

SIMPL: A MICROSIMULATION MODEL FOR POLAND¹

Olivier Bargain (University College Dublin)

Belfield, Dublin 4, bargain@ucd.ie

Leszek Morawski (University of Warsaw)

Długa 44/50, 00-241 Warsaw; lmorawski@wne.uw.edu.pl

Michal Myck (DIW-Berlin)

Mohrenstraße 58, D-10117 Berlin; mmyck@diw.ge

Mieczyslaw Socha (University of Warsaw)

Długa 44/50, 00-241 Warsaw; socha@wne.uw.edu.pl

ABSTRACT: This paper presents SIMPL, a tax-benefit microsimulation model for Poland. The model allows simulating most of the direct taxes, social contributions and benefits in Poland for the years 2003 and 2005. It is based on the Household Budget Survey 2003. We present here the tax-benefit rules, the simulation assumptions, the data and the validation of the model through various robustness checks.

1. INTRODUCTION

In many countries microsimulation models have by now become standard tools for policy design and evaluation, and proved extremely useful in the clarification and analysis of consequences of fiscal reforms. The model presented in this paper aimed at filling this gap in the case of Poland. We introduce the first Polish microsimulation model, christened SIMPL, and the dataset used for application, namely the household budget survey 2003 (Badania Budżetów Gospodarstw Domowych, below referred to as BBGD-2003). The model in its current version allows simulating most of the direct taxes, social contributions and benefits in Poland for the years 2003 and 2005. In addition to official rules, we also describe the assumptions/simplifications made when coding these rules in the model.² We provide a robustness analysis of the model for the year 2003 where the coded rules match the year of the available data and present a similar comparison of simulated and official statistics for 2005 in the Appendix

2. TECHNICAL DESCRIPTION

2.1 Structure of the Model

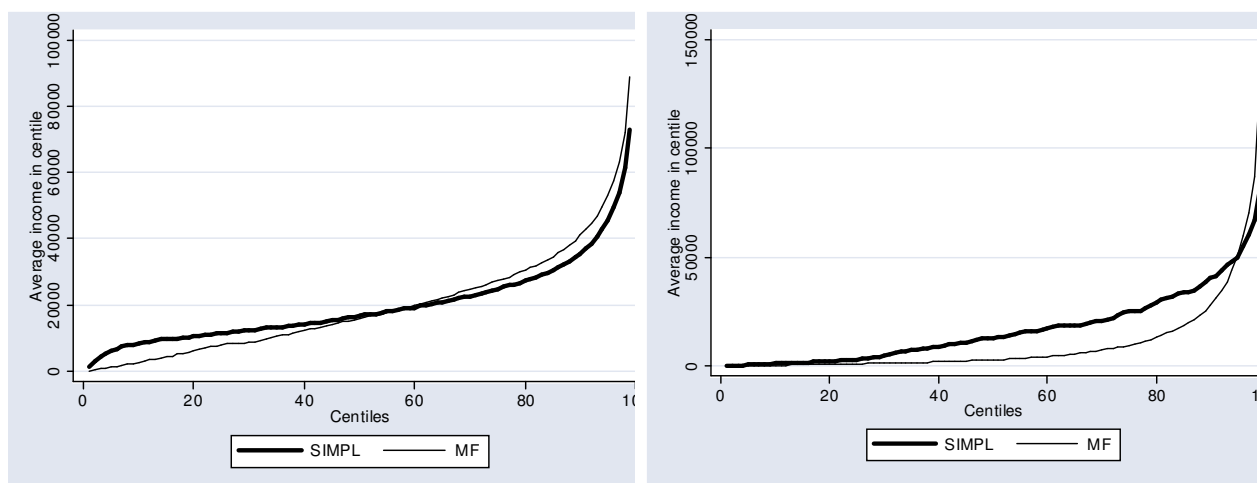
The structure of the model is similar to that of the early French microsimulation model SYSIFF.³ The model is built within an EXCEL file and uses EXCEL functions and VISUAL BASICS macro commands. Outputs typically include household ID, household sample weight, number of adults and children in the household, total household gross income, total household disposable income, and a summary of the various components of disposable income: the total amount of social security contributions (SSC) withdrawn from gross income, the total tax withdrawn, the total amount of family benefits (FB), of housing benefits (HB) and of social assistance (SA). Disposable income is gross income minus taxes and SSC plus all transfers to the household (family benefits, social assistance, etc.). The model computes the effective average tax rate of this household (ATR), as one minus the ratio of disposable over gross income, and the effective marginal tax rate (EMTR), calculated as one minus a marginal variation of disposable income over the corresponding variation of gross income.

Calculations are made at the individual level (e.g. social security contributions), family level (e.g. family benefits) or household level (e.g. housing benefit). The choice is either guided by the tax-benefit legislation itself or by the limits of what can be inferred from the data about the various units under consideration. In the model, a *family* consists of a couple or a single adult individual, with possibly dependent children. Other relatives (non-dependent children, grand-parents, siblings, aunts and uncles, friends and flat mates) are treated as other independent families within the household. Each individual in the household is identified according to the family he/she belongs to and to his/her position in the family: (i) head of the family, defined for convenience as either the only adult in the family or as the man in couples, (ii) spouse and/or (iii) dependent child or children.

