and *woredas/kebeles*) are included in the simulation of the programme since there is no information as to which *woredas/kebeles* were covered in 2016–23 and since the sampling design for the survey data is not sufficiently disaggregated to cover all *woredas/kebeles*.

Public work (bsaur00_s)

Definitions

One of the policies that we simulate is the conditional cash transfer under the UPSNJP. UPSNJP is provided in 83 cities in Ethiopia: major urban areas from all regions, including the two city administrations (Addis Ababa and Dire Dawa).

The UPSNJP-PW is for households with able-bodied household members who are either fully unemployed or partially unemployed (under-employed), i.e. those with marginal self-employment and/or low wage employment. Those fully unemployed have no earnings. Households with marginal self-employment are those whose members are involved in self-employment but do not earn enough to fulfil the basic needs of the household. Households with low wage employment are those whose members have wage jobs and are fully employed but do not earn enough to cover the needs of the household.

Eligibility conditions

To identify the poor who could take part in public work, we consider working-age individuals without disabilities within poor households living in eligible urban areas. A household is flagged as poor if its aggregate consumption is below the absolute poverty line. We prefer to use expenditure over income when ranking households for three reasons: (i) many households report zero income for the period under consideration; (ii) consumption can be considered to better reflect what the KTCs observe when making their ranking and selection; and (iii) we consider expenditure as a good proxy for the income of poor households.

Income test

The programme does not involve an income test for targeting beneficiary households. Beneficiary targeting is conducted using a PMT model, although the final list of clients is decided by the community.

Benefit amount

The amount of benefit received is dependent on the number of household members that are enrolled in the programme. If up to four members of the household participate in the UPSNJP-PW, each will receive ETB90 per day for 48 days in a year beginning 2021. The benefit amount is adjusted annually using the appropriate price index. If more than four members of the household participate in the programme, they will share the amount that is calculated on the basis of the participation of four household members.

ETMOD notes

In the simulation, we have aligned the number of beneficiaries generated by the simulation with data from external sources by implementing a downward adjustment technique. This technique limits the set of individuals whose random number is less than the actual ratio of those receiving benefits based

on external data. Due to data limitations, we apply the ratio specific to 2022 for the remaining years. Additionally, we have assumed that all household members who are currently not earning money from either self-employment or wage employment will participate for the maximum number of days. This assumption simplifies the simulation but might deviate from real-world practice. For example, if a person has been employed by the programme for 48 days in the first year and still finds her/himself in a position of qualifying for the benefit, (s)he will only be allowed to work for 24 days in the third year. As a result, after the first year, it is likely that some people work less than the full 48 days. We are, however, unable to simulate these details.

Direct support (bsaur01_s)

Definitions

UPSNJP has a direct support component targeting households whose members are unable to work because they are elderly, chronically ill, disabled, and/or destitute.

Eligibility conditions

Households are selected in the same way as for the UPSNJP-PW component. However, instead of focusing on households with able-bodied household members, we focus here on poor households that do not have able-bodied household members and depend on the support of others for their basic needs.

Income test

As with UPSNJP-PW, there is no income test; rather, the targeting is based on community ranking. However, there is a PMT model that is used for verification which is currently implemented only in Addis Ababa.

Benefit amount

Members who are selected for support receive ETB315 per person per month since 2021. The benefit amount is adjusted annually using the appropriate price index. As the benefit is deemed too low to cover basic needs and recipients are unable to work, additional support for housing, health care, and other services is provided.

ETMOD notes

In the simulation, we've matched the number of beneficiaries produced by the model with external data by employing a downward adjustment approach. This method restricts the selection of individuals to those whose random numbers are below the ratio of those receiving benefits based on external data. Owing to data constraints, we maintain the ratio from 2022 for the subsequent years. Furthermore, the underpinning input data does not report four towns (Areka, Holeta, Kemise, and Togo Wuchale) from the total 83 UPSNJP towns. Therefore, our simulation is limited to 79 urban areas.

2.4.2 RPSNP

The Federal Food Security Coordination Directorate reviews the number of clients for each existing or new *woreda* on the basis of the recurrent emergency caseload. The Woreda Food Security Task Force (WFSTF) decides and approves the maximum number of beneficiaries for each *kebele* under its jurisdiction each year based on available resources. Then the Kebele Food Security Task Force (KFSTF) confirms whether the numbers of beneficiaries approved by WFSTF meet their expectations based on past trends. If the numbers are significantly different from their expectations, the KFSTF asks the WFSTF for a correction or clarification. Once the issue regarding the number of clients is resolved, the KFSTF identifies the recipient candidates using the list of criteria adopted by the WFSTF. These criteria are related to locally relevant indicators of poverty such as livestock holdings, land size, access to irrigation, and holdings of locally predominant assets (fruit trees, timber trees, perennial crops, etc.), as

well as their employment status, receipt of remittances, etc. Finally, the Community Food Security Task Force (CFSTF) in each *kebele* decides which households will be covered by the RPSNP, and by which component, public work or direct support. The PMT model is used to rectify potential inclusion errors. A household that exceeds the PMT threshold will be removed from the programme and replaced by another poor household within the community.

