# FINAL REPORT PROJECT AG/01/116
# VALORISATION OF THE MICROSIMULATION MODEL FOR SOCIAL SECURITY MIMOSIS
## Part 3

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# INTRODUCTION

This report is part of the output of the project AG/01/116. 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.

The following text contains section 4 and section 5 of the overall report of the project AG/01/116. This text presents 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.

# 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]

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

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:

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

Here $Y_{net}^{x}$ and $Y_{gross}^{x}$ are household disposable and gross income respectively when individual $i$ enters the labour market works $x$ hours a week; $Y_{net}^{0}$ and $Y_{gross}^{0}$ 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; $\Delta PIT$ are the changes in personal income taxes; $\Delta SSC$ are the changes in social security contributions; $\Delta FB$ are changes in family allowances; $\Delta SB$ are changes in other social benefits; and $\Delta SA$ 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<br>- membership of an insurance fund for the last year is required, as is the payment of the membership fee<br>- 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<br>- membership of an Unemployment Insurance Society for the last 12 months is required, as is the payment of the membership fee<br>- 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<br>- 82% of the maximum monthly benefit for the unemployed who receive benefits after studies<br>- 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<br>- 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)<br>- only available from the age of 20!<br>- benefit amount: €29.00 per day after full-time work or studies, proportionally lower after part-time work<br>- 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.

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[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.

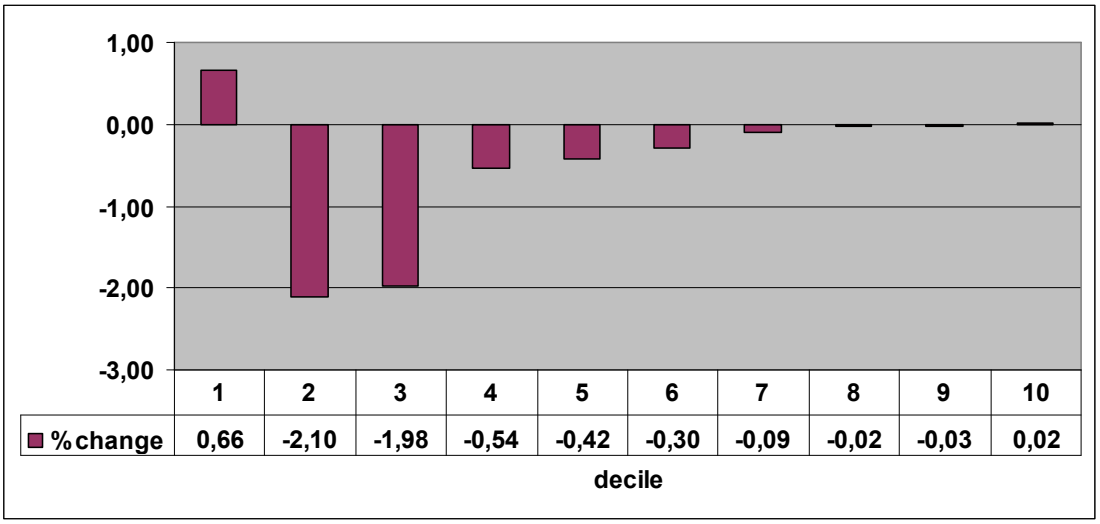
TABLE 4-12 EFFECT OF THE REFORM IN TERMS OF GLOBAL BUDGET FIGURES (CHANGE IN BILLION EURO AND AS % OF PRE REFORM)

| | 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.

