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A bird's eye view on 20 years of tax-benefit reforms in Belgium[1]

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Abstract

Belgium has seen major changes in its tax-benefit system over the past twenty years. These changes have, to a large extent, co-determined the evolution of disposable incomes of Belgian households on one hand, and their incentives to work on the other. In this paper we assess equity and efficiency aspects of changes in tax-benefit policies over the full course of 1992-2012. By simulating effects of current and past tax-benefit policies using the microsimulation model MEFISTO-EUROMOD, we summarize the shifts in policy orientation over this period using two summary measures of redistribution and work incentives.
Our three main findings are: 1) the changes in the tax-benefit system have to a large extent been pro-poor, and redistribution has been increased; 2) the introduction of an earned income tax credit and the lowering of personal income taxes has contributed to improve work incentives, but this effect was partially eroded by an increase in unemployment benefits since 2000; 3) the results crucially depend on whether one chooses as 'no policy change' counterfactual indexation with inflation or indexation with nominal wage growth.

JEL: C81, H21, H41, J20

Keywords: Labour supply, Marginal Cost of Public Funds, Microsimulation, Redistribution, Taxation, Tax-Benefit system.

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1. INTRODUCTION

That inequality has regained the centre stage of the public debate worldwide seems to be an understatement. Indeed, Piketty's (2014) bestselling book was already preceded by Deaton (2013), Milanovic (2011), Stiglitz (2012), and Wilkinson and Pickett (2010), to name a few. Also international think-thanks, institutes or policy circles such as IMF, OECD or the European Commission devote ample treatment to the issue of rising income and wealth inequality (see, among others, OECD 2008, 2011 and Cingano, 2014). Inevitably, this renewed attention to increased inequality in the public sphere also raised the question as to what extent the government role, exerted through the redistributive tax transfer system, has been co-responsible for this evolution. Of course, changes in the per person distribution of disposable income are caused by many different factors, often summarized in three broad categories: changes in the socio-demographic structure of the population (changing household composition, ageing, etc.), changes that drive the level and composition of market gross incomes (changes in technology, returns to education, etc.), and changes in the tax-benefit system. Starting from Oaxaca (1973), a vast literature has emerged on how to decompose differences or changes in mean outcomes and distributions into these different underlying factors (for an overview see Fortin, Lemieux and Firpo, 2011 and for a nice empirical application see Hyslop and Maré, 2005).

This paper contributes to this understanding by singling out the effect of one specific factor, the tax-benefit system, in one specific country, Belgium, over a well-defined time period, 1992-2012. Similar to many other OECD-countries, Belgium has seen major changes in its tax and benefit system over these past twenty years. And the similarities run deeper. First, these changes occurred against the background of budgetary consolidation (in the nineties), favourable growth figures (in the noughties, up to 2008), and a severe double-dip recession since 2009. Secondly, the changes in the tax benefit system have often been inspired or advocated on two broad grounds: distributional effects on the one hand, and work incentives on the other.

In this paper we scrutinize the manifold and heterogeneous policy choices of different governments over these two-decades by capturing all of them by means of two summary measures of the two crucial dimensions in the public debate. This allows us to reduce hundreds of parameters of the tax benefit system into one single point in a two-dimensional space. In this respect, the main focus of this paper will be descriptive, from a bird's view perspective. But by framing the policy choices into the well-known axes of both equity and efficiency, we hope that we will be able to detect whether, over the course of these two decades, significant shifts in policy orientation have occurred and whether the relative importance of these two broad objectives has changed.

Both for measuring the distributional impact of policy choices in the tax benefit sphere and for isolating the policy effect itself, it is natural to rely on the now well established microsimulation methodology. The defining characteristic of microsimulation models is that they run on a representative sample of the population, and hence reflect the rich heterogeneity in socio-

demographic characteristics, preferences and endowments of this population. Therefore, it is difficult to imagine how one could dispense of these kinds of models in any serious attempt to chart distributional effects of policy choices. Moreover, microsimulation models provide the researcher with an as detailed and operational as possible implementation of often complex, and highly nonlinear tax benefit systems. They translate the interplay of the tax-benefit system with gross market incomes and the vector of socio-demographic characteristics of an individual into the net disposable income for that person. This allows the researcher to translate policy choices into changes of the parameters of the system, and trace the effect on disposable incomes, and the distribution thereof. In this sense, a counterfactual analysis of what the distribution of disposable incomes would have looked like in the case that the policy change would not have been implemented, or if other options would have been chosen, becomes possible. For recent overviews of the different strands in microsimulation methodology, we refer to Bourguignon and Spadaro (2006) and O'Donoghue (2014).

The majority of tax benefit microsimulation models, and certainly those that are publicly available, are of the arithmetic type. They calculate the direct, morning after impact on disposable incomes, without considering second round effects following from changed behaviour, let alone from general equilibrium effects.[2] This might lead one to conclude that this most widely spread form of arithmetic microsimulation models is not very useful to assess the impact of policy reforms on what is generally called 'efficiency', to be understood here as the welfare cost of the distortions introduced by the tax-benefit system. Yet, we illustrate in this paper that these reservations are only partly justified. Even an arithmetic microsimulation model, which has no behavioural model inside, is a sufficiently sophisticated tool to calculate at least some of the most important ingredients of measures of the welfare cost of distortionary taxes and benefits: effective marginal tax rates. By incrementing gross incomes by a small amount, the resulting change in the disposable income serves as a reliable estimate of the marginal effective tax rate, taking into account the complexities of non-linear schemes, complicated eligibility or means-testing rules. The same holds for the so-called participation tax rates, which can easily be obtained from a comparison of the net income from out of work benefits with the net income obtained from labour force participation, ceteris paribus. This crucial information on work incentives can then be combined with reduced form information about labour supply in the form of labour supply elasticities. This in order to obtain an estimate of the welfare cost of distortions, in the form of the well-known concept of the marginal cost of public funds (MCF).[3]

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[2] Of course, since arithmetic microsimulation models map gross incomes into net disposable ones, they are often an indispensable tool in the estimation of behavioural models, such as labour supply models (see Aaberge and Colombino, 2014 for an overview). In the same vein the arithmetic microsimulation models are used as necessary ingredients of empirical optimal tax exercises (Aaberge and Colombino, 2013 or Blundell and Shephard, 2012).

[3] According to Mayshar (1990, pg.263) the marginal cost of public funds 'should be regarded as the most useful concept in applied tax analysis'. See Dahlby (2008) for a comprehensive overview of the concept.

Again, the microsimulation methodology allows the preservation of the rich heterogeneity in the pattern of work incentives, both at the intensive as well as at the extensive margin, and thus produces a nuanced and well-founded estimate of the MCF. From the empirical applications in Kleven and Kreiner (2006) and Immervoll et al. (2007), it has become clear how important it is to fully account for heterogeneity both at the individual level and at the extensive margin of labour supply when estimating the MCF. Indeed, initial MCF models were computed using macro indicators or representative agents alone, and were often restricted to proportional tax systems (e.g. Browning, 1976). Hansson and Stuart (1985) and Dahlby (1998), among others, extended the concept to marginal changes in progressive, piece-wise linear tax systems. Finally, Kleven & Kreiner (2006) also brought the extensive margin of labour supply on board when estimating the MCF. Since Saez (2002) it is well known that this is a crucial margin of response to determine the distortions introduced by taxes and benefits. In this paper we use this most extended form of the MCF to assess changes in this distortionary cost of taxes and benefits, induced by the policy changes over the last two decades.

To simulate the effects of current and past tax-benefit policies we make use of the microsimulation model MEFISTO-EUROMOD (see Decanq et al. 2012). We use the EU-SILC 2010 dataset with incomes from 2009 as the underlying population. To single out the effect of policies, we use the decomposition technique of Bargain and Callan (2010), which boils down to calculations of counterfactual income distributions, and in this respect is much simpler than the literature referred to above. This 'what if' approach answers the question: what would the income distribution have looked like *in 2012*, if, given unchanged characteristics of this 2012-population, the tax-benefit system of, say, 1992 would have been applied. We explain this technique in more detail in section 3.1, where we also highlight the crucial choice of the default 'no policy change'-scenario, being either price indexation or indexation with nominal wage growth. For similar recent applications of this method to other European countries see Hills et al. (2014) and, for the UK, Clark and Leicester (2004) and Adam and Browne (2010).

