SOUTHMOD – simulating tax and benefit policies for development

On-model adjustment of incomes during COVID-19 in SOUTHMOD tax-benefit microsimulation models

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Abstract: This note describes methods to derive employment-to-unemployment transition shares across industries during the COVID-19 pandemic and to use these shares in SOUTHMOD tax-benefit microsimulation models to adjust relevant labour market variables. The first method entails the derivation of industry-specific output shocks from sectoral GDP data, which are used as a proxy for the sectoral shares of workers who transition to unemployment with zero earnings. The second method involves creating a new policy (lma_cc) in a given country model. In this policy, the transition shares are used to allocate randomly selected workers within industries into unemployment and to adjust their incomes to account for the crisis. By presenting an approach to adjust labour market variables inside the EUROMOD software, this note offers an alternative to previous research relying on SOUTHMOD models where such adjustments are applied to model input data.

Key words: COVID-19, economic shocks, unemployment, income, expenditure, EUROMOD

JEL classification: C80

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1   Introduction

One major challenge for evaluating the distributional impact of the COVID-19 pandemic in developing countries is the lack of up-to-date microdata. Such data, including detailed information on household characteristics and income, usually become available with a considerable time lag, often up to 2–4 years. Simulating changes in disposable incomes resulting from such a crisis is still possible using microsimulation techniques as long as suitable microdata can be generated or adjusted appropriately inside the microsimulation models.

This technical note focuses on the latter and illustrates a method to adjust relevant labour market variables 'on-model' in SOUTHMOD tax-benefit microsimulation models. Namely, the document provides instructions for modelling a policy called 'lma_cc',[1] which allocates selected workers in the input data to unemployment and then adjusts their earnings[2] accordingly, thus accounting for the economic crisis in 2020. The main features of the 'lma_cc' policy are based on the 'Labour Market Adjustment (LMA)' add-on available for EUROMOD country models (Christl et al. 2022).

The on-model data adjustment using the 'lma_cc' policy requires knowledge of employment-to-unemployment 'transition shares' in different industries in each country. In the application presented here, the transition shares are derived based on industry-level gross domestic product (GDP) shocks. A GDP shock is defined as the deviation of 2020 GDP in each industry from its counterfactual value for 2020, computed based on the pre-COVID-19 linear trend. The GDP shocks serve as proxies for average sectoral earnings reductions, or alternatively the shares of workers in each industry who transition to unemployment with zero earnings (the adjustment occurs at the extensive margin).

It is worth emphasizing that this note offers just one simple approach for deriving the transition shares and implementing the related adjustments in a given country model. In particular, several assumptions are made based on related work by Lastunen et al. (2021).[3] The user is always free to use other methods both to estimate the transition shares and to implement related on-model adjustments. In the simplest case, this is a matter of changing the default parameter values or switching particular functions 'on' or 'off'. Another caveat is that survey data will eventually become available in related countries that will render the methods described here redundant. Nevertheless, the techniques presented may be relevant in other contexts, such as other major economic crises, where outdated survey data is alone insufficient for simulating the resulting changes in income, consumption, and distributional outcomes.

The rest of the technical note is structured as follows. Section 2 describes the derivation of sectoral GDP shocks, or transition shares. Section 3 uses VNMOD, the microsimulation model for Viet Nam, to illustrate the resulting on-model adjustment. Specifically, it shows screenshots and related

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[1] 'cc' refers to a given country abbreviation.

[2] Earnings in this technical note refer to employment income (yem), self-employment income (yse), and farm income (yag), which make up the earnings income list (ils_earns) in SOUTHMOD microsimulation models.

[3] Lastunen et al. (2021) analyse the distributional effects of the COVID-19 pandemic and related tax-benefit measures in 2020 for five countries in sub-Saharan Africa. The authors apply GDP shocks and associated labour market transitions directly to model input data. For the courtesy of general users of EUROMOD software and SOUTHMOD models, this note is intended as a guide to implement the corresponding analysis 'on-model'.

descriptions of functions in the 'lma_cc' policy, where the transition shares are used to adjust relevant labour market variables—e.g., namely, labour income—to reflect the economic shock.

