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## A Microsimulation model of the Slovak Tax-Benefit System<sup>1</sup>

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### ABSTRACT

This paper sets out in detail a microsimulation model of the Slovak tax and transfer system that builds on the existing EUROMOD platform. The objective is to give an overview of the development process, and to discuss differences relative to EUROMOD. In a validation exercise, we demonstrate that refinements to the current version of the EUROMOD can improve the match between simulated output, underlying data and official statistics. It is concluded that the model is a valid tool to conduct tax and benefit simulation exercises in the context of Slovakia.

*Keywords:* microsimulation, EUROMOD, tax and benefit policy, Slovakia

*JEL classification:* C81, I38, H24

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## List of Abbreviations

The following table describes the significance of various abbreviations and acronyms used in the paper.

<b>Abbreviation</b>	<b>Meaning</b>
COLSAF	Central Office of Labour, Social Affairs and Family
CBR	Council for Budget Responsibility
HBS	Household Budget Survey
HFCS	Household Finance and Consumption Survey
ISAE	Information System on Average Earnings
LFS	Labour Force Survey
MNB	Material needs benefit
SIC	Social insurance contributions
SK-SILC	National version of the European Union Statistics on Income and Living Conditions (EU-SILC)
SSA	Social Security Agency



## 1 Introduction

In this paper we describe a microsimulation model that has been developed to simulate the Slovak tax and transfer system. The model is based on the existing EUROMOD platform, albeit several modules were customized and enlarged.<sup>5</sup> We show that such adjustments provide us with simulated output that matches official statistics more closely.

The presented microsimulation model serves as an assessment tool developed primary for the needs of the Council for Budget Responsibility (CBR). It is a key building block in a general equilibrium framework designed to assess the consequences of tax and benefit reform strategies. The paper documents the process of building the microsimulation model and outlines in detail the approach that has been applied. The intention is to provide a thorough documentation, with the lessons learned for those who might be interested in a detailed description of the model as well as for those who might wish to work with it.

More generally, researchers with interest in microsimulation might benefit from some of the innovative solutions applied here. In particular, our refinement to the modelling of benefits whose amount and duration is conditional on unobserved factors - such as the material needs, unemployment and maternity leave benefit - should be of interest to a larger audience. It is shown that our approach improves the fit between simulated output, underlying data and official statistics. It also has a positive effect on simulation-based econometric estimates, as reported in Siebertova et al. (2014).

The paper is structured as follows. Section 2 describes the selection of the appropriate micro-level dataset and the adjustments of the underlying data that were necessary. Section 3 shortly summarizes the tax and benefit system in Slovakia. Section 4 briefly reviews the EUROMOD microsimulation model, describes an adaptation of the existing EUROMOD modules and explains the need for more detailed simulations. Section 5 presents comparison and provides a discussion on the simulation results using EUROMOD and the CBR approach. Section 6 concludes.

## 2 Data

### 2.1 Available data sources and selection of dataset

A necessary precondition for the development of a microsimulation model is the existence of suitable micro-dataset containing information preferably both on individuals and households. Usually, household survey data are used for these types of analyses; use of the administrative (or census) data is rather scarce.

In Slovakia, there exist several surveys conducted by the Slovak Statistical Office and by the National Bank of Slovakia (NBS) that provide data on individual level. An obvious source for this

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<sup>5</sup> The results presented in this paper are based on EUROMOD version F6.36 which was the best available version at the time of writing.



type of project would be the Household Budget Survey (HBS) or the European Union Statistics on Income and Living Conditions (EU-SILC). Both of these surveys are conducted on a yearly basis in Slovakia. HBS contains broad information on consumption and income measures (including gross wages and transfers), and also detailed individual characteristics. The main limitation of using this dataset in a microsimulation model is that there is no information on family relationship between household members (although the head of the household is identified). Other surveys that are currently run, but not suitable for this project, include Labour Force Survey (LFS) and Household and Finance Consumption Survey (HFCS). LFS concentrates primarily on working age population (i.e., those older than 15 years) and it does not collect information on income and family relationships. HFCS is conducted by National Bank of Slovakia and it is currently available as a pivotal dataset from 2010 which does contain unique information mainly on financial actives/passives of households. However, the coverage of income items and transfers is not sufficiently detailed to provide a comprehensive basis for a microsimulation model.

Except for the full Census (latest in 2011), that does not ask questions about income, there exist two administrative datasources that contain information on income. The first one is the quarterly Information System on Average Earnings (ISAE) that collects detailed information on income of employees and their characteristics. The second dataset comes from the Social Security Agency that collects social security contributions<sup>6</sup>. This dataset provides detailed information on paid contributions and information on gross monthly wage can be retrieved out of it. Both datasets were ruled out since they contain no information on transfers and family relationships. Characteristics of available datasets is further detailed in Table A1 in the Appendix.

## 2.2 SK-SILC dataset

The national version of the EU-SILC survey, abbreviated as SK-SILC<sup>7</sup>, was selected as a base dataset for the tax-benefit microsimulations. Currently, it does best at meeting the data requirements for a microsimulation model, when compared to other datasets described in the previous section. Compared to the user database version of the EU-SILC, SK-SILC dataset includes more variables.

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<sup>6</sup> Technically, Social Security Agency (SSA) administrates several individual level datasets. The one mentioned above comprises information on paid contributions of employees, vendors and self-employed. SSA also administrates dataset that contains information on selected transfers paid to inhabitants (e.g., old-age and disability pensions, maternity benefits). Administrative data on paid unemployment benefits and different family related and social assistance transfers are governed by Central Office of Labour, Social Affairs and Family (COLSAF). Currently, these official datasets are not interconnected. However, there exist an ongoing pressure of analytical departments of government institutions and academic sector to create an effective database that will combine all available individual data from SSA, COLSAF and Tax Authorities.

<sup>7</sup> Information on the EU-SILC database reported in this section are based on national Intermediate Quality Report EU-SILC 2010. Note that income data in a survey denoted as 2010 EU-SILC corresponds to the fiscal year 2009.

The EU-SILC is an annual survey that has been conducted in Slovakia since 2004, it is collected by the Statistical Office of the Slovak Republic on behalf of EUROSTAT. Survey questions are focused on the income and living conditions of different types of households, as well as on the individual demographic characteristics, education, health status, employment, housing conditions and deprivation measures.

The database contains cross-sectional data both at individual and household level. It has a panel<sup>8</sup> rotational design with 4 sub-samples, each subsample lasts in the survey for 4 years. Private households are the primary sampling units, the sampling procedure is one-stage stratified sampling. The sampling frame was stratified on the basis of geographical criteria (NUTS<sub>3</sub> region and degree of urbanisation) and proportional simple random sampling has been applied within each stratum. Concerning the data quality; the household response rate for the total 2010 SK-SILC sample yielded 88.59%.

Weights that scale up sample numbers to the population have been computed such that non-response at the household level has been taken into account. Each household in the sample is weighted in an inverse ratio to the probability by which it has been selected (i.e., it is multiplied by the inverse value of the response rate). In the next step, the weights have been calibrated to match the demographic structure in regions (based on external data). Finally, the cross-sectional household weights and personal weights have been integrated such that they are equal.

**Table 1: Descriptive statistics of the grossing-up weight in SK-SILC samples**

	SK-SILC 2010	SK-SILC 2011	SK-SILC 2012
Individuals	16,275	15,327	15,440
Households	5,376	5,200	5,291
Projected population	5,415,559	5,389,454	5,395,519
Projected households	1,911,664	1,911,664	1,911,664
<b>Grossing-up weight</b>			
Mean	332.753	351.631	349.451
Std. Dev.	117.117	113.936	125.988
Minimum	106.640	118.822	108.690
Maximum	1,137.724	1,641.253	1,226.095

The 2010 SK-SILC database collects information on 16,275 individuals living in 5,376 households, 2011 SK-SILC reports 15,327 individuals living in 5,200 households and 2012 SK-SILC contains 15,440 individuals in 5,291 households. Table 1 presents descriptive statistics of the grossing-up weight and population estimates of the re-weighted samples.

The database comprises detailed information describing the personal characteristics, household members' relationships and labour market activity of individuals. Individual characteristics include age, gender, education, region of permanent residency and marital status.

<sup>8</sup> EU-SILC for Slovakia is available also as a panel dataset. In our micro-simulations we work with a national extended version SK-SILC, which is currently not available as a panel.



The dataset also reports detailed information related to labour market status – whether an individual was employed (full-time, part-time), self-employed or whether (s)he stayed unemployed in the reference period. Information on length of working history (in years) is also available. Furthermore, extensive information on the structure of individual income is available. Survey participants were asked to declare their yearly gross earnings from employment (and/or self-employment), fringe benefits, and also detailed transfers from the state, e.g. unemployment benefits or pensions (old-age, disability). Some of the transfers are legislatively defined for households and thus reported just on the household level (material needs benefit, child benefit or parental allowances). Further description and summary statistics of relevant income variables and transfers can be found in Table A2-Table A4 in the Appendix.

### 2.2.1. SK-SILC versus official statistics

The dataset is largely representative of the country population. However, as it is frequent in survey data, SK-SILC might also over-represent or under-represent certain cohorts. Particular limitations are inspected in details below, in such a way that SK-SILC data are compared to the appropriate official statistics. These comparisons serve indeed as highly instructive in later assessment of simulations.

Table 2 presents weighted data on number of individuals (in the selected age cohorts) in the input database used in the simulation model against external benchmark. The SK-SILC dataset underestimates number of new-born (age 0) and small children (under 3 years), but matches relatively well to the overall pre-prime age cohort (0-26 years). This applies both in 2009 and subsequent years 2010 and 2011.

**Table 2: Age cohorts in SK-SILC and population**

Age cohort	SK-SILC / population*		
	2009	2010	2011
0	0.58	0.38	0.55
0 - 3	0.66	0.61	0.63
0 - 16	0.84	0.83	0.82
0 - 26	0.97	0.97	0.98
Prime age	1.03	1.02	1.03
Retirement age	1.10	1.11	1.08

Source: Authors' calculations using SK-SILC and Slovak Statistical Office

\* Ratio displays number of individuals in SK-SILC (weighted) to population in the respective age cohort.

Prime age: 15-64 years. Retirement age: males 62+, females 58+

Data on representation of the economic activity of Slovak population is shown in Table 3. The results document that based on these criteria, SK-SILC dataset reflects official statistics well.



The only exception is the number of unemployed in 2009, which is 14% higher in the dataset used, than recorded by external benchmark.

**Table 3: Economic activity of population (in thousands persons)**

	LFS			SK-SILC			SK-SILC / LFS		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
Employed	2,365.80	2,317.50	2,315.30	2,345.47	2,314.18	2,312.76	0.99	1.00	1.00
Unemployed	324.20	389.00	364.60	368.42	375.08	355.17	1.14	0.96	0.97
Economic active pop.	2,690.00	2,706.50	2,680.00	2,713.88	2,689.26	2,667.92	1.01	0.99	1.00
Population total	5,409.50	5,421.80	5,392.40	5,414.41	5,388.58	5,395.52	1.00	0.99	1.00

Source: Authors' calculations using SK-SILC and LFS.

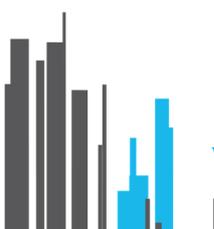
Table 4 compares the aggregate number of unemployment benefit recipients to total number of unemployed persons in the input database to corresponding administrative data from COLSAF and data from LFS. The ratio of recipients of unemployment benefit to total number of unemployed is substantially smaller in SK-SILC compared to official statistics.

**Table 4: Unemployment benefit validation: Aggregate number of recipients (in thousands pers.)**

	Official statistics			SK-SILC			SK-SILC / Official statistics		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
Recipients of unemp. benefit*	135.37	138.83	141.85	84.21	80.88	78.53	0.62	0.58	0.55
Unemployed**	324.20	389.00	364.60	368.42	375.08	355.17	1.14	0.96	0.97
Recipients / Unemployed	0.42	0.36	0.39	0.23	0.22	0.22			

Source: Authors' calculations using SK-SILC, COLSAF\* and LFS\*\*.

In the next two tables, i.e. in Table 5 and Table 6, different sources of income reported in SK-SILC are related to official statistics given by SSA. A comparison is provided with respect to number of individuals receiving certain type of income as well as in terms of reported aggregate amounts of income. The number of people that have reported an income from employment is over-represented in the input SK-SILC data, while those who declare an income from agreements are under-represented and this applies to all three years. On the other hand, the number of self-employees match relatively well when compared to the data from SSA in 2009 and 2010, in 2011 they are according to this statistics oversampled. However, comparing the number of self-employed to the statistics of SSA is not completely correct. SSA database is primary a dataset of paid social insurance contributions and gross income can be derived based on it. In case of self-employed SSA dataset captures those individuals who pay SIC. When the number of self-employed is taken from the registry of the Statistical Office, SK-SILC is in 2009 and 2010 substantially undersampled (corresponding ratios are 0.62 in 2009, 0.64 in 2010 and 0.92 in 2011).



**Table 5: Individuals with nonzero income (in thousands persons)**

Income from	SSA			SK-SILC			SK-SILC / SSA		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
Employment	1,905	1,835	1,859	2,242	2,172	2,078	1.18	1.18	1.12
Agreements	732	779	859	318	319	337	0.43	0.41	0.39
Self-employment	291	282	277	258	264	372	0.89	0.93	1.34
Empl. and agreements	2,637	2,614	2,718	2,561	2,491	2,414	0.97	0.95	0.89

Source: Authors' calculations using SK-SILC and SSA (based on total number of employees and self-employed paying SIC).

The figures reported in Table 6 are in line with the evidence on recipients of different income provided in Table 5 above. Aggregate income from employment is approximately 18% higher than documented by SSA, while the income from agreements is substantially underreported. As it is inspected in detail in Appendix B, low-income earners are oversampled while high-income earners are undersampled in the input data.

