As SIMPL As That: Introducing a Tax-Benefit Microsimulation Model for Poland

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ABSTRACT

As SIMPL As That:
Introducing a Tax-Benefit Microsimulation Model for Poland[*]

The Polish tax and benefit system is presented in the context of a recently developed microsimulation model, SIMPL. The model allows simulating direct taxes, social contributions and public benefits in Poland for the years 2003 and 2005. It is based on the Household Budgets Survey data (Badania Budżetów Gospodarstw Domowych) from 2003 and 2005. The document describes details of the Polish tax and benefit system and the simulation assumptions which were necessary in modelling it in SIMPL. We provide information on the quality of the data used in the model and some details of the validation process through various robustness checks. Finally we provide examples of application of the model for analysis of effects of policy reforms.

JEL Classification: H24, H31, I32, I38

Keywords: microsimulation, tax and benefit systems, income distribution, Poland

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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.[2] The models, however, are still relatively under-developed in many of the countries which have recently undergone economic transition, several of which recently became new EU members.[3] Yet, arguably it is in these countries that they could prove especially useful, as transformed economies may require a fine institutional tuning and particularly some reforms of the tax system, social security, transfers to low-incomes, disabled or families with children. Apart from the better understanding of reform costs and their redistributive consequences, which the models make possible, microsimulation models also prove indispensable in the economic debate on labour supply issues, labour force participation, fertility and other socio-economic aspects on which tax and benefit systems have a major influence. At the moment, however, these models are still in an early stage in most of the.

The model presented in this paper aims at filling this gap in the case of Poland. We introduce the first fully functional Polish microsimulation model, SIMPL, and the dataset used for its application, namely the Household Budgets Survey (Badania Budżetów Gospodarstw Domowych, below referred to as BBGD). 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 and runs on these two years of the BBGD data. In addition to official rules, we also describe the assumptions/simplifications made when coding these rules in the model.[4] Further 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.

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[2] Applications of microsimulation models abound. See for example: Blundell et al. (2000), Brewer et al. (2001), Clark et al. (2002), Steiner and Wrohlich (2004), Haan and Myck (2007a).

[3] An important exception is the advanced Hungarian microsimulation model at Tarki, presented in Szivos (1998). An EU-funded project, the I-CUE project (Improving the Capacity and Usability of EUROMOD), is also laying the technical basis for a 25-country comparative research infrastructure. Ultimately, the EU-15 microsimulation model EUROMOD could be extended to 25 or more countries.

[4] 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.

The layout of the paper is as follows. Section 2 provides a technical description of the model. Section 3 describes the rules regarding taxes and social security contributions and Section 4 social and family benefits. In each case, we explain the simplifications and assumptions made when interpreting and coding the rules. Section 5 presents the data, the net-to-gross conversion and a quality assessment of the selected dataset. To check the robustness of the model, we present the most important results of the baseline simulation and its comparison to official aggregates (Section 6). In Section 7 we demonstrate applications of the model in simulation of budget constraints for example families and in simulation of effects of six hypothetical reforms on disposable incomes of a representative sample of households from BBGD-2003. Section 8 concludes the paper.

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.[5] The model is built within an EXCEL file and uses EXCEL functions and VISUAL BASICS macro commands. The advantage of this type of model is its simplicity and the fact that it does not require any specific programming skills to take advantage of the model's full functionality. Information about a given household (incomes, socio-demographic characteristics, etc.) is imported into the model and used to process the tax-benefit calculations. The outcome is exported and stored in an output section. The procedure is repeated for all the households of a given dataset.

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.). In addition, 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

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[5] SYSIFF was originally developed at DELTA, Paris, by Francois Bourguignon, Amedeo Spadaro, Olivier Bargain, Isabelle Terraz, José Sastre and others. See Bourguignon et al. (1988) for the first version.

rate (EMTR), calculated as one minus a marginal variation of disposable income over the corresponding variation of gross income.

2.2. Economic Units

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 model allows up to five families and eight individuals per households. 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,[6] (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.

2.3. Income Variables

Incomes provided by BBGD (2003 and 2005) are net of tax and social contributions. The first step of the modelling process is therefore a conversion of net incomes to gross values. Moreover,

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[6] 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.

since 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. This naturally requires assumptions on how this income varies throughout the year. These assumption are specified in Table 1, which summarizes the income variables used in the model. The incomes data provided in the BBGD does not specify the type of contract on the basis of which the income is paid, but only if it comes from a job lasting (or expecting to last) more or less than three months. These are respectively labelled as permanent and temporary salary incomes. In the model we treat the permanent incomes as incomes resulting from a permanent job contract (*umowa o pracę*). Since the two types of temporary contracts (*umowa zlecenie* – commission contract, and *umowa o dzieło* – task contract) cannot be distinguished in the data, we treat all temporary contracts in the model as the more common *umowa zlecenie*. This has implications for assumptions concerning Social Security Contributions, which we describe in detail below.

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

Total gross income from work is the sum of salaries from permanent and temporary jobs and from self-employment. Total gross income for an individual is gross income from work plus unemployment benefit, old-age and disability pensions. Incomes kept at the individual level are typically subject to (individually-based) social security contributions (SSCs). Other incomes (i.e.

not liable to SSCs) are aggregated and made available only at family levels to be used for tax computation (taxes are computed at family level). Gross income for Personal Income Taxation includes the sum of individual gross incomes, family pension, income from property and maternity leave benefit. Investment (financial asset) income is not liable to Personal Income Taxation but instead to a flat tax. Finally, irregular incomes, including rehabilitation, sickness, and funeral benefits, alimony and other incomes, are treated as non-taxable incomes and provided at family level.

Note that as is often the case, 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.

3. Taxes and Social Security Contributions

3.1. Social Security Contributions (SSCs)

The social security system in Poland covers various types of replacement incomes. Insurance related to specific forms of replacement incomes is labelled as being paid either by the employee, the employer or by both. The income base for these computations is gross income defined as:

$$\text{gross income} = \text{net income} + \text{PIT} + \text{HI} + \text{the employee part of SSCs} \qquad (1)$$

The total employer's cost is therefore gross income + employer's SSCs.

Both the employer and the employee pay old-age pension insurance at the rate of 9.76%, as well as disability/survivors' pensions at the rate 6.5%. The total cost of these two types of pension insurance is therefore 32.52%. Insurance for sickness and maternity (or sickness insurance hereafter) is paid only from employees' SSCs, at the rate of 2.45%, while insurance for accidents at work and occupational diseases (or work accident insurance hereafter) is paid by employers. The rate for the latter insurance differs according to the degree of accident hazard; the minimum rate is 0,97%, the maximum rate is 3,86%. In the model we assume the average rate 2,42%. Unemployment benefits are also paid by employers only, through contributions to the Labour Fund (rate of 2.45%) and to the Fund of Guaranteed Employees' Benefits (0.15%).

Social security contributions are paid on the basis of gross income from work.[7] The contributions 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. Other replacement incomes (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 same rate of contributions applied as for incomes from work. Sickness insurance is voluntarily paid by the self-employed and in the model we assume that it is not paid. The self-employed who hold permanent employee contracts do not need to pay SSCs on their self-employment incomes. In the model we assume that all those with permanent employee incomes do not pay SSCs on their self-employment income.

Farmers pay SSCs to Agricultural Social Insurance Fund (KRUS). They pay quarterly pension insurance contributions 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. In the model we assumed monthly average payments equal to 54.7 PLN for 2003 and 56.3PLN for 2005. The farmer pays also the accident, health and maternity insurance contribution to Contributory Social Insurance Fund of Farmers, which covers expenditure on work accident, sickness and maternity benefits, expenditure on prevention and rehabilitation and administrative expenditure. 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.

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[7] In the case of temporary labour contracts (free-lancing) signed under regulation of the Civil Law Act, retirement and disability insurance contributions are to be paid but sickness insurance is paid on a voluntary basis. Contributions to the Labour Fund and FGSP fund are paid but the employer does not pay work accident insurance unless work is accomplished in the employer's office – as assumed in the model. In case of multiple activity (fixed labour contract and a temporary activity signed under the Civil Law Act), SSCs are paid only from the fixed contract. Whether SSC on temporary income are obligatory or voluntary also depend on some other characteristics (like being a student or being disabled).

3.2. Health Insurance (HI)

While sickness insurance provides payment for sickness and maternity expenses, health insurance corresponds to a system of benefits for the preventive, diagnostic, therapeutic and rehabilitation costs. It is also paid from alimonies if they are the only income source. It is not paid by students who receive incomes from temporary job.

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. In practice, if income tax before deduction is larger than full HI, the full contribution is paid and 7.75 points of HI are taken out from the income tax liability, so that only 0.25 (or 0.75 in 2005) points are paid in addition to the Income Tax. If income tax (before deduction) is lower than the computed HI liability, then HI is null.

3.3. Income Tax (IT): General Principles

The Polish direct tax system consists of 12 types of taxes: personal income tax, corporate income tax, inheritance and gifts tax, tax on acts in civil law, agricultural tax, forestry tax, real estate tax, transportation tax, dog tax. 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 (Act of 26 July 1991 on Personal Income Taxation), and *flat-rate taxation* for investment income, income from rent and a few other sources of income (Act of 20 November 1998). Income from farm activity or self-employment is more complex and treated separately.

3.4. Progressive Income Taxation

Tax unit

Personal income tax is individual but couples and single parents may fill a joint tax return with their partners or children respectively. Therefore we use our family definition as the unit of reference. 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 benefit (NB, see below) 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.

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).[8] 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, see equation (1)) 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.

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 (the treatment of HI in relation to income tax is explained above) 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.

3.5.   Flat-rate 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

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[8] Revenue costs from temporary labour contracts are equal to 20% of the contract value (50% for artistic or scientific activities, which is ignored in the model).

at the family level: income from property and income from financial assets or investment income. Investment income is taxed at a 20% flat rate. As far as income from property is concerned two taxation methods exist: the general progressive scheme with three income brackets or lump-sum taxation at 8.5% up to 4000 euros and 20% for higher income. In the model we assume that all property income is taxed as part of progressive income taxation (see above), as in reality this is the more popular of the two.

3.6.   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.

4.   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 (no SSCs are paid on these transfers).

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.[9] Eligibility conditions or computation rules may have changed substantially, as described below. A summary of the simulated transfers is presented in Table 2.

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 is a supplement of the Family Allowance corresponding to education expenses if a child must travel to school.[10] 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.[11]

Finally, note that 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.