In order to delimit families within each household, we need a *global* definition of *dependent children*. Note, however, that each instrument has its own *local* definition of what a dependant child is. To keep the model tractable, we only examine the eligibility of (globally defined) dependent children of a given family, other children being treated as independent families. As a result a preferred *global* definition of a dependent child ought to be relatively broad to cover all those who are then considered as dependent children by various systemic *local* definitions. Dependent children in the model are defined as: (i) someone aged 18 or less, who is neither a parent nor married,⁴ (ii) someone aged 25 or less, neither a parent nor married, in full time education (daytime) regardless of whether he/she works or not, and living with his/her parents, (iii) someone aged 25 or less, neither a parent nor married, in part time education (evening or weekend) and not working and not registered as unemployed, and living with his/her parents.

3. DATA AND INCOME VARIABLES

Computations in SIMPL are based on the Badanie Budżetów Gospodarstw Domowych (Household Budget Survey) from 2003.⁵ The HBS is a cross-sectional household budget survey and is conducted throughout the year, sampling annually over 30,000 households, i.e. about 90,000 individuals. The so-called “model dataset”, the dataset used by SIMPL, is derived from raw data provided by GUS – the Central Statistical Office. The discrepancy between the grossed up population figure (38,096,226 individuals) and the official population statistics (38,174,000) for year 2003 is a result of excluding several groups of the population from the HBS sample frame. These are primarily: (i) individuals in long-term care institutions, (ii) individuals in prisons, (iii) students in boarding schools or student dorms. This discrepancy could not be easily corrected but is very small and should not be a matter of much concern. The final size of the model dataset corresponds to 99.4% of the initial database, and the population weights in the model dataset are adjusted to gross-up to the original population totals.⁶ Raw income variables as collected in the data are net of SSC and net of income tax. Gross earnings are calculated numerically since SSC and income tax are depend in complex way on net earnings. There are several additional difficulties. First, data are recorded on a monthly basis while the tax schedule applies to the cumulated income at a given point in the year (at the date of interview). In the computations we assume that a given person worked for the whole year and that gross earnings were constant over a year. Second, we have no information on whether the net income reported in the BBGD-2003 data takes some of the tax credits or joint taxation of couples into account. In the net-gross conversion we choose to assume joint taxation for one-earner couples. Finally, two other common issues most probably affect the value of reported incomes. First there may be underreporting of incomes in the data (especially at the higher end of the incomes distribution). Second, some people may report incomes from the shadow economy which are not subject to tax and SSC, and are as a result not included in the official figures published by GUS (Central Statistical Office) or tax authorities. It is impossible to verify this information, and thus we work under the assumption that all incomes are legal and thus subject to taxes and SSCs according to general rules. We would expect to see more low-level incomes reported to tax authorities, then in the data and then, as incomes rise to see that underreporting and under-representation leads to higher incomes in the official statistics compared to the information in the data. Figure 1 shows that for both employment and self-employment we observe an expected pattern of average (gross) annual incomes by centile, for centiles from 1-99. There are greater discrepancies for the self-employed who – in official statistics - seem to be much more differentiated in terms of incomes reported in the BBGD. There seem to be very many self-employed with very low incomes. The incomes of the top earners in the official statistics are on the other hand significantly higher than those observed in the data.



a. Employment

b. Self employment

Sources: MF – data provided by the Ministry of Finance. SIMPL – the model database based on BBGD-2003 (grossed up using the model net-gross converter).

Notes: Self-employment includes incomes from temporary employment contracts (in both MF and SIMPL data). Average incomes by centile computed for gross annual incomes.

Figure 1 Average values of incomes by centile – SIMPL and MF – centiles 1-99.

After consultations with the Ministry of Finance we rescaled the incomes in the top centiles in both distributions so that the average income in these centiles matches that in the MF data. This implies scaling incomes in the top SIMPL centiles by a factor of 1.328 in the case of earnings and by a factor of 2.785 for self-employment incomes. These corrections have a relatively small effect on the overall level of gross earnings and self-employment income⁷.

One of the major sources of income in the BBGD data is income from farming. Over 2.5 thousand households report positive values of this income in the data which grosses up to over one-million households. The reported income in the data comes from sales of agricultural produce only from one month. To correct for the seasonal fluctuation we propose we propose to estimate a linear model on the log of farm income with month of interview, region, and farmsize as independent variables. Such a model can be used to produce expected values of income for every month – given farmsize and region, and these in turn can be used to calculate an average expectation of household income. The measure of average household income would be:

$$FInc_i = \frac{\sum_{m=1}^{12} \hat{\beta}' X_{i,m}}{12} \quad (1)$$

where $\hat{\beta}$ are the estimated coefficients from the equation, and $X_{i,m}$ are characteristics of household 'i' in month 'm'. The final specification of the farm income equation included a polynomial for farmsize, interaction of farmsize and farmsize-squared with month of interview, and interaction of a farmsize polynomial with regional dummies.

Each income source is provided in the data for the month of interview, it is transformed into a value for a 'representative' month, i.e. an annual average. Assumptions on how this income varies throughout the year is summarized in Table 1.

