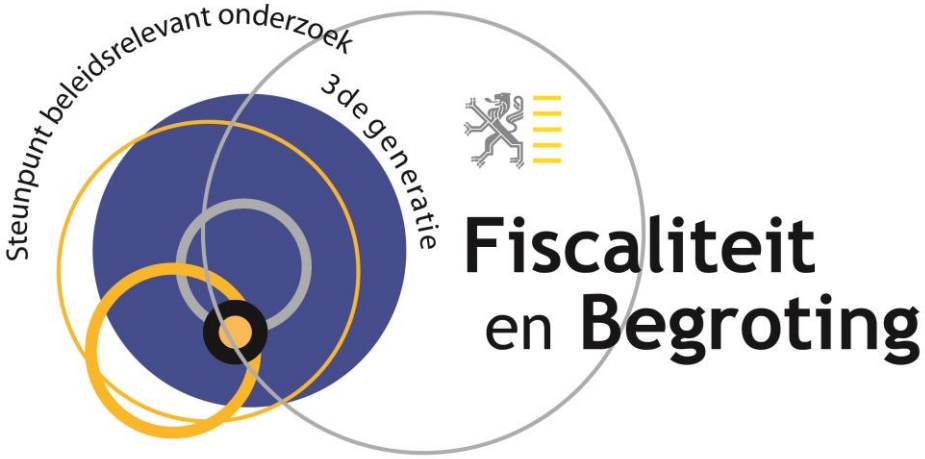

Project B1:

FISCAL EXPENDITURES AND PROGRESSIVITY IN THE BELGIAN PERSONAL INCOME TAX

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March 2013

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De hogere belastingtarieven in de hogere inkomensschijven zorgen ervoor dat het Belgische personenbelastingsysteem progressief is. Echter, er wordt steeds vaker beweerd dat door de vele belastingaftrekken –en verminderingen het systeem de facto proportioneel wordt. Deze belastingvoordelen in combinatie met de snel oplopende marginale aanslagvoeten voor de werkende bevolking zouden de progressiviteit van het belastingsysteem wel eens kunnen ondermijnen. Deze nota toont echter aan dat het Belgisch personenbelastingsysteem, gegeven de hoeveelheid aan belastingvoordelen, toch progressief blijft. Deze conclusie blijft zelfs behouden, weliswaar in kleinere mate, wanneer we de dataset beperken tot de subgroep werkende bevolking zonder vervangingsinkomen.

Aan de hand van het gedetailleerd micro-simulatiemodel FANTASI toont deze paper aan dat belastingvoordelen wel degelijk een effect hebben op de progressiviteit maar dat hun individuele impact op de gemiddelde aanslagvoet relatief beperkt is. Wanneer we echter alle belastingvoordelen schrappen, behalve het belastingkrediet voor kinderen en vervangingsinkomen, zien we dat de ongelijkheid daalt en de progressiviteit en herverdeling toeneemt. Deze counterfactual is natuurlijk niet budgetneutraal en leidt tot een verhoogde effectieve gemiddelde aanslagvoet waardoor iedereen slechter af is.

Daarom simuleren we in deze paper vier extra scenario's die wel budgetneutraal zijn en waarvoor een vergelijking met de progressiviteit en herverdeling van het huidige systeem zinvol is. Hieruit blijkt dat de mogelijkheid bestaat om budget neutrale hervormingen door te voeren in de belastingstructuur die leiden tot een stijging in zowel progressiviteit en herverdeling als tot een daling in de ongelijkheid. Belangrijk hierbij op te merken is dat de simulaties statisch zijn en dus enkel eerste-orde effecten weergeven. De vraag blijft in welke mate hervormingen in de belastingstructuur leiden tot terugverdieneffecten door gedragswijzingen die op hun beurt potentiële wijzingen in de tarieven kunnen veroorzaken.

FISCAL EXPENDITURES AND PROGRESSIVITY IN THE BELGIAN PERSONAL INCOME TAX[1]

MARCH 2013

PRELIMINARY – PLEASE DO NOT QUOTE

ANDRÉ DECOSTER
KRIS DE SWERDT

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1. INTRODUCTION

Given the complexity of the personal income tax legislation the question is often raised whether the system as a whole is still progressive. Although the statutory marginal rate structure is clearly progressive, perception prevails that because of the many income and tax deductions the personal income tax system is de facto proportional, i.e. everybody pays the same share of income in taxes as in a system with only one rate and no deductions.

Such a flat rate system is often considered the reference point for progressivity analysis of the personal income tax system in place. In this view a tax system is progressive if the share of income paid in taxes rises with income and it is considered regressive if the opposite is true, i.e. share of income paid in taxes decreases with income. A more general definition of progressivity is that a tax system is considered progressive if the distribution of after-tax income is more equal than the distribution of pre-tax income and regressive if after-tax income is less equally distributed than pre-tax income (Piketty and Saez, 2007). Of course, progressivity alone is not the sole factor contributing to a more equal income distribution. The latter also depends on the level of tax revenues and how they are spent. So for example, in the Nordic countries the tax systems are less progressive than in the USA but the revenues are much higher (including VAT). These higher revenues are spent on social security and services, both major contributors in the reduction of income inequality.[2]

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[1] The calculations in this paper make use of the microsimulation model FANTASI developed as a B-project within "Steunpunt Fiscaliteit en Begroting", financed by the Flemish Government. The results presented in this text must also be situated within the context of "Steunpunt Fiscaliteit en Begroting", yet are the sole responsibility of the authors. The Flemish Government cannot be held accountable in any way for the use made of the results presented in this paper.

[2] See blog of N. Gregory Mankiw at http://gregmankiw.blogspot.be/2011/03/what-nation-has-most-progressive-tax.html

Nevertheless, progressivity *is* a factor in inequality reduction and in this note we will shed some light on the progressivity of the Belgian personal income tax system using administrative tax data and a detailed microsimulation model for personal income taxes, FANTASI (Decoster and De Swerdt, 2013). Section 2 provides a brief description of the model and the data as well as some choices that have been made for presentation of the results. In section 3 we will look at average tax rates and income shares of different income deciles and socio-economic groups. Section 4 analyses the progressivity of the personal income tax more rigorously using regression analysis. The next section, section 4.2, digs deeper into the effect of fiscal expenditures (income and tax deductions) on progressivity, while section 6 considers the effects of separately taxed income items, i.e. income items that are not added to regular income taxed at the progressive rate structure. In section 7 we look at how removal of (some) tax and income deductions as well as globalization of all income can be translated in a different rate structure and how it affects different income deciles. Finally section 8 concludes.

2. MODEL AND DATA

As briefly mentioned in the introduction, the model we use is a detailed static microsimulation tool, FANTASI. It runs on administrative tax return data providing an opportunity to model the personal income tax legislation in a much more detailed way than is usually the case in similar models that run on survey data. The latter often lack crucial information needed to refine the model, i.e. to replicate as closely as possible taxes due as calculated by the tax administration itself. Provided with a sample of 36,483 *actual fiscal returns* for assessment year 2010 (incomes 2009), referred to as IPCAL-data, FANTASI aims at doing exactly that, i.e. approximating as closely as possible the actual tax calculation while leaving ample room to change parameters for policy simulations.[3]

Administrative tax return data also include many individuals or households that do not declare income but are still liable to file a tax return. Among them are civil servants employed at international organizations, recipients of social assistance, but also for example illegal refugees. The consequence is that the data contain a non-negligible amount of zero incomes. In fact when we construct deciles on the basis of gross income nearly the entire first decile has gross income equal to zero as 3,254 on a total of 36,483 observations, or nearly 9%, declares no income. More than two thirds of those are individuals younger than 30 years of age and over 25% are even younger than 18. As an illustration, in Table 1, we show the age demographic of the 3,354 tax returns with zero gross income.