2 Derivation of employment-to-unemployment transition shares during the COVID-19 pandemic

This section describes how sectoral employment-to-unemployment transition shares are derived based on industry-level GDP shocks in the 2020 calendar year.[4] In Section 3, these shares are used 'on-model' to adjust labour market variables as a result of the COVID-19 pandemic. The adjustment is modelled using a definitional policy called 'lma_cc', available in all SOUTHMOD microsimulation models released by UNU-WIDER in early 2022. Note that general users of SOUTHMOD models do not need to implement the analysis described in this section; the resulting transition shares and the 'lma' policy are incorporated directly into the models.

2.1 Background

Due to lack of timely microdata, sectoral GDP data is used to approximate the size of the COVID-19 shock on the labour force in each sector of the economy. Specifically, the estimated sectoral GDP shocks are used as a proxy for the relative earnings loss of workers across different industries.

Earnings in this technical note refer to employment income (yem), self-employment income (yse), and farm income (yag). These income sources make up the 'earnings' income list (ils_earns) in SOUTHMOD models and are distinct for other income sources, including private transfers, royalties, rent, and interest.

2.2 Estimation of GDP shocks

The GDP shock estimation entails three steps. First, annual or quarterly industry-level GDP data is gathered from each country for years 2017 to 2020.[5] Quarterly GDP estimates are annualized by simple summation across each calendar year. Second, the industry categories for which GDP data is available are matched with the industry categories available in the survey data that underpin each SOUTHMOD model. Finally, the economic shock in 2020 is derived as the deviation of inflation-adjusted 2020 GDP in each industry from its counterfactual 2020 value, predicted based on the pre-COVID, 2017–19 linear trend.[6] Note that the estimated shocks apply to the entire calendar year of 2020, thus including also the first quarter of 2020 when the pandemic had not yet affected the countries under consideration.

As an illustration, Figure 1 shows the calculation of this shock for the accommodation and catering services sector in Viet Nam (-19.6 percent). The associated shocks, calculated for each industry in

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[4] Subject to data availability, the same exact approach can be implemented for shock estimation and 'on-model' data adjustment in 2021 as well. Alternative approaches to survey data adjustment are discussed in Oliveira et al. (2021).

[5] See Table 1 in Lastunen et al. (2021) for data sources used for different SOUTHMOD countries.

[6] Specifically, the counterfactual estimate for 2020 (such as 148,699 billion Vietnamese dongs in Figure 1) is calculated by estimating a linear regression using the 2017–19 values (pre-COVID data) and extrapolating this line to 2020. In Microsoft Excel, this can be achieved using function 'LINEAR.FORECAST(x, known_ys, known_xs)' where known x's are years 2017, 2018 and 2019; known y's are the associated annual GDP values for these years; and 'x' for which the counterfactual value is computed is 2020 (or 2021).

the country, are shown in Figure 2. Corresponding shock estimates are available for all SOUTHMOD countries.

Figure 1: Example of the computation of the GDP shock in accommodation and food services in Viet Nam
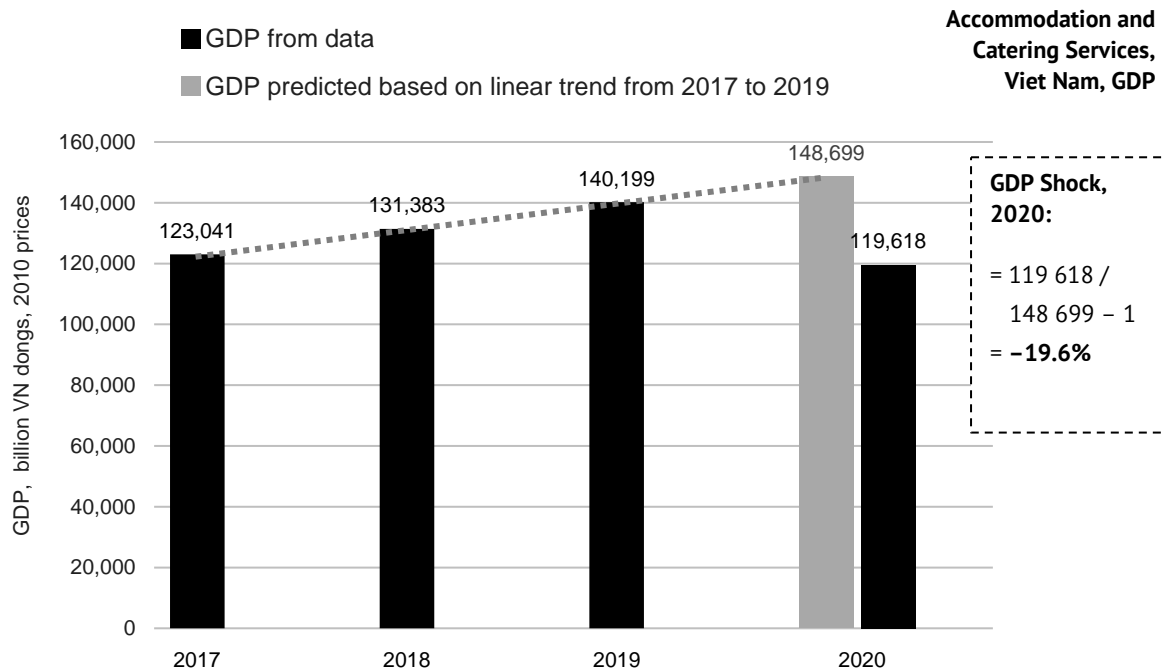
Source: author's elaboration based on national GDP data (quarterly GDP at constant 2010 prices up to Q4/2020, General Statistics Office of Viet Nam).