Public work (bsaur02_s)

Definitions

The public work component of the PSNP is a benefits package that offers conditional monetary support for rural poor households with at least one adult engaged in public work. In the households that are eligible for RPSNP-PW, every member is considered as a client of the programme. However, only up to five members are entitled to receive the benefit at a time. A household receives the benefit for six months in a year. For households with five or fewer members, all household members, regardless of their age, will be listed and eligible for a transfer.

Eligibility conditions

A rural poor household with at least one able-bodied member above 16 qualifies for RPSNP-PW, provided that no member of the household is chronically sick or physically or mentally disabled.

Income test

The involvement of a household in PSNP-PW is not determined by an income test; rather, it is decided on the basis of an assessment by the WFSTF of the extent of food poverty and the wealth ranking of the household at community level.

Benefit amount

The benefit amount for UPSNJP is explicitly reported in the project plan manual. This is not the case for RPSNP. Therefore, we impute the monthly benefit amount for the RPSNP by converting the wage defined in kilograms of cereal and pulses into birr values using the retail price of these commodities in the respective area. Since 2021, the benefit amount for a single member of the household is equivalent to 15 kg wheat per month. We simulate the benefit using the average retail price of wheat. In the year 2021, ETB39 was the national average price for 1 kg of wheat. We use the food consumer price index to update the above price for the remaining years. In line with the actual practice of RPSNP, the model restricts beneficiaries to receive transfers for six months each year.

ETMOD notes

In the simulation, we have harmonized the numbers of beneficiaries produced by the model with external data by employing a downward adjustment method. This method constrains the selection of individuals to those whose random numbers fall below the ratio of beneficiaries according to external data. Because of data constraints, we maintain the ratio specific to 2022 for the remaining years. A household exits the programme or graduates from it if it achieves food sufficiency in the absence of external support. The CFSTF uses the Graduation Prediction System (GPS) and wealth ranking to determine the potential graduates. Due to lack of data on graduation history, our simulations assume that everyone satisfying the eligibility conditions receives the benefit.

Direct support (bsaur03_s)

Definitions

RPSNP-DS is an unconditional benefit package targeting poor rural households. A household without any able-bodied member qualifies for RPSNP-DS. As with RPSNP-PW, up to five individuals from a household can claim the unconditional benefit.

Eligibility conditions

A rural poor household without an able-bodied member is entitled to RPSNP-DS. This includes the elderly, disabled, chronically ill, pregnant and lactating women, and children under the age of 16.

Income test

As with RPSNP-PW, eligibility for RPSNP-DS is not determined by an income test, but by an assessment by the WFSTF of the extent of food poverty and the wealth ranking of the household at community level.

Benefit amount

The RPSNP-DS benefit amount is the same as the amount under RPSNP-PW. Therefore, a household admitted for RPSNP-DS receives the same amount of money as another household of the same size enrolled in RPSNP-PW. In accordance with the established practice of RPSNP, the model limits beneficiaries to receiving transfers for 12 months annually.

ETMOD notes

As with RPSNP-PW, due to data restrictions, our simulation does not take into account the graduation mechanism built into the programme. Rather, we assume that all rural poor households without able-bodied adult members take up the unconditional transfer.

2.4.3 COVID-related school meals benefit

During the COVID-19 pandemic, the Addis Ababa city administration allocated ETB20 per day to cover the cost of breakfast and lunch for students enrolled in public schools from kindergarten up to grade 8. The benefit was provided for four months, from 1 September 2020, and modelled by re-scaling benefit amounts for 2020–22 years using FYA (see Section 2.3).

2.4.4 COVID-related school uniform benefit

The Addis Ababa city administration also provided school uniforms to students attending public schools. As shown in Table 2.4, the cost of a uniform per student differs by grade. ETMOD simulates the school uniform benefit considering the ownership of the school, the grade of the student, and the corresponding cost of a uniform per individual student.

Table 2.4: Cost of school uniform per student by grades in ETB

Kindergarten	Grade 1–3	Grade 4–6	Grade 7–8	Grade 9–12
936	1,150	1,490	1,429	1,530

Source: Authors' compilation based on data from Addis Ababa city administration.

2.5 Social contributions

Currently, all people employed by either the government or private organizations are required to make mandatory pension contributions. There is no pension scheme available for self-employed people.

