THE MICROSIMULATION MODEL OF THE OFFICE OF THE FISCAL ADVISORY COUNCIL (FISKSIM): INTERACTION EFFECTS OF SELECTED TRANSFERS IN AUSTRIA (EXECUTIVE SUMMARY)[1]

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FISKSIM: using microsimulation as a costing tool

Using individual and household data collected in the AT-SILC, the FISKSIM microsimulation model simulates the most important social, unemployment and family benefits as well as wage tax and social security contributions. Altogether, it captures around 53% of Austrian social expenditure excluding pensions. Pensions cannot be simulated in FISKSIM as data on contribution history are missing. In the calculation of net household income, however, pensions are included according to the values provided during data collection. The same applies to other transfers such as sickness benefits, care benefits and advances on maintenance payments, which means that in total around 97% of social expenditure are accounted for in the calculations.

To calculate minimum income benefits (MIB), the requirements of each household (minimum standards in cost of living and housing) are identified on the basis of the applicable regional legislation and then compared with eligible household income on a monthly basis. Given that people often do not claim minimum income benefits, MIB non-take-ups are simulated partly on the basis of economic factors and partly at random. Altogether, if requirements are above eligible household income and if MIB take-up is simulated, the resulting amount of transfer payments is positive; this amount may change if eligible household income or the regulations governing minimum income benefits change owing to reforms of the system of taxes and transfers.

Adjusting weights to improve the accuracy of estimates

The FISKSIM microsimulation model was designed as a costing tool to estimate the cost of reforms of the Austrian system of taxes and transfers and is based on the AT-SILC data provided by Statistics Austria. To increase the **accuracy of estimates**, the **weights** used in FISKSIM are **adjusted** in a way that goes beyond the calibration of the original weights by Statistics Austria. This recalibration process aims to align the numbers of benefit recipients and tax payers resulting from AT-SILC with those in official statistics in order to achieve estimates of public tax revenues and transfer expenditure that are as accurate as possible. Figari et al. (2014) point to deviations between estimations of aggregate tax revenues and transfers based on microdata and those based on official statistics. Survey data may feature an undercoverage of transfer recipients or transfers due to underreporting or missing information from households surveyed or an above-average nonresponse rate of transfer recipients in the survey. Comparing simulated aggregate tax revenues and transfers with official statistics is an important component both in developing tax and transfer systems and in validating the underlying microdata.

For a number of reasons, estimates of the tax and transfer system constitute a special case for which an adjustment of survey weights is particularly suitable. First, there are reliable and current official statistics available on the individuals and/or households in question to which weights may be

1 For the full version of this study (in German), which was commissioned by the Austrian Fiscal Advisory Council, see www.fiskalrat.at/Publikationen/Sonstige.html.

adjusted. Second, the constraints for the FISKSIM calibration process (e.g. the number of recipients of unemployment benefits) only marginally overlap with those applied by Statistics Austria, which rely more strongly on demographics. Finally, the applications are limited to the tax and transfer system, for which they are particularly suited.

Many institutions that analyze reforms of systems of taxes and transfers and therefore require accurate cost estimates adjust survey weights. Examples for this practice are the microsimulation models described in Creedy and Tuckwell (2004) for the ministry of finance of New Zealand, in Giles and McCrae (1995) for the British Institute for Fiscal Studies, in Flory et al. (2012) for the German ministry of finance[2], in Siebertová et al. (2016) for the Slovak fiscal advisory council and in Curci et al. (2017) for the Italian central bank[3].

Especially if there is e.g. a time gap between the year of data collection and the year to which the estimate refers, aggregate features of the dataset are aligned with demographic features by changing the weights of individual datasets used to extrapolate calculations to the entire population. To keep information losses resulting from the construction of the original weights at a minimum, an **optimization algorithm** is used to identify those weights that deviate least from the original weights while fulfilling the targets, i.e. keeping in line with the population indicators of the relevant year. Since this method of weight adjustments relies on minimizing the deviation between old and new weights, the rescaling factor for calculating the new weights in the FISKSIM model is rather small, namely between 0.8 and 1.2 in 50% of cases and between 0.6 and 1.4 in 80% of cases. Also, the distribution of gross annual income weighted by the adjusted weights is similar to that weighted by the original weights.