Note that income from self-employment should be validated with caution and results proposing substantial over-reporting in the input data are only indicative. The reason is that SK-SILC reports for the self-employed the value of profit/loss in the income reference period, while the SSA database reports the legislatively correct assessment base which is based on the value of declared return in the year t-2, i.e. there is an inconsistency both in variables that are equated and time aspect.

**Table 6: Aggregate income (in mil. euro)**

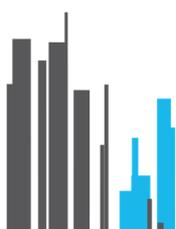
Income from	SSA			SK-SILC			SK-SILC / SSA		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
Employment (total)	14,395	14,632	15,625	16,898	17,393	18,072	1.17	1.19	1.16
Agreements	565	663	798	244	224	345	0.43	0.34	0.43
Self-employment**	1,058	1,084	1,079	1,907	2,245	3,065	1.80	2.07	2.84
Empl. and agreements	14,960	15,295	16,423	17,142	17,618	18,417	1.15	1.15	1.12

Source: Authors' calculations using SK-SILC and SSA.

\*Mean and median values are expressed in euro.

\*\* Validation of income for self-employed is only indicative. SK-SILC reports for self-employed the value of profit/loss in the current year, while the SSA database reports the assessment base which is based on the value of return in the year t-2 (inconsistency both in variable and time).

Furthermore, the main non-simulated benefits and pensions, which serve as an input to later simulations, are inspected in the next two tables. The aggregate numbers of recipients of maternity benefit and four types of pensions are exhibited in Table 7. Maternity benefit recipients are undersampled in the input databases in all tested years. Since the eligibility for the maternity benefit is up to approximately 6 months after the child's birth (in 2011 this has been enlarged to 7 months after the child's birth), the reported figures match with the undersampling of the youngest age cohort in SK-SILC as it is documented in Table 2. On the other hand, the elderly are oversampled in SK-SILC data in all three years. This again mirrors



the higher share of old-age pension beneficiaries, documented in the input data, than reported by the official statistics. Disability pensioners and orphans are undersampled in the SK-SILC data, while widows and widowers well approximate the figure addressed by SSA.

**Table 7: Non-simulated benefits and pensions: Number of recipients (in thousands persons)**

	SSA			SK-SILC			SK-SILC / SSA		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
<b>Benefits</b>									
Maternity	20	20	23	11	7	13	0.55	0.34	0.55
<b>Pensions</b>									
Old age	932	955	958	1077	1084	1091	1.16	1.14	1.14
Disability	204	214	223	183	181	188	0.90	0.85	0.84
Widow/er	338	337	337	317	337	356	0.94	1.00	1.06
Orphans	29	28	28	24	19	19	0.82	0.66	0.69

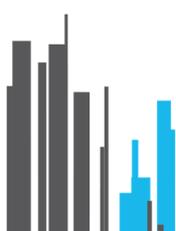
Source: Authors' calculations using SK-SILC, Social Security Agency (SSA).

Table 8 summarizes the aggregate amounts of benefits and pensions: data in the input dataset are compared to external statistics from the SSA. Not surprisingly, old-age pension payments are approximately 20% higher in the SK-SILC data than reported by SSA. Other non-simulated benefit and pension payments are in general underestimated. The gap between official records and input data is extreme in case of sickness benefits, where aggregate payments reported in SK-SILC reached in 2010 only 40% of the official statistics, in subsequent years this gap has been even pronounced. Maternity benefit payments represent 40 to 60% of the official SSA records and these figures match with the underestimated number of recipients reported over the years 2009-2011 (see Table 7 above).

**Table 8: Non-simulated benefits and pensions: Aggregate amounts (in mil. EUR)**

	SSA			SK-SILC			SK-SILC / SSA		
	2009	2010	2011	2009	2010	2011	2009	2010	2011
<b>Benefits</b>									
Maternity	67,933	76,650	107,124	41,354	32,774	66,008	0.61	0.43	0.62
Sickness	248,698	261,773	274,259	98,390	74,277	84,924	0.40	0.28	0.31
<b>Pensions</b>									
Old age	3,595,383	3,758,182	3,926,901	4,376,861	4,586,734	4,770,933	1.22	1.22	1.21
Disability	622,259	656,420	689,217	545,067	574,392	596,370	0.88	0.88	0.87
Widow/er	532,374	546,777	559,056	470,168	514,143	549,542	0.88	0.94	0.98
Orphans	44,490	43,283	43,057	44,535	35,830	35,834	1.00	0.83	0.83

Source: Authors' calculations using SK-SILC, Social Security Agency (SSA).



### 2.2.2. Adjustments and re-weighting of the data

Only minor adjustments of variables were needed in the original SK-SILC databases. In particular, some corrections were necessary when we checked for the consistency in family relationships (to control for the appropriate difference in age of parents and their children). In few cases we had to correct the proclaimed number of months when transfers were received (mostly in case of maternity benefit or parental allowance) – when the reported numbers exceeded actual legislative maximum. These corrections were necessary, since this information enters as an input into our microsimulations. On the other hand, we did not correct in the original sample the reported unusually high values (above legislative maximum) of those transfers, which we subsequently simulate with our model.

As it is frequent in a survey data, SK-SILC also over-represents low-income groups and under-represents high-income groups (these are in fact missing) when compared to the official statistics that can be retrieved from SSA database<sup>9</sup>. We are aware of this caveat and we can include a correction step before actual microsimulation starts, if it is applicable. Correction of income distribution is subsequently applied in our general equilibrium model to evaluate fiscal effects of reforms more precisely.

The correction procedure works as follows. In both datasets we compute the mean value of gross income in every percentile. As a next step, we calculate the ratios of the computed means from the two datasets (percentile by percentile). These computed shares serve as a correction, we multiply the gross income in SK-SILC by these percentile specific factors. Scaling factors and corresponding income distributions are plotted in detail in Appendix B.

## 3 The Tax and Benefit System in Slovakia

### 3.1 Taxes and social insurance contributions

The Slovak *tax system* is largely unified; all important components are set at the state level. Taxation of income is conducted at an individual level and it is levied on gross income including wages, income from business activities, fringe benefits, capital incomes (dividends excluded), interest and rental income. Joint taxation of married couples is not possible. Social insurance contributions and social benefits are exempt from the tax base, i.e. the tax base is given as gross earnings net of employee social insurance contributions (SIC).

All relevant parameters needed to compute personal income tax (PIT) are available in the SK-SILC data - both those which are related to individual and household level. During the years 2009 to 2011 PIT amounts to a 19% flat tax rate with a constant non-taxable allowance.

Tax expenditures that are deducted from the tax liability in the PIT include:

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<sup>9</sup> Individual tax-return data are available in Slovakia starting from 2013.



- (a) Basic tax allowance: tax allowance each individual can apply, the amount of the allowance is based on the legally defined minimum subsistence level.
- (b) Spouse tax allowance: an individual may be entitled to a spouse tax allowance if the income of spouse satisfies certain conditions (earnings under a certain level).
- (c) Employee tax credit (ETC, effective from 01.01.2009): the amount depends on employee's income and on the period he has been working (at least 6 months). It is targeted at low-income groups who have to pay health and social insurance contributions<sup>10</sup>.
- (d) Child tax credit: one spouse may claim an allowance for the children in the household (per every child) if the child satisfies certain conditions (e.g., aged under 18 or aged under 26 and in full time education or aged under 26 when physically or mentally disabled and not receiving disability pension). This tax credit can be received, if the parent annually earns at least 6 times the minimum wage. If the credit exceeds the tax liability, the excess is paid to the taxpayer.

The Slovak *social insurance system* is made up of two components; namely social insurance contributions and health insurance contributions. The assessment base for contributions is narrower compared to the PIT base since capital income is not considered.

(a) Social insurance contributions

Both employers and employees pay unemployment, sickness, disability and old age insurance (but different percentages from the social insurance assessment base, for a detailed overview of contribution rates valid in 2009-2011, see Table 9 below).

Old-age insurance is from January 2005 composed of public pay-as-you-go and private pillars. Employees already working before January 2005 had to choose whether they split their contributions between public and private pillar or pay the whole amount to the public pillar. Participation in the private pillar of employees who started to work in January 2005 and later had been stated as mandatory.

In addition, employers also pay contributions to a reserve solidarity fund, accident insurance and guarantee insurance.

The self-employed are treated differently; they pay sickness, disability and old age insurance and contributions to the reserve solidarity fund.

(b) Health insurance contributions

These contributions are paid by employers, employees and also self-employed. The percentage to be paid is different for the three categories of payers.

<sup>10</sup> If income is between 6 times of the minimum wage and 12 times of the minimum wage, the tax credit is calculated as 19% of the difference between the basic tax allowance and the tax base, evaluated at the level of the minimum wage. If income exceeds 12 times the minimum wage, then the ETC is calculated as 19% of the difference of the basic allowance and the tax base. There is no tax credit when the tax base is equal to or higher than the basic tax allowance.



**Table 9: Social insurance contribution rates 2009-2011 (in %)**

	Employees						Self-employed
	Public system		Combined system				
			Public pillar		Private pillar		
	Employee	Employer	Employee	Employer	Employee	Employer	
<b>Health Insurance</b>	<b>4.00</b>	<b>10.00</b>	<b>4.00</b>	<b>10.00</b>			<b>14.00</b>
<b>Social Insurance</b>	<b>9.40</b>	<b>25.20</b>	<b>9.40</b>	<b>16.20</b>		<b>9.00</b>	<b>33.15</b>
Sickness	1.40	1.40	1.40	1.40			4.40
Old-age	4.00	14.00	4.00	5.00		9.00	18.00*
Disability	3.00	3.00	3.00	3.00			6.00
Unemployment	1.00	1.00	1.00	1.00			2.00**
Reserve solidarity f.		4.75		4.75			4.75
Accident		0.80		0.80			
Guarantee		0.25		0.25			
	13.40	35.20	13.40	26.20	0.00	9.00	47.15
<b>Total</b>	<b>48.60</b>		<b>48.60</b>				<b>47.15</b>

\*Note: Old-age insurance of self-employed can be paid either as 18% to public pillar, or 9% to public and 9% to private pillar.

\*\*Voluntary payment.

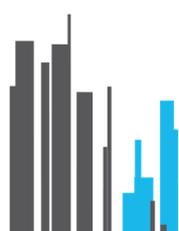
### 3.2 The social system

The Slovak benefit system consists of three components, termed as contributory, social assistance and poverty, and state social support.

- Contributory benefits include old-age pension, early old-age pension, disability pension, widow's and widower's pension, orphan's pension, sickness cash benefit, benefit for nursing a sick relative, equalization allowance, maternity benefit, and unemployment insurance benefit.
- Social assistance program covers material need benefit.
- State social support includes several programs, namely child birth grant, additional birth grant, multiple birth benefit, child benefit, additional child benefit, parental allowance, funeral benefit, scholarships for pupils in elementary school, scholarships for students in secondary school, and social scholarships for university students.

## 4 Tax and Benefit System Simulations

When constructing any microsimulation model, one needs to select policies that will be simulated and those that will be left out. Not surprisingly, these decisions are usually based on the underlying data constraints. Since the aim of using our microsimulation module is to use it as an input to other labour supply models (more details in *section 4.2* below), the target is to



capture those policies that are primarily relevant with respect to their impact on individual and household incomes.

#### 4.1 Existing models

To the best of our knowledge, the EUROMOD has been the only model available for the Slovak tax-benefit system microsimulations, which could be used equally by government agencies and the academic community. It is an EU-wide tax-benefit microsimulation model that can simulate individual and household tax liabilities and benefit entitlements according to policy rules valid in the respective EU states. EUROMOD is a unique tool that can be used both at national and cross-country levels; moreover it can serve as an input to different labour supply models. Its major advantage is the fact that it is openly accessible and users are able to either alter the existing or add completely new policies.<sup>11</sup> The Slovak EUROMOD runs on SK-SILC data and the simulated policies currently include:

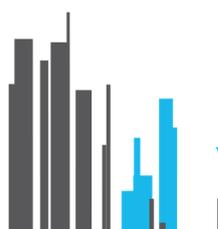
- Personal income tax is simulated in the model as a final tax liability, i.e. it is computed after all tax allowances and tax credits.
- Withholding income taxes are not simulated. Other direct taxes (such as local taxes) and indirect taxes (such as VAT, excise taxes) are also not simulated.
- All health and social insurance contributions paid by employers, employees and self-employed are simulated.
- Benefits that are fully simulated include family related programs, namely child birth grant, child benefit including additional child benefit and parental allowance.
- Means-tested material needs benefit and contributory unemployment insurance benefit are simulated partially under simplifying assumptions.

Simulations of other benefits, which may impact both individual and household incomes, are not included due to the lack of information on previous employment and contribution history. In particular, these include:

- Sickness benefits
- Disability pensions
- Old-age pensions are not simulated since there is no information on contribution record.
- Scholarships, which are means-tested, are not simulated – the reason is that the grades of potentially eligible students are not available.

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<sup>11</sup> For the current state and details of the EUROMOD project, see Sutherland and Figari (2013). The EUROMOD model for Slovakia is well documented in the EUROMOD Country Report, for a detailed overview of application rules and payable eligibility, see Porubsky et al. (2013).



## 4.2 The need for a detailed model

The secretariat of the CBR is currently developing a dynamic behavioural micro-macro model that should be able to provide an assessment of tax and transfer system reforms and to calculate long-run dynamic impacts on employment, GDP, wealth redistribution or government budget. This model is composed of three parts, namely tax-benefit microsimulation module, labour supply module<sup>12</sup> and macro module.