2.5.1 Employee social contributions (tscee_et)

Liability to contributions

As indicated above, employees of both public and private organizations are required to make pension contributions.

Income base used to calculate contributions

Pension contributions for both private and public sector employees are calculated on the basis of their monthly gross salaries.

Contribution rates

A public servant pays 7 per cent of her/his monthly salary as a contribution to the Public Sector Employees' Pension Fund, whereas private sector employees make an equivalent 7 per cent contribution to the Private Sector Employees' Pension Fund.

2.5.2 Employer social contributions (tscer_et)

Liability to contributions

Both private and public sector employers are liable to make pension contributions on behalf of their respective employees.

Income base used to calculate contributions

The pension contribution made by employers is also based on the monthly gross salaries of their employees.

Contribution rates

The employing public office makes a contribution of 11 per cent towards the Public Sector Employees' Pension Fund and private sector employers also make an equivalent 11 per cent contribution to the Fund. In the case of the military and police force, the employing public office makes a 25 per cent contribution to the Military and Police Service Pension Fund.

2.6 Personal income tax

2.6.1 Tax unit

Under the Ethiopian income tax regime, the tax unit for both employment and self-employment income taxes is the individual employee and the self-employed person. In other words, the system does not allow joint filing and does not consider other characteristics of the household.

2.6.2 Exemptions

The following sources of income are exempted from taxation under the personal income tax rules: income from casual employment, pension contribution of the employer, gratitude payments, medical treatment of the employee paid by the employer, travel allowances, reimbursement of travelling expenses, and hardship allowance. Due to data limitation, ETMOD exempts only employer pension contribution from income tax.

2.6.3 Tax allowances

There are no tax allowances in the Ethiopian income tax system.

2.6.4 Tax base

To calculate the tax an employee or self-employed person pays we need to first determine the tax base by subtracting all exemptions and deductions from gross income. In the current case, the tax base for employment income tax is the gross income of the employee. The tax base for self-employment income tax, on the other hand, is calculated as the difference between total turnover and the cost of operation considering the employer pension contribution deduction.

2.6.5 Tax schedule

The tax schedule in operation for both employment and self-employment income during the fiscal years 2002/03 to 2015/2016 is given in the first column of Table 1.2. The tax schedule rule changed in July 2016, and this new tax schedule is given in the second column of Table 1.2.

2.7 Indirect taxes

2.7.1 VAT and TOT

There are two kinds of indirect sales tax in Ethiopia: VAT and TOT. Both taxes are intended as consumption taxes that impose fixed tax rates on the final price of consumption goods. The only difference is that TOT is easier to administer as it requires less complicated book-keeping by the firm. Accordingly, the application of VAT is limited to businesses with an annual volume of trade exceeding ETB500,000. For businesses whose annual volume of trade does not reach this threshold, TOT is applicable. VAT and TOT are imposed on both imports and domestic transactions.

Tax base and tax schedule

The tax base for VAT includes: (i) every taxable transaction by a registered person; (ii) every import of goods, other than an exempt import; and (iii) every import of services unless exempted. Unless a good is zero-rated or exempted, a uniform VAT rate of 15 per cent is applied.

The tax base for TOT is turnover, i.e. the gross value of goods supplied and services rendered. A 2 per cent rate is applicable to the gross receipts of goods sold locally and a 10 per cent rate to all services rendered except those of contractors and grain mills and those rendered using tractors and combine harvesters, which incur a 2 per cent TOT rate.

VAT and TOT exemptions

Both VAT and TOT have the same exhaustive list of exempted goods and services. In general, goods and services that constitute the consumption basket of consumers and are exempted from VAT and TOT. These include rental of houses, financial services, specified prescription drugs, religious services, educational services, books, childcare provided by pre-school institutions, transportation services, electricity, kerosene, water, and the humanitarian aid service.

ETMOD notes

The consumer pays the VAT/TOT depending on the level of the annual gross income of the seller (s)he transacts with, as confirmed by the tax authority. Hence, the buyer pays VAT/TOT only if the seller is registered for VAT/TOT. The data do not, however, allow us to distinguish whether a consumer bought a commodity from a seller registered for VAT or TOT. Hence, we apply the 15 per cent VAT rate on all consumption items that are eligible for VAT and a 2 per cent TOT rate on goods or a 10 per cent TOT rate on services (house rent, restaurants, and transport). As VAT and TOT do not apply simultaneously, they are simulated separately using a switch (see Section 2.3).