The fact that we confine this investigation to a well-defined 'what if'-analysis brings us to the first caveat about the interpretation of the results. We want to be very clear that we definitely do *not* describe the evolution of inequality in disposable incomes in Belgium during the period 1992-2012. We have stressed above that many more factors determine the dynamics of an income distribution than the tax-benefit system alone. Since we simulate all counterfactuals of previous tax benefit systems on one and the same dataset (EU-SILC 2010), in which structural characteristics such as socio-demographic characteristics and gross market incomes are kept unchanged, it is evident that we cannot trace changes in these other factors. Even worse, we cannot exclude the possibility that the results we obtain are co-determined by the specific choice of this underlying dataset. It is well-known that global, empirical measures of redistribution and progressivity are inescapably determined by the empirical distribution on which a system with given characteristics of local progressivity and redistribution is applied.[4]

[4] See Lambert (2001) for a treatment of measures of progressivity and redistribution. The terminological practice of distinguishing between structural characteristics of tax and benefit

Yet, if properly interpreted, we are convinced that the results we obtain will give a clear picture of the policy orientations chosen during the time period 1992-2012.

The second caveat concerns the temptation to interpret the results as a description of the possible equity-efficiency trade-off faced by policy makers during the mentioned period. We definitely will *not* describe this eventual trade-off in this paper, and hence also not the choice policy makers have made in this eventual trade-off. The reason is that we use our two aggregate measures, the redistributive effect of the tax benefit system and the effect the system has on work incentives, as mere descriptive devices. Except for the fact that they originate from the same real-world tax-benefit system, the two measures are unrelated in this paper. The distributive effects are measured as outcomes of a given system and hence have nothing to do with marginal changes in that system. The MCF, on the other hand, describes this same tax benefit system by considering one of many different possible marginal changes in the system. In this sense our exercise is fundamentally different from other papers, starting with Browning and Johnson (1984) and later expanded by, among others, Mayshar (1990) and Dahlby (1998), who explicitly quantify the trade-off at the margin. They do this by changing one specific element of the tax system, which can be identified as marginally changing the progressivity characteristics of the tax system (the demogrant in the case of Browning and Johnson (1984), one of the tax rates in a piece-wise linear system in the case of Dahlby (1998)) and then calculating the MCF. In that case, the MCF explicitly measures the welfare cost of marginally more redistribution. It is this approach that has been extended with the extensive margin of labour supply in Adam (2005) for the UK and in Immervoll et al. (2007) for several European countries. This is not what we present in this paper. Since changes in the tax benefit system have affected work incentives differently for different groups in the population, preserving the heterogeneity at the stage of the calculation of changes in work incentives is important. We then use the MCF merely as a sophisticated, but well understood, way of *aggregating* the work incentives produced by a tax benefit system across a heterogeneous population.

The rest of this paper is structured as follows. In section 2 we describe the major changes in the Belgian tax benefit system during the period 1992-2012. Section 3 is devoted to the methodology of the counterfactual 'what if' analysis and to the two main output measures of our analysis: the redistributive effect and the marginal cost of public funds (MCF). In section 4 we apply these two measures to give a description of the Belgian tax system in the benchmark year 2012. We trace the policy choices over the period 1992-2012 in terms of the framework built-up before in section 5. Section 6 concludes.

systems on one hand (like the rate structure) and the effect this system produces when applied on a specific empirical distribution before tax incomes on the other, is not very sound. We join some authors here to call the former 'local' measures of progression and distributive power and the latter 'global' measures of progressivity and redistributive effect.

2. MAJOR CHANGES IN THE BELGIAN TAX-BENEFIT SYSTEM SINCE 1992

In this section we give an overview of the most important policy changes in taxes (both personal income taxes and indirect taxes), social security contributions and social insurance benefits during the period 1992-2012. The summary contains the major changes but is not intended to be exhaustive. Generally tax and benefit parameters in Belgium are indexed with the growth in consumer prices; exceptions to this rule are indicated.

2.1 Personal income taxes

The most important reform in the personal income taxes in the 1992-2012 period took place in 2001 and was gradually rolled out between 2002 and 2005 (for more information see Saintrain (2001), Valenduc (2002), Cantillon et al. (2003), Carey (2003) and Abreu (2004). This reform had four objectives: (1) reduce the tax burden on labour, (2) achieve neutrality with respect to lifestyle choices (i.e. remove differential treatment of married and unmarried couples), (3) improve the way in which children are taken into account in the tax system and (4) re-orient the tax system towards an environment friendly direction. In order to achieve the first objective, the two highest marginal tax rates (52.5% and 55%) were removed, the middle tax brackets were broadened, the allowance for work-related expenses was increased and a refundable tax credit for low incomes from work was introduced. To achieve neutrality with respect to lifestyle choices, the marital quotient was extended to legally cohabiting couples, the basic allowance for couples was made equal to twice the amount for singles, non-labour-related income of both spouses was taxed separately and the tax credit for replacement incomes was calculated on an individual basis. Three measures tried to improve the way in which children are taken into account in the tax system: the additional tax credit for lone parents was extended to all lone parents (i.e. also including all divorced lone parents), the tax credit for dependent children became refundable (up to a certain maximum) and the income ceiling below which a child of a lone parent could earn without losing its qualification as 'dependent child' was increased.

Besides this major reform, the Belgian personal income tax system underwent several changes in the 1992-2012 period. In 1992-1993, the fiscal regime of long-term savings (the so-called 3rd pillar of the pension system) changed significantly. The previous deduction of life insurance and capital repayments on mortgage loans (at the marginal tax rate) was replaced by a tax credit. In 1993, a crisis surcharge of 3% on the final tax liability was introduced. This crisis surcharge was abolished in 2002. In the period 1994-1999: the standard practice of indexation of tax brackets was suspended. In 2005, taxation of owner occupied housing was reformed. Before, imputed rent (also known as 'cadastral income', which is not consequently updated since 1975) was part of taxable income and home owners were eligible for four different tax reductions. From 2005 onwards, this imputed rent became tax-exempt. For those contracting a mortgage after the 1st of January 2005, the four different tax reductions for mortgage payments were replaced by one tax deduction: the so called 'dwelling bonus' (for an evaluation, see Verbist and Vanhille, 2012).

2.2 Indirect taxes

The most important reform in the 1992-2012 period took place in 1992. The main objective was to bring the Belgian value added tax (VAT) system more in line with the recommendations of the European Commission. The government decided to drop three (17%, 25% and 33%) of the seven different VAT rates. At the same time, the standard rate was increased from 19% to 19.5%, leaving five different rates at that time: 0%, 1%, 6%, 12% and 19.5%. Mainly for budgetary consolidation purposes, the standard VAT-rate was further increased, to 20.5% in 1994 and to 21% in 1996 (Decoster & Van Camp, 2001). Excises were not indexed automatically to inflation, resulting in diverging taxes on different categories, even within specific categories of goods (see for example Table 1, which provides an overview of the changes in excises on energy products).

TABLE 1: EVOLUTION OF THE CHANGES IN EXCISES ON ENERGY PRODUCTS IN THE 1992-2012 PERIOD (2009 EUROS PER UNIT)

	1992	2001	2007	2009	2012
Petrol (w/o lead, per l)	0.53	0.59	0.67	0.63	0.58
Gasoline (per l)	0.39	0.35	0.35	0.37	0.41
Natural gas (per MWh)	0.00	1.46	1.29	1.22	1.13
Electricity (per MWh)	0.00	1.63	2.02	1.91	1.77

Source: Federal Ministry of Finance

2.3 Social insurance contributions

In 1994, a special social insurance contribution was introduced, applicable to employees and civil servants. However, the most important change in the social insurance contributions was the social 'Work Bonus', introduced in 2000 as an in-work tax credit to improve work incentives for lowly paid employees. This credit is tapered away when the wage level increases. By 2007 this reduction had been widened through both an increase of the base reduction and of the wage ceiling below which individuals are eligible for the reduction. In 2005 the above social work bonus was complemented by a fiscal work bonus, which is a refundable tax credit in the personal income tax system, calculated as a fraction of the *work bonus*. It replaced a low-wage tax credit, which was introduced in the major tax reform of 2001.