Table 1 Income Sources in SIMPL

Income type	Assumptions
Individual incomes	
permanent salary income	Constant across the year → full year job
temporary salary income	One month job (2003)
self-employment income	Full year job
unemployment benefits	6 months for each person
old age pension	Full year pension
invalidity pension	Full year pension
Family incomes	
capital income (financial asset income)	Full year
capital income (property income)	Full year
maternity leave pay	6 (3) months for 2003 (2005)
irregular income (e.g. rehabilitation/sickness/funeral benefits)	One month
family pension	Full year
private alimony received	Full year
Alimony fund payments	Full year
other income (incl. private transfers received)	One month

Replacement incomes (unemployment benefit, old-age and disability pensions, maternity leave pay) depend on individual work and contributions history, and cannot be simulated, thus we use only the information provided in the data.

4. TAXES AND SOCIAL SECURITY CONTRIBUTIONS

4.1 Social Security Contributions (SSCs)

The social security system in Poland covers various types of replacement incomes. Social security contributions are paid on the basis of gross income from work with rates given in appendix. The contributions to retirement and disability insurance are paid as long as the yearly cumulative gross income is lower than a threshold computed as 30 times the average monthly wage from the previous calendar year, which gives 65,850 PLN in 2003 and 72,690 PLN in 2005. Although some forms of temporary incomes are exempt from SSCs, since we cannot distinguish the specific forms of the

contract in the data we assume that SSCs are paid on all employment incomes, subject to the standard rules. Maternity leave benefits and unemployment benefits are liable to retirement and disability insurance contributions, with standard rates and thresholds. Old age pension, family pension, disability pension and pre-retirement transfers are not liable to contributions. The monthly basis for social security contributions from self-employment income was equal to 75% of economy-wide average monthly wage in the previous quarter in 2003 and 60% of it in 2005. The farmer pays quarterly pension insurance contribution that comes to 30% of the basic farmer's pension for each person covered by the pension insurance. The yearly amount in 2003 was 663.3PLN and 675.2PLN in 2005. The farmer pays also the accident, health and maternity insurance contribution to Contributory Social Insurance Fund of Farmers. In 2003 the amounts were 54 PLN per person per quarter. The rates in 2005 were – 60 PLN for the first and the second quarters and 72 PLN for the third and fourth ones.

4.2 Health Insurance (HI)

Health insurance corresponds to a system of benefits for the preventive, diagnostic, therapeutic and rehabilitation costs. Theoretical contributions are paid at the rate of 8% in 2003 (8.5% in 2005) of income from work and replacement incomes net of employer and employee SSCs. Most of this (7.75 percentage points) can be deducted from personal income tax.

4.3 Income Tax (IT): General Principles

The Polish direct tax system consists of 12 types of taxes. We focus on the main instrument, the personal income tax, for which 24 million people have filled a tax return in 2003 (coverage of 77%) and whose receipts account for about 24% of all tax revenues. There are two main forms of income taxation: *progressive taxation*, applying to most of income sources and in particular to salary income and replacement incomes, and *flat-rate taxation* for investment income, income from rent and a few other sources of income.

4.3.1 Tax unit

Personal income tax is individual but couples and single parents may fill a joint tax return with their partners or children respectively. There is a special definition of dependent children used for income tax purposes: (i) a child aged 18 or below, (ii) a child for whom nursing allowance is received, regardless of age, (iii) a child aged 25 or below, student and with income less than a limit of 690.70 PLN in 2003 (695.60 PLN in 2005). For single parents and couples benefiting from income tax splitting, only half of the family income is subject to the tax schedule and the resulting tax liability is then multiplied by two.

4.3.2 Tax allowance and tax base

The main tax allowances are the work costs deducted from labour income and known as ‘revenue costs’. For people with fixed labour contract, the maximum allowance was 1200 in 2003 (1227 in 2005). Other tax allowances (including donations to charities, housing loan interest allowances since 2002, rehabilitation expenses allowance, internet allowance since 2005) are not accounted due to lack of information in the data. The tax base is computed as the total family income from salary work (gross income) and replacement incomes, property income (we assume that all property income is taxed progressively), family pension, self-employment income (we assume that all self-employment income is taxed progressively), minus employee’s SSCs and tax allowances.

4.3.3 Tax schedule and credits

Income taxation in Poland is characterized by progressive marginal tax rates applied to three income brackets. The lowest bracket (with the corresponding 19% rate) ends at 37,024 PLN per year, while the second bracket, where income is taxed at 30%, at 74,048 PLN per year. Beyond this level taxes are paid at a rate of 40%. The system remained unchanged between the years 2003 and 2005 with rates and thresholds fixed in nominal terms. Several tax credits can be deduced from the tax liability in the progressive income taxation: a universal tax credit (530,08 PLN per year), health insurance and housing tax credits (which are not accounted for in the model due to lack of necessary information). It is worth noting that as a result of the tax splitting system for couples and single parents the value of the universal tax credit effectively doubles for these types of families.

4.3.4 Linear taxation

Linear taxation concerns essentially all capital income including savings, investment income, income from rent, etc. In SIMPL, data are rationalised into two types of capital incomes, defined at the family level: income from property and income from financial assets or investment income. Investment income is taxed at a 20% flat rate. In the model we assume that all property income is taxed as part of progressive income taxation.