Figure 2: Industry-level GDP shocks in 2020, Viet Nam
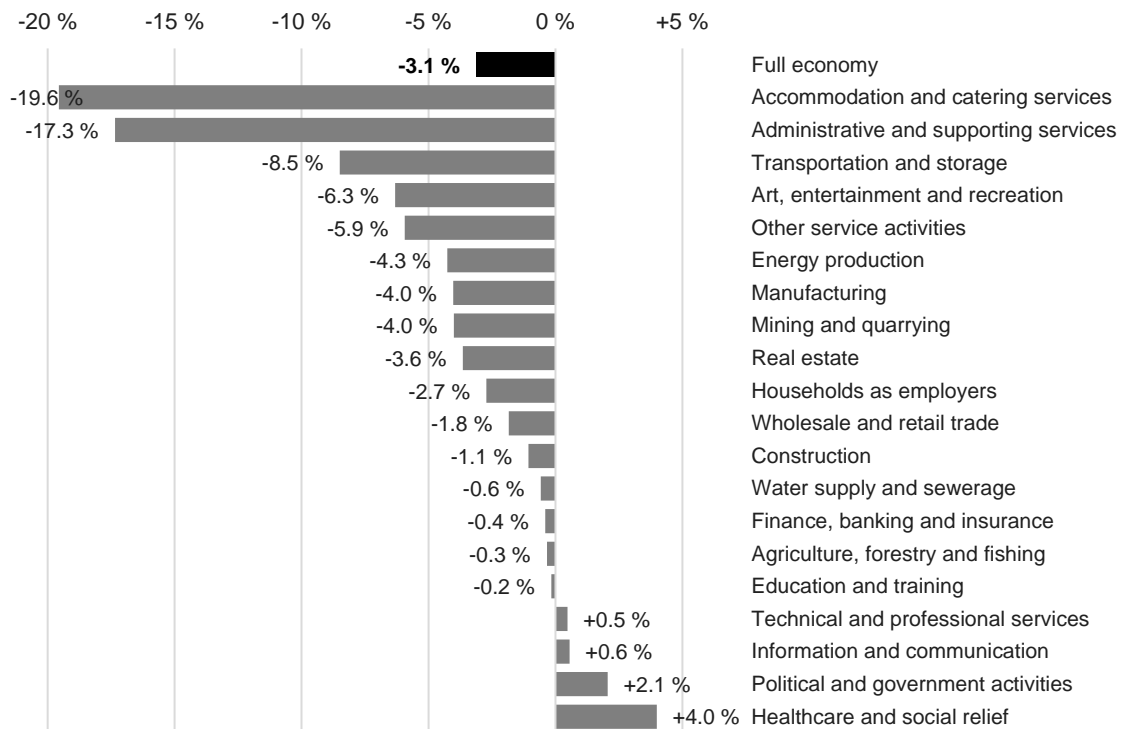
Source: author's elaboration based on national GDP data (quarterly GDP at constant 2010 prices up to Q4/2020, General Statistics Office of Viet Nam).

2.3 Using GDP shocks to approximate earnings losses

As discussed, sectoral GDP shocks are used as a proxy for average earnings losses in each industry. Specifically, it is assumed that the negation of the proportional GDP shock in a given sector is equivalent to the share of workers who transition to unemployment with zero earnings.