Given the requirements of the task outlined above, a decision to create an own microsimulation model has been taken. The new model has been developed using an existing platform, such that the whole setup of the EUROMOD model was recoded into an independent program<sup>13</sup>. It is important to stress that a primary intention has not been to replace the existing EUROMOD, which is a simple and transparent static tax-benefit calculator. Rather, the objective has been to expand its use and to tailor it directly to demands of dynamic behavioural microsimulation model. Besides these considerations about the type of microsimulation model that was needed – in terms of static/dynamic setup and capability of the inclusion of behavioural responses, also the operation, i.e. how easy is to incorporate it to a dynamic model setup, where the convergence could be achieved only after several iterations, has been an issue.

### 4.2.1. Overview of major differences between EUROMOD and the CBR microsimulation model

All tax and benefit instruments in the CBR model are simulated in the same order as in EUROMOD “spine”. Furthermore, the CBR model also includes the simulation of the length of the eligibility period to a maternity benefit (simulation is incorporated as a separate policy in the “spine”) and a substantial extension of simulation of material needs benefit. The order of simulation and policy interdependencies did not change during years 2009 to 2011.

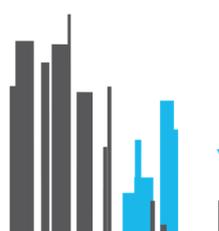
#### *Simulations “by months”*

In the original EUROMOD setup all benefit instruments are simulated on a yearly basis. Based on predefined eligibility requirements, it is tested if an individual is entitled to receive certain benefit. An assignment is provided if the predefined conditions are met and subsequently the corresponding amount is simulated. For example, conditional eligibility to an unemployment benefit (among other conditions, an individual should not receive parental allowance) is checked and parental allowance is simulated prior to unemployment benefit. In other words, subsequent entitlement to certain transfers is ruled by the order of simulation policies. However, this procedure does not take into account possible variability that can occur during the whole period of one year – such that an individual might be eligible for several transfers that are available to him/her subsequently, if these transfers are paid for shorter period than one year.

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<sup>12</sup> For the extensive margin of the labour supply module, see our related working paper by Siebertova et al. (2014).

<sup>13</sup> Software STATA has been used.



In order to allow for changes in receiving different benefits during the annual period, a key difference between the two approaches is that in the CBR model, eligibility to selected transfers is simulated on a monthly basis<sup>14</sup>, depending on the predefined requirements. This applies particularly to family related and unemployment benefits, which are simulated in the following order:

- maternity benefit: length of eligibility period is simulated, which is 7 months (or 9 months in case of multiple births). The amount of benefit is presently not simulated because of lack of information on contribution history to health insurance.
- parental allowance: length of eligibility period is simulated, entitlement ends when the child reaches 3 years of age. Entitlement is possible up to 6 years in case of unfavourable child's health condition, but this cannot be simulated. The amount needs not to be simulated - it is a fix payment.
- unemployment benefit: length of eligibility period is simulated, maximum is 6 months.

Minor modifications of tax-benefit system simulations used in CBR model are detailed in Table C1 in the Appendix. Two major modifications were implemented and these apply to the simulation of material needs benefit and unemployment benefit.

#### *Simulation of the material needs benefit*

The material needs benefit (MNB) is a means tested transfer that is intended for families with income below the minimum subsistence level. The actual benefit amount is calculated as a difference between the eligible maximum of MNB - composed of social benefit, health care allowance, housing allowance, activation and protection allowance - and the income of individuals living in a household. In our simulation, we include a more precise specification of the assessed income computation. Furthermore, we include a different computation of the protection allowance: in our implementation, it is based on the set of predefined eligibility conditions. The essential is the change in the definition of an individual allocation to the activation allowance<sup>15</sup>. EUROMOD, in its original implementation, assigns activation allowance to all those, who are not eligible to receive protection allowance. However, this approach is not based on valid legislation and as a result, it largely overestimates the assignment of the activation allowance (see validation of simulation results in Table 11 below). On the contrary, in our approach we define eligibility conditions that an individual needs to fulfil in order to be entitled to draw this allowance. This gives us a set of people who potentially might take part in activation

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<sup>14</sup> This approach could be applied thanks to the fact that in SK-SILC dataset information on month of birth of an individual is recorded. Consequently, based on the month of the year when a child was born, it is possible to accurately allocate family related benefits.

<sup>15</sup> SK-SILC survey contains a question on how many persons from the household received activation allowance in the income reference period. There is no assignment on the individual basis, who actually took part in activation works.



works. In the next step, we randomly draw<sup>16</sup> from this predefined group a subset of individuals (who will be finally assigned to activation works participation), such that the ratio of those who participate in activation works to total number of those who receive MNB equals, when compared to the official statistics. For a detailed summary on identified differences between the two models, see Table C1 in the Appendix.

#### *Simulation of the unemployment benefit*

The unemployment insurance benefit is a contributory transfer aimed to compensate temporarily for the income loss due to unemployment. In our adaptation (as compared with EUROMOD) we provide a more precise simulation of eligibility period on a monthly basis, this is possible also thanks to the more precise simulation of the length of the maternity benefit.

Another major adjustment closely connected with the simulation of this benefit appears in the labour supply module of our model, and follows as a next step after tax-benefit calculations.<sup>17</sup> When we model the extensive margin of labour supply, we simulate several hypothetical scenarios concerning the labour market states of individuals. In the situation, when the labour income of employed individuals is hypothetically set to zero (persons are hypothetically set out of workforce), eligibility conditions to receive an unemployment benefit are simulated. Based on the predefined eligibility conditions, a set of potential unemployment benefit recipients is formed. Using the same logic as in the simulation of MNB, a subset of beneficiaries is randomly drawn such that the ratio of recipients to the total number of unemployed matches the official statistics.

## **5 Model and validations of simulation results**

Most surveys do contain caveats in the data and it is questionable to what extent a microsimulation model should reproduce reality. Frequently, there is a trade-off between developing realistic results and adjusting the underlying data to produce such results. Nevertheless, it is generally preferable to adjust the data minimally – unless the applied correction is overall robust.

Validation of model outputs, i.e. comparison of computed results with reality, is a useful approach to test the overall relevance and weak points of the microsimulation model. However, one should always bear in mind what the principal purpose of using the model is, and in this light, some discrepancies between simulated model and recorded reality might not be an important issue.

There are several possible approaches how to validate results produced by a microsimulation model. We adopt an approach similar to EUROMOD country reports, where baseline systems

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<sup>16</sup> Another approach is to model a potential participation in the activation works based on individual demographic characteristics by using a probit model. This approach would be applicable in the future, since starting from 2014 SK-SILC; a survey question on individual participation in activation works will be included.

<sup>17</sup> See the related paper by Siebertova et al. (2014).



are validated and tested at aggregate macro level. Results of microsimulations are validated also at the micro level, where we compare how well individual allocations of simulated transfers respond to records in the input data.

## 5.1 Aggregate validation

Total expenditures and the number of beneficiaries of those transfers that are not simulated, but act as inputs to the model, are compared to the official statistics in section 2.2.1 above. In the next step we look in detail at the transfers that are simulated by our model and compare the simulation results to the official statistics and to the results calculated by the EUROMOD. Finally, aggregate estimates of tax revenues, social security contributions and number of tax payers resulting from our microsimulations are linked to the official statistics and to the EUROMOD results.

### 5.1.1. Validation of outputs from simulation model

A summary on the aggregate validation process of the main simulated benefits is presented in Table 10 to Table 12, where the results produced by CBR and EUROMOD microsimulation models are validated against external official statistics. In addition, the last two columns of Table 10 and Table 11 compare results to the records in SK-SILC input dataset and thus provide information on how well simulations can replicate the original data.

The total number of recipients as well as aggregate amount of payments of unemployment benefit is underestimated both in CBR and EUROMOD<sup>18</sup> models when compared to the official statistics (see columns (III)/(I) in Table 10 and Table 11). The allocation of this benefit can be rather precisely simulated using the information available in the input database. Not surprisingly, simulation results correlate with the overall undersampling of unemployment benefit recipients in SK-SILC (see Table 4).

Aggregate validation of family related benefits, i.e. parental allowance and child birth grant, shows that these transfers are underestimated in our microsimulation model when compared with the official statistics, both in terms of aggregate amounts and number of recipients. The reported underestimation of these transfers directly mirrors undersampling of newborn and small children in SK-SILC. Moreover, precision of simulation of parental allowance is limited also by the available information in the input data; it is not possible to capture cases when the allowance is granted up to 6 years of child's age due to unfavourable child's health condition. Child benefit payments and recipients are approximately 10% overestimated compared to the official data. Note that matching is relatively good since also the corresponding age cohort (0-26 years), where the eligibility applies, is well represented in SK-SILC. When these family benefits are compared to SK-SILC data, overall they match relatively well. The only exception is the child birth grant that is substantially overestimated both in 2010 and 2011. This fact can be

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<sup>18</sup> Differences in simulation of unemployment benefit in CBR and EUROMOD models are minor, see Table C1.



explained by the interplay of several factors. First, the child birth grant is a one-off payment to parents of a child. In our simulation, it covers also the additional child birth grant which is a one-off payment that can be paid out after one month (child should be at least 28 days old). If the child was born at the end of year, parents could have applied for this benefit only in the next year. However, in our simulation we did not take this timing into account and we might have incorrectly assigned the payment. Furthermore, under certain conditions, parents are only eligible to receive the child birth grant and not the additional child birth grant. Note that the additional child birth grant is more than four times higher than child birth grant.<sup>19</sup> If the additional grant is incorrectly assigned, this may lead to substantial overestimation of the aggregate amount.

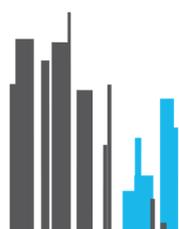
**Table 10: Simulated benefits: Aggregate amounts (in mil. EUR)**

	Official stat. (I)	SILC (II)	CBR (III)	EUROMOD (IV)	(III) / (I)	(IV) / (I)	(III) / (II)	(IV) / (II)
<b>2009</b>								
Unemp. benefit	172,578.56	136,889.93	134,162.71	133,288.45	0.78	0.77	0.98	0.97
Parental allowance	259,206.43	170,507.04	155,786.39	211,746.99	0.60	0.82	0.91	1.24
Child benefit	304,585.41	320,340.84	333,368.22	262,247.34	1.09	0.86	1.04	0.82
Child birth grant	40,786.36	25,066.60	27,659.30	27,555.47	0.68	0.68	1.10	1.10
Material needs benefit	231,354.18	142,857.85	218,376.10	338,549.19	0.94	1.46	1.53	2.37
<b>2010</b>								
Unemp. benefit	150,681.94	100,557.64	97,668.35	97,668.46	0.65	0.65	0.97	0.97
Parental allowance	316,604.87	210,282.95	240,385.72	270,012.11	0.76	0.85	1.14	1.28
Child benefit	314,465.07	339,682.57	344,624.78	272,451.34	1.10	0.87	1.01	0.80
Child birth grant	43,881.52	11,632.61	17,512.15	16,921.22	0.40	0.39	1.51	1.45
Material needs benefit	281,400.95	162,870.05	263,224.53	373,028.80	0.94	1.33	1.62	2.29
<b>2011</b>								
Unemp. benefit	163,513.25	90,696.19	89,065.05	89,065.18	0.54	0.54	0.98	0.98
Parental allowance	341,842.21	204,240.96	217,780.94	265,460.47	0.64	0.78	1.07	1.30
Child benefit	310,682.24	330,690.92	341,801.55	269,538.82	1.10	0.87	1.03	0.82
Child birth grant	44,300.91	18,599.04	27,048.62	27,046.61	0.61	0.61	1.45	1.45
Material needs benefit	272,002.58	141,982.45	259,416.99	337,974.34	0.95	1.24	1.83	2.38

Source: Authors' calculations using SK-SILC, official statistics on unemployment benefit from SSA, other benefits COLSAF.

The aggregate amount of payments of material needs benefit in the CBR model correspond well to the official data, being on average 5% lower. In EUROMOD, this transfer is simulated differently and the applied approach leads to substantial overestimation of the total payments. Table 11, where aggregate numbers of recipients are displayed, offers another comparison. Total number of recipients is underestimated compared to the official statistics mainly due to considerable underestimation of the activation allowance. Note that EUROMOD significantly overestimates this transfer due to overestimation of the activation allowance. Compared to SK-

<sup>19</sup> In 2009 to 2011 child birth grant was 151.37 euro and additional child birth grant was 678.49 euro.



SILC, CBR approach overestimates the number of beneficiaries less than EUROMOD, although in both methodologies, the overestimation is still substantial.