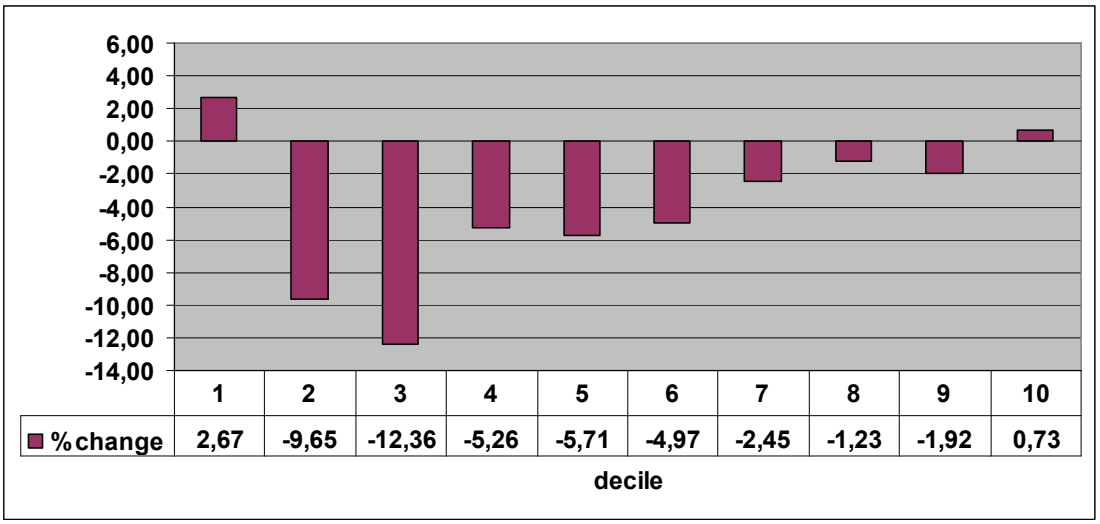
FIGURE 4-1 CHANGE IN DISPOSABLE INCOME OF ENTIRE POPULATION AFTER SOCIAL TRANSFERS PER INCOME DECILE (DURATION RESTRICTION TO 6 MONTHS)




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.

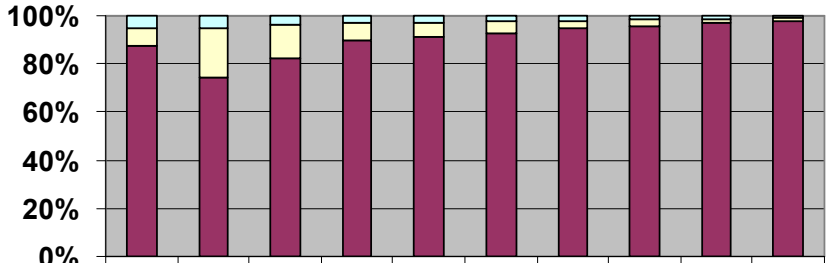
[45] The disposable income is obtained by summing up all incomes of all individuals in a household and by subtracting the personal income taxes paid by all members of that same household. We then divide this disposable income by an equivalence scale. The equivalence scale is 1 for the first member of 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