2.4 Social insurance benefits

2.4.1 Family allowances and child benefits

In general, the system of family allowances has not undergone major reforms in the 1992-2012 period. In 1997, age supplements for children of rank 1 (the eldest child) were halved (transition measures for those children already in the system were put in place). In 2007, two extra supplements were introduced. The first one is the 'back-to-school premium', gradually introduced and available for all children eligible for a child benefit. The second one is a means-

tested supplement granted to single parent families who receive a standard child benefit. The amount of this supplement depends on the rank of the child.

2.4.2 Public pensions

The three public pension schemes (employees, self-employed and civil servants) underwent several changes. We here focus on the pension system for employees (by far the most important one), because we are only able to simulate the impact of the changes in this system. In concrete, we simulated the impact of the welfare adaptation mechanisms introduced in 2002.[5] On top of the regular indexation to compensate for the increase in consumer prices, pensions have been adapted to catch-up with the increase in average salaries. The eligibility for this 'welfare adaptation' depends on the year in which the individual retired. In practice though, the increase applied to nearly all retired persons, save the ones who retired most recently. We list the welfare adaptations in the appendix and summarize them in section 3.1.

2.4.3 Unemployment benefits

Replacement rates for singles, cohabitants and household heads have converged in the 1992-2012 period. While they have been kept constant at 60% for household heads (and this for all unemployment periods), the replacement rates have increased for long term unemployed singles: from 40% in 1988 to 55% in 2012. Replacement rates for short term (less than one year unemployed) cohabitants remained at 55% up to 2007. In 2008 and 2009 they were gradually increased to reach 60%. Replacement rates for long term (more than one year unemployed) cohabitants were increased from 35 to 40% in 2002. From 2001 onwards, the minimum and maximum unemployment benefits increased over time, herby outpacing the average wage growth, especially for singles and cohabitants. These welfare adaptations will be summarized in section 3.1.

2.4.4 Sickness and disability benefits

Replacement rates for disability allowances for singles have risen gradually (from 45% in 1988 to 50% in 2003, 53% in 2008 and 55% in 2010). Until 2006, sickness and disability replacement rates were differentiated between singles and couples. In 2007, cohabitants were introduced as a separate category.

2.4.5 Income support

Next to the standard income support scheme, there also exists an income support scheme especially for the elderly. Both schemes were introduced in 2000 and replaced previous ones. Benefits were made more generous and the entitlement became attached to the individual.

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[5] As will be explained in section 3.1, we did not simulate the pension benefit itself. We start from the pension benefit as observed in the EU SILC 2010 dataset.

3. HOW WE MEASURE THE EFFECTS OF THE TAX-BENEFIT SYSTEM

In order to study the effect of changes in tax-benefit policies on disposable incomes, we apply a simplified version of the counterfactual approach as described in Bargain & Callan (2010). It boils down to simulating disposable incomes using fixed household characteristics and market incomes, as observed in EU-SILC 2010, while applying the tax-benefit rules of 1992, 2001, 2007 and 2012. For these counterfactual distributions of disposable incomes, we calculate distributional characteristics before and after taxes, which give an estimate of the redistributive properties of the different tax benefit systems. We also calculate the marginal effective tax rates, both at the intensive and at the extensive margin, in order to estimate the work incentives implied by the different tax benefit systems. We first explain the counterfactual methodology in section 3.1. More information about the data used (EU-SILC 2010) is given in section 3.2. In section 3.3 we briefly describe the measures applied in order to evaluate both the redistributive effect and the effect on work incentives of changes in the tax-benefit system in the 1992-2012 period.

3.1 The counterfactual 'what if'-perspective

We consider the tax-benefit system of year j as a function $d^j(.)$ which maps, for each individual h, a vector of pre-tax and -transfer incomes $\mathbf{y}_h^k$, and a vector of socio-demographic characteristics $\mathbf{z}_h^k$ (age, household size, sex, …), both observed in year k, into an output scalar $x_h^{k,j}$:

$$x_h^{k,\mathrm{j}} = d^j\left(\mathbf{p}^j, \mathbf{y}_h^k, \mathbf{z}_h^k\right), \tag{1}$$

where the superscript of k refers to the year in which incomes and characteristics are observed, and the superscript j to the identification of the policy year. The vector $\mathbf{p}^j$ denotes all nominal parameters of the tax-benefit system (child allowances, minimum and maximum benefits, values used in means tests, lower and upper bounds of the tax brackets, ceilings on tax deductions, etc.). All other structural characteristics of the tax benefit systems are captured by the function $d^j(.)$ itself. In our application, the output variables are disposable individual and household income.

Let's assume that we have two observations available about disposable incomes, say in year 1 and in year 0, giving us $x_h^{1,1}$ and $x_h^{0,0}$ respectively. It is clear from (1) that the income change between 0 and 1 results from many possible changes: in the tax-benefit system (either through changes in the parameters $\mathbf{p}^j$ or through a change in the function d^j), in market incomes or in the socio-demographic characteristics. Using the conceptual framework put forward by Bargain & Callan (2010), we decompose the change as follows:

$$
\begin{aligned}
\Delta x_h \equiv x_h^{1,1} - x_h^{0,0} &= d^1\left(\mathbf{p}^1, \mathbf{y}_h^1, \mathbf{z}_h^1\right) - d^0\left(\mathbf{p}^0, \mathbf{y}_h^0, \mathbf{z}_h^0\right) \\
&= \underbrace{d^1\left(\mathbf{p}^1, \mathbf{y}_h^1, \mathbf{z}_h^1\right) - d^0\left(\alpha^{0,1}\mathbf{p}^0, \mathbf{y}_h^1, \mathbf{z}_h^1\right)}_{\text{change in policy}} \\
&\quad + \underbrace{d^0\left(\alpha^{0,1}\mathbf{p}^0, \mathbf{y}_h^1, \mathbf{z}_h^1\right) - d^0\left(\alpha^{0,1}\mathbf{p}^0, \alpha^{0,1}\mathbf{y}_h^0, \mathbf{z}_h^0\right)}_{\text{change in market earnings \& demographics}} \\
&\quad + \underbrace{d^0\left(\alpha^{0,1}\mathbf{p}^0, \alpha^{0,1}\mathbf{y}_h^0, \mathbf{z}_h^0\right) - d^0\left(\mathbf{p}^0, \mathbf{y}_h^0, \mathbf{z}_h^0\right)}_{\text{fiscal drag}},
\end{aligned}
\tag{2}
$$

in which we use a scalar $\alpha^{0,1}$ to denote an uprating factor of the nominal parameters of the tax benefit system between period 0 and period 1.

The first term of the right-hand side of equation (2) isolates the effect of changes in the tax-benefit system itself by keeping pre-tax and –transfer incomes and demographics constant. The way it is written in equation (2), this policy effect is calculated on the incomes and characteristics observed in period 1. By including the uprating factor $\alpha^{0,1}$ in this term, we allow ourselves to choose the underlying default of "no policy change" (for example by using the evolution of the CPI-index as the uprate-factor, we impose that the default of 'no policy change' is a full indexation of all nominal parameters of the tax-benefit system with changes in the consumer price index). In case actual policies deviated from this default indexation - as was for example the case in the nineties for the tax brackets of the personal income tax system and for certain social benefits - will show up as changes in the disposable income in the simulated counterfactuals. This non-indexation has to be interpreted as a discretionary "policy choice".

However, an important element in the public debate on tax-transfers systems concerns the question about the relative position of benefits with respect to the evolution of market incomes. Some argue that the tax-benefit system must only safeguard the person's purchasing power. Others disagree and - in the light of changing pre-tax incomes - make a case for a closer link between social benefits and market incomes. Increasing prosperity is then shared between people at work and people out of work. For benefits which replace previous or foregone labour income, this might take the form of keeping the so-called 'replacement rates' constant, and increasing the minima and maxima at the same rate as wages increase. In equation (2) above, this can be implemented by choosing an index for nominal wage growth as the uprating factor $\alpha^{0,1}$. Assume, as an example, that we observe the actual real wage growth, and actual tax benefit parameters were indexed with CPI only. In our simulations this will show up as a decrease of the simulated counterfactual disposable incomes. This decrease reveals that, w.r.t. the benchmark of increasing real wages, real disposable incomes lagged behind. Real life examples are the limitation of indexation of the personal income tax brackets to CPI-increases, or the lack of so-called 'welfare adaptations' of benefits, like pensions and unemployment benefits.