4.4 Taxation of farmers and self-employed

Incomes from agricultural activities, with some exceptions, are liable to an agricultural tax whose tax base depends on the farm size expressed in ‘conversion hectares’. The calculation of this farm area depends on the type of arable land, the class and the location of the farm. The tax rate for agricultural land amounts to the pecuniary equivalent of 2.5 quintals of rye per conversion hectare while for non-agricultural land 5 quintals of rye per hectare. The data contain information on the conversion hectares for each farm household and the corresponding farm taxes can be thus computed. Income from self-

employment can be taxed under progressive or flat-rate taxation and the type of activity determines which one applies. Since about 82% of self-employed in Poland opt for the former scheme, we apply progressive taxation for all self-employment income in the model.

5. FAMILY AND SOCIAL BENEFITS

We simulate most non-contributory family benefits (FB), housing benefits (HB) and the main elements of the social assistance scheme (SA). As mentioned above, contributory replacement incomes, i.e. national insurance benefits (NI), are typically not simulated due to lack of information of individual employment history, marital status history and health status. Information on pensions and unemployment benefits is used in the model based on declared receipt of these transfers. Unemployed workers receive benefits for a period of 6, 12 or 18 months, beyond which they may be entitled to social assistance. Older workers who become unemployed may receive pre-retirement benefits, which are recorded in the data and treated in the same way as retirement pensions for the purpose of tax computation. Important changes have occurred in the system of family and social transfers between 2003 and 2005. In particular, the nature of some transfers has changed between 2003 and 2005, making the classification of the various instruments fairly complex.⁸ Eligibility conditions or computation rules may have changed substantially, as described below. A summary of the simulated transfers is presented in Table 2.

Table 2 Benefits Simulated in SIMPL.

Model name	Type in 2003	Type in 2005	Description
Family Allowance (FA)	FB	FB	Means tested child benefit
Nursing Allowance (NA)	FB	FB	Not means tested benefit for disability.
Parental leave allowance (PLA)	FB	FB*	Means-tested benefit for voluntary parental leave.
Supplement for child birth (SCB)	SA	FB*	Lump sum for birth or adoption.
Supplement for lone parents (SLP)	-	FB*	Means tested supplement for bringing up a child alone and the loss of the right to unemployment benefit.
Supplement for large family (SLF)	-	FB*	Supplement for third and subsequent children.
Supplement for education of disabled child (SEDC)	-	FB*	Supplement for education and rehabilitation of disabled child.
Supplement for starting the school year (SSS)	-	FB*	Supplement for education expenses.
Social assistance – permanent and periodic (SA)	SA	SA	Main social assistance scheme.
Allowance for disabled childcare /Nursing Benefit (NB)	SA	FB	Means tested allowance for parents voluntarily on leave to care for disabled children.
Housing benefit	HB	HB	Means tested housing benefit.

FB*: in 2005, these benefits are supplement of the Family Allowance (FA) and as such, are conditional on the same eligibility rules

Some non-contributory transfers are not (or only partially) simulated in the model due to lack of information required to simulate the benefit or to identify a particular type of recipient. Two of them are related to Social Assistance and described below. The third one is the supplement for starting education outside the household (*Dodatek na podjęcie przez dziecko nauki w szkole poza miejscem zamieszkania*). This cannot be simulated as we do not have information of school location in the data. The last one is the sickness childcare benefit (*Zasiłek chorobowy*), which depends on (unknown) employment decisions and family sickness history.⁹ A general assumption made when simulating benefits in microsimulation models is full take-up of benefits and no tax evasion. This assumption is made for most benefits but SA is subject to a wealth test as explained below.

5.1 Housing Benefits (HB)

In principle, several families in one household could claim HB. It happens rarely (5% of the cases) and therefore in the model we use the household as the unit for computation of the benefit eligibility and applicable amounts and the resulting values are then allocated in equal proportions to each family within this household. The sum of incomes (labour and replacement income, net of social contributions but not net of taxes) of all individuals in the household is used to calculate eligibility and amounts of the benefit. To qualify for HB, income per capita must be below 125% of the Minimum Pension (562.58 PLN/month in 2003 and 2005) for a multi-person household and 175% for a one-person household. There are also restrictions on the size of the flat, which must be smaller than 35m² for a one-person household, and the maximum flat area increases by 5m² for the second and third person, by 10m² for the fourth and fifth person, by 5m² for any additional persons. The eligible amount of HB is computed as a function of imputed expenses (E) and a proportion of total household income (Y_{HB}), following the formula $HB = E - k * (Y_{HB})$, where k equal to 10%, 12%, 15% or 20%, depending on per capita income and household size. Household income for the purposes of HB eligibility computation is the same as for Family Benefits but of course is augmented by the amount of these benefits ($Y_{HB} = Y_{FB} + FB$). As in the case of Family Benefits farmers' income for the purpose of the benefit eligibility computation is computed on the basis of equivalence hectares (and again is augmented by the received FB). Expenses E include rent and other housing related bills (gas, electricity, heating, water, etc.). However, the authorities use imputed rent and expenses in their computations of eligibility, rather than actual values provided by the household. Imputed rent for example corresponds to at most the maximum level of local municipal rent. HB are not taxable but enter income assessment of SA. Since housing benefits are granted by the authorities using imputed and not actual rent and housing

expenditure values, we use a form of imputation in the model as well. Using information on the cost of social rent in the data we calculate the social rent cost per square meter by region and then use this as a proxy for rent values in the computation of HB. Similarly we put as ceiling on the value of housing expenditure at the level of 161PLN (182PLN in 2005) per person in the household. This corresponds to the 75th percentile of housing expenditures per person in the data. The sum of the imputed rent and actual housing expenditures (subject to the per capita ceiling) is then used in the model as a value for “E” in the computation of HB.