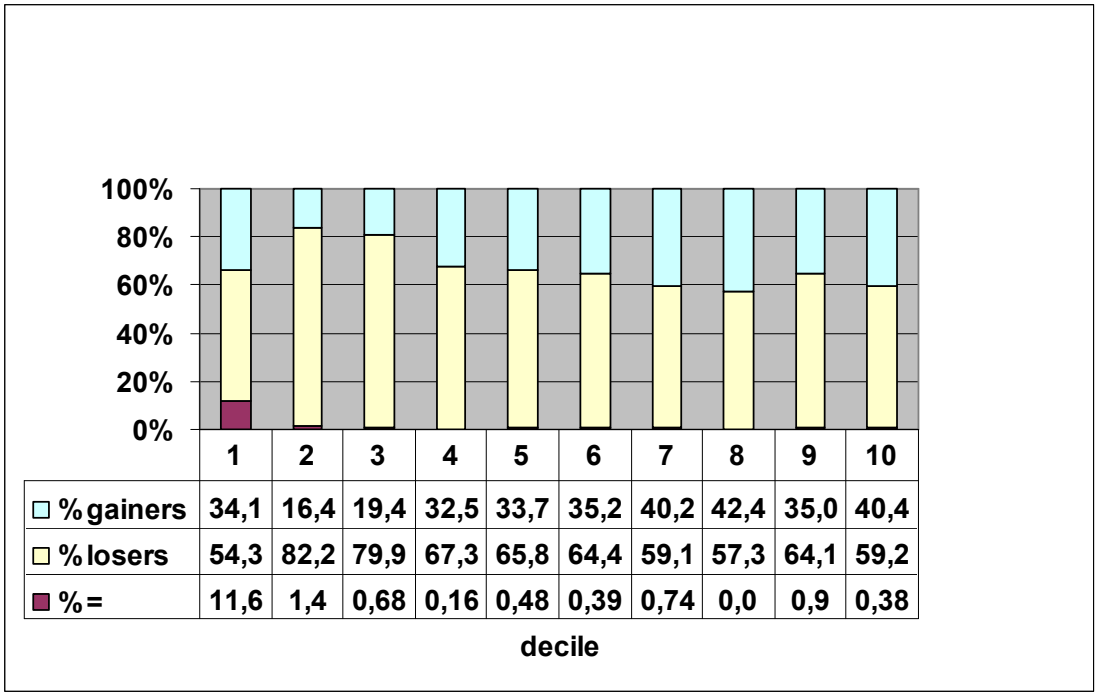



| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| % gainers | 5,4 | 4,9 | 3,5 | 3,1 | 3,1 | 2,5 | 2,0 | 1,8 | 1,2 | 0,8 |
| % losers | 7,0 | 20,5 | 14,1 | 6,9 | 5,6 | 4,6 | 3,0 | 2,3 | 1,9 | 1,2 |
| % = | 87,7 | 74,6 | 82,4 | 90,0 | 91,3 | 92,8 | 95,1 | 95,9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

decile

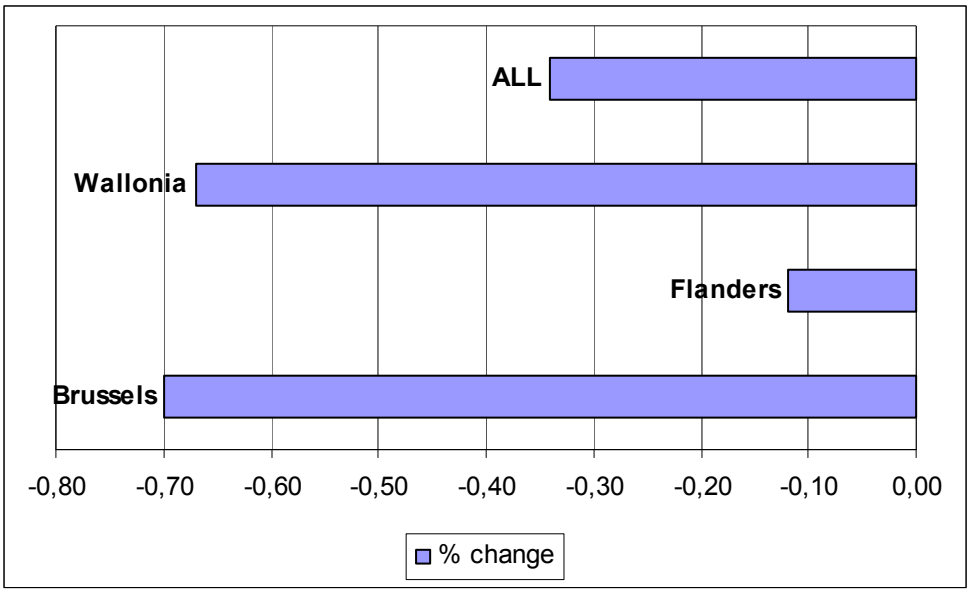
When we look at gainers and losers of the reform for the group of unemployed workers itself, we find the highest percentage of losers among the lower deciles (Figure 2bis): 82.2% of individuals in the second decile and 79.9% of individuals in the third decile see their incomes decrease as a consequence 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



