EFFECTIVE AVERAGE AND MARGINAL TAX RATES IN THE BELGIAN TAX BENEFIT SYSTEM

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Abstract: Macro-economic calculations and international comparisons have shown that Belgium is amongst the countries with the highest tax burden. Such macro-economic numbers, however, neglect to some extent the many complexities that are often characteristic of tax-benefit systems, especially a rather complex one such as the Belgian system. To analyze in depth the tax benefit system in its full complexity, this report relies on the microsimulation methodology.

By means of the microsimulation model MIMOSIS, running on a large administrative dataset, we calculate and simulate taxes, social security contributions and disposable incomes for a large representative sample of the population. In this respect the current report can be seen as a complement to the yearly OECD publication "Taxing Wages" where a limited number of household typologies are studied on hypothetical data and quantifying only the incentive to supply more hours.

We sketch a detailed picture of the current tax burden on labour, implicit in the Belgian tax benefit system. In the simulation part we calculate counterfactual taxes, social contributions and disposable incomes, for a range of working hours. This allows investigating the incentive structure of the current system, taking into account interactions between benefits received, means testing, or progressivity of the rates in the personal income tax system. We look at both the incentive to participate in the labour market as the incentive to supply more hours.

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1 INTRODUCTION

As necessary as taxes are, as diverse are the tax systems prevalent in the many countries of the developed world. Focusing on the personal income tax system, they range from quite simple systems with only one rate and a base allowance, as in some countries in Eastern Europe, to highly complex non-linear systems with many deductibles and other exceptions and loopholes. The Belgian personal income tax system system is an example of a rather complex system that has a progressive rate schedule combined with numerous rules for deductions and reductions based on demographic characteristics (e.g. number of children), physical characteristic (e.g. being disabled), socio-economic characteristics (e.g. being unemployed, pensioner, …), or other item-related deductions and reductions, such as mortgage payments, installation of solar panels, third pillar pension system contributions, charitable gifts, and numerous other deductible expenditures, mainly related to environmentally friendly investments/purchases.

Most of these deductions and reductions can probably be viewed as a way for the government to implement policy objectives, such as the protection of vulnerable groups through lower taxes, or as a means to stimulate certain behaviour, such as labour force participation, energy conservation, homeownership, childbearing, etc. However, these many rules make the tax system complex. Especially the interaction of eligibility criteria for different deductions and/or reductions or means testing of benefits or tax reductions make it quite difficult to uncover the implicit or effective average and marginal tax rates faced by individuals. Therefore, looking at the statutory tax rates is insufficient to reveal the redistributive and incentive aspects inherent in a tax-benefit system. This is the starting point of the analysis in this research report.

To analyze in depth the tax benefit system in its full complexity, this report relies on the microsimulation methodology. By means of a microsimulation model running on a large administrative dataset, we calculate and simulate taxes, social security contributions and disposable incomes for a large representative sample of the population. This allows sketching a very detailed picture of the current tax burden on labour, implicit in the Belgian tax benefit system. In the simulation part we also calculate counterfactual taxes, social contributions and disposable incomes, for a range of working hours. This allows investigating the incentive structure of the current system, taking into account the different interactions between benefits received, means testing, or progressivity of the rates in the personal income tax system. Needless to say that this incentive structure plays an important role in the decision to participate in the labour market, or to increase the number of hours worked. Note that in this report, we confine ourselves to the descriptive part of the analysis. In a companion second report of this research project, we use the same data and microsimulation model to estimate a

behavioural model of labour supply and to evaluate some possible reforms in the incentive structure of the system (Decoster, De Swerdt and Van Camp 2010).

The specificity of the results presented here, lies in the broad scope of the underlying database on which we calculate average and marginal tax rates. The microsimulation methodology combines the full heterogeneity of the population with the complexity of the tax system. It is this combination which differentiates our results from the by now standard and yearly OECD publication Taxing Wages (OECD, 2009). The OECD calculations are 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). This 'typical family' approach certainly has its own merits: results can be pinned down to explanatory variables of well defined cases, and besides the tax calculator itself, one does not need underlying micro-data. But inevitably, the question arises how representative these cases are. This is where our approach becomes complimentary to the OECD-approach. The point is less whether we can produce cases where we find inactivity traps. The real question is whether these cases are exceptional or widely prevalent. In this report we therefore perform a much more refined and in-depth analysis of the incentive effects hidden in the Belgian tax-benefit legislation. As sort of a comparative analysis we also describe the change of effective tax rates and incentive effects that occurred between 2001 and 2009.

In our description we will distinguish between three different concepts: the average tax rate, the participation tax rate and the marginal tax rate at the intensive margin. We will use the average tax rate to illustrate how large the variation is of the tax wedge as published by the OECD. It is also the average tax rate which determines whether the tax system is overall progressive. For the description of the incentives within the system we use two marginal tax rates. The first one, the participation tax rate, is determined by the change in net disposable income if an individual switches from not working to participation in the labour market. In the labour supply literature, this is sometimes called the "extensive margin". The second marginal tax rate, is the one at the "intensive" margin. It is determined by the change in disposable income when the individual decides to work a bit more (e.g. one hour).

By calculating the 'fiscal burden' at the level of the individual or household, this report takes a very different stance than the often used macro approach, more particularly broad tax ratios as a percentage of GDP. Such tax ratios do not always relate the taxes to the relevant tax bases, and are more suited to measure the scope of the role the government (or 'non-market') plays in the economy. Since GDP also includes value added created by government activity itself, the macro figures are ill suited to measure tax burdens. Yet, even our micro calculations of effective tax rates, should in no way be seen as an approximation of the welfare losses as a result of taxation. For this we would have to incorporate much more information. The welfare loss essentially follows from the distortionary character of the tax instrument, and is

embodied in the concept of excess burden. To calculate this excess burden at the individual level, we would need to incorporate much more information, e.g. behavioural reactions, and we would have to compare the current tax situation with a revenue neutral non distortionary situation. This lies outside the scope of this report.

The remainder of the report is structured as follows. In section 2 we briefly describe the results of the OECD with respect to tax burdens in Belgium. Section 3 presents the tax benefit model and the underlying administrative dataset used to calculate taxes and benefits at the individual and household level. In section 4 we give a description of the tax burden facing individuals in 2001 and 2009 based on the microsimulation model MIMOSIS and the detailed administrative dataset underlying this model. Section 5 describes the concept of participation tax rates in more detail. In this section we start from a general overview to finally come to an analysis of participation tax rates for the currently inactive population, i.e. what are the (dis)incentives for this group to enter the labour market. In section 6 we present results for marginal tax rates first based on a simulation of the budget constraint facing households, and subsequently through an analysis of marginal tax rates from the perspective of the currently working population, i.e. what marginal tax rate do they face if they were to work one hour more, or , more generally, if their gross labour income were to increase by a certain percentage, e.g. as a result of a promotion or a change of jobs. Finally, section 7 contains some conclusions and suggestions.

2 TAX BURDENS IN BELGIUM: OECD FINDINGS

As stated in the introduction looking at the statutory personal income tax rates to get an idea of the incentive structure or the burden of a tax system is misleading as the tax-benefit system is more than personal income taxes alone. Many policy domains are interwoven and the effects on disposable income by changing labour market behaviour are not always as straightforward, especially when labour market income is combined with (means-tested) benefits. Such interactions are typically well captured by micro-simulation models that aim to model the complexities of tax-benefit system as closely as possible. Such models can be used to run a) either on hypothetical data or b) on survey or administrative data that are representative of the population being analyzed. Option a) is the one used by the OECD in its yearly publication "Taxing wages" (OECD, 2009, see also Carone et al., 2004, and Immervoll, 2004). From section 3 onwards in this report, we will switch to option b) to analyze the Belgian tax-benefit system.

The OECD calculations are 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. All taxes are calculated at the household level, taking into account all the interactions between spouses' earnings and the consequences thereof in the tax-benefit legislation. Implicit in this methodology is the assumption that work decisions are made at the household level.

The OECD methodology has the advantage that it provides a good and clear description of the statutory system, especially if one were to draw out the budget constraint for that specific case. It is easier to pin down inactivity traps in the tax-benefit legislation. An inactivity trap occurs when the marginal tax rate exceeds a certain percentage, usually around 80 to 85%, making the extra euro earned not worth the effort.

The representativeness of the typical cases might be questionable, however. Moreover, the OECD does not calculate budget constraints for the typical households that they study. A marginal tax rate is calculated following a 1% increase in gross wage earnings. This is the marginal tax rate at the so called 'intensive' margin, that is, for people that are already working and see their wages increased. As such, the OECD study does not take into account the marginal tax rates faced by currently inactive individuals, the tax rate at the 'extensive' margin or participation tax rate. Assessing the latter requires one to simulate taxes and benefits at different levels of hours worked and compare the resulting disposable income with the disposable income in the base scenario where the individual is not actively participating in the labour market. As will become clear in subsequent sections simulating the budget constraint is a valuable tool to assess inactivity traps, especially of individuals that are currently not participating in the labour market (see section 5).

The 'tax wedge' in the OECD publications is defined as the sum of income tax, employee and employer social insurance contribution expressed as a percentage of labour costs. Labour cost is defined as gross wages plus employer social insurance contributions, i.e. the actual monetary cost to the employer of employing the employee. According to the latest OECD publication, in Belgium this tax wedge amounts to 56% for a single person without children who earns the average wage. The burden borne by employee, i.e. income tax plus social insurance contributions expressed as a percentage of his or her gross wage, is 42.5%. The marginal tax rate is calculated at the intensive margin by the OECD, and amounts to 55%.

TABLE 1 TAX BURDEN IN BELGIUM IN 2008 ACCORDING TO OECD

	single	single	single	single	married	married	married	married
	no ch	no ch	no ch	2 ch	2 ch	2 ch	2 ch	no ch
% of average wage	67	100	167	67	100-0[1]	100-33[1]	100-67[1]	100-33[1]
income tax plus sic employee and employer as % of total labour cost	50.3	56.0	61.1	35.9	40.8	41.8	48.6	48.5
income tax plus sic employee as % of gross wage earnings	36.0	42.5	49.3	30.6	31.3	33.4	38.5	35.2
income tax as % of gross wage earnings	22.1	28.5	35.2	16.7	17.3	22.6	24.5	24.5
marginal tax rates as % of gross wage earnings	54.9	54.9	60.9	54.9	54.9	54.9	54.9	54.9

Note: ch=children; sic=social insurance contributions

1. two earner families: first number % of average wage of principal earner, second number % of average wage of secondary earner

Source: OECD (2009)

The different columns illustrate the way in which the OECD calculations try to incorporate the heterogeneity of population into the calculations. They replicate the calculation of the tax wedge and the marginal tax rates for three different wage levels (1/3rd below the average wage, and 2/3rd-s above) and for other demographic situations. Focusing first on the single without children, it will not come as a surprise that the tax burden varies considerably with the gross wage level. The tax wedge goes up to 61% for the high wage earner, and also the marginal tax rate experienced by the employee at this level is 61%. The average tax level for the employee is 49.3%. The tax burdens are also quite sensitive to the socio-demographic status of the tax unit. Comparing a married couple with two children to a single, where the single and the first income earner in the couple are both at the average wage level but the second earner in the couple is at 67%, reduces the tax wedge from 56% to 48.6% for the employer, and the tax burden for the employee from 42.5 to 38.5%.

In this report we investigate whether this rough picture of the tax-benefit legislation through the lens of quite specific household and individual situations can be generalized when the full heterogeneity of the population is taken into account. We will calculate the same concepts as the ones used in Table 1. But since we can use the MIMOSIS-model and especially the very detailed administrative dataset underlying it, this enables us to reveal the whole distribution of tax burdens across the population. We will be able to investigate more in detail the role of explanatory variables for the level of the tax wedge, or the average and marginal tax rates. We will especially focus on the identification of potential inactivity traps in the tax system and how they have

evolved between 2001, the year of the data, end 2009, the last year of tax-benefit regulation encoded in MIMOSIS.

3 DATA AND MODEL

In the next sections we sketch a detailed picture of tax burdens calculated at the micro level of a representative dataset. We therefore first briefly discuss the underlying dataset and the microsimulation model MIMOSIS.

3.1 DATASET OF THE MODEL MIMOSIS AND SAMPLE SELECTION FOR TAX WEDGE CALCULATIONS

The dataset underlying the microsimulation model MIMOSIS contains some 305000 individuals, drawn at random form the National Register, and representing a little less than 100000 households. The underlying dataset is based on detailed administrative data provided by several different administrative agencies. The advantage of using administrative data is the absence of measurement error and non-response, and the fact that these data are effectively used by the different public administrations to determine social security benefits and contributions and to calculate personal income taxes. Therefore the data also contain information on past employment histories, most often completely absent in survey information. The drawback of this administrative dataset is that it does not include non-declared incomes as well as the lack of some – often crucial - socio-economic variables, e.g. educational level. Moreover, the constructed dataset does not contain information on income from financial assets and real estate.

To describe the general tax system and the average tax burdens in this section we use all individuals in the sample. But simulating work incentives only makes sense though for individuals that are effectively available to participate in the labour market. Therefore, in section 5 and 6, where we present marginal tax rates, and especially participation tax rates, we only use those individuals that are actually or can potentially be active on the labour market.

Generally speaking all individuals aged 18 to 65 are available for the labour market. Of course, not all individuals in this group are actually available for the labour market. As such, to simulate work incentives, we have further restricted the sample by excluding all students and all sick and disabled that do not have an observed positive amount of hours worked in the dataset. Furthermore, we excluded self-employed from the simulation of participation tax rates. The reason is that for the participation tax rates, we need to simulate gross labour income and disposable income at different levels of hours worked and compare this with the situation where the individual does not work. To determine the gross labour income at a particular number of hours of

work, we need information on the gross hourly wage, and this is missing for the self-employed.

Summing up: when describing the general tax-benefit system, i.e. the tax burdens in this section, we have used the entire sample that underlies MIMOSIS. But if we investigate the work incentives inherent in the tax-benefit system we only retain individuals that are actually active on the labour market or that are potential candidates to enter or re-enter the labour market, e.g. unemployed, inactive individuals and early retired.

3.2 THE MICROSIMULATION MODEL: MIMOSIS

MIMOSIS is a microsimulation model for social security and personal income taxes. In essence it is an arithmetical model, i.e. a static model without behavioural responses.[1] It incorporates several domains related to social security and personal income taxation and the interactions between them.

The legislation applicable to the different policy domains is programmed in different *modules* using the Fortran programming language and allows for the (re)calculation of benefits received and taxes paid for each individual and/or household in the dataset. The different policy domains that are included in the model are family allowance, sickness and disability benefits, unemployment benefits, pensions, social assistance, social security contributions (payroll taxes), and personal income taxes.

Both the nature of the data and the scope of MIMOSIS, i.e. covering several different social security domains and including personal income taxes, set it apart from other Belgian microsimulation models such as MODÉTÉ which is based on survey data (Joyeux, 1998); MISIM which, as MIMOSIS, covers social security benefits and contributions and personal income taxation but is based on survey data (Verbist, 2002); and SIRe, a microsimulation model developed by the Ministry of Finance based on administrative fiscal data but only covering personal income taxation (Standaert and Valenduc, 1996). Another distinctive feature of MIMOSIS is that – in contrast to most other tax-benefit microsimulation models – it also allows to (re)calculate replacement incomes, such as unemployment benefits and pensions, since the data also contain information on past employment histories.

All policy domains have been parameterized as much as possible in separate ASCII files (parameter files) leaving considerable flexibility to the user in the choice of

[1] In a companion report of this research project, we use the same data and microsimulation model to estimate a behavioural model of labour supply and to evaluate some possible reforms in the incentive structure of the system (Decoster, De Swerdt and Van Camp 2010).

possible policy simulations.[2] The version of MIMOSIS used in this report allows implementing tax-benefit legislations of 2001 through 2009.

As already mentioned, the current version of the administrative data does not contain information on income from real estate or financial assets which influences the final amount of taxes paid. Take as an example mortgage repayments that are tax deductible to a certain extent. Other examples are contributions to private pension plans and remuneration in kind, both of which also have or can have an impact on the final tax liabilities. Finally, and as is common in most tax-benefit microsimulation models, MIMOSIS assumes full take-up of social assistance, often resulting in an overestimation of disposable income and an underestimation of poverty.

4 TAX BURDENS IN BELGIUM

In this section we describe the tax wedge and the variation of this tax wedge across the population. We use the relation between gross and net disposable income, calculated by the tax benefit model at the household level, to summarize the global tax benefit system in a stylized way by means of a regression. This also allows to sketch how progressive the tax system is. Finally we decompose the average effective tax rates at the household level into the contributions from personal income taxes, social security contributions and social benefits.

4.1 TAX WEDGE: A GLOBAL MEASURE OF TAX BURDEN

In many publications what is often referred to as tax burden is what we will call the tax wedge. It is the difference between the total cost to an employer for employing an employee and the disposable income the employee receives, expressed as a percentage of the labour cost for the employer. It includes the employer social insurance contributions, the employee social insurance contributions and the personal income taxes. In Table 1 above, the tax wedge is found in the first row. It shows that the OECD estimates the tax wedge somewhere between 35.9% to 61.1% as a percentage of the labour cost.