4.1. Family Benefits (FB)

General principles

Means-testing of family benefits is conducted on family income per capita (total family income is simply divided by the family size). The income concept used for the eligibility test, Family Benefit assessment income – Y_{FB}, is:

$$Y_{FB} = \text{gross income} - \text{employee's SSCs} - \text{PIT} - \text{HI} + \text{maintenance payments} \qquad (2)$$

where gross income is defined as in (1).

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[9] 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.

[10] Amounts to 80 PLN per month for 10 months (if the child must leave home) or 40 PLN (if the child must only travel to school).

[11] 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).

Table 2. Benefits simulated in SIMPL.

Model name	Original name	Type in 2003	Type in 2005	Description
Family Allowance (FA)	Zasiłek rodzinny	FB	FB	Means tested child benefit
Nursing Allowance (NA)	Zasiłek pielęgnacyjny	FB	FB	Not means tested benefit for disability.
Parental leave allowance (PLA)	Zasiłek wychowawczy (2003)/ dodatek z tytułu opieki nad dzieckiem w okresie korzystania z urlopu wychowawczego (2005)	FB	FB*	Means-tested benefit for voluntary parental leave.
Supplement for child birth (SCB)	Jednorazowy zasiłek macierzyński (2003) / jednorazowy dodatek do zasiłku rodzinnego z tytułu urodzenia dziecka (2005)	SA	FB*	Lump sum for birth or adoption.
Supplement for lone parents (SLP)	dodatek z tytułu samotnego wychowywania dziecka, na które nie ma możliwości zasądzenia alimentów (2005)	-	FB*	Means tested supplement for bringing up a child alone and the loss of the right to unemployment benefit.
Supplement for large family (SLF)	dodatek na wychowywanie dziecka w rodzinie wielodzietne	-	FB*	Supplement for third and subsequent children.
Supplement for education of disabled child (SEDC)	dodatek na kształcenie i rehabilitację dziecka niepełnosprawnego	-	FB*	Supplement for education and rehabilitation of disabled child.
Supplement for starting the school year (SSS)	dodatek na rozpoczęcie roku szkolnego	-	FB*	Supplement for education expenses.
Social assistance – permanent and periodic (SA)	Pomoc społeczna + zasiłek okresowy	SA	SA	Main social assistance scheme.
Allowance for disabled childcare /Nursing Benefit (NB)	zasiłek stały (2003)/ świadczenie pielęgnacyjne (2005)	SA	FB	Means tested allowance for parents voluntarily on leave to care for disabled children.
Housing benefit	dodatek mieszkaniowy	HB	HB	Means tested housing benefit.

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

Income of all family members is included and all types of income (except investment income) are aggregated (work and replacement incomes, contributory benefits, property income).

For farmers, the income assessment relies on an hectare-based imputed earnings (194 PLN/ha):

$$Y_{FB\_farm} = 194PLN * \text{equivalence hectares} \qquad (3)$$

Family Benefits are not taxable nor subject to SSCs. However they enter income assessment for Social Assistance. The three main family benefits in 2003 were the Family Allowance, the Nursing Allowance and the Parental Leave Allowance. The same benefits are prominent in 2005 but a series of supplements, conditional on eligibility to Family Allowance, were added, as detailed below.

Family Allowance (FA)

In 2003, the eligibility to FA requires the presence of dependent persons in the family, defined as (i) a dependent child aged 16 or below, or 20 or below and still in education (school, studies, vocational training), (ii) a dependent spouse who either cares for a disabled child or is at/above retirement age (65 for men and 60 for women) or severely disabled (disability status is recorded in the data).[12]

In 2005 there was a redefinition of the dependent child and the benefits are no longer paid for dependent spouses. A dependent child is defined as follows: (i) a child aged 18 or below, (ii) aged 21 or below and in secondary school, (iii) aged 24 or below and continues education and holds a certificate of disability.[13]

Benefit is granted once a year and means-tested on the basis of previous year's income using the personal income tax form. Income (Y_{FB}) *per capita* over this year must be below a threshold of 548 PLN per month in 2003 (504 PLN in 2005). In 2003 the threshold was different for lone parents (612 PLN), while in 2005, the threshold was 583 PLN if there is any disabled child in the family, and thresholds are the same for lone parents and couples. These levels are cut-off threshold, i.e. there is no phasing out of the benefits.

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[12] As we shall see in Section 7 the payment of the FB to dependent souses will have interesting effects in case of changes of eligibility rules.

[13] Unlike for adults there are no separate invalidity levels which apply for children. In the data child invalidity is identified through receipt Nursing Allowance for a dependent child (NA is not means tested and depends only on the child being classified as disabled).

Amounts of Family Allowance in 2003 were 43 PLN for the first child and for the second child, 53 for the third child and 66 for the fourth and every subsequent child. In 2003 a single parent bringing up a child requiring special care was entitled to double the amount of FA for this child. In 2005 the FA amounts were: 44 PLN for a child in age less then 6 years, 56 PLN for a child in age from 6 to 18 and 65 PLN for a child in age 19 and up to 25.

In the model we identify children requiring special care using their disability status (in the data this is equivalent to receiving Nursing Allowance for a dependent child).

Parental Leave Allowance (PLA)

This allowance is granted to workers taking parental leave to care for at least one child below 6 during maternity leave. Involuntary unemployed parents are not entitled. The maximum duration is 24 months, 36 months if a lone parent or if there are twins, 72 months if the child is disabled and requires special care. In the model, we assume that only the woman would stop working in a couple, and that she receives the allowance over the whole year. We cannot check maternity leave. We simply check if the spouse is indeed inactive (and not job seeker). For 2003 we also check if there is a child up to 2 years old or a child up to 3 in the lone parent family or a disabled child up to 6 years . For 2005 we check only the first and the third conditions since the second one no longer applied.

We suppose here that PLA can be cumulated with FA. In both 2003 and 2005, the means-test of PLA is the same as for FA. In 2005, the allowance is renamed "*Supplement for child care within the period of parental leave*", and as such, is a supplement to FA.

In 2003, monthly amounts were 318,10 PLN for two-parent families and 505,80 PLN for lone parents and persons bringing up the third and each subsequent child. In 2005, the monthly amount is 400 PLN for all families.

Nursing Allowance (NA)

This allowance is not means-tested. It is granted at the value of 141.75 (2003) and 144 (2005) to:

- child aged 16 or less if it has a disability status (2003 and 2005);

- a person above 16 if in moderate disability (2003) and the disability started before they reached adulthood (defined in the system as the period when they were eligible to receive Family Benefits);

- a person above 16 in severe disability (2003 and 2005);

- a person aged 75 yeas old or older who receives nether a disability pension nor a retirement pension (2003 and 2005).

Individuals who receive disability or retirement pensions are not eligible to receive NA. Instead they receive Nursing Supplement the value of which is the same as the value of NA (see below).

Because in the data we cannot identify the age when disability started the procedure of allocating the NA in the model is two step:

1) in the data child disability is recorded as "receipt of NA" – we thus allocate an appropriate NA amount to all children recorded as disabled in the data.

- NA is also allocated to all those aged 75+ who receive neither the disability nor the retirement pension, and to all adults with severe disability status;

- in 2003 NA is granted to individuals with declared moderate disability who have a value reported under NA in the BBGD data.

Supplements to the Family Allowance

In the 2004 reform, two existing benefits (PLA, described above, SCB described below) have become supplements to the Family Allowance (FA). Some other supplements to FA have also been introduced. Thereby, in the 2005 system, eligibility to these supplements depends on both eligibility to FA (general conditions + means-testing) and specific conditions as stated below.

The Supplement for Child Birth (SCB) consists in a 500 PLN lump-sum for the birth or adoption of a child in 2005. In 2003, this instrument is part of social assistance, hence not conditional on FA eligibility and not means-tested at all, and the amount is a lump-sum of 200 PLN for each child born in the year (double if twin).

The Supplement for Large Families (SLF) consists of a 50PLN lump-sum payment for the third child and subsequent children (this is true both for singles and couples).

The Supplement for Starting the School Year (SSS) amounts to 90 PLN, payable once in September, for each child in primary and secondary school (in the model we assume for each child in education below 16).

The Supplement for Education of Disabled Child (SEDC) is granted until the child reaches age 16 or 24 if in education and subject to moderate or severe degree of disability The monthly amount is 50PLN per child under age 5, 70PLN per child aged 5 to 24.

The Supplement for Lone Parents (SLP) is granted to single parents who are not receiving alimony because the child's father is dead or unknown. Eligibility is not granted if alimony is legally determined but father does not pay (in this case, the mother receives payments from the state alimony fund). In the model, we assume eligibility if the mother receives neither private alimony nor alimony fund payments.[14] In the 2003 legislation, SLP can be received for the maximum of 3 years, at the following values: 461 PLN per month the first year, and 80% of this sum in the second and third year. Due to lack of information, in the model we allocate amounts as if we were in the 2nd or 3rd year. The income test for the SLP simply states that income per capita must be less than 461. In 2005, SLP corresponds to monthly amounts of 170 PLN per child and 250 per disabled child, with a maximum of 750 PLN per family. We simply use here our global definition of the dependent child.[15] In 2005 the SLP is a supplement to the FA hence depends on FA eligibility conditions (see above).

Nursing Benefit (NB) (zasiłek stały (2003), świadczenie pielęgnacyjne 2005)

This allowance is *not* means-tested and is part of SA in 2003, while it is means-tested and part of FB in 2005. In 2003 this benefit is granted to a parent (either in couple or single family) in case of resignation from employment to take care of a disabled child. There is no condition on the child age to qualify.[16] The amount of the benefit is 418 PLN in 2003 and 420 PLN in 2005 PLN per month. In 2005 the threshold income on which the benefit is conditioned is the same as for FA in case of presence of a disable child (i.e. family net income must be below 583 per person).

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[14] Additional rule (not modelled, to be checked): in 2003, this allowance for bringing up a child alone requires (i) the child to be 7 at most and (ii) the loss of the right to unemployment benefit due to cessation of the statutory period of its acquisition (i.e. single parent is unemployed without unemployed benefits but had once received some).

[15] Since 1/09/2005: if total income is less than half the usual threshold (291,50 PLN per person), there is an extra 50 per child.

[16] In other words, it is modelled as Parental Leave Allowance but replacing age condition (age 6) by a disability condition.