Table 1 presents the simulated revenues from social security contributions, income tax and capital gains tax as well as the simulated transfer expenditure (column 1). Column 3 shows the ratio of FISKSIM estimates to the target values (column 2) derived from the final budget accounts and from official statistics for 2017. As weights are adjusted to the numbers of transfer recipients, employees and pensioners, the FISKSIM model produces estimates close to target. Column 4 of *table 1* shows the **ratio of the estimation results** of the European Commission's microsimulation model, EUROMOD, **to the targets**. EUROMOD is also based on EU-SILC data (or AT-SILC data for Austria). Since EUROMOD extrapolations use the original weights, the difference between the two ratios – FISK-to-target and EUROMOD-to-target – can be used as an indicator for the degree by which an adjustment of weights contributes to improving the accuracy of estimates.

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2 I.e. the microsimulation model of the Fraunhofer Institute for Applied Information Technology FIT, which was commissioned by the German Federal Ministry of Finance.

3 For an overview, see O'Donoghue und Loughrey (2014).

Table 1: Simulated tax revenue, simulated transfer expenditure, and target values for 2017

	(1) FISKSIM estimates, EUR million	(2) Target values, EUR million	(3) FISKSIM estimate-to-target ratio	(4) EUROMOD estimate-to-target ratio
Family allowance	3,340	3,422	0.98	0.99
Child tax credits	1,284	1,326	0.97	0.99
Childcare benefits	1,231	1,219	1.01	0.79
Maternity benefits	463	517	0.90	--
Unemployment benefits	1,844	1,863	0.99	1.16
Unemployment assistance	1,562	1,562	1.00	0.69
Minimum income benefits	915	924	0.99	2.32
Wage tax, employees*	20,389	20,182	1.01	0.99
Social security contributions, employees	22,911	22,382	1.02	0.94
Wage tax, pensioners	6,198	6,142	1.01	--
Social security contributions, pensioners	2,785	2,729	1.02	1.01
Capital gains tax	395	2,754	0.14	0.13

* Total income tax 2016 for EUROMOD.

Source: EU-SILC, authors' calculations, Austrian Association of Social Insurance Providers, Statistics Austria, Federal Ministry of Finance, minimum income benefits statistics, wage tax statistics, Federal Ministry for Labour, Social Affairs, Health and Consumer Protection, final budget accounts, Fuchs and Hollan (2018).

Table 1 shows that the FISKSIM model achieves a high correspondence of estimates for the most costly and, from a welfare perspective, most relevant transfers – **family allowances**, **childcare benefits**, **unemployment benefits** and **unemployment assistance** – with the targets, as it uses adjusted weights. By contrast, using the original weights leads to an over- or underestimation of expenditure for unemployment benefits and childcare benefits.

Take-up of **minimum income benefits** is lower, by far, than take-up of other transfers, which means that assumptions concerning non-take-ups drive estimation results. While EUROMOD assumes 100% take-up,[4] FISKSIM models empirically calibrated assumptions of non-take-up. This approach – together with the use of adjusted weights – makes FISKSIM estimates highly accurate and explains the difference to EUROMOD overestimations.

With regard to **capital gains tax**, weights are not adjusted for two reasons: first, because there is no statistics on taxpayers paying capital gains tax and thus no target value for the persons concerned; and second, because an undercoverage of investment income data can be attributable to both underreporting or missing data, and an adjustment of weights might only be justified in the latter case. Even then, however, undercoverage would be considerable and would require using high weights for those households whose investment income is covered.[5]

A **nowcasting exercise for a base year** for which the numbers of transfer recipients and taxpayers as well as transfer expenditure and tax revenue are known (here: 2017) serves as **quality control**

4 See Fuchs and Hollan (2018), p. 60.

5 Future findings from the OeNB's Household Finance and Consumption Survey (HFCS), a comprehensive survey of Austrian households' assets, might contribute to clarifying the undercoverage of investment income and improve the basis for calculating capital gains tax.

for the development of microsimulation models, e.g. regarding the underlying assumptions and the programming of the system of taxes and transfers.