The question arises how dependent the results in table 1 are on the chosen typology of households. Moreover, the results in table 1 also discard eventual heterogeneity among households of the same type. Therefore, we display in Figure 1 a box-plot diagram of the tax wedge per wage decile for the years 2001 and 2009 for the subpopulation of wage earners.[3] The body of the candle represents the interquartile

[2] Structural changes in the tax-benefit legislation – i.e. changes which cannot be captured by the change of one or more parameters - cannot be simulated without changing the source code. An example would be the introduction of a means test in current family allowances and child benefits.

[3] In a couple both spouses have to be wage earners to be included in the subsample of Figure 1.

range, i.e. the mass between the 25th and 75th percentiles. The top of the upper whiskers corresponds to a value that exceeds the 75th percentile by an amount equal to 1.5 times the interquartile range, and the bottom of the lower whiskers corresponds to a value that is 1.5 times the interquartile range smaller than the 25th percentile. The horizontal bar within each of the boxes represents the median. The corresponding figures are in Table 2.

FIGURE 1 TAX WEDGE IN % OF LABOUR COST FOR 2001 AND 2009 FOR WAGE EARNER HOUSEHOLDS (IF COUPLE, BOTH ARE WAGE EARNER)

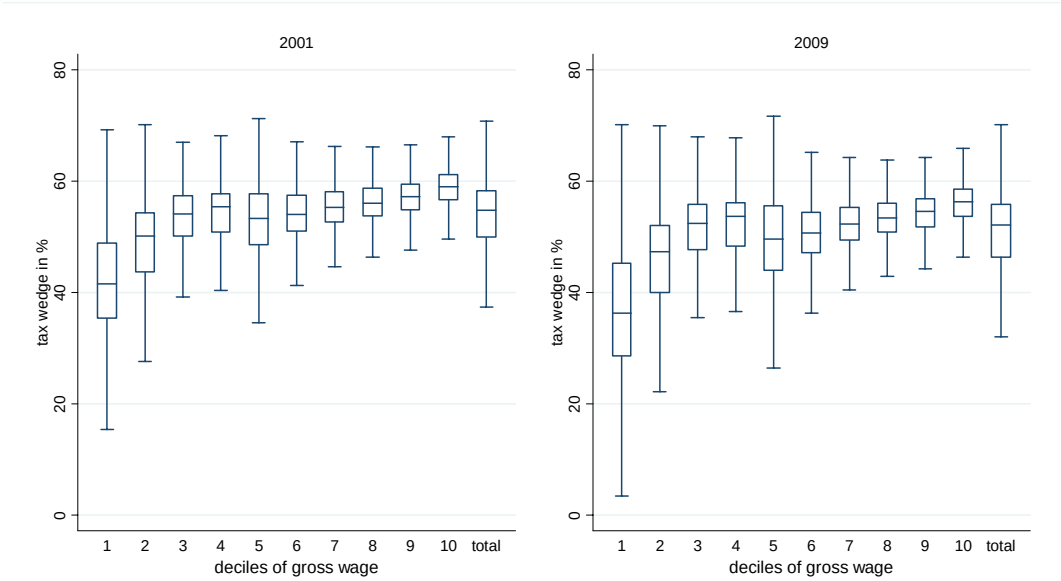


TABLE 2: TAX WEDGE PER DECILE OF GROSS WAGE

Decile of gross wage	2001 median (1)	2001 interquartile range (2)	2009 median (3)	2009 interquartile range (4)	change 2001 to 2009 median (5)	change 2001 to 2009 interquartile range (6)
1	41.5	13.6	36.3	16.8	-5.2	3.2
2	50.2	10.7	47.4	12.1	-2.8	1.4
3	54.1	7.3	52.4	8.2	-1.7	0.9
4	55.4	7.0	53.7	7.8	-1.7	0.9
5	53.3	9.3	49.6	11.7	-3.8	2.4
6	54.0	6.5	50.7	7.3	-3.3	0.8
7	55.3	5.4	52.3	6.0	-3.0	0.5
8	56.1	5.0	53.4	5.3	-2.7	0.3
9	57.2	4.7	54.6	5.0	-2.6	0.3
10	59.0	4.6	56.3	4.9	-2.7	0.3
all	54.8	8.3	52.1	9.6	-2.7	1.2

Figure 1 underscores the strength of a microsimulation model based on a representative sample of individuals and households. Clearly, there is considerable variation in the magnitude of the tax wedge, even within the same decile and when looking only at wage earner households. The median tax wedge went down from 54.8% in 2001 to 52.12% in 2009. But the variation has gotten larger: from 8.3% to 9.6%. The tax wedge increases with the gross wage, and the gradient is especially steep in the first three deciles. The lower wage deciles also show the largest variation with interquartile ranges of about 10 to 17 percentage points. The decrease in the tax wedge between 2001 and 2009 was outspoken for the lowest deciles. This reflects the measures introduced to lower the cost to employers of low-skilled workers. Other measures include the workbonus that reduces the social insurance contributions paid by lower earning employees and the introduction of a refundable, but limited, tax credit for children.

Proponents of the typical household methodology could argue that much of the variation within deciles is probably due to the differences in household structures. But Table 3 shows that this is not the case. If the tax wedge in percentage terms is regressed on explanatory variables such as the gross wage, household structure, region, and age we find that we can only explain less than 7% of the variation in tax wedges.

TABLE 3 REGRESSION COEFFICIENTS WITH AS DEPENDENT VARIABLE TAX WEDGE AS PERCENTAGE OF LABOUR COST

variable	2001		2009	
gross labour income (in 1000's)	0.08	***	0.10	***
age head	0.14	***	0.14	***
Brussels	-0.75	**	-0.13	
Wallonia	-0.72	***	-0.40	
couple, no children	-1.30	**	-1.38	**
couple, one child	-0.99		-1.20	
couple, two children	-1.56	**	-1.71	*
couple, three or more children	-5.94	***	-6.44	***
single, one child	-3.13	***	-3.99	***
single, two children	-5.65	***	-6.01	***
single, three or more children	-10.97	***	-19.96	***
married, no children	0.58		-1.21	**
married, one child	0.30		-1.43	***
married, two children	-0.78	**	-2.48	***
married, three or more children	-4.15	***	-6.39	***
constant	46.68	***	41.93	***
Adjusted R^2	0.0628		0.0684	
Number of obs.	22506		22506	

*** significant at 1% level
** significant at 5% level
* significant at 10% level

The constant in Table 3 shows that the tax wedge for singles without children, i.e. the reference group in Table 3, has decreased significantly between 2001 and 2009. The tax wedge increases with age, and decreases with the number of children in the household. Remarkably the effect of the regional dummies, indicating a significantly lower tax wedge in Wallonia and Brussels, has diminished in 2009 and is no longer statistically significant. Also the sign for being married has been reversed for couples with one or no children although the effect was not statistically different from zero in 2001.

The description of the tax wedge for a heterogeneous population has shown convincingly that it is worthwhile to look at the tax system and tax burden on the basis of micro data. In the next section we focus on the employee (and the household in general) by leaving out social insurance contributions paid by the employer.

4.2 THE GLOBAL TAX-BENEFIT SYSTEM: IS IT LINEAR?

In this section we focus on the tax benefit system from the perspective of the household, by defining the tax benefit system as the relationship which transforms gross income into household disposable income. To include the whole population (e.g. also pensioners) we define gross income as gross market income (i.e. including social security contributions paid by the employee), plus gross benefits received (i.e. including social security contributions paid by the recipient of the benefits). Disposable income equals this gross income concept minus social security contributions and personal income taxes.

Denoting gross income by Y, and disposable income by y, we define the global tax benefit system as:

$$T(Y) \equiv Y - y(Y) = t(Y), \tag{1}$$

where gross income is assumed to be exogeneously given.

In recent year it became quite popular to state that, despite the progressive rate structure in the personal income tax system, the Belgian tax benefit system is close to linear. To test this assertion, we use a specification which has proven to behave well empirically to fit existing tax systems:

$$T(Y) = Y - \alpha Y^{\beta}, \tag{2}$$

where α and β are the two parameters determining the shape of the net tax schedule, and T is total taxes and social insurance contributions paid at the household level.

We can easily derive expressions for the average and marginal tax rates from (2):

$$t(Y) = \frac{T(Y)}{Y} = 1 - \alpha Y^{\beta - 1}, \tag{3}$$

for the average tax rate and

$$t'(Y) = \frac{\partial T(Y)}{\partial Y} = 1 - \alpha \beta Y^{\beta - 1}, \tag{4}$$

for the marginal tax rate. Taking the derivative of the average tax rate in (3) w.r.t. income, quickly shows that the average tax rate will increase with gross income if $\beta < 1$. In that case the tax system is progressive. In the reverse case where $\beta > 1$, the tax system is regressive (an average tax rate which decreases with gross income), and if $\beta = 1$, the average tax rate is constant and the tax system is proportional.

Re-arranging terms and taking logarithms in equation (2), it is easily seen that the parameters α and β can be estimated by regressing disposable income linearly on gross income:

$$\ln(y) = \alpha + \beta \ln(Y). \tag{5}$$

If the coefficient β is not significantly different from one, the system can be said to be linear. If β is significantly different from one, however, the system is non-linear. Equation (5) also reveals that parameter β can be interpreted as the elasticity of net income with respect to gross income. The lower β, the less net income increases for a given percentage increase in gross income, and the more progressive the system.

The results of the estimations of equation (5) for the tax liabilities calculated with MIMOSIS, are given in Table 4. We show three different estimations for both the 2001 and 2009 systems. The basic regression is the one shown in equation (5). The other two regressions are extensions of (5) where demographic and socio-economic characteristics are taken into account in two different ways.

The first approach is to include other characteristics as simple shifts of the constant, that is, as separate dummy variables that are added to the right-hand side of (5) as in (6):

$$\ln(y) = \alpha + \beta \ln(Y) + \boldsymbol{\gamma}'\mathbf{X}, \tag{6}$$

where $\mathbf{X}$ is a vector of demographic and socio-economic characteristics.

The second approach to incorporate the demographic and socio-economic characteristics is to incorporate them in the β coefficient in (5), i.e. to make β household specific as:

$$\ln(y) = \alpha + (\beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_n x_n)\ln(Y). \quad (7)$$

The results are shown in Table 4. A test of β being equal to one was rejected in all cases, implying that the overall tax-benefit system is clearly non-linear.

TABLE 4 GLOBAL TAX SYSTEM: REGRESSION APPROACH

		2001			2009	
Equation in text	(5)	(6)	(7)	(5)	(6)	(7)
β	0.76***	0.74***	0.72***	0.78***	0.74***	0.72***
α	2.14***	2.17***	2.38***	2.11***	2.24***	2.44***
Age head		1.5E-03***	1.4E-04***		1.3E-03***	1.2E-04***
Brussels		-1.7E-03**	-1.8E-04**		-0.01***	-9.6E-04***
Wallonia		1.3E-03***	1.5E-04***		-0.01***	-7.9E-04***
couple, no childr.		0.11***	0.01***		0.11***	0.01***
couple, 1 child		0.16***	0.02***		0.15***	0.02***
couple, 2 childr.		0.20***	0.02***		0.19***	0.02***
couple, >=3 childr.		0.29***	0.03***		0.29***	0.03***
single, 1 child		0.09***	0.01***		0.09***	0.01***
single, 2 childr.		0.16***	0.02***		0.15***	0.01***
single, >=3 childr.		0.27***	0.03***		0.27***	0.03***
married, no childr.		0.08***	0.01***		0.10***	0.01***
married, 1 child		0.13***	0.01***		0.15***	0.01***
married, 2 childr.		0.18***	0.02***		0.19***	0.02***
married, >=3 chil.		0.28***	0.03***		0.29***	0.03***
Self-employed		-1.1E-03	-2.8E-05		-0.01***	-6.3E-04***
Civil servant		1.5E-03*	2.3E-04***		2.2E-03***	3.0E-04***
Pensioned		0.06***	0.01***		0.06***	0.01***
unemployed		0.09***	0.01***		0.08***	0.01***
Inactive		0.04***	3.9E-03***		0.02***	2.6E-03***
Sick/disabled		0.09***	0.01***		0.08***	0.01***

*** significant at 1% level
** significant at 5% level
* significant at 10% level

The interpretation of β as the elasticity of net income with respect to gross income, implies that for each 1% increase in gross income net income increases by an average of more than 0.76% in the basic specification without demographic variables. Controlling for socio-economic and demographic characteristics increases progressivity slightly. There are some minor differences in the coefficients when using the two different approaches to incorporate these socio-economic and demographic characteristics but the general picture remains the same and it alters only moderately the coefficient on the gross income variable.

The overall progressivity have somewhat decreased in 2009 as compared to 2001. The reason is to be found in changes related with demographic or socio-economic characteristics. Indeed, the β-parameter has not changed between 2001 and 2009 once we control for demographic and socio-economic characteristics.

In Table 5 we confine the sample to households that consist of employees only, i.e. single employees or couple households where both partners are employee on the private labour market. The results are unchanged: the tax system is non-linear, although progressivity is slightly less than with the full sample of Table 4. A test on the β-coefficient being equal to one was rejected in all cases. Progressivity increases once we control for demographic characteristics. Contrary to what we found in table 4, between 2001 and 2009 and controlling for socio-demographic characteristics, progressivity now slightly increased.

TABLE 5 GLOBAL TAX SYSTEM: REGRESSION APPROACH FOR HOUSEHOLDS WHERE BOTH PARTNERS ARE EMPLOYEE

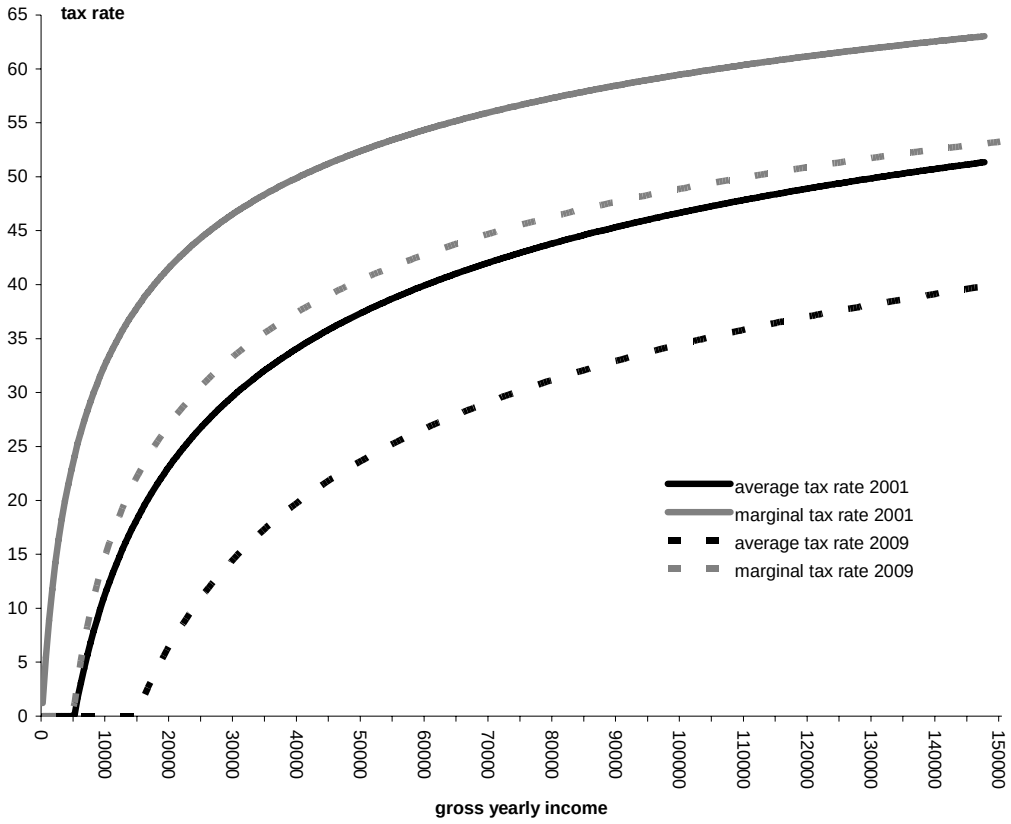
		2001			2009	
Equation in text	(5)	(6)	(7)	(5)	(6)	(7)
β	0.80***	0.72***	0.70***	0.80***	0.70***	0.68***
α	1.70***	2.37***	2.56***	1.80***	2.70***	2.89***
Age head		1.30E-03***	1.2E-04***		1.3E-03***	1.3E-04***
Brussels		-1.1E-03	-1.0E-04		-0.01***	-1.1E-03***
Wallonia		-1.2E-04	6.9E-06		-0.01***	-1.1E-03***
couple, no childr.		0.17***	0.02***		0.18***	0.02***
couple, 1 child		0.22***	0.02***		0.23***	0.02***
couple, 2 childr.		0.26***	0.02***		0.27***	0.03***
couple, >=3 childr.		0.35***	0.03***		0.36***	0.03***
single, 1 child		0.10***	0.01***		0.10***	0.01***
single, 2 childr.		0.18***	0.02***		0.17***	0.02***
single, >=3 childr.		0.31***	0.03***		0.31***	0.03***
married, no childr.		0.13***	0.01***		0.17***	0.02***
married, 1 child		0.18***	0.02***		0.22***	0.02***
married, 2 childr.		0.21***	0.02***		0.25***	0.02***
married, >=3 chil.		0.30***	0.03***		0.34***	0.03***

*** significant at 1% level
** significant at 5% level
* significant at 10% level

The estimates for α and β from (5) in Table 4 determine a stylized tax system for which we can display the average and marginal tax rates for 2001 and 2009. We do so in Figure 2 where we range gross income from zero to €150 000 per year in increments of €500. The figure reveals the increasing average tax rate, indicating a progressive tax system. The marginal and average tax rates increase rapidly at the lower end of the

income distribution followed by a clear flattening in the speed of increase for higher incomes. The average and marginal tax rates are substantially lower in 2009 than they were in 2001.

