FINAL REPORT PROJECT AG/01/116

VALORISATION OF THE MICROSIMULATION MODEL FOR SOCIAL SECURITY

MIMOSIS

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1 INTRODUCTION

In this report we describe the activities carried out under project AG/01/116, how it builds on and further refines work done in project AG/01/86, and how it links to the new project "MIMOD".

The main objectives of project AG/01/116 were to further refine and validate the microsimulation model for social security, MIMOSIS, both by extending the data coverage and refining the modules as through a comparative study of how MIMOSIS is positioned in an international perspective and also by use of MIMOSIS for evaluation of (hypothetical) policy reforms.

In section 2 we will describe MIMOSIS both in terms of the underlying dataset as in terms of the programmatic building blocks – modules – that together make MIMOSIS to what it is: a microsimulation model for social security and personal income taxation. In the description of the data we will focus on the nature of the data as well as give an overview of the main variables that are available in MIMOSIS either by observation, by construction or both. We will also point out the main variables that are missing in MIMOSIS but may nonetheless be of importance for some policy reforms in the domains covered by MIMOSIS. The different building blocks of MIMOSIS will be described by providing a general overview of the legislation modeled in MIMOSIS – the legislation of 2001 – and by listing the most important parameters that can be changed by the user of the model. It are the latter that determine the flexibility and scope, and hence the applicability, of MIMOSIS. Some validation results will also be provided for each policy domain to give the reader an idea of how aggregate results produced by MIMOSIS compare to the same numbers published by external sources. Section 2 also devotes some attention to what extent and how MIMOSIS can be used to evaluate progress in attaining the goals set forth in the National Action Plans on Social Inclusion. The level of detail provided by MIMOSIS allows for a thorough analysis and evaluation of such programs.

Section 3 describes MIMOSIS relative to other national and international models as far as underlying data, scope and flexibility are concerned. Two models will be described and compared in greater detail. One is the Finnish national microsimulation model TUJA and the other is the European wide microsimulation model EUROMOD. This analysis will be further refined and continued in more detail in the new project "MIMOD".

Sections 4 and 5 present the results of some simulation exercises. In section 4 three different simulations are presented: the calculation of effective average and marginal tax rates, the adaption of pensions to the evolution of welfare, and limiting the duration of unemployment benefits. The first simulation is meant to give an idea of the effective tax rates facing different groups of the population. As such it is not a simulation of a change in policy but nevertheless provides policy makers with an idea of how work (dis)incentives are distributed among the population. It is also meant to show the use of MIMOSIS as a flexible tool for analysis. The second and third application *do* simulate potential (and actual) policy reforms. Both are carried out in a static framework, i.e. they only show the "morning after" effects of a policy change without taking into account second

order effects through changes in economic agents' behaviour. These first round effects are nevertheless important as they might be crucial in the adoption or rejection of a certain policy proposal.

The incorporation of behavioural reactions is taken up in section 5 were the introduction of a work bonus for the low skilled is analyzed and evaluated. Estimation of behavioural reactions allows to also assess the second order effects of policy reforms. As such it enables a more rigorous and more long-term oriented analysis of both distributional and budgetary effects of the reform(s). Behavioural reactions are modeled through changes in the hours of labour supplied by the (affected part of the) population. It should be noted that labour supply reactions do not form an integrated part of the model, i.e. they are not built-in in MIMOSIS but rather estimated separately and the resulting coefficients used in the evaluation of the reform. Finally section 6 concludes.

As the development of a microsimulation model of the scope and detail of MIMOSIS is a continuously ongoing task some of the work described in this report will be continued and analyzed in more detail in the follow-up project "MIMOD". Also in that respect, one of the tasks originally taken up as an objective in this project, namely writing a procedure for recurrent updating of the data and the model, will be part of the new project. New simulations will be carried out and others refined. It is also in this vein that some of the results reported here must not be taken at face value but rather be read as the result of a first exploration into the possibilities of MIMOSIS. The latter is especially true for the part on the calculation of effective tax rates where the current version of MIMOSIS still needs refinement to be able to calculate reliable effective tax rates for the whole population. The same holds true for the labour supply models underlying the behavioural reactions.

2 MIMOSIS: A DESCRIPTION

The use of microsimulation models has become standard practice for ex-ante analysis of policy changes (see Bourguignon and Spadaro, 2005 for an overview and for two recent examples Bargain, 2004; and Immervol et al., 2007). In general one distinguishes between arithmetical and behavioural models. An arithmetical model consists of two elements: 1) a micro dataset covering all the relevant variables for a representative sample of the population, and 2) rules constituting the economic environment of individual agents. A behavioural model adds to that a third element, namely behavioural responses of agents to changes in the economic environment.

In arithmetical models the possible change in behaviour following changes in the economic environment is not modelled. Yet when policy changes are marginal this assumption might be justified. Indeed, since each individual is assumed to be at his or her optimum, *marginal* changes in the economic environment might not lead to changes in behaviour. In that case even arithmetic models allow estimating budgetary costs of a policy reform by aggregating over all individuals (Bourguignon and Spadaro, 2005).

It is clear that defining the economic environment as in arithmetic models, is a necessary condition for modelling behavioural responses. Building an arithmetic model is thus a necessary first step towards a more comprehensive behavioural model that allows to fully analyze policy changes, i.e. also taking into account second-order effects as a result of changes in (optimal) behaviour by economic agents.

MIMOSIS is such an arithmetic microsimulation model for social security and personal income taxes. It is thus a static model without behavioural responses and incorporates several domains related to social security and personal income taxation and the interlinkages between them. It is based on a detailed administrative dataset combining data provided by several different administrative agencies. The legislation applicable to the different policy domains is programmed in different *modules* and allows for the (re)calculation of benefits received and taxes paid for each individual and/or household in the dataset. Both the nature of the data and the scope of MIMOSIS, i.e. covering several different social security domains and including personal income taxes, set it apart from other Belgian microsimulation models such as MODÉTÉ that is based on survey data and acts as the Belgian component of EUROMOD (Joyeux, 1998); MISIM which, as MIMOSIS, covers social security benefits and contributions and personal income taxation but is based on survey data (Verbist, 2002); and SIRe, a microsimulation model developed by the Ministry of Finance based on administrative data but only covering personal income taxation (Standaert and Valenduc, 1996). In section 3 we will discuss in more detail the positioning of MIMOSIS with respect to other models, both nationally and internationally.

As MIMOSIS is an arithmetic model, in the remainder of this section we will discuss the two elements that constitute such a model in more detail for the Belgian social security and tax benefit legislation. In what follows we will first describe in broad the kind of data that have been collected and used. These are administrative data provided by several different administrative agencies and collected by a central Datawarehouse Labour Market and Social Protection (DWH). It is the DWH

that distributes the data to researchers. Secondly we will discuss in more detail the different policy domains that have been incorporated and modelled in MIMOSIS and validation results for each policy domain are provided.

2.1 CONSTRUCTION OF THE INPUT DATASET

When constructing a microsimulation model one of the first decisions to be made concerns the type of dataset that will be used to run the model. A microsimulation model can run on data stemming from registers (administrative data) or it can be run on data collected through a survey (survey data). Administrative data have the advantage that they are in general more detailed and accurate than survey data. A potential disadvantage of administrative data, however, is that they are not collected for research purposes, so it is possible that not all information required is available. In this respect, survey data can be more comprehensive.

In MIMOSIS the underlying data are *quarterly* administrative data collected by the Datawarehouse Labour Market and Social Protection from different administrative agencies and made available for the construction of MIMOSIS.[1] In MIMOSIS disposable income for individuals (and their households) is calculated taking into account the different rules —and exceptions to those rules— that "transform" gross income into disposable income. The implementation hereof demands, in broad, the following information:

- gross labour income for actives: preferably decomposed in gross hourly wage and hours worked,
- for (part-time) actives and non-actives alike we need to determine their entitlement to and the amount of replacement incomes,
- contributions and taxes paid on these incomes.

Two important sources of income that are not available in the MIMOSIs dataset are incomes from real estate and financial assets.

The flexibility of MIMOSIS lies in the extensive parameterization of policy rules, i.e. the calculation rules of the tax-benefit system to arrive at disposable income.[2] In order to assure this flexibility, a maximum of the external variables has been endogenized, i.e. internally reconstructed by MIMOSIS. Variables from the external sources that could not be reconstructed —due to a lack of information on intermediate variables needed for their calculation— are read in directly from the external data sources.[3] If needed, variables, reconstructed or otherwise, are passed on between modules, reflecting the interactions between the different policy domains.

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[1] For more information on the Datawarehouse Labour Market and Social Protection, the constructed database and the variables in it: http://www.ksz.fgov.be/nl/statistiques/stats_home.htm (in Dutch).

[2] The base year of MIMOSIS is the year 2001.

[3] Directly observed variables, i.e. variables read in from the external data, cannot be manipulated by the user. The use of observed variables has been restricted to a minimum.

Administrative data have the advantage that they are in general more detailed and accurate than survey data. A potential disadvantage of administrative data, however, is that they are not collected for research purposes, so it is possible that not all information required is available for the research question(s) one is interested in. In this respect, survey data can be more comprehensive. Table 2-1 gives a broad overview of the variables used in MIMOSIS and whether they are observed and/or constructed or reconstructed. This table is not exhaustive, but lists the most important variables currently available and/or constructed in MIMOSIS. Variables that are more specific to a certain policy domain have not (always) been listed but will be discussed in section 2.2 where the different modules are described. The same applies for many of the model parameters.

For a microsimulation model to be useful it is important that the underlying data are representative of the population most likely to be affected by the legislation modeled. The next subsection therefore briefly describes the procedure used to sample from the population.

TABLE 2-1 OVERVIEW OF IMPORTANT VARIABLES IN MIMOSIS

Variable*	Observed?**	Modelled?**
age	yes	no
sex	yes	no
population weight	no	yes
family ties	yes	yes
family type	yes	yes
type of couple (married, living together, …)	yes	yes
number of dependent children in tax unit	no	yes
number of dependent children below the age of 3	no	yes
number of dependent others	no	yes
household size	yes	no
worker type (blue/white collar)	yes	yes
type of profession	yes	no
socio-economic position	yes	yes
gross hourly income	no	yes
gross quarterly income	yes	yes
gross income earned as wage earner on the private labour market (labour income + holiday earnings + other supplements)	yes	yes
gross income earned as wage earner on the public labour market (labour income + holiday earnings + other supplements)	yes	yes
gross income self-employed	yes	yes
social security contributions paid on gross income	yes	yes
gross retirement pensions	yes	yes
gross survival pensions	yes	yes
guaranteed income	no	yes
gross family allowances	no	yes
gross benefits for industrial accidents and occupational disease	no	yes
gross sickness and disability benefits (other than the above)	yes	yes
gross unemployment benefits	yes	yes
early retirement benefits paid by unemployment agency	yes	yes
early retirement benefits paid by previous employer	yes	yes
premiums received as employee	yes	no
compensation in case of job loss	yes	no
net income as wage earner	no	yes
net income as self-employed	no	yes
net own professional income	no	yes
costs deductible from employment or self-employment income	no	yes
gross taxable income per year	no	yes
net taxable income per year	no	yes
net taxable occupation income	no	yes
net taxable income from pensions	no	yes
net taxable income from sickness and disability benefits	no	yes
net taxable income from unemployment benefits	no	yes
net taxable income from early retirement benefits	no	yes
prepayments per year	no	yes

TABLE 2-1 OVERVIEW OF IMPORTANT VARIABLES IN MIMOSIS

Variable*	Observed?**	Modelled?**
gross amount of personal income taxes	no	yes
tax reductions	no	yes
net personal income taxes	no	yes
unemployment status	yes	yes
duration of unemployment	yes	yes
number of years worked as wage earner	yes	no
last daily wage earned before entering unemployment	no	yes
type of job left (in case of unemployment)	yes	no
level of unemployment in region of unemployed	yes	no
number of days per quarter unemployment benefits are received	yes	no
type of health hazard in health insurance legislation (sickness, maternity, occupational disease, industrial accidents, etc.)	no	yes
disabled (yes/no)	yes	no
start date disablement	yes	no
probable end date disablement	yes	no
individual giving right to child benefits	yes	yes
individual receiving child benefits	yes	yes
years of pension	yes	yes

*unless otherwise stated, all (replacement) income and benefit variables are on a quarterly basis

**"observed" means that the variable is available in the external data; "modelled" means that the variable is either constructed or reconstructed in MIMOSIS

SAMPLE

The population consists of all individuals that are registered in the National Register. We sampled among all individuals with main place of residence in Belgium on January 1st 2002. The complete household of the individuals thus selected are reconstructed using information in the National Register. Remark that also individuals living in collective households are included in the sample.[4] Since microsimulation models often apply to certain policy domains aimed at specific subgroups of the population, in the sampling stage it is often advised to oversample the target (sub)population(s). MIMOSIS is a microsimulation model on social security and personal income taxes and thus focuses on different types of income sources. In the National Register, however, information on income sources is not available and therefore there is no oversampling of certain subgroups (according to income source) in the construction of the dataset. The sample size is taken large enough such that a sufficient amount of variation is observed within certain subgroups in the final sample. This resulted in a preliminary sampling of 100 000 individuals. After including all other household members, the final sample consists of 305 019 individuals. For each individual a population weight has been determined to make the sample representative of the population

[4] If an individual from a collective household is sampled, the other "household" members are not added to the sample, in contrast to what is done when a member of private household is sampled.

present in the National Register and with place of residence in Belgium. Once we have drawn the sample and constructed the input dataset the next step is to program the policy rules that apply to the different policy domains. This is done in modules, each representing a policy domain, and discussed in the next section. But before doing so, in Table 2-2 we give an overview of the incomes and income concepts found in the Belgian panel of the European Union Statistics on Income and Living Conditions survey (EU-SILC) and currently covered in MIMOSIS. It is clear that some incomes that could be of importance for policy analysis are currently not covered in MIMOSIS, e.g. income from property such as imputed rents and income from capital in general. Also mortgage interest payments and housing allowances are not covered in MIMOSIS. Still, a majority of policy relevant income concepts *are* covered and modelled in detail in MIMOSIS.

TABLE 2-2 GROSS INCOME VARIABLES AND THEIR COMPONENT IN EU-SILC AND MIMOSIS

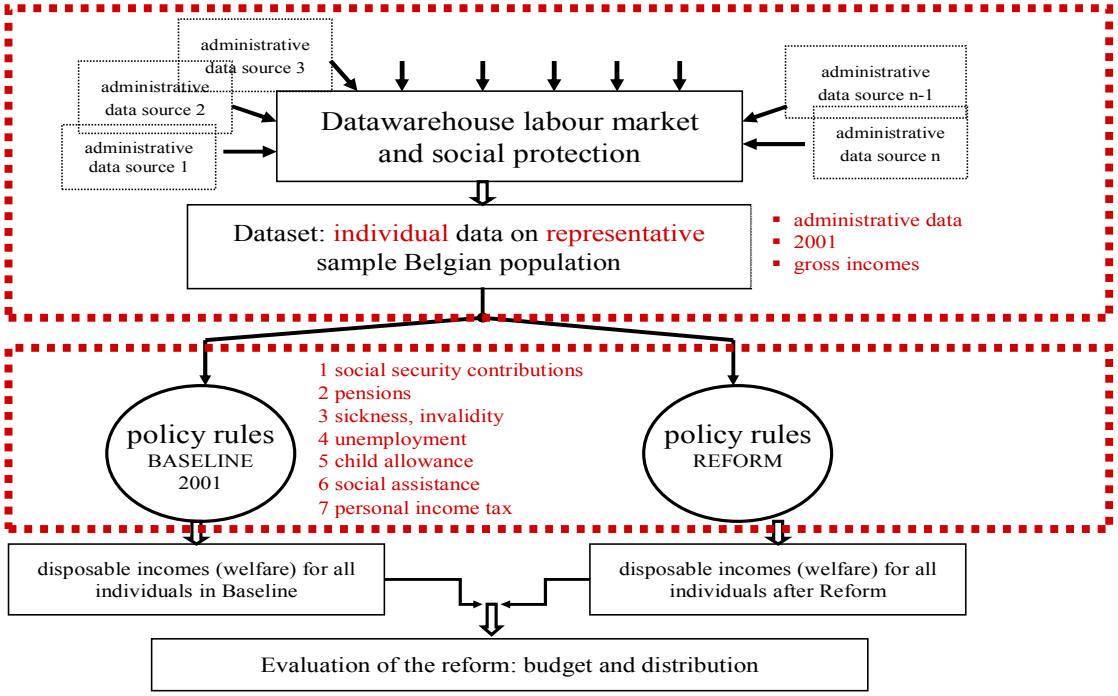
Income categories	Income components in EU-SILC	Covered in MIMOSIS?
Gross employee income	Gross cash or near-cash employee income	Yes
	Gross non-cash employee income	No
	Employers' social insurance contributions	Yes
Self-employment income	Gross cash profits or losses from self-employment (including royalties)	Yes
	Value of goods produced for own consumption	No
Imputed rent	Imputed rent	No
Property income	Interest, dividends, profit from capital investments in unincorporated business	No
	Income from rental of property or land	No
Current transfer received	Social benefits	Yes
	Family/children-related allowances	Yes
	Social exclusion not elsewhere classified	No
	Housing allowances	No
	Unemployment benefits	Yes
	Old-age benefits	Yes
	Survivors' benefits	Yes
	Sickness benefits	yes
	Disability benefits	Yes
	Education-related allowances	No
	Regular inter-household cash transfers received	No
Other income received	Income received by people aged under 16	???
Interest payments	Interest paid on mortgage	No
Current transfers paid	Tax on income and social insurance contributions	No
	Regular taxes on wealth	No
	Employers' social insurance contributions	Yes
	Regular inter-household cash transfers paid	no

2.2 MODULES: BUILDING BLOCKS OF MIMOSIS

The different modules are at the heart of MIMOSIS. The programming language Fortran is used to translate the policy rules applicable to the different domains of social security and personal income taxation into computer code. One module, the FAMREL-module, is of an auxiliary nature and determines the relations between household members. Family relations, and especially the incomes of family members, often determine the amount of benefits received and contributions paid. It serves as input to every other module. We will, however, not devote a separate section to the description of the FAMREL-module. Where family relations are important it should be borne in

mind that they are provided by FAMREL. In Figure 2-1 we show a schematic representation of MIMOSIS where the first dotted rectangle represents the creation of the input dataset and the second dotted rectangle is a schematic representation of the core of MIMOSIS where the policy rules of 2001 in the different policy domains have been translated into variables, parameters and calculation rules, ultimately determining for each individual the disposable income. The disposable income in the reform situation is obtained by changing the policy parameters that have been programmed in the different modules.

FIGURE 2-1 SCHEMATIC REPRESENTATION OF MIMOSIS



The policy domains MIMOSIS is built around are listed in Table 2-3, each of which constitutes a separate module and also shown in Figure 2-1:

TABLE 2-3 POLICY DOMAINS COVERED BY MIMOSIS

module/policy domain	Does what?
CONTRIB	calculates social security contributions
FAMAL	calculates family allowances
SICK	calculates sickness and disability benefits
UNEM	calculates unemployment benefits
PENSWELF	calculates pensions[5]
PIT	calculates personal income taxes
SOCBEN	calculates social assistance benefits
EVAL	assesses budgetary and distributional impact of reforms

The modules are not independent of each other. They are interlinked and provide information and feedback to one another. Income concepts that are calculated in one module are passed on to subsequent modules. This allows assessing the *global* impact of a policy reform. Raising benefits in some domain, e.g. unemployment or pensions, can and often will change the amounts of benefits received in other domains and/or the amount of personal income taxes due. In the remainder of this section we will describe each module, i.e. policy domain, in more detail focusing for each on the most important variables and parameters that can be manipulated by the user. For a more detailed description of the different modules we refer the reader to the technical module notes that can be found on the website of the FPS Social Security.[6] For each policy domain we will also present validation results, i.e. to what extent the results of the module calculations correspond to external statistics for the policy domain in question. Where possible we will also briefly describe the changes in the legislation that have taken place since 2001.

2.2.1 family allowances (FAMAL-module)

A BRIEF OVERVIEW OF THE LEGISLATION

Under the heading of family allowances we consider child allowances, birth allowance, orphan allowances and guaranteed family allowances. Family allowances depend on the number of children, their birth rank and age. There are different persons that intervene in the right to child allowances. First, there is the person that initiates the right to child allowances (the beneficiary). In most cases this will be the father. Second is the person that is the beneficiary of the child allowances (child-beneficiary). And third is the person that actually receives the child allowances —in principle the mother.

The monthly amount of child allowance progressively increases with the number of children up to rank three, whereafter they are fixed for any additional children. In principle child allowances

[5] Currently the module for pensions is restricted to observed pensions only. Simulation possibilities are therefore restricted to evaluating e.g. welfare adaptations of current pensions. A more elaborate module for calculating pensions based on past career information – the PENSCALC module – is currently being developed and shall be integrated in a next version of MIMOSIS.

[6] See http://socialsecurity.fgov.be/nl/nieuws_publicaties/publicaties/mimosis/domeinen.htm

are paid until the age of 18. This can be extended to the age of 25 if the child is either a student, trainee or apprentice and has no net own means that surpass a certain ceiling. Before the age of 18 the right to basic child allowances is not means-tested, neither on the income of the recipient and/or beneficiary, nor on the net own means of the child itself. The monthly basic amounts are listed in Table 2-4.

The legislation provides for monthly age supplements that —obviously— depend on age and also on rank.[7] For children of long-term unemployed (>6months), retirees and beneficiaries of survival pensions, a social supplement, the amount of which depends on the rank of the child, can be added to the monthly amount. These social supplements are subjected to a means-test on the income of the beneficiary and his or her partner however. This also applies to social supplements provided for beneficiaries that are disabled. Handicapped children less than 21 years old are entitled to social supplements that are not means-tested but that are dependent on the rank of the child.[8]

TABLE 2-4 BASIC MONTHLY CHILD ALLOWANCES IN EURO PER MONTH

Rank of child	Basic allowance in Euro per month
Wage earners and civil servants	
1st rank	71.18
2nd rank	131.71
3rd rank	196.66
Active self-employed	
1st rank	36.21
2nd rank	131.71
3rd rank	196.66
Retired self-employed	
1st rank	57.41
2nd rank	154.17
3rd rank	200.60

At the birth of a child parents are entitled to a birth premium that depends on the birth rank of the child. In case of a firstborn the premium will be higher than for later births, i.e. €964.40 for a firstborn compared to €725.60 for second, third, etc. A firstborn is defined as the first child of one of the parents. It is thus perfectly possible to have two firstborns in the same household. For following births —for the same parents— premiums are constant.

Orphan allowances do not depend on the child's rank, have a different base allowance than is applied for child allowance and can be supplemented according to the age of the child. If there is a

[7] Remark that it is possible for a child to change rank. This happens for example if the oldest one (child of rank 1) leaves home or does no longer give right to a child allowance. The second oldest then becomes of rank 1. There are at most 3 ranks. All children after the third have rank 3.

[8] In the current version of MIMOSIS we cannot identify handicapped children. All children are assumed to be physically and mentally able.

surviving parent he or she must not be remarried or form a new household with a person who is not a relative up to the 3rd degree.

Guaranteed family allowances are provided for the most destitute families based on a means-test on the household's income. The quarterly income ceiling is increased by 20% for each dependent child other than the first. The amount of the allowances also depends on whether or not the child already gives right to child allowances in another scheme. If the latter is true and the means-test passed, the amounts of guaranteed family allowance are the same as those for active self-employed. Otherwise they are the same as in the wage earner and civil servant schemes.

WHAT CAN THE USER CHANGE?

In the following list we give an overview of the policy parameters the user can change for the FAMAL-module:

- the (monthly) income ceiling to determine the eligibility of the child beyond the age of 18,
- the ceilings on income of beneficiary and partner to determine eligibility for social supplements,
- the ceiling on household income for guaranteed family allowance,
- the percentage used to increase the ceiling for the guaranteed family allowances,
- the monthly basic amounts for the different schemes and ranks of the children,
- the monthly amounts for supplements —both age and social— according to rank and age if applicable.
- the monthly amounts for supplements for handicapped children.

WHAT IS NOT POSSIBLE?

MIMOSIS offers the possibility to change the policy parameters of the current legislation. Changes in the legislation beyond changes in parameter values, e.g. a whole new way of calculation social security benefits, cannot be simulated without changing the source code. For example, in the FAMAL-module it is not possible to make basic child allowances means-tested.

VALIDATION

The performance of the current version of the module is summarized in Table 2-5. The aggregates for employees and self-employed correspond quite well to figures from external sources. The public sector and especially guaranteed family allowances are considerably off the mark. One of the reasons is the faulty classification of the number of right-giving children that is overestimated by 999.29% —a difference of 160 875 individuals— for the category of guaranteed family allowance.

TABLE 2-5 EXPENSES FOR FAMILY ALLOWANCES IN 2001 IN MILLION EURO

	Reference year (1)	MIMOSIS: baseline (2)	Diff. (2)-(1)	Diff. (2)-(1) as % of (1)
Employees	3186.4	3212.4	26.0	0.82
Self-Employed	354.9	347.4	-7.5	-2.11
Public Sector	1060.0	577.4	-482.6	-45.53
Guaranteed Family Allowance	33.2	286.3	253.1	762.35

*CHANGES IN THE LEGISLATION SINCE **2001***

- Introduction of a back-to-school premium for wage earners' children in 2007. For the year 2007, the amounts are 50 euros for children between 6 and 11 and 70 euros for children between 12 and 17.
- age supplements

  Some changes on the calculation of age supplements have come into effect in 2003. The most important changes are listed below in Table 2-6.

TABLE 2-6 AGE SUPPLEMENTS FOR CHILDREN BORN BEFORE JANUARY 1ST 1991 OR AFTER DECEMBER 31ST 1990

Age category	Amount
Age supplements for children with supplement for handicap; with orphan supplement; with a social supplement; having guaranteed family allowances; being 2nd or more rank of an "ordinary" family; being 1st rank of a monoparental family.	
6-12 years old	€ 27,85
12-18 years old	€ 42,56
18 years old or more	€ 54,11
Age supplements for children born after December 31st 1990 being 1st rank of a "ordinary" family	
6-12 years old	€ 13,97
12-18 years old	€ 21,27
18 years old or more	€ 27,85
Exceptions:	
1. Children born between the 1st of January 1991 and the 31st of December 1996 that become 1st rank are entitled to a fixed supplement from the age of 6	€ 27,85
2. Children who already received an age supplement on the 1st of January 1997 and born between:	
The 1st of January 1985 and the 31st of December 1990 who are less then 18	€ 27,85
The 1st of January 1985 and the 31st of December 1990 who are at least 18	€ 29,91
The 1st of January 1981 and the 31st of December 1984	€ 44,62

2.2.2 sickness and disability benefits (SICK-module)

A BRIEF OVERVIEW OF THE LEGISLATION

The module for calculating sickness and disability benefits focuses on three major areas of application: benefits in case of primary disablement (sickness and maternity leave), benefits in case of disability, and benefits in case of industrial accidents and occupational diseases. For each of these areas a distinction is made for employees, self-employed and civil servants.

SICKNESS

During the first thirty days of sickness employees are entitled to a guaranteed income paid by the employer. This guaranteed income is different for white- and blue-collar workers and is determined as follows:

- white collar workers receive their normal wages for the full thirty days,
- blue collar workers receive an amount depending where they are in the thirty day period:
  - first week : normal wages,
  - second week : 60% of lost wages (limited to daily maximum amount of €116.74[9]) + supplements[10], all paid by employer,
  - third week onward : same as second week but 60% now paid by health insurance,

After the first thirty days and for the next eleven months the amounts received depend on the family situation as follows:

- 60% of lost wages (limited to daily maximum amount) for employees with dependent family or who have lost their sole source of income,
- 55% of lost wages (limited to a daily maximum amount) for employees without dependent family and who have not lost their sole source of income.

Self-employed are not compensated during the first month of sickness. The following eleven months they receive a payment that depends on the family situation. If the self-employed has dependent family the amount is set at €18.62 per day, otherwise it is €15.12 per day. These amounts are payable each day of the week except on Sundays.

Civil servants have a maximum number of 21 working days of sick leave per 12 months of seniority. During the sick leave civil servants receive 100% of their wages If the period of official sick leave is exceeded, the benefits are limited to 60% of lost wages irrespective of family situation. In case the sickness is deemed to be serious and long term, the benefits remain at 100% however.

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[9] This maximum is reduced to €97.28 daily if the worker has a six-day working week.

[10] The supplement a blue-collar worker receives amounts to: (25.88% of part normal wages that does not exceed the daily maximum) + (85.88% of part of normal wages that exceeds the daily maximum)-

MATERNITY

Maternity leave for employees and civil servants usually extends to a period of 15 weeks. Civil servants receive 100% of their wages during that period. For employees a distinction has to be made between active employees, unemployed and employees in a period of disablement as follows:

- maternity benefits for active employees:
  - 82% of lost wages (unlimited) during first 30 days,
  - 75% of lost wages (limited to daily maximum of €116.74) after the first 30 days,
  - 60% of lost wages (limited to daily maximum of €116.74) if the maternity leave is extended beyond 15 weeks,
- maternity benefits for unemployed:
  - basic indemnity of 60% of lost wages (limited to €116.74 daily) + supplement of 19.5% of lost wages (limited to €116.74 daily) for the first 30 days,
  - basic indemnity of 60% of lost wages (limited to €116.74 daily) + supplement of 15% of lost wages (limited to €116.74 daily) after the first 30 days,
  - 60% of lost wages (limited to daily maximum of €116.74) if the maternity leave is extended beyond 15 weeks,
- maternity benefits for employees in a period of disablement:
  - 79.5% of lost wages (limited to €116.74 daily) for the first 30 days,
  - 75% of lost wages (limited to €116.74 daily) after the first 30 days,
  - 60% of lost wages (limited to daily maximum of €116.74) if the maternity leave is extended beyond 15 weeks.

Self-employed receive a fixed amount of €943.14 for the entire period of their maternity leave which, in 2001, was only three weeks. Civil servants receive 100% of their wages during the 15-week maternity leave.

DISABILITY

The period of disability starts after one year in primary disablement and also here the benefits are a function of the family situation. For employees the percentages are as follows:

- 65% of lost wages (limited to daily amount of€116.74) for employees with dependent family,
- 40% of lost wages (limited to daily amount of€116.74) for employees without dependent family and who have not lost their sole source of income,

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(prepayments on taxes by the employer on total taxable wages the blue-collar worker would have normally received).

- 45% of lost wages (limited to daily amount of€116.74) for employees without dependent family and who have lost their sole source of income.

For self-employed the amounts are dependent also on whether or not the self-employed has to close shop because of the disability. The daily fixed amounts are as follows:

- €29.55 for self-employed with dependent family who do not have to close the business,
- €22.16 for self-employed without dependent family and who do not have to close the business,
- €31.31 for self-employed with dependent family and who have to close the business,
- €23.48 for self-employed without dependent family and who have to close their business.

INDUSTRIAL ACCIDENTS AND OCCUPATIONAL DISEASES

Employees are entitled to a guaranteed income paid by the employer in case of industrial accidents or occupational diseases that lead to a temporary full disablement. Blue-collar workers receive an amount equal to their usual wages for the first seven days of disablement and white-collar workers receive their usual wages during the first month. Once the period of guaranteed income is exceeded the employee receives a replacement income equal to 90% of average daily wages that, as of January 1, 2001, is limited to a maximum daily amount of €68.19.[11]

In the case an accident or disease leads to temporary partial disablement, i.e. the employee continues working according to his or her ability, the benefit is calculated as the difference between the previous wage and the wage (temporarily) received in the new "function".

Permanent disablement gives rise to an annual allowance based on the previous wage and the degree of disability and limited to an annual amount of €24 888.70 as of January 1, 2001. After three years of disablement the annual allowance is replaced by a life annuity, possibly supplemented if the disabled needs help from a third person to perform normal activities if life.

In the scheme of the self-employed there is no special arrangement for industrial accidents or occupational diseases. The replacement income is the same as in the case of primary disablement. Civil servants, on the contrary, receive their usual wage during the whole period of temporary disablement without time restrictions and an annuity calculated on the basis of the wage in case of permanent disablement. The annuity cannot exceed €21 047.40.

WHAT CAN THE USER CHANGE?

Following is a list of parameters that can be adjusted by the user:

- income ceilings used to limit daily benefits for sickness, industrial accidents and occupational disease,

[11] For occupational diseases a supplementary condition is that the period of disablement is at least 15 days.

- percentages and thresholds used to calculate actual sickness and disability benefits and benefits in case of industrial accident and or occupational disease,
- percentages used to determine the supplements for blue-collar workers in case of sickness,
- percentages used to determine daily maternity benefit,
- lump sum benefits for sickness and disability and maternity leave for self-employed,
- percentages and thresholds in case of supplement for help of a third person,
- percentage of social security contributions on gross incomes and tax parameters needed to calculate prepayment amounts where applicable.

WHAT IS NOT POSSIBLE?

It is not possible to adapt periods for which benefits are applicable. One of the main political parties proposed to increase the legal period for maternity leave in the most recent federal elections of June 2007. This, however, is not possible to simulate with MIMOSIS without changing the source code.

Since MIMOSIS is a static model transitions in and out of "states" are not modeled. For the SICK-module this implies that maternity benefits are assumed to have no effect on fertility, although this might be an implicit policy goal in societies with a rapidly ageing population.

VALIDATION

Table 2-7 shows the model estimations of the amounts paid for the different types in the different schemes.

TABLE 2-7 BENEFITS PAID FOR SICKNESS AND DISABILITY IN 2001 IN MILLION EURO

	Reference year (1)	MIMOSIS: baseline (2)	Diff. (2)-(1)	Diff. (2)-(1) as % of (1)
Primary disablement				
Employees, blue collar	534.40	890.01	355.6	66.54
Employees, white collar	207.13	169.78	-37.3	-18.03
Self-employed	19.97	-	-	-
Invalidity				
Employees, blue collar	1350.33	1143.44	-206.9	-15.32
Employees, white collar	422.76	447.78	25.0	5.92
Self-employed	128.03	95.52	-32.5	-25.39
Maternity				
Employees, primary period	339.65	536.13	196.5	57.85
Self-employed	4.67	-	-	-
Benefits temporary disablement	-	154.39	-	-
Benefits permanent disablement	40.77	38.22	-2.6	-6.27
Benefits temporary occupational disease	4.96	1.60	-3.4	-67.80
Benefits permanent occupational disease	226.94	244.73	17.8	7.84

*CHANGES IN THE LEGISLATION SINCE **2001***

- paternity leave

  Since July 1st 2002 every employee has the right to paternity leave of 10 days after the birth of his child. The employee has to take this leave within a period of 30 days starting the day of the birth. The first three days of his paternity leave the employee is entitled to his full wages paid by his employer. For the days after the first three days the employee is entitled to paternity benefits paid by the health insurance. The paternity benefits amount to 82% of the lost but limited wages of the employee. On January 1st 2007 the wages per day are limited to € 132.7860 if the employee is working in a five-day working week, and limited to € 110.6550 if the employee is working in a six-day working week. Prior to July 1st 2002 the employee was entitled to a paternity leave of only 3 days, for which he received his full wages.

- adoption leave

  Also since July 1st 2002 every employee has the right to adoption leave of maximum 6 weeks if the adopted child is younger than 3 years; 4 weeks if the adopted child is older than 3 but younger than 8 years. The first three days of this leave the employee is entitled to his full wages paid by his employer. For the days after the first three days the employee is entitled to benefits paid by the health insurance. The benefits amount to 82% of the lost but limited wages of the employee.

Since January 1st 2007 also self employed have the right to adoption leave of 6 weeks if the adopted child is younger than 3 years; 4 weeks if the adopted child is older than 3 but younger than 8 years. During this time the self employed receives a fixed amount per week that is set to € 347.11.

- breast-feeding breaks
  Since July 1st 2002 an employee has the right to suspend her activities to nurse her baby or to express milk. The break lasts half an hour. An employee working 4 hours a day or more is entitled to one break for that day. An employee working at least 7 hours and half is entitled to 2 breaks that day. During these breaks the employee is entitled to benefits in accordance to the maternity benefits (82% of the lost and unlimited wages).

- introduction of a minimum right for employees in primary disablement
  Since January 1st 2003 there are minimum benefits for employees in primary disablement from the 7th month of primary disablement on. Before there were no minimum benefits, and for part-time employees or employees with low income this usually meant that they received very low benefits when they got ill.

- second ceiling for the income conditions of household members
  To determine the household position of the sick and disabled we look at the income of the other household member(s) that has to satisfy certain conditions. To be classified as an employee with dependent family the other household member(s) of the sick and disabled can not have an income that amounts to more than € 758.63 per month. Since July 1st 2004 a second ceiling permits to be classified as an employee without dependent family but who has lost his sole source of income when the income of the other household member(s) is smaller or equal to € 1283.91 per month.

- social status of child minders
  Since April 1st 2003 childminders[12] can be entitled to sickness and disability benefits, maternity benefits and benefits in case of industrial accident or occupational disease.

  As for employees the amount of benefits depends on the household position and the lost "wages" of the childminder. Because child minders do not earn a wage as such, but receive remuneration, their lost wages per month are determined as follows:

  *Fictitious wage=(the number of child care hours * the number of children in child care) * fictitious hourly wages*

  The fictitious hourly wages are set to € 7.80. If the child minder takes care of one child during a whole day this is then equal to 1.9 hours.

[12] The childminder must have joined a service that is recognized by the Flemish, Walloon or German-speaking Community.

2.2.3 unemployment benefits (UNEM-module)

A BRIEF OVERVIEW OF THE LEGISLATION

In the unemployment legislation three groups of unemployed are distinguished:

- unemployed in search of work that are entitled to benefits either after studies or after previous employment.
- unemployed not in search of work and that are entitled to a benefit: conventional early retirement, career break, older unemployed with seniority supplement, other exemptions.
- employees entitled to benefits: part-time early retirement, part-time career break, guaranteed income benefits, temporarily unemployed, individuals in social activation programs.

In Table 2-8 we list the daily unemployment benefits of the young unemployed, i.e. after leaving school.[13] To check whether or not family members are dependent, one has to determine their net own means. If the latter exceed what is legally set as maximum the person is no longer considered dependent. We do not mention those ceilings here but they are available as parameters in MIMOSIS.

TABLE 2-8 DAILY UNEMPLOYMENT BENEFITS FOR THE YOUNG UNEMPLOYED

	Benefits per day in Euro
Unemployed with dependent family	30.99
Single unemployed	
Younger than 18	8.63
18 or older and younger than 21	13.56
21 or older	21.19
Cohabitating unemployed	
Partner has low unemployment benefits (sole source of income and <= €917.80 a month)	
Younger than 18	7.99
18 or older and younger than 21	12.84
21 or older	12.84
Partner's (replacement) income exceeds €917.80 monthly	
Younger than 18	7.54
18 or older and younger than 21	12.02
21 or older	12.02

In case the unemployed worked before becoming unemployed the unemployment benefits depend on the average lost wages (based on last 4 weeks in employment), the family situation and the time already unemployed. The daily benefits are restricted: they cannot fall below a certain

[13] To be eligible for those benefits the young unemployed has to respect a "waiting period", i.e. during this period no unemployment benefits are received. The waiting period depends on the age and ranges from a minimum of 155 days to a maximum of 310 days.

threshold and cannot exceed a certain maximum. In Table 2-9 we list the percentages and minimum and maximum amounts for the unemployment benefits of the previously employed.

TABLE 2-9 CONDITIONS TO DETERMINE DAILY UNEMPLOYMENT BENEFITS AFTER EMPLOYMENT

Category	% of daily wages	Minimum daily amount (in euro)	Maximum daily amount (in euro
Unemployed with dependent family			
Disabled	60%	-	-
Not disabled	60%	31.78	35.30
Single unemployed			
Disabled	50%	-	-
Not disabled			
First 12 months	60%	24.07	35.30
After 12 months	45%	24.07	26.48
Cohabitating unemployed			
Disabled	50%	-	-
Not disabled			
First 12 months	55%	17.70	32.35
13th until 15th month[14]	35%	17.70	20.58
After 15 months			
Worked for more than 20 years as wage earner	35%		
Permanently disabled	35%		
All other cases			
Partner has monthly unemployment benefits not exceeding €917.80 as sole source of income		13.21+4.41	
Partner has (replacement) income exceeding €917.80 monthly		13.21	

People in *conventional early retirement* receive 60% of their lost quarterly wages with a minimum of €2478.84 and a maximum of €2753.40. These amounts are supplemented by a benefit paid by the employer and equal to half the difference between net income and the unemployment benefit. The amount of gross quarterly wages taken into account to determine net income is limited to €8329.23. In the case of a *career break* benefits are different when leaving full time or part time employment. For the latter the benefit would be calculated in function of the hours worked proportional to a full time worker in the same job. No information on the hours worked by part time workers is available and the benefit for this group is not reconstructed but read in directly from external data. *Elderly unemployed with a seniority supplement* receive benefits that vary according to age, unemployment duration and family situation.

For individuals with part-time early retirement, part-time career break, temporary unemployment, etc. benefits are either a lump sum amount per day or per month, often

[14] This period is increased by three months for every additional year —after the first— worked as wage earner.

supplemented with an amount paid by the employer (part-time early retirement, part-time career break, …) or depend on the hours worked (temporary unemployment).

WHAT CAN THE USER CHANGE?

Below we list some of the most important parameters that can be changed by the user in the UNEM-module.

- ceilings used to determine dependent family,
- maximum monthly amount of unemployment benefits of partner with unemployment benefits as sole source of income,
- daily lump sum benefits for young unemployed,
- percentages applied to average lost daily wages,
- ceilings applied to average lost daily wages,
- ceilings and percentages to compute early retirement benefits,
- monthly lump sum benefits in case of career break and part-time career break,
- daily lump sum amounts in case of part-time early retirement,
- tax parameters used to determine net income where necessary,
- period during which unemployment benefit amounts are applicable.

WHAT IS NOT POSSIBLE?

The unemployment status is read in from external data and is fixed within a run of MIMOSIS. It is thus not possible to model transitions in and out of unemployment.[15] For the group of part-time unemployed where the benefits depend on hours worked the benefits are not reconstructed but read in directly from external sources because of lack of information on hours worked. Simulations cannot be performed for this group. As mentioned before, MIMOSIS is a static arithmetic model. For the UNEM-module this implies that changes in unemployment benefits are assumed not to have any effect on labour supply.