As an example, if GDP in a given industry was 20 per cent lower in 2020 than predicted based on pre-pandemic trends (a shock of -20 per cent), 20 per cent of randomly selected workers in that sector would be assumed to lose their jobs and earnings. As a result, overall earnings in the sector would be reduced by approximately 20 per cent, contingent upon the exact outcome of the randomization process. Note that, for simplicity, only negative GDP shocks are considered; industries for which positive output shocks are estimated are assumed to be unaffected by COVID-19.

The implementation of the resulting individual-level labour market transitions is described in Section 3 below. It is worth noting here, however, that the adjustment of monetary variables depends on the worker's industry assignment. In each sector apart from agriculture, only non-agricultural earnings (employment and self-employment income) are reduced for those who transition to unemployment. The rationale is that shocks from COVID-19 to, say, the financial sector, do not influence farm incomes earned by those who work primarily in finance. In agriculture, non-farm earnings are also shocked for those who transition, while farm earnings (available at the household level) are only reduced if the household head is classified as a formal worker and has other earnings sources. The rationale here is that informal farmers with no other sources of market income are often subsistence farmers, not significantly affected by the economic shock to the formal agricultural sector.[7] Alternative modelling choices are possible.

It is also useful to point out the main assumptions underlying the adjustment approach presented. First, factor shares (shares of production given to the factors of production, e.g., capital and labour) remain constant. Second, all adjustment occurs at the extensive margin (i.e., complete employment and earnings loss for selected workers instead of partial income loss for a larger number of workers).[8] Third, the random allocation applied means that, in a given industry, each worker has an equal chance of transitioning to unemployment regardless of individual-level characteristics. With more detailed microdata, many of these assumptions can be relaxed in future model versions.

The resulting labour market transitions and shocks are implemented using the 'lma_cc' policy in each SOUTHMOD model, as illustrated in the next section.

3 EUROMOD implementation of 'on-model' shocks to incomes and expenditures

This section describes the steps required to incorporate income shocks into the standard SOUTHMOD tax-benefit microsimulation models, using VNMOD v2.3 in Viet Nam as an illustrative example.

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[7] In practice, GDP shocks in the agricultural sector were small in most SOUTHMOD countries in 2020.

[8] The choice to adjust earnings at the extensive margin is made here due to its simplicity. An alternative would be to adjust earnings at the intensive margin, for instance by reducing earnings proportionally for all workers across sectors based on the estimated GDP shocks. Notably, economy-wide outcomes (e.g., changes in the poverty rate due to the COVID-19 crisis) are generally very similar between the two methods.

First note the following prerequisites for the modelling of these shocks, which are readily implemented in SOUTHMOD models and related input datasets released in early 2022:

- **The newest input dataset in each model includes variable 'lindi00', which denotes the industry assignment of employed workers.** The relevant industry categorizations come from Lastunen et al. (2021) and include sectors for which GDP data is available for 2020 (and generally also for 2021).

- **Each model also includes a definitional 'lma_cc' policy.** This policy contains several functions, described below, that enable shocking incomes to reflect the economic shock from COVID-19. The main variable defined under the policy is 'i_lma', which is initialized at '0' for all individuals in the input data, but set to '1' inside the policy for workers who transition to unemployment. Related income shocks are then applied to these workers. In the spine, the 'lma_cc' policy is positioned among other definitional policies, but after any standard variable calculations such as setting negative incomes to zero. 'cc' refers to the relevant country abbreviation.

- **The 'lma_cc' policy uses the shares of workers across industries who transition from employment to unemployment with zero income.** These 'transition shares' (which are different for 2020 and later years) are derived based on the analysis described in Section 2 and available in the released models.

The rest of the note explains the implementation of the 'lma_cc' policy. The process applies to each SOUTHMOD country model released in early 2022. The following five steps are required:

1. **Defining the sectoral transition shares as constants.**
2. **Generating a random number for each individual in the input data.**
3. **Assigning selected workers to unemployment.** Namely, this transition (switching 'i_lma' from '0' to '1') is applied to eligible workers whose random number is below their industry's transition share in the relevant system year (here, 2020).
4. **Modifying labour market variables for workers transitioning to unemployment.** Specifically, for individuals with 'i_lma=1' after the adjustment, labour market status (les), occupation (loc), employment formality status (lfo), and civil servant status (lcs) are edited to denote unemployment and lack of occupational, formality and civil servant status. Some SOUTHMOD models have additional labour market variables that are edited accordingly.
5. **Modifying earnings for workers transitioning to unemployment.** For individuals with 'i_lma=1', income from relevant employment sources (i.e., earnings) is set to '0'. These sources include employment income (yem), self-employment income (yse), and farm income (yag). In the application presented in this technical note, farm income may only be set to zero for formal workers (lfo=1) who work primarily in the agricultural sector and have positive non-farm earnings.