3 Data

3.1 General description

The microdata used in ETMOD are taken from the Ethiopian Socioeconomic Survey (ESS). This survey is conducted by the Central Statistical Agency (CSA) of Ethiopia in collaboration with the World Bank's Living Standards Measurement Study team. The first wave of the ESS was conducted in 2011/12. The

second wave was carried out in 2013/14, while the third and fourth rounds of the survey were administered in 2015/16 and 2018/19, respectively. In this section, we present a general description of the survey with more emphasis on the fourth wave, as well as on the 'Basic Information Document' prepared by the CSA and World Bank (see CSA and LSMS-ISA 2012, 2015, and 2017).

The first wave of the ESS covered only rural areas and small towns. The second wave was extended to all urban areas. Since the ESS was planned as a longitudinal data set, the rural and small-town households in the second wave were the same as those in the first wave. The second wave made the ESS representative as a panel at national level, albeit only for households in rural and small-town areas. The second and third waves of the ESS create a panel dataset for urban households. The medium- to long-term goal was to generate a new panel wave every two years by interviewing the same households. In general, the ESS represents a three-period panel structure for households in rural and small towns and a two-period panel data structure for the major urban areas.

The second and third waves of the ESS covered all areas of Ethiopia except three zones of Afar and six zones of Somalia, so the ESS can be considered nationally representative. It has expanded the number of enumeration areas (EAs) from 333 to 433.

As with the first wave, the sub-national representativeness of the survey in the second and third waves depends on the size of the region in question. The difference in representativeness across regions is due to the imposition of a quota. The number of EAs in each region is specified in such a way that it is possible to draw a certain minimum number of households from each EA. Thus, this quota makes it difficult to include a large enough number of EAs from the smaller regions. As a result, the data are regionally representative only for the four most populous regions (Amhara, Oromiya, SNNPR, and Tigray). For the smaller regions, the data are representative only when the regions are combined (as 'other regions').

The 2018/19 ESS (ESS4) is not a follow-up to previous ESS waves. Rather, it is considered as the baseline survey for the future waves. It covers all nine states and two cities, Addis Ababa and Dire Dawa. ESS4 was conducted in 541 EAs, of which 297 are rural and 244 are urban. Unlike previous ESS waves, ESS4 is not only nationally representative but also tailored to be representative for each of Ethiopia's 11 regions and of both rural and urban areas.

Analogous to the previous three rounds, ESS4 applies a two-stage probability sampling strategy to select households within each stratum. In the first stage, for rural areas, EAs were selected using the simple random sampling (SRS) strategy from a list of EAs covered in the 2018 Annual Agricultural Sample Survey. Similarly, EAs for the urban areas were selected directly from the urban EAs within each region using probability proportional to size (PPS).

Table 3.1: ETMOD database description

	Second wave	Third wave	Fourth wave
Years of collection	2013/14	2015/16	2018/19
Period of collection	September 2013–April 2014	September 2015–April 2016	September 2018–August 2019
<i>Number of households</i>			
Rural	3,323	3,272	3,115
Small town	453	427	
Urban	1,486	1,255	3,655
<i>Total</i>	<i>5,262</i>	<i>4,954</i>	<i>6,770</i>
Income reference period	2014	2016	2019
ETMOD input file	ET_2014_a4	ET_2016_a5	ET_2019_a2

Source: Authors' compilation.

In the second stage, systematic random sampling was employed to identify households in each EA. For rural areas, ten agricultural households were selected as a subsample from households covered in the Annual Agricultural Sample Survey and two additional non-agricultural households were interviewed in each EA. For urban areas, 15 households were selected per EA regardless of the households' economic activity. The households were selected using systematic random sampling from the total households listed in that specific EA.

Table 3.1 describes the main features of ESS starting from the second wave. The 2013/14 round interviewed 5,262 households and 23,776 individuals. The third wave covered 4,954 households, with 3,272 from rural areas, 427 from small towns, and 1,255 from major urban areas. The fourth round of ESS is the largest in terms of sample size, with 6,770 households and 28,719 individuals, with 3,115 households from rural and 3,655 households from urban areas.

Concerning the data collection, the fourth-round survey was conducted through three visits. The first visit occurred between September and December 2018. Data on post-planting agriculture and the livestock were gathered between September and October 2018. The crop cut questionnaire was administered from September up to December 2018. The post-harvest-related questionnaire was administered during the second visit, between February and March 2019. Furthermore, data related to the respondents' urban area, household, and community were collected in the third visit, which took place between June and August 2019.

3.2 Sampling weights

The ESS data incorporate sampling weights whereby variables in the dataset can be weighted to generate figures that represent the national-level population of rural, small-town, and urban households. Summing the survey weights at the individual level (90 million) does not amount to the official population in Ethiopia for 2019 (98.7 million). The sum of survey weight for the 2018/19 round is in fact far below that of the third round (96.8 million), implying that the fourth-round survey also underreports weights at the household and individual levels. Hence the survey weights need to be adjusted to maintain consistency with the national population estimates.