VALIDATION

In Table 2-10 the reproduction of aggregate statistics is shown. In general the module estimates fairly accurately the aggregate statistics as published by external sources.

[15] It is not possible to model this by changing a parameter. However, changing the input dataset is an alternative to model such transitions.

TABLE 2-10 UNEMPLOYMENT BENEFITS IN 2001 IN MILLION EURO

	Reference year (1)	MIMOSIS: baseline (2)	Diff. (2)-(1)	Diff. (2)-(1) as % of (1)
Full-time unemployed	4.23	3.97	-0.26	-6.17
Part-time unemployed	0.34	0.33	-0.01	-2.03
Early retirement	1.15	1.10	-0.06	-4.89
Career break and time credit	0.27	0.26	-0.01	-5.14
Total	6.00	5.66	-0.34	-5.64

CHANGES IN THE LEGISLATION SINCE 2001

- youth holiday

  Since January 1st 2001 the system of youth holidays replaces the system of supplementary holidays for young employees. To be eligible for youth holidays a young employee has to meet not only the conditions to be permitted to the system of unemployment benefits on the basis of studies (see section 3.3 of the UNEM module note), but also the following conditions:

  - the young employee did not meet the eligibility conditions for youth holidays or supplementary holidays during one of the previous years;
  - the young employee has exhausted his normal days' holiday he is entitled to;
  - the youth holiday benefits are requested for days that fall within a period the young employee is bounded by an employment contract;
  - the young employee is during his vacation hours an unemployed without pay and without replacement benefit.

  When eligible the young employee is entitled to 4 weeks of youth holidays, reduced by the number of normal paid days' holiday he is entitled to. The benefit the young employee receives is equal to 65% of the average daily wages he is normally entitled to when he takes up youth holiday for the first time.

- childminders

  Since April 1st 2003 a social safety net came into effect for childminders. If the income of a child minder decreases because of the temporary absence of (some of) the children normally under her or his care, for reasons independent[16] of the child minder, she or he can be entitled to a child minder benefit paid by the RVA/ ONM. To be eligible the childminder has to meet the following conditions:

  - she or he takes care of the children in a family context and the children are brought by their parents to the childminders home;
  - she or he has joined a service that is recognized by the Flemish, Walloon or German-speaking Community;

[16] If the childminder e.g. takes a day off she or he will not be entitled to a childminder benefit for that day.

- she or he is not bounded to this service by an employment contract.

This regulation does not hold for child minders who are self-employed child minders or who work with an employment contract.

The daily amount of the child minder benefit amounts to €25.09 (since October 1st 2006). The total amount of the benefit is calculated per month with the following method:

- determination of the maximum number of child care days;
- determination of the number of missing paid child care days;
- determination of the number of days child minder benefits are paid:

(the number of missing paid child care days*1.9)/6.33

The number of days that child minder benefits are paid can be reduced if the child minder performs another activity or receives an income that can not be cumulated with child minder benefits. However, if the other activity is secondary, if the child minder already performed the activity during three months prior to the start of the activity as child minder, the activity only is performed during the evening (between 6 pm and 7 am) during the week (from Monday till Friday), the activity does not belong to a non permitted area (e.g. catering industry, pedlar, insurance agent), the activity is declared on the form C220A when the child minder benefits are applied for, cumulation with child minder benefits is possible. The child minder benefits can also be cumulated with survivor pension for a period of 12 months and with benefits in case of career break (but not with unemployment benefits after studies or employment).

- time credit

Since January 1st 2002 time credit is the system of common career break for employees who are working in the **private sector**. Employees have a right to a full or partial interruption of their working hours for at most one year[17] during their entire career. The minimum length of a period of interruption is three months. To be entitled the employee must have worked 12 months for his employer during the 15 months prior to the request for time credit. In Table 2-11 the level of benefits in case of time

TABLE 2-11 LEVEL OF NET BENEFITS IN CASE OF TIME CREDIT (SINCE OCTOBER 1ST 2006)

Full interruption of a full-time job		Reduction of a full-time job to a half-time job	
< 5 years seniority	> 5 years seniority	< 5 years seniority	> 5 years seniority
€418.76	€558.35	€209.37	€279.17

For employees who fully interrupt a part-time job, the amount of benefits in case of time credit is reduced proportionally to the number of working hours in their part-time job. For

[17] Through a collective labour agreement the duration can be extended to a maximum of 5 years during the entire career.

employees who reduce their working hours in a part-time job (at least ¾ of a full-time job) to a half-time job, the amount of benefits in case of time credit is reduced proportionally to the number of reduced working hours.

Employees working in a five-day working week or more also have the right to decrease their working days for:

- one day per week;
- or two half days per week;

during a maximum period of five years during their entire career. The minimum length of a period of this kind of interruption is six months. To be entitled the employee must have worked for his employer during the five years prior to his request and he must have worked full-time during the last 12 months of those five years. The net benefits the employees receives amount to €177.93 per month if he is single; and €137.88 per month for other employees (employees with dependent family and cohabitating employees).

Employees of 50 years and older also have the right to:

- reduce their working days with one day per week or two half days per week on the condition that they are working in a five-day working week or more (the minimum length of a period of this kind of interruption is also six months);
- reduce their full-time job to a part-time job.

There is no maximum length to this right. To be entitled the employee must be 50 years or older; he must have worked for his employer during the five years prior to his request; he must have a seniority of 20 years as a wage earner. The net benefits amount to €233.77 per month for a single employee in case of a decrease of 1/5 and €193.72 for other employees (employees with dependent family and cohabitating employees); and to €417.05 per month in case of a decrease to a part-time job. For employees who reduce their working hours in a part-time job (at least ¾ of a full-time job) to a half-time job, the amount of benefits in case of time credit is reduced proportionally to the number of reduced working hours.

- guaranteed income benefits

  Since July 5th, 2005 guaranteed income benefits are computed as:

  guaranteed income benefit=reference monthly benefit - the net monthly wages obtained as part-time + a monthly lump sum amount of the hourly bonus

  *monthly lump sum amount of the hourly bonus = (hours > 1/3 of the number of hours full-time) * hourly bonus*

  hours > 1/3 of the number of hours full-time = only the hours that exceed 1/3 of a full-time job give raise to the hourly bonus (55 hours per month in case of employment in a job of which the number of full-time hours is equal to 38 hours per week)

TABLE 2-12 LEVEL OF THE HOURLY BONUS (SINCE OCTOBER 1ST 2006)

	Situation	Hourly bonus
1	Unemployed with dependent family	€ 2.65
2	Single unemployed	€ 1.86
3	Cohabitating unemployed	€ 1.06

The two systems are used simultaneously. If the unemployed was already working part-time in the old system before July 2005, the highest result of both systems is allocated to the unemployed.

- activation benefits

  Measures were taken to activate unemployment benefits, such as the Activa job scheme. Within this job scheme part of the wages is paid by the RVA/ONEM when long-term unemployed are employed. The part of the wages that is paid is then called "employment benefit".

  Generally the "employment benefit" equals € 500 per month. This amount is reduced proportionally in case of part-time employment, and the amount is limited to the net monthly wages the unemployed receives.

  If the unemployed is employed by local authorities in the scope of the safety and prevention policy (stadswacht / assistant de prévention et de sécurité) the "employment benefit" is increased to € 900 per month or to € 1100 per month.

  If the unemployed is working in an interim job the amount of the "employment benefit" is multiplied with the following fraction:

  $$500 * [q/(s * 4.33)]$$

  - the denominator is equal to the number of hours a full-time employee normally works per week (factor s) multiplied with 4.33;
  - the numerator is equal to the number of hours wages that are paid per month to the unemployed (factor q)

  If the unemployed is working with a short term job contract the same calculation rules apply as for unemployed working in an interim job.

  If a young unemployed who is not entitled to waiting benefits follows an individual education plan he is then entitled to waiting benefits during the period of education. For the calculation of these waiting benefits we refer to section 3.3 of the UNEM module note.

  If an older unemployed (aged 50 or older) resumes working as an employee or a self-employed (in main occupation) he is then entitled to a "resumption of work benefit". The "resumption of work benefit" amounts to € 172.31 per month, and is payable for a maximum period of 24 months.

- particular benefits for the disabled

  The rules concerning the particular unemployment benefits for the disabled were lifted (as a simplification of the unemployment legislation). Given the fact that the guaranteed minimum income also applies to the employment of disabled employees the deviating regulation had no longer raison d'être. Since April 1st 2003 the disabled unemployed are indemnified according to the rules of the general system.

2.2.4 social security contributions (CONTRIB-module)

A BRIEF OVERVIEW OF THE LEGISLATION

Social security contributions are paid quarterly on total gross earnings, without income ceiling and before any tax deductions. Earnings are any advantage in money —or that can be expressed in money— granted by the employer as compensation for labour. Social security contributions depend on the labour market status of the individual and are paid on a quarterly basis. In some instances social security contributions are also due on replacement incomes. This is the case for (early) retirement and survival pensions and disability benefits (except for primary disablement). The social security contributions due depend on the number of dependent family members. The calculation bases for determining contributions come from the different modules where the respective benefits are calculated, i.e. pensions module, unemployment module and sickness and disability module.

Contributions are levied to fund government expenditures on social security such as pensions, unemployment, but also wage moderation and funds in case of company closings. In Table 2-13 we list the percentages of general social security contributions on gross earnings, differentiated according to the purpose of funding, for employees and employers. Social security contributions for civil servants without statutory service are similar to those of wage earners on the private labour market.

TABLE 2-13 PERCENTAGES TO DETERMINE SOCIAL SECURITY CONTRIBUTIONS FOR WAGE EARNERS

	Blue-collar workers			White-collar workers		
	employee	employer	total	employee	employer	total
Pensions	7.50	8.86	16.36	7.50	8.86	16.36
Sickness and disability						
Medical care	3.55	3.80	7.35	3.55	3.80	7.35
Disability benefits	1.15	2.35	3.50	1.15	2.35	3.50
Unemployment	0.87	1.46	2.33	0.87	1.46	2.33
Family allowances	0.00	7.00	7.00	0.00	7.00	7.00
Work accidents	0.00	0.30	0.30	0.00	0.30	0.30
Occupational disease	0.00	1.10	1.10	0.00	1.10	1.10
Annual vacation	0.00	6.00	6.00	0.00	0.00	0.00
Paid educational leave	0.00	0.04	0.04	0.00	0.04	0.04
Work integration activities	0.00	0.10	0.10	0.00	0.10	0.10
Child care	0.00	0.05	0.05	0.00	0.05	0.05
Temporary unemployment and older unemployed	0.00	0.10	0.10	0.00	0.10	0.10
Wage moderation	0.00	7.48	7.48	0.00	7.48	7.48
Total[18]	13.07	38.64	51.71	13.07	32.64	45.71

Similar to Table 2-13, in Table 2-14 we list the percentages applicable to gross earnings of civil servants with statutory service working at either the local or federal level.

[18] Remark that we only list the general contributions here. If we take into account contributions for other purposes such as funds for company closings, the employer contributions total 40.82% for blue-collar workers and 34.82% for white-collar workers, while the employee contributions remain at 13.07%. This implies a total percentage of 53.89% for blue-collar workers and 47.89% for white-collar workers.

TABLE 2-14 PERCENTAGES TO DETERMINE SOCIAL SECURITY CONTRIBUTIONS FOR CIVIL SERVANTS

	Employee	Employer	Total
Civil servants working at local level			
pensions	7.50	20.00	27.50
Sickness and disability benefits	3.55	3.80	7.35
Family allowances	0.00	5.25	5.25
Occupational disease	0.00	0.17	0.17
Wage moderation	0.00	6.00	6.00
Children attendance	0.00	0.05	0.05
Total	11.05	35.27	46.32
Civil servants at the federal level			
Survival pensions	7.50	0.00	7.50
Health care	3.55	3.80	7.35
Family allowance	0.00	0.00	0.00
Occupational disease	0.00	0.00	0.00
Wage moderation	0.00	0.00	0.00
Children attendance	0.00	0.00	0.00
Total	11.05	3.80	14.85

Self-employed are subject to a quarterly lump sum amount of €32.50 if income is in the range €10 306.07-€49 993.26 and a lump sum amount of €64.50 if income exceeds €49 993.26. These lump sum amounts are supplemented by a variable contribution of 16.70% if income is between €10 306.07 and €49 993.26 and of 12.27% if net income exceeds that amount.

Depending on the characteristics of the employer and/or employee the tax benefit legislation also provides for deductions on employer social security contributions for a fixed gross wage. Those are either lump sum amounts or a percentage of remuneration and are either structural, i.e. applicable to all companies in an industry, or targeted, i.e. targeted toward specific worker categories such as job seekers, unemployed that are difficult to re-integrate in the labour market …. Deductions are also applicable on employee social security contributions, e.g. for workers with low wages.

Civil servants also can enjoy deductions on the social security contributions paid. Deductions on employers' contributions for civil servants typically only apply for civil servants at the local level. Currently there is not enough information available to reconstruct the 7 possible deductions on employers' social security contributions for civil servants.

Apart from the calculation of social security contributions for employers and employees in the different schemes the module on social security contributions also computes gross taxable income concepts that are important as input for the module on personal income taxation and for other modules where income conditions are needed (e.g. to determine dependent family). Gross taxable labour market income is defined as reconstructed gross income variables minus the social security contributions. Gross taxable replacement income is the sum of replacement incomes from the various modules minus the social security contributions due on some of those incomes.

WHAT CAN THE USER CHANGE?

We list some of the most important policy parameters of the CONTRIB-module.

- parameters used to determine single and double holiday earnings for blue- and white-collar workers and civil servants,
- percentages used to calculate social security contributions for wage earners and civil servants,
- percentages and amount used to determine deductions,
- quarterly lump sum amounts to be paid by all self-employed,
- percentages and income levels used to determine variable component of self-employed social security contributions,
- percentages, (lump sum) amounts and ceilings used to determine social security contributions on replacement income,
- parameter to indicate that labour income should be computed as the product of hours worked and a wage,
- parameter to increase the hourly wage earned, either on male or female income or both.

The latter two points allow the construction of complete individual budget constraints by looping over the hours worked.

WHAT IS NOT POSSIBLE?

Currently none of the replacement incomes in MIMOSIS are adapted conditional on income earned on the labour market. Such adaptation rules nevertheless do exist in the tax benefit legislation and are of importance in determining effective tax and participation rates for example.

All income concepts are based on the predefined and fixed labour market status and hence, it is currently not possible to perform simulations where individuals change labour market status.

In principle gross wages are fixed and changes in social security contributions, especially those of employers, will have no effect on them. Again, as for the other modules, labour supply responses are not modeled.

VALIDATION

Table 2-15 shows how well the contributions as calculated by the CONTRIB-module correspond with external statistics ("n.a." in either column means data were not (yet) available). The small total deviation conceals a wide range of deviations for the more detailed items. Some of the categories cannot be distinguished in the data, for example student jobs, for others data is lacking to reconstruct the contributions. For the contribution types for which data is available the estimation results are in general quite satisfactory except for salaried employees working for local authorities and civil servants.

TABLE 2-15 CONTRIBUTIONS AFTER DEDUCTION OF REDUCTIONS (YEARLY AMOUNTS IN MILLION EURO 2001)

	Reference year (1)	MIMOSIS: baseline (2)	Diff. (2)-(1)	Diff. (2)-(1) as % of (1)
Wage earners scheme, normal contributions (employee and employer)				
Social Security	24938.59	25967.40	1028.82	4.13
Social Security Local Authorities	896.41	272.84	-623.56	-69.56
Wage moderation	2914.60	3606.79	692.19	23.75
Wage earners scheme, specific contributions (employee and employer)				
On double holiday earnings	537.14	302.71	-234.43	-43.64
Wage moderation double holiday earnings	244.13	251.11	6.98	2.86
reduction child allowance	0.004	n.a.		-
premiums group insurance	144.73	n.a.		-
employer contribution part-time unempl. + seniority	58.41	59.66	1.25	2.14
employer contribution early retirement + elderly unempl.	63.36	153.88	90.51	142.85
compensating contribution employer for early retirement	4.06	n.a.		-
private use company car	70.77	n.a.		-
part-time employment	0.03	n.a.		-
profit sharing	n.a.	n.a.		-
Wage earner scheme, special funds (employee and employer)				
other than yearly vacation and closure of businesses-	1327.58	113.36	-1214.22	-91.46
yearly vacation	3322.67	3192.75	-129.92	-3.91
closure of businesses	159.15	171.82	12.67	7.96
	2116.88	2389.99	273.12	12.90
Self-employed, normal contributions	2.08	n.a.		-
Self-employed, consolidation contribution	99.34	n.a.		-
Self-employed, company contribution	6.63	n.a.		-
Self-employed, specific contributions	1327.58	113.36	-1214.22	-91.46
Contributions on replacement income				
(survival) pensions	528.37	665.35	136.98	25.93
benefits from occupational disease and accidents	n.a.	57.92		-
Pension contributions statutory civil servants (federal)	n.a.	1018.42		-
Pension contributions statutory civil servants local authorities	n.a.	0.00		-
Contributions statutory federal civil servants (other than pensions)	n.a.	951.70		-
Contributions statutory civil servants local authorities (other than pensions)	n.a.	189.30		-
Total	37434.92	39365.01	1930.10	5.16

CHANGES IN THE LEGISLATION SINCE 2001

A new system has been implemented in 2004 in order to simplify and harmonize the different reductions of contributions. In this new system, all reductions are gathered under a global one that is composed of two parts: a general reduction which is the structural one and a target group reduction. In the new framework, the structural reduction can be combined with only one target group reduction. The five possible target group reductions are: first job, long term unemployed, old worker, young worker and collective reduction of the work time.

On the other side, to be entitled to a reduction, the worker must work at least 27.5 % of the normal time in the considered quarter.

2.2.5 pensions (PENSWELF-module)

A BRIEF OVERVIEW OF THE LEGISLATION

In this module we distinguish between retirement pension, survival pensions, minimum pensions and guaranteed income for wage earners and self-employed. The pension amount received depends on whether the individual is married and whether the spouse also receives a pension and/or income from professional activities or replacement income. In general, for married couples where the spouse has no other incomes the replacement rate is 75%, for singles and couples not in the situation above the replacement rate is 60%.[19] The minimum monthly pension amounts depend on the replacement rate and are also differentiated according to the coverage scheme, i.e. wage earner or self-employed. Survival pensions are differentiated only between coverage schemes. Minimum pension are further adjusted according to the "career fraction". A full career is 45 years and minimum pensions are proportional to the number of years worked relative to a full career.

WHAT CAN THE USER CHANGE?

This is a fairly simple module and its main purpose is to offer a possibility to adjust pensions to the overall evolution of welfare in society. Pensions that can be adapted include normal retirement, survival, and minimum pensions in the systems of employees and self-employed and guaranteed income. The pensions for civil servants have different rules, are in general higher, and have incorporated in them some sort of welfare adaptation already.

The adaptation can be differentiated along the following dimensions (and combinations thereof) by introducing either an absolute change or a percentage change:

- according to type: retirement pension, survival pension, minimum pension, guaranteed income,

[19] If both partners in a couple have a pension and the highest pension calculated at 75% is higher than the sum of both pension calculated at 60%, the rate of 75% is applied. It is 60% for each partner in all other cases.

- according to scheme coverage: wage earner, self-employed
- according to replacement rate: at 75% or 60%
- according to years already receiving (pension) benefits: 0-4 years, 5-9 year, 10-15 years, or 15 years or more.

WHAT IS NOT POSSIBLE?

The PENSWELF-module does not recalculate pensions. It therefore does not allow changing replacement rates for example. A more elaborate pension module is currently being developed that recalculates pensions based on career information for wage earners on the private and public labour market and that allows greater flexibility and potential for policy simulations.

VALIDATION

The validation of the module results thus far is summarized in Table 2-16. In aggregate the module reproduces quite well external statistics, except for the income guarantee for elderly where there is an underestimation of 82%.

TABLE 2-16 EXPENSES FOR PENSIONS IN 2001 IN MILLION EURO

	Reference year (1)	MIMOSIS: baseline (2)	Diff. (2)-(1)	Diff. (2)-(1) as % of (1)
Employees	12809.9	13221.0	411.1	3.21
Self-Employed	1875.6	1708.3	-167.3	-8.92
Public Sector	7254.8	7678.2	423.4	5.84
Income guarantee elderly	257.1	63.1	-194.0	-75.46

CHANGES IN THE LEGISLATION SINCE 2001

- Generation Pact
  The Generation Pact sets up a mechanism to adapt all social allowances to the evolution of welfare. The Belgian government has to agree every two years, and for the first time in 2006, upon the amount whereby social allowances are allowed to increase. This system is limited to the self-employed and wage earner schemes only.
- minimum pension
  Form April 1st 2003, it is possible to cumulate years worked across schemes, i.e. wage earner and/or self-employed scheme, in order to increase the number of years used in the calculation of the minimum pension. When such accumulation is taken advantage of, the minimum pension calculated will be that of a self-employed.
- Anticipated pension for self-employed
  From April 1st 2003, it is possible to have an anticipated retirement pension in the self-employed scheme without any reduction in the retirement amount. The condition to benefit

from this rule is that the length of the individual's career must be equal to a full career in the wage earner scheme, i.e. 45 years of professional career for men and 43, 44 or 45 years for women according to year of the pension.

- Income Guarantee Elderly
  The age eligibility criteria for the guaranteed income for the elderly have been increased from 62 in 2001 to 63 as of January 2003 and 64 starting January 2006. As of 2009 individuals have to be 65 or older to be eligible for the guaranteed income for the elderly. As from December 2006 the monthly guaranteed income amounts are also increased to 530.30€ (from 457.49€) per month for an elder person not living alone and to 795.46€ (from 686.24€) per month for a single elder individual.[20] As amounts are indexed, starting from January 2008 the indexed amounts will be 551.74€ per month for elderly not living alone and 827.61€ per month for single elderly.

- women's retirement age
  From July 1997, there is a transition period for women's retirement age. After this period, the retirement age for men and women will be the same, i.e. 65 years. The transition period is detailed in Table 2-17.

TABLE 2-17 TRANSITION PERIOD FOR WOMEN'S RETIREMENT AGE

Starting pension data	Women's retirement age
Before July 1st 1997	60
July 1st 1997 – December 31st 1999	61
January 1st 2000 – December 31st 2002	62
January 1st 2003 – December 31st 2005	63
January 1st 2006 – December 31st 2008	64
From January 1st 2009	65

2.2.6 personal income taxes (PIT-module)

A BRIEF OVERVIEW OF THE LEGISLATION

Taxes are calculated for each fiscal unit within the sociological household. A fiscal unit consists of the taxpayer (individual or married couple) and his or her dependents. To be considered as dependent one's net own means may not exceed certain threshold amounts. To determine net own means both taxable and non-taxable incomes are taken into account net of the costs (supposedly) made to obtain the income.

[20] These increases are not merely indexations. The amounts in parentheses are the *indexed* amounts for December 2005, indexed from base amounts 393.88€ per month and 590.82€ per month respectively in 2001.

BASIC TAX CALCULATION

Once tax units are determined personal income taxes due can be calculated using parameters from the tax legislation of 2001. From gross taxable income costs to obtain that income are subtracted to arrive at net taxable income. A fiscal unit can choose to deduct the real costs made or opt for a lump sum deduction. For employees the latter is determined according to the graduated percentages listed in Table 2-18. For self-employed the lump sum amount is determined as 5% of their gross taxable income and limited to €2880.

TABLE 2-18 RATES APPLIED ON GROSS TAXABLE INCOME OF EMPLOYEES TO DETERMINE LUMP SUM COSTS MADE TO OBTAIN THE INCOME

Gross taxable income brackets in Euro	Rate applied to bracket in %
>0 and <=4320	20.0
>4320 and <=8580	10.0
>8580 and <=14280	5.0
>14280 and <=57780	3.0
>57780	0.0

Net taxable income is obtained by subtracting the costs from gross taxable income. For married couples a marital quotient is applied if one of the spouses earns less than 30% of total net taxable occupational income. Income from the higher earning spouse is then transferred to the other spouse as if the latter earned 30% of total net taxable occupational income. The amount transferred is limited to €7710 however. Net taxable income can then be further reduced for tax units declaring expenses such as mortgage interest rate payments, charitable gifts, etc. To the net taxable income thus obtained, and of each spouse in the case of a married couple, a graduated rate structure is applied to determine the gross personal income taxes due.[21] In Table 2-19 we list the different income tax brackets and the rates that apply to them. The gross personal income taxes are then further reduced by various tax reductions.

TABLE 2-19 TAX RATES APPLICABLE ON NET TAXABLE INCOME IN 2001

Net taxable income brackets in Euro	Tax rates per income bracket in %
>0 and <=6570	25.0
>6570 and <=8710	30.0
>8710 and <=12420	40.0
>12420 and <=28540	45.0
>28540 and <=42810	50.0
>42810 and <=62790	52.5
>62790	55

[21] Net taxable income also includes income from other sources, e.g. real estate property.

TAX REDUCTIONS

Tax reductions are a function of the size and composition of the tax unit, possible replacement income(s), expenses, and income earned abroad. It is possible that the total amount of tax reductions for a fiscal unit exceeds the amount of taxes due. In that case, taxes are set equal to zero, i.e. the Belgian tax system has no provision for tax refunds.

The most important tax reduction is the basic tax exempt amount, augmented for dependent children and other dependent persons. The amounts are listed in Table 2-20. These amounts are further increased for handicapped members of the tax unit. In case of a married couple only the basic tax exempt amount is applied to the income of the spouse with the lowest income. The other exemptions accrue to the spouse with the highest income. Tax reductions are calculated from the bottom-up, i.e. taxes on these amounts are calculated using the rate structure in Table 2-19. The tax amounts so calculated are then subtracted from the gross taxes calculated on net taxable income.

TABLE 2-20 TAX EXEMPT AMOUNTS APPLICABLE TO INCOME EARNED IN 2001

	tax exempt amount in Euro
Basic tax exempt amount	
single	5350
married couple (each partner)	4240
Dependent children	
first	1140 (+ 430)*
second	1780 (+ 430)*
third	3630 (+ 430)*
fourth and following	4050 (+ 430)*
Dependent other persons (per person)	1140

* €430.00 is added for each dependent child under the age of three and wherefore no childcare costs are declared

Tax reductions for replacement income are calculated at the level of the tax unit and start from the maximum amounts listed in Table 2-21. These maxima are reduced in function of the share of replacement incomes in total income of the tax unit, i.e. the basic tax reduction is equal to the share of replacement income(s) in net taxable income multiplied by the maximum amount. This basic tax reduction is further reduced depending on the total amount of net taxable income and is limited to its share of taxes (share of replacement income in total net taxable income multiplied by the taxes due after application of tax reductions other than those for replacement incomes). In some cases taxes can be further reduced to zero if the sole source of income of the tax unit is a single type of replacement income and does not exceed a certain amount.

TABLE 2-21 MAXIMUM TAX REDUCTIONS FOR REPLACEMENT INCOMES IN 2001

Type of replacement income	Single (in Euro)	Married couple (in Euro)
pension benefits and early retirement benefits new type (starting as of January 1, 1987)	1550	1810
early retirement benefits old type (started before January 1, 1987)	2800	3060
unemployment benefits	1550	1810
unemployment benefits older unemployed (age 58 and above)	1550	1810
sickness and disability benefits	1990	2250
other replacement income	1550	1810

WHAT CAN THE USER CHANGE?

Below a list of the most important parameters that can be manipulated in the PIT-module:

- rates and brackets to determine lump sum (professional) costs for employees,
- cost percentages to determine net own means of family members,
- ceilings to determine dependent family members,
- marital quotient and maximal amount that can be transferred,
- income brackets and rate structure,
- basic exempted amount,
- tax exempted amounts for dependent children and dependent others,
- maximum tax reduction amounts for replacement incomes,
- rates and amounts used to reduce basic tax reduction for replacement incomes.

WHAT IS NOT POSSIBLE?

Because of privacy reasons there is no data available on the exact municipalities the fiscal units reside in and it is thus not possible to calculate the supplementary municipal taxes. We also have no information on interest and capital repayments of mortgages nor on the cadastral incomes (used to calculate property taxes). As such it is not possible to perform simulations in these areas, e.g. reduction in or complete abolishment of deductibility of mortgage repayments.

VALIDATION

In Table 2-22 we show fiscal statistics per decile of total taxable net income, i.e. after deduction of costs made to earn the income. The quantile values of the distribution of taxable income are systematically underestimated by MIMOSIS. Except for the lowest decile this also holds for the total

taxable net income per decile.[22] The total amount of taxes is severely underestimated for the first three deciles and to a lesser extent also for the fourth. As for the other deciles, total taxes paid are somewhat overestimated except for the tenth decile where there is again an underestimation, albeit less severe compared to the first deciles. Average tax rates closely resemble those found in external statistics for deciles 4 through 10 and are underestimated considerably for the first three deciles. It should be noted that we do not have tax information on the municipal and/or provincial level, nor do we have data on items such as mortgage repayments, gifts, property taxes, etc.

[22] Deciles are based on fiscal units.

TABLE 2-22 TAXABLE NET INCOME AND TOTAL TAXES IN 2001 (INCOME EARNED IN 2001)

Decile	Total taxable net income			Total taxes		
	Upper limit (€)	Total amount (billion €)	% of total	Total amount (billion €)	% of total	Average tax rate (%)
External data from fiscal statistics						
1	7536	1.88	1.6	0.02	0.1	1.09
2	10968	4.69	3.9	0.16	0.5	3.42
3	13433	5.97	4.9	0.50	1.5	8.30
4	16067	7.23	6.0	0.92	2.8	12.73
5	18957	8.59	7.1	1.55	4.8	18.02
6	22221	10.07	8.3	2.23	6.9	22.13
7	26891	11.96	9.9	3.03	9.3	25.32
8	34229	14.86	12.3	4.19	12.9	28.21
9	46763	19.51	16.1	6.11	18.8	31.31
10		36.37	30.0	13.82	42.5	38.00
Total		121.13	100.0	32.52	100.0	26.85
Data calculated by the MIMOSIS module on personal income taxes						
1	6997	2.12	1.8	0.01	0.0	0.48
2	10356	4.35	3.8	0.11	0.3	2.50
3	12695	5.67	4.9	0.34	1.1	6.01
4	15578	6.90	6.0	0.83	2.6	12.07
5	18624	8.37	7.3	1.62	5.1	19.32
6	21884	9.90	8.6	2.35	7.5	23.73
7	26476	11.80	10.2	3.14	10.0	26.64
8	33465	14.57	12.6	4.26	13.5	29.22
9	46451	19.24	16.7	6.20	19.7	32.25
10		32.49	28.1	12.60	40.0	38.79
Total		115.41	100.0	31.47	100.0	27.27
Differences between calculated and external data in % of external data						
1	-7.15	12.71	14.76	-50.29	-67.55	-55.79
2	-5.58	-7.16	-3.25	-32.08	-30.75	-26.84
3	-5.49	-5.15	0.19	-31.33	-27.86	-27.59
4	-3.05	-4.58	-0.34	-9.49	-5.44	-5.16
5	-1.76	-2.46	2.19	4.55	7.10	7.21
6	-1.52	-1.68	3.37	5.42	8.21	7.23
7	-1.54	-1.34	3.25	3.80	7.37	5.20
8	-2.23	-1.93	2.66	1.60	4.92	3.60
9	-0.67	-1.39	3.54	1.56	4.88	3.01
10		-10.68	-6.17	-8.83	-5.77	2.08
Total		-4.72	0.00	-3.25	0.00	1.55

CHANGES IN THE LEGISLATION SINCE 2001

- determining lump sum expenses

  Throughout the tax years 2002-2005 the rate on the first bracket to determine lump sum expenses is increased in two steps: for the tax year 2003 it has increased from 20% (year 2001) to 23%; thereafter it further increased to 25% in the tax year 2004.

- treatment of couples

  From the tax year 2005 the way couples are treated changed considerably. The marital rule will only be applied if it results in a tax advantage for the couple. Before the tax year 2005 all income sources, other than net taxable occupational income, were added to the net taxable occupational income of the highest earning spouse after application of the marital splitting rule. As from tax year 2005 such incomes will be added to the income of the spouse that earned them.

- tax brackets

  There have been some changes in the statutory tax brackets since 2001. The highest two tax rates have been abolished. The 55%-rate has been abolished in the tax year 2003 while the rate of 52% has been abolished since the tax year 2004.

  The nominal amounts of net taxable income determining the brackets have also been changed for certain tax brackets. An overview is given in

TABLE 2-23 RATES APPLIED ON NET TAXABLE INCOME OF EACH SPOUSE TO DETERMINE GROSS PERSONAL INCOME TAXES FOR DIFFERENT TAX YEARS

Rate applied on net taxable income	Non indexed amount of net taxable income on EUR Tax year 2003	Non indexed amount of net taxable income on EUR Tax year 2004	Non indexed amount of net taxable income on EUR Tax year 2005
25%	>0 and <=5 705	>0 and <=5 705	>0 and <=5 705
30%	>5 705 and <=7 565	>5 705 and <=8 120	>5 705 and <=8 120
40%	>7 565 and <=10 785	>8 120 and <=12 120	>8 120 and <=13 530
45%	>10 785 and <=24 800	>12 120 and <=24 800	>13 530 and <=24 800
50%	>24 800 and <=37 185	>24 800	>24 800
52%	>37 185	abolished	abolished
55%	abolished	abolished	abolished

- tax credits

  The exemption for both partners of a tax couple will be increased to the level of that of a single in two steps: in the tax year 2004 the non-indexed amount for each partner is increased from 3 250 EUR to 3 390 EUR; in the tax year 2005 this is further increased to 4 095 EUR.

  From the tax year 2006 the age of dependent children for which the taxpayer does not declare daycare costs and for which she enjoys an exemption is increased from 3 to 12 years.

From the tax year 2003 on, the exemption for singles with dependent children will be given a broader interpretation as before. Until the tax year 2002 only specific singles, such as non remarried widow(er)s with dependent children, could benefit from the tax exemption. This has broadened to all single taxpayers with dependent children. The exempted non-indexed amount is set at 870 EUR. Furthermore, the tax credit for children is made refundable.

From the tax year 2003 onwards a refundable tax credit for low labour income is introduced. To determine this credit one the legislator takes into account the total amount of net taxable labour income of each spouse before the marital splitting rule is applied.

From the tax year 2005 onwards taxpayers that enter early retirement are treated differently than those that entered it before. The maximal non-indexed amounts for the tax credits for the 'new' early retired are 1 344.57 EUR for single taxpayers and 1 569.96 EUR for couples (as compared to 2 434.66 EUR for singles and 2 660.07 EUR for couples in the case of early retirement of the 'old' type).

2.2.7 minimum income/social assistance (SOCBEN-module)

When income is insufficient to provide for basic needs, individuals are entitled to a minimum income. Eligibility is conditional on having exhausted all other possible sources of income, including transfers from social security institutions (e.g. pensions, unemployment benefits, …) and/or rights to alimony. The transfer amount is determined as the difference between the minimum income level and the level of net own means (means-tested) and also depends on the family situation of the applicant. It is to be noted however that social assistance is not automatic and follows the (approved) application of the individual in need. The approval is by the social welfare agencies and at their discretion, i.e. a similar application might be rejected by one and approved by another. In MIMOSIS an automatic procedure is assumed, i.e. abstraction is made of issues of non take-up.

Some resources, such as child benefits, war pensions, alimony for children, etc., are excluded from the means-test. From the income sources that are included in the means-test the most important that are currently lacking in the model are (imputed) income from property (real estate) and income from capital along with private pensions (not funded by social security contributions) and alimony to adults. A part of net own means thus calculated is exempted: it is subtracted from net own means in the calculation of the social benefit. The amounts that are exempted depend on the family situation and are included in the model as parameters as is the maximum amount of transfer. Other income sources and social transfers are calculated and available from the other modules.

CHANGES IN THE LEGISLATION SINCE 2001

Sine 2002 the right to a minimum income has been replaced by a right to social integration. The most important change for the minimum income legislation is the individualization of the right to income assistance. The right to income assistance is henceforth assessed at the individual level and

the income transfer is in favour of the individual and not the household. The legislator also introduced a new household typology: that of a parent only living with his or her children for half of the time or who pays alimony in their favour.

2.2.8 evaluation module (EVAL-module)

Whereas in the previous modules the main objective was to reconstruct different income concepts and to calculate personal income taxes, the evaluation modules brings all of these together and determines net disposable incomes of individuals, i.e. gross incomes minus social security contribution and personal income taxes and plus social welfare. The net incomes thus obtained will then be used to judge the budgetary and distributional impacts of a reform. Broadly speaking this implies a comparison of net disposable incomes before and after a reform.

When evaluating distributional consequences of a reform a number of options are available to the user as to what poverty benchmarks, equivalence scales, units of analysis she wants to look at. Poverty lines can be 40%, 50% or 60% of median or mean income; the basic unit of analysis is the individual but also households can be used as unit of analysis; the choice of equivalence scale is restricted to the new OECD-scale, i.e. 0.5 for additional adults and 0.3 for children, the old OECD-scale, i.e. 0.7 for additional adults and 0.5 for children, and (square root of) household size. To measure poverty incidence measures of the Foster-Greer-Thorbecke (FGT) class are offered, which includes the headcount ratio, the mean deprivation gap and the mean of squared deprivation gaps. The Gini coefficient is used for inequality measurement. Apart from tables per decile of equivalized income of losers and gainers, poverty incidence, and income inequality, results are also produced for different socio-economic classifications and age groups to provide for a more detailed and informed look at the population groups most (likely to be) affected by the reform. The importance and breadth of the results produced by the evaluation module will become clearer in section 4 where we discuss some simulations using MIMOSIS.

As a further illustration of the possibilities of MIMOSIS and of the richness of it's underlying database, in the next section we will briefly describe the National Action Plans on Social Inclusion and to what extent MIMOSIS can be used to evaluate them and hence the progress made toward their accomplishment.

2.2.9 National Action Plans on Social Inclusion: another look at the possibilities of MIMOSIS

During the Lisbon Summit of March 2000 the European Council decided that the European Union should adopt the strategic goal for the next decade not only of becoming "the most competitive and dynamic knowledge-based economy", but also of achieving "greater social cohesion". At the Summit in Nice, later in 2000, it was agreed to advance social policy on the basis of an Open Method of Coordination (OMC), in order to "make a decisive impact on the eradication of poverty and social exclusion by 2010" (Atkinson, 2002). This OMC aims to organise a process of mutual learning between Member States through frequent reports and the exchange of good

practices (Carpentier e.a., 2006). It was decided that each Member State should implement a national two-year action plan for combating poverty and social exclusion, setting specific targets. Subsequently, the first NAPs/inclusion were submitted in June 2001.

After the reorientation of the Lisbon Strategy which put the emphasis on economic growth and employment (more and better jobs) and less on social inclusion, the NAPs/inclusion were streamlined in an OMC Social Protection and Social Inclusion from 2006 on. The NAPs on social inclusion, pensions and health care were brought together in a National three-year Report on Social Protection and Social Inclusion (Carpentier e.a., 2006).

The National Action Plans on Social Inclusion report on the social situation and list new and existing policy measures. The social situation is described on the basis of a set of indicators (Laeken indicators)[23], that is supplemented with national indicators. The listed policy measures normally cover a wide range of policy domains (among others education, housing, health care and (un)employment) and are designed to aid in the achievement (of the targeted levels) of the indicators.

One of the central ideas of the OMC is the use of outcomes/indicators in policy analysis. This means that indicators are to be used in all the different stages of policy making (from preparation to evaluation). By using indicators policy becomes more transparent and more efficient (Carpentier e.a., 2006).

Policy making on the basis of indicators assumes the sequence of a number of steps and an adequate report on the steps undertaken. First, to describe the social situation data have to be gathered and indicators have to be set. The results of these indicators then have to be analysed and interpreted in order to detect groups and domains at risk. When the groups and domains at risk are detected targets have to be set. Next the existing policy measures and the potential alternative measures have to be listed. These policy measures then have to be evaluated both ex-post and ex-ante (see next paragraph) so that the most adequate mix of policy measures can be determined to reach the targets set a in a previous step. Policy measures that are carried out have to be followed through. Data have to be systematically gathered, analysed and reported to determine if the indicators evolve in the desired direction. Finally, on the basis of an ex-post evaluation of measures good practices can be determined.

Reporting on the evolution of achievements set in the NAPs/inclusion three steps can be distinguished. In a first step the social situation is described on the basis of the analysis of the results of the indicators. Secondly the targets are described that are set on the basis of the groups and domains at risk and the policy priorities. A third and final step is a description of the existing policy and the new policy. In this step an ex-post evaluation is made of the existing policy and an ex-ante evaluation of the new policy measures. The latter can be done using microsimulation models.

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[23] The Laeken indicators is a set of common European statistical indicators on poverty and social exclusion, established at the European Council of December 2001 in the Brussels suburb of Laeken Belgium. For more details, see Eurostat (2003).

2.2.9.1 MIMOSIS AND THE LAEKEN AND NATIONAL INDICATORS OF THE NAPS/INCLUSION

The Belgian NAPs/inclusion cover policy measures taken by the federal government and the government of the regions. In this section we give an overview of the Laeken indicators and the national indicators of the Belgian NAPs/inclusion, and we will indicate whether or not it is possible to calculate the indicators on the basis of MIMOSIS. In the first column of Table 2-24 we list the Laeken indicators and the national indicators of the Belgian NAPs/inclusion. In the second column of the table we indicate whether the indicator is computable on the basis of MIMOSIS. In the third column we then name the concepts to be used in the calculation of the indicator.

TABLE 2-24 MIMOSIS AND THE LAEKEN AND NATIONAL INDICATORS FROM THE NAPS/INCLUSION

Laeken indicators	**Computable in MIMOSIS**	**Concept(s) used in the calculation**
1a: At-risk-of-poverty rate by age and gender	yes	- equivalised total net income per individual (= the household total net income divided by equivalised household size according to the modified OECD scale) - the 'at-risk-of-poverty threshold' (= 60% of national median equivalised income) - the 'at-risk-of-poverty rate' (= the percentage of persons with an equivalised net total income below the 'at-risk-of poverty threshold') - age (0-15 years, 16-24 years, 25-49 years, 50-64 years, and 65 years and more) - gender
1b: At-risk-of-poverty rate by most frequent activity	yes	- equivalised total net income per individual - the 'at-risk-of-poverty threshold' - the 'at-risk-of-poverty rate' - activity status: economically active (unemployed or in work: employed or self-employed) or economically inactive (retired or other economically inactive)
1c: At-risk-of-poverty rate by household type	yes	- equivalised total net income per individual - the 'at-risk-of-poverty threshold' - the 'at-risk-of-poverty rate' - household type[24]
1d: At-risk-of-poverty rate by tenure status	no	(no information on tenure status available)

[24] For the different household types that are distinguished see EUROSTAT DOC. E2/IPSE/2003 Working Group "Statistics on Income, Poverty & Social Exclusion".

