

SOUTHMOD – simulating tax and benefit policies for development

Full-year adjustment for modelling COVID-19 policies in SOUTHMOD tax-benefit microsimulation models

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Abstract: This technical note presents a modelling approach used in Lastunen et al. (2021) where tax and benefit policies are scaled to reflect their actual duration during a single calendar year. It can be applied to tax-benefit microsimulation models implemented in the EUROMOD software. The method is particularly useful when evaluating the impact of discretionary policy measures adopted during the COVID-19 pandemic. Tax-benefit microsimulation models typically simulate policies at a specific point in time, which is problematic when considering changes in policies over time, for instance over the course of the coronavirus pandemic. Using the standard point-in-time approach, only those policies that were in place at the specific cut-off date (e.g. July 2020) would be considered and, even if short-lived in reality, assumed to be effective throughout the whole calendar year. The approach presented here applies ‘full-year adjustment’ to any policies implemented in 2020 that were in force for less than 12 months, ensuring that relevant benefit amounts and tax liabilities are scaled to reflect realistic payments during the year.

Key words: COVID-19, tax-benefit systems, poverty, income inequality, microsimulation

JEL classification: C15, D31, H24, I3

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Related publications: at the end of the paper

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1 Introduction

One central objective of Lastunen et al. (2021) is to assess the distributional effects of tax-benefit measures taken in response to the COVID-19 pandemic in 2020 in five African countries. This technical note presents in detail the approach chosen for modelling tax and benefit policies in microsimulation models implemented in EUROMOD software (EUROMOD 2018) and scaling them based on the actual duration of the different measures. While tax-benefit microsimulation models usually simulate policies at a specific point in time, the objective here is to consider the policy landscape over an extended period of time, namely the whole calendar year.

Adopting the usual point-in-time perspective for assessing the impact of COVID-related policies would be misleading. Policies in place before or after the cut-off date (usually 1 July of the calendar year) would be fully disregarded, and any policies in place at the cut-off would be assumed to be effective for the whole year. For the purposes of the analysis in Lastunen et al. (2021), we resort to modelling a scenario reflecting the policy situation just before the crisis hit (thus the first three months of 2020) and another scenario reflecting the situation during the first phase of the COVID-19 pandemic (last 9 months of 2020).

The method presented in Section 2 guarantees that benefit amounts and tax liabilities in any time-limited policy measures are scaled to reflect their actual duration during a single calendar year. The full-year perspective is particularly important when evaluating the effects of policies taken in response to the COVID-19 pandemic, which have typically involved temporary extensions to existing tax-benefit policies or new measures that have only been in force for a limited duration.

2 Full year adjustment

This section describes the ‘full-year adjustment’ approach used to scale policy measures in SOUTHMOD microsimulation models. Section 2.1 presents the approach, and 2.2 illustrates its practical implementation in EUROMOD, drawing on examples from a single model.

2.1 Scaling policies

For reasons explained above, so-called ‘full-year adjustment’ is applied to relevant policy measures. In practice this means scaling the respective benefit amounts and tax liabilities to reflect actual payments, based on duration of the relevant policies in place during a single calendar year.

Table 1 shows how different policy measures are used in the models and scaled based on their time of introduction and availability, both for standard models (column 3) and models with full-year adjustment discussed in this note (column 4).

Table 1: Scaling of tax-benefit policies based on their time of implementation and duration

Time of introduction	Availability	Implementation in standard model	Implementation with full-year adjustment
Before or beginning of the calendar year	Whole calendar year	No scaling	No scaling
Middle of the year	Starts and ends before cut-off date	Not simulated	Scaled based on duration: e.g., if available for 2 months (April–May), scale by 2/12
Middle of the year	Starts before cut-off date and ends after cut-off date	Simulated for 12 months	Scaled based on duration: e.g., if available for 6 months (April–September), scale by 6/12
Middle of the year	Starts and ends after cut-off date	Not simulated	Scaled based on duration: e.g., if available for 2 months (November–December), scale by 2/12

Note: standard models simulate policies in place at a specific annual ‘cut-off date’, generally 30 June (column 3). Models that use full-year adjustment capture policies in place at any point during a calendar year, scaling benefit amounts and tax liabilities to reflect the duration of the policy measure (column 4).