Nevertheless, tax filers with zero gross incomes are often still eligible for refundable tax credits such as the tax credit for children and do have an impact on government budgets. Since the impact is very small however and given that a combination of (small amounts of) refundable tax credits with near zero incomes leads to extremely high negative average tax rates in the first decile, we have decided to exclude those observations from the calculations presented in the text. Deciles are then redefined on the remaining observations and all calculations are for this subset unless explicitly stated otherwise.

[3] For more detail on the performance and flexibility of FANTASI, see Decoster and De Swerdt (2013).

Table 1 Age demographic of tax returns with zero gross income

Age class	Population	Percentage	Cumulative percentage	Percentage with dependent children
<18	153920	25.6	25.6	0.0
>=18 and <=21	148925	24.7	50.3	0.2
>21 and <=25	64010	10.6	60.9	2.9
>25 and <=30	46065	7.7	68.6	6.8
>30 and <=35	35335	5.9	74.5	19.9
>35 and <=40	29600	4.9	79.4	12.5
>40 and <=45	25160	4.2	83.6	17.6
>45 and <=50	23495	3.9	87.5	13.4
>50 and <=55	20720	3.4	90.9	7.1
>55 and <=60	19055	3.2	94.1	6.8
>60 and <=65	15540	2.6	96.7	3.6
>65 and <=70	6845	1.1	97.8	2.7
>70 and <=75	5735	1.0	98.7	0.0
>75 and <=80	2775	0.5	99.2	0.0
>80	4810	0.8	100.0	0.0
	601990			4.5

3. AVERAGE TAX RATES AND INCOME SHARES

Although the rate structure of the Belgian personal income tax system is straightforward and progressive (see Table 2), the whole system is much more complex due to a multitude of income and tax deductions. Before arriving at taxable income several deductions will already have been applied where applicable. Examples of income deductions include: for working taxpayers a deduction for work-related expenditures, whether actual or lump-sum; interest payments on loans; charitable donations; a lump-sum mortgage deduction for homeowners (as of 2005); etc. Income deductions are thus deductible at the marginal tax rate. Tax deductions or reductions include (at different rates or under different modalities): repayment of mortgage principal (for loans originated before 2005); contributions to pension plans; reductions in the case of replacement income; expenditures for energy conservation; etc.

The presence of income deductions also somewhat clouds tax payers' own perception of the effective tax rate in the personal income tax. Although the top rates of 45% and 50% are reached at relatively low income levels, it should be noted that the income brackets in Table 2 refer to net taxable income, i.e. primary income (gross salary/income) minus personal social security contributions and minus income deductions (see previous paragraph). Moreover, taxation is at the level of the individual, also for couples. Income brackets do not refer to household income but to individual income. To give an idea in Table 2 in the last column the percentage of fiscal

households with a marginal tax rate in that bracket is shown.[4] More than half of the fiscal households have a *marginal* tax rate that is 40% or less, while only 15% of fiscal household have a *marginal* tax rate of 50%. The numbers in the final two columns of Table 2 do not take into account municipal or provincial taxes levied on the federal personal income taxes paid.

Because of the presence of income deductions and because of their different effect for differing income categories, in this text gross income is used as the basis for all calculations. This implies that average tax rates will be expressed as a percentage of gross income rather than of net taxable income. Also if we mention pre-tax income it refers to gross income. Gross here is defined as gross income minus personal social security contributions (if applicable).[5] Income after taxes is simply the difference between gross income and taxes paid, the latter are simulated by FANTASI.

Table 2 Belgian Personal Income Tax: Rate Structure on 2009 Income

Taxable Income Bracket (in Euro)	Tax Rate (2)	% of fiscal households with marginal tax rate equal to rate in column 2	cumulative percentage of fiscal households with marginal tax rate equal to rate in column 2
<=0	0%	9.6	9.6
0 – 7,900	25%	12.3	21.9
7,900 – 11,240	30%	6.5	28.4
11,240 – 18,730	40%	27.8	56.2
18,730 – 34,330	45%	29.2	85.4
more than 34,330	50%	14.7	100.0

Table 3 shows the average effective tax rates and shares as well as the income shares pre- and post-tax for the entire tax population divided into deciles of per capita gross income, i.e. gross income per fiscal unit divided by the number of taxable persons in that unit.[6] The first two columns with calculations show the per capita gross income and tax paid in Euro. This is obtained by dividing the aggregate gross income and taxes paid by the weighted number of individuals in the respective deciles. From this one can see that the higher the income, the higher the tax paid. Of course, this does not necessarily imply the tax structure is progressive and therefore we look at average tax rates and income and tax shares in the remaining columns. As is evident from the table, even when accounting for all the complexity, the personal income tax system is still progressive: the share of income paid in taxes, as measured by the average tax rate, rises as income rises. Also, applying the more general definition of progressivity as mentioned in the introduction, it can be seen that after-tax income is more equally distributed than the pre-tax distribution. The post-tax income share of deciles 1 through 6 increases whereas the share of the

[4] The marginal tax rate for a fiscal household is the maximum marginal tax rate between 'spouses' in case of a fiscal couple.

[5] Personal Social Insurance contributions are not recorded in the administrative tax data.

[6] The number of taxable persons in a tax unit is at most 2, i.e. in the case of married or legally cobitating couples. We do not take into account dependent persons for the calculation of per capita amounts.

highest deciles decreases as compared to their respective pre-tax income shares. In the top percentile (the top 1% gross incomes) the average tax rate is actually lower than in the preceding percentiles and even lower than the average tax rate in decile 9. In fact, in decile 10, as visualized by the top 10 percentiles, one cannot discern a clear progressive pattern as was the case for the general decile distribution. Nevertheless, the entire system is progressive and redistributive as is confirmed by the Kakwani index for progressivity and the Reynolds-Smolensky index for redistribution in the bottom rows of the table. The higher the index, the more progressive, respectively redistributive the system is.

As for inequality, as measured by the Gini index, it should be noted that it uses gross income as the basis. Post-tax in this case, means gross income minus taxes paid. Gross income should not be confused with net taxable income that is obtained after subtraction of work-related expenses and other income deductions. Therefore the Gini index is relatively high as compared to inequality measurement based on net taxable income. The personal income tax system, through its progressive and redistributive nature, decreases inequality by some 8.4%.