**Table 11: Simulated benefits: Aggregate number of recipients (in thousands)**

	Official stat. (I)	SILC (II)	CBR (III)	EUROMOD (IV)	(III) / (I)	(IV) / (I)	(III) / (II)	(IV) / (II)
<b>2009</b>								
Unemp. benefit	163.48	123.10	121.01	120.44	0.74	0.74	0.98	0.98
Parental allowance	177.60	101.94	100.59	122.70	0.57	0.69	0.99	1.20
Child benefit*	712.87	767.04	769.64	632.97	1.08	0.89	1.00	0.83
Child birth grant	56.53	33.83	35.33	35.33	0.62	0.62	1.04	1.04
Material needs benefit	231.30	98.60	202.23	269.18	0.87	1.16	2.05	2.73
Housing allowance	118.47	39.11	102.95	240.61	0.87	2.03	2.63	6.15
Activation allowance	74.30	54.93	62.42	460.99	0.84	6.20	1.14	8.39
Protection allowance	108.60	n.a.	87.07	160.54	0.80	1.48		
<b>2010</b>								
Unemp. benefit	150.14	91.89	88.26	88.26	0.59	0.59	0.96	0.96
Parental allowance	183.05	100.65	102.85	121.13	0.56	0.66	1.02	1.20
Child benefit*	706.33	745.45	762.14	621.56	1.08	0.88	1.02	0.83
Child birth grant	56.74	17.57	22.22	22.22	0.39	0.39	1.26	1.26
Material needs benefit	244.58	101.18	226.10	273.58	0.92	1.12	2.23	2.70
Housing allowance	116.14	39.32	126.89	250.38	1.09	2.16	3.23	6.37
Activation allowance	85.95	45.47	77.22	467.09	0.90	5.43	1.70	10.27
Protection allowance	103.59	n.a.	86.87	161.23	0.84	1.56		
<b>2011</b>								
Unemp. benefit	142.87	73.41	70.86	70.86	0.50	0.50	0.97	0.97
Parental allowance	184.97	105.36	123.69	126.26	0.67	0.68	1.17	1.20
Child benefit*	697.65	749.21	754.59	613.24	1.08	0.88	1.01	0.82
Child birth grant	56.90	29.79	33.60	33.60	0.59	0.59	1.13	1.13
Material needs benefit	243.68	100.28	217.15	243.50	0.89	1.00	2.17	2.43
Housing allowance	113.80	37.84	111.23	218.69	0.98	1.92	2.94	5.78
Activation allowance	94.40	46.53	77.33	441.77	0.82	4.68	1.66	9.49
Protection allowance	94.88	n.a.	76.61	134.18	0.81	1.41		

Source: Authors' calculations using SK-SILC, official statistics on unemployment benefit from SSA, other benefits from COLSAF).

\* Official statistics on child benefit recipients is taken as the average of monthly data over the year. Official statistics on other benefits is the total number of individual recipients (i.e. incidence).

Table 12 offers a different point of view on the analysis of simulated benefits, here the transfers are validated at the individual level. Individual matching is inspected by using two perspectives. First, individual recipients of transfers in CBR simulations are linked to the corresponding recipients observed in the input data (see column CBR in Table 12) and the share of the two is defined as the match ratio. To complete the picture, also the ratio of matched individual allocations to total number of recipients simulated by CBR model is presented (see column CBR/ CBR total). Observed results suggest that family related instruments and unemployment benefit match well also at the individual level. Simulation of the material needs



benefit is a challenge, results documenting individual allocations confirm the significant overestimation already identified in the aggregate validation.

**Table 12: Individual matching of CBR simulation to SILC: Number of recipients**

	SILC	CBR*	CBR** (total)	CBR / CBR total (%)	match (%) ***	SILC	CBR*	CBR** (total)	CBR / CBR total (%)	match (%) ***
	2009					2010				
Unemp. benefit	291	287	287	100	99	210	202	202	100	96
Parental allowance	301	278	294	95	92	252	227	259	88	90
Child benefit	2356	2262	2365	96	96	2131	2065	2184	95	97
Child birth grant	104	95	108	88	91	47	43	57	75	91
Mat. needs benefit	222	115	503	23	52	214	120	518	23	56
	2011									
Unemp. benefit	187	181	181	100	97					
Parental allowance	265	245	309	79	92					
Child benefit	2153	2054	2169	95	95					
Child birth grant	76	71	85	84	93					
Mat. needs benefit	240	112	513	22	47					

Source: Authors' calculations based on SK-SILC.

\* Number of recipients that were matched with recipients in SK-SILC.

\*\* Total number of recipients in CBR model.

\*\*\* Ratio CBR matched / SILC.

An extensive set of information on simulations related to tax and social insurance instruments is presented in Table 13 where the estimates provided by the CBR model and EUROMOD are compared to the official statistics.<sup>20</sup> Detailed overview of simulated SIC and HIC can be found in Table C 2 - Table C 4 in the Appendix. Overall, the aggregate sum of tax liabilities is underestimated compared to the official statistics in all three years. Unfortunately, official data on aggregate amounts of tax credits and tax allowances from tax authorities are not available. Therefore, we can relate the observed underestimation of personal income tax only to corresponding overestimation of social and health insurance contributions. Note that the overestimation of HIC for the economic active population corresponds well to the over-reported aggregate income from employment and agreements in SK-SILC (see Table 6).

<sup>20</sup> SK-SILC survey asks an explicit question on paid taxes and social insurance contributions only at the household level (aggregate sum). On the individual level, total of paid PIT and SIC has been imputed.

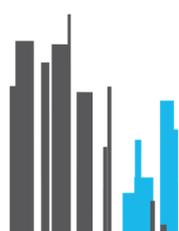


**Table 13: Personal income tax and social insurance contributions: Aggregate amounts  
(in mil. EUR)**

	Official stat. (I)	CBR (II)	EUROMOD (III)	(II) / (I)	(III) / (I)
<b>2009</b>					
Personal income tax (PIT)	1,519,334	1,172,067	1,210,532	0.77	0.80
Social Insurance Contrib. (SIC)					
SIC: Employer	3,198,574	4,206,585	4,210,148	1.32	1.32
SIC: Employee	1,174,680	1,551,264	1,553,046	1.32	1.32
SIC: Self-employed	273,892	279,905	355,568	1.02	1.30
Health Insurance Contrib. (HIC)					
HIC: economic active pop.	2,192,718	2,563,744	2,547,488	1.17	1.16
HIC: economic inactive pop.	1,162,382	1,004,150	1,153,021	0.86	0.99
<b>2010</b>					
Personal income tax	1,513,900	1,221,974	1,354,659	0.81	0.89
Social Insurance Contrib. (SIC)					
SIC: Employer	3,246,656	4,301,687	4,304,876	1.32	1.33
SIC: Employee	1,197,070	1,587,565	1,589,165	1.33	1.33
SIC: Self-employed	266,332	336,498	409,417	1.26	1.54
Health Insurance Contrib. (HIC)					
HIC: economic active pop.	2,243,248	2,626,041	2,618,195	1.17	1.17
HIC: economic inactive pop.	1,282,803	1,254,064	1,231,558	0.98	0.96
<b>2011</b>					
Personal income tax	1,730,483	1,657,723	1,750,768	0.96	1.01
Social Insurance Contrib. (SIC)					
SIC: Employer	3,449,425	4,512,209	4,525,709	1.31	1.31
SIC: Employee	1,266,174	1,669,469	1,670,967	1.32	1.32
SIC: Self-employed	288,366	504,814	600,843	1.75	2.08
Health Insurance Contrib. (HIC)					
HIC: economic active pop.	2,385,268	2,705,210	2,718,284	1.13	1.14
HIC: economic inactive pop.	1,197,816	1,135,574	1,223,780	0.95	1.02

Source: Official statistics on PIT and HIC from Ministry of Finance, SIC from Social Security Agency (SSA).

A possible explanation for the substantial overestimation of SIC can be as follows. The total effect (around 30% both for employees and employers) can be decomposed into several parts. Substantial part (approximately 15 percentage points) might be attributed to the over-reporting of employment income, like in the case of HIC. SIC for employees and employers are in the CBR model simulated based on the reported gross income in SK-SILC database. These aggregates are in validation tables compared to the actually paid amounts, as they are reported in the SSA official statistics. However, SSA total income from insurance should cover also unpaid obligations, which constitute approximately 5% of the total volume of income. These unpaid obligations are not covered in the assessment base of the official SSA statistics in our validation tables since SSA reports only aggregate number (for employees, employers and self-employed) and more detailed structure (that should be related to different categories) is not available. Therefore, the unpaid obligations can constitute additional 5 percentage points part of the overestimation. As a final point, we estimate that extra 5 percentage points can be associated



with the practise when high reward is paid only once a year (here the ceiling for insurance contributions applies) and for the rest of the year only some average wage is paid. The point is that in SK-SILC income is reported on a yearly basis and in our simulations we suppose that income is uniformly distributed across all months. However, as it is clear from SSA data, aggregate gross income is not uniformly distributed across the year.

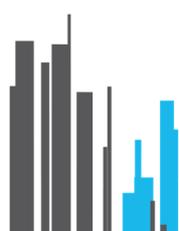
Finally, when the results of the CBR approach and EUROMOD are compared, the significant difference can be identified in the simulation of SIC for self-employed. Although both models overestimate it significantly, CBR model is closer to the official statistics due to the restriction on income of self-employed that was applied. For details and other differences in the two approaches refer to Table C1 in the Appendix.

## 5.2 Validation of income distribution

**Table 14: Personal income tax and social insurance contributions: Aggregate amounts (in mil. EUR), scaled income distribution**

	Official stat. (I)	CBR (II) scaled	CBR (III) original	(II) / (I)	(III) / (I)
<b>2009</b>					
Personal income tax (PIT)	1,519,334	1,555,022	1,172,067	1.02	0.77
Social Insurance Contrib. (SIC)					
SIC: Employer	3,198,574	4,528,719	4,206,585	1.42	1.32
SIC: Employee	1,174,680	1,659,386	1,551,264	1.41	1.32
SIC: Self-employed	273,892	279,905	279,905	1.02	1.02
Health Insurance Contrib. (HIC)					
HIC: economic active pop.	2,192,718	2,717,287	2,563,744	1.24	1.17
HIC: economic inactive pop.	1,162,382	1,004,136	1,004,150	0.86	0.86
<b>2010</b>					
Personal income tax	1,513,900	1,597,163	1,221,974	1.05	0.81
Social Insurance Contrib. (SIC)					
SIC: Employer	3,246,656	4,619,716	4,301,687	1.42	1.32
SIC: Employee	1,197,070	1,694,254	1,587,565	1.42	1.33
SIC: Self-employed	266,332	336,498	336,498	1.26	1.26
Health Insurance Contrib. (HIC)					
HIC: economic active pop.	2,243,248	2,783,354	2,626,041	1.24	1.17
HIC: economic inactive pop.	1,282,803	1,254,456	1,254,064	0.98	0.98
<b>2011</b>					
Personal income tax	1,730,483	2,067,058	1,657,723	1.19	0.96
Social Insurance Contrib. (SIC)					
SIC: Employer	3,449,425	4,840,497	4,512,209	1.40	1.31
SIC: Employee	1,266,174	1,775,597	1,669,469	1.40	1.32
SIC: Self-employed	288,366	504,814	504,814	1.75	1.75
Health Insurance Contrib. (HIC)					
HIC: economic active pop.	2,385,268	2,846,953	2,705,210	1.19	1.13
HIC: economic inactive pop.	1,197,816	1,136,712	1,135,574	0.95	0.95

Source: Authors' calculations using SK-SILC, official statistics on PIT and HIC from Ministry of Finance, SIC from Social Security Agency (SSA).



It was already mentioned above that low-income groups are over-sampled, while high-income are under-sampled in the input data. In Table 14 simulated taxes and social insurance contributions, when the underlying income distribution is rescaled (see section 2.2.2 for details), are compared to original simulation results. The aggregate amount of SIC and HIC for the income related to employment and agreements is over-simulated compared to the official statistics and also compared to the original situation when income has not been rescaled (in all three years it rose by approximately 10 percentage points). On the other hand, simulation of PIT now matches the official statistics well, as it was significantly undersampled in the original dataset, now it is around 20 percentage points higher. Asymmetry observed in the rise of SIC versus rise of PIT could be attributed to the fact that rescaling defined more high-income individuals that pay higher aggregate amount of PIT, while in the payments of SIC there is a ceiling. Income of self-employed has not been rescaled, therefore the results did not change.

## 6 Conclusion

This paper provides a summary on the construction of the Council for Budget Responsibility microsimulation model. An independent model has been developed due to the CBR's need to have a flexibly designed model which can be easily incorporated as a part of larger models. The architecture and the main setup of the CBR model is based on the existing EUROMOD tax-benefit microsimulation model.

A number of challenges were addressed during the process of development. First, we considered issues that were related to the simulation of social structures themselves, i.e. we identified possible improvements (compared to the current version of EUROMOD) such that the tax and benefit system can be replicated as closely as possible. At this point, a major task was to precisely replicate the valid legislation and to source appropriate micro-data. At the same time, we inspected the used micro dataset in great detail and we compared it with administrative statistics. Hence, the simulated output was interpreted also in light of differences between survey data and official statistics. Based on the results obtained so far, we conclude that the identified differences in the survey data do not have a substantial influence on our model's validity.

As a next step, we will extend the tax and benefit model to cover the legislation valid in years 2012 to 2014. This allows us to simulate and ex-post evaluate selected policies and based on the performance to assess the model's validity. Model will be used as a principal tool for the ex-ante evaluation of the suggested changes in legislation.