FIGURE 2 AVERAGE AND MARGINAL TAX RATES FOR THE STYLIZED TAX SYSTEM IN 2001 AND 2009



The progressivity of the tax system, displayed at each income level in Figure 2, can also be aggregated across the empirical distribution of taxable incomes. This is the Kakwani index of tax progressivity, where a higher value of the index indicates a more progressive tax system. From Table 6 we learn that the tax system has become more progressive in 2009 than it was in 2001, i.e. a larger proportion of the tax burden is borne by the higher incomes.

TABLE 6 PROGRESSIVITY AND REDISTRIBUTIVE EFFECT OF THE GLOBAL TAX-BENEFIT SYSTEM

	2001	2009
Kakwani-index (progressivity)	0.1930	0.2236
Reynolds-Smolensky index (net redistributive effect)	0.0878	0.0834

This increase in progressivity, however, has not been translated in an increase in the redistributive effect of the tax-benefit system. This can be measured by the Reynolds-Smolensky index which calculates the difference in the Gini coefficient before and after taxes. On the contrary, as witnessed by the decrease in the Reynolds-Smolensky index, the redistributive effect has actually declined.

Although the decrease is minimal and probably not statistically significant, it shows that even when a tax system becomes more progressive this does not imply that the redistributive effect of that system also increases. In fact the relation between the Kakwani index and the Reynolds-Smolensky index can be written as:

$$\pi^{RS} = \frac{t}{1-t}\pi^{K}, \tag{8}$$

where π^{RS} is the Reynolds-Smolensky index or redistributive effect, π^{K} is the Kakwani or progressivity index and t is the overall average tax rate define as $\sum_i T_i \Big/ \sum_i Y_i$ (Lambert, 2001). In other words, the redistributive effect not only depends on the degree of progressivity but also on the overall tax level. The substantial reduction of the average tax rate between 2001 and 2009 has reduced the redistributive power of the system, notwithstanding the fact that the system itself became more progressive.

4.3 AVERAGE EFFECTIVE TAX RATES

In the previous section we have estimated the relation between disposable income and gross income as in (5), as kind of summary of the tax systsem. This allowed us to answer the question whether the tax system is linear or not. In this subsection we leave the summarizing perspective and dig deeper in the variation of the effective tax rates at the household level by decomposing the average tax rate into its constituent elements: personal income tax, social security contributions on labour income, and social security contributions on replacement incomes.

In (1) we have defined taxes as the difference between gross income Y and disposable income $y(Y)$, which through the tax system, is a function of gross income. Since we also want to consider the social security contributions paid on benefits and replacement incomes, we have included benefits and replacement incomes in the gross income concept. We express the total tax amount as a percentage of gross income. This leads to the following decomposition of the tax rates:

$$
\begin{aligned}
t(Y) &= \frac{Y - y(Y)}{Y} \\
&= \frac{Y - \left(Y - \left[T_{pit}(Y) + T_{ssc}(Y) + T_{ssb}(Y)\right]\right)}{Y} \\
&= \frac{T_{pit}(Y) + T_{ssc}(Y) + T_{ssb}(Y)}{Y},
\end{aligned} \tag{9}
$$

where $t(Y)$ denotes the average tax rate, $T_{pit}(Y)$ is the amount of personal income taxes, $T_{ssc}(Y)$ the amount of employee social security contributions and $T_{ssb}(Y)$ are contributions due on social benefits. The effective tax rate is thus the sum of personal income taxes, employee social insurance contributions and social insurance contributions due on social benefits, expressed as a percentage of gross income, broadly defined.

In Table 7 we show these effective average tax rates for the population in 2001 and 2009 by decile of gross income. Columns (4) and (8) show the total tax rate, the other three columns give the decomposition. In the last two rows, we report measures of progressivity (Kakwani) and net redistributive effect (Reynolds-Smolensky).

TABLE 7 AVERAGE EFFECTIVE TAX RATE AT HOUSEHOLD LEVEL: CONTRIBUTING FACTORS IN % OF GROSS INCOME

	2001				2009			
Decile of gross income	Personal income tax (1)	SIC employee (2)	SIC social benefits (3)	Total (4)	Personal income tax (5)	SIC employee (6)	SIC social benefits (7)	Total (8)
1	0.01	0.27	0.03	0.31	-0.05	0.21	0.03	0.19
2	0.47	1.21	0.02	1.70	0.03	0.85	0.02	0.90
3	3.67	1.89	1.27	6.83	0.83	1.55	0.95	3.33
4	7.88	3.12	2.13	13.13	5.11	2.62	1.81	9.53
5	15.48	5.33	1.69	22.51	10.32	4.85	1.40	16.57
6	18.98	7.81	1.08	27.87	14.87	7.33	1.02	23.22
7	21.20	9.26	0.66	31.12	17.50	8.81	0.61	26.93
8	23.72	10.19	0.44	34.35	19.94	9.76	0.42	30.12
9	26.81	10.81	0.30	37.93	23.32	10.61	0.29	34.22
10	31.83	11.33	0.14	43.30	28.56	11.30	0.14	39.99
all	15.01	6.13	0.78	21.91	12.05	5.79	0.67	18.51
Kakwani	0.2116	0.1782	-0.3128	0.1930	0.2482	0.1984	-0.2802	0.2236
Reynolds-Smolensky	0.0609	0.0166	-0.0019	0.0878	0.0572	0.0177	-0.0015	0.0834

The results of the previous subsection are confirmed. The tax system, including the social security contributions, and defined over the whole population is clearly

progressive. The effective tax rate rises sharply with gross income. The average tax rates were above 30% for the top four deciles in 2001. This is mainly due to the personal income tax and social security contributions paid on labour income. The contributions paid on replacement incomes have a regressive character, due to the fact that these replacement incomes are mainly found in the bottom deciles.

Between 2001 and 2009, the decrease in the effective average tax rate was substantial: more than 3.5 percentage points (from 22% to 18.5%). This decrease is consistent among all deciles of the gross income distribution, with the lowest deciles gaining the most percentage-wise. This has lead to a more progressive system as measured by the Kakwani index. In all sub-systems, progressivity has increased in 2009. But, as already noted in the previous subsection, the substantial decrease in the tax rate, has eroded – be it only slightly - the redistributive power of the system. The index of redistribution goes down from 0.0878 in 2001 to 0.0834 in 2009. This is only due to the decreased redistributive effect of the personal income tax.

Clearly part of the progressivity and redistribution, presented in Table 7 follow from the presence of replacement incomes and households receiving benefits in the bottom deciles. Moreover, in the current tax-benefit system most of the fiscal burden is borne by labour income. Therefore, in Table 8 we also focus at average taxes for employee households that have no replacement income and receive no family allowances --basically singles and couples without children. Since we are looking at households without replacement income it means that the denominator in (9) is gross labour income and the results in Table 8 effectively show the taxes on 'labour' over the different deciles of gross wages.

TABLE 8 AVERAGE EFFECTIVE TAX RATES FOR EMPLOYEE HOUSEHOLDS WITHOUT REPLACEMENT INCOME AND FAMILY ALLOWANCE

	2001			2009		
Decile of gross wage	Personal income tax (1)	SIC employee (2)	Total (3)	Personal income tax (4)	SIC employee (5)	Total (6)
1	16.4	11.8	28.1	15.5	7.4	22.9
2	21.4	12.6	34.0	19.6	10.8	30.4
3	25.1	12.8	37. 9	22.8	12.3	35.2
4	28.1	12.9	41. 0	26.0	12.5	38.5
5	27.7	12.7	40.4	25.3	11.8	37.0
6	27.1	12. 8	39.9	24.5	11.9	36.3
7	28.4	12. 9	41.2	25.4	12.5	37.9
8	29.5	12.9	42.4	26.6	12.6	39.2
9	32.2	12.9	45.1	29.3	12.7	42.0
10	32.9	12.9	45.9	30.1	12.7	42.8
all	26.1	12.7	38.8	23.9	11.6	35.5
Kakwani	0.0898	0.0064	0.0643	0.0900	0.0353	0.0727
Reynolds-Smolensky	0.0353	0.0009	0.0439	0.0309	0.0048	0.0428

Comparing Table 8 with Table 7 shows that the average tax on labour income for this subpopulation evidently exceeds the one for the population as a whole (35.5% in 2009 compared to 18.5% for the population as a whole). In 2001 *average* tax rates were above 40% from the fourth decile on, witnessing and confirming the well known fact of (very) high taxes on labour in Belgium.

The progressivity of the personal income tax system, though, is much lower if we only focus on taxes on labour income (in 2009: a Kakwani of 0.09 compared to 0.25 in Table 6). This might explain the often heard assertion that our tax system is not really progressive. Note that we even find a non monotonically increasing pattern across the deciles, due to declining average social security contributions in the middle of the distribution. This near proportionality of the social insurance contributions further decreases the progressivity of the 'overall' system. While the decrease in the net average tax rate from 39% to 35.5% is driven by the reduction in social insurance contributions for the lowest two deciles, it is almost entirely driven by a reduction in the personal income tax rates for the higher deciles.

In 2009 effective personal income tax rates have declined substantially for all deciles but slightly less so for the first two wage deciles than for the other deciles. The Kakwani index has hardly changed. The social insurance contributions, however, have decreased substantially for the lower two wage deciles following the introduction of the workbonus, i.e. a reduction in the social insurance contributions for low wage

workers. This made the social security contributions much more progressive (the Kakwani index quintupled from 0.0064 to 0.0353). Of course, a reduction in the social insurance contributions also leads to an increase in taxable income and hence higher personal income taxes and a lower decrease in effective personal income tax rates than would otherwise be the case.

We repeat that the reported average tax rates do not take into account taxes on capital income or assets, such as real estate. On the other hand our administrative dataset also lacks information on tax 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.

In the next two sections we move from average tax rates (mainly determining the distributive effects of taxes) to the incentive structure inherent in the tax-benefit system. This can be done in two ways. In section 5 we investigate whether it pays to enter the labour market from a state of inactivity, e.g. unemployment. In section 6 we focus on the currently active labour force, i.e. the individuals and households that are currently active on the labour market. We answer the question whether it is financially advantageous for them to work more (and hence earn more). How much of their extra gross income is taxed away (in the broad sense)?

5 PARTICIPATION TAX RATES: DOES IT PAY TO WORK AT ALL?

The participation tax rate is a measure of the monetary attractiveness of working, of entering the labour market from a state of current inactivity. How much does disposable income change on entering the labour market? If disposable income is actually lower or only slightly higher than in the previous no-work situation, the individual faces what is called an inactivity trap: (s)he is financially better off remaining inactive than (s)he is working.[4] Since there are costs to entering the labour market that are not fully captured by the participation tax rate as calculated in (10) (costs of clothing, transportation costs, child care costs, non pecuniary costs, …), we

[4] Inactivity traps may also refer to individuals that are currently working but who face the decision of (early) retirement (versus continue working).

consider an inactivity trap to occur in a situation where entering the labour market results in a participation tax rate exceeding 80%.[5]

For participation tax rates the reference state is inactivity. A state of inactivity is denoted by the superscript 0 for the variables gross income (Y), disposable income (y) and taxes (T). If an individual enters the labour market at x hours of work a week, the participation tax rate is calculated as:

$$\begin{aligned} ptr &= \frac{T^x - T^0}{Y^x - Y^0} \\ &= \frac{Y^x - y^x - \left(Y^0 - y^0\right)}{Y^x - Y^0} \\ &= 1 - \frac{y^x - y^0}{Y^x - Y^0}, \qquad \text{for } x = 1, \ldots, 40. \end{aligned} \tag{10}$$

or: the participation tax rate ptr equals 1 minus the change in disposable income divided by the change in gross income. We can simulate any transition from inactivity to 1 to 40 hours per week, but below we will mainly concentrate on the transition into part-time or full-time work.

The ptr's, are essentially related to an individual decision to enter the labour market, but – at least for couples - these decisions are taken into a household context. Therefore we proceed in the following way. We simulate maximum two individuals per households that have been selected to be eligible for participation in the labour market. We first simulate all the males, i.e. we change their labour supply to let it run from 0 to 40 hours of work per week, while keeping the income and labour market status of the spouse, if any, fixed. Subsequently we do the same for women. We then calculate a tax rate at the household level for males and females separately. For example, if the male is simulated, we calculate the household net disposable income and gross labour income by adding the incomes of all household members to the simulated income of the male as calculated by MIMOSIS. This gives us the change in household income throughout the whole range of hours when it is the male whose labour supply changes. We do the same thing for females. The result of this procedure are two datasets, one for males and one for females, that are then appended into one dataset of all simulated individuals and the corresponding tax rate at the household level were that particular individual to change his or her labour supply (see Polette, 1995).[6]

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[5] Larmuseau and Lelie (2001) consider tax rates exceeding 85% as identifying an inactivity trap. They consider typical 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.

[6] We limit the sample further to include only heads of households and their spouses. This is to avoid that the individuals that are simulated are not head of household or the spouse of the

We first describe participation tax rates for the whole population, i.e. both the currently working population (for whom we calculate the counterfactual of not working), and the currently non active individuals (for whom we calculate what their disposable income would be if they would switch to work). Since the latter group obviously is the most relevant from a policy perspective, we then focus on different subgroups of the inactive population, to dig deeper into the reasons for excessive participation rates.

5.1 PARTICIPATION TAX RATES: A BIRD'S EYE VIEW FOR THE WHOLE POPULATION

In this section we included all individuals in the simulation sample. This implies that we also include individuals that are currently working (and for whom calculating a participation tax rate might be somewhat unrealistic). For those that are currently working this implies that we have to simulate disposable income at inactivity. Often social assistance is used for this, but we have chosen to simulate unemployment benefits as if the individual becomes unemployed after working and is entitled to full unemployment benefits. If the individual then moves out of unemployment into employment at some level of hours worked, the unemployment and other benefits are adjusted according to what is stipulated in the tax-benefit legislation.[7]

An important element in the tax benefit legislation for moving out of unemployment has to do with the Guaranteed Income Benefit. Generally speaking this benefit implies that an individual who resumes work in a regime that is at least 1/3 of a full-time position and at most 4/5, receives a supplement to his or her net wage that depends on the normal unemployment benefits on the number of hours worked, and on the income level. If the individual works less than 1/3 of a full-time job, (s)he loses the unemployment benefits (s)he previously received. This produces very high participation tax rates at one hour of work (exceeding 600%) and negative tax rates at 13 hours which corresponds to 1/3 of a full-time position and where the Guaranteed Income Benefit kicks in. We therefore present the results graphically starting at 14 hours only. The full results, starting at a position of working 1 hour only are listed in the appendix.

Figure 3 shows the distribution of participation tax rates at different levels of hours worked for both 2001 and 2009. Each data point represents the average participation

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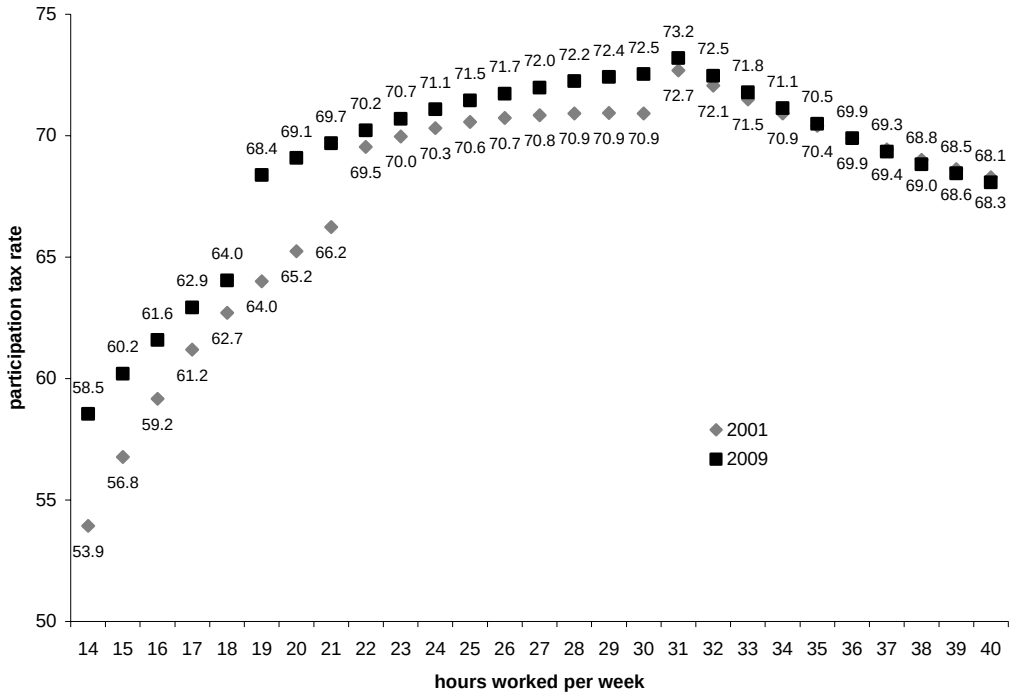
head of household. This situation can occur in households where multiple individuals are given a simulation number. To save run-time we only simulated individuals with simulation numbers 1 and 2. If neither of these is the head of the household or his or her partner, they are not taken up in the presentation of results. Still, we capture 95% of the households that are eligible for simulation by working this way.