The population projection by CSA served as a baseline for reweighting the input micro dataset generated from the 2018/19 round of ESS. We adjust the weight to match official population statistics using the following four steps. We start by organizing the mid-year population projection for 2019 by gender and four-year age intervals. Second, we apply the same procedure to the input file for ETMOD. The next step is reweighting the input dataset using an iterative proportional fitting procedure. Finally, we undertake quality assurance tests on the reweighted input dataset.

Following the adjustment, the sum of weights at the household level for 2019 becomes 22.5 million, while sum of weights at the individual level is consistent with the overall population, 98.7 million.

3.3 Data adjustment

3.3.1 General data adjustment

In the original dataset, some variables required by ETMOD have missing information for some individuals. Whenever possible, we have tried to impute the values for these variables. In some cases, this is achieved using information on other variables in the dataset, or average values conditional on geographical locations and household or individual characteristics. However, as corrections were not feasible in all cases, we dropped a total of 784 observations (individuals) from the original dataset. All individuals dropped from our dataset were household members who had left the respective households, for whom the information required by ETMOD was not available.

We noticed sizable irregularities in employment income. Some of the outliers can be traced back to the hourly and daily wages reported by households, which are in fact likely to refer to daily and monthly earnings, respectively. Such outliers are replaced by 99th percentiles. The adjustment on the survey weight also corrects for out-migrants who have been dropped from the data (784).

3.3.2 Income shocks resulting from the COVID-19 pandemic

Since ETMOD uses ESS survey data from before the pandemic, incomes in the 2020 and 2021 policy systems are not adjusted downwards automatically despite the economic shock resulting from the COVID-19 pandemic.

For the courtesy of the user, ETMOD contains a definitional policy called *lma_et*, which applies relevant shocks to incomes 'on-model' in 2020 and 2021. When the policy is set to '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 on the basis of absolute reductions in disposable income (see Section 3.5).

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_et* policy turned 'on', the user also turns 'on' the FYA switch for the COVID-related policies in the 2020 and 2021 system years, namely school meals (see Section 2.3). In this way, both the shocks and policies will reflect the economic circumstances over the course of the whole year. When both are set to 'off', the model reflects the point-in-time perspective for 2020 and 2021, not accounting for the pandemic or related policy changes. 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 shocks are available in a separate technical note by Lastunen (2022). It is useful to emphasize that this particular method of modelling on-model shocks in ETMOD is based on several assumptions, equivalent in all SOUTHMOD models, that the user is free to amend.⁹

The COVID adjustment policy is switched 'off' in the 2022 and 2023 policy systems. Furthermore, individual-level survey data may become available in the future that can be used to underpin the model, making it possible to account for any future external shocks without separate on-model adjustments.

⁹ Among other assumptions made in the current implementation of on-model shocks, only market income (items that make up the 'earnings' income list) are reduced. Furthermore, farm income 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.

Table 3.2: Transition shares from paid employment to unemployment with no market income, 2020 and 2021

Industry number (lindi01)	Industry	Transition share, 2020	Transition share, 2021
1	Agriculture and fishing	0.0179	0
2	Construction	0.0569	0.0501
3	Education	0.0427	0.0103
4	Financial intermediation	0.0312	0
5	Health and social work	0	0
6	Hotels and restaurants	0.0643	0.0168
7	Mining, manufacturing, and utilities	0.0026	0
8	Public administration and defence	0.0577	0.0254
9	Real estate and business	0.0056	0
10	Transport and communication	0.0800	0.0361
11	Wholesale and retail trade	0.0517	0.0114
12	Other services	0.0552	0

Source: Authors' compilation.

3.4 Updating

As indicated above, we have used data collected in 2013/14, 2015/16, and 2018/19, and simulate policies for 2014–23. However, the simulation results presented in the validation section (Section 4) are entirely based on the data from the fourth wave of the ESS. In order to take into account the time inconsistency between the input data year and policy year, we have updated income and expenditure figures to the simulation years. Consumption levels are also adjusted on the basis of changes in disposable income, as discussed in Section 3.5. While the consumer price index (CPI) is used to update most of the monetary variables in the data, the wage index for civil servants is used to update the wage income earned by public servants. That is, to account for changes in the non-simulated variables that have taken place between the year of the input data and the year of the simulated tax-benefit system, each income and expenditure component in the data is updated using the corresponding CPI as an updating factor (Table 3.3).