5.2 Social Assistance (SA)

Social Assistance system consists of permanent social assistance, temporary social assistance and social assistance in special circumstances. Social assistance is granted from the age of 18. Officially the unit receiving the benefit, or filling the application, is relatively flexible, and families within a household can fill separately or jointly in order to maximise their receipt of SA. In SIMPL we retain the household as the unit of computation, as in most cases this is the best way to fill the application, given a per capita income assessment. In the model the SA receipt is then allocated equally to the different families within the household. Assessed household income (Y_{SA}) for Social Assistance corresponds to:

$$Y_{SA} = Y_{FB} + HB + FB \quad (3)$$

or in the case of farmers to:

$$Y_{SA} = Y_{FB_farm} + HB + FB \quad (4)$$

One-off payments of Family Benefits (i.e. SCB and SSS) are not included in the Y_{SA} . Income of all household members is included and all types of income are aggregated (work and replacement incomes, contributory benefits, property income), except investment income. Social Assistance is a last resort benefit and as such, it does not interact with any other component of the tax-benefit system. In particular, it is neither taxable nor subject to SSCs.

5.2.1 Permanent Social Assistance

The permanent compensation allowance (*Zasilek stały wyrównawczy*, 2003) or permanent allowance (*Zasilek stały*, 2005) is a specific permanent SA allowance for a person unable to work due to disability or age, and who are not entitled to a social insurance invalidity pension. It is computed as the difference

between a threshold (461 for a single, 418 for a family with more than one member) and family per capita income.

5.2.2 Temporary Social Assistance

Temporary Social Assistance (TSA) is a top-up benefit for households which meet two criteria: “insufficient resources” and specific social criteria.¹⁰ The TSA amount corresponds to the difference between a threshold and total household income. The threshold depends on the household composition. In 2003 (2005), the amount is 418 (316) for the first adult in a couple, 461 (461) for the adult in single families, 294 (316) for the other adults (defined as age equal or above 15) in the family, and 210 (316) for any child (defined as aged below 15). Before 2005 although the eligible amounts were determined centrally, the actual payments were at the discretion of local authorities. In 2005 the government guaranteed the payment of 30% of the difference between actual income and the minimum income in case of one person household and 20% of the difference between the family income and this minimum in case of larger households. The payment of the remaining amounts is subject to the discretion of local authorities and its resources. The payment of Social Assistance is also conditional on a judgement of the Local Social Assistance Centre (MOPS) if the family resources other than income justify its payments. Thus although there is no official wealth or assets test, a visit by the MOPS representative in reality acts as such a test. In the model we introduce a type of wealth-test to mimic the local authority discretion concerning the eligibility assessment. The solution retained to overcome this difficulty is a combination of an estimated probability of passing the test and a calibration of the test threshold. We first estimate a probability model of receiving TSA on a set of household characteristics for the entire population. We then use the estimates to generate an expected SA probability value for each household and set a uniform threshold above which a family is eligible. The threshold is calibrated in order to reflect the correct number of recipients of SA according to official statistics. The average amount is calibrated by the fraction of payment paid by the local government. For 2003 it is 20.5% and for 2005 it is 20%.

5.2.3 SA in Special Circumstance

Social assistance in special circumstances (*Zasitek celowy*) is a temporary SA granted in case of: financial problem due to unemployment, chronic illness or disability, income lower than the threshold for SA, and ineligibility for the Social Pension. This benefit is not simulated in the model due to lack of necessary information to simulate it.

6. VALIDATION

The data on the number of recipients of the listed sources of incomes in the SIMPL database seem to be very close to the official statistics, perhaps with the exception of family pensions¹¹. The discrepancy between the number of retirement and invalidity pensioners may result from the confusion of the two sources of income by some respondents (especially old-age recipients of invalidity pensions). This is quite probable especially since the total number of pensioners (retirement and invalidity) in SIMPL and in official statistics is almost identical.

Table 3 Principal income sources and income recipients in SIMPL.

Income source	Amounts mln PLN/month		No. recipients		Monthly average/recipient		Source of validation
	SIMPL	Official stats.	SIMPL	Official stats.	SIMPL	Official stats.	
Permanent salary income	16 814	19 733	9,58	9,24	1 756	2 136	MF
Temporary salary income	608	1 154	0,73	0,85	830	1 360	MF
Self-employment income	3 493	3 293	1,42	1,38	2 454	2 386	GUS
Retirement pension	5 711	5 425	5,01	4,74	1 139	1 144	ZUS
Pre-retirement pension	433	417	0,54	0,51	809	818	ZUS
Invalidity pension	1 936	2 571	2,71	3,10	713	829	MG
Unemployment benefit	359	312	0,50	0,48	724	646	ZUS/KRU
Maternity benefits*	143	82	0,11	0,07	1 294	1 240	ZUS
Family pension*	942	1 423	1,56	1,37	602	1 039	ZUS
Alimony fund#	134	128	0,31	0,50	431	256	ZUS

Notes: * - recipients are families; # - recipients are children in families receiving payments;

All official statistics are for 2003.