1e: At-risk-of-poverty threshold (illustrative values)	yes	- equivalised total net income per individual - the 'at-risk-of-poverty threshold' - illustrative value for a one person household (= threshold*1) and illustrative value for a household consisting of two adult and two children (= threshold*2.1) - the conversion of national currency values into euro and into PPS is done using official exchange rates and PPS values published by Eurostat: New Cronos, Theme 2, Domain "Price", Collection "PPP", Table "PPPSNA95"
2: Inequality of income distribution S80/S20 quintile share ratio	yes	- equivalised total net income per individual - S80/S20 = the quotient of the equivalised income available to the 5th quintile (richest) over the 1st quintile (poorest)
3: At-persistent-risk-of-poverty rate by gender (60% median)	no	(no information on the risk-of-poverty threshold in at least two of the preceding three years)
4: Relative at-risk-of-poverty gap	yes	- equivalised total net income per individual - the 'at-risk-of-poverty threshold' - identification of the 'at-risk-of-poverty' persons - the median equivalised total net income for the 'at-risk-of-poverty' persons - relative at-risk-of-poverty-gap (= 100 * ((at-risk-of-poverty threshold – median equivalised total net income for the 'at-risk-of-poverty' persons) / at-risk-of-poverty threshold))
5: Regional cohesion (dispersion of regional employment rates)	yes	- identification of persons in employment - identification of regional population (persons of working age: 15-64): figures at national level are broken down over individual regions by applying regional structures of most recent population census or result of regional labour force survey - regional employment rates - coefficient of variation of regional employment rates
6: Long term unemployment rate	yes	- identification of persons in employment - identification of persons who are unemployed - identification of the duration of unemployment - identification of the active population - long-term unemployment rate (= persons who have been unemployed for more than 12 months as a percentage of the total active population)

7: Persons living in jobless households	yes	- the number of persons aged 0-65 who are living in eligible households where none of the members are working as a percentage (proportion) of the total population aged 0-65 who are living in eligible households[25]
8: Early school leavers not in education or training	no	(no information on educational level)
9: Life expectancy at birth	no	
10: Self defined health status by income level	no	(no information on self defined health status)
11: Dispersion around the at-risk-of-poverty threshold	yes	- equivalised total net income per individual - the 'at-risk-of-poverty threshold' (40%, 50% or 70% instead of 60%) - the 'at-risk-of-poverty rate'
12: At-risk-of-poverty rate anchored at a moment in time	no	for a given year <<t>> (e.g. 1999) the 'at-risk-of-poverty' rate anchored at a moment in time is the share of the population whose equivalised total net income in that given year is below a risk-of-poverty threshold calculated in the standard way for the earlier year <<t-3>> (e.g. 1996) and then up-rated for inflation
13: At-risk-of-poverty rate before social transfers	yes	- equivalised income before social transfers per household - the 'at-risk-of-poverty threshold' (computed on the basis of the distribution **after** transfers!) - the 'at-risk-of-poverty rate'
14: Inequality of income distribution Gini coefficient	yes	- equivalised total net income per individual - GINI = the relationship of cumulative shares of population arranged according to the level of income, to the cumulative share of the equivalised total net income received by them
15: At-persistent-risk-of-poverty rate by gender (50% median)	no	(no information on the risk-of-poverty threshold in at least two of the preceding three years)
16: Long term unemployment share	yes	- identification of persons who are unemployed - identification of the duration of unemployment - long-term unemployment share (= persons who have been unemployed for more than 12 months as a percentage of the total number of unemployed persons)

[25] Eligible households contain at least one member of the household who is either aged between 18 and 24 and not in education and inactive, or who is aged between 24 and 65.

17: Very long term unemployment rate	yes	- identification of persons in employment - identification of persons who are unemployed - identification of the duration of unemployment - identification of the active population - very long-term unemployment rate (= persons who have been unemployed for more than 24 months as a percentage of the total active population)
18: Persons with low educational attainment	no	(no information on educational level)
National indicators		
inequality of income distribution		
I.1: S80/S20 quintile share ratio by region	yes	- See Indicator 2 of Laeken indicators - region
I.2: Gini coefficient by region	yes	- See Indicator 14 of Laeken indicators - region
at-risk-of-poverty		
I.3: At-risk-of-poverty threshold (illustrative values)	yes	- See Indicator 1e of Laeken indicators
I.4-1: At-risk-of-poverty rate by age, gender and region	yes	- See Indicator 1a of Laeken indicators - region
I.4-2: At-risk-of-poverty rate by most frequent activity and region	yes	- See Indicator 1b of Laeken indicators - region
I.4-3: At-risk-of-poverty rate by household type and region	yes	- See Indicator 1c of Laeken indicators - region
I.4-4: At-risk-of-poverty rate by tenure status	no	(no information on tenure status available)
I.4-5: Percentage of persons with equivalised disposable income below 60% of median national equivalised income by work intensity	no	work intensity of the household refers to the number of months that have been worked during the reference year by all the household members of working age as a proportion of the total number of months they theoretically could have worked (no information on the number of months worked during the reference year)
I.4-6: Percentage of persons with equivalised disposable income below 60% of median national equivalised income by educational level	no	(no information on educational level)

I.4-7: Composition of population at-risk-of-poverty by most frequent activity	yes	- equivalised total net income per individual - the 'at-risk-of-poverty threshold' - the 'at-risk-of-poverty' population - activity status: unemployed, in work, retired or other economically inactive
I.5: Dispersion around the at-risk-of-poverty threshold by region	yes	- See Indicator 11 of Laeken indicators - region
I.6: At-risk-of-poverty rate anchored at a moment in time	no	
I.7: At-persistent-risk-of-poverty rate by gender (60% median)	no	(no information on the risk-of-poverty threshold in at least two of the preceding three years)
I.8: At-persistent-risk-of-poverty rate by gender (50% median)	no	(no information on the risk-of-poverty threshold in at least two of the preceding three years)
I.9: Relative at-risk-of-poverty gap by region	yes	- See Indicator 4 of Laeken indicators - region
I.10: Total poverty gap as a percentage of total income by region	yes	- total at-risk-of-poverty-gap (= 100 * (the total poverty gap of all persons at-risk-of-poverty / total income of all persons))
I.11: Percentage of persons living in households that have difficulties to make ends meet according to the household respondents	no	
social transfers		
I.12-1 and I.12-2: At-risk-of-poverty rate before social transfers by region	yes	- equivalised income before social transfers per household - the 'at-risk-of-poverty threshold' (computed on the basis of the distribution **after** transfers!) - the 'at-risk-of-poverty rate' - region
I.13: Total poverty gap before social transfers by region	yes	- equivalised income before social transfers per household - total poverty gap - region
I.14: Net minimum benefit as a percentage of the 'at-risk-of-poverty threshold' (60% of median income) for a single person	yes	- net minimum benefit (pensions, unemployment,…) - the 'at-risk-of-poverty threshold' - household type
minimum wages		

I.15: Net minimum wages as a percentage of the 'at-risk-of-poverty threshold' (60% of median income) for a single person	yes	- net minimum wages - the 'at-risk-of-poverty threshold' - household type
people with credit problems		
I.16: Number of persons with overdue credit payments known to the Central Credit Register for individuals of the National Bank of Belgium	no	
unemployment		
II.1: Long term unemployment rate by region	yes	- See Indicator 6 of Laeken indicators - gender - region
II.2: Long term unemployed share	yes	- See Indicator 16 of Laeken indicators - gender
II.3: Very long term unemployed rate	yes	- See Indicator 17 of Laeken indicators - gender
II.4: Access of certain groups in the population to the labour market	no	
II.5: Persons living in jobless households by region	yes	- see Indicator 7 - region
II.6: At-risk-of-poverty rate of people in work (employees and self-employed)	yes	- see Indicator 1b
II.7: Regional cohesion at NUTS 2 level	yes	- See Indicator 5 of Laeken indicators - gender - region
housing		
III.1 – III.8: indicators on housing	no	(no information on housing available)
health		
IV.1 – IV.12: indicators on health	no	(no information on health available)
education		
V.1 – V.8: indicators on education	no	(no information on education available)
social integration and participation		
VI.1 – VI.6: indicators on social integration and participation	no	(no information on social integration and participation available)

3 MIMOSIS COMPARED TO OTHER MICROSIMULATION MODELS

In this section we will discuss the position of MIMOSIS in the national and international "population" of microsimulation models. We will begin the comparison by looking at other Belgian models and how they relate to MIMOSIS. Thereafter we discuss the similarities and differences of MIMOSIS as compared to other national and international models. A well-known example of the latter category is EUROMOD (see section 3.5 for details), a microsimulation model for different European countries and to which a separate section will be devoted. An example of a national model and one that is also highlighted in a separate section is TUJA, a microsimulation model for Finland.

3.1 MIMOSIS AND OTHER MICROSIMULATION MODELS IN BELGIUM

Table 1 gives an overview of the various microsimulation models in Belgium. Three models use survey data, whereas three (MIMOSIS, SIRe and PICSOUS[26]) work with administrative data. All models are static, and, except for one, do not incorporate macro-economic effects or behavioural reactions (the exception being the indirect tax model ASTER which includes behavioural reactions in spending as result of price changes, and MIMOSIS, for which labour market reactions will be included in the near future). MISIM[27], MIMOSIS and MODÉTÉ have the widest coverage. The three models not only cover personal income taxes and social contributions, they also simulate the following social benefits: pensions, unemployment benefits, sickness and invalidity benefits, and family allowances. PICSOUS and SIRe only cover personal income taxes and social contributions. ASTER, as noted before, has been designed to analyse indirect taxes.

[26] PICSOUS has not been maintained after 1993.

[27] As the Socio-Economic Panel has ended in 1997, MISIM now runs on the Belgian data of EU-SILC.

TABLE 3-1 MIMOSIS AND OTHER MICROSIMULATION MODELS IN BELGIUM

Model	Coverage	Data source	Static/ Dynamic	Behav. Effects	Macro-link	Unit of analysis
ASTER[a] *CES - KULeuven*	• indirect taxes	Household Budget **Survey** (1987-1988, 1996-1997, 2001)	Static	yes	no	• individual • household
MISIM[b] *CSB-UA*	• personal income taxes • social contributions • social benefits	Socio-Economic Panel (**Survey,** 1992, 1997)	Static	no	no	• individual • fiscal unit • household
MIMOSIS	• personal income taxes • social contributions • social benefits	Various **administrative** datasets (2001)	Static	scheduled	no	• individual • fiscal unit • household
MODÉTÉ[c] *Dulbéa -Eté*	• personal income taxes • social contributions • social benefits	Panel Study of Belgian Households (**Survey**, 1994-2001)	Static	no	no	• individual • household
PICSOUS *FUNDP*	• personal income taxes	**Administrative** tax forms (1991, 1993)	Static	no	no	• fiscal unit
SIRe[d] *Ministry of Finance*	• personal income taxes	IPCAL (**administrative** file of tax forms, 1991-2001)	Static	no	no	• fiscal unit

[a] Decoster e.a. (1994; 1996); [b] Verbist (2002); [c] Joyeux (1998); [d] Standaert e.a. (1996).

Among the models listed in Table 3-1 MIMOSIS is unique in that it enables detailed analyses in a wide variety of policy fields. This level of detail is possible thanks to the use of administrative data and a very large sample (see supra). Moreover, the inclusion of labour supply reactions in the near future will enhance the potential of this model.

3.2 MIMOSIS AND SIMULATION MODELS IN OTHER COUNTRIES

In Table 3-2 and Table 3-3 we compare MIMOSIS with other (inter)national models of EU-countries and Norway. Table 3-2 lists 30 models, grouped per country, as well as information on the dataset used. Obviously tax-benefit models are well represented in European countries. Most models cover personal income taxes, as well as social contributions and social benefits. Some models have a very specific focus, as they simulate only one sector of social security (e.g. DESTINIE in France for pensions) or taxes (e.g. SPAIN in the United Kingdom). Models using survey data are more prevalent (19 of the 30 models in the list) than those using administrative data or a combination of administrative and survey data. This preponderance of survey-data based models is probably due to the fact that this kind of data is more easily accessible than administrative data. Administrative data-based models are more common in Northern Europe. Often these data are supplemented with information from surveys (e.g. household composition).

TABLE 3-2 MIMOSIS AND OTHER MICROSIMULATION MODELS IN EUROPE

Model	Coverage (SB=social benefits)	Data source	Administrative (A) /survey (S)
Austria			
AUSTROMOD (Fuchs, 2005)	• personal income taxes • social contributions • social benefits	EU-SILC 2003	S
Denmark			
LOV model (Statistics Denmark, 2005)	• personal income taxes • social contributions • social benefits	register-based statistical information	A
Finland			
SOMA (Haataja, 2003)	• personal income taxes • social contributions • social benefits	IDS (Income Distribution Survey)	A
TUJA (Haataja, 2003; Salomaki, 1996)	• personal income taxes • social contributions • social benefits	IDS (Income Distribution Survey)	A+S
France			
DESTINIE (Legendre e.a., 2001b)	• SB: pensions	Financial Asset Survey	S
INES (Legendre e.a., 2001b; Murat e.a., 2000)	• personal income taxes • social contributions • social benefits	Revenus fiscaux des ménages and Employment Survey	A+S
MYRIADE (Legendre e.a., 2001a; O'Donoghue, 2001)	• personal income taxes • social contributions • social benefits	Revenus fiscaux des ménages	A
SYSIFF (Legendre e.a., 2001a; O'Donoghue, 2001)	• personal income taxes • social benefits	Budget des familles	S
Germany			
FiFoSiM (Peichl, 2006)	• personal income taxes • social contributions • social benefits	FAST88 (sample of 10% of the German federal income tax statistics) and GSOEP	A+S
GMOD (Wagenhals, 2004)	• personal income taxes • social contributions • social benefits	GSOEP (the German Socio-Economic Panel)	S
KiTs (Wagenhals, 2004)	• personal income taxes • social contributions • social benefits • some indirect taxes	ICS (Income and Consumption Survey)	S
POTSDAM (Wagenhals, 2004)	• personal income taxes • social contributions • social benefits • indirect taxes	GSOEP , ICS and IAW tax panel (Institut für Angewandte Wirtschaftsforschung)	S

Model	Coverage (SB=social benefits)	Data source	Administrative (A) /survey (S)
STSM (Wagenhals, 2004)	• personal income taxes • social contributions • social benefits	GSOEP	S
Ireland			
SWITCH (Callan e.a., 2000)	• personal income taxes • social contributions • social benefits	Living in Ireland Survey	S
Italy			
AWARETAX (Gastaldi e.a., 2000)	• personal income taxes • social contributions • social benefits	SHIW (Survey of Household Income and Wealth)	S
ITAXMOD (Russo, 2004; Solera, 1999)	• personal income taxes • social contributions • SB: family allowances	SHIW	S
MAPP98 (Baldini, 2001)	• personal income taxes • social contributions • social benefits	SHIW	S
MIND (Bianchi e.a.)	• personal income taxes • social contributions • SB: pensions	SHIW	S
Norway			
LOTTE (Kornstad e.a., 2004; Aesness e.a., 2006)	• personal income taxes • social contributions • social benefits	IDS (Income Distribution Survey): a large representative sample survey based on information from administrative and statistical registers (including income tax files), the household composition is established by interviews	A+S
Spain			
ESPASIM (Levy, 2003; Prats e.a.)	• personal income taxes • social contributions • social benefits	Encuesta de Presupuestos Familiares (Household Budget Survey) and the Panel de Hogares de la Unión Europa (Spanish sample of the ECHP)	S
Sweden			
FASIT (Eklind e.a., 2002; Ericson e.a., 2006)	• personal income taxes • social contributions • social benefits	HEK (annual income distribution survey): data are collected from telephone interviews, administrative registers and tax return forms	A+S
MICROHUS (O'Donoghue, 2001)	• personal income taxes • social contributions • social benefits	HUS income distribution database (Household Market and Non-Market Activities)	S
SESIM	• personal income taxes • social contributions • social benefits	LINDA (Longitudinal Individual Data for Sweden)	A

Model	Coverage (SB=social benefits)	Data source	Administrative (A) /survey (S)
United Kingdom			
IGOTM (Hillary, 2001)	• personal income taxes • social contributions • social benefits	FES (Family Expenditure Survey), FRS (Family Resources Survey) and LFS (Labour Force Survey)	S
PENSIM (Zaidi e.a., 2001)	• SB: pensions (+ tax and benefit modelling for pensioners)	RS (Survey of Retirement and Retirement Plans), FES and SCELI (Social Change and Economic Life Initiative)	S
PENSIM2 (Zaidi e.a., 2001; N., 2005; Redway, 2003)	• SB: pensions (+ tax and benefit modelling for pensioners)	LLMDB (Lifetime Labour Market database), FRS and BHPS (British Household Panel Study)	A+S
POLIMOD (Redmond, 1998)	• personal income taxes • social contributions • social benefits	FES and FRS	S
PSM (Duncan, 2001)	• personal income taxes • social contributions • social benefits	FRS	S
SPAIN (Duncan, 2001)	• personal income taxes	output from TAXBEN	
TAXBEN (Duncan, 2001)	• personal income taxes • social contributions • social benefits	FES, FRS, LFS etc.	S

Table 3-3 presents an overview of the main characteristics of the models listed in Table 3-2. Most models are static (exceptions are DESTINIE, PENSIM and PENSIM2, which have pensions as their main focus, and MICROHUS, SESIM and MIND). With respect to the inclusion of behavioural reactions, about half of the models listed (17 out of 30) do not allow for this type of effects, whereas those that do incorporate behavioural reactions do so mainly with respect to labour supply. None of the models, except for FiFoSiM, incorporates linkages with the macro level. All models allow results to be presented at the individual level or at the level of the tax unit; most models also provide the possibility for analyses at the household level.

TABLE 3-3 MIMOSIS AND OTHER MICROSIMULATION MODELS IN EUROPE (CONTINUED)

Model	static (S)/ dynamic (D)	Behav. Effects	Macro-links	Unit of analysis		
				individual	tax unit	household
AUSTROMOD	S	no	no	x	x	x
LOV MODEL	S	no	no	x	x	x
SOMA	S	no	no	x	x	x
TUJA	S	no	no	x	x	x
DESTINIE	D	yes	no	x	x	
INES	S	yes	no	x	x	x

Model	static (S)/ dynamic (D)	Behav. Effects	Macro-links	Unit of analysis		
				individual	tax unit	household
MYRIADE	S	no	no	x	x	x
SYSIFF	S	no	no	x	x	x
FiFoSiM	S	yes	yes	x	x	x
GMOD	S	possible	no	x	x	x
KiTs	S	no	no	x	x	x
POTSDAM	S	possible	no	x	x	x
STSM	S	possible	no	x	x	x
SWITCH	S	no	no	x	x	x
AWARETAX	S	no	no	x	x	
ITAXMOD	S	no	no	x	x	
MAPP98	S	no	no	x	x	
MIND	D	yes	no	x	x	
LOTTE	S	yes	no	x	x	x
ESPASIM	S	no	no	x	x	x
FASIT	S	no	no	x	x	x
MICROHUS	D	yes	no	x	x	x
SESIM	D	yes	no	x	x	x
IGOTM	S	yes	no	x	x	x
PENSIM	D	no	no	x	x	x
PENSIM2	D	no	no	x	x	x
POLIMOD	S	no	no	x	x	x
PSM	S	no	no	x	x	x
SPAIN	S	yes	no	x	x	x
TAXBEN	S	yes	no	x	x	x

3.3 TUJA: THE FINNISH NATIONAL MICROSIMULATION MODEL

In this section we present in more detail one of the national microsimulation models mentioned in Table 3-2 and Table 3-3, namely the Finnish national model TUJA. We have chosen this model because of the close resemblance to MIMOSIS. Similar to MIMOSIS, TUJA also runs primarily on administrative data and has a wide coverage. It also is the basis for the Finnish part of the European microsimulation model EUROMOD (see next section).

The static microsimulation model TUJA was originally developed by the Finnish Ministry of Finance at the end of the 1980's. After the Governmental Institute for Economic Research (VATT) was established in 1990, the two organizations maintained and developed the model together.

The model runs on data coming from the Income Distribution Survey (IDS) (Haataja, 2003; Salomaki, 1996), which is collected by Statistics Finland (http://www.stat.fi/). The data source is

presented in the first part of this section. Next, we discuss the coverage of TUJA, as well as the results of the validation. Finally, we list some applications of TUJA.

3.3.1 The data source[28]

IDS is a sample survey for which data are collected through the use of registers and interviews. The administrative records are mostly used for the collection of income data. Interviews are conducted to obtain information on household composition, to collect information for the construction of classification variables such as activity or occupation, to augment register data and to allow for more flexibility in the use of register data. IDS uses a rotating two-year panel design. Because data are collected from different sources they have to be linked together. This is done by using the personal identification numbers (exact matching), that unambiguously identifies each Finnish citizen. The IDS of 2001 contains 10,736 households representing 28,303 individuals.

3.3.2 coverage and validation

TUJA covers the major part of the Finnish tax-benefit system, as is shown in Table 3-4. As far as benefits are concerned "pensions" is the most important category that is not simulated in the model. The other groups that are not simulated (child disability allowance, special child care allowance and other benefits) represent categories that are rather small in terms of budget and number of recipients. Social contributions are entirely covered in TUJA. With respect to taxes, the model includes earned income taxes, which is one of the major sources of government revenue, as well as state taxes from capital income, taxes that relate to property or real estate and taxes from deposit interests. Indirect taxes are not included (see also footnote 28).

[28] In order to evaluate the impact of the VAT-reform in the mid nineties, Salomaki (1996) merged the IDS data-set of 1994 with the data from the Household Budget Survey (HBS), thus enlarging the policy scope of the model. Two merging methods were used, namely average statistical merging and hot rank merging. The enlarged scope was only meant for the evaluation of the VAT-reform however and is *not* made permanently accessible in the model.

TABLE 3-4 COVERAGE OF TAX-BENEFIT REGULATIONS IN TUJA

	taxes and benefits simulated in TUJA	taxes and benefits not simulated in TUJA
Benefits		
	Child allowance	Pensions
	Child home care subsidy	Child disability allowance
	General housing benefit	Special child care allowance
	Social assistance	Other benefits
	Sickness benefit	
	Maternity benefit	
	Basic unemployment allowance	
	Earnings-related unemployment benefit	
	Labour market support	
	Student payment	
	Pensioner's housing benefit	
	Student's housing benefit	
Social insurance contributions		
	Employee contributions to pension and unemployment insurance	
	Personal contribution to sickness insurance	
	Employer contributions to social insurance	
	Self-employed and farmer contributions	
Taxes		
	State tax from capital income	Value-added tax
	Tax from deposit interest	
	Earned income taxes (state tax, municipal tax and church tax)	
	Property tax	
	Real estate tax	Excise taxes
Public service charges		
	Municipal day care fee	Private child care subsidy

Source: based on Viitamäki (2004)

Table 3-5 gives the validation results of TUJA by comparing expenditures and number of recipients with those found in statistics. The statistics mainly come from registers of tax authorities, from the Social Insurance Institution and the Social Welfare Board[29].

In general, the results of TUJA are quite close to the figures coming from the statistics, though for some categories, such as 'social assistance' and 'disposable income' there are differences. It is not immediately clear what explains these differences. Overall, the match is good, and given the fact that TUJA is a model that simulates tax-benefit regulations in detail, it is possible to use the model for high-quality simulations in the field of tax and social policy. Reforms can be simulated for a

[29] Some small adjustments have been made to the statistics to have them comparable with the model income concepts.

wide array of policy fields; it is possible to simulate both broad policy reforms as well as 'smaller' measures (small in terms of the number of recipients or the budget involved).

TABLE 3-5 AGGREGATE TAXES AND BENEFITS IN TUJA COMPARED WITH STATISTICS (MIL EURO AND 1000 RECIPIENTS), YEAR 2001

	TUJA		Statistics		TUJA/Statistics %	
	mil €	recipients (x1000)	mil €	recipients (x1000)	mil €	recipients (x1000)
Taxable capital income [1)]	6319.2	1251.5	6322.8	1012.6	0.1%	-19.1%
Tax from capital income (state)	981.6	742.2	1018.8	742.9	3.8%	0.1%
Wage and salary income [2)]	52060.8	2639.0	52941.6	2670.8	1.7%	1.2%
Earned income from agriculture	927.6	147.4	848.4	130.6	-8.5%	-11.4%
Earned income from forest	170.4	144.6	190.8	166.8	12.0%	15.4%
Earned income from business	1741.2	116.7	1762.8	114.8	1.2%	-1.6%
Earned income from business partnership	735.6	44.1	752.4	45.2	2.3%	2.5%
Pension income	14001.6	1226.6	14671.2	1311.0	4.8%	6.9%
Sickness benefit [3)]	286.8	126.6	285.6		-0.4%	
Labour market support	752.4	258.7	837.6	271.4	11.3%	4.9%
Basic unemployment benefit	73.2	40.7	86.4	43.7	18.0%	7.4%
Earning-related unemployment benefit	1138.8	270.6	1191.6	276.6	4.6%	2.2%
Child home care subsidy	343.2	100.3	345.6	116.1	0.7%	15.8%
Maternity payment	464.4	148.7	436.8	139.7	-5.9%	-6.1%
Student payment	429.6	333.6	444	322.4	3.4%	-3.4%
Private pension contributions	363.6	193.3	364.8	194.7	0.3%	0.7%
Employee unemployment + pension contribution	2704.8	2630.6	2600.4	2529.2	-3.9%	-3.9%
Taxable earned income (state taxation)	69262.8	4012.7	69960	4162.8	1.0%	3.7%
Taxable earned income (local taxation)	62202	3633.5	62712	3722.2	0.8%	2.4%
State earned income tax	6579.6	2407.5	6562.8	2418.7	-0.3%	0.5%
Municipal tax	10836	3619.1	10935.6	3705.4	0.9%	2.4%
Sickness contribution	1042.8	3602.0	1062	3658.9	1.8%	1.6%
Church tax	670.8	3086.9	675.6	3150.4	0.7%	2.1%
Tax from deposits [3)]	216	728.3	218.4		1.1%	
Child benefit	1380	611.5	1376.4	580.0	-0.3%	-5.2%
Social assistance	528	311.8	429.6	0.0	-18.6%	
Housing benefit for pensioners	212.4	146.2	246	165.2	15.8%	13.0%
Housing benefit (general) [4)]	427.2	226.1	400.8	158.5	-6.2%	-29.9%
Housing benefit for students	240	198.4	208.8	175.0	-13.0%	-11.8%
Municipal day care payment	214.8	120.9	225.6		5.0%	
Employer social insurance contribution	13670.4		12876		-5.8%	
Disposable income [5)]	63357.6	4205.7	63028.8	2380.0	-0.5%	-43.4%

Source: Viitamäki (2004)

1) The figures of *Tax Statistics 2001* has been made comparable by adding "the tax paid by companies"; 2) The income concept in model calculation and *Tax Statistics 2001* differs; 3) The receivers of benefit are not comparable (or not available) in statistics; 4) In Statistics the receivers are in the end of the year (or the time period differs otherwise); 5) In Statistics the disposable income is from *Income Distribution Statistics 2001* (Statistics Finland) and is on household level.

3.3.3 using TUJA

The model has been in use since the end of 1980's for more or less all significant reforms concerning income taxes or social benefits, e.g.

- the elimination of sickness tax deduction 1989

- the total tax reform 1989-91
- the food turn over reform proposal 1991
- the development of the structure of family social security 1991
- the student payment reform 1992
- the capital income reform 1993
- the VAT reform 1994
- the family security package 1994
- the development of the housing benefit 1995
- the incentive trap working group 1997
- the corporation and capital income reform 2005

Some of these reforms were large; however, the model is also used regularly for smaller "reforms" in the Ministry of Finance (changing the structure of tax deductions, planning the budget year's revenues, etc). In fact for all changes connected to personal income taxes, and often also benefits, the model is used. This is also the case when corporate taxes are changed because in the Finnish dual tax system the dividend and corporate tax rates are closely linked together. This means that TUJA is used very regularly in the Ministry of Finance.

Though VATT is a research institute the work is often - for practical reasons - closely related to the work in the Ministry. As a result the use of the model has focused more often on planning reforms, and less on the ex-post evaluation of the financial and distributional impact of tax and transfer reforms.

3.4 HOW DOES MIMOSIS COMPARE TO TUJA

In many ways, MIMOSIS and TUJA are very similar. They both work with a detailed administrative dataset. The dataset of TUJA is however updated on a regular basis. TUJA has been used for most of the significant policy reforms with respect to taxes and benefits in Finland. Given the scope and detail of MIMOSIS, it, too, is perfectly capable to take up a similar role for the analysis of Belgian policy reforms with respect to taxes and benefits. It will therefore be of crucial importance to describe a procedure and set up a framework for the recurrent update of MIMOSIS and the data underlying it. Only then will MIMOSIS keep its attractiveness and remain an invaluable tool for policy analysts and researchers alike.

3.5 EUROMOD: AN INTEGRATED EUROPEAN TAX-BENEFIT MODEL

EUROMOD is a European tax-benefit microsimulation model covering all pre-May-2004 EU-15 Member States (Sutherland, 2001). In the first part of the section we give a brief overview of the projects through which the development of EUROMOD was funded. Then in a second part the

actual construction of the model and the main construction tasks are discussed. Finally, the use of EUROMOD is illustrated.

3.5.1 Development of EUROMOD

The development of EUROMOD runs through 3 European Commission-funded projects:

- the initial model construction project with the original EU-15 Member States;
- the MICRESA project ("Micro-level analysis of the European Social Agenda") which explored the impact of national, social and fiscal policies, and reforms of these policies on poverty reduction in the original 15 Member States;
- the I-CUE project ("Improving the Capacity and Usability of EUROMOD") to expand and enhance EUROMOD to enable the incorporation of the 10 new Member States.

The initial model construction project was financed by the *Targeted Socio-Economic Research (TSER)* programme of the European Commission (CT97-3060) and the aim was to build a tax-benefit microsimulation model, EUROMOD, covering all member states of the European Union at that time (i.e. 1998). The MICRESA project was funded by the European Commission's "Improving Human Potential" programme, part of the Fifth Framework programme. The I-CUE project started in May 2005 and is supported by the FP6 Research Infrastructures Action as a Design Study.

The basic output from EUROMOD is the micro-level change in household disposable income as a result of policy changes. This in turn provides a basis for the calculation of

- estimates of aggregate effects on government revenue;
- distribution of gains and losses;
- the first-round impact on measures of poverty and inequality;
- differential effects on groups classified by individual or household characteristics;
- effective marginal tax rates and replacement rates, and changes to them;
- between-country differences in the costs and benefits of reforms.

3.5.2 construction of EUROMOD

The actual construction of EUROMOD involved three main tasks:

1. the development of a micro-database for each country, containing the input variables necessary for tax-benefit calculations, together with variables to be used in the analysis of model output;
2. the collection, the coding and the parameterisation of policy rules for 15 tax-benefit systems based on (existing) national models, e.g. MODÉTÉ for Belgium (see Table 3-7);
3. the testing and the validation of simulated outputs from the model.

Also two further tasks were essential:

4. designing the model framework;
5. documentation: Country Reports were written to document the data used, the tax-benefit rules and the coverage for each country, as well as the validation of some basic output.

DATA SOURCES

In Table 3-6 the main sources of micro-data for EUROMOD are presented. The source for each country was selected on the basis of suitability for tax-benefit modelling and availability for the project.

TABLE 3-6 SOURCES OF MICRO-DATA FOR EUROMOD, BY TYPE

Country	Base Dataset	Type
Austria	European Community Household Panel	ECHP
Belgium	Panel Survey on Belgian Households (PSBH)	National Panel
Denmark	European Community Household Panel	ECHP
Finland	Income distribution survey (IDS)	Register + survey
France	Budget de Famille (BdF)	Household Budget Survey
Germany	German Socio-Economic Panel (GSOEP)	National Panel
Greece	European Community Household Panel	ECHP
Ireland	Living in Ireland Survey (LII)	National Panel
Italy	Survey of Households Income and Wealth (SHIW95)	Income survey
Luxembourg	PSELL-2	National Panel
Netherlands	Sociaal-economisch panelonderzoek (SEP)	National Panel
Portugal	European Community Household Panel	ECHP
Spain	European Community Household Panel	ECHP
Sweden	Income distribution survey (IDS)	Register + survey
UK	Family Expenditure Survey (FES)	Household Budget Survey

Source: Sutherland (2001)

On the basis of these data sources common variables were defined for each of the countries. Country-specific variables were only added to the database when they were necessary for the simulation of the national tax-benefit system but not available or needed for other countries.

SIMULATION OF POLICY RULES

The following instruments are simulated in EUROMOD for all countries:

- income taxes (national and local)
- social insurance contributions (paid by employees, employers and the self-employed)

- family benefits
- housing benefits
- social assistance benefits and other income-related benefits.

The following instruments are *generally* not simulated in EUROMOD:

- capital and property taxes
- real estate taxes
- pensions and survivor benefits
- contributory benefits
- disability benefits
- indirect taxes.

In Table 3-7 the differences in coverage between national models and EUROMOD are summarized.

TABLE 3-7 EUROMOD AND NATIONAL MODELS: DIFFERENCES IN POLICY COVERAGE

Country	Elements simulated in National Model, not in EUROMOD	Elements simulated in EUROMOD, not in National Model	Name of National Model
Austria	N/A	N/A	N/A
Belgium	Unemployment benefit	Social assistance benefits (minimex and RGPA)	
Denmark	None	None	LOVMODEL
Finland	Sickness and Maternity Benefit, Student Benefit and Housing Benefit for Students, Unemployment Benefit, Pensioner's Housing Benefit	None	TUJA
France	None	None	SYSIFF
Germany	None	Social Assistance, Housing Benefit, Parts of income tax	DIW
Greece	N/A	N/A	N/A
Ireland	Back to Work Allowance, Back to School Allowance, Benefit and Privilege aspects of eligibility for unemployment assistance, Part-time Job Incentive scheme	Housing Benefits, Employer SICs	SWITCH
Italy	None	Level of detail for instruments where unit is the family. EUROMOD is able to determine the correct units of assessment whereas national model always takes entire household as unit.	ITALMOD
Luxembourg	N/A	N/A	N/A
Netherlands	N/A	N/A	N/A
Portugal	N/A	N/A	N/A
Spain	None	Regional income tax credits for children, dependent parents and the elderly.	ESPASIM
Sweden	Unemployment and Sickness benefits, Child Care benefits, Capital gains tax	None	
UK	Council tax	Contributory Job Seekers Allowance	POLIMOD

Notes: N/A - no national model available to the EUROMOD team.

Source: Sutherland (2001)

DESIGNING THE MODEL FRAMEWORK

The model design strategy concentrated on finding common features across countries throughout the model construction process. In practice it involved:

- identifying common structural characteristics in national policies;
- identifying common data requirements;
- parameterising and generalizing as many aspects of the model as possible.

Important aspects, such as the definition of the following important concepts are harmonised across countries:

- the income base for each tax and benefit;
- the unit of assessment or entitlement for each tax and benefit;
- the effective equivalence scales inherent in social benefit payments;
- the output income measure.

For the simulation framework to be valid across many countries, features of tax-benefit systems were conceptualized and then operationalised. A hierarchical structure was devised in which each tax-benefit "system" is made up of individual "policies", a "policy spine" and "modules". The "policies" are the elementary collections of tax-benefit instruments such as income taxes, social insurance contributions and social assistance benefits. The "policy spine" is a list of policies indicating the sequence in which they apply in the tax-benefit system. At the lowest level is the tax-benefit "module", which performs the calculation of a certain part of the tax or benefit (e.g. a deduction or applying a rate schedule to a tax base) on each fiscal unit. The "modules" represent the elementary building blocks of the tax-benefit system: only the "modules" contain actual tax-benefit rules. The other levels are necessary to structure these rules and apply them in the correct sequence.

TESTING AND VALIDATION

There were three stages in the validation process. During the *first* stage the policy rules were checked to ensure that they were coded correctly (e.g. through simple plausibility checks on the amounts of taxes and benefits relative to original income and household size).

During the *second* stage of validation the data were run through the model and the aggregate output statistics were compared with corresponding independent statistics for 1998 (e.g. compare the number of fiscal units paying income tax with corresponding information from tax administration statistics). An important component of the validation during this stage was the "cross-country validation" or the ranking of countries in terms of poverty and inequality statistics. The aim of this validation exercise was to show that EUROMOD baseline results were broadly in line with other sources and that EUROMOD is a reliable tool for simulation experiments with policy changes.

TABLE 3-8 EUROMOD INCOME INEQUALITY INDICATORS AND POVERTY RATES

	EUROMOD 1998		ECHP 1996	
	Gini	Poverty Rate %	Gini	Poverty Rate %
Austria	0.25	11.3	0.26	13
Belgium	0.24	14.8	0.28	17
Denmark	0.24	11.1	0.23	12
Finland*	0.23	9.4		
France	0.28	11.8	0.29	16
Germany	0.28	13.5	0.28	16
Greece	0.33	20.3	0.34	21
Ireland	0.33	18.0	0.33	18
Italy	0.34	19.9	0.33	19
Luxembourg	0.26	11.8	0.28	12
Netherlands	0.25	9.9	0.30	12
Portugal	0.36	21.9	0.37	22
Spain	0.32	18.5	0.33	18
Sweden*				
UK	0.31	20.0	0.34	19

Notes: -The poverty rate is percentage of persons in households below the poverty line which is defined as 60% of national median equivalised household disposable income. The equivalence scale is the "modified OECD". No adjustments are made for differences in purchasing power between or within countries.

* EUROMOD results for Sweden are not yet available. ECHP estimates do not include Finland or Sweden.

Source: Sutherland (2001)

As Table 3-8 shows, the Gini coefficients calculated on the basis of EUROMOD seem similar to the Gini coefficient calculated on the basis of the ECHP (European Community Household Panel). For some countries the Gini slightly differs, this is so for the UK, Belgium and especially for the Netherlands. Also the poverty rates calculated on the basis of EUROMOD and the poverty rates calculated on the basis of the ECHP are quite similar. But, as with the Gini, some poverty rates calculate by EUROMOD are lower than the ECHP poverty rates, this is so for the Netherlands, France, Germany and Belgium.

In the *third* stage of the validation process the results of simulated policy changes were compared with estimates obtained independently. This relied on having access to national models or published national model output, together with information about exactly how the estimates were obtained.

3.5.3 use and applications of EUROMOD

Before presenting the types of analysis that are feasible within EUROMOD some "limitations" on the use of EUROMOD are discussed.

LIMITATIONS

EUROMOD is a static model designed to calculate the immediate, "morning after" effect of policy changes. It does not incorporate the effects of behavioural changes (i.e. changes in (labour supply) behaviour following changes in tax-benefit policy, and hence incentives, are not modelled), nor does it model the long-term effect of change. As such EUROMOD cannot be used to examine a policy that is only designed to change behaviour and/or that only has impact in the long term (e.g. some forms of pension policies). Estimated behavioural responses are deliberately excluded in this first attempt at a multi-country microsimulation model mainly for reasons of feasibility and practicality. Another (evident) limitation is that EUROMOD can only simulate policies which depend on variables that are present in the underlying database.

APPLICATIONS

EUROMOD is increasingly used for comparative analyses of the characteristics and results of European tax-benefit models. We briefly discuss here three examples. For other illustrations we refer to the EUROMOD Working Papers on the website (http://www.iser.essex.ac.uk/msu/emod/).

CHILD POVERTY AND CHILD BENEFITS IN THE EUROPEAN UNION

In a preliminary exercise that used evidence from the European Community Household Panel it was found that family benefits vary in their importance to household incomes and in the prevention of child poverty across Europe (Immervoll et al, 2001). In one group of countries family benefits appear to have a significant effect on the protection of children from financial poverty. The UK and the Netherlands are both members of this group. EUROMOD was used to examine the extent to which differences in child benefits explain the very different levels of child poverty in the two countries. Also the effect of "swapping" child benefit systems between the two countries was explored. The major conclusion was that the poverty reduction properties of universal child benefits may be improved without resorting to means-testing or compromising the other functions of these benefits.

A EUROPEAN SOCIAL AGENDA: POVERTY BENCHMARKING AND SOCIAL TRANSFERS

The European countries which perform best in terms of reducing poverty tend to have higher social spending (Atkinson, 2000). Such statistical performance indicators need to be accompanied by the evaluation of the relationship between policy instruments and poverty reduction, showing the trade-off between poverty reduction and social spending at the level of individual policies. Illustrative estimates using EUROMOD suggest that employing universal social transfers to reduce a country's poverty rate from the EU-average of 18% to the best-performing average of 12% would necessitate an increase in social transfers of some 2% of GDP. More targeted schemes may allow sizeable expenditure savings but at the cost of increased disincentives; the design of Europe's

social agenda has to confront well-known issues of economic trade-offs; economic and social policy cannot be divorced.

MICROSIMULATION OF SOCIAL POLICY IN THE EUROPEAN UNION: CASE STUDY OF A EUROPEAN MINIMUM PENSION

The implications for poor pensioners of setting a European Minimum Pension (EMP) are explored for 6 countries (Atkinson et al., 2002). The analysis shows that the composition of the bottom of the combined income distribution is sensitive to assumptions about the comparability of purchasing power across countries and about the treatment of households of different types. The conclusion is that the formulation of policy for the protection of Europe's poorest people requires an appreciation, not only of the composition and location of this group (targeted are those in the bottom quintile group but recipients of EMP and pensioners are not all concentrated at the bottom of the overall distribution), but also of the assumptions that have been used to identify it (e.g. the choice of exchange rate to convert incomes in different countries into a common currency, the choice of equivalence scale used to account for differences in household size and composition). Aspects of the EMP proposal are identified which need further specification, such as the nature of the interaction of the EMP with existing national pension systems, and with national redistributive systems in general, and the choice between different treatments of the unit of assessment of pension income.