Different policy makers adhere to different social contracts with respect to the tax-benefit system. In this respect inflation and wage uprating are complementary in order to understand

better the actual effects policy decisions have had and which implicit or explicit choices with respect to the social contract were made over time. In our analysis we therefore apply both inflation and wage uprating. [6] [7]

The second term of equation (2) captures the effect on disposable incomes of real changes in market earnings and of changes in socio-demographic characteristics. The third term captures the effect of inflating simultaneously all market incomes and all nominal tax benefit parameters with the price or wage index $\alpha^{0,1}$. Using the price index as the uprating factor, this term should equal zero if a tax-benefit system is inflation proof. If not, there is nominal fiscal drag, possibly due to non-linearities in the system. When one uses the nominal wage index for the uprate factor $\alpha^{0,1}$, the third term captures 'real' fiscal drag. For most personal income tax systems which only index brackets and nominal parameters with the CPI, this term will normally not be zero. In a progressive PIT-system, it reflects the increase in the average tax rate as real incomes grow and people end up in higher brackets.

In this paper we only calculate the first term of equation (2). The reason is that we do not dispose of comparable datasets covering the whole period of interest. We use a single dataset (EU-SILC 2010) containing gross incomes and household information of 2009. Needless to say that this one out of three terms in equation (2) is only part of the explanation of the total change in equivalent disposable incomes between different years. Contrary to Bargain and Callan (2010), we cannot even assess the relative importance of this factor, as compared to the other two factors. Moreover, Bargain & Callan (2010) show that the choice of the base year is important, since it determines the demographic and socio-economic structure of the data that will be applied to all policy years.[8] Yet, this does not prevent the first term of equation (2) to be used as a reliable metric of the effect of changes in a highly complex tax and benefit system on the disposable incomes of all households.

We summarize the change in the Belgian tax benefit system over the 1992-2012 period by observing it at four different points in time: 1992, 2001, 2007 and 2012. Each of these four tax benefit systems is applied to the 2009 income data of EU-SILC 2010, by means of the

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6 Moreover, Hills et al. (2014) show that results will also differ according to whether one chooses to measure nominal income growth by nominal wage growth or by nominal GDP growth. In appendix B, we illustrate the importance of uprating by means of an example.

7 Note that, if 'nominal wage uprating' is attractive for those who adhere to a social contract which entails fixed replacement rates, it also implies that the default policy would be a redesign of the progressive personal income tax system such that tax brackets are indexed with nominal income growth. This would bring down the elasticity of personal income tax revenues w.r.t. the growth of the taxable base to unity (instead of about 1.30 now).

8 The decomposition presented in equation (2) can also be written with the policy effect evaluated on income data and socio-demographic structure of year 0, leading to a different relative contribution of the three effects. Bargain & Callan (2010) use a Shorrocks-Shapley decomposition to average the two decompositions.

microsimulation model MEFISTO-EUROMOD[9]. The model implements competences for both the Belgian federal level and the different regions. It simulates the personal income tax system, social insurance contributions, child allowances and social assistance, hereby using the parameterized tax structure and (uprated) nominal values that apply in the specific policy year.

The EU-SILC 2010 dataset contains cross-sectional data and thus misses retrospective career information, which makes it usually not possible to simulate unemployment and pension benefits. These two important benefits are therefore not parameterized in MEFISTO-EUROMOD, and hence not simulated. Yet, important policy changes in the pension system occurred in the 1992-2012 period, as described above. We therefore chose a strategy which mimics as closely as possible the effects of the actual policy changes which occurred in the 1992-2012 period. As described in section 2.4.2, these changes were predominantly welfare adaptations for well-defined categories of pensioners (see table 9 in the appendix for a detailed list). In our SILC-dataset, we have information whether persons received a pension benefit. We cumulate all welfare adaptations listed in table 9 of the appendix and apply them backwards to calculate the height of the pensions in 1992, 2001 and 2007, and forwards to calculate the amount in 2012. This means that, for pensioners observed to receive a pension in 2009, we obtain pension benefits in the counterfactual situation in which welfare adaptations would not have taken place. The resulting pattern of real increases in pension benefits is summarized in Table 2, with 2009 as the base year. We do not take into account the gradual increase in the minimum pension age for women from 60 in 1996 to 65 in 2009.

For unemployment benefits we follow a similar procedure. We derive an average real increase in the unemployment benefit due to welfare adaptations in the minimum and maximum amount of the unemployment benefit. We hereby differentiate between persons who were less or more than 1 year unemployed. As for pensions, this methodology is a simplification of the changes in the unemployment systems in the 1992-2012 period. For example, changes in the eligibility criteria for receiving an unemployment benefit are not taken into account.

For social assistance benefits, we take into account a factor correcting for non-take up. We use the same factor as in EUROMOD, 45%, meaning that only 45% of those who are in theory eligible for this benefit receive it. In the 4 different counterfactuals (1992, 2001, 2007 and 2012), MEFISTO-EUROMOD revaluates the eligibility for the social assistance benefits and recalculates its height.

[9] See Decancq et al. (2012) for a detailed presentation of the EUROMOD based MEFISTO (Modelling and Evaluating Flanders' FIscal and Social Tomorrow) microsimulation model. The European EUROMOD microsimulation model was developed and is maintained by ISER (Institute for Social and Economic Research) at the University of Essex, in collaboration with the national teams. For more information on Euromod, see Figari and Sutherland (2013), Sutherland (2007) and Lietz & Mantovani (2006), or visit http://www.iser.essex.ac.uk/euromod/.

Sickness and disability benefits are omitted from the analysis, since we do not have enough information in the EU-SILC dataset to model them in sufficient detail in order to produces reliable results.

In the upper part of Table 2 we summarize the evolution of the most important benefits. We compare them with the evolution of the real wages, as measured by the nominal wages agreed upon in the collective labour agreements. They are all divided by the consumer price index (as given in the first line of table 2). In the bottom part of Table 2 we translate levels into yearly growth rates over the different sub-periods.

It is clear that, compared to real wage growth (bottom line of Table 2), the welfare adaptations for pensions and unemployment benefits will play an important role in the overall evaluation of policy changes during the 1992-2012 period. Pensions and unemployment benefits lagged behind real wage growth in the first sub-period (1992-2001). However, the gap was closed from 2001 to 2012. Over the whole period, unemployment benefits grew faster than real wages, whereas pensions grew more or less in line with real wages. Note again that the indices and growth rates are based on the size of the statutory transfer and do not take into account possible changes in eligibility criteria. Child benefits, in general, did not grow in step with real wages. Base amounts and social supplements decreased slightly in real terms, but age supplements decreased the most: -26% between 1992 and 2012. This decline has to be studied together with the introduction of a means-tested supplement for lone parents and a school premium halfway through the noughties.