Table 3.3: Raw indices for deriving ETMOD updating factors

Updating indexes	Constant name	'18	'19	'20	'21	'22	'23	Source
CPI for food	<i>\$food_cpi</i>	134	165	203	285	375	494	CSA
CPI for hotels and restaurants	<i>\$hotel_cpi</i>	130	153	180	230	325	459	CSA
CPI for alcohol	<i>\$alcohol_cpi</i>	118	140	172	230	307	409	CSA
CPI for cloth	<i>\$cloth_cpi</i>	147	161	183	228	319	445	CSA
CPI for furniture	<i>\$furniture_cpi</i>	140	153	172	247	373	563	CSA
CPI for non-foods	<i>\$none_food_cpi</i>	130	151	176	220	295	394	CSA
CPI for transport	<i>\$transport_cpi</i>	124	154	200	215	278	359	CSA
Miscellaneous CPI	<i>\$miscellaneous_cpi</i>	124	143	168	216	334	515	CSA
Overall CPI	<i>\$f_cpi</i>	132	158	190	255	338	447	CSA
Wage index	<i>\$f_yem01</i>	157	171	205	246	295	354	PDC

Note: Consumer price index (CPI) uses December 2016 as the base period.

Source: Authors' compilation.

3.5 Consumption levels

Consumption levels are based on the original reported consumption levels in the input data (*xhh*). These levels are updated from the base year to the policy year, as discussed above, 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 income led to the same changes in consumption levels. In recognition of the fact that there may be some consumption of self-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).

3.6 Imputation of consumption items

We found very significant differences in poverty rate and VAT between external source data (from MoF) and the ETMOD simulation using an input file entirely compiled using the ESS. These discrepancies were due to major consumption items that were missing from the survey. It is pertinent to recognize that the following nine categories of household expenditure are missing in all waves of the survey: health; repair and maintenance; tap water; domestic workers; vehicles and spare parts; software and communication; recreation; education; and financial services. Therefore, we have attempted to impute the missing items in the most recent dataset.

The Household Consumption Expenditure Survey (HCES) is more thorough than the ESS in terms of coverage of consumption items. The HCES is a primary source for the compilation of official distributional consumption-related indices (Gini coefficient and poverty). In addition, the missing components in the ESS are substantially covered in the HCES. The CSA conducts the HCES once every five years; the last publicly available wave was collected in 2015/16. Therefore, we imputed consumption expenditures missed in the 2015/16 round of the ESS from the 2015/16 HCES, as the reference period of the two surveys was the same.

We applied the following four steps in imputing household consumption expenditure on the missing items in the ESS from the HCES. First, we identified the following exogenous variables for the statistical matching: region, urban/rural, household size, age, gender, employment type, highest school grade completed, and the sum of selected expenditure items in common in the two surveys with a similar pattern (mean of ESS over HCES or the reverse at least equal to 0.7). Second, we matched households in the two databases using a one-to-one propensity score matching procedure. Third, we imputed the missing consumption expenditure in the 2015/16 wave of the ESS from matched corresponding households in the HCES. Finally, we estimated household expenditures on the missing items by computing the ratio of imputed to included commodities by quintiles in 2015/16 and adjusted the consumption expenditures in the 2018/19 round of ESS. The quintiles allow quantifying the distinct consumption patterns for different groups of households.

4 Validation

4.1 Aggregate validation of outputted (simulated) taxes and benefits

This section attempts to validate ETMOD results against external official data. It makes detailed comparisons on employment income tax, individual business profit income tax, VAT, TOT, social security contributions, and numbers of beneficiaries, as well as government expenditure on RPSNP and UPSNJP. In addition, we compare the main distributional indicators from our simulations with data from external sources. Note that there are no external sources for aggregate social security contributions received by the relevant bodies, which makes it impossible to compare simulated social security contributions with official figures based on administrative data. All simulation results presented in the Annex are based on the input microdata compiled using the fourth wave of the ESS.

4.1.1 Employment income tax

Table A1 in the Annex shows the comparison between employment income tax simulated in ETMOD and the total tax amount reported by MoF. We found very noticeable outliers in the employment income figures from survey data (ESS). In the input data we therefore corrected these extreme values by censoring employment incomes at the 99th percentile. As a result, the simulated and actual employment income taxes become satisfactorily close to each other.

4.1.2 Business profit income tax

Table A2 presents business profit tax from ETMOD and MoF. The simulated business profit tax is much lower than the official figure. The 2018/19 wave of ESS underreports revenue generated by non-farming enterprises compared to the previous rounds of the survey.