3.5.4 how does MIMOSIS compare to EUROMOD

There are some considerable differences between EUROMOD and MIMOSIS. Firstly, MIMOSIS has a much wider scope and detail than EUROMOD: it covers almost the entire social security system, thus including more sectors (e.g. unemployment benefits, sickness and invalidity benefits) and more measures per sector (e.g. a detailed reconstruction of the various reductions applicable for social security contributions). Secondly, MIMOSIS runs on a much larger database than the Belgian model in EUROMOD. A 'larger database' refers both to the number of individuals in the dataset, as well as to the number of variables. Moreover, variables in MIMOSIS are (probably) a much more precise representation of reality, as they come directly from administrative sources. (e.g. gross wages are directly observed in the MIMOSIS dataset, and not calculated out of net wages, as is done in EUROMOD). Overall, MIMOSIS enables more detailed and precise simulations than EUROMOD. The great advantage of EUROMOD however is its internationally comparative design. The differences between the two models imply that it is not obvious how to integrate them. This will be further investigated in the follow-up project "MIMOD".

4 MIMOSIS IN ACTION: SOME APPLICATIONS

In this section we present three applications of MIMOSIS. We stress that all results are preliminary. The first application uses the data and legislation captured by MIMOSIS to calculate effective tax rates. We will focus on both *average* effective tax rates and *marginal* effective tax rates. The latter also include *participation* tax rates, i.e. tax rates resulting from entering the labour market from a previous state of inactivity. A second application analyses the distributional consequences of changing the eligibility criteria for entitlement to unemployment benefits. The proposed change is that of a limitation of the duration of unemployment benefits. A third and final application assesses the distributional impact of alternative pension welfare adaptation reforms.

4.1 EFFECTIVE TAX RATES AND INACTIVITY TRAPS

4.1.1 introduction

Each year the OECD publishes a report on the effective tax rates facing individuals in different countries (OECD, 2007; also see Carone et al., 2004; Immervoll, 2004). This is done for a set of hypothetical family types where the earnings of one or both partners are taken to be in a range around the Average Production Worker earnings (APW). Taxes include national and local income taxes and standard tax relief, i.e. tax relief that is not related to expenditures made by the households. Social security contributions are own mandatory contributions made by employees. Benefits include family benefits, unemployment benefits, minimum income and housing benefits. Disability and pension benefits as well as income from capital and/or assets are not included.

The hypothetical households and earning ranges are as follows:

- single adults without children; earnings 0-200% APW,
- single adult parents with two children; earnings 0-200% APW,
- one-earner adult couples; earnings first spouse 0-200% APW, second spouse inactive,
- same as previous but with two children,
- two-earner couple; earnings first spouse fixed at 67% APW, earnings second spouse 0-200% APW,
- same as previous but with two children.

The marginal tax rates are calculated at the household level, i.e. taking into account all the interactions between spouses' earnings and the consequences thereof in the tax-benefit legislation. The calculation of effective tax rates at the household level implies the assumption that work decisions are made at the household level.

In this application we will calculate effective tax rates facing individuals in Belgium in 2001 using MIMOSIS. Unlike the OECD studies, in MIMOSIS we capture full heterogeneity of the

population by looking at representative micro-data. There exist studies of this kind for European countries, including Belgium, using EUROMOD (for more on this tax-benefit model see section 3.5). For certain countries in EUROMOD, however, – Belgium being one of them – gross wages are not directly observed but obtained by a "reverse calculation" starting from net wages. In MIMOSIS we *do* observe gross earnings directly from administrative data. Our approach for calculating effective marginal tax rates in section 4.1.3 is also slightly different in that we do not calculate effective marginal tax rates by increasing earnings directly in the micro-simulation model as is done in the OECD studies, but rather by simulating earnings for a given fixed wage rate at different hours of labour supplied.[30]

First we will present some results on average effective tax rates, both by looking at taxes paid as by looking at an overall tax rate incorporating benefits received, to calculate a 'net' tax rate. In section 4.1.3 we will describe the procedure used to determine effective marginal and participation tax rates and present some first preliminary results. Section 4.1.4 provides some concluding remarks for this application.

4.1.2 average effective tax rates

The average effective tax rate for an individual measures the payment to the tax authorities as a fraction of the income on which those taxes are levied. As such we can look at taxes on labour income or at taxes on some broader income concept, e.g. gross income including benefits received. It allows calculating what we could call a 'net' tax rate, i.e. a tax rate that takes into account the benefits received by subtracting from tax payments the benefits and expressing the result as a percentage of gross income.

In describing the 'fiscal burden' in Belgium one often refers to macro numbers, and more particularly tax ratios as a percentage of GDP. Such tax ratios do not always relate the taxes to the relevant tax bases. GDP includes more than labour income alone and an income tax ratio of x % may be the result of a low income tax rate and a broad base or a high income tax rate and a narrow tax base. Moreover, and even if one does assign taxes to the appropriate tax base, it remains that benefits are often not included in such ratios. Especially when one attempts to compare to other countries, the result will be a comparison that ignores institutional differences: what are benefits in one country may be administered through the income tax in another. In the former case the benefits will not be counted in the tax ratio, while in the latter they will.

In this exercise we will sketch a first picture of the incidence of tax payments. It should in no way be seen as an approximation of the economic losses experienced by individuals as a result of taxation. For this we would have to incorporate much more information, e.g. on prices and behavioural reactions. Moreover, we would need to simulate a situation without taxation to compare the current situation with. In most tables that will follow we show the distribution of

[30] The change in the earnings can be interpreted as resulting from a change in working hours, e.g. for currently unemployed/inactive or part-time working individuals, or as resulting from a change in the wage rate, e.g. for currently full-time working individuals.

taxes over deciles of income. The deciles will be either based on disposable income or equivalent income. In the latter case the equivalence scale used is the OECD-scale, applying a factor of 1 to the first adult, a factor of 0.5 to any additional adults, i.e. persons older than 14 years of age, and a factor of 0.3 for all persons aged 14 or less. If subpopulations are considered deciles are recalculated so that each decile represents 10% of the subpopulation analyzed.

In Table 4-1 we show the effective average tax rates for the population in 2001. The tax rates are calculated at the household level as follows:[31]

$$t = \frac{T_{pit} + T_{ssc} + T_{ssb}}{Y_{gross}} = \frac{Y_{gross} - Y_{net}}{Y_{gross}}, \quad (1)$$

where t is the average tax rate; Y_{gross} is gross income broadly defined, i.e. including gross labour income and all social benefits; Y_{net} is disposable household income; T_{pit} is the amount of personal income taxes; T_{ssc} the amount of employee social security contributions and T_{ssb} are contributions due on social benefits. The effective tax rate is thus the sum of taxes paid as a percentage of gross income. Taxes here are defined as personal income taxes, employee social security contributions and social security contributions due on social benefits.

As Table 4-1 shows the overall tax-benefit schedule is progressive in that higher income households in general also pay more gross taxes, both when we look at disposable as well as equivalent income distributions. Comparing disposable and equivalent income distributions we see that from the 2nd to the 7th decile average tax rates are lower in the equivalent income distribution as compared to the same deciles in the disposable income deciles. The reverse holds for the first income decile and also for the three highest income deciles. Remark also that the equivalent income distribution is much more condensed with the highest equivalent income decile being little more than half the corresponding disposable income decile. The same holds, be it to a lesser extent, for all upper income deciles, implying richer households also being the larger ones.

When we look at tax rates for households where at least one individual works as a wage earner on the private labour market, we see in Table 4-2 the same progressive pattern but much less pronounced as in Table 4-1. Based on equivalent income the distribution of tax rates is somewhat more dispersed with tax rates being lower for the first three deciles and higher for the 7 highest deciles as compared to the tax rates in the corresponding deciles of disposable income.[32] The average total tax rate for households where at least one individual works is 'only' some 10% higher than the overall average tax rate for the population as a whole.

[31] Remark that taxes are *not* calculated as a percentage of the income concepts on which deciles are based.

[32] We stress that this result is solely due how income distributions are represented. The calculation of tax rates is identical in both cases and based on (1).

TABLE 4-1 AVERAGE EFFECTIVE TAX RATES AT HOUSEHOLD LEVEL: ENTIRE POPULATION

	deciles based on disposable household income		deciles based on equivalent income	
deciles	household disposable income	average tax rate	equivalent income	average tax rate
1	6542	2.61	5660	3.62
2	9620	5.01	7133	4.94
3	11554	10.71	8697	10.17
4	13438	18.94	10079	14.15
5	15654	19.85	11044	15.95
6	18448	25.09	12114	24.34
7	22279	27.74	13416	29.36
8	26587	32.09	14998	33.86
9	31966	35.52	17244	37.62
10	44782	40.07	22837	43.55
total	20083	21.76	12322	21.76

TABLE 4-2 AVERAGE EFFECTIVE TAX RATES AT THE HOUSEHOLD LEVEL FOR HOUSEHOLDS WHERE AT LEAST ONE INDIVIDUAL WORKS AS A WAGE EARNER ON THE PRIVATE LABOUR MARKET

	deciles based on disposable household income		deciles based on equivalent income	
deciles	household disposable income	average tax rate	equivalent income	average tax rate
1	10249	21.63	7155	14.81
2	14269	31.03	9593	23.08
3	17549	30.17	11045	27.82
4	20880	29.74	12269	30.98
5	23958	30.98	13369	33.18
6	26652	33.10	14476	35.05
7	29451	34.69	15703	36.70
8	32852	36.25	17172	38.56
9	37779	37.94	19162	41.09
10	50083	41.47	24463	45.73
total	26372	32.70	14440	32.70

In the welfare system as it currently exists most of the fiscal burden is born by labour income. Therefore in Table 4-3 we only look at average taxes on households where at least one individual

works as a wage earner in the private sector and that do not receive any replacement income other than family allowances. We show the average tax rates as they are defined in (1) but also include a broader tax concept by incorporating employers' social security contribution in both the numerator and denominator of (1). Since we are looking at households without replacement income it means that the denominator in (1) is basically the gross labour income if we exclude employers' contributions and gross labour *cost* if we include the employer's contributions. The results in Table 4-3 thus effectively show the taxes on 'labour'.

In the column labeled "average tax on labour income" in Table 4-3 we show the total amount of taxes and contributions paid by the household as a percentage of gross labour income, i.e. apply formula (1) to the subpopulation of households with at least one individual working as a wage earner on the private labour market and that do not receive any replacement income other than family allowances. The column labeled "average tax on labour cost" shows the total of taxes and contributions, including employer's social security contributions, as a percentage of gross labour cost, i.e. gross income defined as in (1) *plus* employer's social security contributions. We also show the average personal income tax rate for each decile in the column "average pit-rate".

The table indeed shows that the average tax on labour income born by the employee is higher than for the population as a whole and higher on average than that of the households as defined in Table 4-2. This is especially the case for the lower income deciles where the differences are substantial. Of course, also the disposable income for working households is higher and hence they are still better off on this metric even if they face a higher tax burden as compared to the population as a whole. The average tax on gross labour *costs* is around 50% and the dispersion is rather small across the income deciles based on disposable income and a little higher when looking at deciles based on equivalent income. Remarkably, when looking at the distribution of tax rates we see a non-monotonic pattern for all three tax-rate concepts across the disposable income distribution, with tax rates actually decreasing for deciles 2 to 4 (or even until decile 5 for the average tax on labour costs).

While in 2001 the top statutory marginal tax rate in the personal income tax schedule was 55% the average personal income tax rate as shown in Table 4-3 (the column "average pit-rate") is well below this rate for all income deciles. In fact, even if we account for social security contributions the average total tax rate never exceeds 50%.

TABLE 4-3 AVERAGE EFFECTIVE TAX RATES AT HOUSEHOLD LEVEL FOR HOUSEHOLDS WHERE AT LEAST ONE INDIVIDUAL PARTICIPATES IN THE LABOUR MARKET AND THAT HAVE NO REPLACEMENT INCOME

	deciles based on disposable household income				deciles based on equivalent income			
deciles	disposable household income	average tax on labour income	average pit-rate	average tax on labour cost	equivalent income	average tax on labour income	average pit-rate	average tax on labour cost
1	10513	28.57	18.64	45.16	7476	20.85	10.64	40.31
2	14219	35.81	26.52	51.46	9781	27.01	17.47	44.82
3	17486	35.45	26.31	50.98	11233	31.16	21.84	47.59
4	20837	34.22	25.16	49.65	12433	34.15	25.06	49.60
5	23940	34.50	25.62	49.63	13501	36.06	27.23	51.11
6	26644	36.07	27.38	50.77	14594	37.86	29.21	52.25
7	29454	37.47	29.03	51.84	15809	39.32	30.88	52.97
8	32866	39.02	30.81	52.74	17276	40.92	32.63	54.06
9	37774	40.76	32.89	53.79	19234	42.93	34.88	55.34
10	50451	44.31	36.96	55.80	24846	47.13	39.72	57.99
Total	26567	36.76	28.09	51.29	15298	36.76	28.09	51.29

Another way of looking at the distribution of taxes is to consider effective average tax rates by age cohort. Table 4-4 shows results for 6 age cohorts. Again, the figures show that the highest burdens are born by that part of the population that is in working-age range. The tax rates shown are calculated at the household level and the cohorts are based on the age of persons indicated to be the head of household. Apart from the tax rates we also show the constituents that make up total gross income in percentage terms.

As the calculations show most of the taxes paid are born by the middle cohorts, the households with a head of household in the age range 25 to 55. The youngest and oldest cohorts bear the least and the one but oldest cohort, where less than 50% of gross income stems from labour market activities, is somewhere in between. The youngest cohort gets almost 27% of its gross household income from family allowances.[33]

There is also quite a substantial difference in disposable household income between youngest and oldest cohorts on the one hand and the middle cohorts on the other. This dispersion fades a great deal when looking at equivalent incomes.

Note that the numbers that we have shown do not take into account local taxes or taxes on capital income or assets, such as real estate. On the other hand we also lack information on tax

[33] Remark that child allowances can be received until the age of 25 provided the child does not surpass certain ceilings on net own means (see section 2.2.1).

deductible expenses, some of which can be quite important. Examples include mortgage interest payments, contributions to private pension plans, childcare related costs, gifts, etc. The former omission implies an underestimation while the latter implies an overestimation of tax rates. The overall balance between the two obviously depends on several factors, such as type of household, place of residence, homeownership, etc. We also do not take into account tax evasion, i.e. the tax calculations in MIMOSIS are based on the premise that everybody fully pays the taxes he or she owes.

TABLE 4-4 AVERAGE EFFECTIVE TAX RATES AT HOUSEHOLD LEVEL BY AGE COHORT

			tax rates as a percentage of gross income			
age head hh	equivalent income	disposable income	personal income tax	employee social security contributions	contributions on social benefits	total taxes
<25	8778	11454	10.91	6.93	0.08	17.84
>=25 and <35	12654	19593	17.41	9.05	0.05	26.50
>=35 and <45	12547	23187	18.10	8.90	0.06	27.06
>=45 and <55	13322	24765	18.89	8.61	0.15	27.63
>=55 and <65	12717	20294	14.39	5.03	1.26	20.65
>=65	11390	15417	9.05	0.86	1.98	11.89

4.1.3 effective marginal tax rates

In this preliminary application we look at the effective marginal tax rates facing individuals in 2001. Given the complex interactions in the tax-benefit legislation looking at statutory tax rates to have an idea of the incentive effects of taxation for different groups of individuals can be very misleading. Indeed, even though statutory tax rates for low levels of taxable income are low, the *effective* marginal tax rates of low income individuals can be substantially higher, especially in the case of means-tested or earnings-tested benefits that are (gradually) withdrawn as earnings increase. The effective marginal tax rates measure how much of the extra income is taxed away when an individual increases working hours or enters the labour market from a previous state of inactivity. It are thus the *effective* marginal tax rates that are important in describing the (dis)incentive effects of policies that aim to increase labour force participation among the active population (or any other policies that might have an effect on taxes and benefits or somehow interact with other work-inducing policies).

In order to calculate marginal tax rates we simulated for each head of household and his or her spouse the earnings when they work zero to 60 hours a week. We start with the head of household simulate earnings at 61 different points corresponding to the number of hours worked per week leaving both the wage rate and the earnings of the spouse fixed. We then do the same for the spouse. The effective marginal tax rates are calculated at the household level for each of the spouses separately (if there are more than one) as follows:

$$emtr_i^h = 1 - \frac{\Delta Y_{net}^{h,i}}{\Delta Y_{gross}^{h,i}}, \tag{2}$$

where $emtr_i^h$ is the effective marginal tax rate at household level for household h when changing the labour supplied by individual i; $\Delta Y_{net}^{h,i}$ is the change in disposable household income for household h when individual i changes the number of hours worked; and $\Delta Y_{gross}^{h,i}$ is the corresponding change in gross household labour income. In calculating effective marginal tax rates the change in income will always be with respect to the previous state, i.e. the change when one hour more of labour is supplied. For example if an individual changes hours of labour supplied from 35 to 36 per week the effective marginal tax rates will be calculated as:

$$emtr = 1 - \frac{Y_{net}^{36} - Y_{net}^{35}}{Y_{gross}^{36} - Y_{gross}^{35}}, \tag{3}$$

where Y_{net}^{35} and Y_{net}^{36} represent net household disposable income at respectively 35 and 36 hours of labour supplied, and similarly for gross household incomes Y_{gross}^{35} and Y_{gross}^{36}. For participation tax rates the reference state is the one where the simulated individual does not work and gets the

social assistance level of income.[34] If an individual enters the labour market at x hours a week, the participation tax rate will be:

$$t_{part} = 1 - \frac{Y^x_{net} - Y^0_{net}}{Y^x_{gross} - Y^0_{gross}}, \qquad \text{for } x = 1, \ldots, 60. \tag{4}$$

Here Y^x_{net} and Y^x_{gross} are household disposable and gross income respectively when individual i enters the labour market works x hours a week; Y^0_{net} and Y^0_{gross} are respectively net and gross household income in case individual i does not work.[35] Since there are costs to entering the labour market that are not fully captured by the participation tax rate as calculated in (4) (costs of clothing, transportation costs, child care costs, non pecuniary costs, …), we consider an inactivity trap to occur in a situation where entering the labour market results in a participation tax rate exceeding 80%.[36]

Simulating earnings and taxes at 61 points and for every member in the household that is a potential supplier of labour takes a considerable amount of computing time. Therefore in a first step we calculated effective marginal and participation tax rates for households where simulations have been carried out for the head of household.[37] Moreover, we limit the sample to heads of household that are currently employed. The reason is that certain interactions between employment statuses and policy domains have not yet been fully exploited in this version of MIMOSIS.

The results shown will be limited to the first 40 hours of work only (instead of showing the full range of 60 hours), both to save space and because of the preliminary nature of the results. Moreover, we also believe that this range includes the most relevant and interesting cases from a social policy perspective.

In what follows social security contributions paid by employers are not taken into account in the calculation of effective marginal tax rates. It is assumed that any forward or backward shifting of such contributions is 'absorbed' in the contractual wage. If employers have to pay an amount x of social security contributions and shift a proportion, s, onto employees in the form of a lower wage this is identical to a situation where employees have to pay x and shift part of it, $1-s$, to

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[34] Participation tax rates give an idea of changes in income when one enters the labour market rather than as a consequence of changes in hours of work or in earnings when already working. They are often related to so-called "inactivity traps".

[35] Remember that tax rates are always calculated at the household level when changing the labour supplied by one individual while holding constant the labour market status and hene income of the other member(s).

[36] Larmuseau and Lelie (2001) consider tax rates exceeding 85% as identifying an inactivity trap. They consider archetypical households and take into account child care costs, i.e. the 85% is relative to a gain in net income after deducting child care costs.

[37] Simulations were carried out for the first two individuals in the household that are potential suppliers of labour. Since the ranking of individuals for simulation in the household does not necessarily correspond to the sociological rank, it is possible that there are households where no simulations were carried out for the head of household. In a future exercise the simulations will be done for all members in the households that qualify to enter the labour market.

employers. In the two situations employers 'pay' social security contributions of $(1-s)x$, and hence wages will be the same in both cases. The incidence of social security contributions in the two scenarios is the same and it suffices to look at employee social security contributions only to calculate marginal tax rates (Carone et al., 2004).

In Table 4-5 and Table 4-6 we show respectively effective marginal tax rates and participation tax rates per decile of the earnings distribution and for all heads of households for whom a simulation has been carried out.[38] As can be seen in Table 4-5 effective marginal tax rates more or less show a U-shaped pattern across the hours distribution and this for all deciles. The lower deciles have slightly higher marginal tax rates (the first decile being an exception especially at the lower end of the hours distribution) but from around the 20th hour all deciles have very similar marginal tax rates. Overall, all deciles show more or less the same pattern with relatively high marginal tax rates for low hours of worked supplied, decreasing marginal tax rates as more hours are supplied, and again an increasing trend starting from around 20 hours of work per week but never reaching the levels witnessed at the low number of hours supplied.

As for the participation tax rates shown in Table 4-6 one could claim that they show a limited inverse U-shaped pattern, with tax rates increasing in the beginning, followed by a decline continuing until the end of the hours distribution. Also here the largest differences between deciles exist at the bottom of the hours distribution with differences leveling off from the 20th hour onwards. In no one situation does the participation tax rate exceed 80%, and hence no inactivity traps are identified for this broadly defined subpopulation.

[38] The selection of individuals within each household to be simulated has been done somewhat at random. It is therefore possible that not for all heads of household a simulation has been carried out at this stage. Again, these are preliminary results and should not be interpreted in any other way.

TABLE 4-5 EFFECTIVE MARGINAL TAX RATES AT HOUSEHOLD LEVEL: HOURS WORKED SIMULATED FOR HEAD OF HOUSEHOLD

	deciles of wage distribution										
hours	1	2	3	4	5	6	7	8	9	10	All
1	50.39	58.70	60.15	60.05	61.14	61.66	61.63	63.89	62.89	63.63	60.41
2	60.66	72.59	71.36	69.69	69.91	68.94	67.54	69.60	68.50	67.58	68.63
3	60.02	71.92	70.93	68.89	69.63	68.34	67.56	69.73	69.43	68.13	68.45
4	59.21	71.31	70.62	69.08	70.53	68.36	68.44	70.25	69.49	68.82	68.61
5	60.01	72.79	71.18	70.66	71.27	72.05	69.96	71.22	70.42	68.82	69.83
6	61.69	75.68	73.31	74.45	73.19	71.58	71.22	70.88	68.73	66.41	70.71
7	64.76	75.15	72.23	73.64	72.26	69.60	69.71	69.87	67.47	61.99	69.67
8	64.97	74.90	72.88	69.54	69.73	67.25	67.33	66.62	64.41	58.69	67.63
9	63.55	70.47	67.83	65.79	65.76	62.83	62.83	62.67	58.69	56.14	63.66
10	63.67	67.66	64.94	62.04	60.76	60.04	58.15	59.63	56.94	53.17	60.70
11	67.32	65.59	61.39	60.09	57.91	56.14	55.58	54.95	52.72	50.01	58.18
12	66.98	63.39	58.22	56.09	54.76	53.93	52.71	53.25	51.15	49.99	56.05
13	66.38	59.59	54.78	53.76	52.52	51.18	50.94	51.01	50.01	49.34	53.96
14	63.51	57.04	52.84	51.70	50.56	49.98	49.89	49.46	49.09	49.69	52.38
15	60.63	55.01	50.18	48.87	48.51	48.57	48.03	49.51	48.79	49.73	50.79
16	56.95	52.69	49.10	48.72	47.79	47.90	47.72	48.88	49.46	49.83	49.91
17	54.91	51.01	48.80	47.74	48.05	48.02	47.77	48.91	49.66	50.31	49.52
18	52.87	50.02	48.33	47.57	47.99	48.35	48.11	49.26	50.17	50.89	49.36
19	51.15	49.71	48.55	47.96	48.69	48.68	48.69	49.45	50.33	51.31	49.45
20	50.57	49.46	48.74	48.68	49.20	49.23	49.50	49.93	50.92	52.02	49.82
21	49.84	49.99	49.87	49.29	49.74	50.00	50.34	50.73	51.51	52.72	50.40
22	50.05	50.30	50.36	49.79	50.79	50.97	51.08	51.36	52.12	52.98	50.98
23	50.81	51.07	51.17	50.89	51.05	51.16	51.77	51.99	52.51	53.46	51.59
24	51.17	51.03	51.42	51.44	51.97	51.59	52.21	52.42	53.12	54.15	52.05
25	51.38	51.62	52.02	51.91	52.44	52.60	52.74	52.92	53.59	54.47	52.57
26	51.93	52.39	52.62	52.78	52.98	52.61	52.94	53.27	54.06	54.93	53.05
27	52.55	52.79	53.17	53.02	53.27	53.30	53.62	53.77	54.41	55.14	53.50
28	52.96	53.53	53.46	53.34	53.67	53.87	53.75	54.25	54.74	55.65	53.92
29	53.36	53.81	53.98	53.74	54.04	54.27	54.12	54.52	55.16	56.01	54.30
30	53.70	54.07	54.19	54.03	54.32	54.19	54.40	54.88	55.40	56.32	54.55
31	53.98	54.57	54.88	54.52	54.80	54.75	54.84	55.25	55.79	56.78	55.01
32	54.71	54.91	55.03	54.73	54.89	54.94	55.12	55.59	56.03	56.90	55.28
33	54.54	55.01	55.14	54.90	55.30	55.17	55.56	55.90	56.31	57.11	55.49
34	54.92	55.80	55.64	55.37	55.56	55.57	55.74	56.24	56.80	57.64	55.93
35	55.36	55.50	55.50	55.61	55.77	55.83	56.12	56.24	56.87	57.88	56.07

	deciles of wage distribution										
hours	1	2	3	4	5	6	7	8	9	10	All
36	55.50	55.85	55.87	55.81	56.04	55.90	56.18	56.69	57.44	58.22	56.35
37	55.87	56.03	55.98	56.07	56.44	56.24	56.49	56.91	57.54	58.53	56.61
38	55.69	56.24	56.21	56.49	56.62	56.45	56.93	57.10	57.79	58.90	56.84
39	56.44	56.36	56.59	56.46	56.86	56.86	57.07	57.46	58.08	59.07	57.12
40	56.56	56.73	56.84	56.76	57.08	57.06	57.23	57.65	58.41	59.35	57.37

TABLE 4-6 PARTICIPATION TAX RATES AT HOUSEHOLD LEVEL: HOURS WORKED SIMULATED FOR HEAD OF HOUSEHOLD

	deciles of wage distribution										
hours	1	2	3	4	5	6	7	8	9	10	All
1	50.39	58.70	60.15	60.05	61.14	61.66	61.63	63.89	62.89	63.63	60.41
2	55.53	65.65	65.75	64.87	65.52	65.30	64.58	66.74	65.70	65.60	64.52
3	57.03	67.74	67.48	66.21	66.89	66.31	65.58	67.74	66.94	66.45	65.83
4	57.57	68.63	68.26	66.93	67.80	66.82	66.29	68.37	67.58	67.04	66.52
5	58.06	69.46	68.85	67.68	68.50	67.87	67.02	68.94	68.14	67.39	67.19
6	58.66	70.50	69.59	68.80	69.28	68.49	67.72	69.26	68.24	67.23	67.77
7	59.54	71.16	69.97	69.50	69.70	68.65	68.01	69.35	68.13	66.48	68.04
8	60.21	71.63	70.33	69.50	69.71	68.47	67.92	69.01	67.67	65.51	67.99
9	60.59	71.50	70.05	69.09	69.27	67.85	67.36	68.30	66.67	64.47	67.51
10	60.89	71.12	69.54	68.38	68.42	67.06	66.44	67.44	65.70	63.34	66.83
11	61.48	70.61	68.80	67.63	67.46	66.07	65.45	66.30	64.52	62.13	66.04
12	61.94	70.01	67.92	66.67	66.40	65.06	64.39	65.21	63.40	61.11	65.21
13	62.28	69.21	66.91	65.67	65.34	63.99	63.35	64.12	62.37	60.21	64.35
14	62.37	68.34	65.90	64.68	64.28	62.99	62.39	63.07	61.42	59.46	63.49
15	62.25	67.45	64.86	63.62	63.23	62.03	61.43	62.17	60.58	58.81	62.64
16	61.92	66.53	63.87	62.69	62.26	61.15	60.58	61.34	59.89	58.25	61.85
17	61.51	65.62	62.98	61.81	61.43	60.37	59.82	60.61	59.29	57.78	61.12
18	61.03	64.75	62.17	61.02	60.68	59.71	59.17	59.98	58.78	57.40	60.47
19	60.51	63.96	61.45	60.33	60.05	59.13	58.62	59.42	58.33	57.08	59.89
20	60.01	63.24	60.82	59.75	59.51	58.63	58.17	58.95	57.96	56.83	59.39
21	59.53	62.60	60.30	59.25	59.04	58.22	57.79	58.56	57.66	56.63	58.96
22	59.10	62.05	59.85	58.82	58.67	57.89	57.49	58.23	57.40	56.46	58.60
23	58.73	61.57	59.47	58.48	58.34	57.60	57.24	57.96	57.19	56.33	58.29
24	58.42	61.13	59.13	58.18	58.07	57.35	57.03	57.73	57.02	56.24	58.03
25	58.14	60.75	58.85	57.93	57.85	57.16	56.86	57.54	56.88	56.17	57.81
26	57.90	60.43	58.61	57.74	57.66	56.98	56.71	57.37	56.78	56.12	57.63
27	57.70	60.14	58.41	57.56	57.50	56.85	56.59	57.24	56.69	56.09	57.48
28	57.53	59.91	58.23	57.41	57.36	56.74	56.49	57.13	56.62	56.07	57.35
29	57.39	59.70	58.08	57.28	57.25	56.66	56.41	57.04	56.57	56.07	57.24
30	57.27	59.51	57.95	57.17	57.15	56.57	56.34	56.97	56.53	56.08	57.15
31	57.16	59.35	57.86	57.09	57.07	56.51	56.29	56.91	56.51	56.10	57.09
32	57.08	59.21	57.77	57.01	57.00	56.46	56.26	56.87	56.49	56.13	57.03
33	57.01	59.09	57.69	56.95	56.95	56.43	56.24	56.84	56.49	56.16	56.98
34	56.94	58.99	57.63	56.90	56.91	56.40	56.22	56.83	56.49	56.20	56.95
35	56.90	58.89	57.57	56.87	56.88	56.38	56.22	56.81	56.51	56.25	56.93

	deciles of wage distribution										
hours	1	2	3	4	5	6	7	8	9	10	All
36	56.86	58.80	57.52	56.84	56.86	56.37	56.22	56.81	56.53	56.30	56.91
37	56.83	58.73	57.48	56.82	56.84	56.37	56.23	56.81	56.56	56.36	56.90
38	56.80	58.66	57.44	56.81	56.84	56.37	56.24	56.82	56.59	56.43	56.90
39	56.79	58.60	57.42	56.80	56.84	56.38	56.27	56.83	56.63	56.50	56.91
40	56.79	58.56	57.41	56.80	56.85	56.40	56.29	56.85	56.67	56.57	56.92

The relative contribution of different tax-benefit instruments to (high) effective marginal tax rates is of importance when thinking about the effects of policy measures. Moreover, there exists a trade off when devising policies to encourage transition into work that has to do with different labour supply elasticities at the intensive and extensive margin. The former is the labour supply response to changes in wages of people already in work while the latter measures the elasticity of those currently not in paid employment. Policies to encourage transition into the labour market can have adverse effects on the labour supply of those already working, especially at lower levels of earnings, because the in-work benefits that are designed to attract individuals into work are (gradually) decreased as earnings increase. The contributions of different tax-benefit instruments can furthermore help in integrating and coordinating (parts of) the tax-benefit legislation to avoid situations with high marginal effective tax rates.

In Table 4-7 we show such a decomposition for the total effective marginal tax rates shown in Table 4-5. Again, to save space and because results are preliminary we only show the decomposition for the effective marginal tax rates and not for the participation rates. Moreover, we restrict the presentation to total marginal tax rates instead of looking at the decomposition for each decile of the earnings distribution. The calculation of the numbers in Table 4-7 is as follows[39]:

$$emtr = \frac{\Delta PIT + \Delta SSC - \Delta FB - \Delta SB - \Delta SA}{\Delta Y_{gross}}, \tag{5}$$

where $emtr$ is the effective marginal tax rate; ΔPIT are the changes in personal income taxes; ΔSSC are the changes in social security contributions; ΔFB are changes in family allowances; ΔSB are changes in other social benefits; and ΔSA the changes in the level of social assistance income. The change in social security contributions are further divided in changes in employee social security contributions and contributions on social benefits. The social benefits include unemployment benefits and sickness and disability benefits. Changes in benefits contribute negatively to the marginal tax rates whereas changes in contributions and taxes contribute positively.

As could be expected at the lower end of the hours distributions the main contributor to the effective marginal tax rate is the change in the level of social assistance. Remember that this was

[39] We dropped super- and subscripts here not to confuse notation. All calculations are still at the household level while hours of work are simulated for one individual at the time.

the level of income attributed to the simulated individuals at zero hours of work. The other two main contributors are changes in personal income taxes and employee social security contributions where the former becomes the more important as more and more hours of labour are supplied. Social security contributions remain constant as they are calculated applying a more or less fixed percentage on gross labour income (see section 2.2.4 for more details). Note also that changes in family allowance only play a minor role as was to be expected since we only look at simulation here for heads of household. If we were to simulate for all potential suppliers of labour in the household changes in family allowance will become more important. If children still living at home, e.g. students older than 18, start supplying labour this will have an effect on the child allowances received and thus also have an effect on the household effective marginal tax rate.[40]

As singles become more and more important as a demographic group in today's society it pays to look at how effective marginal and participation tax rates are for this group. Singles have no income of a partner to fall back on when out of work and the tax rates for this group also give an idea of what effective tax rates would look like if we look at individuals rather than households. We present effective marginal tax rates in Table 4-8 and participation tax rates in Table 4-9.

It is immediately clear that the tax rates are substantially higher than those calculated at the household level with tax rates exceeding 80% for most deciles at low numbers of hours worked, some even have tax rates exceeding 100%. Individuals in this range have no or very little incentive to increase the number of hours worked at the margin. Around the 10th hour of work the marginal tax rates substantially drop to lower levels at around 50% from which they again gradually increase to levels of around 60% at a labour supply of 40 hours a week. Very few have effective marginal tax rates below 50%.

Participation tax rates never exceed 100% but are in general higher than the marginal tax rates at the lower end of the hours distribution. In fact, participation tax rates are very high for up to 20 hours of work a week and exceed or are near 80% for most deciles up to 15 hours. Moreover, they seem to be highest for higher earning individuals. For most individuals in the earnings distribution, on average, it does not pay to start working at less than 15 hours: the extra income they gain as compared the social assistance level is not worth the extra cost of entering the labour market. Notice that the partication tax rate for singles is nearly nowhere below 60% and remember that the reference income here is social assistance.

[40] While calculating effective marginal tax rates at the household level for spouses one might not find this as intuitive when simulating the labour supply of children. Nevertheless and under certain conditions the decision of the child to enter the labour market can and will have an effect on the marginal tax rates of the parents.

TABLE 4-7 CONTRIBUTING FACTORS TO TOTAL EFFECTIVE MARGINAL TAX RATE AT HOUSEHOLD LEVEL: HOURS OF WORK SIMULATED FOR HEAD OF HOUSEHOLD

hours	emtr	personal income taxes	employee social security contributions	contributions on social benefits	unemployment benefits	family allowances	sickness	disability	social assistance
1	58.04	9.50	12.85	0.00	6.31	0.00	-0.85	0.06	30.17
2	68.79	9.92	12.85	0.00	-0.35	0.00	0.00	0.06	46.31
3	68.58	10.45	12.85	0.00	0.24	0.03	0.00	0.03	44.99
4	68.73	10.96	12.85	0.00	1.21	0.19	0.01	0.02	43.50
5	70.05	11.51	12.85	0.00	3.85	0.38	0.01	0.16	41.29
6	71.14	12.26	12.85	0.00	7.06	1.26	0.00	0.18	37.54
7	70.05	13.33	12.85	-0.01	6.77	2.33	0.01	0.34	34.42
8	67.62	14.76	12.85	-0.01	5.47	2.74	0.03	0.41	31.36
9	63.89	16.33	12.85	-0.02	2.92	2.19	0.01	0.55	29.05
10	61.30	18.00	12.85	-0.02	2.16	1.85	0.01	0.55	25.87
11	59.18	20.04	12.85	-0.02	1.32	1.14	0.03	0.35	23.45
12	57.01	22.04	12.85	-0.01	0.89	1.25	0.01	0.45	19.52
13	54.87	24.02	12.85	-0.02	0.62	0.03	0.00	0.26	17.10
14	53.25	25.99	12.85	-0.02	0.57	0.09	0.00	0.45	13.31
15	51.48	27.75	12.85	-0.01	0.51	0.03	0.00	0.18	10.16
16	50.36	29.52	12.85	0.00	0.44	0.01	0.01	0.04	7.49
17	49.95	31.21	12.85	0.00	0.38	0.02	0.00	0.04	5.45
18	49.59	32.68	12.85	0.00	0.31	0.00	0.00	0.01	3.74
19	49.59	33.98	12.85	0.00	0.25	0.04	0.00	0.02	2.45
20	49.91	35.19	12.85	0.00	0.22	0.02	0.00	0.02	1.61
21	50.48	36.30	12.85	0.00	0.19	0.03	0.00	0.00	1.11
22	51.02	37.19	12.85	0.00	0.16	0.04	0.00	0.00	0.78
23	51.73	38.16	12.85	0.00	0.15	0.05	0.00	0.00	0.52
24	52.11	38.84	12.85	0.00	0.14	0.00	0.00	0.00	0.28
25	52.59	39.43	12.85	0.00	0.13	0.04	0.00	0.00	0.13
26	53.10	40.07	12.85	0.00	0.11	0.03	0.00	0.00	0.04
27	53.59	40.63	12.85	0.00	0.09	0.02	0.00	0.00	0.00
28	54.01	41.07	12.85	0.00	0.07	0.02	0.00	0.00	0.00
29	54.37	41.46	12.85	0.00	0.06	0.01	0.00	0.00	0.00
30	54.64	41.74	12.85	0.00	0.05	0.00	0.00	0.00	0.00
31	55.14	42.26	12.85	0.00	0.03	0.00	0.00	0.00	0.00
32	55.44	42.57	12.85	0.00	0.03	0.00	0.00	0.00	0.00
33	55.61	42.74	12.85	0.00	0.02	0.00	0.00	0.00	0.00

hours	emtr	personal income taxes	employee social security contributions	contributions on social benefits	unemployment benefits	family allowances	sickness	disability	social assistance
34	56.09	43.21	12.85	0.00	0.02	0.02	0.00	0.00	0.00
35	56.20	43.34	12.85	0.00	0.01	0.00	0.00	0.00	0.00
36	56.48	43.62	12.85	0.00	0.01	0.00	0.00	0.00	0.00
37	56.72	43.85	12.85	0.00	0.01	0.02	0.00	0.00	0.00
38	56.96	44.11	12.85	0.00	0.01	0.00	0.00	0.00	0.00
39	57.22	44.22	13.00	0.00	0.00	0.00	0.00	0.00	0.00
40	57.49	44.49	13.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 4-8 EFFECTIVE MARGINAL TAX RATES FOR SINGLES

	deciles of wage distribution										
hours	1	2	3	4	5	6	7	8	9	10	All
1	50.53	61.96	64.43	73.99	75.49	77.96	83.66	85.51	87.21	93.07	75.37
2	68.92	82.20	91.30	97.26	101.05	101.35	101.42	101.57	102.07	102.25	94.93
3	68.64	81.61	91.26	97.32	100.37	101.27	100.93	101.08	101.66	101.56	94.56
4	66.98	81.66	90.02	96.74	99.18	100.70	100.08	100.13	101.59	100.45	93.75
5	66.52	81.45	89.40	95.08	98.75	99.31	97.72	98.36	100.01	95.48	92.20
6	65.83	78.62	88.31	93.24	96.83	98.40	95.27	96.73	96.21	89.65	89.90
7	63.27	77.28	84.48	92.56	95.78	96.28	92.60	92.91	92.06	82.70	86.99
8	58.49	82.32	87.03	91.86	92.62	90.82	89.73	86.95	85.52	74.29	83.96
9	61.94	80.05	86.20	87.75	87.30	85.44	82.55	80.82	77.86	68.96	79.89
10	66.54	80.76	82.94	83.74	82.98	79.99	78.17	73.58	70.15	63.15	76.20
11	79.44	81.68	80.63	79.54	77.67	73.99	70.98	66.74	62.67	58.14	73.16
12	77.22	76.47	78.26	73.48	71.30	67.28	62.62	59.89	59.90	55.21	68.17
13	84.05	74.99	73.13	67.04	65.99	62.08	58.29	56.32	55.85	52.99	65.08
14	78.66	70.78	67.94	62.80	59.67	57.91	53.84	54.33	53.67	51.84	61.15
15	72.16	67.15	62.45	58.68	55.22	53.56	51.84	52.48	52.31	50.86	57.67
16	66.40	61.86	58.55	55.11	52.70	50.89	51.47	50.69	52.16	50.60	55.05
17	61.32	58.21	55.04	53.92	51.48	50.02	51.53	50.22	51.99	51.58	53.53
18	56.21	55.15	52.53	52.12	49.73	50.13	51.20	49.83	51.40	51.93	52.02
19	52.65	51.93	52.07	50.47	49.33	50.06	50.81	50.40	50.80	51.99	51.05
20	50.43	51.22	51.35	50.10	49.96	50.52	51.45	51.27	51.54	52.94	51.08
21	49.32	50.95	51.63	50.78	50.80	51.12	51.90	52.28	52.20	53.84	51.48
22	49.95	50.61	51.67	51.19	51.17	52.34	52.52	52.51	53.16	53.96	51.91
23	50.18	51.44	51.95	51.96	51.93	52.71	52.99	53.63	54.14	54.54	52.55
24	51.24	50.90	51.64	52.31	52.59	53.10	53.35	53.39	53.96	55.12	52.76
25	50.97	51.63	51.85	52.38	52.94	54.04	54.79	54.34	54.16	55.38	53.25
26	51.15	52.39	52.98	53.01	53.36	54.81	54.17	54.62	54.42	55.54	53.64
27	52.17	52.77	53.37	54.06	53.96	54.20	55.09	55.60	55.19	55.81	54.22
28	52.38	53.42	54.19	53.90	54.10	54.63	55.05	55.25	55.53	56.13	54.46
29	53.12	53.61	54.46	54.81	54.57	55.34	55.48	55.02	55.42	56.62	54.84
30	53.17	54.24	54.59	54.44	54.94	55.49	55.55	55.76	55.65	57.01	55.08
31	53.51	54.83	54.70	55.30	55.53	55.66	56.33	55.77	56.03	57.31	55.50
32	54.73	54.88	55.76	55.42	55.66	56.20	56.05	56.13	56.18	57.08	55.81
33	54.07	55.06	55.39	55.57	55.79	56.41	56.23	56.58	56.59	57.18	55.89
34	54.87	55.34	56.36	55.95	56.06	56.82	56.60	56.44	57.08	57.91	56.34
35	55.46	55.63	55.87	56.09	55.99	56.51	56.53	56.96	56.88	57.98	56.39

	deciles of wage distribution										
hours	1	2	3	4	5	6	7	8	9	10	All
36	55.84	55.55	56.12	56.45	56.32	56.75	56.79	56.83	57.33	58.52	56.65
37	55.78	56.52	56.41	56.33	56.60	57.51	56.91	57.25	57.25	58.59	56.91
38	55.51	55.99	56.92	56.91	57.00	57.63	57.12	57.82	57.62	58.92	57.14
39	56.40	56.62	56.72	57.27	57.45	57.71	57.57	57.82	57.98	59.02	57.45
40	56.47	56.85	57.29	57.52	57.37	57.52	57.81	57.75	58.20	59.44	57.62