These steps are covered in greater detail below with examples from VNMOD, the tax-benefit microsimulation model for Viet Nam. Note that, for each policy year, consumption is adjusted in a separate 'xhhadj_cc' policy based on changes in disposable income between current year and survey base year. This step, readily implemented in all models, is also discussed below.

Figure 3 shows the 'lma_vn' policy in VNMOD for the 2020 system year, including relevant functions and comments with short descriptions.

Figure 3: Labour market transition policy ('lma_vn'), 2020, Viet Nam, VNMOD v2.3

	Policy		Grp/No	VN_2020	Comment
3	▾ 🔵	**lma_vn**		on	**DEF: Select individuals that transition to unemployment and amend incomes and consumption expenditures accordingly**
3.1	▸ *fx*	DefConst		on	Specify 'transition shares' (shares of employed workers transitioning to unemployment across sectors) and a constant for the share of own-account production consumed that is protected from the shock
3.2	▸ *fx*	DefVar		on	Define temporary variables
3.3	▸ *fx*	RandSeed		on	Define random seed
3.4	▸ *fx*	ArithOp		on	Generate random numbers
3.5	▸ *fx*	Elig		on	Set eligibility criteria for labour market transitions
3.6	▸ *fx*	BenCalc		on	Remove the industry value if the above criteria are not met
3.7	▸ *fx*	BenCalc		on	Random allocation of workers into unemployment (requires that random number < transition share for the relevant sector)
3.8	▸ *fx*	BenCalc		on	Adjust les
3.9	▸ *fx*	BenCalc		on	Adjust loc
3.10	▸ *fx*	BenCalc		on	Adjust lfo
3.11	▸ *fx*	BenCalc		on	Adjust lcs
3.12	▸ *fx*	BenCalc		on	Adjust yem
3.13	▸ *fx*	BenCalc		on	Adjust yse
3.14	▸ *fx*	BenCalc		on	Adjust yag

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

Additional screenshots and related instructions here cover the five steps from the above list, assuming that the definitional 'lma_cc' policy has been added to the spine and set 'on' for 2020. It is recommended that the policy is set to 'n/a' (instead of 'off') for the years when it is not available (which is the default setting for years other than 2020). This makes it possible to observe at one glance whether the policy is available in a policy year or not.

3.1   Step 1: defining the sectoral transition shares as constants

Figure 4 shows how the employment-to-unemployment transition shares ($eu_lindi#), derived in Section 2, are specified using the 'DefConst' function.

Note that Viet Nam has 20 industries with relevant sectoral GDP data, used to derive the GDP shocks and resulting transition shares. Out of the 20 industries, 16 are estimated to have employees who transition to unemployment in 2020. For instance, in manufacturing (industry 3), the transition will be applied to approximately four per cent of eligible workers.

Figure 4: DefConst function to specify the sectoral shares of eligible workers who transition to unemployment

	Policy		Grp/No	VN_2020	Comment
3.1	▾ _fx_ DefConst			on	Specify 'transition shares' (shares of employed workers transitioning to unemployment across sectors) and a constant for the share of own-account production consumed that is protected from the shock
3.1.1		$eu_lindi1	1	0.00335	Agriculture, forestry and fishing
3.1.2		$eu_lindi2	2	0.03999	Mining and quarrying
3.1.3		$eu_lindi3	3	0.04028	Manufacturing
3.1.4		$eu_lindi4	4	0.04261	Energy production
3.1.5		$eu_lindi5	5	0.00580	Water supply and sewerage
3.1.6		$eu_lindi6	6	0.01064	Construction
3.1.7		$eu_lindi7	7	0.01838	Wholesale and retail trade
3.1.8		$eu_lindi8	8	0.08498	Transportation and storage
3.1.9		$eu_lindi9	9	0.19557	Accommodation and catering services
3.1.10		$eu_lindi10	10	0	Information and communication
3.1.11		$eu_lindi11	11	0.00403	Finance, banking and insurance
3.1.12		$eu_lindi12	12	0.03648	Real estate
3.1.13		$eu_lindi13	13	0	Technical and professional services
3.1.14		$eu_lindi14	14	0.17348	Administrative and supporting services
3.1.15		$eu_lindi15	15	0	Political and government activities
3.1.16		$eu_lindi16	16	0.00165	Education and training
3.1.17		$eu_lindi17	17	0	Healthcare and social relief
3.1.18		$eu_lindi18	18	0.06315	Art, entertainment and recreation
3.1.19		$eu_lindi19	19	0.05935	Other service activities
3.1.20		$eu_lindi20	20	0.02721	Households as employers