4.1.3 Simulated VAT/TOT

As a consumption tax, VAT/TOT is normally collected when taxpayers purchase goods and services for final consumption. However, this is not always the case because it is sometimes easier to levy tax on goods at the point of origin. For instance, VAT on imported goods is levied at the border. This may not create a large divergence between the simulated and actual VAT collected if the country's VAT system is such that it is only levied on imported items that are meant for final consumption and/or if the VAT collected on imports is not a large component of overall VAT revenue. In the case of Ethiopia, however, neither condition applies. For instance, VAT is collected at the border on goods that are meant for intermediate input. In addition, the VAT on imported goods constitutes a large share of the overall VAT raised in the country. For these reasons, one would expect the simulated VAT amount to lie between the VAT collected from final consumption on domestic goods and services and the VAT collected on domestic as well as imported goods and services (as reported by external sources).

Table A3 shows VAT revenues estimated by ETMOD simulations and using data from MoF. The simulated VAT for the year 2019 is the closest to the indirect tax collected from goods and services, excluding imported goods as recorded by the external source. The simulated VAT amount for the year 2022 is in turn closest to the indirect tax receipts, including imported goods, reported by the external source.

Ideally, we would like to compare the simulated VAT with the VAT levied on goods and services (domestic and imported) that are consumed in the same fiscal year. As there is no such information in the country, we are not able to do so at the moment.

The imputation procedure discussed in Section 3.6 has significantly reduced the gap between VAT simulated using ETMOD and official sources. In addition, it has enabled the inclusion of some VAT- and TOT-exempt goods and services in the model.

Table A4 compares the simulated TOT from ETMOD with the indirect tax revenue, including a tax on domestic and imported goods and services, from MoF. The ratio of TOT produced by ETMOD to the figure from MoF is very small; 0.28 is the maximum ratio for all years. It implies that the simulation with TOT policy switched on underestimates the indirect tax.

However, the list of items included in the ESS is particularly sparse regarding items subject to excise tax. Therefore, ETMOD currently does not permit simulation of excise tax.

4.1.4 Social insurance contribution (old-age pension)

As discussed in Section 1.2, there are two old-age pension schemes in Ethiopia: the public servants' pension scheme and the private organizations' employees' pension scheme. Table A5 shows the

simulated employees' and employers' pension contributions. Due to lack of data from external sources, we are unable to compare pension revenue and the numbers of contributors generated from ETMOD with official figures.

4.1.5 RPSNP

Table A6 shows government expenditure on the RPSNP and the number of recipients generated from ETMOD simulation and the corresponding figures from the Ministry of Agriculture. Following a downward adjustment, particularly on public work component, the number of beneficiaries produced by the model is aligned with data from the external source.

4.1.6 UPSNJP

Table A7 reports the number of beneficiaries and government expenditure on the UPSNJP as per the ETMOD simulation and external statistics from the Ministry of Urban and Infrastructure (MoUI). The take-up from the simulation is harmonized with figures from the external source after implementing a downward adjustment procedure.

4.2 Income distribution

This section compares inequality and poverty statistics from ETMOD with official figures. It is worth bearing in mind that distributional measures are generally not computed on the basis of income in Ethiopia. Hence, we report only consumption-based GINI coefficient and poverty rate from ETMOD simulation.

4.2.1 Income inequality

As shown in Table A8, the Gini coefficient using the consumption expenditure approach in ETMOD for 2018–27 is 0.37, which is very closer to the official figure (0.33). The consumption-based Gini coefficient is calculated using the same equivalence scale used by the PDC to calculate official indices (a calorie-based equivalence scale, reported in Table A10).

4.2.2 Poverty

The poverty statistics shown in Table A9 are compiled using an absolute poverty line of ETB7,184 (adjusted for inflation between 2016 and 2019). We updated this threshold for the remaining years using the overall CPI. The poverty rate from ETMOD using the consumption expenditure approach for the year 2019 (35.8) is relatively closer to the official figure (23.5).

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Annex: Validation tables

Table A1: ETMOD validation: Employment income tax

Employment income tax	2018	2019	2020	2021	2022	2023
<i>Revenue (Million Birr)</i>						
ETMOD	22,633	27,345	35,180	49,292	68,152	93,138
External (MoF)	41,202	49,870	66,032	82,815	108,810	
Ratio	0.55	0.55	0.53	0.60	0.63	
<i>Number of taxpayers (Million)</i>						
ETMOD	3.19	3.19	3.16	3.26	3.31	3.33

Notes: As no external information regarding the number of taxpayers from employment income is available, the simulation results for all years rely on data from ESS 2018/19.

Source: Authors' compilation and MoF.

Table A2: ETMOD validation: Business profit tax

Business profit tax	2018	2019	2020	2021	2022	2023
<i>Revenue (Million Birr)</i>						
ETMOD	9,664	11,724	10,226	19,340	25,995	34,850
External (MoF)	59,407	64,664	83,905	98,762	116,886	
Ratio	0.16	0.18	0.12	0.20	0.22	
<i>Number of taxpayers (Million)</i>						
ETMOD	0.11	0.13	0.13	0.13	0.14	0.15

Note: As no external information regarding the number of taxpayers from employment income is available, the simulation results for all years rely on data from ESS 2018/19.