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## Appendix A – Characteristics and summary statistics of SK-SILC samples

**Table A1: Characteristics of available micro-level datasets in Slovakia**

Dataset	SK-SILC	HFCS	HBS	ISCP	Social Security Agency
	Statistics on Income and Living Conditions	Household Finance and Consumption Survey	Household Budget Survey	Information System on Average Earnings - matched employer/employee administrative dataset	Administrative data from the agency collecting social security contributions
<b>Frequency</b>	yearly / from 2004	one wave available (2010)	yearly	quarterly - data available from the end of 1990s	monthly
<b>Panel</b>	yes	no	no	yes / limited usage	yes
<b>Observations</b>	5,291 HH / 15,440 individuals (SK-SILC 2012)	2,057 HH / 5,351 individuals	4,698 HH	6,600 enterprises / more than 1mil employees	more than 2.7mil individuals
<b>Contents</b>					
<b>Income</b>	detailed info on income and transfers of individuals	gross yearly income of individuals (wage, unempl. benefits), transfers to HH	gross monthly income of individuals (wage, unempl. benefits), transfers	gross wage including bonuses and allowances, net wage, average hourly wage	gross monthly wage (derived from the paid contributions)
<b>Demography</b>	age, gender, education (ISCED), marital status, region	age, gender, education (ISCED), marital status, region	age, gender, education (ISCED), region, marital status	age, gender, education (ISCED), region (ZIP code),	age, gender, region (ZIP code) where a person resides and where (s)he works
<b>Labour market</b>	LM status (work/unemployed, student retired, disability), for employees sector (NACE), occupation (ISCO)	LM status (work/unemployed,...), for employees sector (NACE), occupation (ISCO)	LM status (work/unemployed,...), for employees sector (NACE), occupation (ISCO)	only employees: detailed sector (NACE), occupation (ISCO)	employees, vendors, self-employed
<b>Advantage</b>	extensive information on individual and family relationships, detailed income and transfers	information on financial actives/passives on HH level: bank accounts, funds, mortgages, etc	detailed information on consumption and income	precise computation of hourly wage (comparable across enterprises), good representation of high/low income groups	administrative data - comprises all individuals paying social security contributions
<b>Limits</b>	caveats documented in text	undersampled high income groups, no information on number of months when wage or unemployment benefits were paid	no family relationship, undersampled low/high income groups	information only on employees, taxes paid only implicitly, no information on transfers, no family relationships	information only on gross wage, no information on family relationships

**Table A2: Summary statistics of 2010 SK-SILC (refers to 2009)**

Demographic characteristics	Mean	Std.Dev.	Min	Max	Non-zero obs.
Female	0.531	0.499	0	1	8,634
Age in years	39.012	20.921	0	98	16,163
Education: Primary	0.290	0.454	0	1	4,724
Education: Secondary	0.561	0.496	0	1	9,131
Education: Tertiary	0.149	0.356	0	1	2,417
Family: Single	0.420	0.494	0	1	6,833
Family: Married	0.458	0.498	0	1	7,454
Family: Divorced	0.047	0.211	0	1	763
Mother with child under 3years	0.023	0.151	0	1	380
Student	0.124	0.329	0	1	2,016
Pensioner	0.190	0.392	0	1	3,092
<b>Labour income (yearly)</b>					
Gross wage employment	3,095.468	4,610.848	0	90,000	6,750
Income from self-employment	340.967	2,061.485	0	55,000	763
Other payments made by employers	14.693	195.156	0	20,304	1,009
Income from agreements	42.860	292.125	0	11,784	941
Fringe Benefits except vouchers	12.169	150.752	0	6,000	2,008
Fringe Benefits vouchers	89.970	179.324	0	5,943	5,292
Severance payments	7.931	122.459	0	4,500	100
Termination pay (lump sum )	4.460	258.286	0	26,500	16
Income from abroad	62.445	871.442	0	35,890	143
<b>Non-labour income (yearly)</b>					
Unemployment benefit	19.033	168.797	0	4,680	291
Maternity benefit	7.656	122.365	0	4,270	80
Child birth grant	4.634	62.315	0	1,811.7	104
Child benefit (incl additional child benefit)	62.750	180.440	0	3,588	2,356
Parental Allowance	30.518	247.099	0	12,081	301
Material needs benefit	19.770	239.467	0	9,473	222
Nursing allowance	13.080	175.121	0	7,999.9	118
Sickness and nursing benefits	17.513	188.141	0	8,172	352
Education scholarships	7.489	139.877	0	8,916	111
Other survivor benefits	0.776	8.463	0	521.29	180
Disability pension	98.804	568.563	0	9,840	551
Old-age pension	797.165	1,682.937	0	13,200	3,233
Widow's and orphan's pension	96.884	457.753	0	19,200	1,039
Private pensions	1.228	41.894	0	3,984	38
Income from property	5.457	137.491	0	13,507	289
Investment income - interests	3.223	99.336	0	12,346	1,040
Investment income - dividends	0.422	9.091	0	650	87
<b>Sample size</b>	<b>16,272</b>				



**Table A3: Summary statistics of 2011 SK-SILC (refers to 2010)**

Demographic characteristics	Mean	Std.Dev.	Min	Max	Non-zero obs
Female	0.534	0.499	0	1	8,188
Age in years	39.887	20.905	0	98	15,266
Education: Primary	0.280	0.449	0	1	4,286
Education: Secondary	0.562	0.496	0	1	8,606
Education: Tertiary	0.159	0.365	0	1	2,433
Family: Single	0.418	0.493	0	1	6,402
Family: Married	0.452	0.498	0	1	6,924
Family: Divorced	0.052	0.222	0	1	793
Mother with child under 3years	0.021	0.143	0	1	321
Student	0.126	0.332	0	1	1,934
Pensioner	0.199	0.400	0	1	3,057
<b>Labour income (yearly)</b>					
Gross wage employment	3,252.844	5,301.625	0	14,6000	6,262
Income from self-employment	392.606	2,399.673	0	89,458	742
Other payments made by employers	11.806	128.926	0	10,000	816
Income from agreements	41.656	266.504	0	8,300	923
Fringe Benefits except vouchers	11.458	122.295	0	5,500	1,872
Fringe Benefits vouchers	84.490	206.541	0	11,800	4,977
Severance payments	8.917	251.338	0	20,000	60
Termination pay (lump sum )	2.292	150.128	0	18,000	20
Income from abroad	59.416	852.556	0	30,000	121
<b>Non-labour income (yearly)</b>					
Unemployment benefit	14.267	146.651	0	4,420	210
Maternity benefit	5.915	115.568	0	4,410	51
Child birth grant	2.048	40.133	0	905.54	47
Child benefit (incl additional child benefit)	64.229	194.645	0	4,968	2131
Parental Allowance	34.621	288.086	0	4,920	252
Material needs benefit	21.438	275.232	0	20,752	214
Nursing allowance	9.593	139.521	0	3,300.1	89
Sickness and nursing benefits	13.756	155.963	0	5,186.3	299
Education scholarships	8.173	171.935	0	7,200	80
Other survivor benefits	0.724	7.494	0	254.3	161
Disability pension	106.021	611.249	0	11,664	531
Old-age pension	873.547	1,792.113	0	16,620	3,213
Widow's and orphan's pension	104.855	450.501	0	8,581.7	1,038
Private pensions	1.628	63.827	0	6,000	33
Income from property	8.771	152.781	0	6,500	289
Investment income - interests	3.156	34.813	0	3,000	1,432
Investment income - dividends	1.070	81.804	0	10,000	70
<b>Sample size</b>	<b>15,325</b>				



**Table A4: Summary statistics of 2012 SK-SILC (refers to 2011)**

Demographic characteristics	Mean	Std.Dev.	Min	Max	Non-zero obs
Female	0.536	0.499	0	1	8,281
Age in years	40.135	20.868	0	99	15,355
Education: Primary	0.272	0.445	0	1	4,196
Education: Secondary	0.562	0.496	0	1	8,675
Education: Tertiary	0.166	0.372	0	1	2,569
Family: Single	0.419	0.493	0	1	6,470
Family: Married	0.445	0.497	0	1	6,876
Family: Divorced	0.055	0.229	0	1	855
Mother with child under 3years	0.022	0.147	0	1	341
Student	0.125	0.330	0	1	1,925
Pensioner	0.201	0.401	0	1	3,105
<b>Labour income (yearly)</b>					
Gross wage employment	3,560.444	5,153.741	0	71,172	6,378
Income from self-employment	381.008	2,128.760	0	45,000	740
Other payments made by employers	12.295	79.484	0	4,600	973
Income from agreements	61.615	370.490	0	10,314	963
Fringe Benefits except vouchers	11.098	120.152	0	4,900	1,503
Fringe Benefits vouchers	86.991	181.676	0	4,803	5,328
Severance payments	6.311	121.809	0	7,000	58
Termination pay (lump sum )	2.288	83.409	0	5,700	19
Income from abroad	65.937	878.967	0	25,244	134
<b>Non-labour income (yearly)</b>					
Unemployment benefit	14.667	158.873	0	3,762.6	187
Maternity benefit	11.005	178.001	0	4760	77
Child birth grant	3.146	49.231	0	835.8	76
Child benefit (incl additional child benefit)	61.267	183.333	0	4,968	2,153
Parental Allowance	33.519	270.173	0	4,276.8	265
Material needs benefit	20.073	230.808	0	6,235.2	240
Nursing allowance	10.276	144.858	0	3360	91
Sickness and nursing benefits	16.588	154.732	0	4400	336
Education scholarships	8.610	185.987	0	7200	81
Other survivor benefits	0.798	7.637	0	232.36	182
Disability pension	111.062	622.229	0	8,730.8	551
Old-age pension	899.707	1,849.127	0	13,200	3,227
Widow's and orphan's pension	110.484	452.722	0	8,365.6	1,098
Private pensions	1.372	33.634	0	1500	44
Income from property	6.905	129.701	0	7000	280
Investment income - interests	3.633	28.063	0	2490	1,885
Investment income - dividends	1.629	87.864	0	10,000	83
<b>Sample size</b>	15,440				



## Appendix B - Income distribution and scaling factors

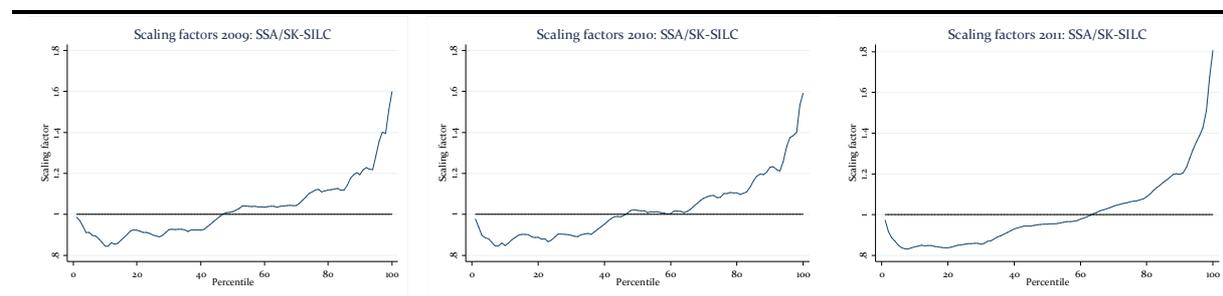
One way how to look at the income distribution of individuals reported in SK-SILC is to calculate percentage shares how the selected income groups contribute to the total labour income. Based on the results reported in Table B1 we can conclude that the weight of the respective income groups is stable over time; approximately 85% corresponds to income from employment, while self-employment reveals only 10%.

**Table B1: Weight of selected income groups on total income in SK-SILC datasets (in %)**

	SK-SILC 2010	SK-SILC 2011	SK-SILC 2012
Gross wage from employment	84.32	84.15	85.02
Income from self-employment	9.29	10.16	9.10
Other payments made by employers	0.40	0.31	0.29
Income from agreements	1.17	1.08	1.47
Fringe Benefits except vouchers	0.33	0.30	0.26
Fringe Benefits vouchers	2.45	2.19	2.08
Severance payments	0.22	0.23	0.15
Termination pay (lump sum )	0.12	0.06	0.05
Income from abroad	1.70	1.54	1.57
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

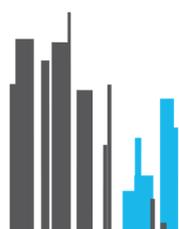
When computing the scaling factors, in the first step observations below minimum wage and those above the 99<sup>th</sup> percentile are excluded both from SSA and SK-SILC datasets. In the next step the mean value of gross income<sup>21</sup>, defined as an income from employment and income from agreements, is computed in every percentile. Scaling factors are constituted as ratios of the percentile specific means from SSA data to SK-SILC.

**Figure B1: Scaling factors and income distribution\***



\*Note: Income from employment and agreements.

<sup>21</sup> Only income from employment and agreements is compared when scaling factors of the two datasets are computed. Self-employed are not included since based on the data from SSA database more than 80% of them report income at the level of minimum wage.

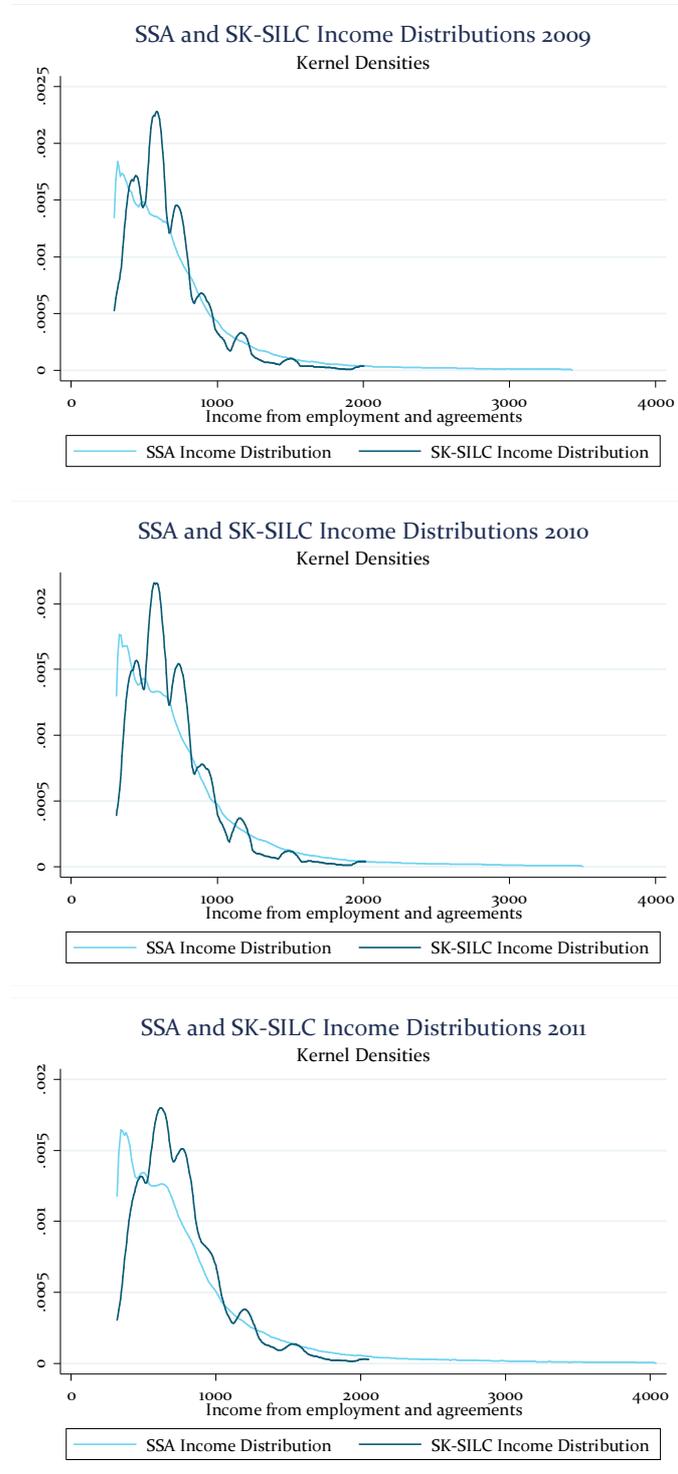


As graphically displayed in Figure B1, low income is over-valued and high income is under-valued in all SK-SILC datasets. Notice that both in 2009 and 2010 income recorded in SK-SILC datasets had comparable median values with the corresponding administrative SSA databases, i.e. scaling factors around the 50<sup>th</sup> percentile were close to one. However, this does not hold in 2011, where the scaling factors equal one around the 65<sup>th</sup> percentile.