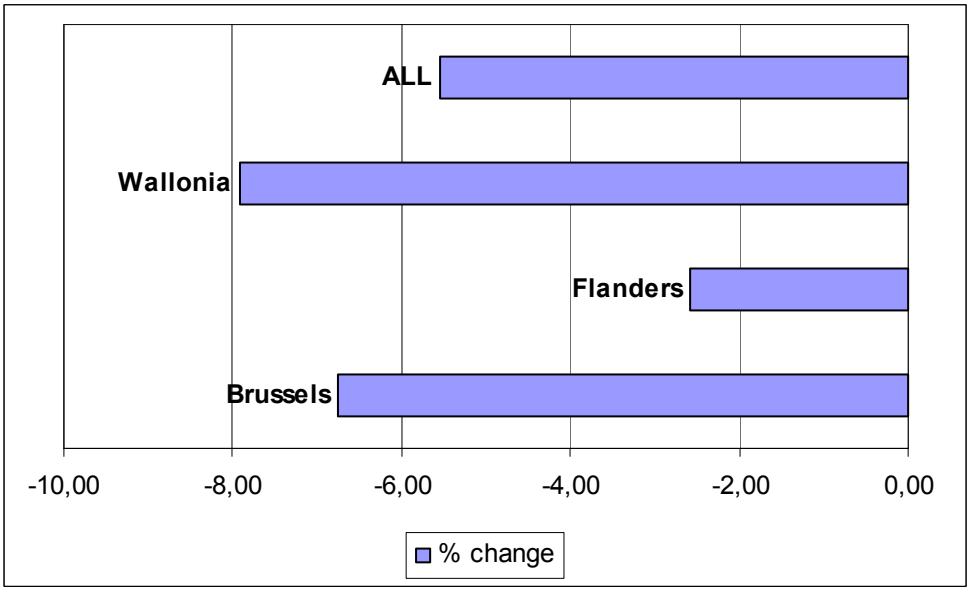

The reform has a different effect in the various regions, which is closely linked to regional differences in incidence of unemployment benefits. When looking at the change in disposable income after reform by region (Figure 4-5), we find that Wallonia (-0.67%) and Brussels (-0.70%) have the highest change. 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;<br>50 € for household pensions above the minimum;<br>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.

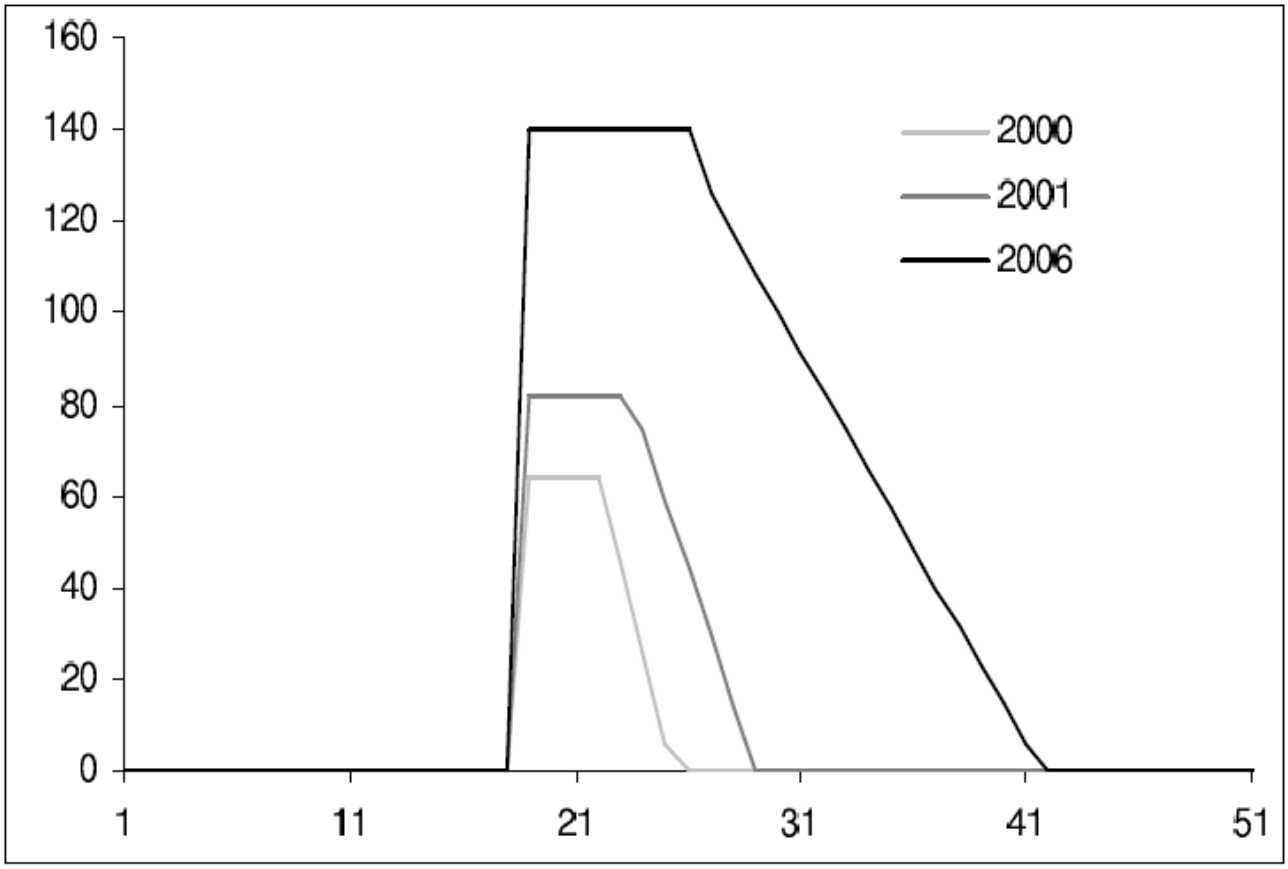
[55] The French Prime Pour l'Emploi (PPE) share similar features, but the amount of the benefit is also a function of the family situation and the scaling with respect to working time is not linear, so that the benefit still delivers a part-time premium (Orsini, 2006b).