TABLE 4-9 PARTICIPATION TAX RATES FOR SINGLES

	deciles of wage distribution										
hours	1	2	3	4	5	6	7	8	9	10	All
1	50.53	61.96	64.43	73.99	75.49	77.96	83.66	85.51	87.21	93.07	75.37
2	59.72	72.08	77.87	85.62	88.27	89.66	92.54	93.54	94.64	97.66	85.15
3	62.69	75.26	82.33	89.52	92.31	93.53	95.34	96.06	96.98	98.96	88.29
4	63.76	76.86	84.25	91.33	94.02	95.32	96.52	97.08	98.13	99.33	89.65
5	64.31	77.78	85.28	92.08	94.97	96.12	96.76	97.33	98.51	98.56	90.16
6	64.57	77.92	85.79	92.27	95.28	96.50	96.51	97.23	98.12	97.08	90.12
7	64.38	77.83	85.60	92.31	95.35	96.47	95.95	96.62	97.26	95.02	89.67
8	63.65	78.39	85.78	92.26	95.01	95.76	95.18	95.41	95.79	92.43	88.96
9	63.46	78.57	85.82	91.76	94.15	94.62	93.77	93.79	93.80	89.82	87.95
10	63.77	78.79	85.54	90.95	93.03	93.15	92.21	91.77	91.43	87.16	86.78
11	65.19	79.06	85.09	89.92	91.64	91.41	90.28	89.49	88.82	84.52	85.54
12	66.19	78.84	84.52	88.55	89.94	89.40	87.98	87.02	86.41	82.08	84.09
13	67.57	78.54	83.64	86.89	88.10	87.30	85.69	84.66	84.06	79.84	82.63
14	68.36	77.99	82.52	85.17	86.07	85.20	83.42	82.49	81.89	77.84	81.09
15	68.61	77.27	81.18	83.40	84.01	83.09	81.31	80.49	79.92	76.04	79.53
16	68.47	76.30	79.77	81.64	82.06	81.08	79.45	78.63	78.18	74.45	78.00
17	68.05	75.24	78.31	80.01	80.26	79.25	77.81	76.96	76.64	73.10	76.56
18	67.40	74.12	76.88	78.46	78.56	77.63	76.33	75.45	75.24	71.93	75.20
19	66.62	72.95	75.58	76.98	77.02	76.18	74.98	74.13	73.95	70.88	73.93
20	65.81	71.87	74.36	75.64	75.67	74.90	73.81	72.99	72.83	69.98	72.79
21	65.02	70.87	73.28	74.46	74.49	73.77	72.77	72.00	71.85	69.21	71.77
22	64.34	69.95	72.30	73.40	73.43	72.79	71.84	71.12	71.00	68.52	70.87
23	63.72	69.15	71.41	72.47	72.49	71.92	71.02	70.36	70.27	67.91	70.07
24	63.20	68.39	70.59	71.63	71.66	71.13	70.29	69.65	69.59	67.38	69.35
25	62.71	67.72	69.84	70.86	70.91	70.45	69.67	69.04	68.97	66.90	68.71
26	62.27	67.13	69.19	70.17	70.24	69.85	69.07	68.48	68.41	66.46	68.13
27	61.90	66.59	68.61	69.57	69.64	69.27	68.55	68.01	67.92	66.07	67.61
28	61.56	66.12	68.09	69.01	69.08	68.75	68.07	67.55	67.48	65.71	67.14
29	61.27	65.69	67.62	68.52	68.58	68.28	67.64	67.12	67.06	65.40	66.72
30	61.00	65.31	67.19	68.05	68.13	67.86	67.24	66.74	66.68	65.12	66.33
31	60.75	64.97	66.78	67.64	67.72	67.46	66.88	66.39	66.34	64.87	65.98
32	60.57	64.66	66.44	67.26	67.34	67.11	66.54	66.07	66.02	64.62	65.66
33	60.37	64.37	66.10	66.91	66.99	66.79	66.23	65.78	65.73	64.40	65.37
34	60.21	64.10	65.82	66.58	66.67	66.49	65.95	65.50	65.48	64.21	65.10
35	60.07	63.86	65.53	66.28	66.37	66.21	65.68	65.26	65.23	64.03	64.85

	deciles of wage distribution										
hours	1	2	3	4	5	6	7	8	9	10	All
36	59.95	63.63	65.27	66.01	66.09	65.95	65.43	65.03	65.01	63.88	64.62
37	59.84	63.44	65.03	65.75	65.83	65.72	65.20	64.82	64.81	63.73	64.42
38	59.73	63.24	64.82	65.52	65.60	65.51	64.99	64.63	64.62	63.61	64.22
39	59.64	63.07	64.61	65.31	65.39	65.31	64.80	64.46	64.45	63.49	64.05
40	59.56	62.91	64.43	65.11	65.19	65.11	64.63	64.29	64.29	63.39	63.89

4.1.4 conclusion

As we have stressed at several occasions the results in this section are preliminary and are yet another indicator of the possibilities of MIMOSIS as a tool for (policy) analysis. Results presented here should be interpreted as such and should not be taken at face value. Nevertheless they raise some interesting points.

We have seen that average tax rates, including employee social insurance contributions, rarely exceed 50% even though the top marginal tax rate in the personal income tax schedule was 55% in 2001. Average tax rates on total labour *cost*, thus including employers' social security contributions, are higher and around 50% on average.

Average tax rates are also higher for younger cohorts than they are for older ones. The oldest but one cohort (age 55 to 64) gets less than 50% of its gross income from labour market activities, with the percentage further declining to some 8% for the oldest cohort. Even for the middle cohorts the percentages are no higher than 75%, with unemployment benefits, family allowance and social assistance making up the greater part of the other 25%. The youngest cohort has a relatively large percentage of family allowances at around 30% (results not shown in the tables in the text).

The effective marginal and participation tax rates show that when we look at singles, risks of inactivity traps do exist and this until the middle of the hours of work distribution (20 hours of labour supplied). The high participation tax rates obtained are relative to social assistance levels of income. As we did for heads of household in general we did not yet make a decomposition of contributing factors for the singles. We will certainly do so in the future, but meanwhile hope to have shown the usability and level of detail if MIMOSIS from a slightly different point of view, i.e. by mainly focusing on taxes.

We have also stressed that some information on taxes is lacking in MIMOSIS such as local taxes, property taxes, capital income taxes and the like. On the other hand we also lack information of some important tax deductible expenditures such as mortgage interest payments, contributions to private pension plans, gifts, childcare costs, etc. We feel that especially childcare costs can have a decisive impact on the choice whether or not to supply labour, especially in couples where one of the partners is inactive or unemployed and at the lower end of the wage distribution. When entering the labour market children have to be cared for and costs can be relatively substantial for low wage workers increasing their effective marginal tax rates.

4.2 RESTRICTION OF THE DURATION OF UNEMPLOYMENT BENEFITS

In the framework of the Lisbon-strategy, Belgium is faced with the challenge to increase its employment rates. Overall employment rates amount to 62.7% (2003), compared to 65.5% for the entire European Union (EU-15). Employment rates are especially low for older individuals (28% of the 55-64 year old), youngsters (27% of the population aged 15-24) and ethnic minorities. For prime-age workers, employment rates are close to international averages (OECD, 2005). The Belgian employment problem is also reflected in its high unemployment rates, especially for long-term unemployment: the overall unemployment rate in 2004 amounts to 12%, of which 49.6% are long term unemployed (12 months or more, OECD). The EU-15 unemployment rate for the same year is 8.3%, with a share of 42.6% long term unemployed (of the EU-15 only Germany, Greece and Italy have a higher share of long term unemployment than Belgium).

The duration of the entitlement to unemployment benefits is often blamed, among other factors, for this high long-term unemployment level, and the generous unemployment replacement rates are often blamed for the high unemployment levels in general (see Nickell, 1997; Nickell et al, 2005). For high unemployment replacement rates, and thus high levels of benefits, imply that the costs of being unemployed are low. Because of this, unemployed workers tend to search for a job less intensely and tend to stay unemployed longer. So high replacement rates do not only bring about high(er) unemployment levels, they also cause a longer duration of unemployment. However, when faced with a limit on the duration of entitlement to unemployment benefits, unemployed workers tend to speed up their job search. Particularly when the date approaches on which benefits will expire, unemployed workers tend to increase the intensity of their job search and the rate of job finding increases. Consequently, around that time the exit rate from unemployment rises quite dramatically (Lalive, 2006; van Ours et al, 2006).

The idea of restricting the duration of entitlement to unemployment benefits often appears in the Belgian policy debate (see e.g. Karel Van Eetvelt (topman Unizo, Opiniestuk in De Standaard van 24 april 2006) and Bart Somers (Voorzitter VLD, Opiniestuk in De Standaard van 8 juni 2006), Prime Minister Verhofstadt in his "Het Vierde Burgermanifest. Pleidooi voor een open samenleving." (2007)). This discourse is often supported by references to practices in other countries, and more specifically to the Scandinavian model that combines higher benefits with a limited duration. In the next section we will look closer at the unemployment benefit systems of Denmark, Norway and Sweden.

In the third section we briefly discuss the legislation rules concerning unemployment benefits in Belgium. In the fourth section we then propose alternatives for the Belgian situation. Inspiration for these alternatives comes from the practices in the Nordic countries and from ideas put forward in the Belgian policy debate. In the fifth section some simulation results of the proposed alternatives are presented. In the sixth and final section we conclude.

4.2.1 the Scandinavian model of unemployment

The title of this section is somewhat misleading because there is no one, unique Scandinavian model of unemployment. If we talk about the Scandinavian model of unemployment we are in fact referring to the unemployment benefit systems of the Scandinavian countries Denmark, Norway and Sweden. What the unemployment benefit systems of these Scandinavian countries have in common is that they all combine high(er) benefit amounts with limited benefit duration.

In the discussion of the Scandinavian unemployment benefit systems (see Table 4-10) we first look at the conditions unemployed workers have to meet to be eligible for unemployment benefits. We then give an overview of the amounts of unemployment benefits and benefit duration the Scandinavian unemployed workers are entitled to.

For each of the unemployment benefit systems we discuss the rules of the unemployment legislation for the year 2001, following the time frame applied to MIMOSIS.

TABLE 4-10 THE SCANDINAVIAN MODEL OF UNEMPLOYMENT

	Denmark	Norway	Sweden
Eligibility conditions	- unemployment insurance is voluntary - membership of an insurance fund for the last year is required, as is the payment of the membership fee - eligible after 52 weeks of full-time work within the last 3 years	the unemployed worker must have had an income from work of at least 1.25 times the basic amount[a] the preceding calendar year or an income from work which at least equals the basic amount as an average during the 3 preceding calendar years	- unemployment insurance is voluntary - membership of an Unemployment Insurance Society for the last 12 months is required, as is the payment of the membership fee - eligible after 6 months of work or 450 hours during a continuous period of 6 months
Amount of benefits	- 90% of previous earnings (with a maximum monthly benefit of €1 709.08) for unemployed workers who receive benefits after employment - 82% of the maximum monthly benefit for the unemployed who receive benefits after studies - 91% of the maximum monthly benefit for the older workers who have reached the age of 60 (= early retirement pay)	benefit rate a day is 0.24% of the calculation basis (= income from the last preceding calendar year or the average over the last 3 preceding calendar years), or 62.4% per year (with a maximum benefit amount of €461.76 per week) + child supplement (€2.12 per day)	- 80% of previous earnings (with a maximum daily benefit of €73.05 the first 100 days and €62.30 the rest of the unemployment period)
Benefit duration	The maximum benefit period is 4 years, no waiting period.	- 3 years if income > 2*basic amount - 1.5 years if income < 2*basic amount	The maximum benefit period is 300 days or 60 weeks, after a 5-day waiting period.
Unemployment assistance	No unemployment assistance	No unemployment assistance	- for those not insured but who meet the employment conditions and those having just finished their full-time studies (student condition) - only available from the age of 20! - benefit amount: €29.00 per day after full-time work or studies, proportionally lower after part-time work - benefit duration: maximum of 300 days, after a 5-day waiting period when based on employment condition and 90 days when based on student condition

[a] The basic amount was €6 409.73 from May 2001

4.2.2 duration of entitlement to unemployment benefits in Belgium

The group of unemployed workers that we discuss here consist only of the unemployed in search of work and who are entitled to benefits. Within this group we distinguish the unemployed who receive benefits after study and the unemployed who receive benefits after employment. For

the other two groups of Belgian unemployed workers, notably the unemployed not in search of work but who are entitled to benefits paid by the RVA/ONEM[41] and the employees entitled to benefits paid by the RVA/ONEM[42], other rules of legislation apply and thus they fall out of the scope of the simulations presented in this paper.

In principle, the duration of entitlement to unemployment benefits in Belgium for unemployed workers who receive benefits after studies or after employment is indefinite. Depending on the family type, however, the unemployment replacement rate and thus the amount of unemployment benefits for unemployed workers who receive benefits after employment may decrease over time (see first three columns of Table 4-11, for the amounts applicable in MIMOSIS for the year 2001). For unemployed workers whose unemployment benefits are the sole source of income in the family (with dependants), there is no decrease over time. For those unemployed workers the amount remains at 60% of previously earned wages[43] throughout their whole unemployment spell. For a single unemployed worker, the amount is diminished from 60 to 45% of previously earned wages after 12 months; the minimum daily amount remains the same, but the upper limit is also lowered. For an unemployed worker living in a household with other income recipients, the replacement rate goes down from 55% to 35% after 12 months, and decreases again to a lump sum after 15 months of unemployment (though this period of 15 months may be extended in function of work past). Apart from family type, also regional location can limit unemployment benefit claims: if an unemployed worker has received benefits for a period equal to twice the average duration of unemployment for an unemployed worker with similar characteristics (age, sex, region), then benefits can be withdrawn. This withdrawal does not apply for unemployed workers of 50 and older, and when household income is below a certain threshold.

[41] Within this group we distinguish the unemployed who are on conventional early retirement, the unemployed who are on career break, the older unemployed who receive a seniority supplement, and the unemployed who receive an exemption.

[42] Within this group we distinguish the employees who are on part-time early retirement, the employees who are on part-time career break, the unemployed who receive guaranteed income benefits, employees who are temporarily unemployed, the unemployed who are working for a Plaatselijk Werkgelegenheidsagentschap/Agence locale pour l'emploi, and the unemployed who are working in some kind of activation program.

[43] Note that the previously earned wages are limited. On June 1st 2001 the maximum gross monthly wages were limited to €1 529.28; and the maximum daily wages were limited to €58.82.

TABLE 4-11 LEVEL OF COMMON UNEMPLOYMENT BENEFITS ON JUNE 1ST 2001 (FIRST THREE COLUMNS); LEVEL OF BENEFITS FOR THE PROPOSED ALTERNATIVE (LAST THREE COLUMNS)

	Baseline			Reform		
Category	Rule	Minimum daily amount	Maximum daily amount	Rule	Minimum daily amount	Maximum daily amount
Unemployed with dependent family						
Unemployed is disabled	60% of ALDW[a]			90% of ALDW		
Unemployed is not disabled	60% of ALDW	€ 31.78	€ 35.30	90% of ALDW	€ 31.78	€ 65.73
Single unemployed						
Unemployed is disabled	50% of ALDW			90% of ALDW		
Unemployed is not disabled						
The first 12 months of unemployment	60% of ALDW	€ 24.07	€ 35.30	90% of ALDW	€ 24.07	€ 65.73
After the first 12 months of unemployment	45% of ALDW	€ 24.07	€ 26.48	90% of ALDW	€ 24.07	€ 65.73
Cohabitating unemployed						
Unemployed is disabled	50% of ALDW			90% of ALDW		
Unemployed is not disabled						
The first 12 months of unemployment	55% of ALDW	€ 17.70	€ 32.35	90% of ALDW	€ 17.70	€ 65.73
from the 13th until the 15th month[b]	35% of ALDW	€ 17.70	€ 20.58	90% of ALDW	€ 17.70	€ 65.73
after 15th months						
the employee has worked for more than 20 years as a wage earner	35% of ALDW			90% of ALDW		
the employee is permanently disabled for at least 33% of his earning capacity	35% of ALDW			90% of ALDW		
All other cases						
Not cohabitating with a partner with low unemployment benefits	€ 13.21 per day			€ 13,21 per day		
Cohabitating with a partner with low unemployment benefits only	€ 13.21+€ 4.41 per day			€ 13.21+€ 4.41 per day		

[a] The abbreviation ADLW refers to the average of the lost but limited daily wages.
[b] This period is increased by 3 months for every additional year that the employee has worked as a wage-earner.

4.2.3 simulation of proposed alternatives

As mentioned above, for the proposed alternatives we seek inspiration in practices in other countries, more specifically the Scandinavian model. It is however important to stress in this context that the Scandinavian model differs in other aspects from the Belgian situation: Scandinavian countries have a well-established system of supporting the unemployed in their

search for a new job. This intensive support cannot be taken up in the simulation, but it is important to keep this difference in mind when interpreting the results.

Our simulation of an alternative for the current legislation on unemployment benefits is partly inspired on the Danish system (OECD, 2004a), which provides for high but in time restricted unemployment benefits. In particular we take the level of replacement rate and maximum amounts of benefits and wages from the Danish system. We then combine this to a restriction of duration suggested by Van Eetvelt, who was mentioned in the context introduction. He suggests limiting the duration of benefit entitlement to 6 months, with a possibility to extend those 6 months with 1 month per year worked. Unemployed workers who are no longer entitled to benefits after the restricted period then fall back on social assistance.

We now briefly describe how we have simulated a Danish-like unemployment benefit system in the Belgian context, and also indicate on which assumptions we had to rely in order to execute the simulation.

INCREASE BENEFITS IN THE BEGINNING OF THE UNEMPLOYMENT PERIOD

In Denmark replacement rates amount to 90% of previous earnings for everybody (irrespective of family situation). There is however an exception to this: for school leavers the unemployment benefit is 82% of the maximum unemployment benefit. Persons older than 60 do not receive an unemployment benefit but an early retirement benefit; we take this regulation as being the corresponding system for what is provided for our group of older unemployed workers, namely those aged 50 or more and we do not make any changes to the current Belgian unemployment legislation for this group. The maximum unemployment benefit in Denmark is substantially higher than in Belgium: 12 740 DKR per month (around €1 709.08). We replace the Belgian maximum amounts for all family types with this maximum Danish amount; we convert this monthly amount to daily amounts in the source code of MIMOSIS (e.g. €65.73 for a head of household instead of €35.3; see last three columns of Table 4-11). Because the daily benefits are a percentage of the average lost but limited wages we also have to adapt the level of limit that is used. The threshold is set to €73.03 (Danish-like situation) instead of €58.82 (current Belgian situation).

For school leavers we adapt the amounts in the source code as follows: their unemployment benefit will amount to €1 401.45 per month (82% of €1 729.08). This means that their benefit will amount to €53.90 per day.

ASSUMPTIONS

In the Danish-like system we want to restrict the period of benefit entitlement to 6 months, with the possibility to extend this restricted period with one month per year worked. When unemployment entitlements are exhausted, people fall back on social assistance. Currently, the information on the number of years worked as an employee is available in the PENSWELF module (see Section 0 of this report) but there is no exchange of the information to the UNEM module (see Section 2.2.3). This means that we cannot simulate this extension of duration in function of years

worked. We remedy this by using various thresholds of restriction of duration. We limit the duration for everybody to e.g. 6 months, 1 year, 15 months, 18 months and 2 years.

We also make some other assumptions:

- we assume that the second period of cohabiting unemployed is always 3 months. This assumption is necessary, because we do not have information on the time period the unemployed has worked as an employee.
- each cohabiting unemployed that is more than 15 months unemployed receives a lump sum benefit. This assumption is necessary, because we do not know whether the unemployed has worked more than 20 years as an employee; nor can the degree of permanent work incapacity be determined.

4.2.4 simulation results

The results we present here are on the one hand figures for the entire population, and on the other hand results for the group of unemployed workers itself.

BUDGETARY IMPLICATIONS

With respect to budgetary effects following from the reform, we present the two main changes that take place, namely on the one hand the change in RVA unemployment benefits, and on the other hand the change in social assistance ("guaranteed minimum") following from the fact that as unemployment benefit entitlements are exhausted, more individuals will receive allowances from the social safety net. The reform also affects personal income taxes and RKW family allowances[44].

When we look at the effects of using various thresholds of restriction of duration and of increased benefits during the restricted unemployment period, we find in Table 4-12 that for a restriction of 6 months the budget spent on unemployment benefits is reduced by more than 30% (or €1.36 million). Consequently, the budget spent on social assistance is raised by 38.0% (or €1.05 million). When the duration of unemployment benefits is restricted to 24 months, the budget spent on unemployment benefits is raised by 1.42%.

[44] For the scenario in which benefits are restricted to 6 months, we find e.g. an increase in personal income taxes of €0.060 billion euro and in RKW family allowances of €0.048 billion euro.

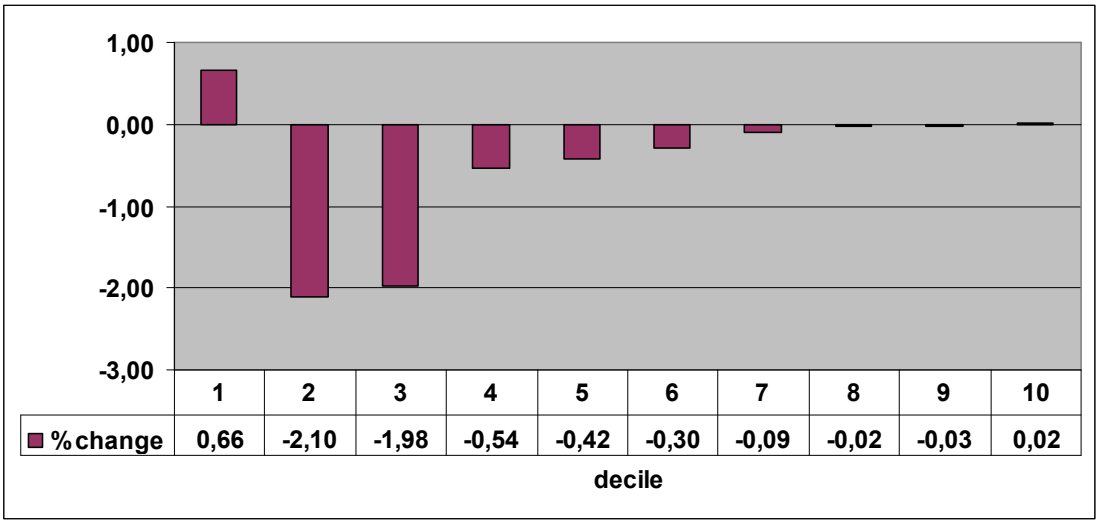
TABLE 4-12 EFFECT OF THE REFORM IN TERMS OF GLOBAL BUDGET FIGURES (CHANGE IN BILLION EURO AND AS % OF PRE REFORM)

	Baseline (billion €)	Budgetary change in billion euro (%)				
		6 months	12 months	15 months	18 months	24 months
Unemployment Benefits	4.51	-1.36 (-30.17%)	-0.62 (-13.66%)	-0.40 (-8.86%)	-0.24 (-5.30%)	0.64 (1.42%)
Social assistance	2.75	1.05 (38.0%)	0.89 (32.3%)	0.84 (30.7%)	0.80 (29.0%)	0.72 (26.1%)

EFFECTS ON DISPOSABLE INCOME[45]

When the duration of unemployment benefits is restricted to 6 months (which is the reform that yields the strongest effects), we see in Figure 4-1 that the most important changes in disposable income occur for the lower deciles. Disposable income in decile 2 and decile 3 is reduced by more than 2% and almost 2% respectively.

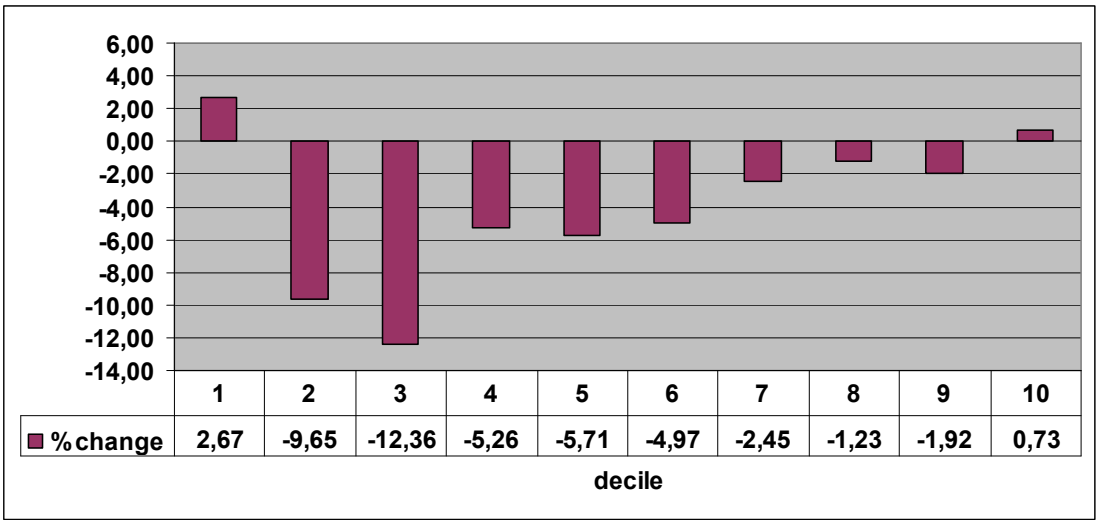
FIGURE 4-1 CHANGE IN DISPOSABLE INCOME OF ENTIRE POPULATION AFTER SOCIAL TRANSFERS PER INCOME DECILE (DURATION RESTRICTION TO 6 MONTHS)



When we look at the results for the group of unemployed workers itself, we find in Figure 4-2 that again the most important changes in disposable income occur for the lower deciles. Disposable income in decile 2 and decile 3 is reduced by almost 10% and more than 12% respectively.

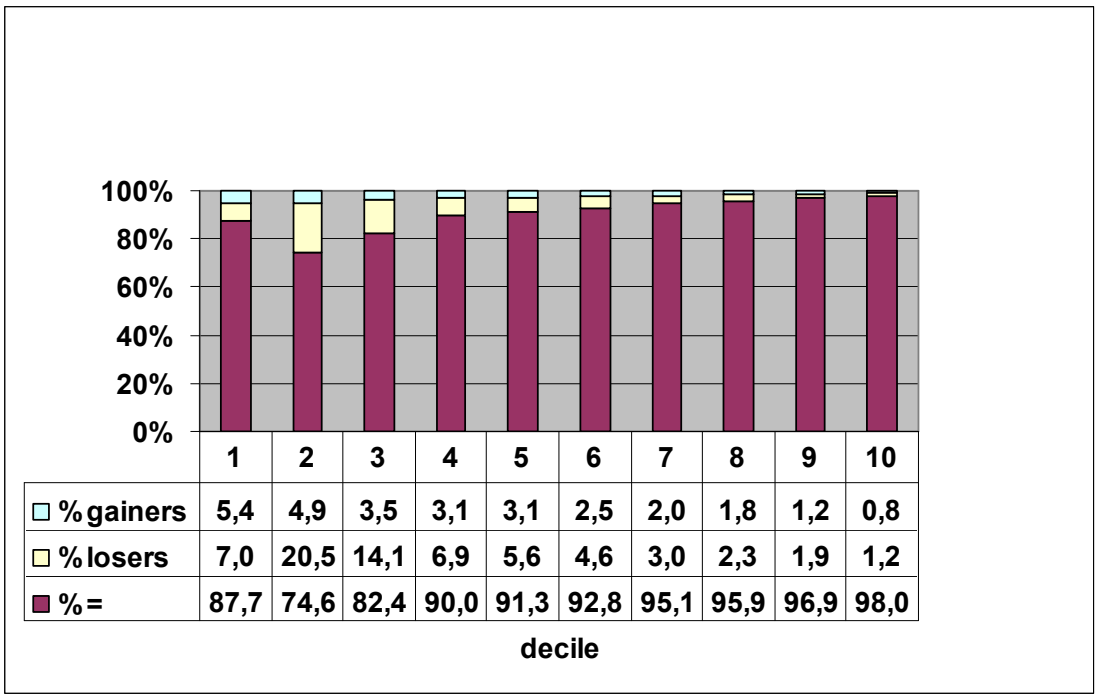
[45] The disposable income is obtained by summing up all incomes of all individuals in a household and by subtracting the personal income taxes paid by all members of that same household. We then divide this disposable income by an equivalence scale. The equivalence scale is 1 for the first member of the household, 0.5 for the second member and 0.3 for children. The result of that calculation is then attributed to each household member.

FIGURE 4-2 CHANGE IN DISPOSABLE INCOME OF UNEMPLOYED AFTER SOCIAL TRANSFERS PER INCOME DECILE (DURATION RESTRICTED TO 6 MONTHS)



Of all individuals, 6.7% loose from the reform and 2.8% of the population gains; 90.5% is not affected by the reform. Overall, 9.5% of all individuals are affected by the proposed alternative, either by a direct change in disposable income or indirectly through the change in disposable income of another member of the household. Changes mainly take place in the lower end of the income distribution, which is also illustrated by the prevalence of gainers and losers of the reform: we find the highest percentage of both losers and gainers among the lower deciles (Figure 4-3). On the one hand, 20.5% of the second decile and 14.1% of the third decile are losers of the reform, whereas on the other hand 5.4% in the first decile, 4.9% in the second decile and 3.5% in the third decile are gainers.

FIGURE 4-3 GAINERS AND LOSERS OF DURATION RESTRICTION TO 6 MONTHS PER INCOME DECILE

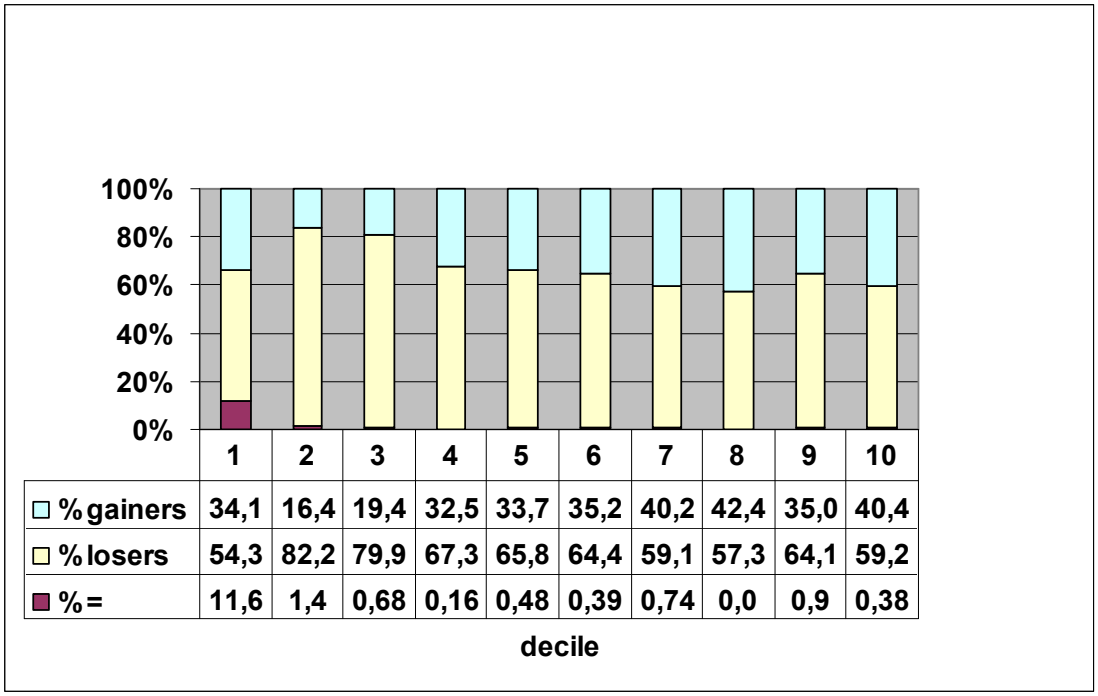


	1	2	3	4	5	6	7	8	9	10
% gainers	5,4	4,9	3,5	3,1	3,1	2,5	2,0	1,8	1,2	0,8
% losers	7,0	20,5	14,1	6,9	5,6	4,6	3,0	2,3	1,9	1,2
% =	87,7	74,6	82,4	90,0	91,3	92,8	95,1	95,9	96,9	98,0

decile

When we look at gainers and losers of the reform for the group of unemployed workers itself, we find the highest percentage of losers among the lower deciles (Figure 2bis): 82.2% of individuals in the second decile and 79.9% of individuals in the third decile see their incomes decrease as a consequence of the reform. Among the higher deciles we find the highest percentage of gainers: 40.2% of individuals in the seventh decile, 42.4% of individuals in the eighth decile and 40.4% of individuals in the tenth decile experience income increases.

FIGURE 4-4 GAINERS AND LOSERS PER INCOME DECILE AMONG THE UNEMPLOYED OF A DURATION RESTRICTION TO 6 MONTHS

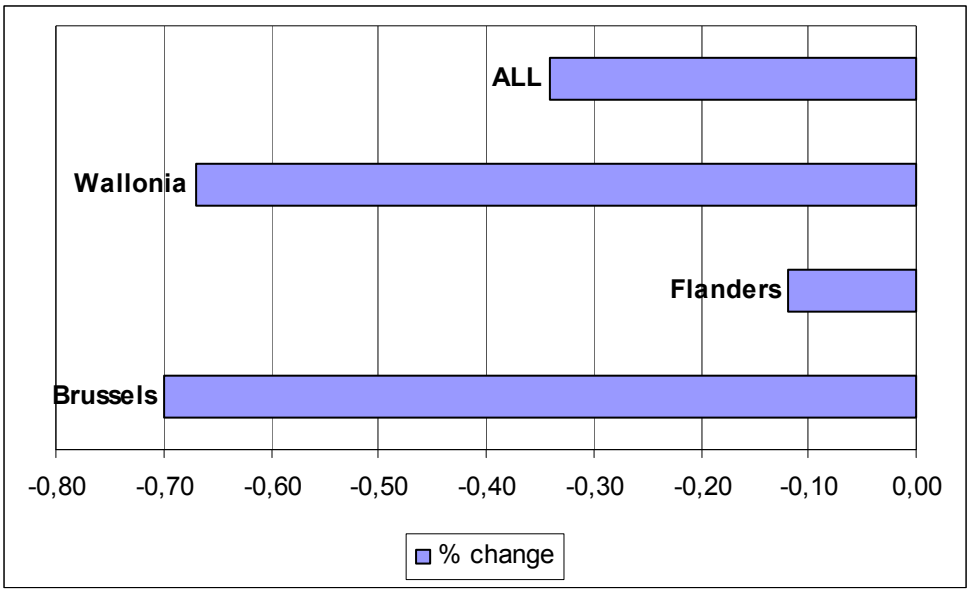


	1	2	3	4	5	6	7	8	9	10
% gainers	34,1	16,4	19,4	32,5	33,7	35,2	40,2	42,4	35,0	40,4
% losers	54,3	82,2	79,9	67,3	65,8	64,4	59,1	57,3	64,1	59,2
% =	11,6	1,4	0,68	0,16	0,48	0,39	0,74	0,0	0,9	0,38

decile

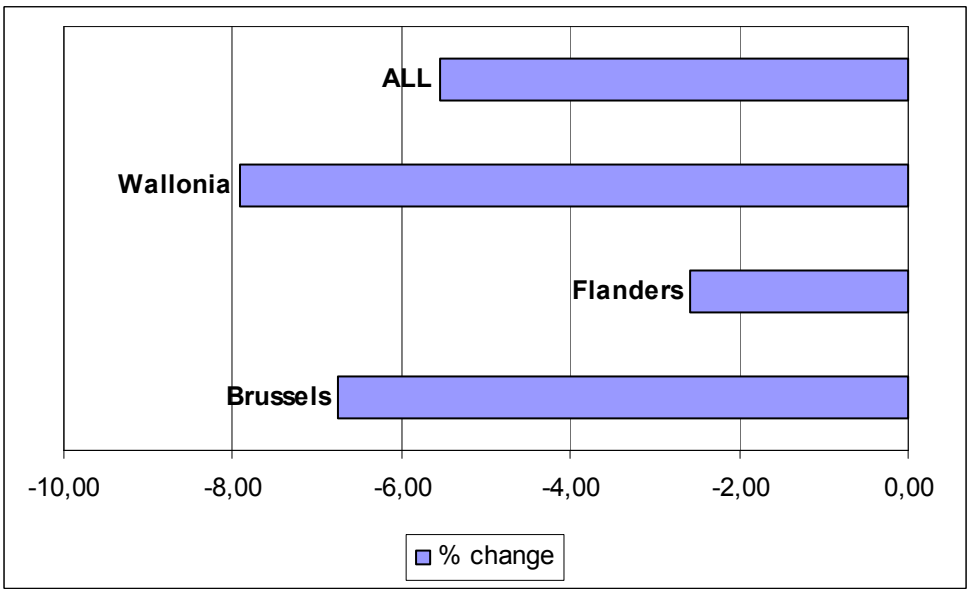
The reform has a different effect in the various regions, which is closely linked to regional differences in incidence of unemployment benefits. When looking at the change in disposable income after reform by region (Figure 4-5), we find that Wallonia (-0.67%) and Brussels (-0.70%) have the highest change. The change in disposable income in Flanders is the lowest (-0.12%).

FIGURE 4-5 CHANGE IN DISPOSABLE INCOME BY REGION (DURATION RESTRICTED TO 6 MONTHS)



When we look at the change in disposable income after reform by region for the group of unemployed workers itself (Figure 4-6), we also find that Wallonia (-7.91%) and Brussels (-6.75%) have the highest change and that the change in disposable income in Flanders is the lowest (-2.58%).

FIGURE 4-6 CHANGE IN DISPOSABLE INCOME OF THE UNEMPLOYED BY REGION (DURATION RESTRICTED TO 6 MONTHS)



EFFECTS ON INEQUALITY AND POVERTY

Overall, inequality as measured by the Gini increases with 1.7% due to the reform for the scenario of restriction to 6 months (see Table 4-13). Inequality decreases when the duration of benefits is extended. The effect on poverty is measured by the head count and by the normalized poverty gap (FGT2), using 60% of median income as poverty line. Poverty increases with about 9.3% in the strictest scenario (6 months). The FGT2-measure, which attributes more weight to the bottom of the income distribution, shows an increase of even 19.4% in the normalized poverty gap due to the reform. For both poverty measures, the increase is smaller when benefit duration is extended.

TABLE 4-13 EFFECT OF THE REFORM ON INCOME INEQUALITY (GINI) AND POVERTY (HEAD COUNT AND FGT2) (INDICES PLUS % CHANGE)

		Index (% change in index)				
	baseline	6 months	12 months	15 months	18 months	24 months
Gini	22.7	23.1	22.9	22.9	22.8	22.7
		(1.7%)	(0.9%)	(0.7%)	(0.5%)	(0.0%)
Poverty rate (head count)	14.0	15.3	14.8	14.6	14.5	14.2
		(9.3%)	(5.6%)	(4.5%)	(3.5%)	(1.7%)
FGT2	0.7	0.8	0.8	0.8	0.8	0.7
		(19.4%)	(14.1%)	(12.3%)	(11.1%)	(8.2%)

When we look at the inequality measure and poverty measures for the group of unemployed workers itself (see Table 4-14), we find that inequality is higher for a restriction of 12 months or 15 months than for a restriction of 6 months. For a benefit duration of 18 months or 24 months inequality decreases in comparison to a benefit duration of 6 months. Inequality for all benefit duration is higher than inequality in the baseline situation. Poverty measures are much higher for all benefit durations in comparison to poverty measures in the baseline situation. For both poverty measures, the increase is smaller when benefit duration is extended.

TABLE 4-14 EFFECT OF THE REFORM ON INCOME INEQUALITY (GINI) AND POVERTY (HEAD COUNT AND FGT2) (INDICES PLUS % CHANGE) FOR THE UNEMPLOYED

		Index (% change in index)				
	baseline	6 months	12 months	15 months	18 months	24 months
Gini	19.0	24.0	24.2	24.1	23.8	23.2
		(26.3%)	(27.4%)	(26.8%)	(25.3%)	(22.1%)
Poverty rate	24.0	42.8	36.9	35.1	33.3	30.2
(head count)		(78.3%)	(53.8%)	(46.2%)	(38.8%)	(25.8%)
FGT2	0.5	2.7	2.2	2.0	1.9	1.5
		(440.0%)	(340.0%)	(300.0%)	(280.0%)	(200.0%)

Table 4-15 presents the effect on poverty for the three regions. Not surprisingly, the regions Brussels and Wallonia have the highest increase in poverty. For Brussels poverty is increased from 25.2% to 27.6% after the reform. For Wallonia poverty is increased from 15.8% to 18.0%. The raise in poverty in Flanders is rather limited, from 11.2% to 11.8%.