TABLE 2: INFLATION, WELFARE ADAPTATION FOR PENSIONS, UNEMPLOYMENT BENEFITS (UB), SOCIAL ASSISTANCE AND CHILD BENEFITS, AND REAL WAGE GROWTH

	1992	2001	2007	2009	2012
CPI-index	100.0	116.7	131.8	139.5	150.2
	welfare adaptions (1992=100) for selected benefits				
Real pensions	100.0	100.0	102.0	104.1	108.2
Real UB (<12m)	100.0	99.5	105.9	115.2	114.5
Real UB (>12m)	100.0	101.3	112.3	115.7	115.0
Real social assistance	100.0	99.9	105.7	112.5	113.0
Child ben. (base amount)	100.0	98.4	98.2	98.4	97.0
Child ben. (social suppl.)	100.0	98.5	98.2	98.4	97.0
Child ben. (age suppl.)	100.0	89.5	64.9	75.0	74.0
Child ben. (single parent)	NA	NA	100.0	162.4	160.1
Child ben. (School prem.)	NA	NA	100.0	203.5	195.8
Real wage-index	100.0	111.6	115.5	114.9	113.6
annual growth rates (%)		1992-2001	2001-2007	2007-2012	1992-2012
CPI		1.73	2.04	2.65	2.06
Real pensions		0.00	0.33	1.20	0.40
Real UB (<12m)		-0.05	1.03	1.58	0.68
Real UB (>12m)		0.14	1.73	0.49	0.70
Real social assistance		-0.01	0.95	1.25	0.62
Child ben. (base amount)		-0.18	-0.03	-0.25	-0.15
Child ben. (social suppl.)		-0.17	-0.05	-0.25	-0.15
Child ben. (age suppl.)		-1.23	-5.22	2.66	-1.49
Child ben. (single parent)		NA	NA	9.87	NA
Child ben. (School prem.)		NA	NA	14.38	NA
real wages		1.23	0.57	-0.33	0.64

Source: National Bank of Belgium, FPS Social Security, Own calculations

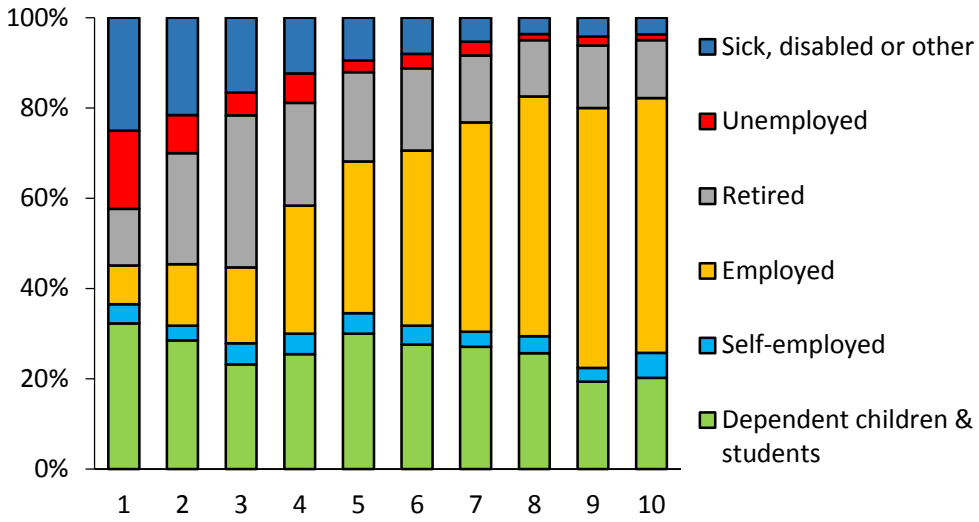
3.2 Data

We use the Belgian European Union Statistics on Income and Living Conditions (EU-SILC) dataset, the reference household survey for inequality and poverty analysis. It provides extensive information on the demographic and socio-economic characteristics of households as well as their reported incomes. We rely on EU-SILC 2010 data, containing information for 6100 households (14700 individuals). The dataset is validated for the microsimulation model MEFISTO-EUROMOD (see the latest EUROMOD country report[10] for more details).

[10] The most recent EUROMOD Country Report can be downloaded from the ISER-website here: https://www.iser.essex.ac.uk/euromod/resources-for-euromod-users/country-reports

In section 5.1, we will present the effects of different policy changes on the purchasing power for the entire population, divided in deciles based on equivalised disposable household income.[11] Here, we show the variation in socio-economic composition of the Belgian population across the distribution (Figure 1). The picture confirms the importance of the employment status for determining the position in the distribution. Pensioners are mainly found at the bottom of the distribution (deciles 2, 3 and 4), but the gradient is still more outspoken for unemployed persons, who are predominantly present in the first decile.

FIGURE 1: SOCIO-ECONOMIC STATUS OF ALL INDIVIDUALS



Source: EU-SILC 2010; deciles based on equivalised household disposable income

It makes no sense to calculate work incentives for persons who are not available for the labour market. For the analysis of work incentives we therefore remove pensioners, sick and disabled persons and all individuals younger than 18 or older than 59 years. The size of the resulting subsample for which we calculate the work incentives is shown in Table 3. Since we calculate work incentives at the individual level and since these will be matched with labour supply elasticities, which differ according to earnings levels, we construct deciles for this subsample on the basis of gross hourly wages. For those not earning a wage we use imputed values (see the appendix for details on the imputation method used).

[11] Each decile contains an equal number of persons, i.e. 10% of the individuals in the population.

TABLE 3: DATA SELECTION FOR REDISTRIBUTIVE EFFECT AND ESTIMATION OF WORK INCENTIVES

Index	Number of observations	Population
Individuals	14.700	10.681.543
minus people younger than 18 older than 59, sick and disabled & early retirees		
Working age population	7.439	5.560.530

Source: EU-SILC 2010

3.3 Output measures

We will compare the policy stance w.r.t. redistribution and work incentives in one diagram. We chose one general measure for the redistributive effect of the tax benefit system, the Reynolds-Smolensky index and one measure which summarizes work incentives, the marginal cost of public funds. In the next two subsections, we explain how each of these measures is calculated.

3.3.1 Redistributive effect

We first show the effect of changes in the tax-benefit structure as changes in purchasing power across the decile distribution of equivalised disposable income for the whole population. [12] We measure changes in purchasing power as percentage changes of equivalised disposable income in the baseline. Disposable income is 'original' household income minus social insurance contributions and personal income taxes, plus transfers. Original household income consists of earnings, incomes from capital and pensions.

For the subpopulation of individuals aged 18 to 59 available for the labour market, we summarize the overall redistributive effect of the tax-benefit system by means of the Reynolds-Smolensky index, Π^{RS}. Loosely speaking, Π^{RS} is the change in the Gini of individual disposable income, due to the process of the tax-benefit system.[13] We decompose the redistributive effect into the effect from the average tax rate t and the effect from the disproportionality of the tax instrument. The average tax rate is calculated as total net revenues divided by total original income. The disproportionality of net taxes, often abbreviated as 'progressivity of the system' is measured by the difference between the Gini before taxes and transfers and the concentration index of taxes and transfers (the Kakwani-index denoted Π^{K}). The relationship between the redistributive effect and the progressivity is described by:

[12] Disposable income is equivalised using the standard OECD equivalence scales, assigning a weight of 1 to the first adult, 0.5 to each subsequent person 14 or older, 0.3 to each child aged under 14.

[13] We write "loosely", because the redistributive effect is measured by keeping the rank of individuals or households in the pre-tax and –benefit distribution fixed. Since, in practice, the tax benefit system may also re-rank individuals, the actual difference between the Gini-index of disposable incomes before and after taxes and benefits is the redistributive effect plus the re-ranking effect.

$$\Pi^{RS} = \left(\frac{t}{1-t}\right).\Pi^{K}, \quad (3)$$

illustrating that there is no one-to-one relationship between progressivity and the redistributive effect. An increase in progressivity is compatible with a decrease in the redistributive effect, if the average tax rate decreases. And even if the progressivity is lowered, the redistributive effect can be enhanced by an increase in the average tax rate.

3.3.2 Work incentives

As already mentioned above, the changes in work incentives are only calculated for the subpopulation of working age persons available for the work force. We define the subsample as those individuals aged 18 to 59. People receiving pensions, early retirement or disability benefits are considered to be no longer available for the labour market and are therefore excluded from the sample.

Labour market research of the last two decades has highlighted the importance of the extensive margin of behaviour (i.e. to work or not), in addition to the intensive margin (how much to work). In the next subsections, we therefore first explain how we compute the marginal tax rates at both the extensive (the participation tax rate τ_i) and intensive margin (the marginal effective tax rate m_i). We calculate these effective tax rates at the individual level. Finally, we turn to the definition of the marginal cost of public funds, as a way to aggregate work incentives into one summary measure.