Table 3 Distribution of Income and Taxes over deciles of per capita gross income

decile	Gross Income per Capita (in €)	Tax per Capita (in €)	Average Tax Rate	Share in total Tax Revenue	Share in total pre-tax Income	Share in total post-tax Income
All	23,901	4,265	17.8			
1	1,813	-31	-1.7	-0.1	0.6	0.7
2	8,093	-65	-0.8	-0.2	3.8	4.7
3	11,446	153	1.3	0.4	4.7	5.7
4	13,752	482	3.5	1.1	5.5	6.5
5	16,774	1,452	8.7	3.3	6.8	7.6
6	20,782	2,863	13.8	6.8	8.8	9.2
7	25,129	4,476	17.8	10.6	10.6	10.6
8	29,852	6,222	20.8	14.9	12.8	12.3
9	36,929	8,556	23.2	21.3	16.4	15.4
10	66,224	16,502	24.9	41.9	30.0	27.4
Percentile						
91	43,094	10,572	24.5	2.7	2.0	1.8
92	44,785	11,183	25.0	2.8	2.0	1.9
93	46,673	12,212	26.2	3.0	2.1	1.9
94	48,992	12,650	25.8	3.3	2.2	2.0
95	52,059	13,277	25.5	3.4	2.4	2.1
96	55,839	15,214	27.2	3.9	2.6	2.3
97	61,089	16,116	26.4	4.0	2.7	2.4
98	68,490	18,024	26.3	4.6	3.1	2.8
99	83,473	20,968	25.1	5.2	3.7	3.4
100	156,889	34,649	22.1	8.9	7.2	6.8
Gini Pre-Tax (inequality)			0.4582			
Gini Post-Tax (inequality)			0.4199			
Reynolds-Smolensky (redistribution)			0.0383			
Kakwani (progressivity)			0.1900			

Although in Table 3 it was shown that the current personal income tax system is in effect progressive, the argument often goes that this result is due to the presence of retired individuals and other taxpayers not participating in the labor force who, in general, are subject to lower tax rates and in some instances enjoy favourable income tax treatment. In the case of replacement income for example, taxes will be reduced to zero if taxable income only consists of replacement income and does not exceed a certain threshold. Therefore in Table 4 we only look at fiscal units where the main source of income stems from labor market activity and that have no replacement

income.[7] Again we see the progressivity in the income tax system according to the two definitions: the average tax rate is rising across the income distribution and the post-tax income distribution is more equal than the pre-tax distribution. The effects are much less pronounced though, and the top percentile now has an average tax rates that is somewhere between that of the 6th and 7th decile. The less progressive structure among the active population is also evidenced by much lower indexes and less reduction in inequality, the latter being also more outspoken than for the entire population. The Kakwani index drops from 0.1900 to 0.0736 and the Reynolds-Smolensky index more than halves, resulting in a much smaller reduction in inequality.

In this section we have given a broad picture of progressivity based on income deciles and pre- and post-tax income shares and average tax rates. Though it seemed possible to discern a progressive overall personal income tax system from glancing at the tables, in the next section we will take it a step further and analyze whether the observed progressivity also has statistical validity. We do this using a regression approach.

[7] By the main source of income we mean that income from labour market activity is larger than any of the other income components, but not necessarily larger than the sum total of those other components.

Table 4 Distribution of Income and Taxes over deciles of per capita gross income: fiscal households with labour market income as main source of income and no replacement income

decile	Gross Income per Capita (in €)	Tax per Capita (in €)	Average Tax Rate	Share in total Tax Revenue	Share in total pre-tax Income	Share in total post-tax Income
All	30,861	6,681	21.6			
1	635	-12	-1.9	-0.0	0.2	0.2
2	2,039	-17	-0.8	-0.0	0.5	0.7
3	9,639	160	1.7	0.2	3.0	3.7
4	19,069	2,182	11.4	3.4	6.4	7.3
5	24,460	4,154	17.0	6.1	7.7	8.2
6	28,594	5,748	20.1	8.8	9.5	9.7
7	32,974	7,193	21.8	11.3	11.2	11.2
8	38,663	8,971	23.2	14.6	13.7	13.4
9	47,438	11,966	25.2	19.8	17.0	16.2
10	84,936	21,387	25.2	35.7	30.7	29.3
Percentile						
91	55,322	15,382	27.8	2.5	2.0	1.8
92	57,760	15,434	26.7	2.5	2.1	1.9
93	60,241	16,479	27.4	2.7	2.1	2.0
94	63,187	16,414	26.0	2.9	2.4	2.3
95	66,909	18,164	27.1	3.1	2.4	2.3
96	71,842	19,696	27.4	3.2	2.5	2.3
97	78,678	20,412	25.9	3.3	2.8	2.6
98	88,350	22,310	25.3	3.8	3.3	3.1
99	109,061	28,667	26.3	4.8	4.0	3.7
100	197,033	40,757	20.7	6.8	7.1	7.2
Gini Pre-Tax (inequality)			0.5067			
Gini Post-Tax (inequality)			0.4898			
Reynolds-Smolensky (redistribution)			0.0169			
Kakwani (progressivity)			0.0736			

4. ELASTICITY OF TAXES AND OF NET INCOME[8]

In this section we will analyse in greater detail the elasticity of taxes and net income with respect to gross income using two approaches. The first approach is parametric and makes use of regression analysis (in combination with FANTASI) while the second approach is a microsimulation approach and only uses the parameterisation and flexibility FANTASI.

4.1 parametric approach

In this subsection we focus on the personal income tax system from the perspective of the fiscal household, by defining the income tax system as the relationship which transforms gross income into household disposable income. The gross and net income concepts are the same here as in the previous section.

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

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

where gross income is assumed to be exogenously given.

As mentioned in the introduction in recent years it has become quite popular to state that, despite the progressive rate structure, the Belgian income tax 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 paid at the fiscal 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

[8] Much of this section is drawn from Decoster et al. (2010), where a similar exercise was done for the global tax benefit system and based on administrative, though not fiscal, data.

tax system is progressive according to the standard definition of progressivity (Piketty and Saez, 2007). If $\beta > 1$, the tax system is said to be 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[9]:

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

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 FANTASI, are given in Table 17. We show three different regression results. 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):

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

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:

$$\ln(y) = \tilde{\alpha} + (\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n) \ln(Y). \tag{7}$$

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

Here, in Table 5 and Table 6 we summarize some of the results by means of elasticities. We calculate the elasticity of taxes paid with respect to gross income for deciles of gross income (not per capita) according to specification (5) at median decile income (Table 5). For the elasticities of socio-economic groups we use specification (7) and results are shown for the reference group, i.e. singles with no children living in Flanders. This is also the largest group among taxpayers

[9] To shorten the notation in the transformation of (2) we have substituted $\ln(\alpha)$ by $\tilde{\alpha}$.

representing nearly one third of all observations (singles without children in Belgium as a whole constitute more than half of all the observations. Deciles are redefined per socio-economic group as is the median income. In Table 6 we show elasticities for the same socio-economic groups across regions and socio-demographic characteristics, again using estimation results of specification (7) at the median income level of the respective groups.[10]

As one can see from Table 5 elasticity is quite diverse across deciles and socio-economic groups. Notwithstanding a few exceptions, in general elasticity declines with income. This implies that an increase in income results in a *relatively* lower increase in taxes paid than a similar increase at a lower income level. On average the elasticity is around 1.51 implying that a 1% increase in gross income leads to a 1.51% increase in taxes paid. Elasticities are by far the highest among unemployed, reaching almost 3 on average with some extreme negative outliers in the lower deciles. Employees have the lowest elasticity on average while self-employed and pensioners are somewhere in between with very high elasticities at lower income levels that continuously decrease as income increases.

Among socio-economic and -demographic groups Table 6 confirms the picture seen in Table 5 with employees having the lowest elasticities and unemployed the highest. There is quite some heterogeneity among demographic groups however, with elasticities increasing from single to married and couple and clearly increasing the higher the number of dependent children for employees and self-employed. For unemployed and pensioners the patterns are more ambiguous with all-but-one negative elasticities among unemployed demographic groups and a substantial negative elasticity for couple pensioners with 2 dependent children. A negative elasticity implies that taxes paid actually decrease as income increases (moderately). What the tables show is that elasticities are quite diverse and that they can take extreme values, both positive as well as negative.