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 $z = 1, 2, \ldots$ 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

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

[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 $\alpha_c$, $\alpha_f$ and $\alpha_m$ 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 $\beta_k$ 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:

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

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 $\left( C, L_f, L_m \right)$. Just like in the quadratic specification, some coefficients, namely $\beta_f$ and $\beta_m$ 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

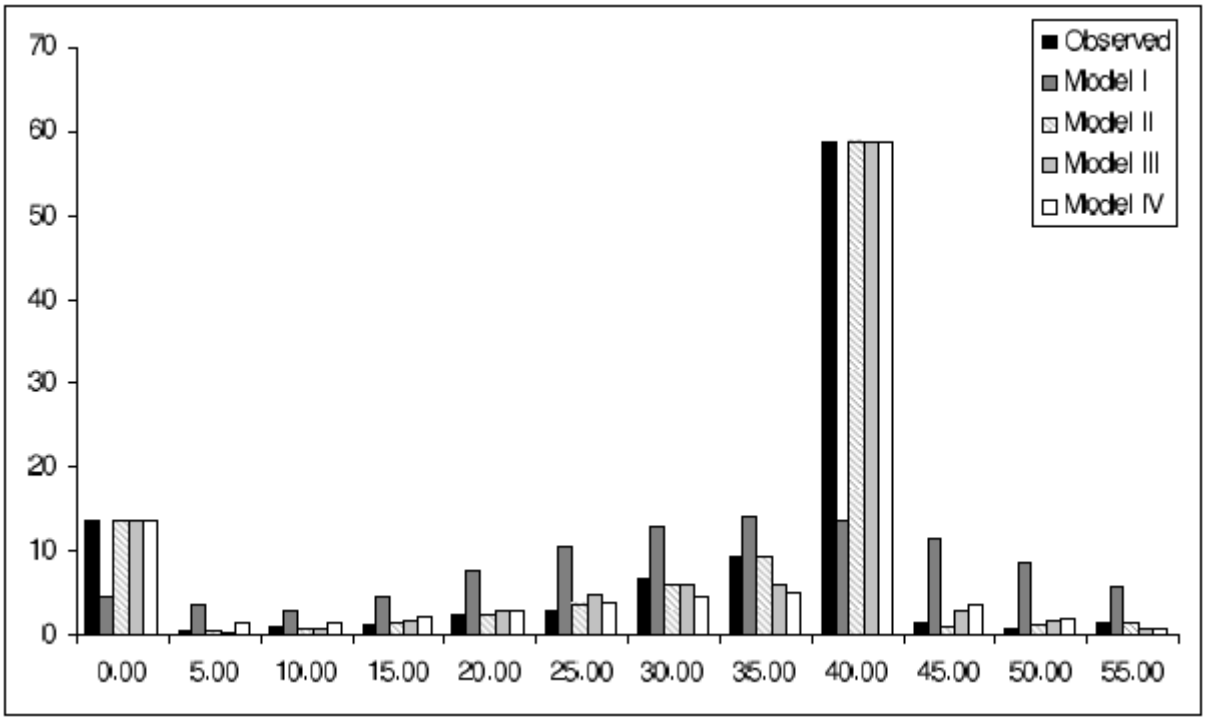


FIGURE 5-3 OBSERVED AND PREDICTED FREQUENCIES: FEMALES IN COUPLES

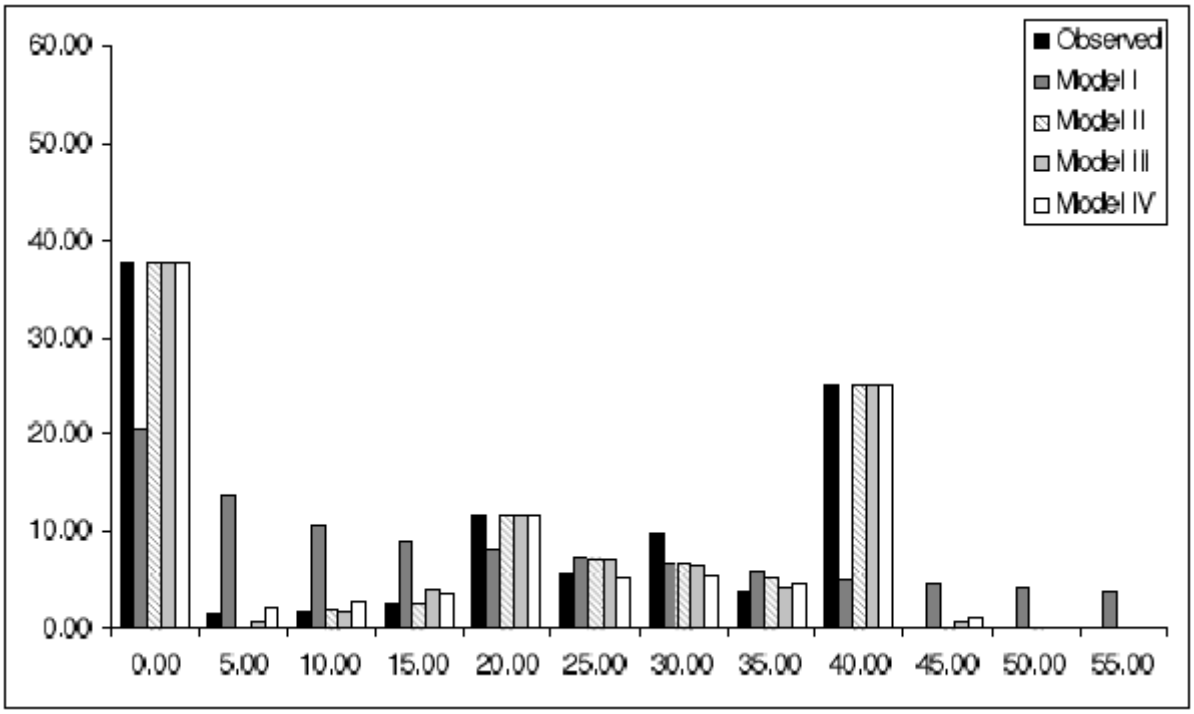



FIGURE 5-4 OBSERVED AND PREDICTED FREQUENCIES: SINGLE MALES

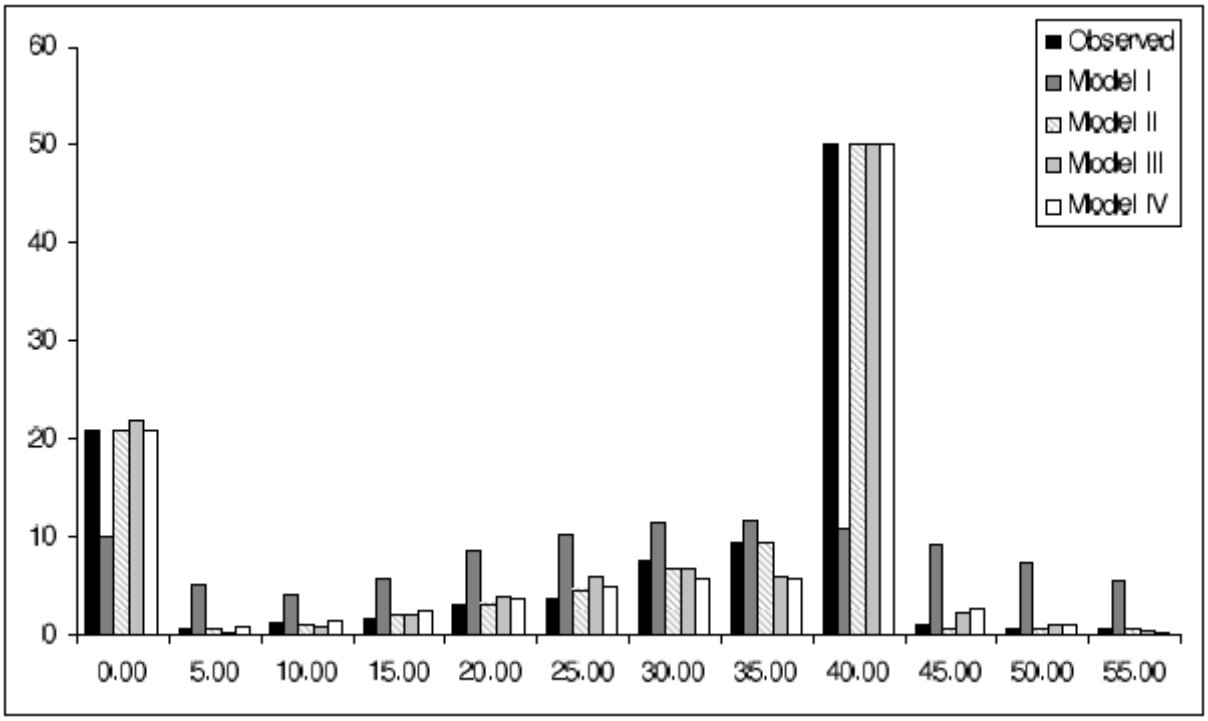
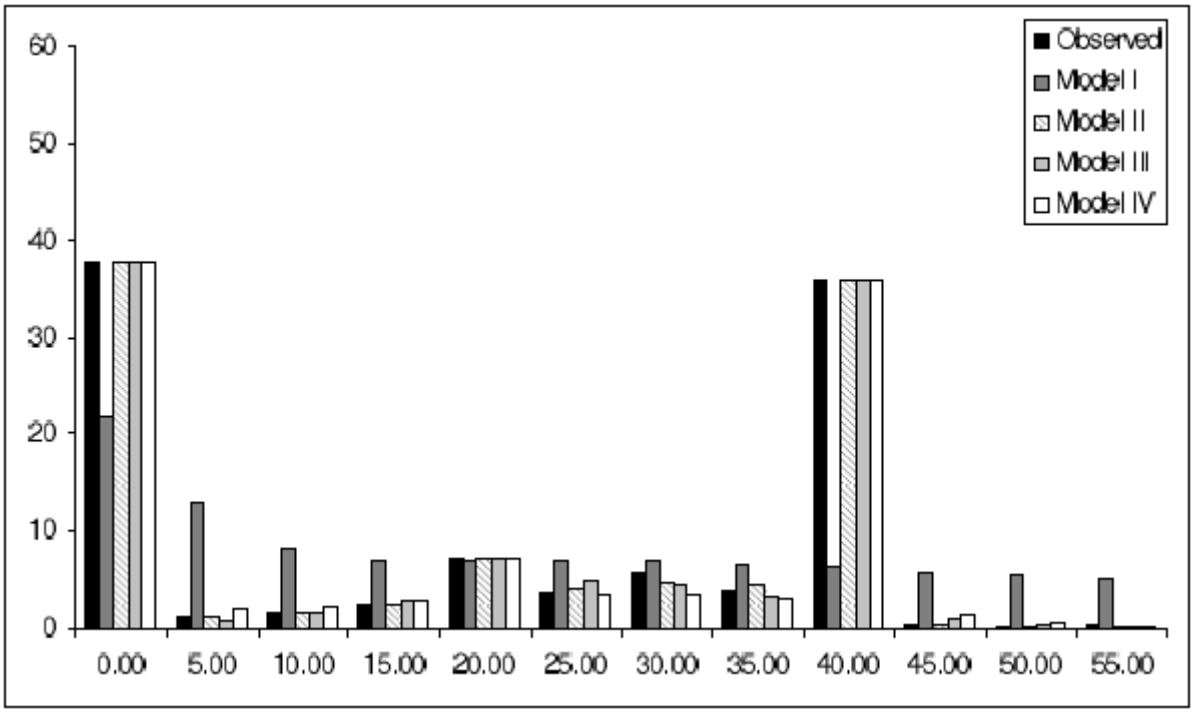