Participation tax rates

The participation tax rate (PTR) is a measure of the monetary attractiveness of working as opposed to not working. How much of a person's gross labour income is taxed away if (s)he is entering the labour market, be it explicitly through income taxes and social insurance contributions, or implicitly through the loss of benefits? If disposable income is actually lower or only slightly higher than in the situation where the person does not work, the individual faces an inactivity trap. Let taxes and transfers be a function $T(w_i h)$, where $w_i h$ denotes gross labour income earned from working h hours at wage rate w_i (for ease of notation at this stage, we suppress all other factors determining the tax liabilities). The budget constraint relating disposable income c to gross earnings, the tax liability and non-labour income I_i reads as:

$$c_i = w_i h - T\left(w_i h\right) + I_i \quad (4)$$

When non-active, disposable income is determined by non-labour income and (eventual) transfers, denoted by $T(0)$, the participation tax rate is calculated as:

$$\tau_i = \frac{T\left(w_i h\right) - T\left(0\right)}{w_i h} \quad (5)$$

Or alternatively, using (4):

$$\tau_i = 1 - \frac{c_i^{IW} - c_i^{OW}}{w_i h} \tag{6}$$

where superscripts IW and OW denote the labour status 'in-work' and 'out-of-work' respectively. In the denominator, $w_i h$ is the gross income from employment. The PTR can be further decomposed in terms of changes in the different tax-benefit components:

$$\tau_i = \frac{S_i^{IW}}{w_i h} + \frac{\left(T_i^{IW} - T_i^{OW}\right)}{w_i h} - \frac{\left(B_i^{IW} - B_i^{OW}\right)}{w_i h} \tag{7}$$

with S_i denoting social insurance contributions to be paid when being employed, T_i taxes to be paid, and B_i transfers received by person i. Since we want to capture the incentive for people out-of-work to take on a job and since we consider different time frames, we take into account the evolution of real wages in the numerator of equation (5). We used the real wage evolution as displayed in Table 2 for this adjustment. Although both social assistance and unemployment benefits have been used as out-of-labour income in the literature, we only compute PTR's using unemployment benefits. We simulate the PTR's separately for single individuals, household heads and cohabitants.

Marginal effective tax rates

Marginal effective tax rates (METR's) measure the incidence of the tax and benefit system on a marginal increase in earnings. This provides a measure of the strength of the financial (dis)incentive for individuals to increase their earnings somewhat – whether by increasing the extent of working time or the intensity of work effort (Callan et al., 2011). This can formally be written as:

$$m_i = \frac{\partial T\left(w_i h\right)}{\partial\left(w_i h\right)} \tag{8}$$

Like the marginal tax rate at the extensive margin, the marginal tax rate at the intensive margin depends crucially on the composition of the household and the earnings of the partner. Therefore the individual METR takes into account taxes paid and benefits received by all members of the household. The METR for an individual i can be rewritten as:

$$m_i = 1 - \frac{c\left[\left(1+b\right) y_i\right] - c\left(y_i\right)}{b y_i} \tag{9}$$

where the numerator measures the change in household disposable income following a change in individual earnings, denoted here by a b percentage rise in gross earnings. Practically, we simulated an increase of gross earnings of 5%. Like the PTR, the METR can be decomposed in the METR of social insurance contributions, personal income taxes and social transfers.

Marginal cost of public funds

Both the participation tax rate and the marginal effective tax rate are measures of work incentives at the individual level. To arrive at one aggregate measure of work incentives for the whole tax benefit system, we use the well-known concept of the marginal cost of public funds (MCF) (see Dahlby (2008) for an extensive overview of this concept). It measures the welfare cost of one additional euro of revenue in monetary terms, by evaluating the distortions introduced by the tax-benefit system in comparison with a lump sum way of raising an additional euro of government revenue (which would cost €1). Not surprisingly, this measure of welfare loss, in excess of the welfare loss of lump sum taxes or benefits, is a function of the level of marginal tax rates on the one hand, and behavioural responses on the other. Since both these inputs are readily observable or can be estimated, there have been several empirical estimates of average or marginal excess burdens (starting with Browning, 1976).

In this paper we use the following formula for MCF, introduced by Kleven and Kreiner (2006) to extend – in the spirit of Saez (2002) - standard empirical excess burden formulas with the integration of the extensive margin of labour supply[14]:

$$MCPF = \frac{1}{\sum_{i=1}^{I}\left[1-\frac{m_i}{1-m_i}\left(\phi_i\varepsilon_i^c-\theta_i\right)-\frac{\tau_i}{1-m_i}\eta_i\right]s_i} \tag{10}$$

in which marginal tax rates at the intensive and extensive margin, denoted respectively by m_i and τ_i for individual *i*, appear in the denominator. Behavioural effects appear as elasticities at the intensive and extensive margins, denoted respectively by ε_i and η_i (participation elasticity). In (10), we have already decomposed the uncompensated elasticity ε_i into a compensated elasticity ε_i^c and an income effect θ_i by means of:

$$\varepsilon_i = \varepsilon_i^c - \theta_i \tag{11}$$

Finally, ϕ_i in (10) is a measure of the progressivity of the marginal change in the tax system[15], and s_i the share of the different individuals (or wage deciles) in the total marginal change of net taxes.

[14] In this version of the MCF-formula, one extra unit of consumption is valued equally across the income distribution. Kleven & Kreiner (2006) also present a more general framework to measure the 'social' MCF, in which distributional weights appear.

[15] One additional euro can be collected in many different ways, e.g. by changing the demogrant element of a linear system, by changing one marginal tax rate, or by changing all marginal tax rates of a nonlinear system. Parameter ϕ_i captures the differential effect on the progressivity of these different marginal changes.

We simplify the general case of equation (10) by assuming that the MCF is calculated for a "proportional" tax increase ($\phi_i = 1$) and we disregard the income effect ($\theta_i = 0$). With these two simplifications, equation (10) reduces to:

$$MCF = \frac{1}{\sum_{i=1}^{I}\left[1-\frac{m_i}{1-m_i}\varepsilon_i-\frac{\tau_i}{1-m_i}\eta_i\right]s_i} \quad (12)$$

clearly illustrating that the MCF can in fact be interpreted as a way to aggregate distortions, as measured by the marginal effective and participation tax rates, into one general measure of distortion. The weights to be used are the labour supply elasticities for the two margins of response.

For the labour supply elasticities, ε_i and η_i, we use stylised values inspired by the sensitivity analysis in Kleven & Kreiner (2006). It is well known that the labour supply elasticities at the intensive margin are quite small, and that the participation elasticity is larger mainly for lower wages. The values chosen in Table 4 correspond to these empirical findings.

TABLE 4: LABOUR SUPPLY ELASTICITIES FOR FIVE WAGE QUINTILES

Quintile	At the intensive margin (ε_i)	At the extensive margin (η_i)
1	0.1	0.4
2	0.1	0.3
3	0.1	0.2
4	0.1	0.1
5	0.1	0.0

Source: Kleven & Kreiner (2006)

4. THE SIMULATED TAX-BENEFIT SYSTEM IN 2012

In this section we describe the counterfactual tax benefit system of 2012 in terms of the output indicators of the previous section. In the next section we then use the same framework to describe the changes in the system over the last 20 years. We limit ourselves to the price counterfactual only in this section.

Table 5 shows the budgetary aggregates for each of the main policy instruments we simulate in this paper. Total simulated government revenue totals 91.6 billion (bn) euros. The biggest revenue source is the personal income tax, which accounts for 51.7 bn euros. Social insurance contributions from employees add another 22.8 bn euros (employer contributions are not simulated). Finally, private households contributed another 17.1 bn euros to government revenue in value added taxes and excises.

At the expenditure side, the simulated cash transfers to households summed up to 56.8 bn euros. Pensions, 41.3 bn euros, are by far the largest category (73%), followed by 8.5 bn euros in unemployment benefits (15%) and 5.3 bn euros in child benefits (9%). The simulated budget for social assistance benefits is smaller: 1.7 bn euros or 3.0%. The bottom line of Table 5 shows that, in our simulation model, the bottom four deciles are net beneficiaries, whereas the upper six deciles are net contributors to the system.