Besides a calculation of elasticities the use of regression analysis has also provided a statistical validation of a progressive personal income tax structure, i.e. $\beta < 1$. In the next subsection, we will bring in more variability and calculate elasticities based on simulation results.

[10] Socio-economic groups are defined on the basis of income. For example, an observation is identified as employee if its main source of income stems from salaried work. Main source of income is determined by the largest income component, i.e. which is larger than all other income components (individually).

Table 5 Elasticity of taxes with respect to gross income: income deciles using parametric approach

		Singles without Children in Flanders			
Decile of Gross Income	Belgium, entire population	Employee	Self-Employed	Unemployed	Pensioner
All	1.51	1.33	1.54	2.87	1.79
1	0.64	-0.37	6.58	-0.35	2.84
2	-0.79	1.91	2.24	-30.74	2.16
3	1.85	1.42	1.84	4.22	2.02
4	1.70	1.37	1.69	3.21	1.92
5	1.58	1.34	1.58	3.00	1.84
6	1.50	1.32	1.51	2.75	1.75
7	1.45	1.30	1.45	2.50	1.68
8	1.40	1.27	1.41	2.23	1.60
9	1.34	1.25	1.35	1.99	1.52
10	1.29	1.22	1.29	1.68	1.42

Table 6 Elasticity of taxes with respect to gross income: socio-economic groups using parametric approach

	Flanders	Wallonia	Brussels
	Employee		
Single, no children	1.33	1.34	1.34
Single, 2 children	1.44	1.46	1.47
Married, no children	1.41	1.43	1.43
Married, 2 children	1.48	1.50	1.51
Couple, no children	1.45	1.47	1.47
Couple, 2 children	1.56	1.59	1.59
	Self-Employed		
Single, no children	1.51	1.58	1.72
Single, 2 children	2.06	2.42	3.42
Married, no children	1.85	2.07	2.57
Married, 2 children	2.39	3.09	6.09
Couple, no children	2.09	2.49	3.62
Couple, 2 children	4.16	13.36	-4.31
	Unemployed		
Single, no children	2.52	3.09	2.86
Single, 2 children	-3.63	-1.59	-2.14
Married, no children	-68.53	-4.37	-7.28
Married, 2 children	-1.44	-0.73	-0.97
Couple, no children	-3.11	-1.42	-1.89
Couple, 2 children	-0.33	-0.09	-0.18
	Pensioner		
Single, no children	1.78	1.82	1.79
Single, 2 children	3.31	3.64	3.36
Married, no children	2.60	2.75	2.63
Married, 2 children	5.06	6.19	5.17
Couple, no children	3.46	3.84	3.52
Couple, 2 children	-11.06	-6.33	-10.64

4.2 simulation approach

In this subsection we use all information and detail available. In the parametric approach, while coefficients were also estimated using all information and detail available, the final calculations

concentrated on one income point, namely median income.[11] Here, we simulate elasticities by increasing gross incomes by 1% and comparing tax revenues before and after the increase. This amounts to a 1% *real* increase in gross incomes as all other parameters and tax brackets remain unchanged. It should be noted that *all* monetary amounts have been increased by 1% which implies that we assume that fiscal expenditures (tax and income deductions) as a percentage of gross income remain constant as do, for example, actual work-related expenses.

Here we do not distinguish between regions and demographics but show results for Belgium. A glance at Table 7 reveals a similar diversity across deciles but here it are the self-employed that have the lowest elasticities.[12] Except for self-employed, on average elasticities are higher when using a simulation approach than when using a parametric approach with an overall elasticity of 1.90 for the entire population versus 1.51 in the parametric approach.

Among socio-economic groups unemployed have by far the highest overall elasticity, followed by pensioners, employees and self-employed respectively. Also in this approach negative elasticities are not uncommon, implying that an increase in gross income results in a decrease in taxes paid. Often this is due to (refundable) tax credits that set in once income exceeds a certain threshold and is then applied with the amount gradually decreasing up to a maximum income level. This is especially true for self-employed in the lower deciles, unemployed and to a lesser extent also pensioners in the first decile. The latter, however, also show by far the highest elasticities in the second and third deciles. For the second decile, for example, an increase in gross income of 1% results in an increase in taxes of more than 81%. This is a result of reduction to zero of taxes if net income consists solely of replacement income and does not exceed a certain threshold. If (gross) incomes are increased by 1% some of those previously enjoying this reduction will now no longer be eligible, even with the existence of a tapering provision.

[11] It is more accurate to say that the estimations used all information and detail chosen by the researchers. Indeed, only the variables that are included in the regression are taken into account in the final calculations.

[12] Remark that deciles have been redefined according to socio-economic groups. For example deciles for employees are defined for that subgroup only and so for the other socio-economic groups.

Table 7 Elasticity of taxes with respect to gross income: income deciles using simulation approach

Decile of Gross Income	Entire population	Employee	Self-employed	Unemployed	Pensioner
All	1.93	1.79	1.12	5.44	3.11
1	0.06	0.04	-514.35	0.00	-3.82
2	-7.87	10.25	-6.31	-0.33	73.56
3	19.98	3.24	-1.83	-4.10	58.91
4	4.50	2.42	-0.07	-1.55	11.74
5	3.28	2.17	0.90	-1.49	4.71
6	2.74	1.89	1.16	-4.58	3.94
7	2.17	1.88	1.16	27.75	4.65
8	1.97	1.88	1.63	7.63	4.51
9	1.82	1.77	1.45	4.94	3.24
10	1.47	1.46	1.24	3.51	1.81

4.3 macro-economic elasticity

In Saintrain (1998) and Frogneux and Saintrain (2012) a methodology is developed and described to calculate elasticities based on aggregate statistics published by Statistics Belgium. As the elasticity is the ratio of the (effective) marginal tax rate to the average tax rate, their methodology is mainly focused on deriving the marginal tax rate for quantiles based on quantile aggregate statistics. They find an elasticity of tax revenue with respect to total net income of around 1.6 for incomes of 2008. Whereas this is considered a macro-economic elasticity, it should be noted from the onset that this is *not* an elasticity with respect to GDP (see next section).

We applied their methodology to incomes of 2009 as published by Statistics Belgium as well as to similar aggregate statistics produced by FANTASI. The results are summarized in Table 8. As the table shows underlying the overall elasticity are quite divergent elasticities across deciles. For net taxable income we have used the same income definition as Statistics Belgium but in our decile distribution based on net taxable income the aggregate tax revenue in the first decile is negative, even though we restrict the sample to observations with strictly positive values of the ordering variable, i.e. net taxable income or gross income. This is the reason we find negative marginal tax rates in the second decile.[13] Nevertheless, the overall elasticities are quite similar when using net taxable income. With gross income as tax base the elasticity is lowest.

These results also differ from the overall results using the simulation approach in the previous subsection where we found an overall elasticity of 1.90. The latter should be compared to the elasticity of 1.48 in the last column of Table 8 using the same tax base. Therefore in Table 9 we

[13] A possible explanation is that Statistics Belgium uses still another selection criterium, other than strictly positive values, for inclusion in the calculation of the quantile distribution.

show the marginal tax rates that underlie the results in the last columns of Table 8 as well as the effective marginal tax rates obtained by increasing gross incomes by 1% in FANTASI. What this shows is that the marginal tax rates are overall smaller when using Saintrain (1998) than when using a 1% increase in gross incomes in FANTASI. And since the average tax rates are identical in both methodologies, the elasticity tends to be lower using the aggregate statistics than when using the full details of the microsimulation model. Moreover, the pattern of marginal tax rates is much more erratic across deciles when using aggregate statistics as compared to a more smoothly increasing pattern when using a microsimulation approach.