FIGURE 5-5 OBSERVED AND PREDICTED FREQUENCIES: SINGLE FEMALES




### 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

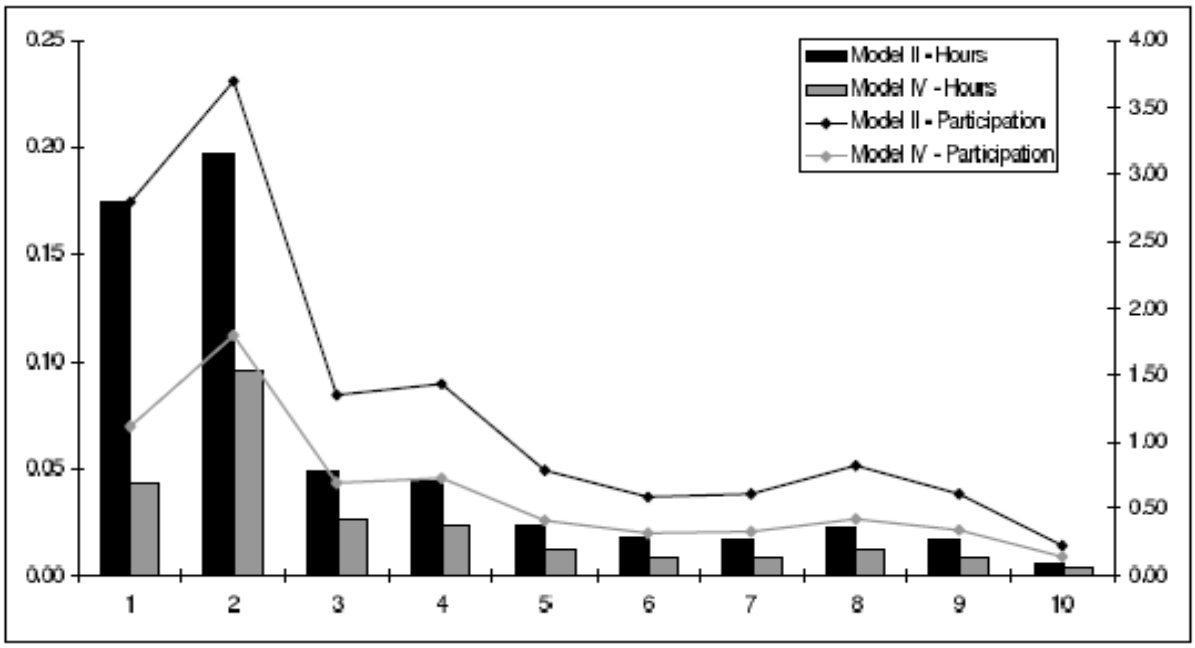



Table 5-10 presents the costs of the 2006 increase in the Workbonus. The first row shows the cost of the Workbonus as derived from official statistics. Based on the data of the Belgian National Social Security Office we have computed the reduction of revenue from social security contributions due to 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.

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