Official sources: GUS – central statistical office, ZUS – social security agency for workers and independents, KRUS: social security agency for farmers, MF – Ministry of Finance. Average values are based on unrounded values and thus may not correspond exactly to computed averages on the basis of the rounded numbers reported in the table.

As far as taxes and SSC are concerned the model results compare rather well with official statistics (Table 6), although in all cases there seem to be more contributors in the model than in official statistic. In this respect the highest differences are in the case of the self-employed and temporary work, which are notoriously difficult to simulate given the complexity of the system for the self-employed and lack of relevant information on costs and period of activity. In SIMPL 1.2mln individuals are modelled as contributing the SSCs, while the official statistics give about 0.8mln. In the case of temporary work the number are respectively: 0.6mln and 0.3mln. The most likely explanation of these discrepancies is non-payment of these obligatory contributions by some self-employed and those with temporary jobs, who are modelled as contributing in the model. As a result of these discrepancies in the numbers of

contributors the overall simulated totals are higher. It is somehow reassuring though that the average contributions for both the self employed and the temporary workers are relatively close to the official statistics. As far as the contributions of those in permanent employment are concerned these reflect the official statistics rather well. The average EESIC contribution is slightly lower than the official statistics, but given the higher number of individuals on work contracts in SIMPL which we mentioned earlier (9.58mln vs. 9.05 in official statistics) the total values of SSCs – both employers’ and employees’ seem to be very precisely simulated. The model oversimulates the number of contributors and the total value of contributions to health insurance, as in the case of employers’ SSC contributions is a result of the higher number of self-employed in the model dataset. Income tax is close to the official statistics.

Table 4 Aggregate validation: tax and social security contribution.

Income source	Amounts		No. individuals (mln)		Monthly average/individual		Source of validation
	SIMPL	Official stats.	SIMPL	Official stats.	SIMPL	Official	
Employees’ SSC	3 707	3 504	11.33	10.14	327	345	ZUS
Permanent work income	3 027	3 113	9.58	9.05	316	344	ZUS
Temporary work income	72	35	0.55	0.25	130	138	ZUS
Self-employment income	603	333	1.17	0.78	514	428	ZUS
Maternity replacement income	5	23	0.03	0.07	180	342	ZUS
Employers’ SSC	3 450	3 528	10.2	9.4	340	377	ZUS
Permanent work income	3 372	3 468	9.58	9.0	352	383	ZUS
Temporary work income	72	35	0.55	0.3	130	138	ZUS
Maternity replacement income	6	25	0.03	0.07	200	380	ZUS
Income Tax	2 130	2 489	19.1	23.3	111.6	107.0	MF
Health insurance	1 902	2 236	19.1	20.0	99.7	112.0	NFZ

All official statistics are for 2003.

Official sources: ZUS – social security agency for workers and independents, MF – Ministry of Finance, NFZ – National Health Fund. Average values are based on unrounded values and thus may not correspond exactly to computed averages on the basis of the rounded numbers reported in the table.

Comparisons of simulated and official information on benefit claims will naturally suffer from several causes. Among them are: lack of detailed information concerning eligibility to benefits, inability to model all elements of the benefit system, non take-up of benefits by families which are eligible to claim them due to stigma or some form of costs. The sequence of allocating Social Assistance is the following. First the Permanent Compensation Allowance is simulated. Then Temporary Social Assistance is given to households with the wealth-related expected value of the if the probability of receiving SA over 0.2. The

value has been calibrated to reflect (in combination with the income means-test) the number of families who monthly receive the TSA. According to information from the Ministry of Labour and Social Policy 88 thousand families received the TSA. The model, using the 0.18 wealth test threshold value allocates the TSA to about 90 thousand families. The average value granted in the model is calibrated by 25% proportion of the difference between actual and minimum income which is paid out in the simulations.

Table 5 Aggregate validation: benefits - 2003.

Income source	Amounts mln PLN/month		No. recipients (mln)		Monthly average/individual		Source of validation
	SIMPL	Official stats.	SIMPL	Official stats.	SIMPL	Official stats.	
Housing Benefit (HH)	295	115	2.26	0.99	130.2	116.4	GUS
Social Assistance system							
Social Assistance (FAM)	53	51	0.22	0.20	242.1	255.7	MSP
a) permanent SA	37	34	0.13	0.11	292.4	310.1	MSP
b) temporary SA	15	16	0.09	0.09	170.7	187.0	MSP
Social Pension (FAM)	113	98	0.27	0.23	418.0	419.3	MSP
Nursing Benefit (FAM)	15	24	0.04	0.06	418.0	415.6	MSP
Family Benefits							
Family Allowance	342	272					MSP
	households		4.06	3.01	84.3	90.3	
	children		7.96	6.32	43.0	43.1	
Supplement for lone parent (FAM)	35	7	0.08	0.02	434.5	385.4	MSP
Supplement for child birth (FAM)	0.22	0.14	0.01	0.01	16.7	16.9	MSP
Nursing Allowance (FAM)	110	89	0.74	0.60	148.3	147.9	ZUS
Parental Leave Allowance (FAM)	116	62	0.32	0.16	366.3	377.2	ZUS
Disposable income (HH)	2 519	2 015.40					ME

All official statistics are for 2003.