Once again the full set of eligibility conditions is not available in the BBGD data. We impute "resignation from employment" on the basis of declared inactivity (i.e. someone not working, not unemployed, not a student and not receiving disability or retirement pension), and allocate NB to all families with an inactive parent and a disabled child (who in 2005 pass the income means-test).

4.2.   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 (MP, 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 $35m^2$ for a one-person household, and the maximum flat area increases by $5m^2$ for the second and third person, by $10m^2$ for the fourth and fifth person, by $5m^2$ 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:

$$HB = E - k*(Y_{HB})
\qquad (4)$$

where k equal to 10%, 12%, 15% or 20%. Depending on per capita income 15% and 20% rates apply for one person household, 12% and 15% rates for households with between 2 and 4 people and 10% and 12% for larger ones. 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:

$$Y_{HB} = Y_{FB} + FB
\qquad (5)$$

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.[17]

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 (177PLN 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.

4.3.   Social Assistance (SA)

Social Assistance system consists of permanent social assistance, temporary social assistance and social assistance in special circumstances.[18]

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:

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[17] FB enter income assessment for Housing Benefit but HB does not enter income assessment of FB.
[18] In 2003 the Social Pension was also a part of the SA system, but it has since been paid by the ZUS as part of Social Security.

$$Y_{SA} = Y_{FB} + HB + FB \qquad (6)$$

or in the case of farmers to:

$$Y_{SA} = Y_{FB\_farm} + HB + FB \qquad (7)$$

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.

Permanent Social Assistance

The permanent compensation allowance (*Zasiłek stały wyrównawczy*, 2003) or permanent allowance (*Zasiłek 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.

Temporary Social Assistance

Temporary Social Assistance (TSA) is a top-up benefit for households which meet two criteria: "insufficient resources" and specific social criteria.[19] Rules and parameters are set at the national level on the basis of which each household or family is eligible to a certain minimum income. 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 still subject to the discretion of local authorities and its resources.

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[19] 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.

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 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). Amounts have been indexed by CPI.

Wealth test for SA

The amounts as computed according to the above rules might not be granted or not fully granted. Indeed, final eligibility and the final value of the support depend on a wealth test conducted by a representative of the Local Social Assistance Centre (MOPS) who assess the financial circumstances of the family. Simulation of means-tested benefits without regard to this test would clearly overestimate the values of temporary social assistance given to families, and would lead to potentially significant errors in the assessment of distributive and cost effects of SA reforms. Other reasons could explain why eligible families do not receive SA: tight social budget in some areas, non-take-up issues (families who would pass the wealth test if they applied for social assistance and who choose not to apply) or temporarily ineligible on grounds other than wealth.

The solution retained to overcome this difficulty is a combination of an estimated probability of passing the test conditional on wealth characteristics and a calibration of the test threshold. We estimate a probability model of receiving TSA on a set of household characteristics for the entire population.[20] The estimates are then used to generate an expected SA-receipt probability value for each household and we set a uniform wealth threshold above which a family is eligible to receive the temporary SA (conditional on passing also the income means-test). The threshold is calibrated in order to reflect the correct number of recipients of SA according to official statistics when both the wealth threshold and the income means test are satisfied.

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[20] More details and results are presented in Myck (2007).

Social assistance in special circumstances (*Zasiłek celowy*) is a temporary SA granted in case of: financial problem due to unemployment, chronic illness of 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 in the data.

5.   Data and Adjustments

5.1.   The Household Budget Survey: BBGD-2003.

Computations in SIMPL are based on the Badanie Budżetów Gospodarstw Dommowych (BBGD) from 2003.[21] The BBGD 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.

Grossing up raw data using weights given by the GUS gives 12,222,765 households and 38,096,226 individuals. 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 BBGD 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.

Since SIMPL is built within EXCEL, we limit our sample to households of no more than 8 members and 5 families (according to the family definition presented above). 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.[22]

Table 4 contains some descriptive statistics for the model database. We show the number of adults and dependent children (separately for men and women) and the proportions and weighted numbers

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[21] The model is already operational on 2005 data and the procedures applied for construction of the datasets in each year are essentially the same. Here we limit the discussion to the description of the data for 2003.
[22] The weights are adjusted so that the grossed-up population in each of the 16 regions is the same as before selection.

of individuals by labour market and disability status. Almost 8% of individuals in our database are registered unemployed. This implies just over 3mln people which closely reflects the total number of registered unemployed in official unemployment statistics from 2003 (GUS gives a total average number of unemployed in 2003 as approximately 3.1mln.[23])

Table 4. Structure of the model database: individual characteristics

	% in sample	Grossed up number (in thousands)
Adults:		
- men	32.44	12,354
- women	37.12	14,139
Dependent children		
- men	15.59	5,937
- women	14.85	5,658
Employment status		
- does not apply	27.09	10,318
- employee	28.89	11,005
- self-employed	6.65	2,532
- seeking work	6.55	2,496
- waiting to start a job	0.33	125
- sick or injured	4.88	1,857
- retired	16.39	6,244
- unoccupied	9.22	3,511
Disability status		
- not disabled	89.24	33,989
- adult significant	2.32	884
- adult medium	4.01	1,526
- adult low	3.88	1,477
- child – invalidity benefit	0.56	212
Registered unemployed	7.96	3,031

Source: authors' calculations on the basis of BBGD-2003 SIMPL database.

5.2. Incomes in BBGD-2003: net to gross conversion and income distribution

Raw income variables as collected in the data are net of SSC and net of taxes. An important step to implement the database for microsimulation purposes is thus to transform these incomes into gross values.

If we let Y be the gross earnings of a worker and N his/her earnings net of tax and social contributions. The relationship between Y and N writes:

$$N = Y - T(Y, X, p)$$

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[23] Statistical Yearbook 2005, p.247

where *T(Y, X, p)* defines taxes and SSCs as a function of gross earnings, worker characteristics, *X*, and a set of parameters, *p*. If *T( )* was a simple function of Y, this could be inverted analytically. In practice, *T( )* consists of a complex set of conditions on *Y*, X and p. The inversion must therefore be performed numerically.

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). This makes it more difficult to impute the precise value of gross earnings because we do not have any information on whether a given person worked for the whole year and whether their gross earnings were constant. In the computations we assume that this was the case. 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 the universal tax credit and 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 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.

5.3.   Gross incomes from earnings and self employment in the BBGD data.

We were aware of a potential problem of accuracy of declared incomes from work and self-employment. This issues is a problem in all surveys, and the distribution of incomes in the data may suffer from several sources of bias:
- under-representation of specific households in the data due to refusal to participate,
- under-reporting of income sources,
- and misreporting of incomes.

For the purpose of the microsimulation model ideally we would of course want to have information of the same income sources and the same reporting times for incomes as those used in the rules governing the application of taxes and benefit eligibility. However in BBGD the

information concerns only the survey month. This has important consequences for comparability of data between the official sources and the BBGD data. This is because:

- the fact that someone is observed as working in one month does not mean that he/she is employed over the whole year – if we assume that the person works over the whole year and he/she only works for part of the year then we shall give this person too high an income from work than that actually reported in the tax or national insurance data,

- the fact that someone is observed as not working (or reports no income from work) does not mean that he/she does not work over the whole year – if we assume that the person does not work over the whole year then we shall give this person income zero while he/she may work in some other months and so report some income to the tax office,

- people may not report incomes which they get over the month and consider as "too small" – yet these (if they are from official sources) will show up in official statistics,

- some individuals may be paid at intervals longer than a month and so we may observe them as receiving no income in the reporting month, even though they receive income for this month before or after the survey,

- the incomes declared as self-employment in the data may deviate a lot from the actual incomes declared to tax authorities given more room for deductions, costs, etc. in the case of the self-employed.

Generally therefore we would expect to see more low-level incomes reported to tax authorities, then in the data (for example the probability to observe someone who works for only three months in the year the data is collected is only 25%, while this person will count in the official statistics), 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. This is in fact the case. While 9.2mln people are reported as having work contracts in a specific month in official GUS statistics for December 2003, and the ZUS the SSC authority puts the average monthly number of individuals on work contracts at 9.1mln, the Ministry of Finance (MF) records income from employment contracts in 2003 from about 10.6mln people.

In BBGD-2003 the number of people reporting income from "permanent work" is 9.6mln, and there are several reasons why it may be higher than the GUS and the ZUS averages. The most likely reasons are that people confuse short-term contracts or some types of self-employment with work contracts, and that some may report income from undeclared work which would not figure in the official sources.

In the case of self employed and those receiving income from temporary employment the official statistic from the Ministry of Finance is 3.7mln, while the number in the data is 1.9mln. In this case, as we would expect the discrepancy is larger as there is many more people who have income from these sources for less than 12 months, and income receipt is often less frequent than monthly.

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 more low income individuals in the MF data than in the SIMPL data (i.e. the successive lower centiles have lower average incomes), but for top earners the average values of gross incomes by centile are lower in the SIMPL data base than in the official statistics. 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 or temporary workers 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.

Figure 1. Average values of incomes by centile – SIMPL and MF – centiles 1-99.
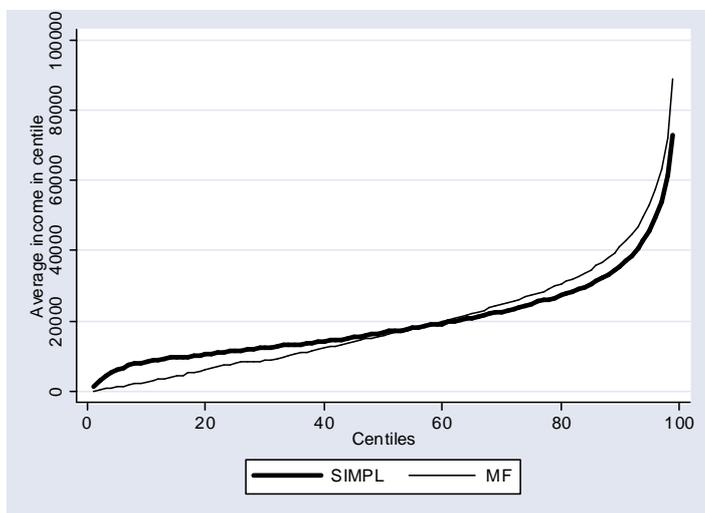
| a. Employment | b. Self employment |
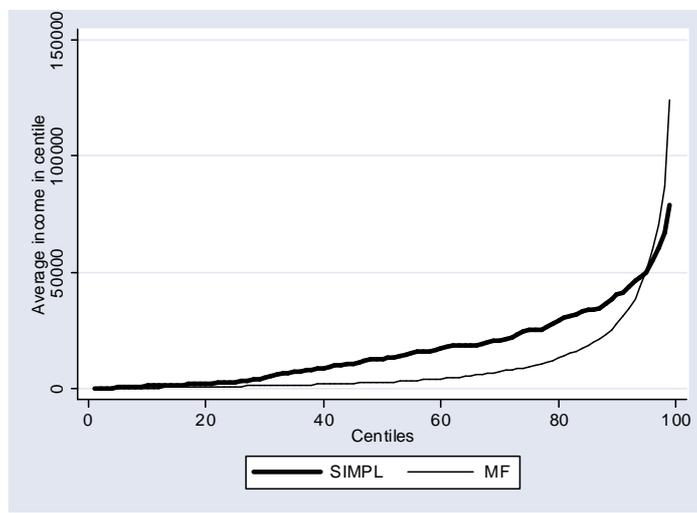
Sources: MF – data provided by the Ministry of Finance. SIMPL – the model database based on BBGD-2003 (grossed up using the model net-gross converter).
Notes: Self-employment includes incomes from temporary employment contracts (in both MF and SIMPL data). Average incomes by centile computed for gross annual incomes.