Kernel densities of the income distribution that document possible over and under-samplings of SK-SILC are graphed in FigureB2 below. Again, observations below minimum wage and above the 99<sup>th</sup> percentile are left out. Graphs document that individuals with the lowest income around minimum wage are undersampled in SK-SILC. However, lower-income groups with wages below approximately 600 euro per month are over-sampled.



**Figure B2: Kernel densities of the income distribution**



## Appendix C - Differences between CBR tax-benefit module and EUROMOD

**Table C1: Differences between CBR tax-benefit module and EUROMOD I**

Code	Policy	Changes in CBR module	Details of CBR approach	EUROMOD approach
TUDef_sk	Tax units definition	<p>Definition of "in education"</p> <p>Definition of IsDepChild_fam</p> <p>Definition of IsDepChild_bsa</p>	<p>PhD students are excluded</p> <p>IsDepChild_fam definition includes condition <math>age \leq 16   (age \leq 18 \ \&amp; \ disability == 1)   (age &lt; 26 \ \&amp; \ in \ education) \ \&amp; \ disability == 0</math>.</p> <p>IsDepChild_bsa definition includes condition <math>age \leq 16 \   \ (age \leq 18 \ \&amp; \ disability == 1) \   \ age &lt; 26 \ \&amp; \ in \ education) \ \dots</math></p>	<p>all students in tertiary education are included (university and postgradual)</p> <p>IsDepChild_fam definition includes condition <math>age &lt; 16   (age &lt; 18 \ \&amp; \ disability == 1)   (age &lt; 26 \ \&amp; \ in \ education)</math></p> <p>IsDepChild_bsa definition includes condition <math>age &lt; 16 \   \ (age &lt; 18 \ \&amp; \ disability == 1) \   \ age &lt; 26 \ \&amp; \ in \ education) \ \dots</math></p>
il_tscee_base il_tscer_base	Income list definition	Definition of assessment bases il_tscee_base, il_tscer_base	il_tscee_base and il_tscer_base are composed of yemwg only, which already includes yemcs	il_tscee_base and il_tscer_base are composed of yemwg and yemcs
tscse_sk	SIC self-employed	Assignment condition: definition	SIC are computed if current yearly gross profit exceeds minimum wage (formally, restriction $yse * 12 \geq 12 * MinWage$ is applied). This is not entirely in line with valid legislative (current profit vs. previous year return).	Restriction is not included



**Table C1: Differences between CBR tax-benefit module and EUROMOD II**

Code	Policy	Changes in CBR module	Details of CBR approach	EUROMOD approach
tscee_sk tscer_sk	SIC employed	Eligibility condition on paying disability insurance contributions  Eligibility condition on paying unemployment insurance contributions	More accurate calculation of the number of months when disability insurance contributions are paid, taking into account the months in which a person worked as an old age pensioner (a possible overlap between yemmy and poamy).  More accurate calculation of the number of months when unemployment insurance contributions are paid, taking into account the months in which a person worked as an old age/disability pensioner (a possible overlap between yemmy, poamy and pdimy).	Disability insurance contributions are assigned when poamy<12. This excludes only those persons that were old age pensioners during the whole year.  Disability insurance contributions are assigned only when poamy<12 & pdimy<12.
bcc_sk	Parental allowance	Simulation of length of eligibility period  Eligibility condition: definition	Eligibility period to the benefit is simulated on monthly level, it takes into account length of reciprocity of maternity benefit simulated before  Eligibility is conditional on valid legislative, in 2009 it is restricted to those who have no employment income.	Simulation is not included  Restriction is not included
bunct_sk	Unemployment benefit	Simulation of length of eligibility period  Hours worked per week (lhw): definition	Eligibility period to the benefit is simulated on monthly level, it takes into account length of reciprocity of maternity benefit and parental allowance simulated before  Variable lhw is necessary for the simulation of benefit amount. We do not impute missing values when constructing lhw.	Simulation is not included  Missing values of lhw are imputed - it seems that imputation is not completely correct. Unusually frequently value 96 has been imputed.



**Table C1: Differences between CBR tax-benefit module and EUROMOD III**

Code	Policy	Changes in CBR module	Details of CBR approach	EUROMOD approach
bma_sk	Maternity benefit	Simulation of length of eligibility period	Length of eligibility period is simulated based on child's age and on information whether children are twins. The amount of maternity benefit is not simulated.	Simulation is not included
bchba_sk	Additional child birth grant	Eligibility condition: definition	Additional child benefit in case of multiple births included for every child that was born.	Additional child benefit in case of multiple births included only once.
bsa_sk	Material needs benefit	Assessed income: definition	Expanded definition of the assessed income. Assessed income <b>does not</b> include: 25% of old-age pension plus 1% if work history is documented for more than 25 years, 25% of widow/er pension if (s)he exceeds retirement age, 25% of orphan pension, 25% of maternity benefit, 25% of the income from employment. Income from agreements is considered as the assessed income only if it exceeds twice the minimum subsistence level.	Assessed income <b>does not</b> include: 25% of old-age pension plus 1% if work history is documented for more than 25 years, 25% of widow/er and orphan pensions, 25% of maternity benefit, 25% of the income from employment.
		Allowance for a pregnant woman	Eligibility defined for women with non-zero number of small children (<1y.), allowance is added to MNB claim, only if MNB has been already approved.	Not included
		Child schooling allowance	Eligibility defined for all children (6-16y.), allowance is added to MNB claim, only if MNB has been already approved.	Not included

**Table C1: Differences between CBR tax-benefit module and EUROMOD IV**

Code	Policy	Changes in CBR module	Details of CBR approach	EUROMOD approach
bsa_sk	Material needs benefit (continue)	<p>Protection allowance: eligibility conditions</p> <p>Activation allowance: eligibility conditions and simulation of number of participants to match the official statistics</p> <p>Social assistance calculation</p>	<p>Eligibility defined by set of conditions: old-age pensioners, disabled, dependent children, single parent of a small child (&lt;1 year), people taking care of disabled, people with strong activity constraint and very bad health status</p> <p>Eligibility defined by set of conditions, first is assumed that all claimants are eligible. Next those who fulfill given constraints are <b>ruled out</b> from the set of potential participants: recipients of protection allowance, underaged (&lt;18 y.), completed tertiary education, inactive (based on a declared labour market status), full-time workers. Individual participants at activation works are randomly drawn from the set of eligible persons such that the ratio of number of participants in activation works to number of those who receive material needs benefit match the official statistics reported by COLSAF. In 2009 this ratio is set to 0.32, in 2010 it equals 0.35 and in 2011 it is 0.39*.</p> <p>Person can change his/her status (maternity leave, (un)employed, etc.) during the reference period. Social assistance is computed at the end for every status independently and it takes into account an actual income at that moment, not some average income.</p>	<p>Eligibility defined by set of conditions: old-age pensioners, disabled, dependent children, single parent of a small child (&lt;1 year)</p> <p>All who are not eligible to protection allowance receive an activation allowance</p> <p>Not included</p>

\* Source: Authors' calculations based on data from COLSAF.

**Table C 2: Personal income tax and social insurance contributions: Aggregate amounts (in mil. EUR) in 2009**

	Official stat. (I)	CBR (II)	EUROMOD (III)	(II) / (I)	(III) / (I)
<b>Personal income tax</b>	1,519,334	1,172,067	1,210,532	0.77	0.80
<b>Social Insurance Contrib. (SIC)</b>					
<b>SIC: Employer</b>	3,198,574	4,206,585	4,210,148	1.32	1.32
Sickness insurance	160,708	221,663	221,725	1.38	1.38
Old-age insurance	1,786,852	2,351,972	2,353,535	1.32	1.32
Disability insurance	373,348	494,178	495,128	1.32	1.33
Unemployment insurance	123,226	163,435	163,757	1.33	1.33
Guarantee insurance	25,310	39,592	39,607	1.56	1.56
Reserve solidarity fund	616,148	797,996	798,526	1.30	1.30
Accident insurance	112,982	135,185	135,303	1.20	1.20
Insurance paid from agreements		2,564	2,566		
<b>SIC: Employee</b>	1,174,680	1,551,264	1,553,046	1.32	1.32
Sickness insurance	160,280	221,663	221,725	1.38	1.38
Old-age insurance	518,790	671,988	672,435	1.30	1.30
Disability insurance	372,597	494,178	495,128	1.33	1.33
Unemployment insurance	123,013	163,435	163,757	1.33	1.33
<b>SIC: Self-employed</b>	273,892	279,905	355,568	1.02	1.30
Sickness insurance	37,393	38,996	48,784	1.04	1.30
Old-age insurance	162,017	167,515	207,508	1.03	1.28
Disability insurance	50,565	54,783	67,571	1.08	1.34
Reserve solidarity fund	23,917	18,612	31,705	0.78	1.33
<b>Health Insurance Contrib. (HIC)</b>					
<b>HIC: economic active pop.</b>	2,192,718	2,563,744	2,547,488	1.17	1.16
HIC: employees	579,787	729,469	729,956	1.26	1.26
HIC: self-employed	143,489	155,128	157,743	1.08	1.10
HIC: employers	1,428,094	1,631,080	1,631,781	1.14	1.14
HIC: voluntary	41,348	48,067	28,007	1.16	0.68
<b>HIC: economic inactive pop.</b>	1,162,382	1,004,150	1,153,021	0.86	0.99

Source: Official statistics on PIT and HIC from Ministry of Finance, SIC from Social Security Agency (SSA).



**Table C 3: Personal income tax and social insurance contributions: Aggregate amounts (in mil. EUR) in 2010**

	Official stat. (I)	CBR (II)	EUROMOD (III)	(II) / (I)	(III) / (I)
<b>Personal income tax</b>	1,513,900	1,221,974	1,354,659	0.81	0.89
<b>Social Insurance Contrib. (SIC)</b>					
<b>SIC: Employer</b>	3,246,656	4,301,687	4,304,876	1.32	1.33
Sickness insurance	167,808	228,235	228,296	1.36	1.36
Old-age insurance	1,811,424	2,403,104	2,404,495	1.33	1.33
Disability insurance	378,284	505,577	506,403	1.34	1.34
Unemployment insurance	125,001	167,158	167,474	1.34	1.34
Guarantee insurance	25,974	40,758	40,771	1.57	1.57
Reserve solidarity fund	624,209	815,350	815,823	1.31	1.31
Accident insurance	113,956	139,151	139,256	1.22	1.22
Insurance paid from agreements	0	2,355	2,358		
<b>SIC: Employee</b>	1,197,070	1,587,565	1,589,165	1.33	1.33
Sickness insurance	167,798	228,235	228,296	1.36	1.36
Old-age insurance	525,957	686,594	686,991	1.31	1.31
Disability insurance	378,320	505,577	506,403	1.34	1.34
Unemployment insurance	124,995	167,158	167,474	1.34	1.34
<b>SIC: Self-employed</b>	266,332	336,498	409,417	1.26	1.54
Sickness insurance	37,441	46,595	55,779	1.24	1.49
Old-age insurance	161,110	202,119	239,695	1.25	1.49
Disability insurance	49,990	65,327	77,320	1.31	1.55
Reserve solidarity fund	17,791	22,457	36,623	1.26	2.06
<b>Health Insurance Contrib. (HIC)</b>					
<b>HIC: economic active pop.</b>	2,243,248	2,626,041	2,618,195	1.17	1.17
HIC: employees	584,698	741,181	741,967	1.27	1.27
HIC: self-employed	139,724	185,188	179,422	1.33	1.28
HIC: employers	1,470,265	1,668,936	1,668,062	1.14	1.13
HIC: voluntary	48,561	30,736	28,744	0.63	0.59
<b>HIC: economic inactive pop.</b>	1,282,803	1,254,064	1,231,558	0.98	0.96

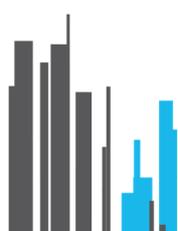
Source: Official statistics on PIT and HIC from Ministry of Finance, SIC from Social Security Agency (SSA).