Table 8 Macro-economic elasticities for 2009 incomes using methodology developed in Saintrain (1998)

Decile	Statistics Belgium (Net Taxable Income)	FANTASI using Net Taxable Income	FANTASI using Gross Income
All	1.58	1.63	1.48
1	1.00	1.00	1.00
2	2.05	-44.64	-1.69
3	3.15	6.09	11.69
4	7.19	8.22	6.08
5	1.62	1.81	2.53
6	3.83	3.80	2.86
7	0.16	0.65	1.52
8	2.50	2.07	1.17
9	0.84	1.09	1.32
10	1.35	1.37	1.10

Table 9 Marginal tax rates for deciles of gross income

Decile	Using methodology developed in Saintrain (1998)	Using a 1% increase of gross incomes in FANTASI
Average Tax Rate	17.82%	17.82%
	Marginal Tax Rates	
All	26.29%	33.86%
1	-1.30%	-0.07%
2	0.64%	3.02%
3	12.10%	20.99%
4	33.19%	24.68%
5	25.86%	32.49%
6	41.76%	36.61%
7	27.27%	37.33%
8	22.76%	37.95%
9	28.05%	38.48%
10	26.29%	34.99%
Elasticity	1.48	1.90

4.4 elasticity with respect to GDP

All of the above elasticities were calculated with respect to the tax base, however defined. For some purposes it can be useful to have the elasticity of tax revenue expressed with respect to GDP. In this subsection we derive expressions that aim to do that.

What we want to establish is an answer to the question how much tax revenue rises a GDP rises. In (8) the elasticity of tax revenue with respect to GDP is expressed in mathematical symbols (making abstraction of nominal versus real):

$$\varepsilon_{T,GDP} = \frac{\frac{\Delta T}{T}}{\frac{\Delta GDP}{GDP}} = \frac{g_T}{g_{GDP}}. \qquad (8)$$

It can be seen that the elasticity is the ratio of the growth rate of tax revenue to the growth rate of GDP. We have no direct way of estimating the elasticity of tax revenue with respect to GDP and want to make use of the results we already have for the elasticity of tax revenue with respect to

the tax base.[14] Similar to (8) we can write the elasticity of tax revenue with respect to the tax base as:

$$\varepsilon_{T,Y} = \frac{g_T}{g_Y}, \tag{9}$$

with Y the tax base. Alternatively, we can write:

$$g_T = g_Y \varepsilon_{T,Y}. \tag{10}$$

We now have an expression for the growth rate in tax revenue in terms of variables/quantities we can easily estimate/simulate. The question then becomes how to translate the growth rate in GDP in a growth rate of the tax base. Here we assume that the share of labour income in GDP remains constant and hence an increase of x% in GDP translates in an increase of x% in labour income. The share of labour income in the total tax base can then be used to translate the growth in GDP in a growth rate of the tax base.

Of course, (10) holds for nominal as well as real growth rates and elasticities. In the preceding sections we have calculated real elasticities and in order to apply (10) to nominal quantities we have to rewrite the variables in nominal terms. Knowing that (where N stands for "nominal", R for "real", and π is the rate of inflation)

$$\left(1+g^N\right) = \left(1+g^R\right)\left(1+\pi\right), \tag{11}$$

and given (9), the nominal elasticity can be written in function of the real elasticity –that we have estimated– as:

$$\varepsilon_{T,Y}^N = \varepsilon_{T,Y}^R \frac{1+\pi\left(1+\dfrac{1}{\varepsilon_{T,Y}^R g_Y^R}\right)}{1+\pi\left(1+\dfrac{1}{g_Y^R}\right)}, \tag{12}$$

where again R stands for "real", N for "nominal", π for the rate of inflation, T is tax revenue and Y the tax base. Given (11) and (12) we can write (10) in nominal terms as:

$$g_T^N = \left(g_Y^R + \left(1+g_Y^R\right)\pi\right)\varepsilon_{T,Y}^R \frac{1+\pi\left(1+\dfrac{1}{\varepsilon_{T,Y}^R g_Y^R}\right)}{1+\pi\left(1+\dfrac{1}{g_Y^R}\right)}. \tag{13}$$

[14] There are methods to estimate the elasticity of tax revenue with respect to GDP, but this would also involve keeping the tax legislation constant. Here we present a methodology that makes use of easily obtainable results.

Given growth rates for GDP we can now calculate the elasticity of tax revenue with respect to GDP by using the familiar variables and quantities. For example, if it is assumed that the share of labour income in the tax base (gross income) is 71.5% and that real GDP-growth is 2.1% we can derive from (10) that the real growth rate in taxes is close to 2.9% (using a real elasticity of tax revenue with respect to the tax base of 1.90) and the **real elasticity** of tax revenue with respect to GDP is approximately to **1.36**. In this scenario we have assumed that the other income components of the tax base had real growth rates equal to zero and hence the real growth rate in the tax base is equal to 71.5% of 2.1% or approximately 1.50%. Of course it is possible to also make assumptions about the growth rates of the other income components of the tax base –that are not counted in GDP– and plug them into the expression for determining the total growth rate in the tax base using the shares of the respective income components (an example is given in the last paragraph to this section).

Assuming a real growth rate in GDP of 2.1% and a rate of inflation of 2.2% together with a share of labour income in the tax base of 71.5% and further assuming no growth in the other income components of the tax base we can derive the **nominal elasticity** of tax revenue with respect to GDP using (13) and arrive at an elasticity of close to **1.21**.

If the other income components of the tax base were to increase in real terms with 1.5% the real and nominal elasticity of tax revenue with respect to GDP would be around 1.75 and 1.37 respectively.

5. PROGRESSIVITY AND FISCAL EXPENDITURES

In the public debate it is often asserted that income deductions and tax reductions greatly diminish the progressivity of the tax system. According to this view, tax deductions are mainly beneficial for the higher income taxpayers, thus lowering their tax burden and hence their share in taxes. In the previous sections we have seen that tax deductions do not cancel out progressivity as all calculations shown up until now took into account tax deductions. One can still wonder whether tax deductions do not greatly diminish the degree of progressivity and that is what we will answer in this section.

A look at Table 10 does indeed show that for most fiscal expenditures, the bulk of the advantage is situated in the higher income deciles. Remark that not all fiscal expenditures are shown in the table, only those that are relevant for the present analysis and with non-negligible budgetary costs. In the last row of the table the contribution to the average tax rate for each of the fiscal expenditures is shown. It means that if we were to ‘switch off’ that particular expenditure the overall average tax rate would increase by the amount shown in the last row. The average tax rate is a determinant in the amount of redistribution as will be shown later in this section. A first glance at the last row already shows that the effect of the separate fiscal expenditures on the average tax rate is relatively modest except for the tax credit for replacement income and to a lesser extent the actual work-related expenses incurred. The one tax credit that clearly favours the lower half of the income distribution is the refundable tax credit for children. Not surprising, as this tax credit depends in large part in taxable income. But also the use of service vouchers is found in the lower deciles much more so than the other fiscal expenditure categories. Of course,

the tax credit for replacement income is also more prominent in the lower regions of the income distribution and is by far the most costly as is shown in the second last row of the table.