The distributions of incomes presented in Figure 1, especially with regard to employment income look close to the official statistics almost all the way up to the very top of the distribution. The differences become much larger for the very top centile, which we add to the graphs in Figure 2. The official values for top incomes are much higher than those reported in the BBGD data. This may be a result of any of the reasons given above, and in the light of the purpose of the model may present difficulties concerning its reliability when simulating taxes and national insurance for the very top earners. After consultations with the Ministry of Finance we proposed to rescale 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 income. 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).

Figure 2. Average values of incomes by centile – SIMPL and MF – centiles 1-100.
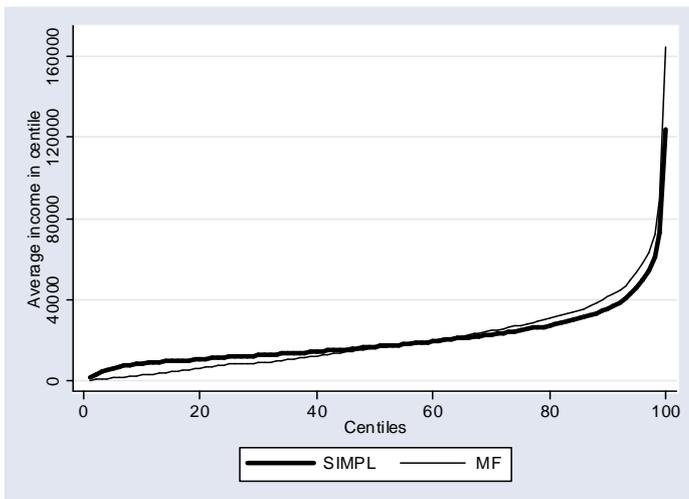
a. Employment   **b. Self employment**
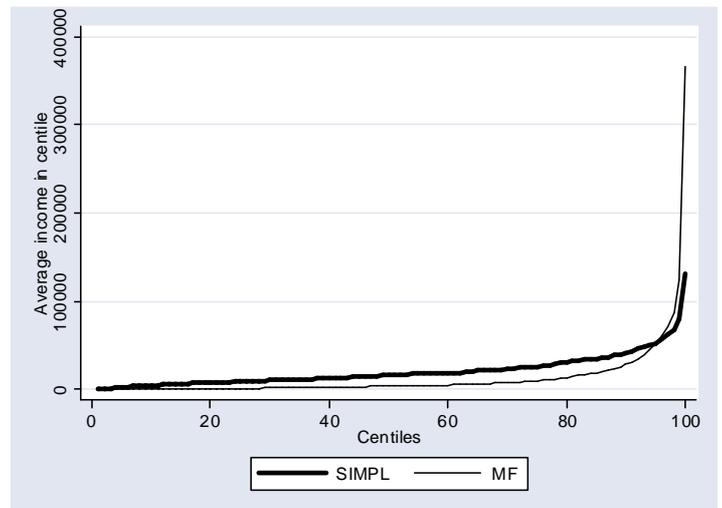
Sources: MF – data provided by the Ministry of Finance. SIMPL – the model database based on BBGD-2003 (grossed up using the model net-gross converter).
Notes: Self-employment includes incomes from temporary employment contracts (in both MF and SIMPL data). Average incomes by centile computed for gross annual incomes.

5.4. Farm income

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, however comes from sales of agricultural produce only from the interview period, i.e. one month. Given significant seasonal fluctuations of income among farmer households, using this measure of income as a reflection of an annual average may be significantly misleading. This would tend to place farmers interviewed in the summer high up in the distribution, and those interviewed in winter in the lower sections, while in fact their financial situation over the year may be very similar. To correct for this seasonal fluctuation we propose to estimate a model of farm income on the basis of which we would be able to calculate the expected ANNUAL average income from a farm of a certain size and location.

To get around the problem of seasonality we estimate a linear model on the log of farm income with month of interview, region, and farm size as independent variables. Such a model can be used to produce expected values of income for every month – given farm size and region, and these in turn can be used to calculate an average expectation of household income. The measure of average household income is then:

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

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 farm size, interaction of farm size and farm size-squared with month of interview, and interaction of a farm size polynomial with regional dummies.

5.5. Some comparisons to official statistics

One of the most important elements of the database from the point of view of the micro-simulation exercise is the quality of data on incomes which are treated as inputs into the model. In Table 5, we present information on nine sources of such incomes for 2003 (income from work and replacement incomes) and compare the number of recipients, the aggregated sum of incomes

and average amounts to official statistics.[24] 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 pensions. It is rather strange that we find an underreporting of incomes in this particular case, as the incomes from family pensions are usually regular and it is unlikely that it would be a source of income to be undeclared in the survey. 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. The difference in the average values of Unemployment Benefit stems most probably from a different definition taken in SIMPL and in the official statistics. In the case of SIMPL unemployment benefit is presented as gross amount and includes both taxes and SSCs. Average net values of UB are almost identical.

Table 5. Principal income sources and income recipients in SIMPL, 2003.

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, 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.

5.6. Updating the dataset

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

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[24] A similar comparison for the 2005 data is presented in Table A2 in the Appendix.

method. There is one parameter for each type of monetary variables (which include all the input income types and some other variables like the level of rent). Naturally, this is an approximation since uniform (i.e. mean) indices are applied to all households of the 2003 samples. In reality, the distribution of the various monetary variables, and in particular the distribution of incomes, may changed between different years, as can of course the demographic structure of the population. We assume these aspects to be constant, which is not a major problem considering the short time interval between the year of the database and the likely simulation systems.

6.   Validation

Validation of a microsimulation model is a multi-stage long-running process. The possible non-representativeness of the dataset, the non-identifiable eligibility conditions for some transfers, the necessary simplification of some tax rules, etc., make it extremely difficult to render a perfect image of the real world. Therefore, it is important to evaluate what could be the satisfying level of validation to be reached if one wants to use the model. Also, it is sometimes difficult to know what to expect: in the absence of previous experience of this type and in the absence of official statistics on all the aspects of interest for microsimulation, it is difficult to define the "target" that the model should aim at. Validation of the model therefore, by its nature, is a continuous process which has to be performed at each point of further model development by its users. Below we present the most important steps which have so far been conducted to ensure reliable functioning of the model.

6.1.   Micro-level validation

A series of validation/robustness check has been performed at various level of analysis. The first level was an examination using net income computations for specific family types. This form of micro level analysis was conducted for various household types (single, single with children, couple with one, two children, two children including a disabled child, etc). The generation of budget constraints conditional on gross incomes and household characteristics together with descriptive output statistics allowed to check the consistency of the results for these various types of households. This exercise allowed to check the validity of each simulated instrument (tax, SSCs and all simulated benefits). It also showed whether specific instruments interact with each other in the way they should according to the rules of the tax and benefit system. Some results of this exercise, run on a validated model are presented in Section 7.

The micro level validation exercise was then repeated on actual households taken from the model dataset. This is an important aspect since archetypal households make use of only parts of the features of each tax-benefit instruments. This stage of the validation sheds further light on the interaction of different modules of the programme.

6.2.   Aggregate validation

The third type of validation consisted of comparing the total aggregates for each instrument with official statistics. The aggregates used are total (and average) values of taxes and benefits as generated by the model on the basis of the full model dataset. This validation has been carried out using the 2003 data and the 2003 system. For each instrument (e.g. income tax), the amounts simulated at the household levels have been aggregated over the whole population, taking into account the sample weight of each household. Below we document the most important aspects of this type of validation.

The difficult aspect of aggregate validation is to find statistics which correctly correspond to what is simulated.

As far as taxes and SSC are concerned the model results compare rather well with official statistics (Table 6 for 2003, and Table A3 for 2005 in the Appendix), although in all cases but maternity replacement income 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 1.17mln individuals are modelled as contributing the SSCs, while the official statistics give   0.78mln. In the case of temporary work the number are respectively: 0.55mln and 0.25mln. 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 simulates well the number of contributors of health insurance while the total value of contributions is slightly underestimated. This is mostly probably due to lower average salary income in the model dataset. Average income tax is close to the official statistics. Lower number of payers in the model is due to observing each household only during one month over year. As is often the case in household surveys, the BBGD suffers from an under-representation of the richest households (despite the adjustments we make to the data), which can be seen in the tax bracket breakdown in Table 7 (corresponding figures for 2005 are presented in Table A4 in the Appendix).

Table 6. Aggregate validation: income tax and social security contributions, 2003

Income source	Amounts Mln PLN/month		No. individuals (mln)		Monthly average/individual		Source of validation
	SIMPL	Official stats.	SIMPL	Official stats.	SIMPL	Official stats.	
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.

Table 7. Aggregate validation: tax brackets, 2003

	No. individuals (mln)		Structure (%)	
	SIMPL	Official stats.	SIMPL	Official stats.
I	18.5	22.0	96.94	94.72
II	0.5	1.0	2.42	4.11
III	0.1	0.3	0.64	1.16
Total taxpayers	**19.1**	**23.3**	**100.0**	**100.0**

Table 8. 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
housholds			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.