Source: authors’ elaboration.

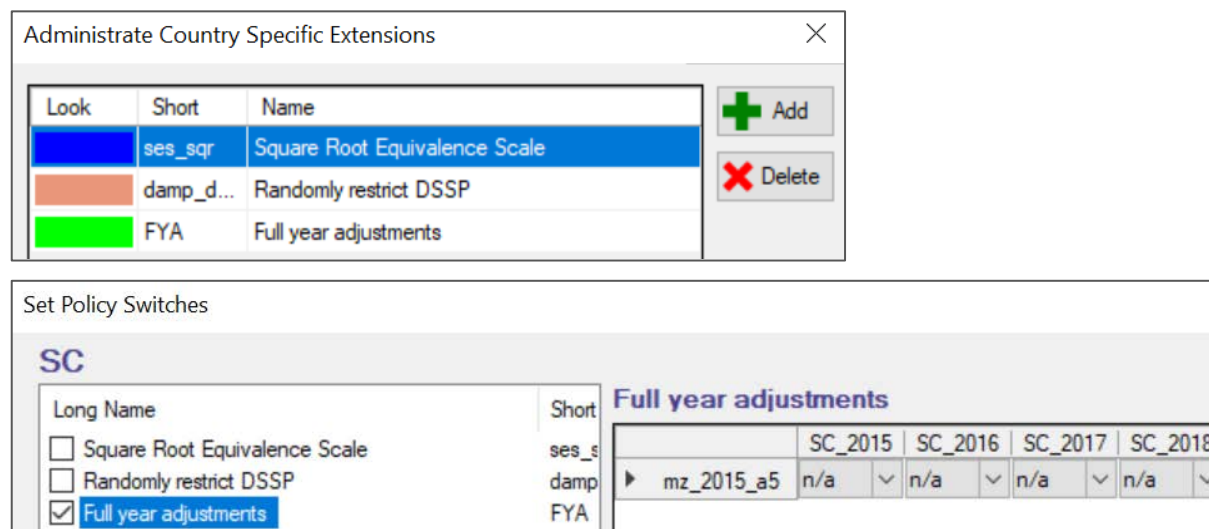
As shown in the table, no adjustments are needed for unchanged policies implemented on 1st of January 2020 or before the 2020 policy year. Policies adopted or dropped *after* January 1st, which in the study were all COVID-related, are scaled to reflect their actual duration as shown in the table. Furthermore, relevant adjustments are needed for policy parameters that have changed during the calendar year (e.g. increase of benefit amount).

2.2 Practical implementation

In practice, full-year adjustment can be implemented directly in the appropriate model function (and appropriate policy system) by multiplying benefit amounts or tax liabilities by a given factor, as shown in column 3 in Table 1. For instance, a COVID-related social benefit in place for six months in 2020 would be multiplied by 6/12 in any system containing COVID policies.

Full-year adjustment can also be implemented as a model extension that can be switched *on* (for full-year adjustment) or *off* (assuming that the policy is in force for a full year, or for standard simulation at the cut-off point). This requires adding a new switch called FYA to the country models and specifying switches for datasets, as showed in Figure 1.

Figure 1: Full year adjustment (FYA) switch



Source: screenshot from MOZMOD v2.7, EUROMOD software.

The sections below show practical examples of incorporating full-year adjustments into the models, using as example MOZMOD, the tax-benefit microsimulation model for Mozambique (see Castelo et al. 2020 for the previous country report).

2.2.1 Policy exists at the cut-off-date but is not effective for the whole calendar year

The implementation is straightforward when a policy has been implemented or dropped during the calendar year but exists at the cut-off date.