[7] Note that we model the transition from inactivity to work in accordance with the *general* rules in the legislation. It is possible that in reality and for individual cases exceptions are to these general rules are made.

tax rate a household faces when the individual enters the labour market at that specific level of hours worked. The average here refers to the averaging process across all simulated individuals.

FIGURE 3 AVERAGE PARTICIPATION TAX RATES



The results are striking. Participation tax rates are high – altough not exceeding our treshold of 80% to classify them as inactivity traps – and they have increased between 2001 and 2009. Especially at the lower end of the hours distribution, the ptr's have increased. They are quite similar in 2001 and 2009 at the higher end of the hours range. The main reason for this increase in participation tax rates is the fact that unemployment benefits have become more generous between 2001 and 2009. The drawback of this policy change – which certainly can be motivated on both equity and efficiency grounds - inevitably is a weakening of the incentive to start working. On average participation tax rates in 2009 now amount to 68.4% for a move from inactivity into halftime, and 68.8% for a move into a full-time position. The maximum is 73.2%, which is one of the two discontinuities we explain in the next paragraph.

Figure 3 reveals two jumps in the participation tax rates. The first one occurs at a level of 22 hours of work in 2001 and 19 hours in 2009. The participation tax rate jumps with 3.2 and 4.4 percentage points in 2001 and 2009 respectively. This discontinuity is due to the combination of pension benefits and work. We do indeed simulate individuals who receive a pension benefit, but who are still eligible for the labour

market. Combination of income from labour market activities and pension benefits is restricted in the sense that a cap is placed on the income that can be earned from employment before losing pension benefits. A transition period is built-in where the pension benefits gradually decline, after which the pension benefits are no longer paid.

The second, smaller, spike occurs at 31 hours in both 2001 and 2009. This is the hours level where the Guaranteed Income Benefit no longer applies since this corresponds to more than 4/5 of a full-time position. From that level of hours on, the working individual 'only' gets a wage and no longer receives the benefit from this Guaranteed Income Benefit.

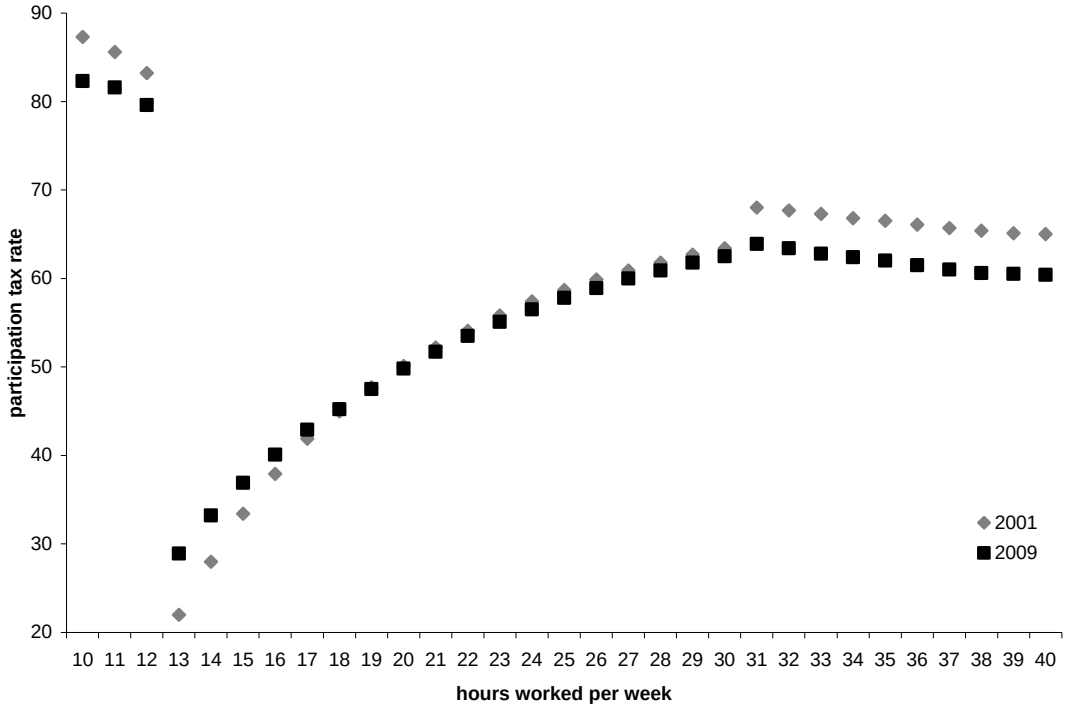
5.2 PARTICIPATION TAX RATES: A DETAILED VIEW FOR THE SUBPOPULATION OF NON WORKING PEOPLE

From a policy perspective, calculation of participation tax rates is especially relevant for those people who are currently inactive. Therefore, in this section, we focus on this subsample of the population. In section 6, we return to the currently working subpopulation by discussing the marginal tax rates at the internal margin. We first show the ptr's for the unemployed, and then move to inactives (i.e. those not receiving an unemployment benefit) and people who receive a pension benefit but are still available for the labour market.

5.2.1 Participation tax rates for the unemployed

In Figure 4 we show the participation tax rates of the currently unemployed. To keep the chart readable the series starts at 10 hours (for the first 10 hours the participation rates range from more than 450% to 90%). The effect of the Guaranteed Income Benefit, aimed at facilitating entry in the labour market, especially at less than half-time already, is confirmed here. Afterwards the participation tax rate rises to above 60% (and even near 70% in the 2001 system), which, while not an inactivity trap, is still quite substantial. If we compare the 2001 and 2009 systems it appears that work is more discouraged in the 2009 system relative to the 2001 system for relatively low hours worked, and it is relatively more encouraged in 2009 for entry points that are considered to correspond to a full-time position, i.e. above 31 hours or 4/5 of a full-time position. In the middle ranges the incentive effects of the two systems are very similar.

FIGURE 4 PARTICIPATION TAX RATES FOR CURRENTLY UNEMPLOYED INDIVIDUALS



We conclude that, *on average*, there do not seem to be genuine inactivity traps in the tax-benefit system for those individuals that are likely to be most targeted in labour market policies, i.e. the currently unemployed. For entry in the labour market that corresponds more or less to a half-time position, the participation tax rate is a bit less than 48% (both in 2001 and 2009). For entry at a full time position however it is much higher but decreased: from 65% in 2001 to 60% in 2009. Of course, this result being based on an average of all unemployed individuals simulated in our database, this does not exclude the possibility that in specific situations, inactivity traps may occur. In section 5.3 below we will single out individuals that effectively face a participation tax rate of more than 100% and investigate why they have such high rates.

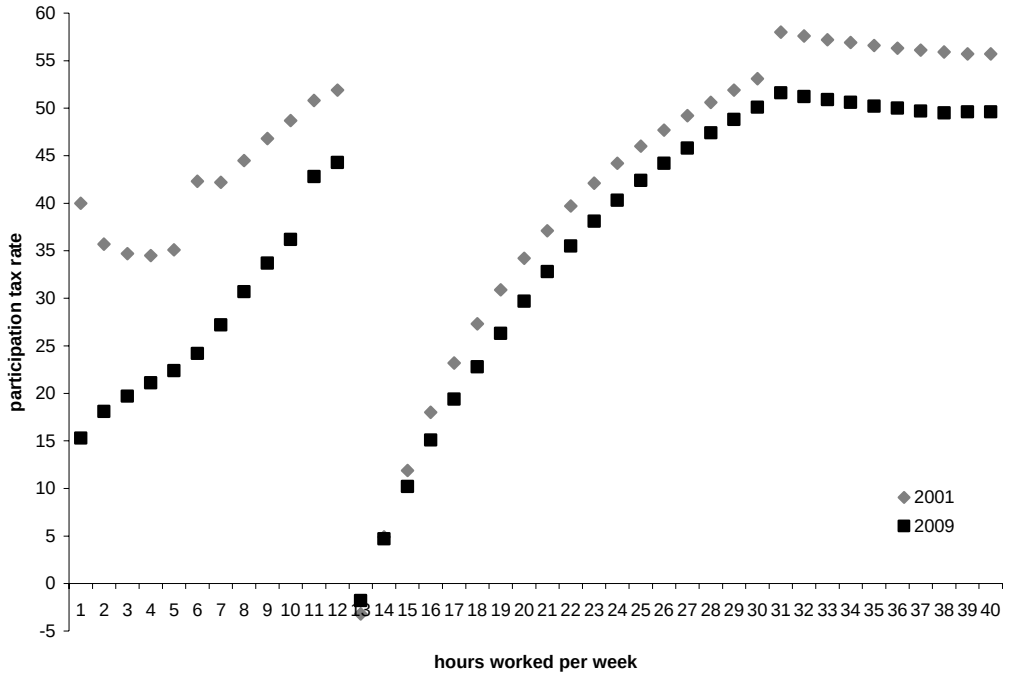
5.2.2 Participation tax rates for the inactives

In Figure 5 we show the participation tax rates for individuals that are currently inactive, i.e. that do not fall under any benefit system such as unemployment, pensions, sick or disabled. Again, these are average participation tax rates for this group.

Overall the participation tax rates are relatively low compared to those for the whole population in Figure 3. As these individual generally do not receive any benefits

the disincentive effect of moving into work is much less for them than it is for benefit recipients. Probably in this group we will find stay-at-home spouses, i.e. the spouse that takes care of the household and possibly the children, saving on childcare costs and potentially also on the cost of hiring cleaning aid. Such costs and the effect they have on participation tax rates are not explicitly modeled in MIMOSIS, but we take them indirectly into account by using a cut-off of 80% to identify inactivity traps.

FIGURE 5 AVERAGE PARTICIPATION TAX RATES FOR CURRENTLY INACTIVE INDIVIDUALS



Counter to what we found in Figure 3, for the inactive population the incentive to start working has increased between 2001 and 2009. This is because the main driver of the participation tax rates is the personal income tax and social insurance contributions, both of which have decreased between 2001 and 2009, especially for the lower wages as far as social insurance contributions are concerned. Since individuals in this socio-economic group are generally not to be found in any of the benefit system there is no disincentive effect of those systems having become more generous over the years.

Furthermore, we can discern more or less three distinct regions in Figure 5. The first region runs from 1 to 12 hours of work per week. This corresponds to the working hour range where the Guaranteed Income Benefit is not applicable. The reason we do not see a huge spike in the participation tax rate at the first hour is that these individuals do not get unemployment benefits when they are not working. Currently employed individuals (who were taken on board in figure 3) are treated by the model

as entitled to full unemployment benefits when being simulated as non working. However, once currently inactive individuals are simulated to enter the labour market their socio-economic status is changed to 'employee' which also makes them eligible to receive the Guaranteed Income Benefit once they work more than 1/3 of a full-time position. In fact, another possibility would have been, not to make them eligible for this Guaranteed Income Benefit, since these individuals did not receive unemployment benefits to begin with. The Guaranteed Income Benefit was indeed conceived as a measure to 1) bridge the gap between net wages and unemployment benefits, and 2) reward working. On the other hand, the picture as its has been drawn now, makes clear how effective this Guaranteed Income Benefit is in lowering participation tax rates, if there would be no loss of unemployment benefit.

The Guaranteed Income Benefit is also the reason for the spike at 31 hours where this benefit is withdrawn, though the spike is much less pronounced under the 2009 system than it is under the 2001 system.

Clearly, for the group of currently inactive individuals, on average, there is not really a policy concern: the participation tax rates are low and there is (are) obviously some other factor(s) rather than monetary incentives that influence the decision not to work.

5.2.3 Participation tax rates for individuals who receive a pension benefit

Finally, Figure 6 depicts the participation tax rates for individuals that are currently receiving any kind of pension benefit but are still available for the labour market, e.g. survival pension, early retired, retired under the age of 65, etc.

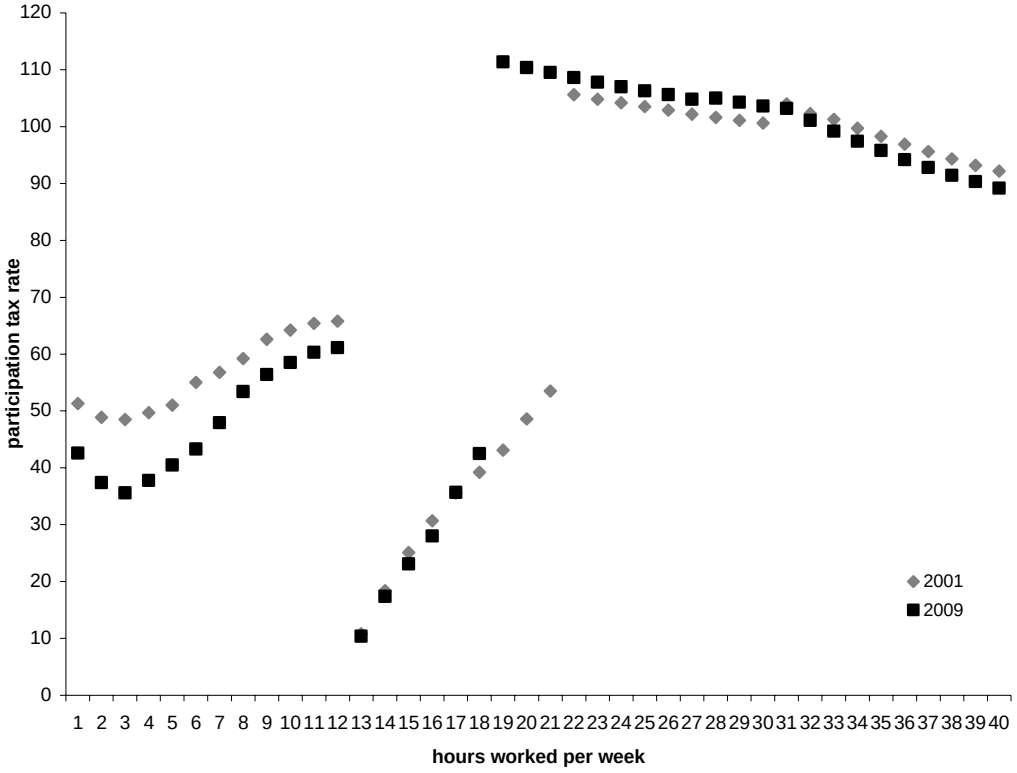
Four regions can be discerned, the first of which corresponds to the working hours range where the Guaranteed Income Benefit does not apply. The same remark holds as for the inactive individuals from the previous subsection: once we simulate these individuals as entering the labour market they become eligible for the Guaranteed Income Benefit. In this range the participation tax rates are generally higher than they are for inactive individuals in the same range.

The second region starts at 13 hours and runs up to 21 hours in 2001 and 19 hours in 2009. The reason is that when pension benefits are combined with labour market income the latter is capped. If the threshold is passed the individual loses his or her pension benefits. Figure 6 reveals that this happens at a bit more than a half time position. Once the treshold is passed, participation tax rates exceed 100% for this socio-economic group. Here we have a clear inactivity trap: it does not pay to enter the labour market at more than 21 hours in 2001, respectively 19 hours in 2009. The shift between 2001 and 2009 of this discontinuity indicates that pension beneficiaries could

work more hours in 2001 before losing their entitlement to pension benefits than is the case under the 2009 system.

The fourth region starts where the Guaranteed Income Benefit regulation no longer applies, and is visible in Figure 6 by the small discontinuity in the 2001 system at 31 hours. However, this is quite irrelevant for the group of pension beneficiaries as no one has any monetary incentive to enter the labour market in that hours range.

FIGURE 6 PARTICIPATION TAX RATES FOR CURRENT PENSION BENEFICIARIES



5.3 INACTIVITY TRAPS: WHOM AND WHY?

Who are the individuals or households that face high participation tax rates and what drives these high rates? In this section we look at the demographic and socio-economic characteristics of households facing high tax rates and we decompose participation tax rates in their contributing components. Obviously, we will focus attention to those households that face (very) high tax rates, i.e. that are 'trapped' in inactivity. Households facing participation tax rates higher than 100% are effectively better off, in monetary terms, by remaining inactive than by entering the labour market.