Comparisons of simulated and official information on benefit claims will naturally suffer from several causes. One of them is lack of detailed information concerning eligibility to benefits, and the resulting inability to model all elements of the benefit system. The other is the problem of non take-up of benefits by families which are eligible to claim them due to stigma or some form of costs.

Result of benefit validation for 2003 are presented in Table 8 for 2003 (and in Table A5 in the Appendix for 2005).

The sequence of allocating Social Assistance is the following. First the Permanent Compensation Allowance is simulated. Then Temporary Social Assistance is allocated to eligible households. As we explained above we mimic the informal wealth test conducted by the local Social Assistance Centres with an expected wealth-related TSA receipt probability. The threshold over which households are made eligible to receive the TSA is calibrated in such a way that the number of recipients of the TSA in the model (i.e. the number of households who pass both the wealth test and the income means-test) corresponds closely to the official statistics. The calibrated values for 2003 and 2005 are respectively 0.180 and 0.125. According to information from the Ministry of Labour and Social Policy 88,000 families received the TSA and the model allocates it to 90,000. The corresponding values for 2005 are 300,000 and 304,000.

The amounts of the SA that are prescribed by the national legislation are paid out by local authorities, who in 2003 had full discretion of whether and how much they pay. In 2003 the average "theoretical" value – i.e. a value corresponding to the legislated family "minimum income" - is significantly higher than the official amount, at 544 PLN per month, compared to 137 PLN per month according to official statistics. This system was somewhat reformed in September 2004 since when the government guarantees 20% or 30% percent of the difference between the legislated minimum income and the actual income, and the local authorities can, but do not have to top it up. In 2005 the local authorities paid about 10% of the remaining difference. As we can see in Table A4 in the Appendix which shows the benefit validation for 2005, the simulated values for 2005 (which take account of the guaranteed proportions and assume a 10% contribution by the local authorities) closely reflect the official statistics.[25] Together with guaranteed amount it combined to about 30% of the amount between the actual and the legislated "minimum incomes". When the 30% proportion is also assumed for 2003, the simulated average amounts of the TSA closely correspond to the values provided in the official statistics.

The Permanent Social Assistance is simulated well while the nursing benefit (NB) is slightly underrepresented.

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[25] We are very grateful to Dorota Gierej from the Ministry of Labour and Social Policy for providing us with detailed information and statistics on the operation of the TSA.

The official data show that about 3mln families, and about 6.3mln children received Family Benefits in 2003. Dividing the average monthly value of the benefit (272mln) by the number of families (children) gives the average monthly payment of 90.3 PLN per family (43.1 per child). In SIMPL we simulate the FB receipt by about 4.06mln families and almost 8.0mln 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 full take-up is assumed 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.

The number of people receiving the lone parents supplement (SLP) 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% (see details above) 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 (see above). The recipients are therefore all those who in the data are not working, do not seek work, and have children qualifying for Family Benefits.

The supplement for child birth (SCB) are simulated with a high degree of precision.

Due to difficulties with identifying benefit eligibility we overestimate the number of recipients of the Nursing Allowance and 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 45% 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.   The model at work

In this Section we present SIMPL at work in straightforward applications well known to all those familiar with the application of microsimulation models. In Section 7.1 we show examples of output from SIMPL regarding the computation of disposable incomes for different types of families and calculation of Effective Marginal Tax Rates for these families. The computations are conducted assuming the 2003 tax and benefit system. In Section 7.2 the model is used to run examples of hypothetical tax and benefit reforms, and we present the computed costs of these reforms and their effect on incomes and income distribution.

7.1.   Budget constraints using the SIMPL model.

In Figures 3 and 4 we show a detailed break-down of income components for two types of families – a single person with two children and a couple with one earner also with two children. The components combine to form the total level of the monthly disposable income conditional on gross earnings. As it is clear from the figures the income components are net earnings, Family Benefits, Housing Benefit and the Temporary Social Assistance. In the figures we also show the level of the legislated "Income Criterion" (or minimum income). This level of income would be what the families would get at low levels of gross earnings if the full amount of the Temporary Social Assistance – i.e. the difference between their actual income and the Income Criterion – were paid to them. As we mentioned above, such generous support is hardly ever available, and the local authorities did not have the obligation to pay the full amounts. The calibrated proportion of the amount between actual income before the TSA application and the legislated Income Criterion suggests that about 30% of this difference was covered by the local authorities in 2003. This proportion was also roughly what since September 2004 became the proportion guaranteed by the central government. Thus on both figures we show the TSA and the Income Criterion separately. The interesting outcome of such an assumption is the fact that the budget constraint then loses its "flat" sections at the lowest levels of gross incomes.

Another interesting point to note is the "point" withdrawal of Family Benefits which can be seen on Figure 3 between the last and the second last income bar shown on the figure. In the Polish system the Family Benefits are withdrawn completely if family income per person exceeds the legislated threshold. Such a design leads to very high EMTRs and may have important disincentive effects in the labour market when individuals consider intensifying their labour market effort.

The design which allocates only 30% of the difference between the actual and the legislated minimum income leads to an interesting picture concerning the differences in the generosity of the

state's support to families with and without children. These can be seen in Figures 5 and 6, where we show the difference in incomes between families with two children and with no children. The Figures are again drawn for single individuals and couples respectively. Even at very low levels of earnings incomes, the state does not seem to be much more generous for those with relative to those without children. The difference in the situation of zero income from work is 113 PLN for single people and 185.5 PLN for couples. This is a result of the combination of the 30% proportion of the legislated TSA being allocated to the families with the fact that families with children receive Family Benefits, which reduce the difference between actual income and the Income Criterion for those without children. At gross earnings levels over about 1500 PLN the main difference between incomes of those with and without children is driven by the Family Benefits. In fact for couples this is the only difference, and this carries through only up to the level of gross earnings of 3350, at which point the system gives no preferential treatment to couples with children. This is not so for lone parents who apart from receiving the Family Benefits are also given preferential treatment in the tax system and could take advantage of income tax splitting, thereby reducing their tax liability. This can be seen in Figure 5, and the difference becomes evident at gross earnings levels over about 3900 per month at which point those without children fall in the second tax bracket and begin to pay tax at 30%.

The differential treatment of those with an those without children in the tax and benefit system of 2003 in Poland is also evident in Figures 7 and 8, where we show Effective Marginal Tax Rates for the same four types of families. The preferential tax treatment of lone parents can be noticed by lower levels of taxation over 3900 PLN of gross income per month. No such difference exists for couples, but since both these with and without children take advantage of tax splitting which is available in Poland for all couples, the EMTR falls to just over 20% once the Social Security Contributions stop being paid, i.e. at about 5490 PLN per month.

The EMTRs reflect also the withdrawal of benefits with very significant spikes at point of the withdrawal of the Family Benefits and the Housing Benefist. FB are withdrawn at the level of about 2400 PLN gross income per month for the lone parent family and 3300 PLN for the couple. For families without children the highest "spikes" in the budget constraint are generated by the withdrawal of the Housing Benefit (components of the disposable income for families without children are presented in the Appendix in figures A1 and A2). For example for single adults without children the HB begins to be withdrawn at about 300 PLN of gross earnings, and stops being paid beyond 1050 PLN. For a couple without children these points are at 750 PLN and 1700 PLN, and the HB is being significantly reduced at about 1550 PLN of gross earnings. The "spikes" in the EMTR related to the Housing Benefit can also be seen for families with children though at slightly higher

levels of gross earnings since families with children qualify for higher levels of the HB. The higher EMTR for the lone parent and the couple with children after respectively about 550 PLN and 650 PLN per month relates to the beginning of the withdrawal of the Housing Benefit. The complicated picture of the EMTR for single people with children reflects the combined withdrawal of the HB and the TSA.

**Figure 3: Components of disposable income in Poland – a single person with two children**
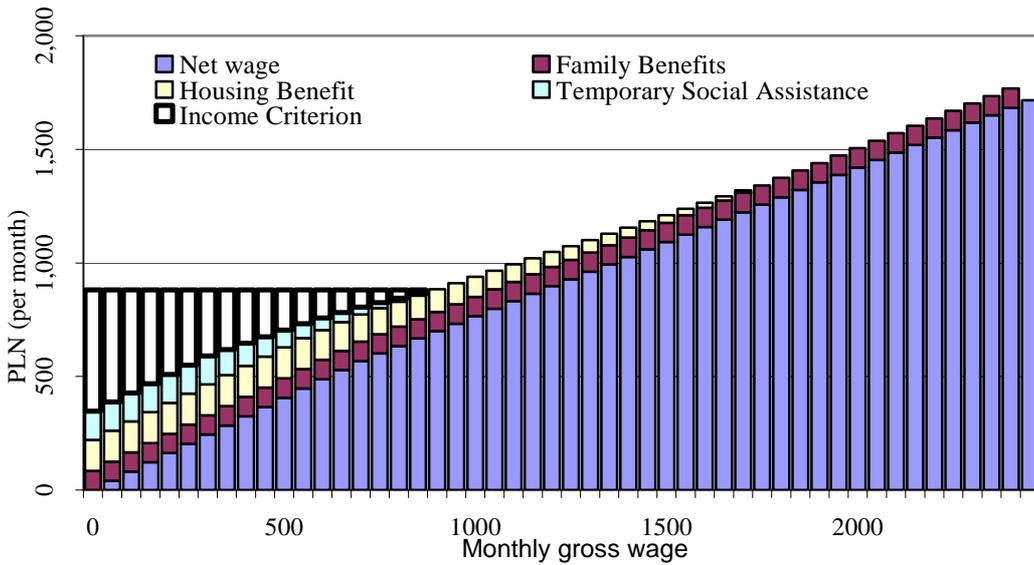
Source: Authors' calculations using SIMPL.