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

The employment-to-unemployment transitions and resulting labour market adjustments are modelled using variables 'i_lma' (labour market transition), 'i_lma_elig' (eligibility for transition), and 'i_mc_rand' (random number for each individual). These variables are defined in a 'DefVar' function, as shown in Figure 5, and edited later in other functions in the policy.

Figure 5: DefVar function to define temporary variables

3.2	▾ _fx_ DefVar		on	Define temporary variables
3.2.1	i_mc_rand	1	0	Random number
3.2.2	i_lma_elig	2	0	Variable denoting eligibility for labour market transitions
3.2.3	i_lma	3	0	Variable denoting labour market transitions

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

3.2   Step 2: generating a random number for each individual in the input data

Generating a random number requires defining a random seed (any non-negative number) in a 'RandSeed' function. This ensures that the generated numbers are the same between different model runs. Random numbers (i_mc_rand) are then generated using an 'ArithOp' function. Figure 6 demonstrates the modelling of both functions.

Figure 6: RandSeed and ArithOp functions to define a random seed and generate random numbers

3.3	▼ *fx* RandSeed		on	Define random seed
3.3.1	Seed		15	
3.4	▼ *fx* ArithOp		on	Generate random numbers
3.4.1	Formula		rand	
3.4.2	Output_Var		i_mc_rand	
3.4.3	TAX_UNIT		tu_individual_vn	

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

3.3   Step 3: assigning selected workers to unemployment

Workers are assigned to unemployment using their industry values ('lindi00'). Before the assignment, however, the pool of workers eligible for a transition is selected by applying specific eligibility criteria to individuals in the input data. This is achieved using 'Elig' and 'BenCalc' functions, which remove the industry value from individuals who are not eligible for a transition. The eligibility conditions are listed below, with model implementation depicted in Figure 7:

- The individual needs to be in the labour market ('les', when available, must be equal to 1, 2 or 3).

- For workers in sectors other than agriculture (lindi00≠1), non-farm earnings ('yem' and/or 'yse') must be positive. Farm income is not considered here because, as shown later, it will only be reduced for selected workers in the agricultural sector. The rationale is that shocks from COVID-19 to, say, the financial sector, do not influence farm incomes earned by those who work primarily in finance.

- For workers in agriculture (lindi00=1), non-farm earnings must also be positive, and farm income (yag) either zero, or positive provided that the worker is a formal sector employee (lfo=1). In other words, workers with farm income do not transition to unemployment if they are informal farmers with no other sources of earnings. The rationale is that these individuals are often subsistence farmers who are not substantially affected by the estimated economic shock to the (formal) agricultural sector.

The user is free to apply alternative assumptions.

Figure 7: Elig function to set eligibility criteria for labour market transitions, and BenCalc function to apply the restrictions

3.5	▾ ƒx Elig			on	Set eligibility criteria for labour market transitions
3.5.1		Elig_Cond		(les=1 | les=2 | les=3) & ((lindi00!=1 & (yem>0 | yse>0)) | (lindi00=1 & (yem>0 | yse>0) & (yag=0 | (yag>0 & lfo=1)))))	To have an industry value and to be eligible for a transition, les (labour market status) has to be equal to 1, 2 or 3 (employee or farmer) and non-farm earnings must be positive in sectors other than agriculture. In agriculture, those (household heads) with positive farm income may only transition if they have other sources of earnings and are in the formal sector.
3.5.2		Output_Var		i_lma_elig	
3.5.3		TAX_UNIT		tu_individual_vn	

3.6	▾ ƒx BenCalc			on	Remove the industry value if the above criteria are not met
3.6.1		Comp_Cond	1	i_lma_elig=1	If the individual meets these conditions...
3.6.2		Comp_perTU	1	lindi00	...industry value is retained (the individual is eligible for transition)
3.6.3		Comp_Cond	2	i_lma_elig=0	If the individual does not meet these
3.6.4		Comp_perTU	2	-1	...industry value is set to -1 (unknown; the individual is not eligible for transition)
3.6.5		Output_Var		lindi00	
3.6.6		TAX_UNIT		tu_individual_vn	

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

Selected workers can now be assigned to unemployment. This requires comparing random numbers (i_mc_rand) to industry-specific transition shares ($eu_lindi#) for relevant workers in different industries (lindi00). This transition (where 'i_lma' is set to '1') is applied to workers whose random number is below their industry's transition share in the relevant system year (here, 2020).