The example in Figure 2 shows a hypothetical case where the Basic Social Subsidy Programme policy in Mozambique was abolished in November 2020, and hence effective only for 10 months during the calendar year. Full-year adjustment requires implementing an additional *ArithOp* function at the end of the policy that scales the number of months for which the benefit is payable and adds the new function to the FYA extension. The simulated benefit amount, when full-year adjusted, is multiplied by the number of months it is available (10, January till October) and divided by 12 months. The benefit is still simulated for 12 months if the switch is off.

Figure 2: Adjustment when policy exists at the cut-off date but is only effective for a limited period of time

bsadi_mz		on	BEN: Basic SSP (BEN: Programa do Subsídio Social Básico)
fx	ArithOp	on	Calculate per capita hh Income (Calcula o rendimento per capita do AF)
fx	Elig	on	means-test of the household (teste de meios para o agregado familiar)
fx	Elig	on	find households containing one or more eligible people (encontrar agregados familiares que contém uma ou mais pessoas elegíveis)
fx	BenCalc	on	assign BSSP by household size (atribuir PSSB por tamanho do agregado familiar)
fx	ArithOp	switch	Full-year adjustment
	Formula	bsadi_s*10/12	... benefit only available Jan-Oct
	Output_Var	bsadi_s	
	TAX_UNIT	tu_household_mz	

Source: screenshot from MOZMOD v2.7, EUROMOD software.

2.2.2 Policy does not exist at the cut-off-date and is not effective for the whole calendar year

The full-year adjustment implementation is slightly more complicated if a policy was abolished before the cut-off date or implemented after the cut-off date.

Figure 3 shows a hypothetical example where a new family allowance benefit is introduced in Mozambique in the beginning of September 2020 (i.e. after the cut-off date). This policy would not be simulated in the standard model and would only be added to the policy system in 2021.

Simulating the policy landscape for the entire calendar year however requires simulating this benefit for four months (September to December) in 2020. This can be achieved by using the FYA switch, so that the benefit is simulated for 4 months when the switch is on, and set to 0 otherwise (e.g. in standard systems or systems without COVID-related policies). As usual, the new benefit also needs to be added to the respective income lists.

Figure 3: Adjustment when policy does not exist at the cut-off date and is only effective for a limited period of time

	bch_sc		on	BEN: Family allowance
	fx BenCalc		on	
x	Comp_Cond	1	dag <= 16	Benefit introduced in Sep
x	Comp_perTU	1	0	... no benefit simulated
✓	Comp_Cond	2	dag <= 16	Full year adjustment
✓	Comp_perTU	2	100#m * 4/12	... benefit introduced in Sep
	Output_Var		bch_s	
	TAX_UNIT		tu_individual_sc	

Source: screenshot from MOZMOD v2.7, EUROMOD software.

2.2.3 Policy parameters change during the year

In the final example, a policy exists for the entire calendar year, but some parameters change during year, for instance the benefit amount or tax rate.

Figure 4 shows a hypothetical example where employers' social insurance contributions were reduced from 4 per cent to 2 per cent in March 2020. Here full-year adjustment requires using a single rate for 2020 that is an average of the old and new rates, each weighted by the number of months they were applicable. When the FYA switch is on, the rate is around 2.3 per cent (4 per cent times 2 months plus 2 per cent times 10 months, divided by 12 months).

Figure 4: Adjustment when policy parameters change during the year

	sic_sc		on	SIC: Segurança Social (Private Sector) (Sector Privado)
	fx BenCalc		on	Private Sector - Employee (Sector Privado - Trabalhador)
	fx BenCalc		on	Private Sector - Employer (Sector Privado - Empregador)
	Comp_Cond	1	yem > 0 & les01 = 1	i.e. in private sector (i.e. no sector privado)
	Comp_perTU	1	yem * amount#1	Contribution by employer (Contribuição do Empregador)
x	#_Amount	1	0.02	
✓	#_Amount	1	(0.04*2 + 0.02*10)/12	... Full year adjustment: 0.04 for Jan-Feb and 0.02 for Mar-Dec
	Output_Var		tscer_s	
	TAX_UNIT		tu_individual_sc	

Source: screenshot from MOZMOD v2.7, EUROMOD software.

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