To analyze this we decompose the numerator of the effective participation tax rates in (10) as follows:

$$ptr = \frac{\Delta PIT + \Delta SSC - \Delta FB - \Delta SB - \Delta SA}{\Delta Y}, \tag{11}$$

where ptr is the participation tax rate; ΔPIT is the change in personal income taxes; ΔSSC is the change in social insurance contributions; ΔFB the change in family allowances; ΔSB is the change in other social benefits; and ΔSA is the change in the level of social assistance income. [8] The change in social insurance contributions are further divided in changes in employee social insurance 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, i.e. if taxes or social insurance contributions increase the participation rate will also increase, whereas an increase in social benefits, family allowances or social assistance will have a negative effect on the participation tax rate.

In the next four tables we show a decomposition of participation tax rates by family type for those individuals facing a tax rate of more than 100%. We do this for transition into half-time work and full-time work only and for the years 2001 and 2009. Overall the population of individuals facing a participation tax rate in excess of 100% is only a small percentage of the whole population. As in section 5.1, we have included all the individuals that are currently at work or potentially available for the labour market.

Table 9 and Table 10 show the decomposition of participation tax rates for the transition into half-time work in 2001 and 2009 respectively. There is a considerable increase in the percentages of individuals facing high participation tax rates between 2001 and 2009. Especially among childless singles we find a sharp increase in the percentage of individuals facing high tax rates. The reason is that the unemployment benefits that are calculated at zero hours of work are more generous in 2009 than they are in 2001. It means that more single individuals will face high participation rates as the unemployment benefits they receive make up the bigger part of their 'household' income. In 2009 and for those having a tax rate exceeding 100% at a half-time position the unemployment benefit made up more than 80% of 'household' income at zero hours versus around 30% for the group with high participation tax rates in 2001. This is also confirmed by the numbers in the tables. In 2001 the change in unemployment benefits 'only' contributed about 24 percentage points to the participation tax rate, while this number more than doubled to 66 percentage point in 2009.

[8] 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.

Of course, unemployment benefits have not only become more generous for singles without children, but for all individuals. However, the impact on household income is much less for multi-person households than it is for singles. Nevertheless we also observe slight to moderate increases for the other family types in the percentages facing high participation tax rates when entering the labour market at a half-time position. It should be noted, though, that these results also include individuals that are currently working and for whom, as already stated before, such a calculation is less policy relevant. However, it does show and confirm that the potential number of individuals facing an inactivity trap has increased in the 2009 tax-benefit system relative to the 2001 tax-benefit system.

Apart from the change in unemployment benefits as a major contributor to high participation tax rates we also point to changes in early retirement benefits, sickness benefits and to a lesser extent changes in pension benefits and social assistance as major contributors to excessively high participation tax rates for certain demographic groups. In the 2009 system, changes in sickness benefits only play a very minor role however. The combination of sickness benefits and labour market income has become much less stringent in 2009 than it was in 2001. Basically, in 2001, the entire gross taxable income is deducted from 150% or 125% of a base sickness benefit, depending on family situation to determine the remaining benefit. If the amount becomes negative it is put to zero. In the 2009 system, the amount to be deducted from the actual benefit is calculated in a more elaborate way using a schedule of daily threshold amounts and percentages.

TABLE 9 DECOMPOSITION PARTICIPATION TAX RATES EXCEEDING 100% BY FAMILY TYPE, MOVE FROM NON WORKING TO HALF TIME, 2001

	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001
family type	% of total population	median PTR	average PTR	Pension benefits	Early ret. benefits	Unemp. benefits	disability benefits	sickness benefits	family allowances	social assistance	employee sic	sic social benefits	personal income taxes
married, no children	2.14	123.6	123.7	24.4	95.9	-12.9	1.5	6.3	0.0	11.1	10.7	-7.8	-13.3
married, one child	0.78	120.1	122.7	17.8	54.8	20.8	2.7	20.1	0.6	10.6	11.6	-4.7	-16.3
married, two children	0.48	117.8	121.6	9.6	19.4	50.9	4.9	31.9	1.1	10.0	12.1	-2.0	-18.2
married, three or more children	0.24	120.2	123.2	9.3	16.7	50.8	4.9	29.6	2.1	12.6	11.9	-1.7	-14.8
unmarried couple, no children	1.45	100.1	105.2	3.9	9.8	66.4	0.7	4.9	0.0	0.5	12.7	-0.8	6.2
unmarried couple, one child	0.29	100.1	108.8	3.2	3.4	69.6	1.5	15.1	0.7	2.1	12.7	-0.4	0.3
unmarried couple, two children	0.14	100.1	107.8	0.6	0.4	74.4	0.8	15.1	0.9	2.3	12.7	-0.1	0.5
unmarried couple, three or more children	0.05	108.1	114.5	1.0	0.0	72.4	3.3	28.8	0.9	3.4	12.6	-0.1	-7.9
single, no children	0.95	115.2	117.6	25.8	45.2	24.3	4.9	19.1	0.0	0.5	11.6	-4.4	-14.0
single, one child	0.32	103.6	111.4	11.2	11.4	57.9	1.7	15.9	0.6	3.8	11.4	-1.3	-2.5
single, two children	0.11	111.2	116.3	8.7	3.2	53.5	1.8	29.9	0.6	17.0	11.3	-0.6	-9.8
single, three or more children	0.03	127.7	124.6	4.5	1.2	35.4	0.0	45.7	2.1	42.5	11.4	-0.3	-18.1

TABLE 10 DECOMPOSITION PARTICIPATION TAX RATES EXCEEDING 100% BY FAMILY TYPE, MOVE FROM NON WORKING TO HALF TIME, 2009

	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
family type	% of total population	median PTR	average PTR	Pension benefits	Early ret. benefits	Unemp. benefits	disability benefits	sickness benefits	family allowances	social assistance	employee sic	sic social benefits	personal income taxes
married, no children	3.50	132.8	145.2	100.3	59.3	-8.5	0.2	0.9	0.0	5.7	4.8	-8.4	-17.5
married, one child	1.17	111.1	131.4	61.2	37.0	30.1	0.4	3.2	0.2	7.1	6.6	-4.8	-14.5
married, two children	0.66	105.6	119.2	29.6	15.1	64.3	0.7	5.6	0.5	7.0	7.8	-1.9	-11.4
married, three or more children	0.41	108.0	118.9	20.6	10.2	76.5	0.7	4.4	0.7	5.8	7.2	-1.0	-7.2
unmarried couple, no children	3.94	105.4	109.1	5.3	3.4	75.7	0.1	0.4	0.0	1.1	10.6	-0.4	12.5
unmarried couple, one child	1.12	105.6	108.1	2.1	0.8	81.7	0.1	1.1	0.1	1.2	10.1	-0.1	10.9
unmarried couple, two children	0.44	105.9	108.1	0.4	0.0	82.2	0.1	1.1	0.3	2.7	10.0	0.0	11.2
unmarried couple, three or more children	0.14	106.1	108.3	0.6	0.0	81.1	0.3	2.4	0.4	5.9	9.4	0.0	8.2
single, no children	7.65	105.3	111.2	20.7	5.8	66.4	0.1	0.5	0.0	0.0	9.5	-1.1	8.2
single, one child	1.15	105.1	110.7	16.8	3.1	66.1	0.0	1.2	0.7	9.9	8.2	-0.7	4.5
single, two children	0.37	106.0	110.7	9.8	1.0	51.8	0.1	2.5	3.0	37.3	6.0	-0.4	-0.9
single, three or more children	0.08	107.0	112.0	3.3	0.5	81.2	0.0	4.7	1.3	21.5	6.5	-0.1	-7.1

Another feature that stands out in the results is the negative contribution of personal income taxes for most of the family types, especially in 2001. This implies that entering the labour market actually reduces personal income taxes due as compared to the situation of inactivity. The main reason is that, on average, the gain in labour market income does not compensate for the loss in benefits. The overall effect is a decrease in taxable income. This decrease is more pronounced in 2001 than it is in 2009, where we actually see a positive and relatively sizeable contribution of increased personal income taxes for some family types, especially unmarried couples. This might be a consequence of more generous benefit systems in 2009 for which the entitlements have not yet fully expired at half-time work. The combination of labour income and benefits for these family types results in a larger taxable income and hence higher personal income taxes.

Table 11 and Table 12 show a similar decomposition analysis but for the transition from not working into full-time work. The pattern is quite similar, though the number of individuals facing a high participation tax rate now decreases between 2001 and 2009. In 2001 the contribution of personal income taxes is negative for all family types whereas in 2009 it is negative for all but unmarried couples. For this group gross labour income increases equally or more than for the other groups while their replacement income decreases considerably less. In 2001 this is much less pronounced: the change in replacement income is similar to those for other groups.

TABLE 11 DECOMPOSITION PARTICIPATION TAX RATES EXCEEDING 100% BY FAMILY TYPE, ZERO TO FULL TIME, 2001

	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001	2001
family type	% of total population	median PTR	average PTR	Pension benefits	Early ret. benefits	Unemp. benefits	disability benefits	sickness benefits	family allowances	social assistance	employee sic	sic social benefits	personal income taxes
married, no children	2.02	117.7	121.7	70.7	38.6	7.8	1.2	4.2	0.0	5.5	8.4	-6.5	-14.8
married, one child	0.54	115.6	120.9	57.1	25.4	17.4	3.0	18.2	0.2	6.6	9.6	-4.8	-16.5
married, two children	0.26	114.3	119.0	34.1	10.7	30.8	6.1	35.4	0.2	7.0	10.9	-2.6	-16.3
married, three or more children	0.13	117.4	121.4	29.9	9.9	31.4	6.9	36.4	0.3	8.8	11.0	-2.3	-13.2
unmarried couple, no children	0.23	114.4	115.6	38.4	22.5	26.9	3.9	18.6	0.0	1.6	10.1	-3.3	-6.3
unmarried couple, one child	0.07	114.4	114.0	19.7	5.6	37.1	6.5	38.6	0.5	3.9	11.7	-1.3	-9.6
unmarried couple, two children	0.03	113.1	113.3	3.7	0.0	51.2	2.8	49.1	0.8	2.5	12.2	-0.2	-9.0
unmarried couple, three or more children	0.02	115.3	116.4	1.4	0.0	48.5	5.6	55.8	0.3	4.4	12.6	-0.1	-12.1
single, no children	1.45	110.8	113.5	50.2	11.3	34.2	2.8	7.9	0.0	0.1	9.8	-2.9	-2.8
single, one child	0.30	108.4	112.7	36.3	4.3	47.4	1.7	14.3	0.3	1.8	10.2	-1.7	-3.7
single, two children	0.10	113.5	115.2	29.8	0.8	48.1	2.0	26.8	-0.2	6.9	10.9	-1.0	-9.9
single, three or more children	0.03	116.2	120.0	17.2	0.0	41.1	0.0	43.4	0.7	20.0	11.4	-0.5	-13.7

TABLE 12 DECOMPOSITION PARTICIPATION TAX RATES EXCEEDING 100% BY FAMILY TYPE, ZERO TO FULL TIME, 2009

	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
family type	% of total popualtion	median PTR	average PTR	Pension benefits	Early ret. benefits	Unemp. benefits	disability benefits	sickness benefits	family allowances	social assistance	employee sic	sic social benefits	personal income taxes
married, no children	1.90	110.9	121.9	76.2	42.5	6.0	0.5	2.5	0.0	3.8	2.3	-6.6	-11.8
married, one child	0.52	110.7	119.6	61.0	29.1	19.7	1.4	10.7	0.2	5.8	4.4	-4.5	-12.7
married, two children	0.24	108.3	115.7	37.9	12.7	37.8	3.2	21.5	0.5	7.3	6.9	-2.2	-12.0
married, three or more children	0.11	108.3	116.3	34.3	12.3	38.6	3.4	22.4	0.8	7.4	7.2	-1.4	-10.0
unmarried couple, no children	0.55	103.2	106.7	13.9	9.7	60.7	0.9	3.9	0.1	2.4	6.5	-1.3	8.6
unmarried couple, one child	0.17	103.5	105.0	7.5	2.6	66.9	1.4	9.5	0.3	1.4	7.8	-0.3	7.6
unmarried couple, two children	0.06	103.1	104.3	2.2	0.0	71.5	0.9	13.1	0.1	1.0	8.4	-0.1	7.2
unmarried couple, three or more children	0.03	104.4	105.0	0.8	0.0	68.5	1.8	19.3	0.2	3.0	8.4	0.0	3.0
single, no children	1.25	109.0	112.0	54.0	13.1	35.3	1.5	5.1	0.0	0.2	4.6	-3.0	-1.7
single, one child	0.24	107.4	110.8	46.4	5.9	43.4	0.8	8.5	0.6	2.6	5.9	-1.7	-3.4
single, two children	0.09	108.2	111.4	36.1	1.0	45.9	1.1	15.0	0.8	12.6	7.2	-0.9	-8.4
single, three or more children	0.03	108.2	111.3	19.5	0.0	47.9	0.0	22.1	1.2	23.4	7.1	-0.5	-9.9

Of course, comparing between the two years on the basis of these results may be somewhat misleading as the composition of the groups is not necessarily the same between the two years. Individuals facing high participation tax rates in 2001 are not necessarily the same as those facing high tax rates in 2001. Therefore in Table 13 and Table 14 we show transition matrices to have an idea of how many individuals actually saw their rate go up in 2009 as compared to 2001.

Table 13 (the move from not working to half time) once more confirms that a considerable number of individuals face a substantially higher participation tax rate in 2009 than they do in 2001. They especially transition into the tax brackets above 70%, due to the increased generosity in the unemployment benefits. In the same tax brackets there are also individuals who see their participation tax rate decrease, but this is usually a jump into the previous bracket which can still represent a decrease of maximum 40 percentage points in the lower brackets (up to 40%) and maximum 10 percentage points in the higher brackets (from 40% onward) though. Of the individuals facing a participation tax rate in excess of 100% in 2001 about two thirds still do so in 2009. There is also a non-negligible inflow in this tax bracket in 2009. In general, few stay in the tax bracket that they were in in 2001. This is especially true for the middle brackets.

TABLE 13 TRANSITION OF PARTICIPATION TAX BRACKETS BETWEEN 2001 AND 2009 FOR ENTRANCE AT HALF-TIME WORK

		2009											
	PTR-band	<=0	>0 and <=20	>20 and <=40	>40 and <=45	>45 and <=50	>50 and <=55	>55 and <=60	>60 and <=65	>65 and <=70	>70 and <=80	>80 and <=100	>100
2001	<=0	58.1	16.8	4.1	0.6	0.6	0.6	0.5	1.1	0.3	0.9	10.0	6.4
	>0 and <=20	23.2	39.2	7.7	0.7	0.6	0.7	0.6	1.6	0.8	1.7	12.6	10.5
	>20 and <=40	8.5	33.2	21.9	1.5	0.6	1.7	1.0	1.5	0.8	2.7	11.0	15.6
	>40 and <=45	1.1	4.0	26.8	3.5	3.6	2.7	12.9	30.5	0.3	0.9	10.7	3.0
	>45 and <=50	1.2	1.9	32.8	21.8	11.8	1.1	1.3	1.6	0.6	1.0	20.9	4.1
	>50 and <=55	1.5	1.2	11.9	17.0	32.4	5.3	1.2	0.9	0.9	5.2	14.9	7.6
	>55 and <=60	1.2	2.4	7.9	5.2	11.5	15.4	5.5	2.9	2.7	8.9	23.6	12.9
	>60 and <=65	2.5	3.3	3.7	3.3	6.6	10.3	9.8	11.4	7.6	3.5	27.0	11.2
	>65 and <=70	1.8	5.9	3.1	2.4	3.9	3.2	5.2	16.2	9.1	22.2	22.8	4.2
	>70 and <=80	1.7	4.9	2.1	1.0	3.7	1.1	1.2	2.5	8.1	23.2	45.3	5.4
	>80 and <=100	2.4	2.6	2.3	0.9	0.9	0.4	0.3	0.3	0.4	1.6	59.1	28.8
	>100	6.2	2.8	2.4	0.8	1.7	0.9	0.2	0.3	0.2	0.7	19.6	64.3

For the transition into full-time work (Table 14) the picture is quite similar, although many more stay in the same bracket and fewer see their participation tax rate (bracket) increase. Still, the inflow in the above 70% bracket is striking, also in this case. If there is a decrease it is largely 'limited' to the neighbouring lower bracket.