**Table C 4: Personal income tax and social insurance contributions: Aggregate amounts (in mil. EUR) in 2011**

	Official stat. (I)	CBR (II)	EUROMOD (III)	(II) / (I)	(III) / (I)
<b>Personal income tax</b>	1,730,483	1,657,723	1,750,768	0.96	1.01
<b>Social Insurance Contrib. (SIC)</b>					
<b>SIC: Employer</b>	3,449,425	4,512,209	4,525,709	1.31	1.31
Sickness insurance	166,303	237,710	238,268	1.43	1.43
Old-age insurance	1,925,348	2,520,513	2,528,025	1.31	1.31
Disability insurance	405,650	532,238	533,908	1.31	1.32
Unemployment insurance	134,253	175,926	176,499	1.31	1.31
Guarantee insurance	27,972	42,445	42,534	1.52	1.52
Reserve solidarity fund	665,061	855,177	857,725	1.29	1.29
Accident insurance	124,838	144,572	145,121	1.16	1.16
Insurance paid from agreements		3,628	3,629		
<b>SIC: Employee</b>	1,266,174	1,669,469	1,670,967	1.32	1.32
Sickness insurance	166,297	238,097	238,268	1.43	1.43
Old-age insurance	559,964	721,733	722,292	1.29	1.29
Disability insurance	405,664	533,344	533,908	1.31	1.32
Unemployment insurance	134,249	176,295	176,499	1.31	1.31
<b>SIC: Self-employed</b>	288,366	504,814	600,843	1.75	2.08
Sickness insurance	37,354	66,458	79,297	1.78	2.12
Old-age insurance	158,976	276,451	328,971	1.74	2.07
Disability insurance	49,705	88,952	105,765	1.79	2.13
Reserve solidarity fund	42,331	72,952	86,810	1.72	2.05
<b>Health Insurance Contrib. (HIC)</b>					
<b>HIC: economic active pop.</b>	2,385,268	2,705,210	2,718,284	1.13	1.14
HIC: employees	607,952	692,434	695,452	1.14	1.14
HIC: self-employed	167,327	239,355	240,642	1.43	1.44
HIC: employers	1,527,510	1,727,020	1,736,696	1.13	1.14
HIC: voluntary	82,478	46,402	45,494	0.56	0.55
<b>HIC: economic inactive pop.</b>	1,197,816	1,135,574	1,223,780	0.95	1.02

Source: Official statistics on PIT and HIC from Ministry of Finance, SIC from Social Security Agency (SSA).



## Appendix D – Validation of Tax-Benefit System 2012

The national version of SK-SILC 2013 has been used as a base dataset for the validation exercise of the Microsimulation model of the Slovak Tax-Benefit System valid in 2012.

In the following, tables and graphs of the main text are updated such that they cover also the reference year 2012 and test the validity of the microsimulation model using the system effective in 2012.

### Part 1: Descriptive statistics of the underlying SK-SILC 2013 sample

**Table D1: Descriptive statistics of the grossing-up weight in SK-SILC samples**

	SK-SILC 2010	SK-SILC 2011	SK-SILC 2012	SK-SILC 2013
Individuals	16,275	15,327	15,440	15,426
Households	5,376	5,200	5,291	5,402
Projected population	5,415,559	5,389,454	5,395,519	5,404,664
Projected households	1,911,664	1,911,664	1,911,664	1,852,059
<b>Grossing-up weight</b>				
Mean	332.753	351.631	349.451	350.361
Std. Dev.	117.117	113.936	125.988	131.954
Minimum	106.640	118.822	108.690	119.909
Maximum	1,137.724	1,641.253	1,226.095	1,083.874

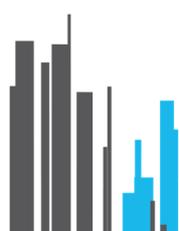
**Table D2: Age cohorts in SK-SILC and population**

Age cohort	SK-SILC / population*			
	2009	2010	2011	2012
0	0.58	0.38	0.55	0.78
0 - 3	0.66	0.61	0.63	0.84
0 - 16	0.84	0.83	0.82	0.96
0 - 26	0.97	0.97	0.98	1.04
Prime age***	1.03	1.02	1.03	1.01
Retirement age	1.10	1.11	1.08	1.01

Source: Authors' calculations using SK-SILC and Slovak Statistical Office

\* Ratio displays number of individuals in SK-SILC (weighted) to population in the respective age cohort.

Prime age: 15-64 years. Retirement age: males 62+, females 58+ (from 2012 females 59+).



**Table D3: Summary statistics of SK-SILC 2013 (refers to 2012)**

Demographic characteristics	Mean	Std.Dev.	Min	Max	Non-zero obs
Female	0.544	0.498	0	1	8,387
Age in years	39.783	21.285	0	99	15,313
Education: Primary	0.277	0.447	0	1	4,269
Education: Secondary	0.561	0.496	0	1	8,650
Education: Tertiary	0.163	0.369	0	1	2,507
Family: Single	0.417	0.493	0	1	6,426
Family: Married	0.443	0.497	0	1	6,827
Family: Divorced	0.060	0.238	0	1	930
Mother with child under 3years	0.029	0.169	0	1	454
Student	0.113	0.316	0	1	1,740
Pensioner	0.202	0.401	0	1	3,113
<b>Labour income (yearly)</b>					
Gross wage employment	3,275.848	4,874.778	0	79,060	6,099
Income from self-employment	382.389	2,280.213	0	51,200	692
Other payments made by employers	12.835	72.531	0	3,000	989
Income from agreements	55.774	508.396	0	50,000	1,048
Fringe Benefits except vouchers	6.453	79.434	0	5,012.5	1,238
Fringe Benefits vouchers	86.675	212.492	0	6,790	5,216
Severance payments	6.178	129.863	0	7,000	51
Termination pay (lump sum )	1.735	65.957	0	4,280	15
Income from abroad	82.352	1,100.795	0	36,800	141
<b>Non-labour income (yearly)</b>					
Unemployment benefit	12.181	148.094	0	6,300	157
Maternity benefit	13.433	202.986	0	6,750	95
Child birth grant	4.667	61.773	0	1,584	100
Child benefit (incl additional child benefit)	66.228	201.692	0	4,664	2,230
Parental Allowance	45.514	317.743	0	10,668	364
Material needs benefit	23.357	254.409	0	7,386	241
Nursing allowance	10.641	166.783	0	8,104	90
Sickness and nursing benefits	18.766	189.412	0	5,700	319
Education scholarships	8.252	167.340	0	7,600	90
Other survivor benefits	0.941	22.357	0	2,580	167
Disability pension	121.394	662.763	0	8,800	589
Old-age pension	938.055	1,914.652	0	14,960	3,258
Widow's and orphan's pension	133.537	582.575	0	12,000	1,113
Private pensions	1.858	42.128	0	2,000	50
Income from property	7.766	128.397	0	6,000	320
Investment income - interests	4.681	84.308	0	10,000	2,092
Investment income - dividends	0.541	17.996	0	1,245	66
<b>Sample size</b>	<b>15,426</b>				



**Table D4: Economic activity of population (in thousands persons)**

	LFS			SK-SILC			SILC / LFS		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Pre-prime age	830.46	832.57	830.58	666.81	666.55	783.15	0.80	0.80	0.94
Prime age*	3,932.09	3,881.09	3,870.04	3,986.02	3,990.65	3,904.05	1.01	1.03	1.01
Post-prime age	672.72	690.66	710.22	735.75	738.32	717.47	1.09	1.07	1.01
Employed	2,317.50	2,315.30	2,329.00	2,314.18	2,312.76	2,233.98	1.00	1.00	0.96
Unemployed	389.00	364.60	377.50	375.08	355.17	360.01	0.96	0.97	0.95
Economic active	2,706.50	2,680.00	2,706.50	2,689.26	2,667.92	2,593.99	0.99	1.00	0.96
Population total	5,421.80	5,392.40	5,410.84	5,388.58	5,395.52	5,404.66	1.00	0.99	1.00

Source: Authors' calculations using SK-SILC and LFS.

\* Prime-age: 15-64 years.

## Part 2: Non-simulated benefits, pensions and statistics on income types

**Table D5 : Unemployment benefit validation: Aggregate number of recipients (in thousands)**

	Official statistics			SILC			SILC / Official statistics		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
	Recipients of unemp. benefit*	138.83	141.85	143.90	80.88	78.53	58.06	0.58	0.55
Unemployed**	389.00	364.60	377.50	375.08	355.17	360.01	0.96	0.97	0.95
Recipients / Unemployed	0.36	0.39	0.38	0.22	0.22	0.16			

Source: Authors' calculations using SK-SILC, COLSAF\* and LFS\*\*.

**Table D6: Individuals with nonzero income (in thousands persons)**

Income from	SSA			SK-SILC			SK-SILC / SSA		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Employment	1,835	1,859	1,828	2,172	2,078	1,983	1.18	1.12	1.08
Agreements	779	859	888	319	337	364	0.41	0.39	0.41
Self-employment	282	277	277	264	372	347	0.93	1.34	1.25
Employment and agreements	2,614	2,718	2,716	2,491	2,414	2,348	0.95	0.89	0.86

Source: Authors' calculations using SK-SILC and SSA (based on total number of employees and self-employed paying SIC).



**Table D7: Aggregate income (in mil. euro)**

Income from	SSA			SK-SILC			SK-SILC / SSA		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Employment	14,632	15,625	16,213	17,393	18,072	16,491	1.19	1.16	1.02
Agreements	663	798	904	224	345	307	0.34	0.43	0.34
Self-employment*	1,084	1,079	1,106	2,245	3,065	3,014	2.07	2.84	2.73
Empl. and agreements	15,295	16,423	17,116	17,618	18,417	16,798	1.15	1.12	0.98

Source: Authors' calculations using SK-SILC and SSA.

\* Validation of income for self-employed is only indicative. SK-SILC reports for self-employed the value of profit/loss in the current year, while the SSA database reports the assessment base which is based on the value of return in the year t-2 (inconsistency both in variable and time).

**Table D8: Non-simulated benefits and pensions: Number of recipients (in thousands persons)**

	SSA			SK-SILC			SK-SILC / SSA		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
<b>Benefits</b>									
Maternity	20	23	24	7	13	15	0.34	0.55	0.61
<b>Pensions</b>									
Old age	955	958	981	1084	1091	1024	1.14	1.14	1.04
Disability	214	223	228	181	188	195	0.85	0.84	0.86
Widow/er	337	337	337	337	356	334	1.00	1.06	0.99
Orphans	28	28	27	19	19	18	0.66	0.69	0.68

Source: SK-SILC, Social Security Agency (SSA)

**Table D9: Non-simulated benefits and pensions: Aggregate amounts (in mil. EUR)**

	SSA			SK-SILC			SK-SILC / SSA		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
<b>Benefits</b>									
Maternity	76,650	107,124	128,873	32,774	66,008	77,728	0.43	0.62	0.60
Sickness	261,773	274,259	299,235	74,277	84,924	101,514	0.28	0.31	0.34
<b>Pensions</b>									
Old age	3,758,182	3,926,901	4,165,740	4,586,734	4,770,933	4,557,389	1.22	1.21	1.09
Disability	656,420	689,217	722,918	574,392	596,370	636,477	0.88	0.87	0.88
Widow/er	546,777	559,056	580,013	514,143	549,542	611,304	0.94	0.98	1.05
Orphans	43,283	43,057	42,801	35,830	35,834	35,238	0.83	0.83	0.82

Source: SK-SILC, Social Security Agency (SSA)



### Part 3: Simulated benefits, personal income tax and social security contributions

**Table D10: Simulated benefits: Aggregate amounts (in mil. EUR)**

	Official stat. (I)	SILC (II)	CBR (III)	EUROMOD (IV)	(III) / (I)	(IV) / (I)	(III) / (II)	(IV) / (II)
<b>2010</b>								
Unemp. benefit	150,681.94	100,557.64	97,668.35	97,668.46	0.65	0.65	0.97	0.97
Parental allowance	316,604.87	210,282.95	240,385.72	270,012.11	0.76	0.85	1.14	1.28
Child benefit	314,465.07	339,682.57	344,624.78	272,451.34	1.10	0.87	1.01	0.80
Child birth grant	43,881.52	11,632.61	17,512.15	16,921.22	0.40	0.39	1.51	1.45
Material needs benefit	281,400.95	162,870.05	263,224.53	373,028.80	0.94	1.33	1.62	2.29
<b>2011</b>								
Unemp. benefit	163,513.25	90,696.19	89,065.05	89,065.18	0.54	0.54	0.98	0.98
Parental allowance	341,842.21	204,240.96	217,780.94	265,460.47	0.64	0.78	1.07	1.30
Child benefit	310,682.24	330,690.92	341,801.55	269,538.82	1.10	0.87	1.03	0.82
Child birth grant	44,300.91	18,599.04	27,048.62	27,046.61	0.61	0.61	1.45	1.45
Material needs benefit	272,002.58	141,982.45	259,416.99	337,974.34	0.95	1.24	1.83	2.38
<b>2012</b>								
Unemp. benefit	175,827.58	71,283.54	70,890.17	66,329.35	0.40	0.38	0.99	0.93
Parental allowance	334,404.98	272,907.03	292,145.00	363,720.70	0.87	1.09	1.07	1.33
Child benefit	312,106.11	370,233.93	372,191.51	303,502.47	1.19	0.97	1.01	0.82
Child birth grant	44,147.10	27,583.57	35,800.56	35,283.12	0.81	0.80	1.30	1.28
Material needs benefit	268,438.46	162,974.48	302,474.47	392,671.75	1.13	1.46	1.86	2.41

Source: Official statistics on unemployment benefit from Social Security Agency (SSA), other benefits from Central Office of Labour, Social Affairs and Family (COLSAF).