The transitions are implemented using a 'BenCalc' function, as shown in Figure 8.[9]

Figure 8: BenCalc function to allocate workers into unemployment across sectors (first and last parameters)

3.7	▾ ƒx BenCalc			on	Random allocation of workers into unemployment (requires that random number < transition share for the relevant
3.7.1		Comp_Cond	1	lindi00=1 & (i_mc_rand<$eu_lindi1)	
3.7.2		Comp_perTU	1	1	
3.7.3		Comp_Cond	2	lindi00=2 & (i_mc_rand<$eu_lindi2)	
3.7.4		Comp_perTU	2	1	
3.7.37		Comp_Cond	19	lindi00=19 & (i_mc_rand<$eu_lindi19)	
3.7.38		Comp_perTU	19	1	
3.7.39		Comp_Cond	20	lindi00=20 & (i_mc_rand<$eu_lindi20)	
3.7.40		Comp_perTU	20	1	
3.7.41		Output_Var		i_lma	
3.7.42		TAX_UNIT		tu_individual_vn	

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

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[9] Note that transitions from unemployment to employment are not currently modelled (as opposed to the LMA model add-on that is used across EUROMOD models for European countries).

3.4 Step 4: modifying labour market variables for workers transitioning to unemployment

For individuals with 'i_lma=1' after the transitions, labour market status (les) is set to '5' (unemployed); occupation (loc) to '-1' (no occupation); employment formality status (lfo) to '-1' (no formality status); and civil servant status (lcs) to '-1' (no civil servant status). These changes are made using 'BenCalc' functions, as illustrated in Figure 9 for variable 'les'. The process is equivalent for variables 'loc', 'lfo' and 'lcs'. Note that, in selected SOUTHMOD country models, additional labour market variables are edited accordingly.[10]

Figure 9: BenCalc function to adjust *les* (labour market status)

3.8	▾ *fx* BenCalc		**on**	Adjust les
3.8.1	Comp_Cond	1	i_lma=0	No change in labour market status...
3.8.2	Comp_perTU	1	les	...No change in labour market status
3.8.3	Comp_Cond	2	i_lma=1	Transition to unemployment...
3.8.4	Comp_perTU	2	5	...Become unemployed
3.8.5	Output_Var		les	
3.8.6	TAX_UNIT		tu_individual_vn	

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

3.5 Step 5: modifying earnings for workers transitioning to unemployment

For individuals with 'i_lma=1' after the transitions, income from relevant employment sources is set to '0' (no income). Figure 10 illustrates the adjustment of 'yem' (employment income) using a 'BenCalc' function. The implementation is equivalent for 'yse' (self-employment income).

Figure 10: BenCalc function to adjust *yem* (employment income)

3.12	▾ *fx* BenCalc		**on**	Adjust yem
3.12.1	Comp_Cond	1	i_lma=0	No change in labour market status...
3.12.2	Comp_perTU	1	yem	...No change in employment income
3.12.3	Comp_Cond	2	i_lma=1	Transition to unemployment...
3.12.4	Comp_perTU	2	0	...Lose employment income
3.12.5	Output_Var		yem	
3.12.6	TAX_UNIT		tu_individual_vn	

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

As discussed earlier and illustrated in Figure 7, agricultural workers with positive farm income may only transition to unemployment if they are formal workers with positive non-farm earnings. In addition, farm income is only reduced for workers in the agricultural sector. The latter restriction is applied using a slightly modified 'BenCalc' function to adjust 'yag', as shown in Figure 11.

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[10] These variables include 'loc01' and 'tcl' in UGAMOD and 'les01' and 'les02' in MOZMOD. Note also that GHAMOD does not have information on 'les' so this variable is not amended for those that become unemployed.

Note also that 'yag' is a household-level variable, meaning that industry information is only used from the household head to adjust farm incomes.