The final column of Table 10 shows the distribution of the share in separately taxed income items. Often those items are taxed at considerably lower rates than the marginal tax rates found in the personal income tax rate structure and applicable to globalized income items. In the calculation of the numbers shown in the last column we do not include capital amounts received by pensioners at the beginning of their pension. More than half of the cost of more than €760 million goes to the top decile and almost 70% to the top 2 deciles, partly explaining the lower average tax rates at the very top of the income distribution.

Table 10 Share in Fiscal Expenditures per decile of per capita gross income

Decile gross income	Share in gross income	Actual work-related expenses[15]	Mortgage deduction (capital, old system)	Service vouchers	Investments in energy saving	Mortgage deduction (capital+interest, new system)	Retirement saving (private)	Long term saving plans	Deduction cadastral income	Interest deduction	Tax Credit Replacement Income	Tax Credit Children	Separately Taxed Income
1	0.6	0.0	0.0	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	10.2	0.0
2	3.8	0.0	0.0	3.1	0.1	0.1	0.1	0.0	1.3	0.1	7.6	33.4	0.3
3	4.7	0.0	0.2	2.5	1.0	0.6	0.7	1.0	4.7	0.5	13.2	20.2	1.0
4	5.5	0.1	1.1	3.2	2.0	1.6	2.1	2.0	8.6	1.3	16.7	16.5	1.8
5	6.8	0.5	3.0	7.7	3.7	4.1	5.1	5.7	12.1	3.2	22.1	10.1	3.9
6	8.8	1.0	6.8	7.1	8.8	10.2	9.0	8.3	12.9	6.7	17.6	3.6	5.9
7	10.6	2.5	11.7	8.0	11.7	18.2	13.4	12.1	11.0	9.3	9.9	2.4	7.5
8	12.8	4.4	17.7	11.1	16.6	22.0	17.4	14.2	11.7	14.6	6.3	0.8	8.9
9	16.4	9.3	26.0	20.0	24.2	22.9	22.6	21.0	15.2	22.5	4.3	0.7	13.6
10	30.0	82.1	33.5	36.4	31.9	20.2	29.6	35.6	22.5	41.7	2.3	2.0	57.1
Cost in million €		1254	864	137	600	820	497	277	487	673	2733	169	767
Average Rate	17.8	0.64	0.44	0.07	0.31	0.42	0.25	0.14	0.25	0.34	1.40	0.09	0.39

[15] The cost of the fiscal expenditure here is calculated as the difference between actual work related expenses incurred (and declared) and what would be deductible under a lump sum system.

To shed more light on the effect of fiscal expenditures on average tax rates, in Table 11 we show the average effective tax rates, extra tax revenue and gain/loss per capita for the population with strictly positive gross income in two situations. One is the tax rate in the current system with all deductions applied and a second is the tax rate in a counterfactual system where all income and tax deductions have been removed, except for the tax credit for replacement incomes and dependent children.[16] Obviously, we do not take into account behavioural responses in this analysis.

The table shows that with all income and tax deductions switched off the average tax rate increases with income albeit less so in the top 10 percentiles of the income distribution. Whereas everybody loses in this 'new' system, inequality decreases, progressivity slightly increases and redistribution increases considerably as compared to the current baseline system. The top deciles and percentiles lose considerably more in absolute terms than do the bottom deciles. They also see their average tax rate increase by more percentage points than the lower income deciles. Given the results in Table 10 this does not come as a surprise. Abolishing fiscal expenditures hurts the higher income earners more because they tend to profit more from them.

The overall extra revenue from no longer applying income deductions and tax reductions amounts to more then €6 billion and the average loss per capita is €756. The question how we can 'redistribute' the extra revenue through changes in the marginal tax rate structure and how it affects different income deciles will be discussed in more detail in section 7.

From Table 10 we know that also separately taxed income items have a 'cost'. At €767 million it is in fact very similar to that of the new system of mortgage and interest deduction ("Woonbonus"). Moreover, it are mainly the upper tails of the income distribution that benefit. In the next section we will take the analysis a step further and look at how separately taxed income items have an effect on progressivity.

[16] Not only the fiscal expenditures shown in Table 10 have been removed but all fiscal expenditures for which a 'on/off' switch is programmed in FANTASI, 21 in total. Besides the ones already mentioned in the text, we leave one deduction in place, namely the deduction of work-related expenses but we do abolish the possibility to deduct actual expenses incurred and replace it by a system of lump sum deductions for all (see also footnote 15).

Table 11 Effective average tax rates across deciles of gross income per capita with and without income and tax deductions for tax returns with positive gross income. Tax credits for replacement income and dependent children remain in place.

Decile of Gross Income	Actual Tax Rate (Income 2009)	Tax Rate with Deductions switched off (except tax credit for children and replacement incomes)	Extra Tax Revenue in Million Euro	Per Capita Gain/Loss in Euro
Entire Population	17.8	21.0	6,167	-756
1	-1.7	-1.5	2	-3
2	-0.8	-0.5	26	-28
3	1.3	2.1	68	-85
4	3.5	4.7	134	-171
5	8.7	10.6	262	-330
6	13.8	16.4	451	-548
7	17.8	20.9	640	-780
8	20.8	24.3	863	-1,032
9	23.2	26.9	1,196	-1,379
10	24.9	29.2	2,526	-2,859
Percentile				
91	24.5	28.4	147	-1,663
92	25.0	29.1	164	-1,852
93	26.2	29.9	150	-1,729
94	25.8	29.7	169	-1,893
95	25.5	29.8	198	-2,234
96	27.2	31.1	194	-2,175
97	26.4	30.3	211	-2,413
98	26.3	30.3	242	-2,710
99	25.1	29.8	341	-3,942
100	22.1	27.1	710	-7,937
Gini Pre-Tax	0.4582	0.4582		
Gini Post-Tax	0.4199	0.4105		
Reynolds-Smolensky (redistribution)	0.0383	0.0477		
Kakwani (progressivity)	0.1900	0.1906		

6. PROGRESSIVITY AND SEPARATELY TAXED INCOME ITEMS

Indeed, popular perception is that tax expenditures favour the larger incomes and that this has a negative effect on the degree of progressivity. The former is certainly true as is shown by the

shares in tax expenditures by deciles shown in Table 10. The decrease in progressivity could not be confirmed by the analysis summarized in Table 11. It actually slightly increased.

What is rarely voiced, though, is the fact that many income items that are taxed separately are done so at considerably lower rates than those applicable to general income (the rate structure as shown in Table 2) and that it are mainly higher income earners that declare such separately taxed items (dividends, interest on capital, capital gains from asset sales, etc.). Therefore in Table 12 the average tax rates are shown when *all* income is taxed at the same progressive rate structure, also known as income globalization.[17]

As the numbers in Table 12 show, both the degree of progressivity and redistribution increase in this scenario, while post tax inequality decreases. The effects are less pronounced than in the case of a general removal of fiscal expenditures (tax and income deductions), but there clearly are effects and the largest 'losers' are the top 2 deciles and especially the top percentile where the per capita loss is more than 5 times that of the second last percentile. A combination of removal of income and tax deductions and of income globalization might leave more room for a potential personal income tax reform, a topic we will address in the next section.

[17] In the current system income globalization is applied only if it is advantageous to the taxpayer. As mentioned in section 4.2 pension capital remains separately taxed and is not included in the globalization.