TABLE 4-15 EFFECT ON POVERTY (POVERTY LINE: 60% OF MEDIAN INCOME), REGIONAL DIFFERENCES

	Baseline	Post reform	Difference
Brussels	25.2	27.6	2.4
Flanders	11.2	11.8	0.6
Wallonia	15.8	18.0	2.2
All	14.0	15.3	1.3

When we look at Table 4-16 showing the effect on poverty by region for the group of unemployed only we come to the same conclusions as for Table 4-15: the regions Brussels and Wallonia have the highest increase in poverty. The raise in poverty in Flanders is less high than in the other regions, but none the less it is a substantial raise.

TABLE 4-16 EFFECT ON POVERTY FOR THE UNEMPLOYED (POVERTY LINE: 60% OF MEDIAN INCOME), REGIONAL DIFFERENCES

	Baseline	Post reform	Difference
Brussels	31.7	52.4	20.7
Flanders	19.1	32.3	13.2
Wallonia	25.7	48.1	22.4
All	24.0	42.8	18.8

4.2.5 conclusion

The Belgian labour market faces different challenges: one of those challenges is to tackle the high unemployment rates, especially for long-term unemployment. In recent years the idea of restricting the duration of entitlement to unemployment benefits has been put forward as a solution for the high unemployment rates. In this respect one often refers to practices in other

countries, and more specifically to the Scandinavian model that combines higher benefits with a limited duration.

In this application we examined the consequences of a reform of the current Belgian unemployment system to a Scandinavian-like system, more in particular a Danish-like system. We increased the unemployment benefits for unemployed workers after studies or after employment considerably and restricted their duration of benefit entitlement to 6 months, 12 months, 15 months, 18 months and 24 months respectively. We used MIMOSIS to simulate the reform and to estimate the impact of the reform on (1) the budget unemployment benefits and the budget social assistance, (2) the disposable income (%-change, gainers and losers, regional differences) and (3) inequality and poverty. When we look at the budgetary implications we find that a restriction to 6 months has the strongest effects. The budget spent on unemployment benefits is reduced by more than 30% and the budget spent on social assistance is raised by 38.0%. In relation to the changes in disposable income the restriction to 6 months again has the strongest effects. The most important changes in disposable income occur for the lower deciles (same results for the entire population as for the group of unemployed workers separately). Also, we find the highest percentages of both losers and gainers of the reform among those lower deciles (results for the entire population). The results for the group of unemployed itself show the highest percentage of losers among the lower deciles, and the highest percentage of gainers of the reform among the higher deciles. When looking at the regional differences we find that Wallonia and Brussels have the highest changes in disposable income, the change in Flanders is the lowest (same results for the entire population as for the group of unemployed workers itself). Concerning the effect on inequality and poverty we find that the inequality and poverty are the highest for the scenario with a restriction to 6 months. Inequality and poverty decrease again when the duration of entitlement to benefits is extended (results for the entire population). Among the unemployed inequality for a benefit duration of 12 months and 15 months is higher than for a benefit duration of 6 months. But here also poverty decreases when the duration of entitlement to benefits is extended.

Poverty and inequality rise when benefit duration is restricted and only social assistance is offered in exchange (same results for the entire population and for the group of unemployed workers itself). Even the defenders of restricted benefit duration cannot defend these consequences of the proposed reform. Without a system of supporting unemployed workers in their search for a new job, the proposed reform has too much downside for the unemployed workers involved and is thus not defensible as it stands.

4.3 PENSION WELFARE ADAPTATIONS

Social Security pension benefits in Belgium are automatically adapted on the basis of the evolution of the consumer price index (CPI) but do not automatically adjust to productivity improvements in the economy. As a consequence, a welfare gap appears systematically between the active and inactive populations and tends to increase, particularly in the case of older pensioners. This is the reason why periodically, not systematically, Pension Welfare Adaptation (PWA) reforms are introduced in order to reduce this gap. What is the redistributive impact of

these reforms among the elderly? How must they be designed to have a higher impact? These are the type of questions we try to answer in this application.

For this purpose, we use the information and the program modules of MIMOSIS – as described in section 2.2 of this report – to simulate the redistributive impact of alternative PWA reforms. The main advantage of the MIMOSIS framework is that it takes into consideration the income of all the household members and allows the evaluation of the distributive impact of reforms in terms of standardized individual after-tax incomes.

Simulations are performed based either on a PWA reform carried on in the past by the Belgian authorities, or on hypothetical reforms. For this purpose, MIMOSIS allows us to parameterise alternative reforms taking into account characteristics of pensioners and of pension benefits. The results show that the redistributive impact of these reforms is greater among elderly people in the first deciles of the income distribution but that this effect is quite sensitive to the poverty definition in use.

In the first section we explain why PWA reforms are needed to maintain living standards of elderly people. We then give a survey of PWA reforms introduced over the last decades in order to identify the alternative ways adopted by the Belgian Social Security to compensate for pensioners' welfare losses over time. Thirdly, we present the main features of the simulation reforms analyzed, including the PWA reform introduced by the Belgian government in January 2002. In a fourth section we present the baseline situation, which is the income distribution pattern among the elderly population in 2001 as reported by MIMOSIS, and the main results of simulations highlighting the impact of reforms in terms of poverty rates incidence among the low deciles of the income distribution. The last section presents the conclusion of this application.

4.3.1 need for welfare adaptation of pensions

For illustration purposes, we present in Figure 4-7 the results of a long term Social Security simulation carried out by the Federal Planning Bureau (Fasquelle, 2007) using the MALTESE model.[46] Figure 4-7 represents the evolution of average annual retirement pensions and wages among wage-earners as projected up to 2050.

According to this simulation, the wage and income from professional activities are expected to increase until 2050 at an average annual rate of 2.5% following the growth of productivity in the economy. Pension benefits however are assumed to be adapted at an average annual rate of only 1.25 % through PWA reforms. These two main hypotheses, based on historical trends, are the main drivers of the increasing gap observed in Figure 4-7 between wages and pension benefits.[47]

[46] For a presentation of MALTESE, see Fasquelle and Weemaes (1997)

[47] Note that this long-term simulation takes into account the PWA reform introduced by the Intergeneration Pact introduced by the Belgian government in 2005.

FIGURE 4-7 EVOLUTION OF WAGE EARNER RETIREMENT PENSIONS AND WAGES UNTIL 2050

Source: Festjens (2007)

However, two other (complementary) explanations for the expected relative evolution of pensions with respect to labour incomes have been proposed (Festjens, 1997, Fasquelle and Weemaes, 1997). On the one hand, there is the impact of a recent social evolution: the increasing number of households in which both partners are eligible for individual pension benefits. Therefore, benefits are computed as for two isolated individuals, which is more advantageous for the household as a whole.[48] But, under the assumption of a fixed budget for pensions, this implies a smaller average individual pension benefit, and therefore also a lower replacement rate.

On the other hand, there is already a welfare adaptation matter, though it is not the one treated here. Under the Belgian Social Security pension schemes, the computation of pension benefits is based on wages earned during the whole active life up to a ceiling of remuneration that varies yearly and is adapted periodically. A slow adaptation of these ceilings with respect to productivity growth and wage increases in the whole economy implies a systematic depreciation of pension benefits over time.

Coming back to the main factor driving the welfare gap between pension benefits and wages (see Figure 4-7), it can be illustrated by looking at the relation between benefits for those who recently retired and those who retired long time ago.

[48] Under the Belgian Social Security pension schemes, couples of pensioners have the choice between receiving individual benefits or to opt for a household pension that includes a 25% partner supplement. Most women retiring today have longer professional careers then their predecessors and often find it more financially advantageous to opt for individual pension benefits.

Given the fact that productivity tends to grow faster than pension benefits, new pensioners receive higher benefits than old pensioners. Indeed, the wages on the basis of which these pension allowances are computed, benefited from a higher rise than pensions that old pensioners were already receiving. The following formula illustrates this fact (Festjens, 1997). The benefits of old pensioners are computed as a function of new pensioners' benefits:

$$B(a,t) = \frac{B(0,t)\prod_{i=0}^{a-1}(1+c_{t-i})}{\prod_{i=0}^{a-1}(1+m_{t-i})},$$

where $B(0,t)$ is the average pension of new retirees in year t; $B(a,t)$ is the average pension in year t of individuals that retired in year a; $1+c_{t-i}$ is the increase in pension due to the welfare adaptation; and $1+m_{t-i}$ is the increase in benefits for new pensioners driven by recent productivity growth and wage improvements, not shared by old retirees.

As long as $m > c$, the gap between recent and old pensioners' benefits increases as $t-a$ increases. Thus, the oldest pensioners would be those for which a PWA reform will be the most needed in order to keep up with wage and new pension benefit increases, both stemming from a rise in productivity.

4.3.2 pension welfare adaptations in past decades

Three main pension schemes, i.e. wage earners, self-employed and guaranteed income coexist under the Belgian Social Security legislation, together with a civil servants' scheme that depends directly on the general national budget. Pensions paid under the civil servants' scheme are automatically protected from relative welfare losses through to an adaptation mechanism that adjusts pensions simultaneously with wage changes intervened at the level of the last employment position occupied by the pensioner.

Social Security pensions are adapted automatically, as are other public replacement income transfers, to changes in inflation (CPI evolution), but not to the evolution of wage earners' income in real terms driven by general productivity improvements in the economy. These adaptations have been applied on a rather discretionary way over the last decades.

More precisely, the welfare adaptation in the pension scheme can take two directions. It can be done through a revaluation of all pensions received in the wage earner and self-employed scheme, or through a revaluation of all minimum pensions and guaranteed income. The adaptation can be lump-sum or as a percentage increase. It usually concerns older pensioners, i.e. those that started receiving their public pension at least 8 to 10 years ago, which is the point at which the gap between new and old pensioners becomes larger.

This revaluation started in the late sixties (Festjens, 1997). In these golden years, wages were increasing very fast and pensioners were left out of this welfare improvement. A first discretionary adjustment was done in 1969, followed by three others in the beginning of the seventies. In 1973, a law ("Namèche Law") set up a welfare adaptation mechanism for pensions, as well as for

remunerations on which pensions were computed. However, in the late seventies and in the eighties, as the economic situation became more precarious, no adaptation of older pensions took place. The only adjustment made was for minimum pensions and guaranteed income for the elderly in the late eighties.

Two new PWA reforms were introduced successively in 1990 and 1991 and a new step was taken in 1996, allowing for a discretionary way to adapt pensions. From 1999 this discretionary rule was applied every two years. The main feature of these PWA reforms is that they concerned mainly pensioner benefits whose payment started at least 8 years before.

Finally, in 2005 the Belgian authorities decided to take a new step and to set up, as part of the Generation Pact, a mechanism to adapt all social allowances to the evolution of welfare. A decision must be made every two years, under the form of an agreement between social partners and the government, about the allowed amount for adapting social transfers, including pensions, so as to share with their beneficiaries general productivity improvements in the economy. This new system is limited to self-employed and wage earner schemes only.

4.3.3 description of the simulations carried out

We conducted four simulations of welfare adaptations of older pensions in the two main Social Security schemes: wage-earners and self-employed. Simulation A is very close to the PWA reform introduced in January 2002, while simulations B, C and D correspond to hypothetical reforms calibrated to have a similar cost, around 590.0 Million €, but different rules of applications:

A. THE 2002 PENSION WELFARE ADAPTATION (PWA) REFORM

In this scenario all observed retirement and survival pensions are increased in a relative way if the first payment of the benefit dates back more than 9 years in 2001. More specifically, if the first payment of this benefit was obtained before the beginning of 1993, benefits were increased by 1%. This simulation resembles a reform implemented by the Belgian government on January 2002.

B. LUMP SUM INCREASE

The second simulation computes decreasing welfare adaptations, in order to have a greater impact both in the revaluation of pensions and on the redistribution of income. All observed retirement and survival pensions in the wage earners and self-employed schemes are increased by a fixed amount: 40.0 € for individual pensions and 50.0 € for household pensions.[49] The only exceptions are pension benefits that are no higher than a fixed threshold, corresponding to the legal minimum pension for complete careers. Pensioners in this category receive a proportional

[49] Pensions are computed on the base of the whole career revenues, either at the individual level, applying a 60% replacement rate, or at the household level, applying a 75% replacement rate. The difference between them is allowed to pensioners whose partner is out of work and does not benefit from social transfers.

increase of 5.18%. This way, those who have less than the minimum pension, would receive proportionally more than those whose pension is higher than the minimum.[50]

C. PROPORTIONAL INCREASE

As in simulation B, but all pensions are increased proportionally by 4.36% corresponding to an equivalent budgetary cost.

D. PROPORTIONAL INCREASE FOR PENSIONS STARTED BEFORE 1994

As in simulation C, but only pension benefits received for the first time before 1994 are increased by 7.30%. On the one hand, the budgetary cost of this reform is equivalent to simulations B and C and, on the other hand, the targeted population is the same as in simulation A, that corresponding to the real PWA reform of January 2002.

Table 4-17 summarizes the characteristics of the PWA reform simulations. In the same table, the last two columns correspond to the cost of these reforms, as percentage budget increases, for the wage-earners and self-employed schemes, respectively. The baseline pension budgets, computed with MIMOSIS for registered paid pensions reported in administrative files, amount to 13 221 Million € for the wage-earners and 1 708 Million € for the self-employment schemes. As expected, the budgetary cost of the January 2002 reform (A) is lower than 1% and that of the other simulations, calibrated to have very similar budgetary costs, an increase around 4% in total transfers to pensioners.

TABLE 4-17 CRITERIA OF THE SIMULATED PWA REFORMS

				Budget increase by scheme	
Simulation	Description	Increase in pension benefits	Year of retirement	Wage-earners	Self-employed
A	2002 PWA Reform	1%	≤1993	0.52%	0.57%
B	Lump sum increase	40 € for individual pensions above the minimum; 50 € for household pensions above the minimum; 5.18% otherwise.	All	3.78%	4.79%
C	Proportional increase	4.36%	All	3.89%	4.04%
D	Proportional increase, pensions started ≤ 1993	7.4 %	≤1993	3.83%	4.23%

4.3.4 simulation results

We are mainly interested in the distributional impact of PWA reforms among the elderly. For this purpose we compare the MIMOSIS baseline income distribution with the results obtained applying simulations A to D. This comparative analysis is based on the computation of

[50] Those who have exactly the minimum pension will also be granted 5.18 % as it is equivalent for these

equivalized disposable income for each individual in the population by using the OECD equivalence scale (1.0 for the first person in the household; 0.5 for other individuals aged 14 or more, and 0.3 for children).

Table 4-18 presents the effects of the reforms on the average individual equivalized disposable income among the elderly in each decile of the income distribution. First, we observe that the elderly are mainly concentrated in the 4th and 5th deciles of the income distribution but that, nevertheless, more than 20% of them belong to the 1st and 2nd deciles. Second, the impact of reforms, in percentage variation of income, appears to be higher for the deciles 2 and 3. Third, the weak impact of PWA reforms on the 1st income decile can be explained by the fact that older individuals in this category are mainly beneficiaries of guaranteed income and social assistance transfers not considered in PWA reforms simulated here. Finally, individuals in the highest deciles of the income distribution are mainly those who are still in activity, or living in households where other members are in activity, so PWA reforms have a rather small impact on their income situation.

Simulations B, C and D were calibrated to have the same budgetary cost. As expected, their distributive impact varies form one to the other but differences are not very important at this level of aggregation. However, it appears that under scenario B – a lump sum transfer – elderly in the first three deciles of the distribution benefit both proportionally and on average, of a higher income increase than under scenarios C and D. On the other side, simulations C and D give results that are very close to each other for most deciles of the distribution, however it appears that simulation D benefits more elderly in the 2nd and 3rd deciles while PWA reform C would benefit more the 5th to 8th deciles of the distribution.

pensions as receiving a lump-sum adaptation of 50 euros.

TABLE 4-18 PWA REFORMS EFFECT ON EQUIVALIZED DISPOSABLE INCOME BY DECILES, AMONG THE ELDERLY (60 AND +)

Deciles	Percentage in elderly population	Baseline income (€/month)	Reform simulations (% change in income)			
			A	B	C	D
1	9.2	504.1	0.13	1.33	1.10	1.07
2	12.1	611.7	0.32	2.68	2.27	2.43
3	12.1	763.3	0.38	2.92	2.67	2.71
4	18.2	874.1	0.27	1.66	1.68	1.71
5	14.4	964.2	0.22	1.61	1.69	1.63
6	10.8	1076.8	0.21	1.46	1.56	1.47
7	7.5	1196.9	0.10	0.77	0.78	0.69
8	6.3	1347.6	0.11	0.78	0.81	0.75
9	4.8	1535.7	0.06	0.39	0.41	0.40
10	4.5	2059.4	0.03	0.21	0.22	0.19
ALL	100.0	969.2	0.19	1.41	1.38	1.36

These results are however very general and do not allow us to identify significant changes in the income distribution. For this purpose, we look at the impact of PWA reforms on poverty rates computed on the basis of equivalized median income thresholds.[51]

In Table 4-19 several age categories are distinguished and for each of them poverty rates at the 50% threshold are reported. Baseline computations show that poverty rates vary dramatically across age groups. Unexpectedly, poverty incidence is higher for younger categories, 7.4% among the 60 to 64 years old, and lower than 2% among the very old (85 and more).[52]

There are some potential explanations for this situation, but probably the most plausible is that single pensioners, an increasing number of widows and widowers at higher ages, benefit from a more favourable treatment than do couples in the Belgian Social Security pension schemes. As an illustration, note that a pension supplement of 25% is allowed to pensioners whose partner is fiscally dependent (has no other income coming from a public transfers or from a professional activity). This supplement is lower than the commonly used 50% (theoretical) budget increase to keep an equivalent standard of living for every additional adult person in the household. Such is the case, for instance, in the OECD equivalence scale used here for the computation of standardized income and, as a consequence, for the computation of poverty rates.

In Table 4-19 are also reported the poverty rates corresponding to alternative simulations. As expected, changes are smaller for simulation A that, as indicated in Section 4.3.3, increased by 1% all pension benefits received for the first time at the latest in 1993. In this simulation, as in the case of simulation D, poverty rates diminish proportionally more for categories between the ages of 70

[51] The individual standardized median income was equal to 1 019.4 € by month in 2001, as reported by MIMOSIS. The corresponding 40%, 50% and 60% thresholds were 407.8 €, 509.7 € and 611.6 €, respectively.

[52] Note that the PWA reforms also have an indirect impact on younger people's living conditions (not reported here). This could happen in households in which pensioners cohabit with children and, in some cases, with grand-children.

to 85 years old. But it is under simulations B and C that the impact of PWA reforms appears as the most effective, especially for the categories between 65 and 74 years old. For these categories a decrease of near 1% point is estimated.

TABLE 4-19 PWA REFORM EFFECTS ON POVERTY RATES (50% THRESHOLD) BY AGE, AMONG THE ELDERLY (60 AND +)

Age categories	Percentage in elderly population	Baseline poverty rate	Reform simulations (poverty rates)			
			A	B	C	D
60-64	22.3	7.4	7.4	7.1	7.2	7.3
65-69	21.9	7.4	7.3	6.5	6.5	7.1
70-74	20.9	6.4	6.2	5.1	5.1	5.8
75-79	17.2	4.3	4.1	3.5	3.7	3.4
80-84	9.5	2.7	2.6	2.3	2.4	2.3
85-89	5.5	1.6	1.6	1.4	1.5	1.4
90-94	2.2	0.7	0.7	0.7	0.7	0.5
95 and +	0.5	1.1	1.1	1.1	1.1	1.1
ALL	100.0	5.7	5.6	5.0	5.1	5.3

The next results concentrate exclusively on the bottom two deciles of the income distribution. It is within these categories that PWA reforms are expected to have a more significant effect on poverty. The total population in these categories in 2001 and based on computations with MIMOSIS, was close to 485 000 individuals representing 21.2% among the elderly and distributed as follows: 42% the 1st decile and 58% in the 2nd decile.

Table 4-20 presents a sensitivity analysis using alternative poverty rate definitions for these two deciles of the income distribution. We also distinguish among the elderly two age categories, 60 to 74 years old and 75 years old and more. We selected the 40%, 50% and 60% of equivalized median income thresholds for this analysis.

Table 4-20 summarizes the results and shows that those correspond in some cases to what was expected. On the one hand, all individuals that belong to the 1st decile of the distribution are poor according to the 60% poverty threshold and, on the other hand, the poverty rates among the individuals in the 2nd decile of the distribution are equal to zero. These results simply indicate that the income threshold separating the 1st and the 2nd deciles lies above the 40% and 50% poverty thresholds but below the 60% threshold.

Nevertheless, Table 4-20 contains interesting information on the impact of alternative PWA reforms on the target population. First of all, it appears that for the very poor, below the 40% threshold, the B, C and D reforms have a moderate impact, from 2.8% to 2.3%, among the 75 years old and more. Second, these reforms have also a significant effect, e.g. from 47.0% to 38.2% under reform D for the same age category, using the 50% poverty threshold. Third, a comparable effect is observed using the same poverty definition, but only for simulations B and C, among the 60 to 74 years old. Finally, paying attention to the impact of reforms using the higher 60% threshold poverty definition, it appears that for the 60 to 74 years old category simulations B and C

performed better than reform D. For the "75 and +" category it is reform D that has the higher potential impact, with a powerful reduction of poverty from 57.2% to 38.8%.

Summing up, a trade-off appears between, on the one hand, reforms B and C that are more effective fighting poverty among younger pensioners' households in the 1st decile of the income distribution and, on the other hand, reform D that appears as potentially more favourable for older pensioners, i.e. 75 years old and more, in the 2nd decile of the income distribution.

TABLE 4-20 PWA REFORMS AND POVERTY RATES (%) SENSITIVITY AMONG THE AGED POPULATION

Income deciles	Poverty rate threshold	Baseline	Reform simulations			
			A	B	C	D
60-74 years old						
1	40%	3.3	3.3	3.2	3.1	3.3
	50%	67.1	66.0	59.2	59.1	64.2
	60%	100.0	100.0	100.0	100.0	100.0
2	40%	0.0	0.0	0.0	0.0	0.0
	50%	0.0	0.0	0.0	0.0	0.0
	60%	52.8	52.3	45.4	44.1	47.1
75 years old and more						
1	40%	2.8	2.8	2.3	2.3	2.3
	50%	47.0	45.0	39.0	39.0	38.2
	60%	100.0	100.0	100.0	100.0	100.0
2	40%	0.0	0.0	0.0	0.0	0.0
	50%	0.0	0.0	0.0	0.0	0.0
	60%	57.2	55.3	49.1	46.6	38.8

The sensitivity analysis clearly shows that in order to identify better the effect of PWA reforms it is necessary to look in more detail at the population categories and the poverty definitions. This is what we did in order to compare the effect of reforms by gender and household composition in Table 4-21 and Table 4-22, respectively. In both tables, we present the results for the two bottom deciles of the income distribution paying attention in each case to a different poverty rate: the 50% threshold for the 1st decile, and the 60% threshold for the 2nd decile.

In Table 4-21 we observe that PWA reform A, that mimics the January 2002 reform, has a relatively higher impact among men in the "75 and +" category. The same is observed for the other potential reforms but with a more dramatic impact. This is mainly the case for men and women in the "75 and +" category in the 2nd decile of the distribution who see their poverty rates diminishing by nearly 20% points (60% threshold).

TABLE 4-21 POVERTY RATES (%) BY AGE AND GENDER

Age	Gender	Baseline	Reform simulations			
			A	B	C	D
		1st decile - 50% threshold				
60-74	Male	70.6	69.9	63.1	63.8	68.4
	Female	63.8	62.5	55.5	56.2	60.3
75 and +	Male	60.5	57.4	49.9	52.5	48.7
	Female	34.6	33.6	29.1	31.2	28.5
		2nd decile - 60% threshold				
60-74	Male	47.8	47.4	39.3	40.6	44.8
	Female	56.2	55.6	47.5	48.7	48.7
75 and +	Male	53.3	50.7	40.5	42.8	31.5
	Female	59.1	57.6	49.7	50.4	42.3

Finally, Table 4-22 gives us similar information but taking into account household composition. We distinguished two categories, 1 or "2 and +" individuals in the household. These results confirm the observation made before that aged individuals living alone are better protected against poverty, at least in terms of the 50% median income threshold definition. This is not the case of old individuals living with a partner or in another kind of "2 and +" household, who experience very high poverty rates in this category. This situation is reversed within the 2nd decile of the distribution. Elderly living in a "2 and +" household are better off than single household members in this category, and in terms of the 60% threshold poverty definition. Summing up, as expected, reform D is doing better for "75 and +" and reform B favors those aged 60 to 74 living in a "2 and +" household.

TABLE 4-22 POVERTY RATES (%) BY AGE AND HOUSEHOLD COMPOSITION

Age	Household composition	Baseline	Reform simulations			
			A	B	C	D
		1st decile - 50% threshold				
60-74	1	2.1	2.1	2.1	2.1	2.1
	2 and +	79.2	78.0	69.7	70.6	75.8
75 and +	1	0.1	0.1	0.1	0.1	0.1
	2 and +	61.6	59.0	51.2	54.2	50.0
		2nd decile - 60% threshold				
60-74	1	74.7	74.4	68.4	69.5	67.8
	2 and +	36.6	35.9	26.3	29.6	31.8
75 and +	1	64.3	63.1	56.8	57.0	48.3
	2 and +	42.6	39.2	25.7	29.0	19.1

4.3.5 conclusion

In this paper we use MIMOSIS to simulate the redistributive impact of alternative PWA reforms in the wage-earners and self-employed schemes. One simulation mimics the reform introduced in

January 2002 by the Belgian government and the other alternative hypothetical reforms calibrated to have similar budget cost but different application rules.

Even if these reforms try to address a particular issue, i.e. the increasing welfare gap between the active and inactive population due to productivity growth, a systematic and complete adaptation of pension benefits to the evolution of wages in the economy is not feasible, at least in the mean term, due to the anticipated acceleration of the ageing process. Therefore, future PWA reforms would certainly take into account distributive issues as the main target. This is the reason why in this study we pay particular attention to the reforms' effects on the bottom deciles of the income distribution and on poverty rates among the elderly.

The results illustrate the need of very detailed information, administrative data on near 100 000 households in the case of MIMOSIS, and of micro-simulation tools in order to identify among the population the categories at risk of poverty. It is in this way that a sensitivity analysis allows us to estimate the impact of reforms on the bottom deciles of the distribution.

It appears in this study that an increase in the budget for pension benefits of about 4% (approximately 600 Million €) would increase the income of elderly by some 1.4% and reduce poverty rate, at the 50% median income threshold, by less than 0.5% points. However, we identify specific categories among the elderly that would certainly benefit of more important welfare improvements, depending overall on the design of the reform.

In future work we plan to run alternative PWA simulations in which the hypothetical reform will address the situation of couples in which one partner benefits from a pension transfer plus a supplement if the partner is inactive and does not benefit from any replacement income. As we showed in this study, unexpectedly, older people living alone, particularly the very old, are proportionally better of in terms of risk of poverty risks than younger couples of pensioners.

5 MODELING OF BEHAVIOURAL REACTIONS WITH MIMOSIS

MIMOSIS and the data underlying it can also be used to estimate behavioural reactions such as labour supply reactions when wages or incomes change in response to policy changes. In this section we will describe in detail one such application. More particularly we will look at the effects of a 'making work pay' policy in Belgium: the Workbonus (crédit à l'emploi/werkbonus). Another application of incorporating labour supply reactions in the MIMOSIS framework can be found in Orsini et al. (2007; forthcoming), where the authors analyze the distributional an budgetary effects of a reform in survivor pensions.

The Workbonus entails a targeted reduction on social security contributions for low skilled workers. The innovative feature of the tax credit is that - differently from other measure existing in OECD countries - eligibility is based on full time equivalent earnings. The instrument therefore distinguishes between low skill and low effort and avoids the disincentive effect on labour supply at the intensive margin typically found in traditional measures means-tested on disposable income or earnings. Here we assess the effects of the Workbonus on labour supply using different econometric frameworks. In particular, we compare estimates based on a traditional labour supply model, with results based on a modeling framework which accounts for heterogeneity in individuals' job opportunities.

5.1 INTRODUCTION

In the framework of the Lisbon-strategy, Belgium is faced with the challenge of increasing its employment rates. According to EUROSTAT, the overall employment rate amounts to 60.3% (2006), compared to 63.5% for the entire European Union (EU-27). Particularly striking in the case of Belgium is the gap between the employment rates of the less educated and the medium and highly educated population. According to EUROSTAT, the employment rate of the low skilled (ISCED 0-2) population aged between 25 and 64 years is only 39.4% in 2006, as opposed to an average of 46.9% for EU-27, and of 50.6% for EU-15. In contrast, the employment rate of the high skilled population is 82.3% in Belgium i.e. in line with the EU-15 average of 82.9%. For the medium skilled population the gap with respect to the EU-15 is in the order of 6 percentage points.

While globalisation and skill biased technological change are often advocated to explain the weak employment rates amongst the less skilled population (Moore and Ranjan, 2005), the wide range of cross national variation in the employment rates of low skilled workers suggests that institutional characteristics of local labour markets have a significant impact on the performance of employment amongst the less skilled. In particular, the level of regulation of labour market is often supposed to have a more adverse effect on the employability of less skilled workers. Similarly, high labour costs tend to have a stronger impact on the employability of low skilled labour, since the labour demand for low skilled workers is more elastic than the labour demand for high skilled labour.

From a labour supply perspective, tax and benefit system may have an important role on the financial incentives faced by households to enter the labour market. It is often argued that the high level of taxation on labour income coupled with generous income support out of employment is one of the main causes of persistent lower employment levels amongst the low skilled population. While income support for the unemployed is not particularly high in Belgium, the tax burden tends to be comparatively high. According to EUROSTAT, the tax burden on low earnings was in the order of 49.2% in Belgium, i.e. the highest of all EU-27. In the same year the EU-27 and EU-15 averages were of 39.7%.[53]

The European countries characterised by high taxes - high benefits systems have implemented several instruments (i.e. generalised reductions of personal income tax, tax credits on low earnings, subsidies on social security contributions and/or in-work benefits) aiming at recreating the financial incentives to take up work amongst the low skilled population, while maintaining high levels of social protection. The potential labour supply effects of these so-called `Making Work Pay' (MWP) policies are reviewed in Orsini (2006b).

In order to analyse potential behavioural effects on reforms of the tax and social security system one needs a structural labour supply model. Unfortunately, there is no general agreement in the research community on which approach is the best to this end. An important generalisation of the conventional textbook model to accommodate nonconvex budget sets was made by Hausman and others, see for example Hausman and Ruud (1984) and the references therein. However, the so-called Hausman approach has turned out to be impractical as regards complicated nonlinear budgets constraints, see Bloemen and Kapteyn (2007) for a discussion on this topic.

van Soest (1995) proposed a discrete choice approach to labor supply modeling. The advantage with this approach is that it is much more practical than the conventional continuous choice approach in the presence of complicated budget constraints. Neither the Hausman model nor the conventional discrete choice model can, however, easily deal with rationing of jobs and quantity restrictions on hours of work. Typically, figures on distributions of hours of work show substantial peaks at full time and possibly part time hours of work, which is reasonable to interpret as stemming from restrictions on hours of work. As a result, the conventional and the discrete choice models are unable to account for observed peaks at full-time and part-time hours of work found in most countries. More fundamentally, the conventional discrete choice approach represents no essential departure from the standard approach. This is because the only new feature introduced is that the set of feasible hours of work is finite, possibly combined with some rationing device.

The alternative modeling approach examined in this paper is based on the model developed by Dagsvik and Strøm (2006) and Dagsvik and Jia (2007). Similarly to the models of van Soest (1995), this approach is also developed within a discrete choice framework. Theoretically, however, it differs from other approaches in that labour supply behavior is viewed as an outcome of agents' choices from a set of feasible jobs, each of which is characterised by offered hours of work and nonpecuniary (qualitative) attributes. Most importantly, however, the set of available job

[53] Low earnings correspond to 2/3 of average earnings.

opportunities varies amongst the agents - allowing for a rationing effect that is neglected in the standard modeling.

The aim of this application is twofold: on the one hand it discusses alternative approaches for modeling labour supply for the purpose of policy evaluations, and on the other hand it provides an assessment of the impact of the Workbonus - an innovative `MWP' instrument recently introduced in Belgium, that could be of great interest for continental European countries with labour markets and institutional setting similar to the Belgian one.

5.2 'MAKING WORK PAY' POLICIES AND THE BELGIAN WORKBONUS

Instruments to increase the financial incentives of the less skilled population to take up work have been increasingly popular in continental Europe in the past decade. Germany, France, the Netherlands and Belgium have all introduced measures to boost the income of low skilled workers (Orsini, 2006b).

These supply side policies follow an orientation that has since long characterised the Anglo-Saxon countries. An overall reduction of the tax burden was at the heart of policy reforms that took place in the UK and later in the US starting from the end of the 70s when the Thatcher and the Reagan administrations brought about extensive tax cuts. More important for the low skilled workers were however the Earned Income Tax Credit (EITC) and the Family Credit (FC), eventually replaced by the Working Family Tax Credit (WFTC). Both policy instruments were specifically designed to encourage employment amongst the low skilled population, by increasing the revenue of poor households where one or both parents engage in paid work.

Despite the relative consensus on the need of such targeted instruments, concerns arise about their optimal design. Policies which are means-tested on household rather than individual income, such as the EITC or the WFTC, are better targeted at households in need, such as lone mothers, but may also discourage second-earners' labour supply and women's in particular. Several studies point at these contrastive effects, using both `ex-ante' and `ex-post' methodologies: see Eissa and Liebman (1996), Bingley and Walker (1997), Eissa and Hoynes (2004), Duncan and Giles (1996) and Blundell et al. (2000). Bargain and Orsini (2006) have simulated the WFTC for Germany and France and find that the measure would have an overall negative impact on labour supply due to the strong disincentive on the labour supply of females in couples.

Individualised schemes such as the Dutch `Arbeidskorting' or the former Belgian tax credit on low earnings (Crédit d'impôt pour les bas revenus d'activité profesionnelle - Belastingkrediet voor lage inkomsten) have less ambiguous effects on the labour supply of secondary earners, but they face difficulties in targeting the most needy households. Moreover, measures which are phased-out as earnings increase, still have a negative impact on labour supply at the intensive margin (Orsini, 2006a).

After decades of demand side policies, policy makers in Belgium have recently implemented supply policies aiming at reducing unemployment and inactivity through decreasing the tax burden on labour income - especially for the low skilled. Indeed, Belgium is the EU country with

the highest taxation on the low earnings is the highest. As it is the case in most Bismarckian welfare states, the high tax burden on low earnings is often driven by the flat-rate contribution rates of the compulsory insurance system.

The Workbonus (Bonus à l'emploi - Werkbonus) is a targeted reduction on the social security contributions (SSC) of low skilled workers that has been in place since year 2000. Since then it has constantly been increased and has now (2006) a considerable budgetary cost, over 650 million EUR/year (i.e. slightly over .2% of GDP). Table 5-1 shows the level of the benefit in 2000, 2001 and 2006, while Figure 5-1 gives a graphical representation of the progressive extension of the subsidy. As shown in the picture, not only the level of the subsidy has increased significantly over time, but eligibility was progressively extended to medium-low earnings. In the 2000 system, according to the National Office for Social Security, less than 250,000 persons were eligible, as compared to over a million in 2006.

The design of the bonus is fairly simple: individuals with full time equivalent (FTE) earnings up to a threshold of 1053.55 EUR in 2000 (1125.19 EUR and 2076.63 EUR in 2001 and 2006 respectively) and above a minimum level are eligible to the full amount of the benefit: 64.45 EUR per month (81.8 EUR and 140 EUR per month in 2001 and 2006 respectively). When FTE earnings exceed the threshold the SSC reduction is tapered away at a rate of 0.40 (0.3806 and 0.1712 in 2001 and 2006 respectively) until it reaches zero. [54]

One of the peculiarities of the Workbonus is that eligibility and level of the benefit are directly related to the individual's earning potential, rather than the actual earnings. That is, in order to define eligibility, current earnings are transformed into full time equivalent earnings. This implies that medium or high skilled workers only working part time or a marginal amount of hours are not entitled to the benefit. Moreover the amount of the benefit is computed pro-rata with respect to working time, so that workers working part-time at minimum wage only get 50% of the benefit. This feature distinguishes the Belgian subsidy from similar measures implemented in the UK, Germany, and the Netherlands.[55] Screening out workers with low earnings due to low effort (labour supply), the subsidy avoids the well known inconvenient built-in in most income or earning tested instruments, that individuals reduce labour supply at the intensive margin finding compensation in increased public benefits.

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[54] Note that the minimum level of earnings is redundant since labour market legislation sets the minimum wage above the minimum threshold. The only cases in which the minimum level becomes relevant is for apprenticeships for which minimum wage may be lower. However, since 2004 the minimum threshold as taken away altogether. Note also that the levels of the maximum benefits cited above are those for white collar workers. Blue collar workers enjoy slightly higher amounts given that they face a slightly higher contribution rate.

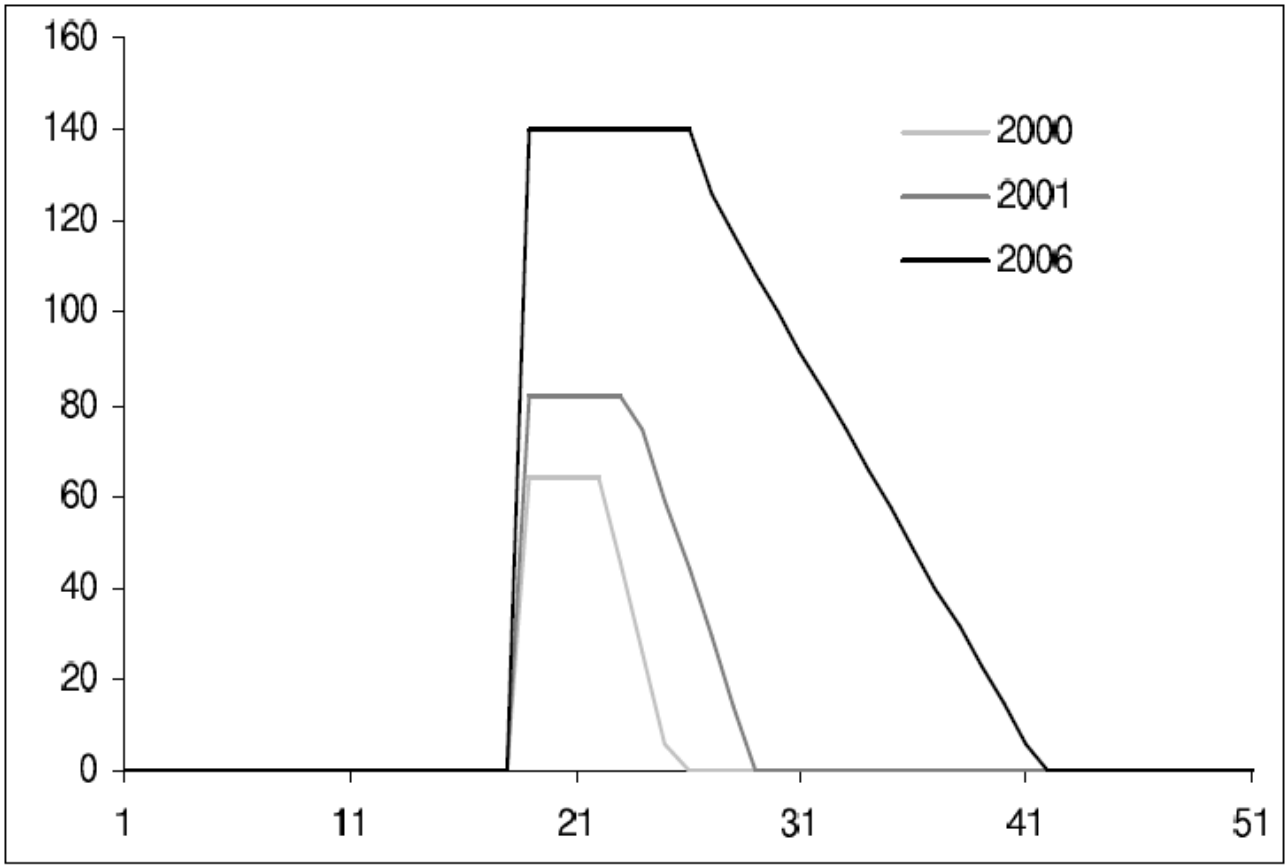
[55] The French Prime Pour l'Emploi (PPE) share similar features, but the amount of the benefit is also a function of the family situation and the scaling with respect to working time is not linear, so that the benefit still delivers a part-time premium (Orsini, 2006b).

TABLE 5-1 THE BELGIAN TAX REFORM AND THE EMPLOYMENT BONUS

Year	Gross monthly earnings (FTEE)	White collar workers	Blue collar workers
2000			
	<842.84	0	0
	≥ 842.84 and <1053.55	64.45	69.61
	≥ 1053.55 and <1214.68	64.45 - (0.40*(FTEE-1053.55))	69.61 - (0.43*(FTEE-1053.55))
	≥1214.68	0	0
2001			
	<859.69	0	0
	≥ 859.69 and < 1125.19	81.8	88.35
	≥ 1125.19 and <1340.11	81.8 - (0.3806*(FTEE-1125.19))	88.35 - (0.4111*(FTEE-1125.19))
	≥ 1340.11	0	0
2006			
	<1258.88	140	151.2
	≥ 1258.88 and <2076.63	140 - (0.1712*(FTEE-258.88))	151.2 - (0.1849*(FTEE-1258.88))
	≥ 2076.33	0	0

FTEE is full time equivalent gross monthly earnings.
Amounts are expressed in EUR/month.

FIGURE 5-1 SUBSIDY ON LOW SKILLED'S SOCIAL SECURITY CONTRIBUTIONS



5.3 DATA SELECTION

For the purpose of modeling labour supply we selected a subsample of households from the MIMOSIS dataset. The sub-sample is made of individuals in working age (18-65) available for the labour market, i.e. he or she may not be (pre)retired nor sick or disabled. Youngsters under the age of 25 who are not employees, self employed or registered as unemployed are assumed to be in full time education and not available for the labour market. Children over 25 with undefined professional status, on the other hand, are assumed to be inactive and thus potentially available for the labour market. This assumption allows us to neglect simultaneity issues of educational investment and labour supply. In modeling labour supply we also exclude the self employed, since we have no information on the hours worked. Self employed are thus treated as having a fixed labour supply. Employees, unemployed and inactives are treated as having a flexible labour supply. For couples we of course also have the possibility of mixed cases. For example a household may consist of a self employed husband and of an employed wife, or vice versa. These groups are currently not modeled.