TABLE 5: REVENUE AND EXPENDITURES FOR THE 2012 COUNTERFACTUAL (2009 PRICES, MILLION €)

Deciles:	1	2	3	4	5	6	7	8	9	10	All
P.I.T.	-49	155	612	1 392	2 580	4 044	5 352	7 296	9 864	20 520	51 720
S.I.C.	107	405	716	1 055	1 690	2 198	2 648	3 422	4 168	6 356	22 812
Indirect Taxes	892	1 219	1 403	1 563	1 622	1 688	1 828	1 953	2 142	2 749	17 058
Total revenue	**951**	**1 779**	**2 731**	**4 010**	**5 892**	**7 930**	**9 828**	**12 671**	**16 174**	**29 625**	**91 590**
Pensions	1 248	3 792	4 752	5 388	3 540	3 516	3 756	3 228	4 008	8 076	41 280
Unempl. benefit	1 308	1 392	721	668	715	733	736	589	718	910	8 484
Social Assist.	721	250	163	134	111	104	85	40	119	35	1 764
Child Benefit	665	622	550	517	586	580	520	502	412	368	5 316
Total expend.	**3 942**	**6 055**	**6 186**	**6 708**	**4 952**	**4 933**	**5 096**	**4 359**	**5 257**	**9 389**	**56 844**
Revenue – Expend.	**-2 991**	**-4 276**	**-3 455**	**-2 698**	**940**	**2 998**	**4 732**	**8 312**	**10 917**	**20 236**	**34 746**

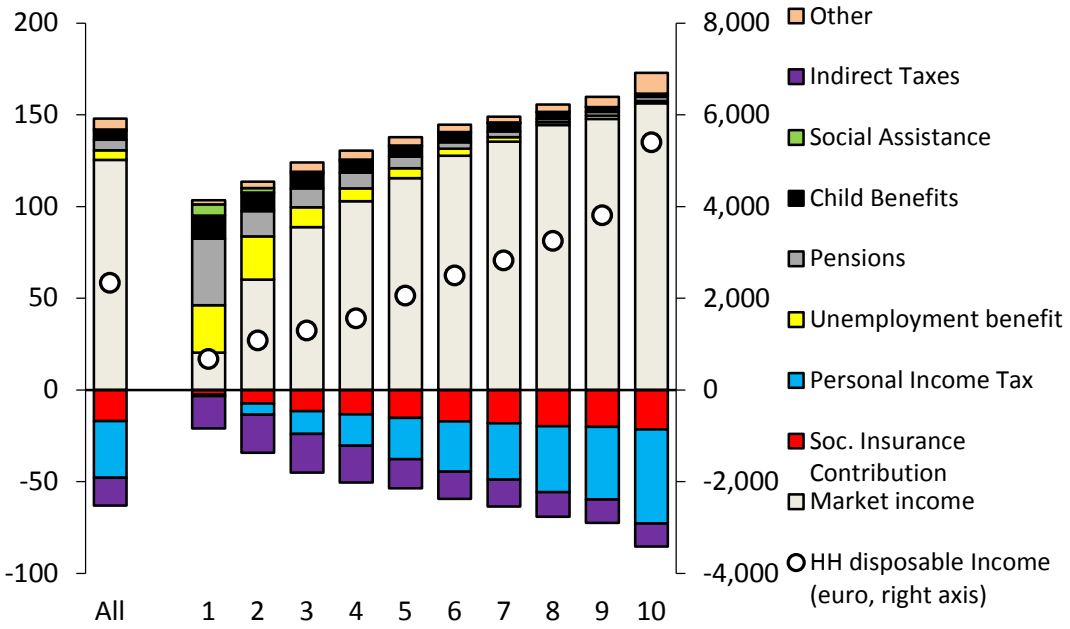
Source: EU-SILC 2010; own calculations using MEFISTO-EM; deciles of equivalent household income using the 1992 tax-benefit system.

Figure 2 translates the different elements of the tax benefit system into a picture of the composition of disposable incomes across the deciles of the distribution.[16] The bars in Figure 2 show the relative importance of market earnings and separate components of the tax benefit system in the disposable household income. The dots (on the right axis) show the level of non-equivalised, monthly household disposable income across deciles[17]. Average disposable income is 2336 euros per household (2751 excluding indirect taxes), ranging from 673 for the lowest decile to 5400 euros for the richest (respectively 817 and 6172 euros without indirect taxes).

[16] We use deciles of the counterfactual distribution in 1992 here, because in the next sections, where we describe policy changes, we keep deciles to which individuals or households belong fixed. We chose for deciles at the earliest point in time to interpret the changes across the distribution in the next sections consistently.

[17] Disposable incomes are corrected for the payment of indirect taxes.

FIGURE 2: INCOME SOURCE W.R.T. DISPOSABLE INCOME (%), 2012 COUNTERFACTUAL SYSTEM

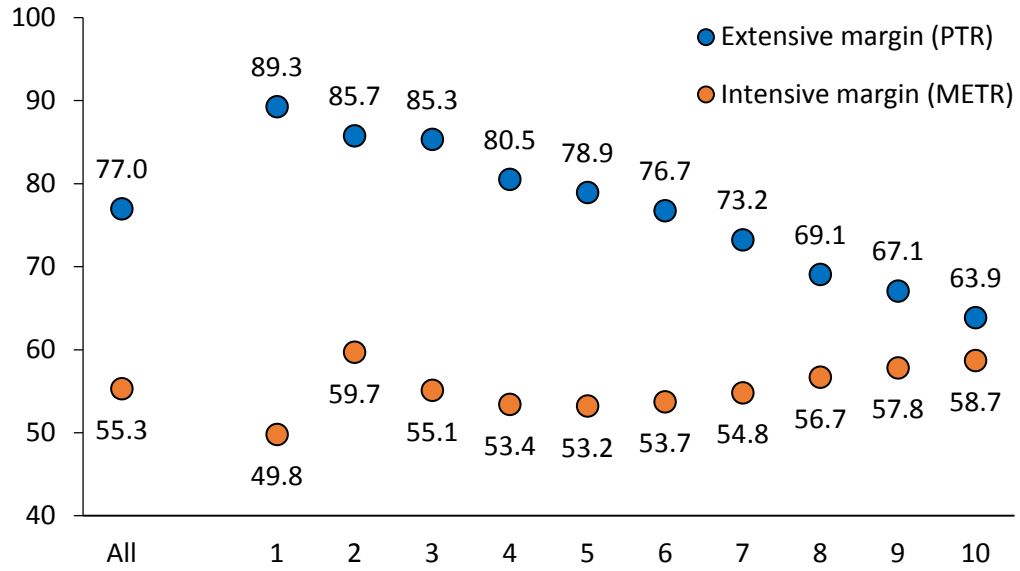


Source: EU-SILC 2010; own calculations using MEFISTO-EM; deciles of equivalent household income using the 1992 tax-benefit system.
Note: The series 'household disposable income' is not equivalised, indirect taxes are subtracted from this income.

The composition of the total disposable household income reveals that market income constitutes only 20% of disposable income for the lowest decile, as compared to 156% for the top decile. Pensions and unemployment benefits comprise on average respectively 36% and 26% of disposable income for the lowest decile. This share gradually decreases when households become richer. Social assistance is only a non-negligible income source for the bottom two deciles, respectively 6% and 2%. Child benefits are also more important at the bottom (13%) than at the top (2%). The relative role of the different taxes across the distribution is as expected: personal income taxes are strongly progressive, social insurance contributions are slightly progressive, and indirect taxes are regressive, all with respect to household disposable income. This unequal distribution of market income, benefits and taxes has an important effect on how changes in policy affect disposable incomes across the income deciles. It is clear that a proportional change in personal income taxes will have a greater effect in the higher income deciles, whereas this will be less outspoken with a proportional change in social security contributions. Also, changes in benefits generally has a much larger relative impact for lower than for higher deciles.

Figure 3 shows the work incentives in the baseline system of 2012, as measured by the participation tax rates and the marginal effective tax rates for all deciles of the wage distribution.

FIGURE 3: MARGINAL TAX RATES AT INTENSIVE AND EXTENSIVE MARGIN OF THE 2012 SYSTEM (%)



Source: SILC 2010; own calculations using MEFISTO-EM; wage deciles.