Official sources: ZUS – social security agency for workers and independents, KRUS: social security agency for farmers, MSP – Ministry for Social Policy, ME – Ministry of Economy.

Social Assistance (SA) in SIMPL includes two means-tested allowances from 2003:

- a) Temporary Social Assistance,
- b) Permanent Compensation Allowance.

Average values are based on unrounded values and thus may not correspond exactly to computed averages on the basis of the rounded numbers reported in the table.

* Eligibility for Social Pension is taken from the data.

Average values of the nursing benefit and of the supplement for child birth are simulated with a high degree of precision. The number of people receiving the lone parents supplement is overestimated in the model in relation to official data. Average values of this benefit are very close to official statistics

and the small difference can be explained because in SIMPL every person is assumed to get 80% of the benefit while in fact they get 100% for the first 12 months. The most likely reason why we overestimate the number of recipients is the assumption we need to make concerning eligibility. Due to lack of data on employment history we are unable to determine if a person resigned from work to take care of a child or not. The official data show that about 3mln families, and about 6.3mln children received Family Benefits in 2003. In SIMPL we simulate the FB receipt by about 4.03mln families and 7.9mln children. The average awards of the benefits closely correspond to the official averages, but the model overestimates the number of FB recipients by about a quarter. Such overestimation in the case of means-tested benefits is very common since in this case we assume full take-up in the model. A non take-up of about 25% is a likely scenario for a benefit which pays out relatively low amounts of benefits and requires a specific benefit application. The total FB fund is thus overestimated by about 25% relative to the actual costs of the benefits. Due to difficulties with identifying benefit eligibility we overestimate the number of recipients of the Nursing Allowance and the number of the Parental Leave Allowance. The average values of the two benefits are however precisely calculated. Non-take-up is also the most likely reason for overestimation of the number of recipients of the Housing Benefit. The combination of cumbersome application procedures, complicated eligibility rules and often small amounts of the benefit once it is granted makes high level of non-take-up very likely. The discrepancy in average values is to a large extent driven precisely by a large number of small amounts of the benefit that households are eligible to. According to the model only about 43% of eligible households receive the benefit. This implies that the total simulated cost of the HB is almost twice as large as in reality.

7. CONCLUSIONS

As far as we know SIMPL model for the year 2003 is the first static tax and benefit model for Poland. Its results seem to keep in line with other such models. The SIMPL2003 gave us a strong background for building an extended version of the model for the year 2005. The preliminary validation results for that model are presented in an Appendix. SIMPL2005 has been recently used for an estimation of the Heckman type selection-corrected wage equation for Poland. Recently it is used for building first microeconomic supply labour model for Poland.

The model database will be updated as new years of data become available. Of course to be able to model tax and benefit systems for years for which data is still unavailable, there needs to be a system of uprating factors to scale the input incomes by appropriate indexes. These uprating factors are included in the model as parameters and can be changed in accordance with the desired uprating method.

APPENDIX

Table A1 Selected elements of the Polish tax and benefit system: 2003 and 2005

	2003	2005
A. Employee SSC rates:		
- retirement insurance	9,76%	9,76%
- disability insurance	6,5%	6,5%
- sickness insurance	2,45%	2,45%
B. Employer SSC rates:		
- retirement insurance	9,76%	9,76%
- disability insurance	6,5%	6,5%
- work accident insurance	2,42%	2,42%
- Labour Fund	2,45%	2,45%
- FGSP	0,15%	0,15%
C. Revenue costs for income tax:		
One job in the area of residence	1 200	1 227
One job outside the area of residence	1 499	1 534
Several jobs in the area of residence	1 799	1 841
Several jobs outside the area of residence	2 249	2 301
D. Family Allowance		
First child	42.5	43
Second child	42.5	43
Third child	52.6	53
Fourth+ child	65.7	66
E. Social Assistance- Contribution to threshold T(n)		
First adult (in couple)	418	316
First adult (single family)	461	461
Other adult (incl. spouse), defined age \geq age15	294	316
Child, defined age $<$ 15	210	316

Table A2 Principal income sources and income recipients in SIMPL - 2005.

Income source	Amounts		No. recipients		Monthly average/recipient		Source of validation
	mln PLN/month		SIMPL	Official	SIMPL	Official stats.	
Permanent salary income	18 646	20 768	9.6	9.5	1 933	2 195	MF
Temporary salary income	559	1 656	0.8	0.9	701	1 795	MF
Self-employment income	3 661	1 581	1.4	1.3	2 586	1 195	GUS
Retirement pension	7 057	6 453	5.8	5.4	1 221	1 186	ZUS
Pre-retirement pension	469	452	0.6	0.5	829	840	ZUS
Invalidity pension	1 724	2 067	2.3	2.3	747	882	MG
Unemployment benefit	259	279	0.3	0.4	743	752	ZUS/KRUS
Maternity benefits*	144	90	0.1	0.1	1 283	861	ZUS
Family pension*	1 049	1 536	1.6	1.4	672	1 108	ZUS

Official sources: , MF – Ministry of Finance ; ZUS – social security agency for workers and independents, GUS – central statistical office, KRUS: social security agency for farmers, MG – Ministry of Economy. Average values are based on unrounded values and thus may not correspond exactly to computed averages on the basis of the rounded numbers reported in the table.