Besides the 'standard' cases of singles and couples there is a residual group of households which contains different types of families and forms of cohabitation: this include homosexual couples or cohabiting flatmates, brothers and sisters or other relatives sharing a same housing arrangement, and mainly couples with grown up children also available for the labour market. From the labour supply perspective, this group tends to be rather heterogenous, and the degree of 'unity' of the household (i.e. the extent to which the income of one member influences the decisions of the other members) is unknown and/or difficult to deduce. In other words, it is not possible to determine whether labour supply should be modeled as an individual or joint decision. We therefore follow the bulk of the literature on ex-ante evaluations and decide not to model these households. Following the selection we are able to model 32 521 couples, 14 710 single males and 13 754 single females, i.e. almost 80% and 70% of males and females available for the labour market. Table 5-2 provides descriptive statistics of the modeled samples.

TABLE 5-2 DESCRIPTIVE STATISTICS (MODELED SUBSAMPLES)

	Singles		Couples	
	Males	Females	Males	Females
Demographics				
Household size	1.05	1.45	3.14	
Children under 3	0.00	0.05	0.19	
Children from 3 to 6	0.01	0.07	0.19	
Children from 6 to 12	0.02	0.15	0.37	
Children from 12 to 23	0.03	0.15	0.38	
Age of male (head)	35.05	-	40.82	
Age of female (head/spouse)	-	37.18	38.68	
Living in Wallonia	0.33	0.34	0.31	
Living in Flanders	0.53	0.50	0.62	
Living in medium cities	0.53	0.52	0.60	
Living in big cities	0.35	0.36	0.25	
Labour Supply				
Hours worked (all)	25.26	20.35	30.29	18.77
Hours worked (population in employment)	33.99	32.34	35.67	29.67
Hourly Wages				
Hourly wage (all)	11.77	10.69	35.46	10.93
Hourly wage (population in employment)	12.73	12.14	15.12	12.46

Table 5-3 shows the average household social security contributions paid by decile of equivalent household disposable income, before the introduction of the Workbonus (the equivalence scale is the squared root of household size). The next two columns show the level of the SSCs in 2001 and in 2006. Workbonus 2001 is mainly in favour of the 3rd and 4th decile, whereas the extension of 2006 also benefits the 5th and the 6th decile. Note that in particular the 2006 extension has a considerable effect on the average disposable income, since in the 3rd and 4th decile the increase is in the order of .44%. Finally, as disposable income increases, the effect of the work bonus on disposable income approaches 0 (in percentage terms).

TABLE 5-3 CHANGE IN SOCIAL SECURITY CONTRIBUTIONS PAID AND IN DISPOSABLE INCOME BY EQUIVALENT INCOME DECILE

	Social security contributions			Change in disposable income	
Decile	No WB	WB 2001	WB 2006	WB 2001	WB 2006
1	333	325	299	0.050	0.238
2	492	477	418	0.092	0.424
3	901	879	781	0.102	0.538
4	1297	1264	1140	0.122	0.567
5	1374	1366	1240	0.034	0.449
6	2131	2118	1980	0.044	0.457
7	2693	2678	2562	0.045	0.352
8	3650	3636	3520	0.033	0.287
9	4689	4679	4591	0.022	0.184
10	7093	7087	7049	0.009	0.061

Income deciles are constructed by equivalent household disposable income, using an equivalence scale of the squared root of household size.

The use of a microsimulation model in this kind of analysis is not only limited to the static analysis. On the one hand, microsimulation allows to translate the complex real world tax benefit system into the budget constraints - a step that as we shall see is fundamental for the estimation of labour supply models.[56] On the other hand, the underlying database with micro information on a representative sample of households or individuals allows to complement the standard aggregate results (e.g. for the budget) with a rich and detailed distributional analysis.

A key variable in the labour supply model is gross wage. For the individuals active in the labour market we determined the gross wage by dividing gross labour income by the number of contractual hours, two variables which are both registered by the Datawarehouse. For the unemployed and inactives, we first tried to reconstruct their gross hourly wage by retrieving the last recorded hourly wage for those who had been active on the labour market before as wage earner. If both current and past labour market information was lacking, we assumed the individual could at least obtain the minimum hourly wage (6.92 EUR in 2001).[57] Overall the average gross hourly wage (either registered or reconstructed) amounts to 13,00 EUR (in 2001 prices).

[56] The - often hidden - interactions between different income components and eligibility rules need a level of detail in the program only available in a genuine microsimulation model.

[57] We are aware that the standard procedure to impute missing wages, is to estimate a wage equation (either a linear regression or a Heckman two stage wage equation). However, since one of the crucial explanatory variables of the wage equation, level of education, is missing we could not fall back on this technique.

Assuming that the hourly gross wage stays constant across different working time options, we computed gross labour income for discrete intervals of weekly labour supply. The intervals ranged from 0 to 55 hours, in steps of 5 hours.[58]

5.4 MODELING LABOUR SUPPLY: TWO ALTERNATIVE CHARACTERISATIONS

5.4.1 the conventional discrete choice modeling approach

The standard discrete choice approach is convenient because no marginal calculation is needed (van Soest, 1995). See also the review by Creedy and Kalb (2005). Specifically, it enables the researcher to straightforwardly apply quite general specifications of the utility function and the budget constraint. However, as mentioned in the introduction, this model is basically a discretised version of the standard approach, and therefore cannot accommodate peaks on full-time and part-time hours nor heterogeneous restrictions on the set of available job opportunities. Let us first introduce the conventional discrete choice modeling approach.

Let $U\left(C, L_f, L_m\right)$ denote the utility function of the household, where L_f and L_m are hours of leisure for the female and the male in the household, respectively and C is household income (or consumption in a static framework). We assume that

$$U = U\left(C, L_f, L_m\right) = v\left(C, L_f, L_m\right) + \varepsilon\left(L_f, L_m\right), \tag{6}$$

where $v(.)$ is a deterministic function and $\varepsilon\left(L_f, L_m\right)$ are random taste shifters. The random taste shifters are assumed to account for unobservable individual characteristics that affect preferences and will vary across households and across choices. The budget constraint in this case can be written as

$$C = f\left(L_f, w_f, L_m, w_m, I\right), \tag{7}$$

where w_f and w_m are the respective wage rates for the female and male, I is unearned income and $f(.)$ is the function that transforms gross income into disposable income for the household. For notational convenience let

$$\psi\left(L_f, w_f, L_m, w_m, I\right) \equiv \exp\left[v\left(f\left(L_f, w_f, L_m, w_m, I\right), L_f, L_m\right)\right]. \tag{8}$$

Let D denote the set of feasible hours of work, which is assumed to be finite and total work hours available is normalised to one. Let $\phi\left(L_f, L_m \middle| w_f, w_m, I\right)$ be the conditional joint probability mass function given the wage rates and nonlabour income. The empirical counterpart of this density is

[58] The introduction of possible labour supply above the legal maximum of 38 hours a week for a single full time job reflects the possibility of a combination of multiple parttime jobs. That people in practice do

the fraction of couples in which the female and the male enjoy L_f and L_m hours of leisure respectively, within the subpopulation of couples with wage rates and nonlabor income equal to w_f, w_m, I. Moreover, we assume that $\varepsilon\left(L_f, L_m\right)$ are i.i.d. across all hours of work combinations and households with c.d.f. $\exp\left(-\exp\left(-x\right)\right)$ for real x. Then it follows from well known results (see McFadden (1974)) that the conditional density of $\left(L_f, L_m\right)$, is given by

$$\phi\left(L_f, L_m \middle| w_f, w_m, I\right) = \frac{\psi\left(L_f, w_f, L_m, w_m, I\right)}{K\left(w_f, w_m, I\right)}, \tag{9}$$

for $L_f < 1$, $L_m < 1$.

$$\phi\left(1, L_m \middle| w_f, w_m, I\right) = \frac{\psi\left(1, w_f, L_m, w_m, I\right)}{K\left(w_f, w_m, I\right)}, \tag{10}$$

for $L_f = 1$ and $L_m < 1$, and similarly for the case where the male does not work, where

$$\begin{aligned} K\left(w_f, w_m, I\right) = & \sum_{y>0, y\in D} \psi\left(1, 0, 1-y, w_m, I\right) + \sum_{x>0, x\in D} \psi\left(1-x, w_f, 1, 0, I\right) \\ & + \sum_{y>0, y\in D} \sum_{x>0, x\in D} \psi\left(1-x, w_f, 1-y, w_m, I\right). \end{aligned} \tag{11}$$

5.4.2 the model with choice among latent job opportunities

In the current subsection an alternative modeling framework is introduced. Dagsvik and Strøm (2006) and Dagsvik and Jia (2007) provide a more detailed description of the model.

In contrast to the traditional approach in which the agent is restricted to have preferences solely over combinations of total consumption and hours of work, the agent is allowed to have preferences over total consumption, hours of work/leisure and unobservable nonpecuniary job attributes such as the nature of the job-specific tasks to be performed, and location of the workplace, etc. Let $U\left(C, L_f, L_m, z\right)$ denote the utility function of the household, where C, L_f and L_m have the usual meaning and $z = \left(z_f, z_m\right)$ indexes the combination of jobs for the female and male in the household, respectively. For a given job opportunity z, associated hours of work is assumed fixed. Let $m_f\left(L_f, w_f\right)$ denote the number of feasible job opportunities with hours of work $1-L_f$ for females with wage rate w_f and let $m_m\left(L_m, w_m\right)$ be the number of feasible job opportunities with hours of work $1-L_m$ for males with wage rate w_m. For the non-market

combine multiple jobs on the Belgian labour market is illustrated in Vermandere and Stevens (2002).

alternative, one can normalise such that $m_k(1, w_k) = 1$ for $k = f, m$ These terms $m_k(L_k, w_k)$ are also called opportunity densities in Dagsvik and Strøm (2006).

We assume an additive separable structure for the utility function, so that $U(C, L_f, L_m, z) = v(C, L_f, L_m) + \varepsilon(z)$ for $z = 1, 2, ...$ where $v(.)$ is the positive deterministic function and $\varepsilon(z)$ are positive random taste shifters. The random taste shifters are assumed to account for unobservable individual characteristics and nonpecuniary job-type attributes that affect utility, and hence will vary both across households and job opportunities. The random terms are assumed to be i.i.d. with c.d.f. $\exp(-\exp(-x))$ for real x. The budget constraint is the same as in (7). We assume further that the choice sets of jobs offered to females and to males are independent.[59]

Under these conditions, Dagsvik and Jia (2007) demonstrate that the conditional density of (L_f, L_m) is given by

$$\phi(L_f, L_m | w_f, w_m, I) = \frac{\psi(L_f, w_f, L_m, w_m, I) m_f(L_f, w_f) m_m(L_m, w_m)}{M(w_f, w_m, I)}, \tag{12}$$

for $L_f < 1$, $L_m < 1$. Furthermore

$$\phi(1, L_m | w_f, w_m, I) = \frac{\psi(1, w_f, L_m, w_m, I) m_m(L_m, w_m)}{M(w_f, w_m, I)}, \tag{13}$$

for $L_f = 1$ and $L_m < 1$, and similarly when the male does not work, where

$$M(w_f, w_m, I) = \sum_{y>0, y\in D} \psi(1, 0, 1-y, w_m, I) m_m(1-y, w_m) + \sum_{x>0, x\in D} \psi(1-x, w_f, 1, 0, I) m_f(1-x, w_f)$$
$$+ \sum_{y>0, y\in D} \sum_{x>0, x\in D} \psi(1-x, w_f, 1-y, w_m, I) m_f(1-x, w_f) m_m(1-y, w_m). \tag{14}$$

Unfortunately, the frequencies $m_k(L_k, w_k)$ for $k = f, m$ m are not directly observable, but Dagsvik and Strøm (2006) and Dagsvik and Jia (2007) show that under the assumptions that $m_k(L_k, w_k)$ is multiplicatively separable in L_k and w_k, identification can be achieved. See Dagsvik and Strøm (2006), Appendix C, for a justification of the separability assumption. Namely, we assume that

$$m_f(L_f, w_f) = \theta_f(w_f) g_f(L_f), \tag{15}$$

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[59] The latter assumption may be restrictive because husband and wife may face the similar constraints on the choice of jobs due to the structure of the local labor market. It is however easy to allow the choice sets of husband and wife to be correlated. A discussion of this extenstion is left for further research.

and that

$$m_m\left(L_m, w_m\right) = \theta_m\left(w_m\right) g_m\left(L_m\right), \tag{16}$$

where $g_k\left(L_k\right)$, $k = f, m$ are normalized such that they become probability density functions.

Note that the conventional discrete model presented in the previous section, can be viewed as a special case of the model presented above by letting the opportunity density is uniform. In other words, the standard discrete choice approach is a special case of the model presented in this section that follows when we let $\theta_k\left(w_k\right) g_k\left(L_k\right) = 1$ for $k = m, f$. In this framework, on the other hand, it is assumed that the econometrician does not observe the choice of the actual job, but only knows that the actual job was chosen from a latent set of jobs with given working hours. The same thing applies for the non selected alternatives. The current choice in the numerator and the non selected alternatives in the denominator are therefore weighted with the number of feasible opportunities corresponding to each hour, while the choice of working zero hour is always available.

5.4.3 functional forms for utility representation

Dagsvik and Strøm (1989) applied a second degree polynomial specification of the deterministic part of the utility function, given as

$$v\left(C, L_f, L_m\right) = \alpha_c C^2 + \beta_c C + \alpha_f L_f^2 + \beta_f L_f + \alpha_m L_m^2 + \beta_m L_m + \beta_{CF} C L_f + \beta_{CM} C L_m + \beta_{FM} L_f L_m, \tag{17}$$

where α_c, α_f and α_m are negative and where $L_k = 1 - h_k / M$ and M is total time available when sleep and rest have been deducted. This specification has the advantage of being flexible and easy to estimate because it is linear in parameters. It has also been applied by several authors, see Blundell et al. (2000), Bargain and Orsini (2006) and Bonin, Kempe, and Schneider (2002).

Finally, Van Soest, Das, and Gong (2002) applied a more general polynomial specification (up to fifth degree). In empirical analysis the parameters on consumption and male and female leisure are specified as linear functions of individual and household characteristics. However, the drawback with this specification is that it is not always globally concave and monotone. Dagsvik and Strøm (2004) proved that a set of plausible scale invariance assumptions imply a general nonseparable Box-Cox functional form given as in

$$v\left(C, L_f, L_m\right) = \beta_c \frac{\left(\left(C - C_0\right)^{\alpha_c} - 1\right)}{\alpha_c} + \beta_f \frac{\left(L_f^{\alpha_f} - 1\right)}{\alpha_f} + \beta_m \frac{\left(L_m^{\alpha_m} - 1\right)}{\alpha_m} + \beta_{fm} \frac{\left(L_f^{\alpha_f} - 1\right)\left(L_m^{\alpha_m} - 1\right)}{\alpha_f \alpha_m}, \tag{18}$$

where C_0 represents a subsistence level of income. It is reasonable to assume that the function $v(.)$ is concave, which implies that $\alpha_k \leq 1$, for $k = c, f, m$. To ensure concavity additional restrictions on the β_k must be invoked as well. If these conditions are fulfilled the function in (18) is globally concave.

The specification in (18) is a special case of a more general case that contain interaction terms between leisure and consumption for male and females, see Dagsvik and Strøm (2006). However, the specification in (18) corresponds to the one applied in the empirical analysis below.

5.5 ESTIMATION RESULTS

The labour supply is estimated separately for couples, single males and single females. Moreover, for each group, different models are estimated. Model I is the standard discrete choice model described above. Table 5-4 presents the results of the model I, and Figure 5-2, Figure 5-3, Figure 5-4 and Figure 5-5 present the fit of the observed distribution of working hours for males and females in couple and for single males and females respectively. Model I performs very badly in fitting the data. In particular the model predicts the inactivity peak and a more or less normal distribution of working hours along the range 5 to 55, but does not capture the full-time peak for male and the part-time and full-time peak for females. The model predicts the average labour supply over the sample, but fails to reproduce the distribution of working hours.

van Soest (1995) introduces dummy variables in the structural utility function. These dummies are supposed to capture unobserved characteristics of the jobs (which are correlated with the length of the working week): flexibility, working environment, working conditions and relative availability of jobs with different hours duration.

In model II we have introduced these dummies in order to fit the part-time and full-time peaks. Additional dummies were introduced for marginal part-time (5 to 15 hours hours per week), the 3/4 full time (25 to 35 hours per week) and over-time (45 to 55 hours per week). Through different specification, it was found that these 5 dummies were necessary to produce an acceptable fit of the observed data. This ad hoc way to account for the part time and full time peaks in the distribution of working hours is not uncommon in the empirical literature, see amongst others Haan (2006), Bonin, Kempe, and Schneider (2002). The effect of these 'calibration dummies', however, is not always innocuous.

The last rows in Table 5-4 and Table 5-5 show the percentage of observation with a positive derivative of the utility function with respect to consumption and leisure. In model I almost all cases have positive derivatives with respect to consumption and leisure (at the chosen hours supplied). The coefficients on the squared leisure terms of single males and females, however, are not negative which imply that the utility function is not concave in leisure. In model II the coefficients have the expected sign, but a large share of cases have negative first derivative with respect to leisure and in some cases also with respect to consumption, implying the existence of an internal saturation point. In particular negative derivatives with respect to leisure can be indeed a consequence of rationing in the availability of work at discrete hours. More harming, for the theoretical consistency of the model, is the fact that the derivative with respect to income are negative for some households, as this implies that households would prefer less income to more income.

The unexpected results may be a cause of a misspecification of the opportunity sets. In particular job opportunities may not be equally available to all individuals. We therefore turn to the model type described in section 5.4.2, which is supposed to correct for latent and heterogeneous choice opportunities.

We start with the specification of the opportunity densities. Specifically, we assume that:

$$\log \theta_k(w_k) = f_{k1} + f_{k2} \log(w_k) + f_{k3} S, \tag{19}$$

where S is a vector that consists of the regional dummies, age, age squared and productivity (as measured by the wage rate). The distribution of working time, on the other hand, is assumed to be homogeniously distributed with a part time and full time peak for females and a full time and a 35 hours peak for males. In model III we first correct for the heterogeneity in the opportunity densities, while keeping the quadratic utility specification.

Table 5-6 shows the estimates of the preference structure. The derivatives of the utility function with respect to income and leisure continue to be negative. Introducing heterogeneity in the opportunity set does therefore not restore the theoretical foundation of the model. On the contrary: in the case of single females the share of females with a negative derivative increases with respect to the previous model. The quadratic model is probably too flexible without additional constraints on the coefficients. The fit of the model, as can be seen from Figure 5-2, Figure 5-3, Figure 5-4 and Figure 5-5 is still very good, but from a theoretical perspective, the model cannot be used to simulate responses in labour supply.

Finally we estimate a model consistent with 13 using a Box-Cox utility function. Total leisure hours are fixed at 80 hours per week, so that the `subsistence' level of leisure is fixed at 25 hours per week. We have chosen C_0 to be approximately 4000 EUR/year and we multiply it by $\sqrt{N}$, where N is the number of persons in the household, to account for economies of scale in consumption. If $\alpha_c < 1$, $\alpha_f < 1$, $\alpha_m < 1$ and $\beta_c > 0$ the term in front of the leisure terms are positive sufficiently large, then utility is increasing in C and decreasing in L_f, L_m for fixed C. Under suitable additional constraints the utility is strictly concave in (C, L_f, L_m). Just like in the quadratic specification, some coefficients, namely β_f and β_m are modeled as a linear function of observed individual and household characteristics.

Table 5-7 presents the estimates of the preference structure of the Box-Cox utility function. This specification imposes a less flexible preference structure. This constraint allows a clearer separation of the factors affecting preferences and the factors affecting the availability of job opportunities. In Table 5-8 we compare the elasticities derived under the 4 different specifications. Elasticities are derived numerically, by increasing hourly wage by 1% and computing the expected change in aggregated labour supply. In the following we will discuss exclusively the results of model II and model IV. Model I predicts in fact a distribution of supplied hours which is inconsistent with the data, whereas model III is theoretically inconsistent, given the high share of households having a negative derivative of the utility with respect to income.

Model II predicts labour supply elasticities at around .4 for single females and males (either in couple or singles), whereas for females in couple, labour supply elasticity are estimated at .76. This result is consistent with several studies surveyed in Blundell and MaCurdy (1999): single males and males in couples tend to have lower labour supply elasticity than secondary earners, i.e. females in couples. Overall, the estimated elasticities are higher than recent estimates for other countries: Bonin, Kempe, and Schneider (2002) and Haan and Steiner (2005) have estimates of around .20 and up to .35 for German males and females in couples. Although for females in couples Aaberge, Colombino, and Strøm (2004) and van Soest (1995) also find particularly high values, ranging from .60 to .70 (respectively for the Netherlands and Italy). Their estimated labour supply elasticities for primary earners, however, are in the range of .1.

As shown in Bargain et al. (2006) the effect of not accounting for labour demand constraint induces an upward bias in the estimates of labour supply elasticities. Model IV predicts lower labour supply elasticities: .28 and .46 for males and females in couples respectively and .11 and .26 for single females and single males. The fact that single females have the lowest labour supply elasticities is at odds with the experience of other countries - in particular the UK. It should be noted, nevertheless, that in Belgium means tested aid for single parents, i.e. mostly single mothers, is rather limited. Contrary to other countries, in fact, single mothers do not receive significantly higher income support. At the same time their unemployment benefits tend to be lower due to weaker labour market attachment. It is therefore likely that a relatively higher share of unemployed single females are affected by rationing on the labour market. On the other hand, the average household size of single females is 1.45 which implies a higher subsistence level of income. This factor is likely to limit for single mothers the number of choices actually available, given that only alternatives with positive income are considered as feasible.

Finally it should be note that the elasticities estimated in accordance to model IV are also higher than estimates for Belgium based on a standard model of labour supply (Orsini, 2006a). This is only partially surprising: former estimates are in fact based on survey data. In the administrative dataset at hand a higher share of non working individuals are classified as available for work. It is likely that a share of the latter would declare themselves as not available for work in survey data due to the 'discouraged worker' effect.

TABLE 5-4 ESTIMATES: MODEL I

	Couples			Single Males			Single Females		
	Parameter	St. Error		Parameter	St. Error		Parameter	St. Error	
Consumption									
Age of male	2.501	0.839	***	-3.095	2.723				
Age of male squared	-1.171	0.404	***	1.420	1.398				
Age of female	8.997	0.811	***				-18.002	2.652	***
Age of female squared	-3.277	0.404	***				9.212	1.345	***
No. of children under 3	0.182	0.065	***	-0.758	0.826		-1.916	0.313	***
No. of children from 3 to 6	0.392	0.061	***	-2.104	0.569	***	-1.425	0.238	***
No. of children from 6 to 12	0.650	0.042	***	0.237	0.341		-0.901	0.141	***
No. of children from 12 to 18	0.502	0.045	***	-0.931	0.301	***	-0.585	0.132	***
Live in medium city	-0.014	0.085		0.200	0.296		0.609	0.243	**
Live in big city	-0.083	0.096		0.340	0.314		0.476	0.256	*
Live in Wallonia	0.191	0.108	*	-0.518	0.300	*	-0.755	0.236	***
Live in Flandres	0.053	0.101		-0.260	0.279		-0.984	0.219	***
Constant	5.067	0.584	***	2.575	1.425	*	11.987	1.344	***
Consumption squared	-0.848	0.023	***	-0.290	0.106	***	-0.774	0.096	***
Leisure of male									
Age of male	-4.527	2.613	*	-29.662	5.456	***			
Age of male squared	6.116	1.266	***	14.660	2.796	***			
No. of children under 3	0.232	0.162		-4.140	1.356	***			
No. of children from 3 to 6	1.214	0.156	***	-5.115	1.025	***			
No. of children from 6 to 12	1.973	0.112	***	-3.507	0.639	***			
No. of children from 12 to 18	1.394	0.121	***	-6.046	0.596	***			
Live in medium city	0.136	0.215		0.779	0.607				
Live in big city	0.309	0.241		1.601	0.634	**			
Live in Wallonia	-0.636	0.262	**	-1.251	0.565	**			
Live in Flandres	-1.623	0.250	***	-2.083	0.528	***			
Constant	28.778	1.597	***	-0.446	2.956				
Leisure of male squared	-14.691	0.295	***	12.062	0.706	***			
Leisure of female							-67.840	4.975	***
Age of female	-2.488	2.363					34.527	2.523	***
Age of female squared	7.930	1.203	***				-1.258	0.534	**
No. of children under 3	2.744	0.157	***				-2.764	0.385	***
No. of children from 3 to 6	2.123	0.145	***				-2.114	0.251	***
No. of children from 6 to 12	2.579	0.104	***				-2.606	0.247	***
No. of children from 12 to 18	1.967	0.111	***				1.187	0.451	***
Live in medium city	0.019	0.199					1.367	0.470	***
Live in big city	0.021	0.225					-0.823	0.419	**
Live in Wallonia	0.531	0.257	**				-2.790	0.392	***
Live in Flandres	-0.025	0.244					22.846	2.599	***
Constant	11.768	1.363	***						
Leisure of female squared	-1.861	0.232	***				9.111	0.527	***
Cross term consumption and male leisure	-2.112	0.137	***	12.293	0.552	***			
Cross term consumption and female leisure	-2.634	0.117	***				6.571	0.433	***
Cross term male and female leisure	3.332	0.388	***						
Log likelihood	-139434.860			-29618.456			-27008.271		
dU/dC¿0	99.689			99.993			99.186		
dU/dLm¿0	97.303			99.979					
dU/dLf¿0	99.945						100.000		

TABLE 5-5 ESTIMATES: MODEL II

	Couples			Single Males			Single Females		
	Parameter	St. Error		Parameter	St. Error		Parameter	St. Error	
Consumption									
Age of male	2.150	0.834	**	-2.167	2.447				
Age of male squared	-1.333	0.400	***	1.237	1.252				
Age of female	10.259	0.800	***				-7.029	2.501	***
Age of female squared	-4.202	0.399	***				3.912	1.259	***
No. of children under 3	-0.137	0.059	**	-0.010	0.821		-0.698	0.288	**
No. of children from 3 to 6	0.082	0.057		-0.873	0.487	*	-0.769	0.223	***
No. of children from 6 to 12	0.318	0.040	***	0.725	0.321	**	-0.557	0.130	***
No. of children from 12 to 18	0.226	0.043	***	0.014	0.280		-0.357	0.122	***
Live in medium city	-0.003	0.084		0.266	0.265		0.551	0.229	**
Live in big city	-0.077	0.094		0.482	0.284	*	0.455	0.242	*
Live in Wallonia	0.276	0.101	***	-0.455	0.268	*	-0.437	0.222	**
Live in Flandres	0.204	0.095	**	-0.480	0.252	*	-0.768	0.207	***
Constant	3.930	0.570	***	3.841	1.319	***	5.913	1.268	***
Consumption squared	-0.650	0.022	***	-0.778	0.101	***	-0.604	0.086	***
Leisure of male									
Age of male	-5.912	2.357	**	-34.095	4.886	***			
Age of male squared	5.360	1.135	***	17.007	2.488	***			
No. of children under 3	0.288	0.141	**	-1.909	1.274				
No. of children from 3 to 6	0.942	0.138	***	-2.220	0.880	**			
No. of children from 6 to 12	1.655	0.099	***	-1.238	0.579	**			
No. of children from 12 to 18	1.329	0.108	***	-2.860	0.538	***			
Live in medium city	0.213	0.193		0.887	0.536	*			
Live in big city	0.384	0.215	*	1.828	0.561	***			
Live in Wallonia	-0.230	0.228		-0.953	0.493	*			
Live in Flandres	-1.214	0.218	***	-2.332	0.465	***			
Constant	33.523	1.905	***	6.304	3.370	*			
Leisure of male squared	-15.976	0.952	***	4.938	1.640	***			
Leisure of female							-46.674	4.526	***
Age of female	2.391	2.191					24.297	2.272	***
Age of female squared	3.850	1.109	***				0.241	0.475	
No. of children under 3	2.160	0.141	***				-1.122	0.350	***
No. of children from 3 to 6	1.534	0.132	***				-0.782	0.223	***
No. of children from 6 to 12	1.911	0.095	***				-1.153	0.223	***
No. of children from 12 to 18	1.504	0.101	***				1.000	0.405	**
Live in medium city	0.086	0.188					1.244	0.422	***
Live in big city	0.076	0.210					-0.263	0.372	
Live in Wallonia	0.675	0.228	***				-2.303	0.351	***
Live in Flandres	0.240	0.218					30.534	3.185	***
Constant	39.186	1.887	***						
Leisure of female squared	-21.745	1.013	***				-6.890	1.623	***
Cross term consumption and male leisure	-3.558	0.140	***	5.185	0.528	***			
Cross term consumption and female leisure	-2.710	0.117	***				3.000	0.391	***
Cross term male and female leisure	-5.391	0.386	***						
Males									
Working 5 to 15 hours/week	3.849	0.095	***	3.554	0.147	***			
Working 20 hours/week	4.015	0.136	***	3.536	0.203	***			
Working 25 to 35 hours/week	4.189	0.160	***	3.786	0.234	***			
Working 40 hours/week	2.717	0.168	***	2.493	0.237	***			
Working 45 to 55 hours/week	7.054	0.166	***	7.156	0.230	***			
Females									
Working 5 to 15 hours/week	3.841	0.077	***				3.732	0.130	***
Working 20 hours/week	2.609	0.113	***				2.969	0.188	***
Working 25 to 35 hours/week	3.139	0.127	***				3.705	0.217	***
Working 40 hours/week	1.210	0.131	***				1.615	0.227	***
Working 45 to 55 hours/week	5.277	0.158	***				5.899	0.251	***
Log likelihood	-95276.0090			-20181.2590			-18096.3240		
dU/dC>0	99.6089			99.783			98.790		
dU/dLm>0	69.9461			95.218					
dU/dLf>0	59.1994						71.904		

TABLE 5-6 ESTIMATES: MODEL III

	Couples			Single Males			Single Females		
	Parameter	St. Error		Parameter	St. Error		Parameter	St. Error	
Consumption									
Age of male	3.837	0.884	***	-0.287	0.667				
Age of male squared	-2.474	0.425	***	-0.015	0.086				
Age of female	8.758	0.801	***				-1.064	0.694	
Age of female squared	-4.007	0.398	***				0.097	0.087	
No. of children under 3	-0.357	0.062	***	0.018	0.821		-1.002	0.290	***
No. of children from 3 to 6	-0.027	0.060		-1.197	0.502	**	-0.866	0.229	***
No. of children from 6 to 12	0.180	0.042	***	0.601	0.327	*	-0.714	0.132	***
No. of children from 12 to 18	0.065	0.044		-0.117	0.281		-0.475	0.124	***
Live in medium city	0.002	0.087		0.270	0.266		0.596	0.234	**
Live in big city	-0.032	0.098		0.460	0.285		0.362	0.246	
Live in Wallonia	0.465	0.111	***	-0.422	0.294		0.270	0.256	
Live in Flandres	0.591	0.105	***	-0.179	0.281		0.112	0.242	
Constant	-0.145	0.612		0.841	1.400		2.059	1.388	
Consumption squared	-0.434	0.026	***	-0.363	0.103	***	-0.309	0.087	***
Leisure of male									
Age of male	2.954	3.565		-7.195	1.649	***			
Age of male squared	-3.434	1.748	**	0.674	0.219	***			
No. of children under 3	-0.514	0.150	***	-1.646	1.258				
No. of children from 3 to 6	0.363	0.147	**	-2.598	0.891	***			
No. of children from 6 to 12	0.944	0.105	***	-1.288	0.584	**			
No. of children from 12 to 18	0.532	0.113	***	-2.758	0.534	***			
Live in medium city	0.195	0.203		0.897	0.531	*			
Live in big city	0.405	0.226	*	1.776	0.556	***			
Live in Wallonia	1.386	0.402	***	-1.109	0.716				
Live in Flandres	1.757	0.386	***	-1.564	0.691	**			
Constant	39.935	2.163	***	33.447	3.526	***			
Leisure of male squared	-26.220	0.573	***	-14.631	1.070	***			
Leisure of female									
Age of female	15.434	3.104	***				-6.916	1.537	***
Age of female squared	-5.721	1.586	***				0.783	0.199	***
No. of children under 3	1.739	0.148	***				-0.363	0.483	
No. of children from 3 to 6	1.151	0.137	***				-1.244	0.358	***
No. of children from 6 to 12	1.405	0.098	***				-1.081	0.228	***
No. of children from 12 to 18	0.882	0.103	***				-1.399	0.228	***
Live in medium city	0.077	0.192					1.089	0.414	***
Live in big city	0.085	0.215					1.077	0.431	**
Live in Wallonia	2.660	0.369	***				1.798	0.624	***
Live in Flandres	3.427	0.354	***				0.381	0.598	
Constant	43.363	1.873	***				38.890	3.203	***
Leisure of female squared	-36.989	0.623	***				-20.644	0.978	***
Cross term consumption and male leisure	-2.117	0.157	***	6.263	0.539	***			
Cross term consumption and female leisure	-1.115	0.130	***				3.964	0.407	***
Cross term male and female leisure	0.429	0.421							
Theta males									
Wage	-0.213	0.007	***	-0.210	0.014	***			
Age	-0.197	1.367		0.171	0.427				
Age squared	1.662	0.669	**	0.056	0.059				
Live in Wallonia	-0.554	0.146	***	0.075	0.191				
Live in Flandres	-1.148	0.141	***	-0.1492	0.187				
Constant	5.894	0.690	***	5.544	0.744	***			
Part time peak	0.763	0.025	***	0.824	0.037	***			
Full time peak	2.792	0.020	***	2.780	0.034	***			
Theta females									
Wage	-0.328	0.006	***				-0.388	0.012	***
Age	-4.476	1.022	***				-0.845	0.365	**
Age squared	2.878	0.520	***				0.143	0.048	***
Live in Wallonia	-0.832	0.123	***				-0.677	0.176	***
Live in Flandres	-1.238	0.118	***				-0.778	0.172	***
Constant	10.833	0.502	***				9.956	0.679	***
Part time peak	0.600	0.0218	***				0.500	0.039	***
Full time peak	2.497	0.027	***				2.838	0.036	***
Log likelihood	-93518.7620			-20081.9400			-17433.8970		
dU/dC>0	97.8199			99.3279			93.5180		
dU/dLm>0	79.4704			79.7311					
dU/dLf>0	47.3965						58.8710		

TABLE 5-7 ESTIMATES: MODEL IV

	Couples			Single Males			Single Females		
	Parameter	St. Error		Parameter	St. Error		Parameter	St. Error	
Consumption	2.709	0.039	***	1.847	0.086	***	0.994	0.064	***
Exponent on Consumption	0.668	0.013	***	0.278	0.022	***	0.082	0.032	***
Leisure of male									
Age of male	-5.242	0.692	***	-1.343	0.164	***			
Age of male squared	2.216	0.335	***	0.154	0.021	***			
No. of children under 3	0.067	0.028	**	-0.195	0.142				
No. of children from 3 to 6	0.109	0.026	***	0.197	0.128				
No. of children from 6 to 12	0.117	0.018	***	-0.171	0.059	***			
No. of children from 12 to 18	0.042	0.018	**	-0.092	0.057				
Live in medium city	0.059	0.034	*	0.050	0.043				
Live in big city	0.169	0.039	***	0.152	0.048	***			
Live in Wallonia	0.171	0.068	**	0.056	0.070				
Live in Flandres	0.162	0.065	**	-0.101	0.067				
Constant	4.301	0.377	***	3.730	0.389	***			
Exponent on leisure of male	-1.474	0.065	***	-2.116	0.133	***			
Leisure of female									
Age of female	-0.985	0.213	***				-0.588	0.103	***
Age of female squared	0.758	0.114	***				0.073	0.014	***
No. of children under 3	0.280	0.016	***				0.380	0.059	***
No. of children from 3 to 6	0.144	0.011	***				0.095	0.036	***
No. of children from 6 to 12	0.137	0.009	***				0.163	0.024	***
No. of children from 12 to 18	0.109	0.008	***				0.099	0.020	***
Live in medium city	-0.006	0.012					-0.001	0.030	
Live in big city	-0.005	0.014					0.034	0.032	
Live in Wallonia	0.066	0.019	***				0.194	0.041	***
Live in Flandres	0.136	0.019	***				0.042	0.036	
Constant	0.707	0.101	***				1.487	0.219	***
Exponent on leisure of female	-3.722	0.072	***				-2.938	0.146	***
Cross term male and female leisure	0.177	0.014	***						
Theta males									
Wage	-0.199	0.007	***	-0.204	0.012	***			
Age	-0.002	0.950		-2.037	0.287	***			
Age squared	1.382	0.458	***	0.275	0.038	***			
Live in Wallonia	-0.522	0.092	***	-0.139	0.126				
Live in Flandres	-1.064	0.090	***	-0.525	0.123	***			
Constant	8.828	0.488	***	9.257	0.542	***			
Part time peak	0.964	0.025	***	0.852	0.038	***			
Full time peak	2.854	0.021	***	2.664	0.035	***			
Theta females									
Wage	-0.305	0.006	***				-0.375	0.012	***
Age	-3.387	0.625	***				-3.020	0.256	***
Age squared	2.439	0.318	***				0.394	0.033	***
Live in Wallonia	-0.318	0.067	***				-0.345	0.102	***
Live in Flandres	-0.695	0.065	***				-0.709	0.099	***
Constant	7.264	0.304	***				12.458	0.501	***
Part time peak	0.894	0.021	***				0.635	0.039	***
Full time peak	2.203	0.024	***				2.655	0.033	***
Log likelihood	-95057.5150			-19995.1430			-17468.2260		
dU/dC>0	-			-			-		
dU/dLm>0	-								
dU/dLf>0	-			-			-		

TABLE 5-8 LABOUR SUPPLY ELASTICITIES

		Singles		Couples	
		Females	Males	Females	Males
Model I	Hours	0.439	0.418	0.916	0.453
	Participation	0.262	0.281	0.32	0.124
Model II	Hours	0.414	0.398	0.439	0.763
	Participation	0.404	0.400	0.342	0.592
Model III	Hours	0.077	0.167	0.311	0.218
	Participation	0.114	0.214	0.236	0.168
Model IV	Hours	0.117	0.213	0.462	0.286
	Participation	0.121	0.203	0.312	0.204