TABLE 14 TRANSITION OF PARTICIPATION TAX BRACKETS BETWEEN 2001 AND 2009 FOR ENTRANCE AT FULL-TIME WORK

		2009											
	PTR-band	<=0	>0 and <=20	>20 and <=40	>40 and <=45	>45 and <=50	>50 and <=55	>55 and <=60	>60 and <=65	>65 and <=70	>70 and <=80	>80 and <=100	>100
2001	<=0	47.0	27.9	3.6	0.0	0.0	0.0	0.0	0.0	0.0	3.1	18.5	0.0
	>0 and <=20	6.8	62.8	9.3	2.7	1.6	1.0	0.9	0.7	1.0	4.6	7.7	1.0
	>20 and <=40	0.0	19.5	52.5	3.4	1.4	2.1	1.2	0.9	1.0	6.2	10.8	0.9
	>40 and <=45	0.0	1.3	46.8	18.1	10.0	1.2	0.9	1.5	1.1	9.7	7.5	1.9
	>45 and <=50	0.0	0.2	22.1	36.6	16.2	2.0	2.1	1.4	2.7	9.2	5.5	2.0
	>50 and <=55	0.0	0.1	6.9	15.6	34.9	19.7	2.2	2.7	5.3	7.8	3.0	1.9
	>55 and <=60	0.0	1.2	5.8	6.2	13.0	31.6	22.1	4.3	3.0	4.3	6.3	2.2
	>60 and <=65	0.0	0.6	4.4	5.8	4.3	8.3	13.4	33.2	20.8	5.5	3.1	0.5
	>65 and <=70	0.0	0.5	2.8	2.9	4.1	3.1	3.0	7.7	23.3	43.9	7.7	1.1
	>70 and <=80	0.0	0.5	3.3	1.8	2.0	0.7	1.1	1.7	11.2	37.6	39.2	1.0
	>80 and <=100	0.0	0.7	2.1	0.9	0.6	0.9	1.3	1.2	1.9	7.9	77.2	5.4
	>100	0.0	0.4	5.3	2.0	1.3	1.4	1.8	0.9	0.8	3.9	20.3	61.9

Table 15 tries to answer the question to which socio-economic group the individuals, susceptible to be caught in inactivity traps due to high participation tax rates, belong. For the different subpopulations, we show the share of this population which has participation tax rates exceeding 100%. The difference in changes between 2001 and 2009 between a movement into half or full time work are striking. For a movement into half time work, the participation tax rates have increased for all subpopulations. For a movement into full time work the share of uneployed who are confronted with these very high ptr's, has decreased substantially.

TABLE 15 SHARE OF SUBGROUPS WITH PTR>=100%

	transition to half time		transition to full time	
	2001	2009	2001	2009
Employee	7.77	30.18	2.75	4.24
Civil servant	0.42	0.34	0.03	0.02
Pensioner	13.27	50.56	35.87	34.55
Unemployed	16.76	22.48	13.30	8.88
Inactive	1.21	1.84	1.00	0.73

In Table 16 and Table 17 we decompose these very high ptr's in its different components. Among the currently unemployed it is not so much the change in unemployment benefits that contributes to high participation tax rates, but rather the change in early retirement benefits. For the early retired, part of their 'pension' is paid by the unemployment agency and part by the former employer. Since they receive benefits from the unemployment office they are categorized here as unemployed.

TABLE 16 DECOMPOSITION PARTICIPATION TAX RATES EXCEEDING 100% BY SOCIO-ECONOMIC STATUS, NON WORKING TO HALF-TIME

	2001					2009				
	employee	Civil servant	Pension beneficiary	unemployed	inactive	employee	Civil servant	Pension beneficiary	unemployed	inactive
Pension benefits	5.2	16.5	127.5	0.0	2.5	1.7	27.3	238.7	0.1	1.1
Early retirement benefits	0.0	0.0	0.0	144.9	0.0	0.0	0.0	0.0	109.1	0.0
Unemployment benefits	74.8	7.3	-13.0	-24.5	-50.8	84.1	10.0	-47.4	14.8	-45.6
Disability benefits	4.1	0.2	0.0	0.2	0.1	0.2	0.2	0.0	0.0	0.0
Sickness benefits	25.4	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0
Family allowances	0.2	0.2	0.0	0.2	4.3	0.0	0.1	0.1	0.1	6.9
Social assistance	0.0	80.5	2.1	0.2	158.4	0.0	79.6	1.1	0.1	164.2
SIC employee	12.9	11.2	13.0	9.7	8.0	10.5	11.2	3.4	4.3	1.4
SIC social benefits	-0.4	-0.8	-5.7	-9.9	-0.1	-0.1	-1.3	-9.7	-7.1	0.0
Personal income tax	-9.4	1.3	-11.4	-8.4	3.8	9.5	-8.1	-32.6	-2.4	0.6

TABLE 17 DECOMPOSITION PARTICIPATION TAX RATES EXCEEDING 100% BY SOCIO-ECONOMIC STATUS, NON WORKING TO FULL-TIME

	2001					2009				
	employee	Civil servant	Pension beneficiary	unemployed	inactive	employee	Civil servant	Pension beneficiary	unemployed	inactive
Pension benefits	13.1	47.2	141.7	0.1	7.1	9.0	61.3	144.8	0.1	7.4
Early retirement benefits	0.0	0.0	0.0	67.1	0.0	0.0	0.0	0.0	104.4	0.0
Unemployment benefits	51.7	0.0	0.3	28.0	0.9	69.8	0.0	0.3	2.4	2.5
Disability benefits	9.6	24.6	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0
Sickness benefits	46.5	0.0	0.0	0.0	0.0	16.4	0.0	0.0	0.0	0.0
Family allowances	-0.1	-1.3	0.0	0.1	1.6	0.0	0.0	0.1	0.1	2.1
Social assistance	0.0	46.8	0.6	0.1	89.3	0.0	61.0	0.8	0.1	98.6
SIC employee	12.7	11.2	8.0	8.7	8.1	8.7	11.2	1.6	1.3	1.7
SIC social benefits	-0.7	-3.4	-7.0	-4.6	-0.2	-0.3	-3.2	-6.6	-6.8	-0.2
Personal income tax	-16.8	-5.4	-21.3	4.0	5.0	-0.1	-11.9	-17.8	1.3	2.8

The above analyses have focused on entry in the labour market. We will now turn our attention to the incentive structure for the currently active population, i.e. what are the effective marginal tax rates they face when they increase their labour time?

6 EFFECTIVE MARGINAL TAX RATES: DOES IT PAY TO WORK MORE?

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. 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).

Effective marginal tax rates are calculated at the household level for each of the spouses separately (if there are more than one) as follows:

$$emtr_{i,h}^{x} = \frac{T_h^{x+1} - T_h^{x}}{Y_h^{x+1} - Y_h^{x}} = 1 - \frac{\Delta y_h^{x}}{\Delta Y_h^{x}}, \tag{12}$$

where $emtr_{i,h}^{x}$ is the effective marginal tax rate at household level for household h when changing the amount of labour supplied by individual i from x hours to $x+1$ hours; ΔY_h^{x} is the corresponding change in gross household labour income and Δy_h^{x} is the change in household disposable income. We calculate effective marginal tax rates for an increase of one hour, when the individual currently works x hours.

We follow the same procedure as for the participation tax rates: we calculate effective marginal tax rates at the household level for the head of the household and his or her partner respectively. We keep the results in separate files at first. For the final analysis we append both files to have one big file that has an entry for each individual that has been simulated (and that is head of household or partner of the head of household) (see Polette, 1995).

There are basically two possible ways to present these effective marginal tax rates. The first is what we will call the 'budget constraint approach'. In that case we calculate the effective marginal tax rates over a whole range of possible working hours per week (0-40 hours per week in our case), where the effective marginal tax rate is determined at each hour point with respect to the previous point. In fact this amounts to a reconstruction of the budget constraint for this individual (or household). The second possibility is to limit the presentation to the effective marginal tax rates, faced by the individuals in their current chosen point of labour supply.

6.1 BUDGET CONSTRAINTS IMPLICIT IN THE CURRENT TAX BENEFIT SYSTEM

In this subsection we look at (hypothetical) budget constraints facing individuals. We will describe the tax-benefit system and its inherent incentive effects by use of (simulated) budget constraints. This is not meant to give a description of the incentive effects actually faced by individuals but rather a summary of potential disincentive effects. As such it describes the tax-benefit system as it is currently in place, without pretending to identify individuals or households currently trapped in any situation they might want to 'escape' from. In short, identification of disincentive effects in this analytical framework does not necessarily mean that there are effectively individuals or households that are in this situation; it rather indicates a *potential* disincentive effect in the tax-benefit legislation. The budget constraint approach, as described in the next paragraph, effectively looks at all combinations of hours worked and disposable income. Plotting these combinations in an XY-diagram (for any one household) would

give a visual picture of the budget constraint faced by that household. On the X-axis hours worked would be plotted and on the Y-axis disposable income. There where the graph would show a decline in disposable income as more hours are worked a trap or disincentive effect is present in the tax-benefit legislation for this particular household or individual.

6.1.1 simulation methodology and sample selection

The methodology is the same as for the calculation of the participation tax rates but we repeat it here for convenience. For each individual we use MIMOSIS to simulate gross and disposable income at different working hours, ranging from 0 to 40 hours worked per week. The income and labour market status of the partner (if any) is left unchanged as is the hourly wage of the simulated individual, i.e. no matter the number of hours worked, the hourly wage is always the same and based on administrative data. After the gross labour income in each situation (hours worked) has been determined the tax-benefit rules as encoded in MIMOSIS are used to determine the disposable income. Other parts of (gross) income are left unchanged unless they change due to changes in the labour market status of the simulated individual, e.g. benefits that are withdrawn as income from labour increases. By determining the disposable income in each situation we have all we need to draw the budget constraint and identify potential disincentive effects.

We do not simulate the budget constraint for all individuals in the dataset. The sample consists of individuals that in one way or the other are potential suppliers of labour. Obviously currently active individuals belong to this group as do currently unemployed actively in search of a job. But also early retired and possibly retired could potentially (re)enter the labour market if conditions permit and are (financially) favourable. Children under the age of 18 are not considered as potential labour market participants. Remark that a household can have more than two individuals that are potential or actual labour market participants and hence will be simulated. In presenting the results in the next section, however, we limit the calculation to maximum two household members, i.e. the head of the household and his or her partner. Self-employed individuals, while active on the labour market, are not included in this sample since we do not observe a wage for these individuals.

6.1.2 incentive effects: summing up budget constraints

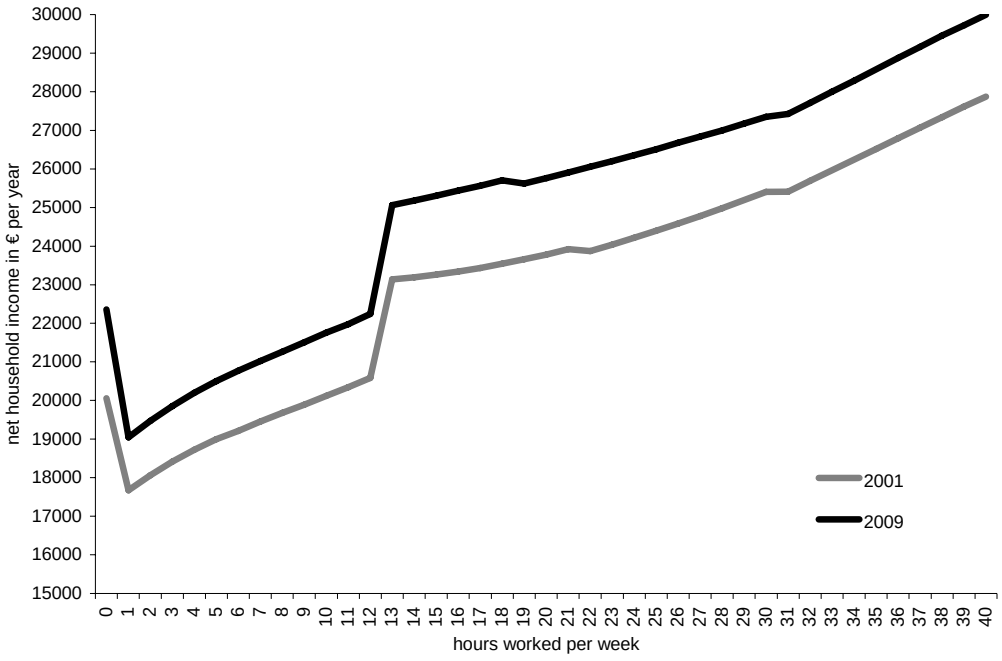
In this section we try to sum up the budget constraints to identify potential traps and disincentive effects.

In what follows social insurance 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 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 Figure 7 to FIGURE 11 to we show the average budget constraints for singles and couples, both with and without children, for the years 2001 and 2009. For each hour point we calculate the average net income at that point and subsequently combine the points to get the budget constraints shown below. All amounts are expressed in terms of 2001 Euros. In general we find a substantial increase in disposable income between 2001 and 2009. Comparing the different graphs shows that the increase is larger for households with children than it is for households without children. For the rest, the overall shape of the budget constraints is quite similar for the different demographic groups. In the region up to 13 hours there is a relatively steep increase in net household income as the amount of hours worked increases. The jump at 13 hours is due to the system of Guaranteed Income Benefit, which applies up to about 30 hours.

FIGURE 7 AVERAGE BUDGET CONSTRAINT IN € OF 2001 FOR ALL SAMPLED INDIVIDUALS



Apart form the obvious drop in net household income at 1 hour (because of the loss of unemployment benefits and the Guaranteed Income Benefit not yet applicable) we can discern two areas where the net household income does not increase or even declines when the individual works an extra hour. The first area around 20 hours corresponds with the threshold on labour market earnings of pension beneficiaries when they combine labour market activities with pension benefits. The second area around 31 hours is where the system of Guaranteed Income Benefit ends. We see that, especially for households without children, this spike is much more pronounced in 2001 than it is in 2009 implying that the change in Guaranteed Income Benefit regulation has attenuated somewhat the transition into what is considered a full-time job, i.e. more than 80% of a standard labour contract of 38 hours. In fact, only singles see a drop in net income at 31 hours in 2001, implying a marginal tax rate in excess of 100%. For the other groups, net income either increases slightly or remains quasi unchanged, still implying a very high marginal tax rate, but not in excess of 100%. In 2009, on average, there is no drop in net income, for none of the demographic groups, at 31 hours. For all groups we also see the sharp increase in net household income around 13 hours where the Guaranteed Income Benefit becomes effective. Here marginal tax rates will generally be very low.