Figure 11: BenCalc function to adjust *yag* (farm income) for workers in agriculture

3.14	▾ *fx* BenCalc		**on**	Adjust yag
3.14.1	Comp_Cond	1	i_lma=0	No change in labour market status...
3.14.2	Comp_perTU	1	yag	...No change in farm income
3.14.3	Comp_Cond	2	i_lma=1 & lindi00=1	Transition to unemployment with zero income (if in the agricultural sector)
3.14.4	Comp_perTU	2	0	...Lose farm income (household heads)
3.14.5	Output_Var		yag	
3.14.6	TAX_UNIT		tu_individual_vn	

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

Finally, consumption is adjusted in a separate 'xhhadj_cc' policy based on the difference between uprated disposable income in current system year (2020 but also other years) and disposable income in the survey base year.[11] Note that all 'own-account' production that a person consumes is protected both during COVID-19 in 2020 and also in other system years where update disposable income declines compared to the base year. The share of own-account consumption (*protect_cons*) in sub-Saharan African is assumed to be approximately 25 per cent following Tschirley et al. (2015).[12] For simplicity, this restriction is also applied to the Vietnamese example presented in this note. Figure 12 shows the on-model implementation of the 'xhhadj_cc' policy, while Figure 13 shows the implementation of the 'ils_con' income list.

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[11] For details, please see UNU-WIDER (2022).

[12] The household data come from East and Southern African (ESA) countries and are derived from the Living Standards Measurement Study (LSMS) datasets 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. The number 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%) by dividing total food expenditure in three mutually exclusive income groups by total expenditure in the same groups (Tschirley et al. 2015: Table 4). We then estimate the average own-production share of the food budget (ca. 47%) by taking the population-weighted average of these shares in five income groups (own-production shares in Tschirley et al. 2015: Table 5; population totals in Table 2). The share of own-account food budget of all expenditure is roughly 54% times 47%, or 25%.

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% of the total value of food consumption, and the total value of food consumption is roughly 60% of total household expenditures. This leads to around a roughly 30% own-account food consumption share of all consumption.

Figure 12: 'xhhadj_cc' policy

● xhhadj_vn		on	on	on	INC: Adjust consumption to new disposable income
▾ ƒx DefConst		on	on	on	Specify share of own-account production consumed that is protected from changes
$protect_cons	1	0.25	0.25	0.25	An optional constant for the share of own-account production consumed that is protected from changes. This is ca. 25% in Sub-Saharan Africa, but can be set to 0%.
▾ ƒx BenCalc		on	on	on	Adjust consumption
Comp_Cond	1	yds<ils_dispy	yds<ils_dispy	yds<ils_dispy	Disposable income higher than in base year
Comp_perTU	1	xhh + (ils_dispy - yds)	xhh + (ils_dispy - yds)	xhh + (ils_dispy - yds)	...increase by change in disposable income
Comp_Cond	2	yds>=ils_dispy	yds>=ils_dispy	yds>=ils_dispy	Disposable income lower than in base year
Comp_perTU	2	xhh + (ils_dispy - yds)	xhh + (ils_dispy - yds)	xhh + (ils_dispy - yds)	...decrease by change in disposable income
Comp_LowLim	2	xhh * $protect_cons	xhh * $protect_cons	xhh * $protect_cons	...but retain 'protected' share
Output_Var		xhh_s	xhh_s	xhh_s	
TAX_UNIT		tu_household_vn	tu_household_vn	tu_household_vn	

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

Figure 13: 'ils_con' income list

▾ ƒx DefIl		on	on	on	Define income list - Simulated Consumption (needed for Statistics Presenter - do not change)
Name		ils_con	ils_con	ils_con	
xhh_s		+	+	+	Consumption adjusted by difference between disposable income in current and base year

Source: screenshot from VNMOD v2.3, the tax-benefit microsimulation model for Viet Nam.

4   Conclusion and advice

The 'lma_cc' policy allows for adjusting income and other labour market variables in the standard, unadjusted model input data (Section 3), using employment-to-unemployment transition shares across sectors (Section 2). In addition to adjusting these transition shares for a relevant country or other context, the user can apply the 'lma' policy with alternative assumptions regarding the treatment of farm income; variables that are adjusted due to the shock; the translation of income shocks to expenditures; and any other part of the policy.

Finally note that the five temporary or intermediary variables (i_*) generated inside the 'lma_cc' policy are included in the model output file only if 'i_*' is defined in the 'DefOutput' function at the end of the spine. For the May 2022 release of SOUTHMOD models, all intermediary variables are excluded from model output. When desired, the user is free to reintroduce these variables to the 'DefOutput' function and thereby to model output data.

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