Source: Authors' compilation and MoF.

Table A3: ETMOD validation: Value added tax

Value added tax	2018	2019	2020	2021	2022	2023
<i>Revenue (Million Birr)</i>						
ETMOD	68,384	81,740	98,498	131,958	177,237	238,439
External (MoF) (excluding imports)	74,942	75,719	80,273	93,666	114,154	
Ratio	0.91	1.08	1.23	1.41	1.55	
External (MoF) (including imports)	110,487	122,279	129,032	157,496	204,200	
Ratio	0.62	0.67	0.76	0.84	0.87	
<i>Number of taxpayers (Million)</i>						
ETMOD	22.50	22.50	22.50	22.50	22.50	

Notes: The simulation results for all years use the input file from ESS 2018/19.

Source: Authors' compilation and MoF.

Table A4: ETMOD validation: Turnover tax

Turnover tax	2018	2019	2020	2021	2022	2023
<i>Revenue (Million Birr)</i>						
ETMOD	23,253	27,450	32,451	42,055	57,291	78,140
External (MoF) (indirect tax)	110,487	122,279	129,032	157,496	204,200	
Ratio	0.21	0.22	0.25	0.27	0.28	
<i>Number of taxpayers (Million)</i>						
ETMOD	22.50	22.50	22.50	22.50	22.50	

Notes: The simulation results for all years use the input file from ESS 2018/19.

Source: Authors' compilation and MoF.

Table A5: ETMOD validation: Social security contributions

Social security contributions	2018	2019	2020	2021	2022	2023
<i>Revenue (Million Birr), ETMOD</i>						
Employees' pension contribution	10,285	11,662	13,756	17,491	22,168	27,937
Employers' pension contribution	16,648	18,856	22,251	28,249	35,751	45,000

Notes: The simulation results for all years use the input file from ESS 2018/19.

Source: Authors' compilation.

Table A6: ETMOD validation: Rural PSNP

Rural PSNP	2018	2019	2020	2021	2022	2023
<i>Benefit (Million Birr)</i>						
ETMOD	6,220	15,963	18,897	26,069	34,089	38,769
External (Ministry of Agriculture)					20,424	
Ratio					1.67	
<i>Number of beneficiaries (Million)</i>						
ETMOD	6.77	6.77	6.77	6.77	6.77	6.77
External (Ministry of Agriculture)					6.99	
Ratio					0.97	

Notes: The simulation results for all years use the input file from ESS 2018/19. Data from the Ministry of Agriculture is available only for 2022.

Source: Authors' compilation.

Table A7: ETMOD validation: Urban PSNP

Urban PSNP	2018	2019	2020	2021	2022	2023
<i>Benefit (Million Birr)</i>						
ETMOD	2,557	4,192	5,039	4,247	5,615	7,455
External (MoUI)					4,426	
Ratio					1.27	
<i>Number of beneficiaries (Million)</i>						
ETMOD	0.89	0.89	0.89	1.02	1.02	1.02
External (MoUI)					0.99	
Ratio					1.03	

Notes: The simulation results for all years use the input file from ESS 2018/19. Data from MoUI is available only for 2022.

Source: Authors' compilation.

Table A8: ETMOD validation: Income inequality

Gini coefficient	2018	2019	2020	2021	2022	2023
Consumption-based (ETMOD)	0.37	0.37	0.37	0.37	0.37	0.37
External (PDC)	0.33	-	-	-	-	-

Notes: The simulation results for all years use on the input file from ESS 2018/19.

Source: Authors' compilation and PDC (2018)

Table A9: ETMOD validation: Poverty index

Poverty index	2018	2019	2020	2021	2022	2023
Consumption-based (ETMOD)	36.4	35.5	35.9	36.01	36.1	36.5
External (PDC)	23.5	-	-	-	-	-

Note: The simulation results for all years use the input file from ESS 2018/19.

Source: Authors' compilation and PDC (2018).

Table A10: Calorie-based equivalence scale used for distributional analysis

Age group	Male	Female
0-1	0.33	0.33
1-2	0.46	0.46
2-3	0.54	0.54
3-5	0.62	0.62
5-7	0.74	0.70
7-10	0.84	0.72
10-12	0.88	0.78
12-14	0.96	0.84
14-16	1.06	0.86
16-18	1.14	0.86
18-30	1.04	0.80
30-60	1.00	0.82
60+	0.84	0.74

Source: PDC (2018).