As soon as a sufficiently high correspondence of target values and estimates is reached, in a next step the weights can be adjusted to population figures or the number of taxpayers and transfer recipients of year *t* or *t+1* to forecast the **accumulated public revenue and expenditure** with regard to the respective taxes and transfers. In fact, forecasts, e.g. of population developments or unemployment figures, are used as target values for the weight adjustments.[6]

Interaction effects of selected transfers in Austria

Microsimulation models allow for the systematic analysis of a country's taxes and transfers. By sequentially calculating tax liabilities and transfers at the individual level, microsimulation models take **interactions between benefits** into account.[7] This applies in particular to means-tested benefits, which interact with other transfers as they require a means test. As shown by Figari et al. (2015), disregarding the interaction between transfers would even lead to biased results in an estimation of the first-round effect. Moreover, by taking the interaction effect into account, the net fiscal stimulus[8] of a reform can be shown, which in turn may serve in particular to estimate reform costs.

In the following, the change in disposable income caused by the receipt of a transfer payment will be referred to as the **household net effect**. Similarly, the **general government budget (GGB) net effect** describes the changes in general government expenditure caused by specific transfer payments and represents the fiscal stimulus. The net effect is composed of the **transfer effect** and the **interaction effect**. The transfer effect corresponds to the transfer payments received at the household level or the general government expenditure for transfer payments. The interaction effect corresponds to the change in household income or the change in expenditure for other transfers due to the transfer payments under consideration. The sum of these two – normally opposed – effects corresponds to the net effect:

$$\text{net effect}_{Tr} = \text{transfer effect}_{Tr} + \text{interaction effect}_{Tr}$$

In some cases, an interaction of transfers is prevented by law; unemployment benefits, for instance, are not paid out while recipients receive sickness benefits. In the present study, we analyze the interaction between

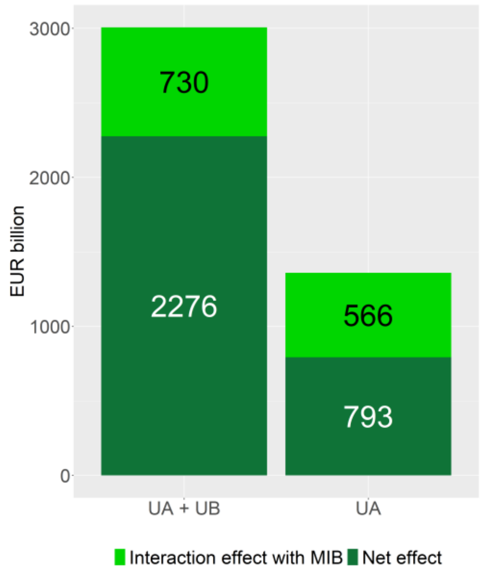
- unemployment benefits (UB) and minimum income benefits (MIB),
- unemployment assistance (UA) and MIB,
- childcare benefits (CCB) and MIB,
- maternity benefits (MB) and MIB,
- and MB and CCB.

6 Forecasts regarding the recipients of unemployment benefits and unemployment assistance are made on the basis of monthly data from the Public Employment Service Austria (AMS) and the short-term economic outlook of the Austrian Institute of Economic Research (WIFO).

7 Here, we study the first-round effect, which can then be integrated in a macromodel.

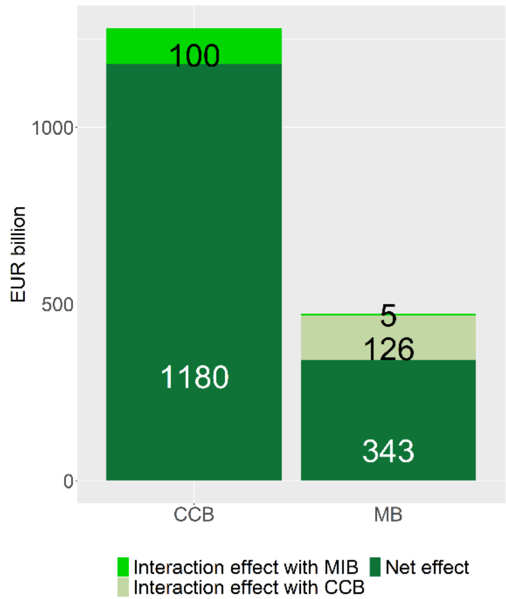
8 Our analysis is purely static, however.