Figure 4: Components of disposable income in Poland – a couple with two children
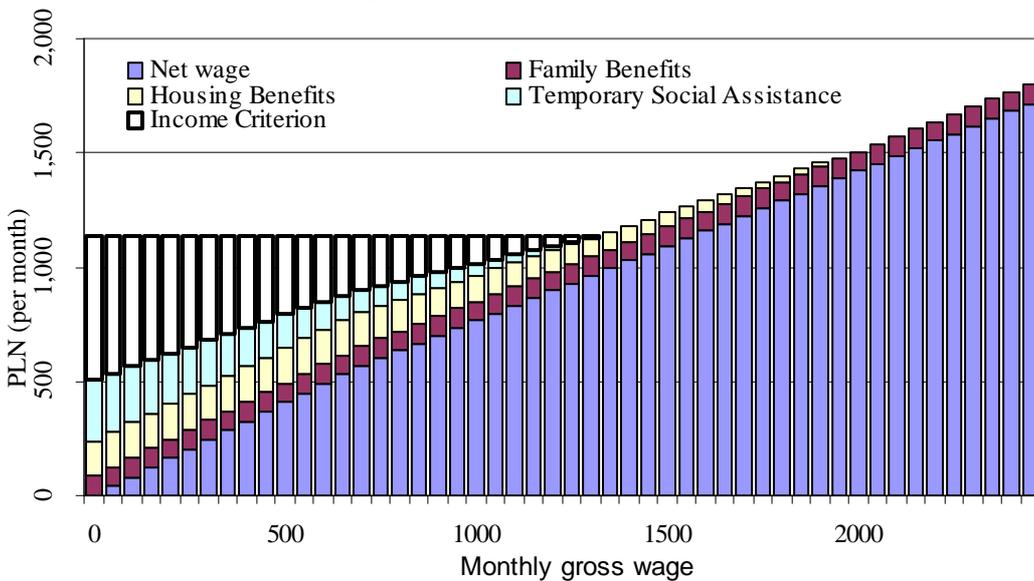
Source: Authors' calculations using SIMPL.

Figure 5: Disposable income in Poland – a single person
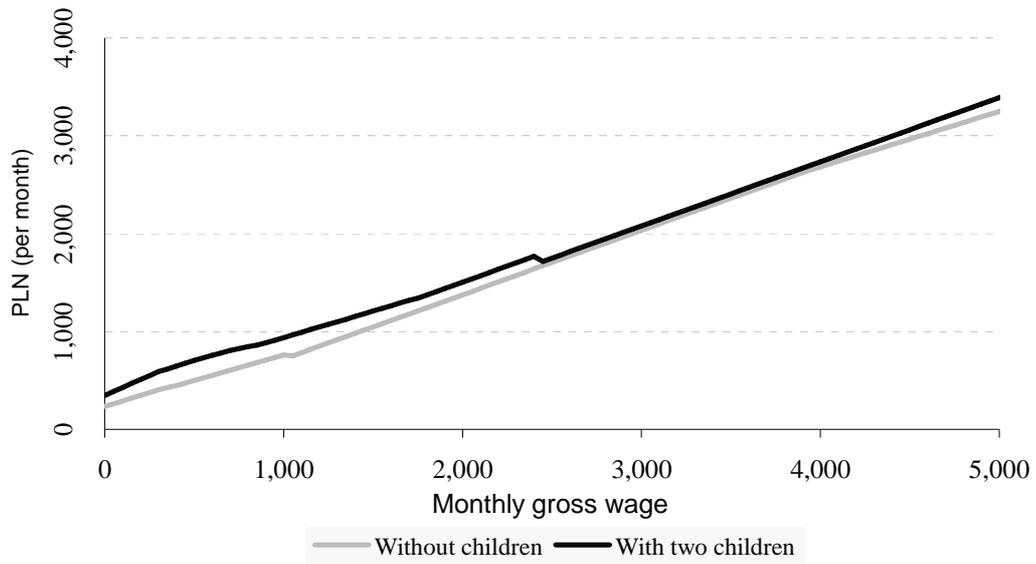
Figure 6: Disposable incomes in Poland – one earner couple
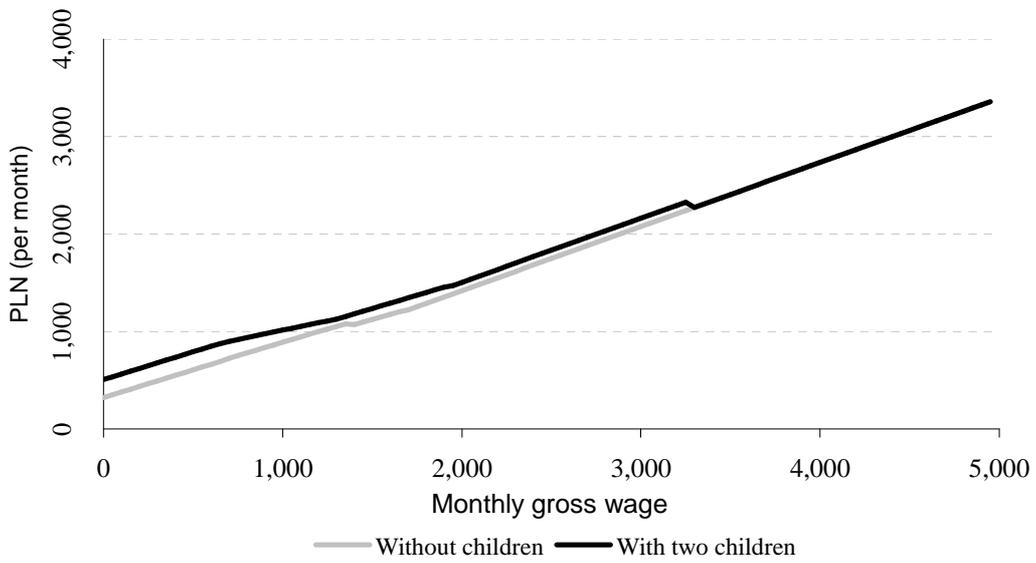
Figure 7: Effective Marginal Tax Rate – a single person
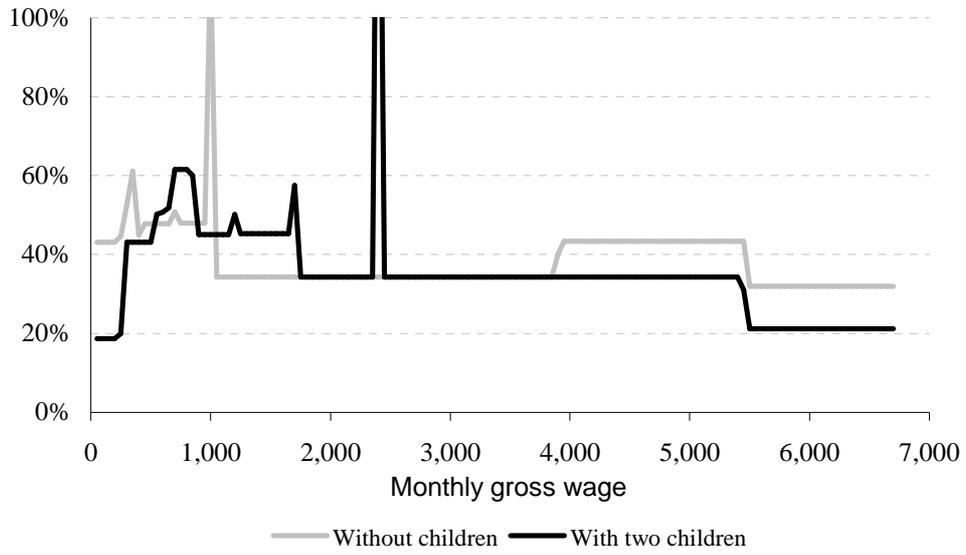
Source: Authors' calculations using SIMPL.

Figure 8: Effective Marginal Tax Rate – one earner couple
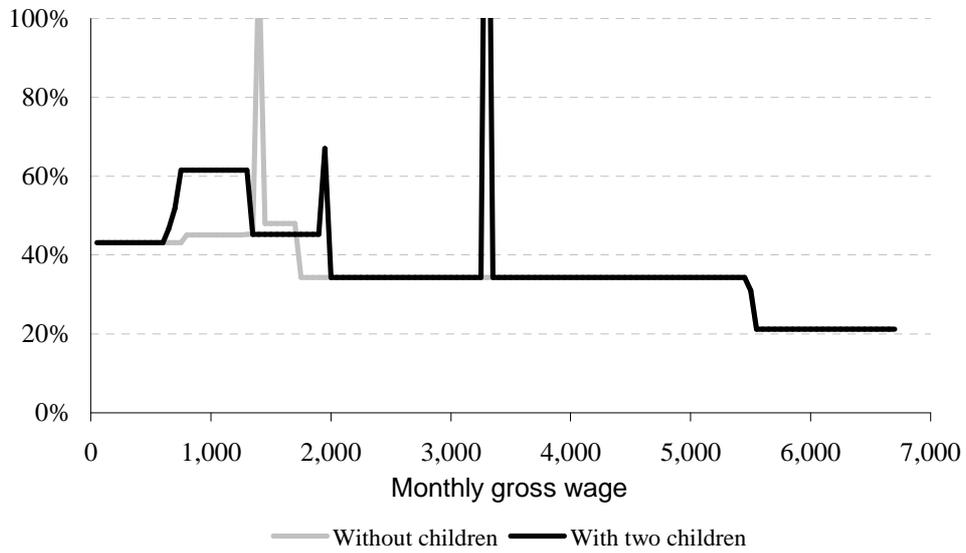
Source: Authors' calculations using SIMPL.

7.2.   Analysis of reforms of taxes and benefits using SIMPL

One of the main uses of a microsimulation models is in demonstration of the effects reforms to the tax and benefit system would have on disposable incomes of households. Below we present results generated using the SIMPL model for three examples of reforms to the income tax schedule and three examples of reforms to Family Benefits. The reforms are ruin on 2003 BBGD data, and are simulated relative to the 2003 tax and benefit system.

The reforms take the following specific form:

Reforms of Income Tax

- Reform I: increasing the value of the universal tax credit from 530.10 to 689,10 (i.e. an increase of 30%);
- Reform II: increasing the value of the revenue costs for income tax from 1200 to 3000 (i.e. an increase of 150%);
- Reform III: changing the lower rate of tax from 19% to 17%.

The three reforms have been selected and adjusted in such a way so that their costs are of similar order of magnitude (see Table 9).

Reforms of Family Benefits:

- Reform IV: increasing the value of the basic Family Allowance from 43, 53 and 66 (see Section 4.1) to 53, 63 and 76 respectively;
- Reform V: an increase of the income per capita eligibility threshold from 548 (and 612 for lone parents) to 648 (and 712 for lone parents), i.e. making Family Benefits available to families slightly higher up the income distribution;
- Reform VI: making Family Benefits universal, i.e. getting rid of the eligibility threshold altogether.

The choice of the these hypothetical reforms of Family Benefits is such as to reflect the potential effects of increasing the generosity of the system through higher values of the benefits or through relaxing the eligibility rules.