FIGURE 8 AVERAGE BUDGET CONSTRAINT IN € OF 2001 FOR SINGLES WITHOUT CHILDREN

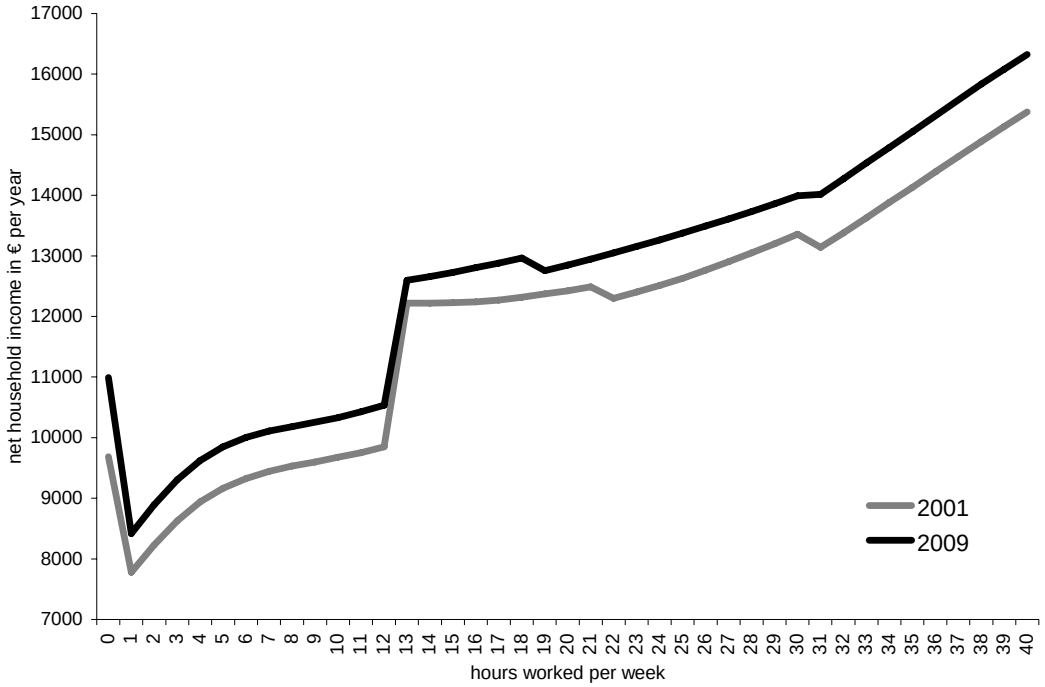


FIGURE 9 AVERAGE BUDGET CONSTRAINT IN € OF 2001 FOR SINGLES WITH CHILDREN

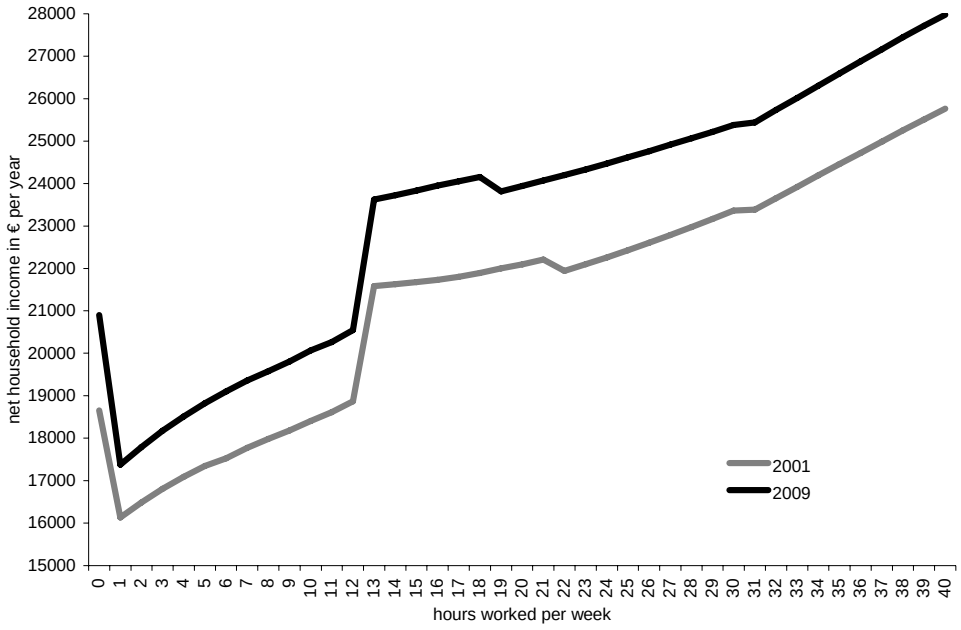


FIGURE 10 AVERAGE BUDGET CONSTRAINT IN € OF 2001 FOR COUPLES WITHOUT CHILDREN

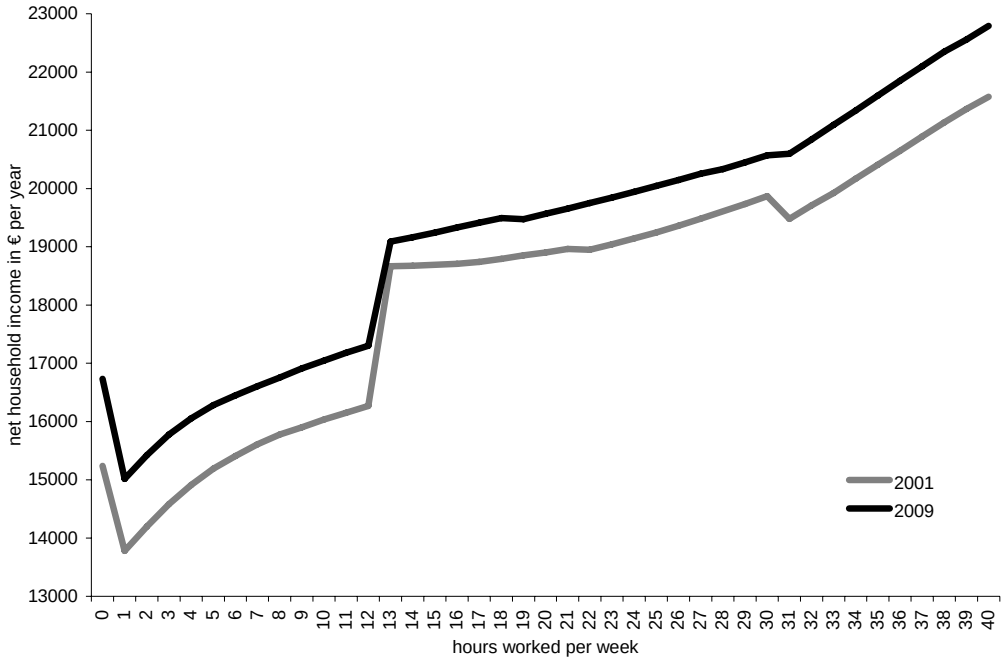
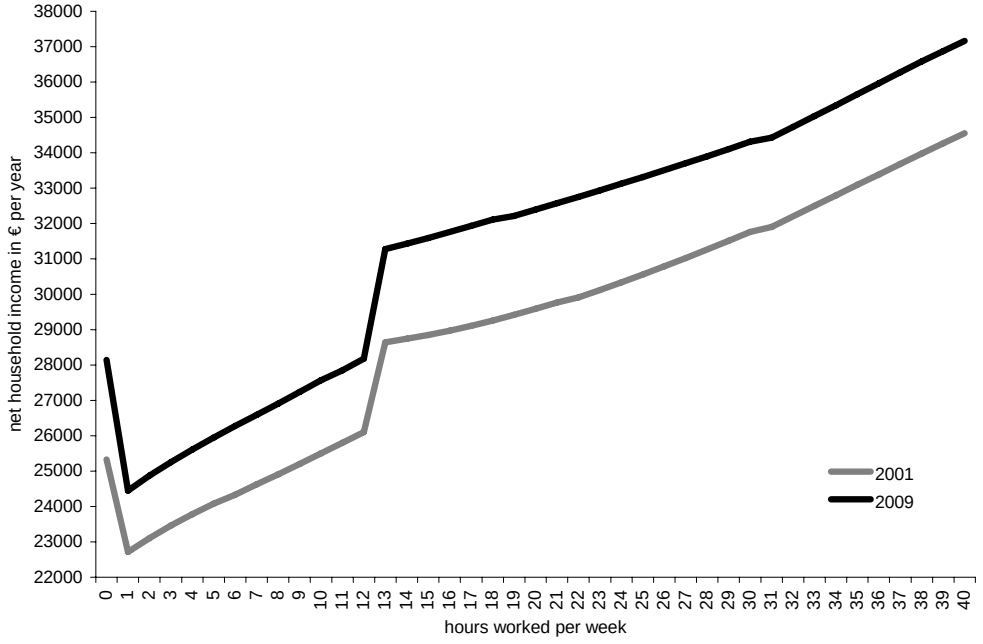
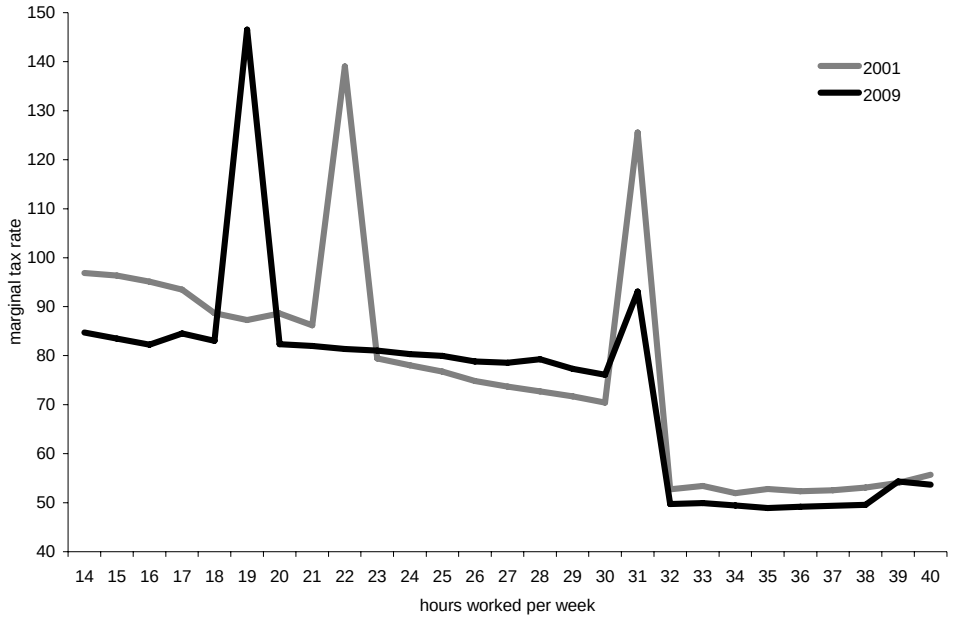


FIGURE 11 AVERAGE BUDGET CONSTRAINT IN € OF 2001 FOR COUPLES WITH CHILDREN



For illustrative purposes, in Figure 12 we show the average effective marginal tax rate over the distribution of hours worked for the whole population for 2001 and 2009. It is Figure 7 translated into effective marginal tax rates.[9] We only show the marginal tax rate starting from 14 hours worked per week. The reason is that in the range from 1 to 12 the marginal tax rates are extremely high at 1 hours (above 500%), then drop very steeply (to around 30%) at 2 hours, followed by an increase to about 60% at 12 hours and become extremely negative at 13 hours worked. The reason is again the system of Guaranteed Income Benefit that is only applicable in the range from 13 to 31 hours. Adding this range would make the picture hard to read.

FIGURE 12 AVERAGE EFFECTIVE MARGINAL TAX RATE OVER WHOLE SIMULATED POPULATION



We see that marginal tax rates are in general quite high with the system in 2009 showing a relatively flat part up to 31 hours at around 80%, followed by a spike and then again a flat region at a lower level around 60%. We see confirmed in this picture the spike in the marginal tax rate at 31 hours and the fact that it is more pronounce in 2001 than it is in 2009. We also see the spike that corresponds with a combination of labour market income and pension benefits at the point where the latter are suspended due to labour market income that has surpassed the allowed threshold. Here the spike is higher in 2009 at almost 150% and also occurs sooner, i.e. at less hours worked per week. In Table 21 in the appendix we show the marginal tax rates on which this figure

[9] This is not entirely correct as we calculate marginal tax rates at the household level and then average over all households. We do not calculate marginal tax rates from the averages on which the overall budget constraint is based.

is based and also for 5 quintiles of the wage distribution and over the entire range of hours worked.

As we have stressed before the results shown in this subsection provide a general description of the tax-benefit system in terms of marginal tax rates. The results include all individuals that are eligible to enter the labour market. In other words, it not only includes working individuals but also those that are currently not working such as unemployed in search of a job, early retired younger than 65, inactive individuals, etc. To have an idea of the incentive structure for those that are currently active on the labour market it makes sense to study only their effective marginal tax rates, i.e. to limit the sample to only those that are currently working and, moreover, to start from their current situation rather than simulating a whole range of hours worked. The question than is: what effective marginal tax rate do the currently active individual face if (s)he works one hour more than (s)he is currently working. This is a question we will explore in the next subsection.

6.2 DOES IT PAY TO WORK MORE?

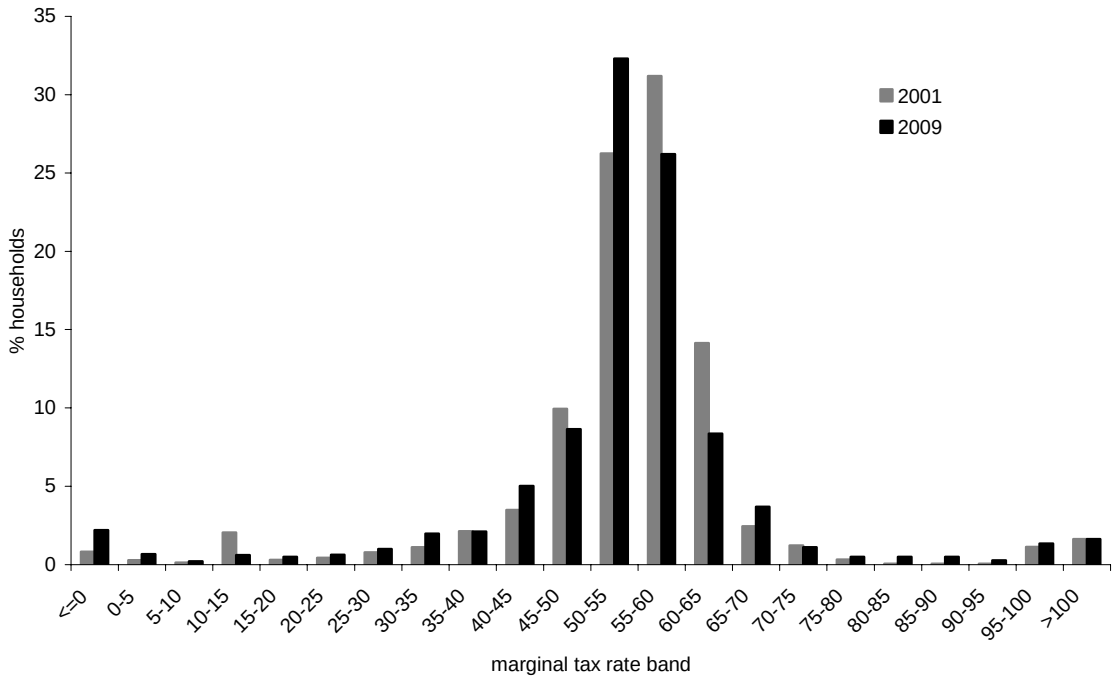
In section 6.1.2 we provided a description of the tax-benefit system as it would be if individuals faced the conditions simulated, i.e. different working hours that can be freely chosen at a fixed hourly wage rate. In this section we will start from the actual labour market situation of the individual and calculate the effective marginal tax rate that (s)he faces in this situation. The sample here consists of all currently employed individuals, including self-employed. To calculate the marginal tax rates the gross labour income is increased by a percentage amount that corresponds to one hour of extra work per week for employees and by 2% for self-employed.[10]

Here we used a percentage increase that corresponds to one hour of extra work, but we could have also taken an arbitrary percentage. Even if the worker is not able to increase his or her labour time by one hour per week, due to contractual constraints, an increase in labour income might also be perceived as stemming from a promotion or a salary increase (bonus) as token of appreciation for the effort supplied by the employee. As such effective marginal tax rates may be seen as stimulators/inhibitors to exert effort, i.e. to be ambitious.

In Figure 13 we show the distribution of households according to the marginal tax bracket they belong to for the tax-benefit system of 2001 and 2009. We see that in 2009 the distribution has shifted somewhat to the left, i.e. more households in lower tax brackets, as compared to 2001. The major part of the working household population is situated in the brackets from 45-50 to 60-65%.

[10] For employees we know or can approximate the number of hours worked per week. For self-employed this information is missing. The assumption is that employees work an average of 50 hours per week.

FIGURE 13 PERCENTAGE OF HOUSEHOLDS IN EACH MARGINAL TAX BRACKET



In Figure 14 and Figure 15 we show similar graphs, but now according to socio-economic status. In both 2001 and 2009 employees and civil servants are more concentrated in the higher tax brackets than self-employed that are more dispersed, skewing to the lower brackets, with two little spikes at the highest marginal tax brackets. Employees have shifted to the lower brackets in 2009 whereas civil servants have remained relatively stable.