Table 12 Effective average tax rates when all income is taxed at the same progressive rate structure (income globalization)

Decile of Gross Income	Actual Tax Rate (Income 2009)	Tax Rate with income globalization	Extra Tax Revenue in Million Euro	Per Capita Gain in Euro
Entire Population	17.8	18.2	779	-96
1	-1.7	-1.7	0	0
2	-0.8	-0.8	2	-3
3	1.3	1.4	8	-10
4	3.5	3.6	14	-18
5	8.7	8.9	30	-38
6	13.8	14.0	46	-56
7	17.8	18.1	59	-72
8	20.8	21.1	70	-83
9	23.2	23.5	107	-123
10	24.9	25.7	444	-502
Percentile				
91	24.5	24.9	15	-168
92	25.0	25.3	13	-148
93	26.2	26.4	11	-130
94	25.8	26.2	16	-175
95	25.5	26.0	25	-280
96	27.2	27.9	31	-344
97	26.4	26.9	25	-291
98	26.3	26.9	38	-426
99	25.1	25.7	41	-479
100	22.1	23.7	228	-2,550
Gini Pre-Tax	0.4582	0.4582		
Gini Post-Tax	0.4199	0.4186		
Reynolds-Smolensky (redistribution)	0.0383	0.0396		
Kakwani (progressivity)	0.1900	0.1908		

7. REDISTRIBUTION OF PERSONAL INCOME TAX 'REFORMS' THROUGH LOWER RATES

We saw in the second last column of Table 11 that a removal of most of the income and tax deductions resulted in an overall average tax rate increase of 3.2 percentage points resulting in a

€6.1 billion increase in tax revenue. Is it possible to redistribute this extra revenue such that total government revenue from personal income taxation remains equal (at approximately €34.8 billion)? Table 13 shows two reform scenarios that do exactly that. The first scenario involves changes in the rate structure while the second scenario keeps the rate structure as is but increases the base tax allowance.

In the first scenario the two middle income brackets have been broadened and the rate structure adjusted. The income bracket taxed at 40% in the current system is integrated with the bracket taxed at 30% in the reform scenario while the income bracket taxed at 45% in the baseline sees its tax base expanded in the reform scenario and its rate lowered to 40%. Finally, the top marginal tax rate is kept at 50% in the reform scenario but is applied only at a much higher net taxable income level compared to the baseline. As mentioned before the second reform scenario, shown in the final column of Table 13, leaves the basic rate structure unchanged but increases the base tax allowance from €6,430 in the baseline to €10,318 in the reform scenario. Remember that in both scenarios the tax credit for dependent children and the tax credit for replacement income remain applicable.

In Table 14 we show the results in the form of per capita gain or loss as well as the effects on inequality, progressivity and redistribution. It can be seen that in the first scenario the first four deciles as well as the top decile are net losers, the latter losing by far the most in absolute terms (nearly €300 per capita per year). Deciles 5 through 9 are net gainers with the gain per capita increasing as we move higher up the income distribution, except for decile 8 where we see a dip in the per capita gain. Overall the gains are relatively modest. Nevertheless, in the bottom rows it can be seen that inequality decreases and both redistribution and progressivity increase.

In the second scenario the gains are considerably higher and distributed over more taxpayers. Deciles 2 through 8 are net gainers showing an inverse U-shaped pattern in the per capita gains with decile 5 gaining more than €600 per capita per year. Decile 1 loses €3 per capita per year while the top decle is confronted with a loss of €1,700 per capita per year. The effects of this reform on inequality, redistribution and progressivity are also more pronounced. Inequality decreases considerably, while redistribution and progressivity increase substantially. Especially the Kakwani index shows a remarkable increase from 0.1900 to 0.2345. Both reforms show that it is possible to devise reform scenarios that are both budget neutral and have a positive effect on inequality, redistribution and progressivity.

Table 13 Tax rate schedule: actual versus 'reforms' with all deductions switched off except tax credit for replacement income and tax credit for children

Actual System Incomes 2009		Reform Scenario 1		Reform Scenario 2	
income brackets net taxable income	marginal tax rate in %	income brackets net taxable income	marginal tax rate in %	income brackets net taxable income	marginal tax rate in %
<=0	0	<=0	0	<=0	0
0 - 7,900	25	0 - 7,900	25	0 - 7,900	25
7,900 - 11,240	30	7,900 - 18,730	30	7,900 - 11,240	30
11,240 - 18,730	40	18,730 - 69,500	40	11,240 - 18,730	40
18,730 - 34,330	45	>69,500	50	18,730 - 34,330	45
>34,330	50			>34,330	50
Base allowance	6,430	Base allowance	6,430	Base allowance	10,318

Table 14 Per capita Gain/Loss for deciles of per capita gross income for two reform scenarios with all tax deductions switched off except tax credit for replacement income and tax credit for children

Decile of Per Capita Gross Income		Reform Scenario 1 Gain/Loss per capita in €	Reform Scenario 2 Gain/Loss per capita in €
1		-3	-3
2		-22	5
3		-16	224
4		-8	398
5		60	604
6		71	487
7		72	295
8		64	99
9		94	-227
10		-291	-1,701
Gini Pre-Tax	(base: 0.4582)	0.4582	0.4582
Gini Post-Tax	(base: 0.4199)	0.4169	0.4102
Reynolds-Smolensky (redistribution)	(base: 0.0383)	0.0413	0.0480
Kakwani (progressivity)	(base: 0.1900)	0.1997	0.2345

The preceding analysis concentrated on the removal of income and tax deductions. In the following two tables two reform scenarios are proposed that combine the removal of income and tax deductions with globalisation of incomes. That is, there are no more separately taxed incomes except for pension capitals. From Table 12 we know that taxing all incomes at the same progressive rate structure adds an additional €767 million to be 'redistributed' through lower statutory marginal tax rates or an increase in the base tax allowance.

We again show the results for two different scenarios using the same philosophy as before, i.e. in the first a change in the rate structure combined with broadening of income brackets and in the second an increase in the base tax allowance. Table 15 shows the rate structure and base tax allowance in the two scenarios. In the first scenario the two first income brackets are left unchanged while the middle income brackets are integrated, expanded and taxed at a (considerably) lower rate of 35%. The top bracket starts at a higher income level and is no longer taxed at 50% but rather at 45%. In the second scenario the base tax allowance is increased to €10,780, or an additional increase of more than €400 made possible through income globalisation.

The gains and losses per capita are shown in Table 16. Here we see the first reform showing a rather regressive pattern with only the 3 top deciles as net gainers. This is also confirmed by a drop in the Kakwani index from 0.1900 to 0.1868. Inequality decreases a little and redistribution increases slightly, but overall this is a regressive reform where the change in the rate structure is clearly focussed on the higher income brackets. The second scenario, not surprisingly, shows the same pattern as found in the second scenario when only income and tax deduction were switched off. All but the first and top two deciles are net gainers with decile 5 now gaining almost €700 per capita per year and the top decile losing more than €2,050 per capita per year. This again shows that separately taxed income items are mainly concentrated among the top deciles. They also enjoy the higher base tax allowance but still lose an additional €300 per capita per year as a consequence of income globalisation. Also, and not surprisingly, the effects on inequality, progressivity and redistribution are greater here than in the case of only removal of income and tax deductions.