FIGURE 5-2 OBSERVED AND PREDICTED FREQUANCIES: MALES IN COUPLES

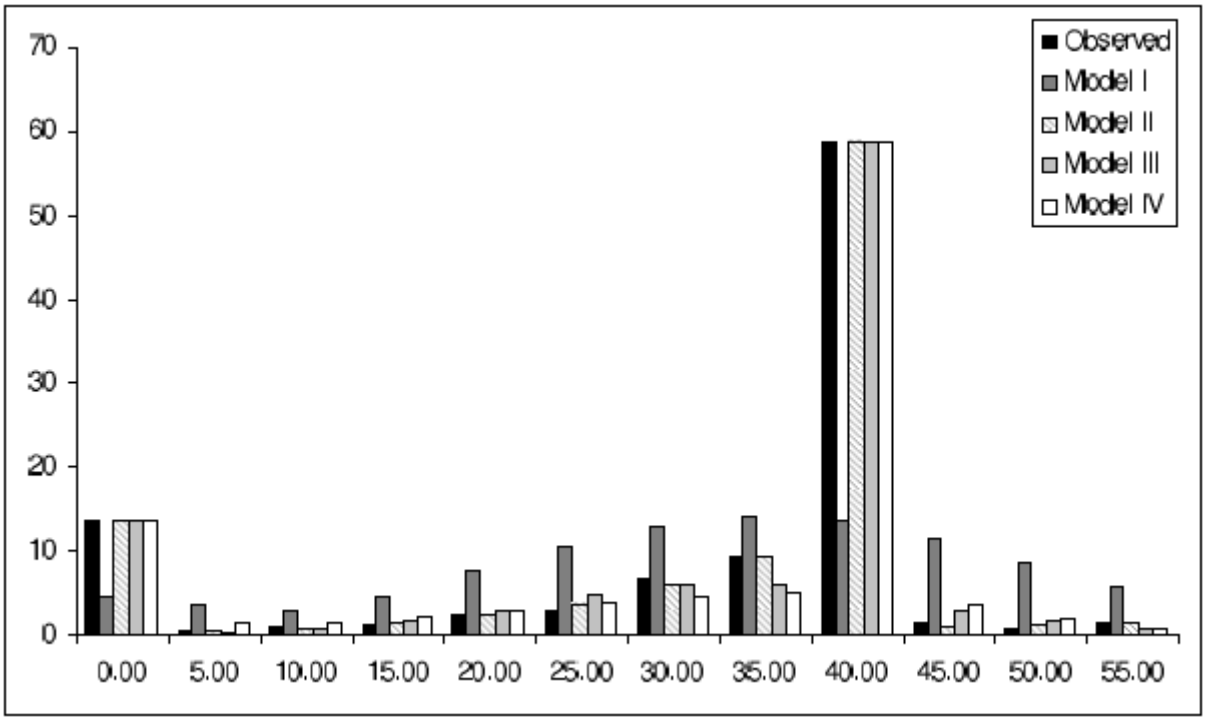


FIGURE 5-3 OBSERVED AND PREDICTED FREQUENCIES: FEMALES IN COUPLES

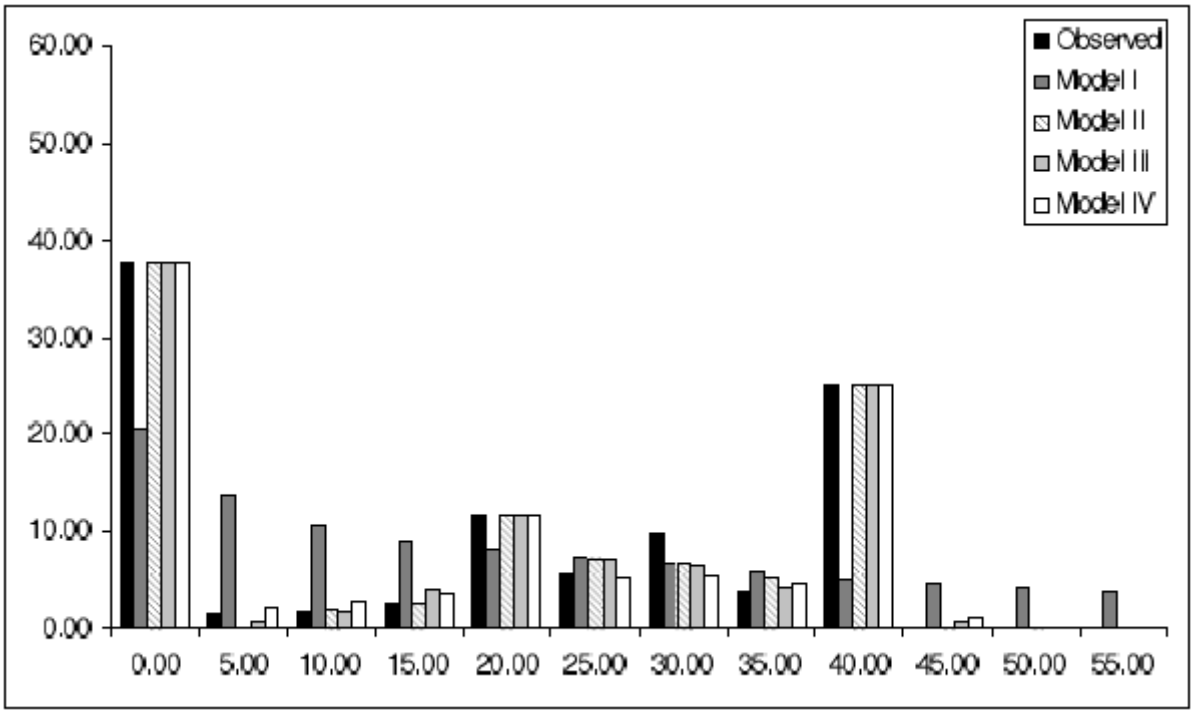


FIGURE 5-4 OBSERVED AND PREDICTED FREQUENCIES: SINGLE MALES

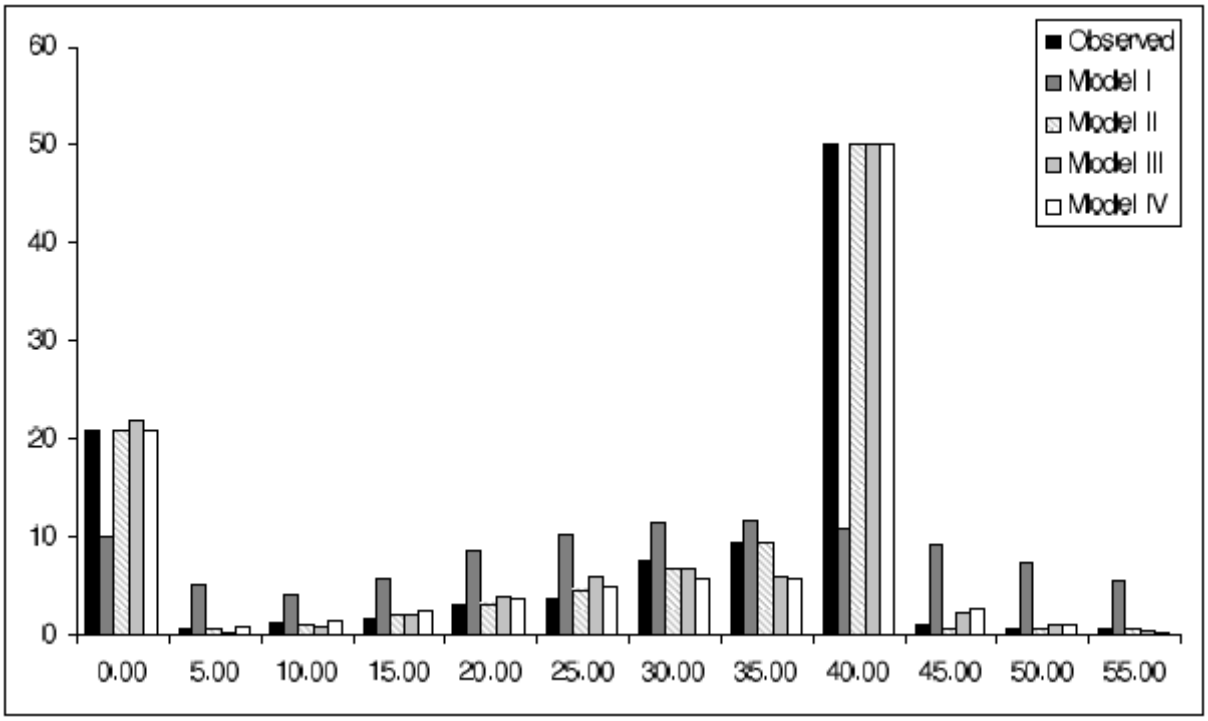
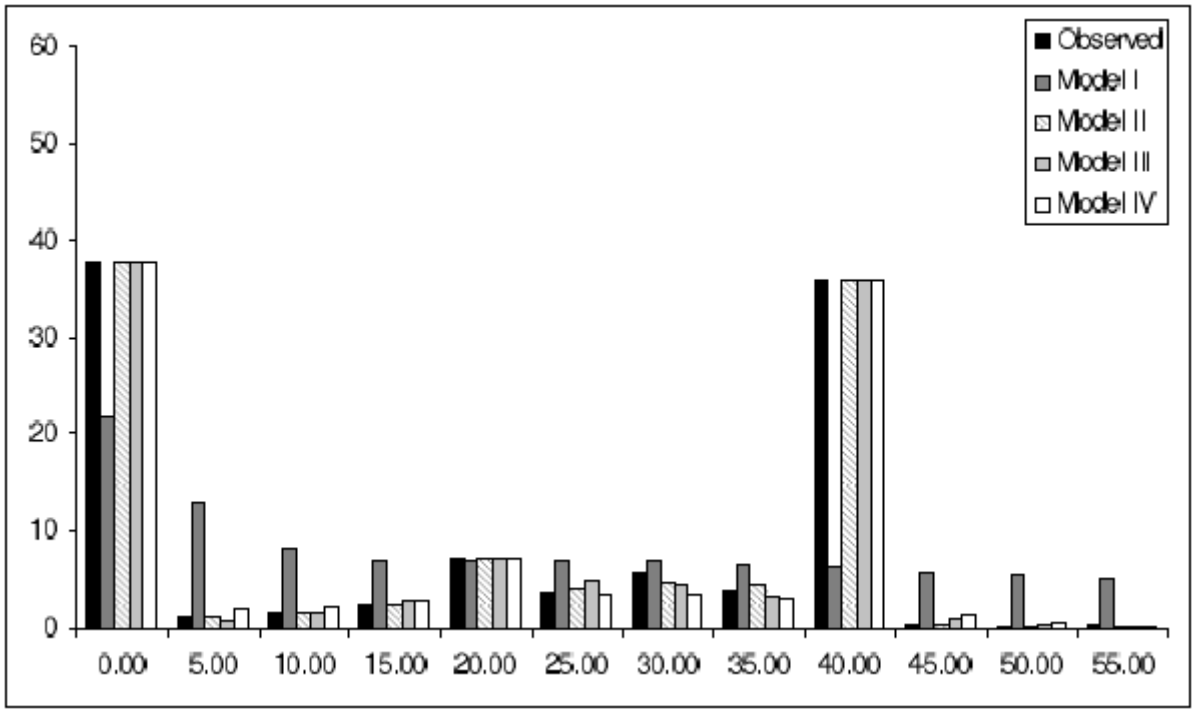


FIGURE 5-5 OBSERVED AND PREDICTED FREQUENCIES: SINGLE FEMALES



5.6 RESULTS FROM POLICY SIMULATIONS

Table 5-9 shows the estimated impact of the changes in the Workbonus: the first two rows relate to an abolishment of the work bonus and the second two rows relate to an extension to its 2006 level. The effects are divided into an aggregate change in labour supply (i.e. change in hours, although expressed in full time equivalent - FTE) and a change in the number of participants and are presented separately for model II and model IV. As could expected by the diverging labour supply elasticities, the two models give quite different predictions. Let us consider first the abolishment of the Workbonus. Should the subsidy be removed, according to model II labour supply would drop by 15000 FTE units, whereas participation would decrease by 17000 units. Females in couples are the main group driving the change in labour supply, since they account for an increase in FTE of 6000 units and an increase in participation of 7000.

The changes predicted by model IV go in the same direction, but the size of the effect is much smaller: labour supply would decrease by only 7000 FTE unit, whereas participation would decrease by about 8000 unit in total. With respect to the composition of the change, the models predict a similar pattern. The change in FTE units is driven by females in couples, then males in couples and to a lesser extent to singles. The predicted change in participation and hours supplied for single females is much smaller than the prediction according to model II, which is in line with the large differences in the estimates of labour supply elasticities for this subgroup.

When we look at the effect of the extension of the Workbonus to its 2006 level, the divergence between the prediction of the two models persists. Moddel II predicts a change in labour supply of about 23000 FTE, whereas according to model IV the increase should be in the order of 12000 FTE.

With respect to participation the two models predict an increase of 25000 and 13000 units respectively. Note that these estimates are not to far from Orsini (2006a): in that paper the estimated labour supply effect for couples ranges from 5200 to 8800 FTE units, whereas here the change is in the order of 8000 units for couples. The model used in Orsini (2006a), nevertheless is a variation of model II which does not account for demand side constraints. As argued above, however, the extent of rationing could probably play a different role within administrative and survey data.

It would be interesting to analyse whether the Workbonus is currently at an optimal level. This however would require an optimal taxation framework and would imply a switch to a normative framework. Less ambitiously, but not less interesting, is the prediction of the effects further expansions of the bonus. De Vos and Konings (2007) propose a series of reforms to improve the performance of the Belgian labour market. Amongst other things they propose a generalised decreasing reduction on social security contributions that should benefit all workers. Note that it is not clear form their paper whether such reduction should be applied on employees or employers social security. For sake of speculation we simulated the potential effect of expanding the Workbonus such that the reduction in social security contributions benefits all wage earners up to a monthly salary of 10000 EUR. The last two rows in table 10 show that the increase in participation could be expected to be in the order of 62000 to 30000 units (according to model II and model IV respectively), whereas in terms of FTE units the increase would be in the range of 29000 (model II) to 59000 units (model IV).

Note finally that the increase in participation and in FTE units goes hand in hand in both scenarios. As argued in the introduction, this is a peculiar effect of targeting the benefit on low FTE earnings, rather than low current earnings. The last expansion of the Workbonus replaced a tax credit on low earned income. Orsini (2006a) shows that compared to the Workbonus, the tax credit would have had a higher participation effect, but a smaller impact on aggregated labour supply. Indeed the tax credit increase the incentives to take up work for the low skilled, but also for the medium skilled willing to work part-time. At the same time, medium skilled workers in employment would reduce labour supply, finding partial compensation from the tax credit. Given that eligibility to the Workbonus is conditional on hourly wage, this negative effect at the intensive margin is not possible, at the same time, however, the positive effect at the extensive margin only concerns the pool of unskilled workers.

Figure 5-6 shows the percentage change in participation and in aggregate labour supply by income decile according to the two models. In particular the upper axes indexes the change in aggregate labour supply, whereas the lower axes indexes the change in participation. The percentage change is expressed with respect to total participation and total labour supply in each income decile. The picture clearly show that the Workbonus increases participation in the lower income deciles, in the first 4 income deciles. The aggregate effect, however, is positive for all deciles. The first order (static) distributional impact is therefore reinforced by the second order (behavioural) effect. Redistributive and incentive effects are therefore mainly directed to the bottom part of the income distribution. This result is at odds with the supposed limited redistributive effect of individualized measures (Bargain and Orsini, 2006).

TABLE 5-9 EXPECTED EFFECTS OF THE WORKBONUS ON LABOUR SUPPLY (FIGURES IN 1000S)

	Hours				Participation				Hours	Participation
	Singles		Couples		Singles		Couples		Total	Total
	Females	Males	Females	Males	Females	Males	Females	Males		
No Workbonus										
Model II	-3	-2	-6	-4	-3	-2	-7	-4	-15	-17
Model IV	-1	-1	-3	-2	-1	-1	-4	-2	-7	-8
Workbonus 2006										
Model II	4	4	9	6	4	4	11	6	23	25
Model IV	1	2	5	3	2	2	6	3	12	13
Extended Workbonus										
Model II	8	10	22	19	9	12	24	18	59	62
Model IV	2	5	11	11	3	6	11	10	29	30

FIGURE 5-6 PREDICTED CHANGE IN LABOUR SUPPLY BY EQUIVALENT INCOME DECILES

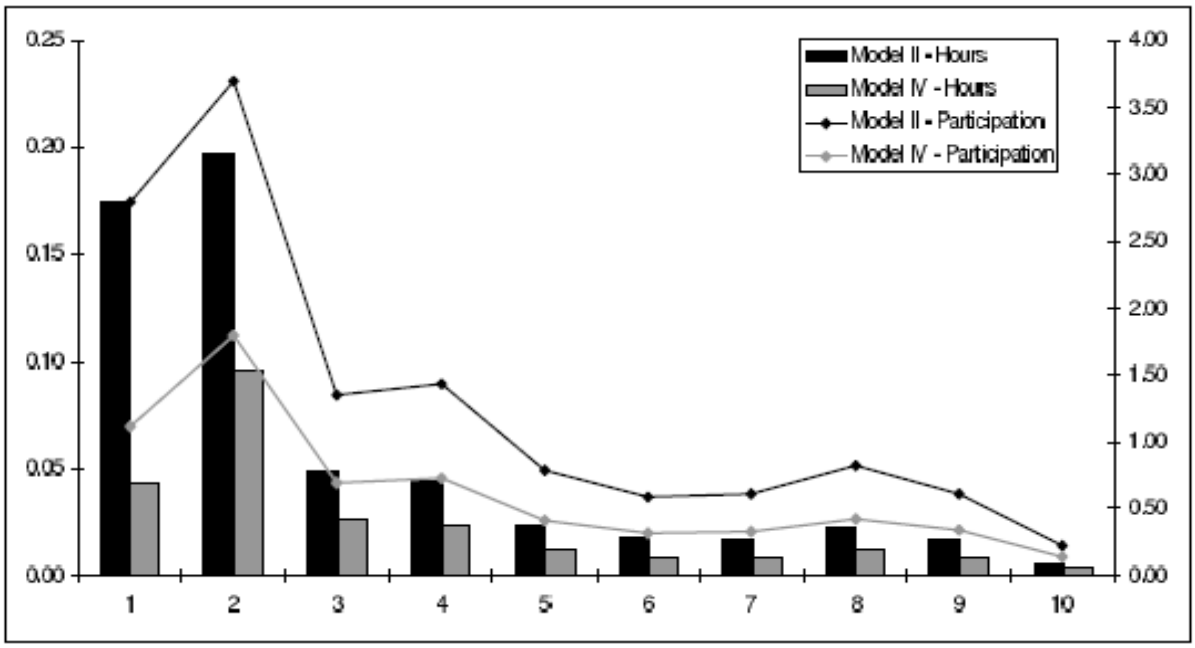


Table 5-10 presents the costs of the 2006 increase in the Workbonus. The first row shows the cost of the Workbonus as derived from official statistics. Based on the data of the Belgian National Social Security Office we have computed the reduction of revenue from social security contributions due to the 2006 expansion as the difference between the 2006 figure and the 2001 figure (inflated to 2006 values). In the second row we show the reduction in social security contributions simulated by MIMOSIS. This figure is derived simply by applying the 2006 rules on the 2001 baseline. The 443 million EUR predicted by MIMOSIS are close to the official figure of 481 million EUR, considering that the microsimulation model does not account for changes in demographic factors and other economic circumstances - including additional labour market participation induced by the benefit itself.

Once we account for behavioural adjustments, the cost increases substantially according to model II (524 million EUR), while model IV predicts an aggregate cost of 483 million EUR which is extremely close to the observed cost of the measure.[60]

TABLE 5-10 REDUCTION ON SSC REVENUE AND BUDGETARY COST

	Total budgetary cost
Official statistics[1]	481
Static microsimulation	443
Model II - after behavioural adjustment	524
Model IV - after behavioural adjustment	483

[1] Total spending on the measure in 2006 minus total spending in 2001 (expressed in 2006 values). Source: ONSS/RSZ.

Table 5-11 presents the cost per additional FTE unit and per additional participant of the 2001 and 2006 extensions, as well as the forecasted cost of the speculative further extension described above. The efficiency cost with respect to participation (total budgetary cost divided by the number of additional participants) is estimated to be in the range of 11430 EUR/year (model II) to 18404 EUR/year (model IV) for the 2001 Workbonus and in the range of 21015 EUR/year (model II) to 40330 EUR/year (model IV) for the 2006 Workbonus. Efficiency cost with respect to FTE units are very similar.

The above figures may be compared with estimates obtained for similar activation measures implemented in other EU countries. Orsini (2006b) reviews a series of evaluation of 'Making Work Pay': according to estimates based on the reviewed works the cost of activation ranges from about 250000 EUR/year for the WFTC to about 120000 EUR/year for the French PPE. Moreover it should be noted that some activation measures, as the German Mini-job reform despite having a positive effect on participation, they tend to have an overall negative effect on labour supply in terms of FTE. This is explained by the fact that the subsidy is targeted on some household income concept rather than on individual earnings or the wage rate.

The efficiency cost of a further extension of the Workbonus is predicted to be in the range of 45680 EUR/year (model II) to 65405 EUR/year (model IV). The result of the last simulation warn against the risk of marginally decreasing efficiency cost as the measure extends to medium and highly skilled workers. Nevertheless, when compared with the efficiency costs of other MWP policies, it could be argued that there is still room for a considerable extension of the instrument both with respect to the amount of the benefit and the extent of the eligibility. Finally the decision

[60] The change in revenue from social security contributions is not the true cost of the reform. Following the reduction in social security new participants would not only stop collecting their unemployment or income assistance benefits, but they also pay social security contributions and personal income taxes. These effects are not considered here.

to further expand the Workbonus calls for a clearer discussion of the aims of MWP policies (and their impact on income distribution) and calls for a discussion on how to finance the reduction in social security contributions. Moreover, extending the reduction in social security contributions would also mean shacking the insurance principle which is at the base of Bismarckian welfare states.

TABLE 5-11 COST PER PARTICIPANT AND FTE UNIT (EUR/YEAR)

	2001 Workbonus	2006 Workbonus	Extended Workbonus
Cost per additional participant (model II)	11430	21015	45680
Cost per additional participant (model IV)	18404	40330	65405
Cost per additional FTE position (model II)	12811	21284	47984
Cost per additional FTE position (model IV)	20807	41743	66768

5.7 CONCLUSIONS

In this application we have used MIMOSIS to evaluate ex-ante the effect of the Belgian Workbonus, a subsidy on social security contributions of employees aimed at supporting the employment of low skilled workers. In the first part of the application we have discussed and tested different specifications of the labour supply model. The first specification, based on a quadratic form, fails to capture the demand side and institutional constraints that drive the presence of part-time and full-time peaks in the distribution of hours supplied. The ad-hoc specification of the model as proposed by van Soest (1995) (model II) produced a good fit of the observed data, although the theoretical consistency of the labour supply model is not always respected. Moreover, although the model accounts in an ad hoc way for the availability and unobserved characteristics of jobs with different working hours, it assumes that the latter factors affect in the same way the utility of all workers, irrespective of their individual observed characteristics. Model III combined the quadratic specification of the utility function allowing for heterogeneity in the distribution of working opportunities. This model also produced a good fit but clearly shows the limitation of the quadratic specification of the utility. In fact, just like in model II, some cases are found to have a negative derivative of the utility with respect to leisure. More importantly, however, the share of households with negative derivative of utility with respect to consumption increases substantially. The quadratic model combined with heterogeneity in job opportunities gives rise to an over-parameterised model which fits the data extremely well, but fail to preserve economic consistency.

Model IV therefore uses a Box-Cox utility function. The latter is less flexible than the quadratic specification. Yet the theoretical consistency is not imposed ex-ante, but verified ex-post. Model II and model IV were both used for assessing the Workbonus. Although the predicted elasticities of model II seem unrealistically high in comparative perspective it is not possible to discriminate between the two specifications: both models give an acceptable fit of the data, but the level of the likelihood cannot be compared given the different specifications.

The 2006 increase in the Workbonus is likely to have increased participation by 13000 to 25000 units (according to model IV and model II respectively). Having computed the budgetary cost of the reform (before and after behavioural responses) it is possible to derive an efficiency measure of the Workbonus. In particular the cost per additional participant were estimated to be in the order of 21015 and 40330 EUR/year for model II and model IV respectively. Although the figures are quite different they are far below the estimated efficiency cost of instruments like the British WFTC (over 200000 EUR/year) or the PPE (around 120000 EUR/year).

The comparatively low efficiency cost could be advocated to demand a further expansion of the Workbonus. A speculative extension of the Workbonus to full time equivalent earnings up to 10000 EUR would still have considerable labour supply effects while keeping the efficiency cost for additional participant and/or additional FTE position comparatively low. An alternative scenario of course could imply a higher benefit with a slightly less sharp taper rate. Such a reform would continue to target the less skilled. Finally however, decision about the eligibility and level of the benefit must take into consideration distributive concerns, while also considering the potential effects of the progressive erosion of the insurance principle of the Bismarckian welfare state. The Belgian Workbonus remains so far a unique case of individualised subsidy based on the wage rate - rather than on earnings. This allows to target low skilled workers and screen out individuals with a higher preference for leisure. At the same time workers with higher wage rates cannot reduce their working time in order to enter in the benefit range.

It should be nevertheless stressed that the Workbonus is particularly suited for the Belgian economic and institutional framework: the presence of the minimum wage coupled with extremely centralised wage bargaining procedures reduce the risk that employers rip the benefit of the reform by offering lower gross earnings. The Belgian way to `Making Work Pay' should therefore deserve greater attentions by policy makers in European countries that share institutional and labour market characteristics comparable to the Belgian ones.

6 CONCLUSION

The microsimulation model MIMOSIS is a powerful tool for policy and other analyses. It covers a wide and detailed range of policy domains and rules and should thus be of great practical value to policy analysts and policy makers. But also scholars can benefit greatly from models such as MIMOSIS with its rich and very extensive dataset and the possibilities that (creative) use of MIMOSIS offers.

As stated in the introduction, the development of a model as wide in scope and detail as MIMOSIS demands ongoing work and effort. We therefore stressed that (at least some of) the simulation results should not be taken at face value. Often they are meant as indications of how MIMOSIS can be used and what it is capable of. Of course, this also implies that MIMOSIS still needs further refinement and that some of the results will be updated and explored in more detail and written down in a final version. This is especially true for the calculation of effective tax rates where still some adjustments need to be made to the code of MIMOSIS in order to give a reliable description of the distribution of effective tax rates among the population.

The same remark holds true for the labour supply models underlying the estimation of the behavioural reactions and hence the results in section 5. Some progress has already been made in this area but time constraints did not allow taking them up already in this report. Much of the work described here and much of the remarks made will be continued and dealt with rigorously in the new project "MIMOD".

Some of the original tasks of project AG/01/116 we were not able to finish, but they will be part of the new project "MIMOD". Work on the module for the *calculation* of pensions (PENSCALC-module) for example is in its final stages but preliminary results warranted further investigation. The current state of the module therefore did not allow it to be taken up in this report. A procedure for a recurrent update of the model and the data as they become available will also be part of the "MIMOD"-project.

7 REFERENCES

Aaberge, R., U. Colombino, and S. Strøm, (2004), Do More Equal Slices Shrink the Cake? An Empirical Investigation of Tax-Transfer Reform Proposals in Italy, *Journal of Population Economics*, 17, pp 767-785.

Aesness, J., Dagsvik, J.K., Thoresen, T.O. (2006), The Norwegian tax-benefit model system LOTTE, http://www.ssb.no/english/research_and_analysis/models/lotte_en/lottedescript.html.

Atkinson, A. B. (2000) A European Social Agenda: Poverty Benchmarking and Social Transfers, EUROMOD Working Paper EM3/00.

Atkinson, A.B. (2002) Evaluation of National Action Plans on Social Inclusion: the Role of EUROMOD, EUROMOD Working Paper EM1/02.

Atkinson, A.B., Bourguignon, F., O'Donoghue, C., Sutherland, H. and Utili, F. (2002) 'Microsimulation of Social Policy in the European Union: Case Study of a European Minimum Pension', Economica, pp. 69.229-243.

Atkinson, A.B., Cantillon, C., Marlier, E. and Nolan, B. (2005), Taking forward the EU social inclusion process - An independent report commissioned by the Luxembourg presidency of the Council of the European Union, http://www.ceps.lu/eu2005_lu/report/final_report.pdf

Baldini, M. (2001), Mapp98: un Modello di Analisi delle Politiche Pubbliche, http://www.capp.unimo.it/pubblicazioni/materiali_di_discussione/Mapp98.pdf.

Bargain O., (2004), Normative evaluation of tax policies: from households to individuals, IZA Discussion Paper No. 1441, available at SSRN: http://ssrn.com/abstract=643643

Bargain, O., and K. Orsini, (2006), In-Work Policies in Europe: Killing Two Birds with One Stone, *Labour Economics*, pp. 667-698.

Bargain, O., M. Caliendo, P. Haan, and K. Orsini, (2005), 'Making Work Pay' in a Rationed Labour Market: the Mini-Job Reform in Germany, DIW Working Paper, No. 536.

Bianchi, C., Romanelli, M., Vagliasindi, P.A., Retirement from the labour market and its social impact. Evidence from Italy using dynamic microsimulation, http://www.labor-torino.it/english/research/labsim/wild/BianchiRomanelliVagliasindi.pdf.

Bingley, P., and I. Walker, (1997), The Labour Supply, Unemployment and Participation of Lone Mothers in In-Work Transfer Programmes, *Economic Journal*, 107, pp 1375-1390.

Bloemen, H., and A. Kapteyn, (2007), The estimation of utility consistent labor supply models by means of simulated scores, *Journal of Applied Econometrics*, forthcoming.

Blundell, R., A. Duncan, J. McCrae, and C. Meghir, (2000), The Labour Market impact of the Working Families Tax Credit, *Fiscal Studies*, 21, pp 75-104.

Blundell, R., and T. MaCurdy, (1999), Labor Supply: A Review of Alternative Approaches, in Handbook of Labor Economics, Vol. 3A, ed. by O. Ashenfelter, and D. Card, pp. 1559-1695. Elsevier, Amsterdam, North Holland.

Bonin, H., W. Kempe, and H. Schneider, (2002), Household labor supply effects of low-wage subsidies in Germany, IZA Discussion Paper, No. 637.

Bourguignon, F., Spadaro, A., (2006), Microsimulation as a tool for evaluating redistribution policies, *Journal of Economic Inequality*, 4(1), pp. 77-106

Callan, T. e.a. (2000), Basic Income in Ireland: A Study for the Working Group on Basic Income. Final Report, http://www.taoiseach.gov.ie/upload/byphase1.june00.doc.

Carone, G., Immervoll, H., Paturot, D., Salomäki, A., (2004), Indicators of unemployment and low-wage traps (marginal effective tax rates on employment incomes, OECD Social, Employment and Migration Working Paper No. 18, Paris: OECD.

Carpentier, S., Cantillon, B., Van Den Bosch, K. en Verbist, G. (2006), Een analyse van de noodzakelijke voorwaarden om indicatoren beleidsanalytisch te gebruiken in het kader van de Belgische nationale actieplannen sociale insluiting, in *Belgisch Tijdschrift voor Sociale Zekerheid*, 3e trimester, pp. 327-365.

Creedy, J., and G. Kalb, (2005), Discrete Hours Labour Supply Modelling: Specification, Estimation and Simulation, *Journal of Economic Surveys*, 19, pp 697-734.

Dagsvik, J., and S. Strøm, (1989), A Labour Supply Model for Married Couples with Non-convex Budget Sets and Latent Rationing, Central bureau of statistics. discussion paper.

Dagsvik, J., and S. Strøm, (2004), Sectoral Labor Supply, Choice Restrictions and Functional Form, Statistics Norway Discussion Papers, No. 338.

Dagsvik, J., and S. Strøm, (2006), Sectoral Labour Supply, Choice Restrictions and Functional Form, *Journal of Applied Econometrics*, 21, pp 803-826.

Dagsvik, J., and Z. Jia, (2007), An Alternative Approach to Labor Supply Modelling, Emphasizing Job-type as Choice Variable., Mimeo.

De Beer, P. (1998), Een stroommodel van de arbeidsmarkt. Voorstudie naar de mogelijkheden, beperkingen en wenselijkheden, http://www.scp.nl/boeken/1998010101/Een_stroommodel_van_de_arbeidsmarkt.pdf.

De Vos, M., and J. Konings, (2007), D'une sécurité de l'emploi vers une sécurité du travail. Idées faveur d'un New Deal pour l'emploi en Belgique, Itinera paper.

Decoster A., Delhaye P. and Van Camp G. (1996), Users' Guide for ASTER. A Microsimulation Model for Indirect Taxes, Version 2, Public Economics Research Paper, nr. 48.

Decoster A., Rober D. and Van Dongen H. (1994), Users' Guide for ASTER. A Microsimulation Model for Indirect Taxes, Public Economics Research Paper nr. 36, C.E.S. (K.U.Leuven), 44 p.

Duncan, A. (2001), Microsimulation and Policy Setting in the United Kingdom, http://www.cerc.gouv.fr/meetings/seminaireoctobre2001/intervention1.doc.

Duncan, A., and C. Giles, (1996), Labour Supply Incentives and Recent Family Credit Reforms, *The Economic journal*, 106, pp 142-155.

Eissa, N., and H. Hoynes, (2004), Taxes and the Labor Market Participation of Married Couples: The Earned Income Tax Credit, *Journal of Public Economics*, 88, pp 1931-1958.

Eissa, N., and J. Liebman, (1996), Labor Supply Response to the Earned Income Tax Credit, *Quarterly Journal of Economics*, 111, pp 605-637.

Eklind, B., Löfbom, E. (2004), Reducing the need for social assistance by fifty per cent – a goal for Sweden between 1999 and 2004, http://www.h.scb.se/scb/Projekt/iariw/program/7Bsocialassmaj2.pdf.

Ericson, P., Fall, J. (2006), Tax Policy and Labour Market, http://www.snee.org/filer/papers/325.pdf.

EUROSTAT (2003), *DOC. E2/IPSE/2003* Working Group "Statistics on Income, Poverty & Social Exclusion": Laeken indicators – detailed calculation methodology.

Fasquelle, N. (2007), Perspectives financières de la sécurité sociale à l'horizon 2050, Bureau fédéral du Plan, forthcoming

Fasquelle, N. and S. Weemaes (1997), Perspectives financières de la sécurité sociale à l'horizon 2050, Planning Paper 83, Bureau fédéral du Plan, 1997

Festjens, M.-J. (1997), La réforme des pensions: une nouvelle génération, un nouveau contrat, Bureau fédéral du Plan, Planning Paper 82, 1997

Fuchs, M. (2005), AUSTROMOD/EUROMOD: An Adaptation of the Tax/Benefit Microsimulation Model EUROMOD to Austria. Distributional Effects of Implemented and Hypothetical Tax/Benefit Policy Changes in Austria 1998-2005, http://www.euro.centre.org/print_detail.php?xml_id=79.

Gastaldi, F., Liberati, P. (2000), Personal Income Tax and Child Allowances in Italy: a difficult interaction, http://selene.uab.es/mmercader/workshop/10 liberati.DOC.

Haan, P., (2006), Much ado about nothing: Conditional Logit vs. Random Coefficient Models for Estimating Labour Supply Elasticities, *Applied Economics Letters*, forthcomming.

Haan, P., and V. Steiner, (2005), Distributional Effects of the German Tax Reform 2000 – A Behavioral Microsimulation Analysis, Schmollers Jahrbuch - *Journal of Applied Social Science Studies*, 125, pp 39-49.

Haataja, A. (2003), Does Motherhood and Fatherhood still 'Pay' after the Policy Reforms of the 1990's in Finland?, http://www.natsem.canberra.edu.au/conference2003/papers/pdf/haataja_anita-1.pdf.

Hausman, J. A., and P. Ruud, (1984), Family Labor Supply with Taxes, *American Economic Review*, 74, pp 242-253.

Hillary, J. (2001), Tax Benefit Modelling in the Treasury, http://itm.bme.hu/dl/pénzinfo/5.%20Pénzinformatikai%20konferencia%20(2001)/Jude%20Hillary.pdf.

Immervoll, H., (2004), Average and marginal effective tax rates facing worker in the EU: a micro-level analysis of levels, distributions and driving factors, OECD Social, Employment and Migration Working Paper No. 19, Paris: OECD.

Immervoll , H., Kleven, H. J., Kreiner C. T., Saez, E., (2007), Welfare reform in European countries: a microsimulation analysis, *The Economic Journal*, 117(516), pp. 1-44

Immervoll, H., Sutherland, H. and De Vos, K. (2001), 'Reducing child poverty in the European Union: the role of child benefits', Chapter 16 in Vleminckx K, T M Smeeding (eds) Child Poverty, Child Well-being and Child Policy in Modern Nations: What Do We Know?, The Policy Press, Bristol.

Joyeux, C. (1998), Modété: Un modèle de microsimulation pour la Belgique, *Cahiers Economiques de Bruxelles*, 158, 2e trimester: 203-227.

Kornstad, T., Thoresen, T.O. (2004), Means-testing the child benefit, http://www.blackwell-synergy.com/doi/pdf/10.1111/j.0034-6586.2004.00110.x.

Lalive, R., van Ours, J., Zweimüller, J. (2006), How changes in financial incentives affect the duration of unemployment, *Review of Economic Studies*, vol. 73 (4), pp.1009-1038.

Larmuseau, H., Lelie, P., (2001), Financiële inactiviteitsvallen in de sociale zekerheid en de sociale bijstand. Een inventaris, *Belgisch Tijdschrift voor de Sociale Zekerheid*, 1ste trimester 2001, 5-78

Legendre, F., Lorgnet, J.P., Thibault, F. (2001a), MYRIADE: le modèle de microsimulation de la CNAF. Un outil d'évaluation des politiques sociales, http://www.caf.fr/web/WebCnaf.nsf/090ba6646193ccc8c125684f005898f3/788d9c30dd2de75bc1256e5b00486ffb/$FILE/RP66-MYRIADE,%20le%20mod%C3%A8le%20microsimulation%20CNAF.pdf.

Legendre, F., Lorgnet, J.P., Thibault, F. (2001b), Les modèles socio-économiques de microsimulation. Panorama et état des lieux pour la France, http://www.caf.fr/web/WebCnaf.nsf/090ba6646193ccc8c125684f005898f3/c7540ddf9b7d1257c1256e5a005107ce/$FILE/Les%20mod%C3%A8les%20socio-%C3%A9conomiques%20de%20microsimulation.pdf.

Levy, H. (2003), Tax-benefit reform in Spain in a European context: A non-behavioural and integrated microsimulation analysis. PhD Thesis, http://www.tdx.cesca.es/TESIS_UAB/AVAILABLE/TDX-1124104-170726//hlc1de1.pdf.

Maréchal, C., Paszukiewicz, A., Perelman, S., Van Camp, G., (2007), Adapting pensions to welfare : analysis of budgetary and ditributional effects using MIMOSIS, mimeo, CREPP, University of Liège

McFadden, D., (1974), Conditional Logit Analysis of Qualitative Choice Behavior, in Frontiers in Econometrics, ed. by P. Zarembka. Academic Press, New York.

Moore, M. P., and P. Ranjan, (2005), Globalisation VS Skill Biased Technological Change: Implications for Unemployment and Wage Inequality, *Economic Journal*, 115, pp 391-422.

Mot, E. (1991), Verkenning van microsimulatiemodellen: inventarisatie en aanbevelingen, Commissie Onderzoek Sociale Zekerheid.

Murat, F., Roth, N., Starzec, C. (2000), The Impact of Tax Benefit System Reforms Between 1990 and 1998 on Income Distribution in France: Evaluation by Microsimulation, http://selene.uab.es/mmercader/workshop/01%20starzec.DOC.

N. (2005), A New Pension Settlement for the Twenty-First Century (appendix f), http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/30_11_05_appendixf.pdf.

N., SESIM – Dynamic Microsimulation. What is SESIM?, http://www.sesim.org/.

Nelissen, J. (1993), The redistributive impact of social security schemes on lifetime labour income, Proefschrift, Tilburg University.

Nickel, S. (1997), Unemployment and labour market rigidities: Europe versus North America, *Journal of Economic Perspectives*, vol.11 (3), pp.55-74.

Nickell, S. (1997), Unemployment and labour market rigidities: Europe versus North America, *Journal of Economic Perspectives*, 11(3), pp. 55-74

Nickell, S., Nunziata, L., Ochel, W. (2005), Unemployment in the OECD since the 1960s. What do we know?, *The Economic Journal*, vol.115 (January), pp.1-27.

Nickell, S., Nunziata, L., Ochel, W., (2005), Unemployment in the OECD since the 1960s. What do we know?, *The Economic Journal*, 115(500), pp. 1-27

O'Donoghue, C. (2001), Dynamic Microsimulation: A Methodological Survey, http://www.beje.decon.ufpe.br/v4n2/cathal.pdf.

OECD (2004a), Denmark Country chapter 2001, http://www.oecd.org/dataoecd/22/53/34006427.pdf

OECD (2004b), Finland Country chapter 2001, http://www.oecd.org/dataoecd/22/54/34006599.pdf

OECD (2004c), Norway Country chapter 2001, http://www.oecd.org/dataoecd/24/1/34007241.pdf

OECD (2004d), Sweden Country chapter 2001, http://www.oecd.org/dataoecd/23/50/34007441.pdf

OECD (2005), Economic Survey – Belgium 2005, Paris.

OECD (2007), *Taxing wages 2005-2006*, Paris: OECD.

Orsini, K., (2006a), Is Belgium 'Making Work Pay?', Ces Discussion Paper, no. 06-05.

Orsini, K., (2006b), Tax and Benefit Reforms and the Labour Market: What can we Learn?, Ces Discussion Paper, no. 06-06.

Orsini, K., Decoster, A., Van Camp, G., 2007, Overlevingspensioenen en toegelaten arbeid: winnaars en verliezers bij de invoering van het generatiepactsysteem, in Van Den Troost, A. and Vleminckx, K., eds., *Een pensioen op maat van vrouwen*, Garant, Antwerpen-Apeldoorn.

Orsini, K., Decoster, A., Van Camp, G., Stop the Grief and Back to Work! An Evaluation of the Government's Plan to Activate Widows and Widowers, forthcoming in *Cahiers Economiques de Bruxelles*

Peichl, A. (2006), The Distributional Effects of a Flat Tax Reform in Germany - A Microsimulation Analysis, http://www.cef-see.org/Peichl_Proceeds.doc.

Prats, M.M., Levy, H., Planas, M., EspaSim, http://selene.uab.es/espasim/eng.htm.

Redmond, G., Sutherland, H., Wilson, M. (1998), The Arithmetic of Tax and Social Security Reform: A User's Guide to Microsimulation Methods and Analysis, http://jasss.soc.surrey.ac.uk/3/1/review/hussenius.html.

Redway, H. (2003), Data Fusion by Statistical Matching, http://www.natsem.canberra.edu.au/conference2003/papers/pdf/redway_howard-1.pdf.

Russo, F. (2004), Vertical Equity and Welfare: Which Effective Redistribution? An Application to Italian Data, http://gemini.econ.umd.edu/cgi-bin/conference/download.cgi?db_name=IIPF60&paper_id=305.

Salomaki, A. (1996), 'Including Consumption Expenditure and Welfare Services in a Microsimulation Model', 93-109 in Harding, A. (ed.), *Microsimulation and Public Policy*, Amsterdam: Elsevier, 527 p.

Solera, C. (1999), Income Transfers and Support for Mothers' Employment: The Link to Family Poverty Risks. A comparison between Italy, Sweden and the U.K., http://www.lisproject.org/publications/liswps/192.pdf.

Standaert, I., Valenduc, C., (1996), Le modèle de micro-simulation de l'impôt des personnes physiques: SIRe, Ministère des Finances, Point d'appui Fiscalité, Research papers, No. 1

STATISTICS DENMARK (2005), The Law Model, http://www.dst.dk/HomeUK/Guide/documentation/Varedeklarationer/Emnegruppe/Emne.aspx?sysrid=1053&timespath=.

Sutherland, H. (ed.) (2001), EUROMOD: an integrated European Benefit-tax model. Final Report, http://www.iser.essex.ac.uk/msu/emod/publications/em901_cov.pdf.

van Ours, J.C., Vodopivec, M. (2006), How shortening the potential duration of unemployment benefits affects the duration of unemployment: Evidence of a natural experiment, *Journal of Labor Economics*, vol. 24 (2), pp.351-378.

van Soest, A., (1995), Structural Models of Family Labor Supply: A Discrete Choice Approach, *Journal of Human Resources*, 30, pp 63-88.

Van Soest, A., M. Das, and X. Gong, (2002), A Structural Labour Supply Model with Flexible Preferences, *Journal of Econometrics*, 107, pp 345-374.

Verbist, G. (2002), An inquiry into the redistributive effect of personal income taxes in Belgium, Doctoral dissertation, University of Antwerp.

Verbist, G. (2006), The Evaluation of Tax-Benefit Policies (PowerPoint presentation).

Verbist, G., Rombaut, K., (2007), Simulation of a time restriction on the entitlement to unemployment benefits using MIMOSIS, mimeo, CSB, University of Antwerp

Vermandere, C., and E. Stevens, (2002), Een volgende aflevering in het datawarehouse-feuilleton, Over.werk no. 1-2/2002.

Viitamäki, H. (2004), EUROMOD Country Report Finland (1998, 2001 and 2003 Tax Benefit Systems), Microsimulation Unit, Essex University, http://www.iser.essex.ac.uk/msu/emod/countries/finland/cr980103fi0904.pdf.

Wagenhals, G. (2004), Tax-benefit microsimulation models for Germany: A Survey, *http://www.uni-hohenheim.de/RePEc/hoh/papers/235.pdf*.

Zaida, A., Rake, K. (2001), Dynamic Microsimulation Models: A Review and Some Lessons for SAGE, http://www.lse.ac.uk/collections/SAGE/pdf/SAGE_DP2.pdf.