**Table D11: Simulated benefits: Aggregate number of beneficiaries (in thousands)**

	Official stat. (I)	SILC (II)	CBR (III)	EUROMOD (IV)	(III) / (I)	(IV) / (I)	(III) / / (II)	(IV) / (II)
<b>2010</b>								
Unemp. benefit	150.14	91.89	88.26	88.26	0.59	0.59	0.96	0.96
Parental allowance	183.05	100.65	102.85	121.13	0.56	0.66	1.02	1.20
Child benefit*	706.33	745.45	762.14	621.56	1.08	0.88	1.02	0.83
Child birth grant	56.74	17.57	22.22	22.22	0.39	0.39	1.26	1.26
Material needs benefit	244.58	101.18	226.10	273.58	0.92	1.12	2.23	2.70
Housing allowance	116.14	39.32	126.89	250.38	1.09	2.16	3.23	6.37
Activation allowance	85.95	45.47	77.22	467.09	0.90	5.43	1.70	10.27
Protection allowance	103.59		86.87	161.23	0.84	1.56		
<b>2011</b>								
Unemp. benefit	142.87	73.41	70.86	70.86	0.50	0.50	0.97	0.97
Parental allowance	184.97	105.36	123.69	126.26	0.67	0.68	1.17	1.20
Child benefit*	697.65	749.21	754.59	613.24	1.08	0.88	1.01	0.82
Child birth grant	56.90	29.79	33.60	33.60	0.59	0.59	1.13	1.13
Material needs benefit	243.68	100.28	217.15	243.50	0.89	1.00	2.17	2.43
Housing allowance	113.80	37.84	111.23	218.69	0.98	1.92	2.94	5.78
Activation allowance	94.40	46.53	77.33	441.77	0.82	4.68	1.66	9.49
Protection allowance	94.88	n.a.	76.61	134.18	0.81	1.41		
<b>2012</b>								
Unemp. benefit	143.90	58.06	58.06	54.14	0.40	0.38	1.00	0.93
Parental allowance	187.62	140.11	162.76	164.52	0.87	0.88	1.16	1.17
Child benefit*	678.74	779.74	788.18	663.65	1.16	0.98	1.01	0.85
Child birth grant	56.99	38.02	42.71	42.71	0.75	0.75	1.12	1.12
Material needs benefit	239.87	102.40	232.02	256.51	0.97	1.07	2.27	2.50
Housing allowance	112.90	39.43	112.33	239.04	0.99	2.12	2.85	6.06
Activation allowance	92.31	54.03	83.57	484.34	0.91	5.25	1.55	8.96
Protection allowance	82.04	n.a.	79.08	168.23	1.02	2.05		

Source: Official statistics on unemployment benefit from Social Security Agency (SSA), other benefits from Central Office of Labour, Social Affairs and Family (COLSAF).

\* Official statistics on child benefit recipients is taken as the average of monthly data over the year. Official statistics on other benefits is the number of individual recipients (i.e. incidence).



**Table D12: Individual matching of CBR simulation to SILC: Number of recipients**

	SILC	CBR*	CBR**	CBR / CBR	match	SILC	CBR*	CBR**	CBR / CBR	match
	(total)	(total)	(total)	(%)	(%) ***	(total)	(total)	(total)	(%)	(%) ***
	2009					2010				
Unemp. benefit	291	287	287	100	99	210	202	202	100	96
Parental allowance	301	278	294	95	92	252	227	259	88	90
Child benefit	2356	2262	2365	96	96	2131	2065	2184	95	97
Child birth grant	104	95	108	88	91	47	43	57	75	91
Mat. needs benefit	222	115	503	23	52	214	120	518	23	56
	2011					2012				
Unemp. benefit	187	181	181	100	97	157	157	157	100	100
Parental allowance	265	245	309	79	92	364	342	419	82	94
Child benefit	2153	2054	2169	95	95	2230	2140	2244	95	96
Child birth grant	76	71	85	84	93	100	93	111	84	93
Mat. needs benefit	240	112	513	22	47	241	135	555	24	56

Source: Authors' calculations based on SK-SILC.

\* Number of recipients that were matched with recipients in SK-SILC.

\*\* Total number of recipients in CBR model.

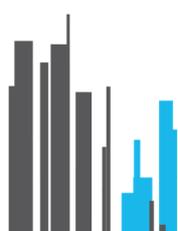
\*\*\* Ratio CBR matched / SILC.



**Table D13: Personal income tax and social insurance contributions: Aggregate amounts (in mil. EUR) in 2012**

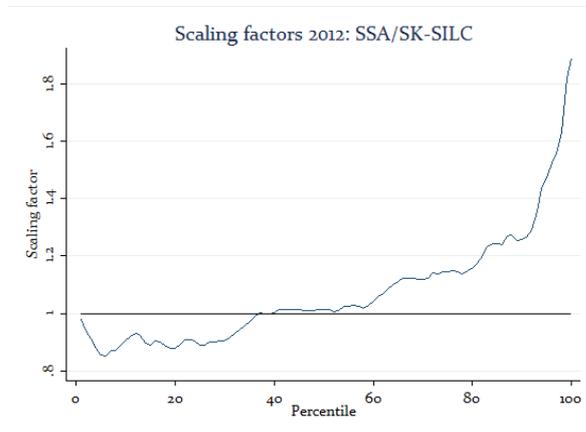
	Official stat. (I)	CBR (II)	EUROMOD (III)	(II) / (I)	(III) / (I)
<b>Personal income tax</b>	1,864,391	1,443,612	1,483,477	0.77	0.80
<b>Social Insurance Contrib. (SIC)</b>					
<b>SIC: Employer</b>	3,580,520	4,123,097	4,136,967	1.15	1.16
Sickness insurance	174,005	220,693	221,164	1.27	1.27
Old-age insurance	2,002,287	2,302,289	2,309,677	1.15	1.15
Disability insurance	421,158	487,017	489,233	1.16	1.16
Unemployment insurance	139,359	160,619	161,397	1.15	1.16
Guarantee insurance	26,951	39,404	39,491	1.46	1.47
Reserve solidarity fund	687,164	781,143	783,648	1.14	1.14
Accident insurance	129,596	131,932	132,357	1.02	1.02
Insurance paid from agreements		3,188	3,191		
<b>SIC: Employee</b>	1,313,414	1,529,705	1,531,697	1.16	1.17
Sickness insurance	174,058	221,082	221,164	1.27	1.27
Old-age insurance	578,600	659,401	659,903	1.14	1.14
Disability insurance	421,358	488,207	489,233	1.16	1.16
Unemployment insurance	139,398	161,016	161,397	1.16	1.16
<b>SIC: Self-employed</b>	286,852	499,020	589,684	1.74	2.06
Sickness insurance	37,250	64,874	77,005	1.74	2.07
Old-age insurance	158,111	272,962	322,585	1.73	2.04
Disability insurance	49,490	89,147	104,958	1.80	2.12
Reserve solidarity fund	42,001	72,038	85,136	1.72	2.03
<b>Health Insurance Contrib. (HIC)</b>					
<b>HIC: economic active pop.</b>	2,426,335	2,512,629	2,515,440	1.04	1.04
HIC: employees	668,052	635,344	637,172	0.95	0.95
HIC: self-employed	151,854	239,475	239,639	1.58	1.58
HIC: employers	1,496,882	1,584,597	1,592,562	1.06	1.06
HIC: voluntary	74,078	53,213	46,067	0.72	0.62
<b>HIC: economic inactive pop.</b>	1,268,096	1,226,680	1,310,730	0.97	1.03

Source: Official statistics on PIT and HIC from Ministry of Finance, SIC from Social Security Agency (SSA).

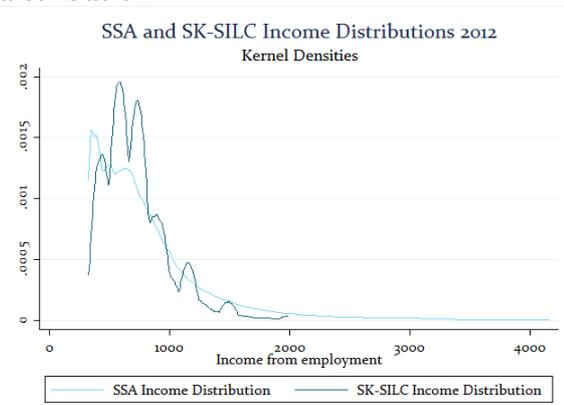


## Part 4: Scaling factors and income distribution

**Figure D1** Scaling factors



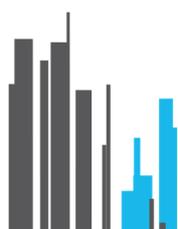
**Figure D2** Kernel densities of the income distribution



Note: Income from employment is considered.

**Table D14: Weight of selected income groups on total income in SK-SILC datasets (in %)**

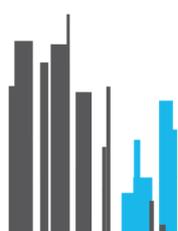
	SK-SILC 2011	SK-SILC 2012	SK-SILC 2013
Gross wage from employment	84.15	85.02	83.78
Income from self-employment	10.16	9.10	9.78
Other payments made by employers	0.31	0.29	0.33
Income from agreements	1.08	1.47	1.43
Fringe Benefits except vouchers	0.30	0.26	0.17
Fringe Benefits vouchers	2.19	2.08	2.22
Severance payments	0.23	0.15	0.16
Termination pay (lump sum )	0.06	0.05	0.04
Income from abroad	1.54	1.57	2.11
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

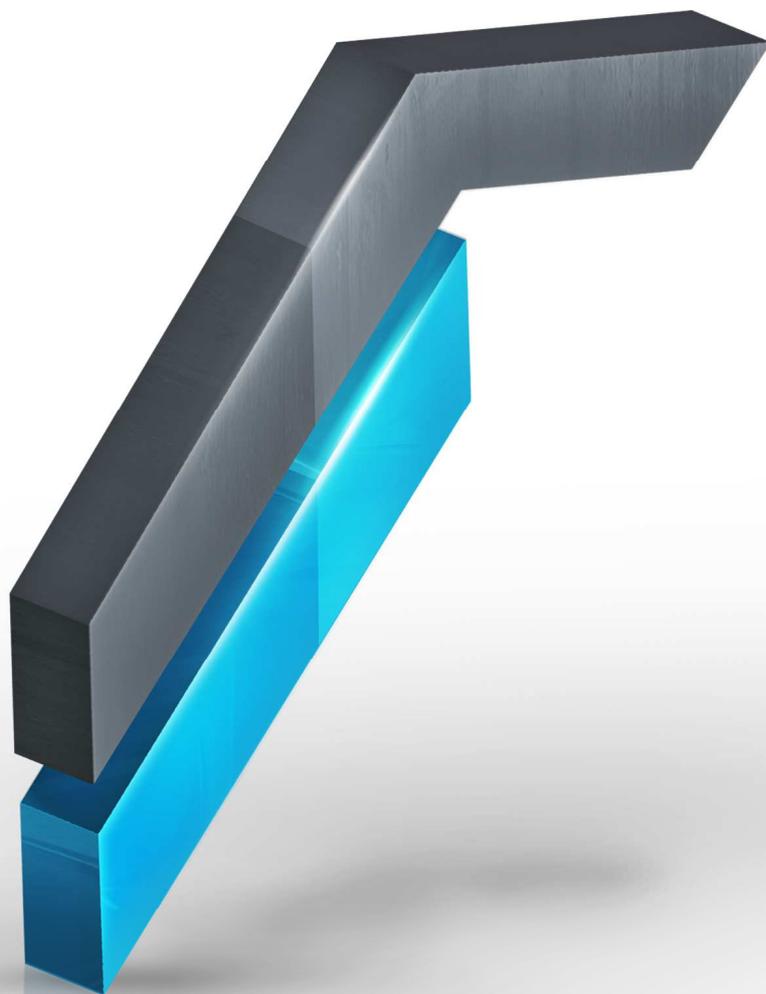


**Table D15: Personal income tax and social insurance contributions: Aggregate amounts (in mil. EUR) in 2012, scaled income distribution**

	Official stat. (I)	CBR (II)	CBR scaled (III)	(II) / (I)	(III) / (I)
<b>Personal income tax</b>	1,864,391	1,443,612	1,730,778	0.77	0.93
<b>Social Insurance Contrib. (SIC)</b>					
<b>SIC: Employer</b>	3,580,520	4,123,097	4,459,541	1.15	1.25
Sickness insurance	174,005	220,693	223,348	1.27	1.28
Old-age insurance	2,002,287	2,302,289	2,500,235	1.15	1.25
Disability insurance	421,158	487,017	529,257	1.16	1.26
Unemployment insurance	139,359	160,619	174,656	1.15	1.25
Guarantee insurance	26,951	39,404	39,865	1.46	1.48
Reserve solidarity fund	687,164	781,143	848,293	1.14	1.23
Accident insurance	129,596	131,932	143,886	1.02	1.11
Insurance paid from agreements		3,188	3,188		
<b>SIC: Employee</b>	1,313,414	1,529,705	1,645,180	1.16	1.25
Sickness insurance	174,058	221,082	223,723	1.27	1.29
Old-age insurance	578,600	659,401	715,958	1.14	1.24
Disability insurance	421,358	488,207	530,447	1.16	1.26
Unemployment insurance	139,398	161,016	175,053	1.16	1.26
<b>SIC: Self-employed</b>	286,852	499,020	499,020	1.74	1.74
Sickness insurance	37,250	64,874	64,874	1.74	1.74
Old-age insurance	158,111	272,962	272,962	1.73	1.73
Disability insurance	49,490	89,147	89,147	1.80	1.80
Reserve solidarity fund	42,001	72,038	72,038	1.72	1.72
<b>Health Insurance Contrib. (HIC)</b>					
<b>HIC: economic active pop.</b>	2,426,335	2,512,629	2,688,164	1.04	1.11
HIC: employees	668,052	635,344	685,572	0.95	1.03
HIC: self-employed	151,854	239,475	239,475	1.58	1.58
HIC: employers	1,496,882	1,584,597	1,710,313	1.06	1.14
HIC: voluntary	74,078	53,213	52,803	0.72	0.71
<b>HIC: economic inactive pop.</b>	1,268,096	1,226,680	1,227,039	0.97	0.97

Source: Official statistics on PIT and HIC from Ministry of Finance, SIC from Social Security Agency (SSA).





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