Table 15 Tax rate schedule: actual versus 'reforms' with all deductions switched off except tax credit for replacement income and tax credit for children AND income globalization (except pension capital)

Actual System Incomes 2009		Reform Scenario 1		Reform Scenario 2	
income brackets net taxable income	marginal tax rate in %	income brackets net taxable income	marginal tax rate in %	income brackets net taxable income	marginal tax rate in %
<=0	0	<=0	0	<=0	0
0 - 7,900	25	0 - 7,900	25	0 - 7,900	25
7,900 - 11,240	30	7,900 - 11,240	30	7,900 - 11,240	30
11,240 - 18,730	40	11,240 - 49,700	35	11,240 - 18,730	40
18,730 - 34,330	45	>49,700	45	18,730 - 34,330	45
>34,330	50			>34,330	50
Base allowance	6,430	Base allowance	6,430	Base allowance	10,780

Table 16 Per capita Gain/Loss for deciles of per capita gross income for two reform scenarios with all tax deductions switched off except tax credit for replacement income and tax credit for children AND income globalization (except pension capital)

Decile of Per Capita Gross Income		Reform Scenario 1 Gain/Loss per capita in €	Reform Scenario 2 Gain/Loss per capita in €
1		-4	-4
2		-28	4
3		-60	226
4		-103	442
5		-137	694
6		-149	571
7		-82	365
8		76	163
9		331	-202
10		119	-2,050
Gini Pre-Tax	(base: 0.4582)	0.4582	0.4582
Gini Post-Tax	(base: 0.4199)	0.4195	0.4090
Reynolds-Smolensky (redistribution)	(base: 0.0383)	0.0387	0.0492
Kakwani (progressivity)	(base: 0.1900)	0.1868	0.2401

8. CONCLUSION

Despite the clearly progressive rate structure of personal income taxes, in recent years some have argued that the tax system with all its complexities is de facto proportional. The many income and tax deductions would undermine the progressivity as well as the rapid increase in marginal tax rates, especially for working individuals (one is subject to the higher marginal tax rates at relatively low incomes).

In this note, however, we have shown that the personal income tax system in its entirety is still progressive. And this holds, even though to a much lesser extent, when we limit the sample to a subset of working taxpayers with no replacement income.

Fiscal expenditures do have an impact on the degree of progressivity but their individual impact on the average tax rate is relatively modest. In fact, a situation where all income and tax deductions except tax credit for dependent children and replacement incomes have been switched off, decreases inequality an increases both progressivity and redistribution. Of course, this situation is not budget neutral and produces only losers as the effective average tax rate increases.

To counter this we have devised four reform scenarios in total that are budget neutral and for which a comparison of progressivity and redistribution with the current system is meaningful. The reforms have shown that it is possible to engineer tax rate structures and/or increases in the base tax allowance that increase the degree of progressivity and redistribution while also

decreasing the degree of inequality. Of course, the simulations we have carried out here are static and only show 'first round' effects. The question remains to what extent the changes in the rate structure and/or base tax allowance lead to cost recovery effects through changes in behaviour, implying a potential further decrease in rates or not.

9. REFERENCES

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10. APPENDIX

Her we show the regression results of the specifications described in section 4 of the main text. The first table (Table 17) shows the results for the entire sample of tax files with strictly positive gross income. 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 0.92% in the basic specification without demographic variables. Controlling for socio-economic and demographic characteristics increases progressivity slightly in the first specification with taste shifters and reduces it slightly in the second specification. 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.

Table 17 personal income tax system: regression approach using gross income

Equation in text	(5)	(6)	(7)
R^2	0.9889	0.9932	0.9929
β	0.9239***	0.9103***	0.9096***
$\tilde{\alpha}$	0.6251***	0.6694***	0.6896***
Age head		0.0002***	-1.82E-06
Brussels		-0.0039**	-0.0004**
Wallonia		0.0003	0.0001
couple, no childr.		0.0786***	0.0070***
couple, 1 child		0.0957***	0.0083***
couple, 2 childr.		0.1310***	0.0106***
couple, >=3 childr.		0.1429***	0.0124***
single, 1 child		0.0513***	0.0044***
single, 2 childr.		0.0811***	0.0068***
single, >=3 childr.		0.2000***	0.0167***
married, no childr.		0.0592***	0.0053***
married, 1 child		0.0834***	0.0073***
married, 2 childr.		0.0953***	0.0082***
married, >=3 childr.		0.1511***	0.0132***
Self-employed		0.1737***	0.0158***
Civil servant		-0.0323***	-0.0032***
Pensioned		0.0915***	0.0099***
Sick/disabled		0.1185***	0.0144***
Manager		0.1361***	0.0066***
Unemployed		0.0686***	0.0130***
Other replacement income		0.1433***	-0.0109***
Inactive		0.0506***	0.0068***

*** 1% significant; ** 5% significant; * 10% significant

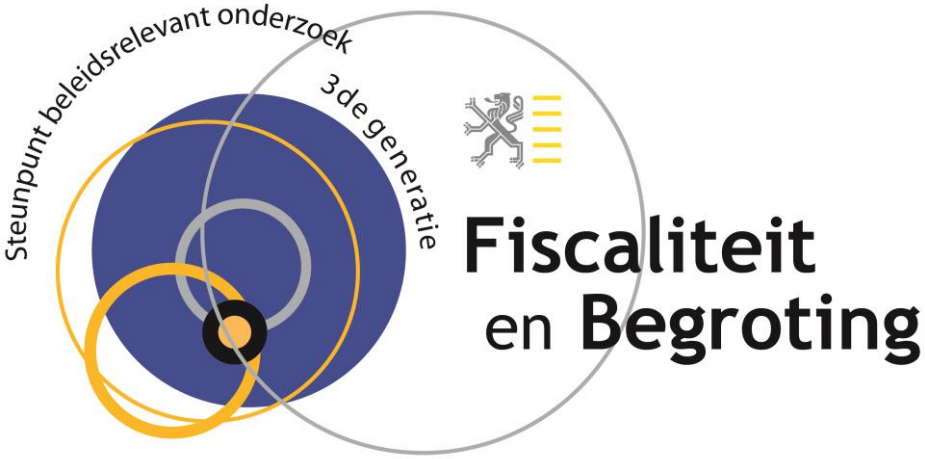
In Table 18 we confine the sample to households that consist of employees only, i.e. single employees or couple households where both partners are employee on the private labour market. The results are unchanged: the tax system is non-linear and progressivity even increases as compared to the full sample of Table 17. A test on the β-coefficient being equal to one was rejected in all cases. Progressivity increases even more once we control for demographic characteristics in both specifications.

Now that we have established the progressivity of the personal income tax system as it currently exists using different approaches and for different subsets, in the next section we will quantify the effect of the different income and tax deductions on the degree of progressivity.

Table 18 personal income tax system: regression approach for employee households

Equation in text	(5)	(6)	(7)
R^2	0.9944	0.9963	0.9962
β	0.9358***	0.9242***	0.9293***
$\tilde{\alpha}$	0.4589***	0.5665***	0.5318***
Age head		-0.0011***	-0.0001***
Brussels		-0.0021	-0.0004
Wallonia		-0.0007	-0.0002
couple, no childr.		0.0633***	0.0053***
couple, 1 child		0.0585***	0.0048***
couple, 2 childr.		0.0918***	0.0079***
couple, >=3 childr.		0.1150***	0.0097***
single, 1 child		0.0439***	0.0035***
single, 2 childr.		0.0576***	0.0050***
single, >=3 childr.		0.1823***	0.0146***
married, no childr.		0.0619***	0.0059***
married, 1 child		0.0744***	0.0065***
married, 2 childr.		0.0802***	0.0066***
married, >=3 childr.		0.1241***	0.0104***
Self-employed		0.1894***	0.0174***
Civil servant		-0.0254***	-0.0024***
Manager		0.0929***	-0.0090***

*** 1% significant; ** 5% significant; * 10% significant



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