Chart 1: Aggregated effects of UB and UA



Source: Authors' calculations.

Chart 2: Aggregated effects of CCB and MB



Source: Authors' calculations.

With regard to the distribution of households receiving transfers across the deciles of the annual equivalent income of households[9], the selected **transfers differ considerably**; this is also reflected in the interaction effects with MIB (see below). While the number of households receiving unemployment assistance decreases in line with household income, such a relation cannot be observed for unemployment benefits.

9 To be able to compare the income situation of households of different sizes, annual disposable household income is weighted according to the OECD's square root equivalence scale, which weights household income by the square root of the number of persons living in the respective household. For example, the annual disposable income of a family of four is weighted by $\sqrt[2]{4}$, i.e. a factor of 2.

The ability of microsimulation models to simulate what-if analyses allows for calculating the GGB net effect. The GGB net effect is calculated as the difference between government expenditure including the transfers in question and general government expenditure excluding these transfers; it represents the net fiscal stimulus. The GGB net effect shows the changes in general government expenditure caused by individual transfers. Since **unemployment assistance depends on unemployment benefits** (i.e. if unemployment benefits change, unemployment assistance changes accordingly), the **interaction between unemployment benefits and minimum income benefits** also includes the interaction effect of unemployment assistance. The concentration of recipients of unemployment assistance at the lower end of the income distribution implies that 78% of the interaction effect of unemployment benefits plus unemployment assistance can be traced to unemployment assistance. The transfer effect of unemployment benefits plus unemployment assistance and that of unemployment assistance come to around EUR 3.01 billion and EUR 1.36 billion, respectively (see *Chart 1*). This budgetary effect is reduced by the interaction effect with minimum income benefits, resulting in a GGB net effect of EUR 2.28 billion and EUR 793 billion, respectively.

The **interaction effect of childcare benefits** is considerably lower than that of unemployment-related transfers as amounts paid out for childcare benefits are comparatively lower. Moreover, the share of households consisting of two partners is higher for families receiving childcare benefits. The consideration of the partner's income in the means test might lead to a household's noneligibility for MIB. The **consideration of maternity benefits in the calculation of childcare benefits** causes a comparably small change in disposable income and thus only little interaction with MIB. Maternity benefits imply a decrease of EUR 126 million in the aggregated expenditure for childcare benefits and a decrease of EUR 5 million in the aggregated expenditure for MIB (see Chart 2).

References

Creedy, J. and I. Tuckwell (2004), Reweighting Household Surveys for Tax Microsimulation Modelling: An Application to the New Zealand Household Economic Survey. Australian Journal of Labour Economics, vol. 7, 1/2004, p. 71–88.

Curci, N., M. Savegnago and M. Cioffi (2017), BIMic: The Bank of Italy microsimulation model for the Italian tax and benefit system. Banca d'Italia Occasional Papers no. 394.

Figari, F., A. Paulus and H. Sutherland (2015), Microsimulation and policy analysis. Handbook of income distribution (vol. 2, pp. 2141–2221). Elsevier.

Flory, J. and S. Stöwhase (2012), MIKMOD-Est: A static microsimulation model of personal income taxation in Germany. International Journal of Microsimulation, 5(2), 66–73.

Fuchs, M. and K. Hollan (2018), EUROMOD Country Report Austria 2015-2018.

Giles, C. and J. McCrae (1995), TAXBEN: the IFS microsimulation tax and benefit model. Mimeo.

O'Donoghue, C. and J. Loughrey (2014), Nowcasting in Microsimulation Models: A Methodological Survey. Journal of Artificial Societies and Social Simulation 17 (4).

Siebertová, Z., N. Švarda and J. Valachyová (2016), Improving the Validity of Microsimulation Results: Lessons from Slovakia. CBR Discussion Paper no. 4/2016.