Results of these six reform simulations are presented below. In Table 9 we show the overall reform costs and their effects on the poverty rate (calculated as the proportion of individuals living in households with income below 60% of the equivalised median income in the base system). In Figures 9-12 we present the effects of these reforms by income groups and family types.

Figure 9: Income tax reforms: average proportional change in income by income deciles.
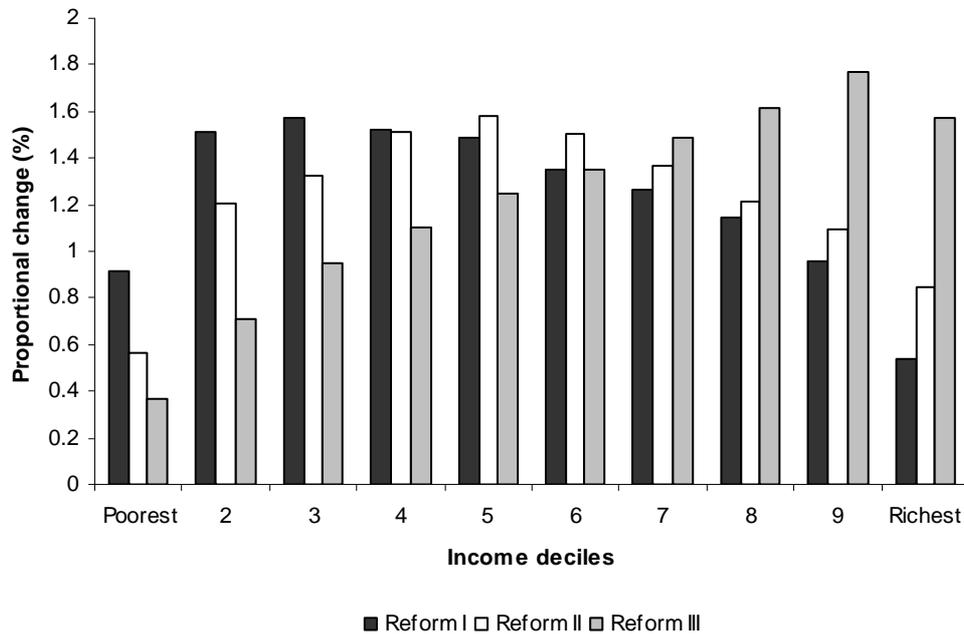
Source: Authors' calculations using SIMPL.
Notes: Individuals allocated to income deciles on the basis of disposable income as defined in the BBGD data by the Central Statistical Office (equivalised using the OECD equivalised scale).

Figure 10: Family Benefits reforms: average proportional change in income by income deciles.
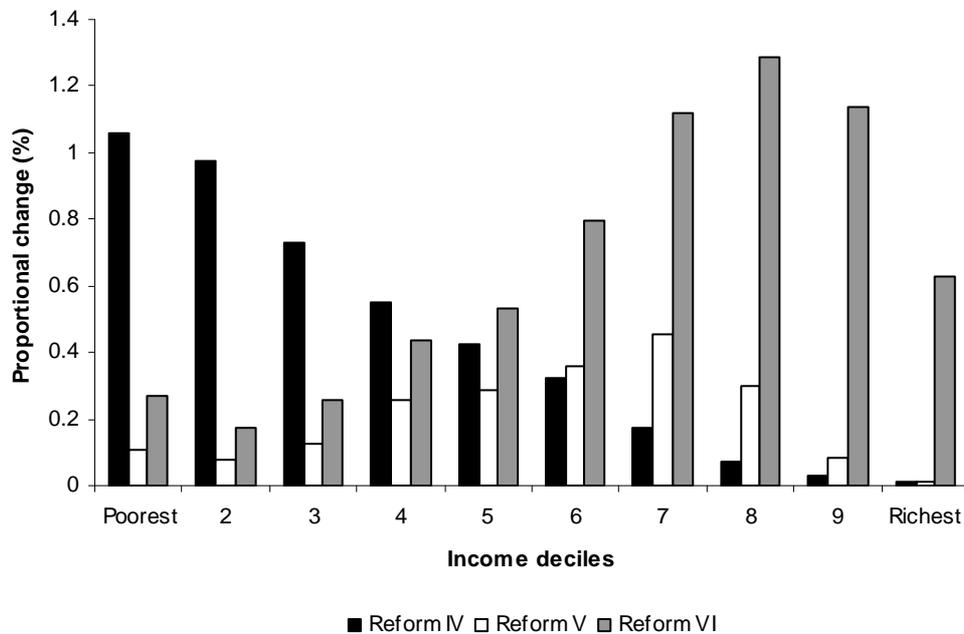
Source: Authors' calculations using SIMPL.
Notes: Individuals allocated to income deciles on the basis of disposable income as defined in the BBGD data by the Central Statistical Office (equivalised using the OECD equivalised scale).

Figure 11: Income tax reforms: average proportional change in income by income deciles.
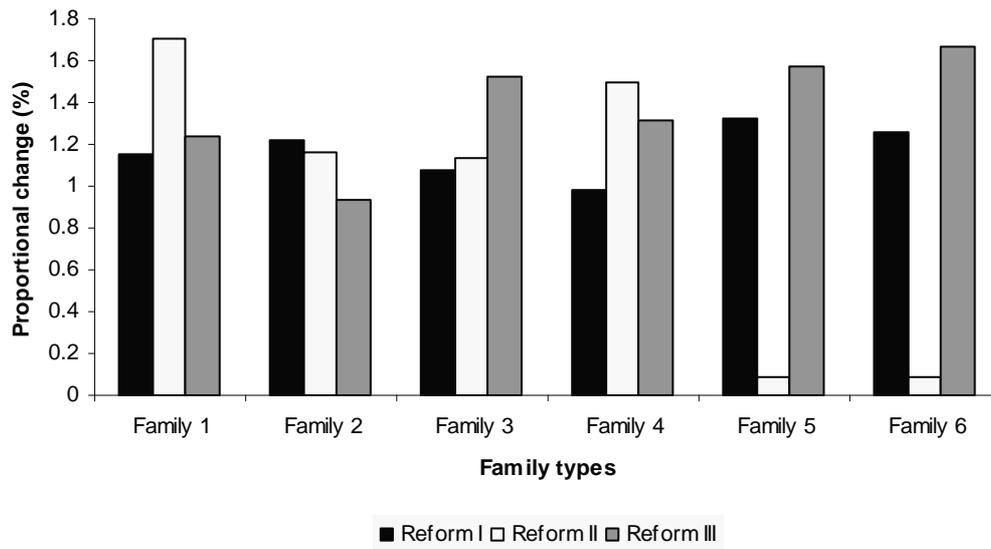
Source: Authors' calculations using SIMPL.
Notes: Family types are defined on the basis of within household relationships. Family types are:
Family 1: single working age adult without children;
Family 2: single working age adult with children;
Family 3: working age couple without dependent children;
Family 4: working age couple with dependent children;
Family 5: single adult of pension age (60 for women, 65 for men);
Family 6: pensioner couple (either of the partners of pensions age).

Figure 12: Income tax reforms: average proportional change in income by income deciles.
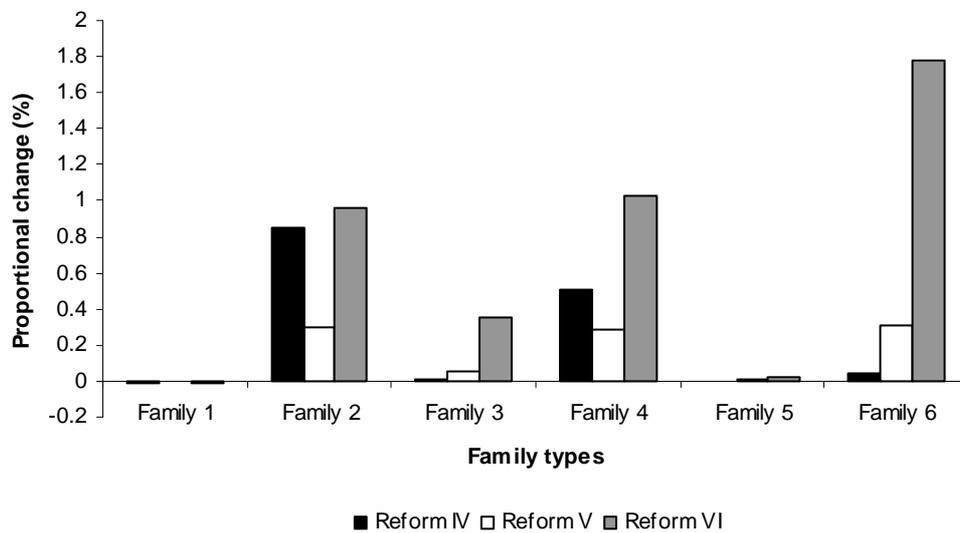
Source: Authors' calculations using SIMPL.
Notes: see notes for Figure 11.

The most progressive of the three tax reforms is the increase in the universal tax credit, while the least progressive one is the cut of the basic income tax rate from 19% to 17%. Households in the poorest decile of the population gain on average 0.91%, 0.56% and 0.37% of disposable income relative to the base system from Reform I, Reform II and Reform III respectively. Those in the richest tenth of the population gain 0.96%, 1,09% 1.77%. Such distributional results are unsurprising. The highest gain from Reform III would go to those with highest levels of taxable income – i.e. those higher up the income distribution. The maximum gains per family from the universal tax credit reform (Reform I) and the revenue costs reform (Reform II) are lower than those of Reform III, and they accrue to families already at the lowest levels of gross earnings. This explains why these two reforms bring proportionally higher effects to the poorer households relative to the cut in the basic rate of income tax. The difference between the effects of extending the universal tax credit and the revenue costs are driven primarily by the fact that the latter reform affects only the working population, while the universal tax credit reform brings gains to all tax payers, including for example pensioners and recipients of unemployment benefits. This effect can be clearly seen in Figure 10, where we show results of these three reforms by family type. Six types of families are distinguished in the analysis: working age single adults without children, working age lone parents, working age couples without children, working age couples with children, single pension age adults, and couples with at least one partner being of pension age. On Figure 10 we can see that Reform II brings hardly any gains to the last two family types, since few pensioners have employment incomes. The revenue costs reform brings highest proportional gains to single adults without children, and is also relatively beneficial to couples with children. It is interesting to note also that proportionally gains from Reforms I and III are relatively high among pensioner families.

