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SOUTHMOD – simulating tax and benefit policies for development

Deriving shocks to household consumption expenditures from the associated income shocks resulting from COVID-19

Jesse Lastunen*

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Abstract: This note, which forms part of a series of technical notes that complement Lastunen et al. (2021), reports the approach used to derive shocks to household expenditures from shocks at the individual-level labour incomes. Its structure is composed by six different parts that describe the technique used for the calculations and include the respective mathematical formulas.

Key words: COVID-19, income shocks, expenditure shocks

JEL classification: C80

Related publications:

Lastunen, J. et al. (2021). 'To the Rescue? The Mitigating Role of Tax and Benefit Rescue Packages for Poverty and Inequality in Africa amid the COVID-19 Pandemic'. WIDER Working Paper 2021/148. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/2021/088-7

McLennan, D. (2021). 'Iterative Proportional Fitting for Reweighting Input Data in SOUTHMOD Microsimulation Models'. WIDER Technical Note 2021/17. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/WTN/2021-17

Gasior, K. et al. (2021). 'Full-Year Adjustment for Modelling COVID-19 Policies in SOUTHMOD Tax-Benefit Microsimulation Models'. WIDER Technical Note 2021/18. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/WTN/2021-18

Oliveira, R.C. et al. (2021). 'Imputation Methods for Adjusting SOUTHMOD Input Data to income Losses Due to the COVID-19 Crisis'. WIDER Technical Note 2021/19. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/WTN/2021-19

* UNU-WIDER, Helsinki, Finland; lastunen@wider.unu.edu

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United Nations University World Institute for Development Economics Research

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

The following short note forms part of a series of technical notes that complement Lastunen et al. (2021).

Here we describe the approach to deriving shocks to household expenditures from shocks at the individual-level labour incomes:

1) We first derive the percentage changes in person-level incomes between pre-crisis and crisis periods:

$$income\_shock_i = \frac{labour\_income_{COVID,i} - labour\_income_{preCOVID,i}}{labour\_income_{preCOVID,i}} \leq 0$$

2) Household expenditure in the model ($expenditure_{hh}$ here) is given at the household (hh) level, while income shocks are derived separately for each person (i), similar to all income sources.

   Therefore, in order to translate income shocks into consumption or expenditure shocks, we need to first distribute the expenditures of a given household among people within the same household.

   This is achieved by using pre-crisis within-household shares of original income (while also weighting by the standard person-level survey weight, not shown in the formula):

$$expenditure_{preCOVID,i} = \frac{orig\_inc_{preCOVID,i}}{orig\_income_{preCOVID,hh}} * expenditure_{preCOVID,hh}$$

3) These pre-COVID individual expenditures are then adjusted in proportion to the income shocks.

   However, before applying the shock, we first exclude *all own-account produced foods* that a person consumes from the expenditures that are subject to a shock. As a first approximation, the share of own-account consumption is assumed to be 25 per cent based on Tschirley et al. (2015).[1,2,3] The initial pre-COVID expenditures are therefore multiplied by $(1 - own\_acc\_share) = 0.75 \leq 1$ for all individuals in all countries.

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[1] The household data come from East and Southern African (ESA) countries and are derived from the Living Standards Measurement Study (LSMS) data sets from Ethiopia 2004/05, Uganda 2009/10, Tanzania 2010/11, Mozambique 2008/09, and Malawi 2010/11, as well as from the 2010 Income and Expenditure Survey from South Africa.

[2] The figure is calculated from tables in Tschirley et al. (2015). We first derive the share of annual food expenditure of total annual expenditure for the whole sample (around 54 per cent) by dividing total food expenditure in three mutually exclusive income groups by total expenditure in the same groups (Table 4). We then estimate the average own-production share of the food budget (ca. 47 per cent) by taking the population-weighted average of these shares in five income groups (own-production shares in Table 5, population totals in Table 2). The share of own-account food budget of all expenditure is roughly 54 per cent times 47 per cent, or 25 per cent.

[3] Other papers use the same or similar data and end up with similar estimates (see for instance Magalhaes et al. 2016). The authors estimate that for Malawi, Tanzania, and Uganda 'the value of consumption from own production represents close to 50 percent of the total value of food consumption, and the total value of food consumption is roughly 60 percent of total household expenditures'. This leads to around a roughly 30 per cent own-account food consumption share of all consumption.

4) Furthermore, since labour income[4] (that is shocked) generally only covers a portion of *all* income,[5] we obtain the final expenditure that will be shocked by multiplying the own-account adjusted expenditure by the share of labour income of total original income ($lab\_inc\_share_i$) for each person:

$$lab\_inc\_share_i = \frac{labour\_income_{preCOVID,i}}{orig\_income_{preCOVID,i}} \leq 0$$

5) The shocked, 'crisis' expenditure for person i is then:

$$expenditure_{COVID,i} = expenditure_{preCOVID,i} + income\_shock_i * expenditure_{preCOVID,i} * (1 - own\_acc\_share) * lab\_inc\_share_i \quad \text{where} \quad expenditure_{COVID,i} \leq expenditure_{preCOVID,i}$$

6) Finally, we sum up shocked individual expenditures within each household to derive shocked expenditures at the household level:

$$expenditure_{COVID,hh} = \sum_{i \in hh} expenditure_{COVID,i}$$

Through this sequence of formulas, we manage to calculate household expenditures from shocks at the individual-level labour incomes by firstly distributing the expenditures of a given household among people within the same household. We then calculate the own-account adjusted expenditure based on Tschirley et al. (2015). Subsequently, we obtain the final expenditure by deriving the share of labour income vis-a-vis the total original income for each person and multiplying it by the own-account adjusted expenditure. Lastly, we sum up shocked individual expenditures within each household to derive shocked expenditures at the household level.

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[4] Labour income includes general employment income and self-employment income, as well as agricultural income for those in the agricultural industry.

[5] In addition to labour income, full original income includes for instance monthly income from rent, private pension, interest on dividends and savings, other private transfers, and other sources.