FIGURE 14 PERCENTAGE OF HOUSEHOLDS IN EACH TAX BRACKET ACCORDING TO SOCIO-ECONOMIC STATUS: 2001

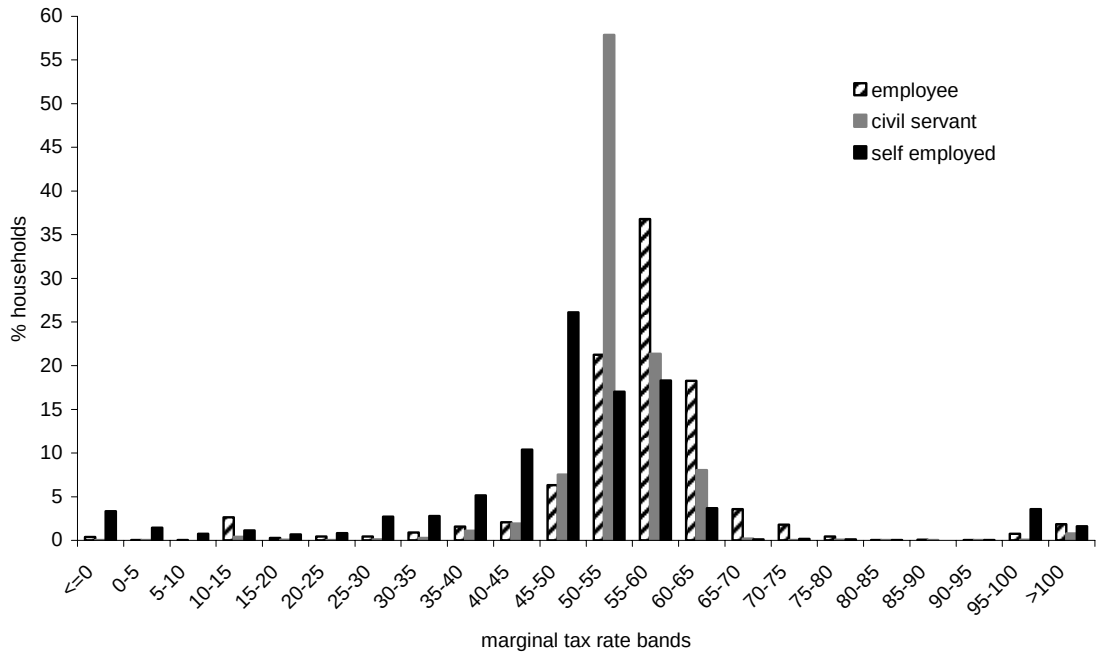
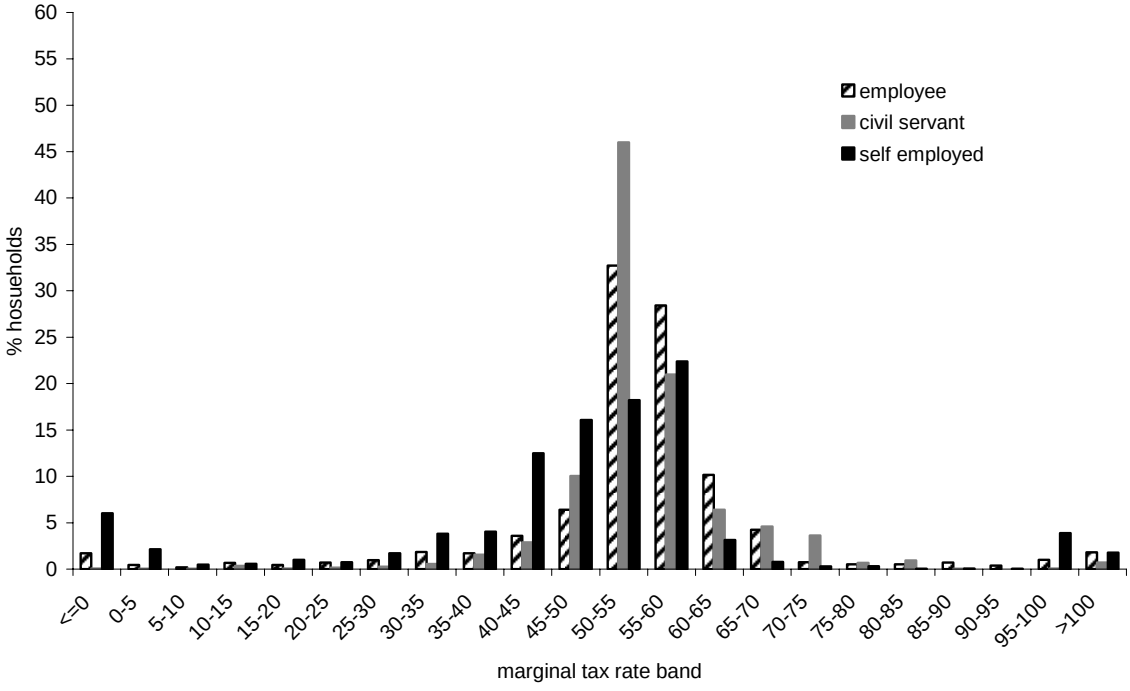


FIGURE 15 PERCENTAGE OF HOUSEHOLDS IN EACH TAX BRACKET ACCORDING TO SOCIO-ECONOMIC STATUS: 2009



Finally, in Table 18 and Table 19 we show a decomposition of the marginal tax rates analogous to what was done for the participation tax rate and following the same methodology as in expression (11). For the largest part the main contributing factor is the change in personal income taxes following a 1 hour change in the number of hours worked. For the higher marginal tax brackets however, the change in social assistance becomes by far the largest contributing factor to high effective marginal tax rates. Also the contribution of the change in employee social insurance contributions is considerable in some marginal tax rate brackets in 2001 and even more so in 2009. A change in unemployment benefits is relatively important only in the highest bracket. The same goes for the change in family allowance that is in fact the second largest contributor in the highest marginal tax rate bracket and which may be due to a loss of social supplements following an increase in labour income.

TABLE 18 MEDIAN AND MEAN MARGINAL TAX RATE AND CONTRIBUTING FACTORS TO TOTAL EFFECTIVE MARGINAL TAX RATES PER TAX BRACKET FOR CURRENTLY ACTIVE POPULATION: 2001

MTR bracket	median MTR	mean MTR	UB	disability benefits	family allowances	social assistance	SIC	personal income taxes
<=0	0.0	-17.7	-0.4	-1.6	0.0	0.0	-40.7	25.0
>0 and <=5	0.0	1.0	0.0	0.0	-0.1	-0.1	-3.0	4.1
>5 and <=10	8.1	7.9	0.0	0.0	0.0	0.0	-4.0	11.9
>10 and <=15	12.9	12.9	0.3	0.0	0.0	-0.3	11.4	1.5
>15 and <=20	17.8	17.6	0.0	0.0	0.0	-0.2	6.6	11.3
>20 and <=25	22.4	22.4	0.1	0.0	0.0	-0.1	8.7	13.7
>25 and <=30	27.8	27.5	-0.1	0.0	0.0	0.1	6.0	21.4
>30 and <=35	32.9	32.6	0.0	0.0	0.0	0.0	8.0	24.6
>35 and <=40	37.8	37.7	0.0	0.0	0.0	0.1	8.0	29.6
>40 and <=45	42.3	42.2	0.0	0.0	0.0	0.0	6.6	35.6
>45 and <=50	47.8	47.7	0.0	0.0	0.0	0.0	7.5	40.2
>50 and <=55	53.7	53.3	0.0	0.0	0.0	0.0	12.0	41.3
>55 and <=60	55.5	56.5	0.0	0.0	0.0	0.0	12.7	43.9
>60 and <=65	61.0	61.4	0.0	0.0	0.0	0.0	13.6	47.8
>65 and <=70	65.4	65.8	0.0	0.0	0.0	0.0	18.1	47.6
>70 and <=75	72.0	72.4	0.2	0.0	0.1	1.4	49.0	21.7
>75 and <=80	76.0	76.3	0.1	0.0	0.3	5.1	39.7	31.0
>80 and <=85	82.0	82.2	0.8	0.0	0.0	11.0	13.2	57.2
>85 and <=90	87.2	87.3	3.0	0.0	0.0	8.9	7.3	68.1
>90 and <=95	92.1	92.3	3.0	0.0	0.0	18.4	2.8	68.1
>95 and <=100	100.0	99.9	4.5	0.0	0.0	79.5	7.6	8.3
>100	113.3	230.0	20.4	4.8	43.7	109.7	10.3	41.0

TABLE 19 MEDIAN AND MEAN MARGINAL TAX RATE AND CONTRIBUTING FACTORS TO TOTAL EFFECTIVE MARGINAL TAX RATES BY TAX RATE BRACKET FOR CURRENTLY ACTIVE POPULATION: 2009

MTR bracket	median MTR	mean MTR	UB	disability benefits	family allowances	social assistance	SIC	personal income taxes
<=0	0.0	-2.8	0.2	0.0	0.0	-0.7	0.0	-2.3
>0 and <=5	0.0	0.5	0.0	0.0	0.0	0.0	0.2	0.2
>5 and <=10	7.9	7.7	0.0	0.0	-0.1	0.0	1.6	6.2
>10 and <=15	12.9	12.7	0.0	0.0	-0.2	0.0	8.3	4.5
>15 and <=20	18.0	17.8	0.0	0.0	-0.1	0.0	-0.2	18.1
>20 and <=25	22.8	22.7	0.2	0.0	-0.1	-0.2	-2.0	24.8
>25 and <=30	27.2	27.3	0.1	0.0	0.0	0.1	1.9	25.2
>30 and <=35	31.7	31.9	0.0	0.0	0.0	0.1	6.2	25.6
>35 and <=40	37.7	37.7	0.0	0.0	0.0	0.1	5.6	32.1
>40 and <=45	41.9	42.2	0.0	0.0	0.0	0.1	5.3	36.9
>45 and <=50	47.5	47.6	0.0	0.0	0.0	0.0	9.1	38.5
>50 and <=55	54.3	53.8	0.0	0.0	0.0	0.0	12.1	41.7
>55 and <=60	58.5	58.3	0.0	0.0	0.0	0.0	15.6	42.6
>60 and <=65	61.3	61.8	0.0	0.0	0.0	0.0	21.0	40.8
>65 and <=70	67.1	67.2	0.0	0.0	0.0	0.1	30.2	37.0
>70 and <=75	71.3	71.8	0.2	0.0	0.0	1.7	23.6	46.4
>75 and <=80	76.6	77.1	0.4	0.0	0.1	7.0	34.3	35.2
>80 and <=85	82.0	82.3	0.1	0.0	0.0	2.5	44.0	35.8
>85 and <=90	87.2	87.3	0.2	0.0	0.2	1.8	69.1	16.1
>90 and <=95	91.5	91.8	0.9	0.2	0.3	1.0	69.2	20.2
>95 and <=100	100.0	99.9	5.5	0.0	0.0	78.2	10.3	5.8
>100	104.4	210.7	15.9	4.0	45.1	91.9	11.8	40.9

7 CONCLUSION

This report has given an overview of the Belgian tax-benefit system through the lense of a microsimulation model. This model allows calculating effective participation tax rates and marginal tax rates. Indeed, looking at the statutory tax rates and brackets in the person income tax system does not provide a full picture of the incentives or disincentives faced by an individuals if (s)he decides to enter the labour market or to increase his or her labour time due to the complexities and interrelatedness of the different policy domains that make up the tax-benefit system.

We have shown that looking at typical households, while interesting in its own right and for many purposes very valuable, does not provide a full picture either of the tax burden faced by society. There is considerable variation in tax burdens even among relatively homogeneous groups, yes even among similar household demographics. A microsimulation model, such as MIMOSIS, based on a detailed micro dataset can be of much value in this respect. It will allow singling out problem areas that require extra policy attention, or, alternatively, it can reveal that what seem like problem areas are not that at all, at least not from a policy and even welfare perspective.

The possibilities to present results and to analyze different scenarios and to study different groups of individuals are near endless with a detailed microsimulation model as MIMOSIS and certainly given the very rich administrative dataset on which it is built. Therefore, we have tried to limit the analysis here to a general level but still give a flavour of the possibilities by not just repeating the same analysis and way of presenting results for each subject that we have covered, i.e. tax burden, budget constraints, effective marginal and participation tax rates and average tax rates.

If a recurrent update of an overview of the tax system is the objective we would suggest to stick with more general tables and or figures, showing results by income quintile or decile and or socio-demographic or –economic group. Examples are Table 7 and Table 8 for the average effective tax rates and Table 20 and Table 21 in the appendix for respectively participation and marginal tax rates. Examples of figures based on these tables are Figure 3 and Figure 12. Figures for more specific groups are are found in the respective sections. If there are changes in tax rates that need further exploration and explanation we suggest starting with a decomposition analysis of the contributing factors to single out the component of the tax-benefit system that contributed most to the change(s). Examples of tables accompanying such analysis are Table 9 through Table 12 and Table 16 through Table 19. We would also include transition tables such as Table 13 and Table 14.

If the objective is to analyze the effect of policy changes on the tax burden or the incentive structure we still suggest to start with a general overview to identify where potential changes that warrant extra analysis are situated. Once the ‘problem’ areas

have been identified, the analysis can than proceed for that area only, focusing on the contributing factors through a decomposition analysis and even looking at individual cases in the data itself to see what is going out. If such an analysis leads to the detection of a flaw in the policy design it can then be brought to the attention of the policy makers. On the other hand, if the problem is individual specific or maybe due to a data problem for a specific individual or household it may not be worthwhile to pursue any further. We looked at specific groups in sections 5.2 and 5.3.

Of course, a change in the incentive structure between years or as a consequence of policy changes is not necessarily informative for the change in labour supply. For this we need to estimate a labour supply model in which effective marginal and participation tax rates are implicitly taken into account. This is the topic of the companion report Decoster, De Swerdt and van Camp (2010).

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9 APPENDIX

TABLE 20 PARTICIPATION TAX RATES OVER ENTIRE HOURS RANGE FOR WHOLE (SIMULATED) POPULATION

	2001						2009					
	Wage quintile						Wage quintiles					
hours	1	2	3	4	5	All	1	2	3	4	5	All
1	211	740	746	583	363	508	214	875	1008	794	491	650
2	122	385	389	308	201	271	117	447	517	411	263	338
3	92	267	271	218	151	193	85	306	354	285	191	235
4	77	208	213	176	128	155	69	235	274	225	158	186
5	69	174	181	153	116	134	60	193	227	191	140	157
6	71	153	160	138	107	122	54	167	198	170	127	139
7	66	138	146	127	101	113	52	150	178	155	118	127
8	65	128	136	119	97	106	52	138	164	143	112	118
9	64	121	128	113	94	102	51	129	154	134	106	112
10	64	116	122	107	91	98	51	124	144	127	101	106
11	65	111	116	104	88	95	56	118	136	120	97	103
12	64	107	111	101	86	92	56	113	130	115	93	99
13	-1	39	68	77	78	51	7	51	73	81	79	57
14	7	44	71	78	77	54	13	55	74	81	78	59
15	14	48	73	79	77	57	18	58	75	81	78	60
16	20	52	74	80	76	59	22	61	75	80	77	62
17	26	55	76	80	75	61	27	63	76	80	76	63
18	30	58	77	81	74	63	31	65	76	79	76	64
19	33	61	78	81	73	64	48	67	77	79	75	68
20	37	63	79	80	72	65	51	68	77	79	74	69
21	41	65	80	80	71	66	53	70	77	78	74	70
22	54	66	80	79	70	70	55	71	77	78	73	70
23	56	68	81	78	69	70	56	72	78	78	72	71
24	58	69	81	77	69	70	58	73	78	78	72	71
25	59	70	81	76	68	71	59	74	78	77	71	71
26	61	72	80	75	68	71	61	75	78	77	71	72
27	62	73	80	74	67	71	62	75	78	77	70	72
28	63	73	79	74	67	71	63	76	79	77	70	72
29	64	74	79	73	67	71	64	77	79	76	69	72
30	65	75	78	72	66	71	65	77	79	76	69	73
31	71	79	78	72	66	73	65	78	81	76	68	73
32	70	78	77	71	66	72	64	77	81	75	68	72
33	69	78	76	71	65	71	63	76	80	75	67	72
34	68	77	75	70	65	71	62	75	79	74	67	71
35	68	76	75	70	65	70	62	75	78	74	67	70
36	67	76	74	70	65	70	61	74	78	73	66	70
37	66	75	74	69	64	69	60	73	77	73	66	69
38	66	74	73	69	64	69	60	72	77	72	66	69
39	65	74	73	69	64	69	59	72	76	72	66	68
40	65	74	72	68	64	68	59	72	76	71	65	68

TABLE 21 EFFECTIVE MARGINAL TAX RATES OVER ENTIRE HOURS RANGE FOR WHOLE (SIMULATED) POPULATION

	2001 Wage quintile						2009 Wage quintiles					
hours	1	2	3	4	5	All	1	2	3	4	5	All
1	211	740	746	583	363	508	214	875	1008	794	491	650
2	32	30	33	34	39	34	19	20	27	30	36	26
3	33	31	35	39	51	38	20	22	28	34	49	31
4	33	32	40	49	63	44	23	23	33	46	61	37
5	35	38	50	61	64	50	23	27	42	56	65	42
6	79	48	57	63	67	64	26	36	52	64	65	48
7	37	47	63	64	66	55	38	49	58	67	65	55
8	56	58	66	63	67	62	48	51	71	59	66	59
9	60	64	67	61	70	64	49	62	69	59	59	59
10	61	68	63	62	64	63	48	71	58	62	56	58
11	73	67	60	67	59	65	110	66	58	58	55	71
12	58	65	59	65	58	61	55	60	60	57	53	57
13	-786	-778	-447	-205	-11	-446	-579	-696	-617	-329	-86	-457
14	112	108	102	92	69	97	88	103	90	79	68	85
15	115	107	102	92	65	96	87	104	85	78	67	83
16	114	107	100	92	62	95	87	100	85	75	66	82
17	112	107	99	90	57	93	101	98	85	73	65	85
18	99	107	97	86	55	89	96	98	84	73	64	83
19	101	107	96	80	55	87	361	100	84	72	63	147
20	113	104	96	74	54	89	96	98	83	72	62	82
21	110	103	96	66	54	86	96	98	83	72	61	82
22	338	102	92	62	55	139	95	97	82	72	60	81
23	97	100	89	58	55	79	96	96	83	72	59	81
24	97	100	83	56	55	78	94	95	83	72	58	80
25	96	100	78	55	55	77	94	95	83	72	56	80
26	94	99	73	54	55	75	91	94	83	71	56	79
27	93	100	68	54	56	74	91	93	84	70	56	79
28	94	95	65	54	56	73	96	92	84	69	55	79
29	93	94	61	54	56	72	89	91	84	67	55	77
30	93	90	58	54	57	70	86	90	85	66	55	76
31	239	210	62	54	57	126	83	99	151	80	55	93
32	43	59	54	55	57	53	28	54	60	56	55	50
33	47	56	54	55	57	53	32	53	57	56	56	50
34	44	50	54	55	57	52	35	50	53	56	56	49
35	44	56	54	56	57	53	37	46	52	56	56	49
36	44	52	54	56	57	52	36	47	53	56	56	49
37	44	52	54	56	57	53	37	47	54	55	56	49
38	46	53	54	56	58	53	37	47	55	55	56	50
39	49	54	55	56	58	54	48	57	56	55	56	54
40	51	60	55	56	58	56	48	53	56	55	57	54