Table A3 Aggregate validation: tax and social security contribution - 2005

Income source	Amounts		No. individuals (mln)		Monthly average/individual		Source of validation
	Mln PLN/month		SIMPL	Official	SIMPL	Official	
Employees' SSC	4 088	3 976	11.51	11.04	355	360	ZUS
Permanent work income	3 353	3 486	9.65	9.46	347	368	ZUS
Temporary work income	65	84	0.60	0.33	109	255	ZUS
Self-employment income	641	390	1.15	1.15	558	339	ZUS
Maternity replacement income	29	17	0.11	0.10	257	160	ZUS
Employers' SSC	3 832	3 986	10.4	9.9	370	403	ZUS
Permanent work income	3 735	3 884	9.6	9.5	387	410	ZUS
Temporary work income	65	84	0.6	0.3	109	255	ZUS
Maternity replacement income	32	19	0.11	0.10	286	177	ZUS
Income Tax	2 478	2 868	19.09	23.27	130	123	ZUS
Health insurance	2 271	2 592	19.08	19.93	119	130	NFZ

Official sources: ZUS – social security agency for workers and independents, NFZ – National Health Fund.

Average values are based on unrounded values and thus may not correspond exactly to computed averages on the basis of the rounded numbers reported in the table.

Table A4 Aggregate validation: benefits - 2005

Income source	Amounts		No. recipients (mln)		Monthly average/individual		Source of validation
	mln PLN/month						
	SIMPL	Official stats.	SIMPL	Official stats.	SIMPL	Official stats.	
Housing Benefit (HH)	212	103	1.61	0.76	131.3	135.1	GUS
Social Assistance system							MSP
Social Assistance (FAM)	113	88	0.46	0.44	244.9	199.6	
a) permanent SA	69	43	0.16	0.14	432.9	311.6	
b) temporary SA	43	45	0.30	0.30	144.7	148.7	
- guaranteed TSA	35	38	0.30	0.30	115.3	126.0	
- municipal TSA	9	7	0.30	0.30	29.5	22.7	
Social Pension (FAM)	67	114	0.16	0.24	419.0	478.0	MSP
Nursing Benefit (FAM)	17	29	0.04	0.07	420.0	420.0	MSP
Family Benefits							MSP/GUS
Family Allowance							
family	293	238	3.28				
children			6.44	5.19	45.5	45.8	
Supplement for lone parent (FAM)	310	126	1.82	0.71	170.4	175.7	
Supplement for large families (CH)	19	13	0.79	0.77	23.9	16.7	
Supplement for education and disabled child (CH)	13	20	0.20	0.30	67.0	66.6	
Supplement for starting the school year (CH)	25	21	3.27	3.00	7.5	7.2	
Supplement for child birth (CH)	9	11	0.21	0.26	41.9	41.7	
Parental Leave Allowance (FAM)	96	56	0.24	0.14	400.0	403.3	
Nursing Allowance (IND)	102	93	0.71	0.64	144.0	144.2	ZUS
Disposable income (HH)	2 519	2 015					MG

Official sources: ZUS – social security agency for workers and independents, MSP – Ministry for Social Policy, GUS – central statistical office, MG – Ministry of Economy.

¹ Acknowledgments: The SIMPL microsimulation model has been created as part of a project jointly funded by three Polish Ministries: the Ministry of Labour and Social Policy, the Ministry of the Economy, and the Finance Ministry. We are extremely grateful for their generous financial support.

² These approximations are inevitable considering the nature of the data, the complexity of the rules, the diversity of individual situations, and the fact that some of the eligibility conditions for benefits are not observables/identifiable.

³ SYSIFF was originally developed at DELTA, Paris, by Francois Bourguignon, Amedeo Spadaro, Olivier Bargain, Isabelle Terraz, José Sastre and others.

⁴ This way, a 16 year old with her own child will not be considered as a dependent child, even if living in the same household as her parents.

⁵ The model is now also functional on 2005 data.

⁶ The weights are adjusted so that the grossed-up population in each of the 16 regions is the same as before selection.

⁷ The overall annual wage-bill increases from 199.0bln to 202.9bln, and the overall annual value of self-employment together with temporary incomes increases from 43.8bln (36.7bln self-employment income, 7.1 temporary incomes) to 48.2bln (41.6bln self employment and 7.2 temporary incomes).

⁸ Some instruments used to be part of Social Assistance (SA) and are now part of Family Benefits (FB), or *vice versa*. The change in the administrations in charge of the payment has no direct consequence for our purposes.

⁹ It is paid to those who must stop working to look after a child below 7, a sick child below 14 (max. 60 days per year) or another member of the family (max. 14 days per year).

¹⁰ The social criteria are related to specific difficulties of the family, meaning that the eligible person belongs to one of the following 'dysfunctionality' groups: poverty, orphanage, disability, unemployment, homelessness, physical or mental impairment, maternity protection, chronic disease, difficulties in social adjustment after imprisonment, inability to provide for the care of household, elemental disaster. In the model, due to lack of such specific information, we must ignore these criteria.

¹¹ The amounts simulated at the household levels have been aggregated over the whole population, taking into account the sample weight of each household.