Table 9. Reform simulation: overall costs and effects on poverty.

	Base system	Reform I	Reform II	Reform III	Reform IV	Reform V	Reform VI
Overall reform cost		3.4bln	3.7bln	4.4bln	0.9bln	0.6bln	2.4bln
Poverty rate	19.2%	18.4%	18.5%	18.7%	18.6%	19.1%	19.1%

Source: Authors' calculations using SIMPL.
Notes: Poverty rate computed as proportion of population living in households with equivalised income below 60% of the median equivalised income in the base scenario.

The difference in the distributional effect of the reforms is even stronger in the three examples of reforms of Family Benefits (Figure 11), but the results are equally intuitive. While effects of Reform IV are concentrated in the lower end of the income distribution, Reforms V and VI bring gains to households located in higher deciles. Increases in the value of the Family Allowance benefit the

families who already receive the support, while extensions of the eligibility thresholds change incomes of those who in the current system are ineligible to claim the FB. Proportionally highest average gains from Reform IV accrue to households in decile 1 (1.26%), of Reform V to those in decile 7 (0.45%), and of Reform VI to those in decile 8 (1.29%). The fact that in 2003 Family Benefits could be claimed for disabled or pension age partners implies interesting distribution of the effects by family type (Figure 11). Not only working age singles and couples benefit from increased generosity of the Family Benefits. In fact highest proportional gains from Reform VI accrue to pensioner couples (Family type 6), since in this scenario all pensioner couples can now receive the Family Allowance for one of the spouses. The fact that the FA benefits could be claimed for a disabled partner lead to gains among couples without children (Family type 3). The cost of the three FB reforms is very different and ranges from 0.6bln PLN for Reform V to 2.4bln PLN for Reform VI. The reforms have rather limited effect on poverty, perhaps with the exception of Reform IV which reduces poverty from 19.2% to 18.6%. This is not surprising since both reforms which change the eligibility threshold for the FB (Reform V and Reform VI) affect primarily families located further up the income distribution.

8. Conclusion

This paper has introduced the first comprehensive tax and benefit microsimulation model for Poland, SIMPL. The model allows simulating direct taxes, social contributions and public benefits in Poland for the years 2003 and 2005 using accurate information on official rules and pragmatic information of actual application principles. According to our robustness check, the Household Budgets Survey data for both years proves to be a sound dataset for the purpose of microsimulation. We have also provided an extensive validation of SIMPL and even if simulated aggregates do not always match official figures, we are confident that the model does the best possible job in capturing the way taxes and transfers affect income distribution in Poland.

We have presented also some initial applications of the model. Applied to hypothetical households, the model allows to draw accurate budget constraints. Such case studies are very useful to understand salient features of the tax-benefit system and to get useful intuitions about the possible effects of policy reforms. Once applied to the representative samples of the BBGD data, the model provides a full picture of the distribution of disposable income, taxes, transfers across the whole population. It allows to assess the role of the tax-benefit system on poverty, inequality, redistribution across demographic groups, financial incentives to work, etc. We applied the model to three hypothetical reforms of the income tax and three hypothetical reforms of the Family Benefits. Such simulations

provide information on the likely cost and distributional effects of reforms, provide information on their consequences for the poverty rate and can be usefully applied to guide choices related to policy design.

A lot is to be learned by using SIMPL in the future. Poverty and inequality in Poland have received a great deal of analysis in the transition period.[26] However, the recent evolution is not dissociable from a thorough understanding of recent changes of the tax-benefit system. Future developments also consist in using SIMPL for microsimulation studies that could help designing optimal tax reforms subject to given policy objectives. In particular, on-going work attempts to evaluate the role of increased transfers to the poor (Haan and Myck, 2007b) or to low-wage workers (Bargain et al. 2007a) on redistribution and employment. Adding labour supply responses would also enrich the analysis, as done through participation effects in Haan and Myck (2007b). A first structural model of labor supply for Poland is estimated in Bargain et al. (2007b).

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[26] Keane and Prasad (2002) analyse the evolution of inequality during the economic transition. They find that inequality in labour earnings increased markedly and consistently throughout the 1990–1997 period. In contrast, inequality in consumption declined to below pre-transition levels during 1990–1992 and increased gradually up to slightly above pre-transition levels by 1997. This conveys that social transfer mechanisms, including pensions, have played an important role in mitigating increases in both overall inequality and poverty. Szukiełojć-Bieńkuńska et al. (2005) show that inequalities may have increased in the late 90s, which is confirmed by Podkaminer (2003). This trend reflects to some extent a reduced redistribution. Indeed, the revenue of personal income tax has decreased (from 8.3% of GDP in 1999 to 4% in 2004) while spending on public health, pension and social transfers has decreased over the period.

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 >=age15	294	316
Child, defined age <15	210	316

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

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	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-retirment 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 contributions - 2005

Income source	Amounts Mln PLN/month		No. individuals (mln)		Monthly average/individual		Source of validation
	SIMPL	Official stats.	SIMPL	Official stats.	SIMPL	Official stats.	
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	
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: tax brackets, 2005**

	No. individuals (mln)		Structure (%)	
	SIMPL	Official stats.	SIMPL	Official stats.
I	18.7	22.4	96.23	94.46
II	0.6	1.1	2.99	4.66
III	0.2	0.2	0.78	0.88
Total taxpayers	**19.4**	**23.7**	**100.0**	**100.0**

Table A5 Aggregate validation: benefits - 2005

| 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)	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	
- quarenteed 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.

Figure A1: Components of disposable income in Poland – a single person without children
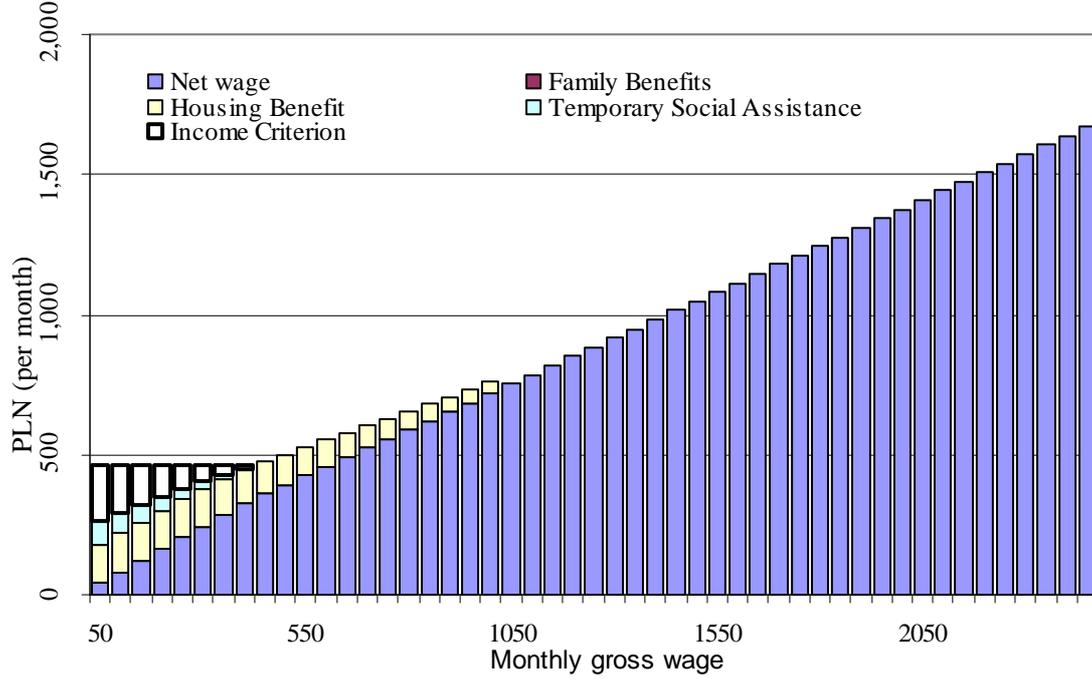
Source: Authors' calculations using SIMPL.

Figure A2: Components of disposable income in Poland – a couple without children
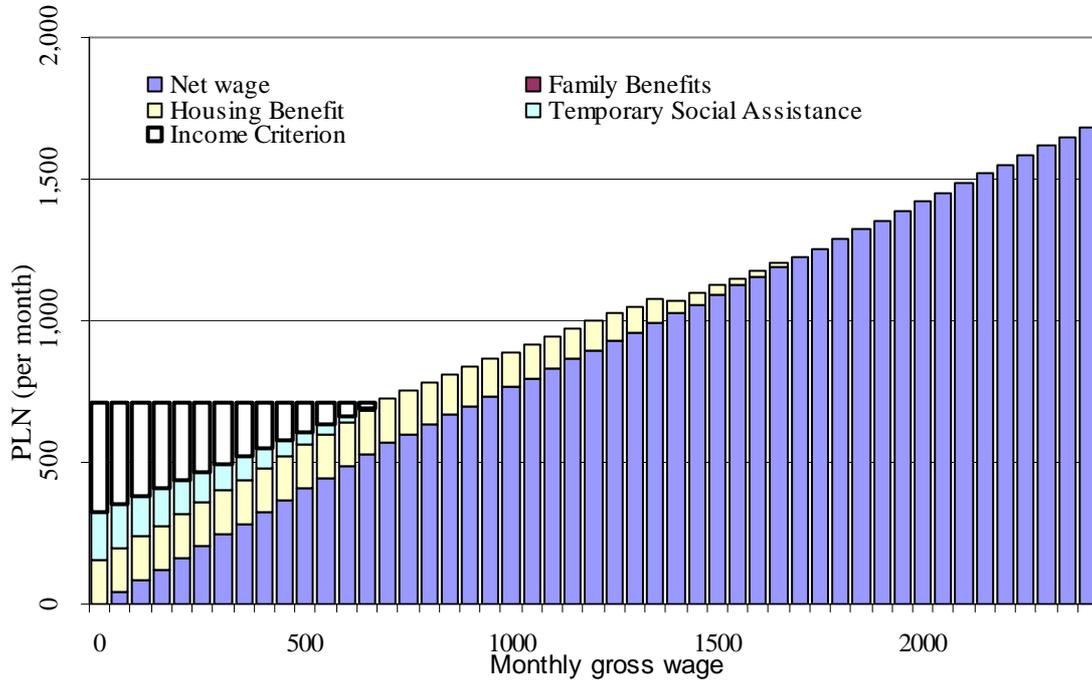
Source: Authors' calculations using SIMPL.

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