The average marginal participation tax rate for the 2012 system is 77.0%, These marginal rates are decreasing in wage, and the most relevant ones, those for people earning low wages, is almost 90%. It implies that disposable income from employment is only 10% higher than disposable income when unemployed. At the intensive margin, the marginal effective tax rate for the 2012 system was on average 55.3%. While the first decile has the lowest marginal tax rate (49.8%), it increases strongly for the second wage decile and is U-shaped for the remaining deciles, decreasing to 53.2% for the fifth decile, and increasing again to 58.7% for the top decile. This decreasing part mainly follows from the tapering away of the earned income tax credit (the so called Work Bonus).

5. EVOLUTION OF THE TAX-BENEFIT SYSTEM SINCE 1992

5.1 Revenue effects

Contrary to a theoretical welfare analysis, in which we would keep the government budget constant, this descriptive analysis does register important public revenue and expenditure effects of the policy changes during the 1992-2012 period. Similar to the figures presented in Table 5, we calculated revenues and expenditures in the three other counterfactuals (1992, 2001 and 2007). Results can be found in Table 6.

TABLE 6: EVOLUTION OF SIMULATED PUBLIC REVENUE AND EXPENDITURES (BILLION EUROS)

		1992-2001	2001-2007	2007-2012	1992-2012
Price uprating	Revenue	4.2	-5.0	1.7	0.9
	Expenditures	-0.2	1.6	3.0	4.3
	Impact budget	4.5	-6.5	-1.3	-3.4
Wage uprating	Revenue	5.3	-4.5	1.4	2.1
	Expenditures	-5.9	-0.1	3.6	-2.4
	Impact budget	11.2	-4.4	-2.2	4.5

Source: EU-SILC 2010; own calculations using MEFISTO-EM

Measured using price uprating, policy choices led to a significant increase in public revenues in the period 1992-2001. Social insurance contributions (+1.4 bn euros), personal income taxes (+1.9 bn euros), and indirect taxes (+0.9 bn euros) all contributed to this revenue increase. Expenditures over this period remained almost constant, except for lower child benefits (-0.1 bn euros). This stands in sharp contrast with the second sub-period (2001-2007), during which personal income taxes were lowered substantially (-4.9 bn euros). Total revenue from social insurance contributions changed only marginally (-0.1 bn euros), while indirect taxes increased slightly (+0.1 bn euros). During this period, expenditures increased slightly, most notably unemployment (+0.5 bn euros) and pension benefits (+0.8 bn euros). In the final period (2007-2012), public revenue increased again. Personal income taxes (+1.2 bn euros) and social insurance contributions (+0.5 bn euros) increased, while indirect taxes remained almost constant. On the expenditure side, we observe the strongest increases in pension (+2.2 bn euros) and unemployment benefits (+0.6 bn euros), whereas social assistance and child benefits increased only slightly (+0.1 bn euros).

Calculating revenues and expenditures of policy changes in the 1992-2012 period using wage uprating as the 'no policy change'-default gives a different view. Remember that we now take as default that benefits should have been increased in step with nominal wage growth. That policymakers decided *not* to do this, led to 5.9 billion euros of less expenditures between 1992 and 2001, than if they would have done so. The same holds, to a lesser extent for revenues. Compared to the situation where, e.g. brackets of the personal income tax would have been adjusted for nominal wage growth, the government now collected 5.5 billion euros more in revenues by keeping the brackets fixed in that period. The net impact of actual policy in this period compared to a policy of nominal wage indexation then amounts to 11.2 billion euros. In the second period (2001-2007), we notice that on the revenue side, the cost of the tax reform which was 5 billion euros when looking at price uprating, now reduces to 4.5 billion euros when looking at wage uprating. So although the 2001 PIT reform decreased revenues considerably, the bracket creep in this period gave rise to a 0.5 billion euros increase (or smaller decrease) of the total tax revenue. At the expenditure side, the 1.6 billion euros of additional expenditures, which appeared when looking at price uprating, now disappears from sight when one uses nominal wage growth as default policy adjustment. This reveals that expenditures –on average-

did not outpace wage growth. In the final period (2007-2012) the differences between price and wage uprating are less important.

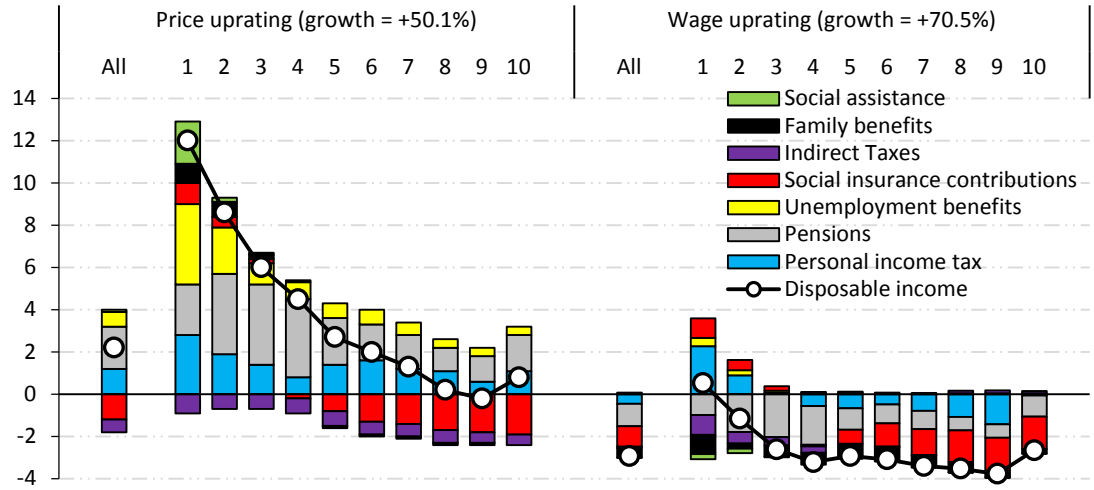
The rightmost column of Table 6 summarizes the budgetary stance over the whole 1992-2012 period. The difference between price and wage uprating as the 'no policy benchmark' against which we mark out the policy changes is striking and reveals the counterfactual nature of the exercise very clearly. Compared to a default policy which would keep benefits constant in real terms, and allows the government to cash in the above unitary elasticity of progressive personal income taxes, the actual policies of the 1992-2012 period reduced the government budget with 3.4 billion euros. But, if one considers that default policy would index benefits with nominal wage growth and would also regularly adapt personal income tax brackets to compensate for real bracket creep, the actual policies led to an increase in net taxes over these two decades.

Note that these changes in net revenue only capture the changes in *simulated* policies, calculated on a fixed counterfactual socio-economic and demographic situation. Therefore, similar to all results following in the next sections, these revenue effects should be strictly interpreted as a measure of changes in policy orientation, and not as a description of actual changes of the governments' net surplus.

5.2 Distributional effects

Figure 4 shows the difference in disposable income per decile, if we apply the 2012 tax-benefit system, as compared to the 1992 system. We express the results in percentage changes with respect to disposable incomes under the 1992 system. A positive value indicates that the tax-benefit system has become more generous either in real terms (when we use price uprating as the uprating factor), or with respect to wage growth (when we use nominal wage growth as the uprating factor). Price uprating as benchmark is displayed in the left panel of Figure 4, wage uprating in the right. The first bar shows the effect for the whole population. The other bars display the effects across income deciles.

FIGURE 4: CHANGE IN DISPOSABLE INCOME 1992-2012



Source: EU-SILC 2010; own calculations using MEFISTO-EM; deciles of equivalent household income using the 1992 tax-benefit system.

Figure 4 shows the importance of the choice of the benchmark policy system. Taking price uprating as the benchmark and given the pre-tax incomes and socio-economic characteristics of the SILC 2010 population, average real disposable income is 2.2% higher under the 2012 policy rules than it would be if the tax-benefit system of 1992 was still in effect. But with nominal wage uprating as the benchmark, the right-hand side of Figure 4 indicates that the overall tax benefit system gave rise to a lagging behind of disposable incomes with respect to nominal wage growth. The large difference with the figure for price uprating can be explained by two features: firstly, in the nineties, most policy parameters were indexed using inflation, keeping them constant in real terms, while at the same time the large growth in real wages caused benefits to lag behind on wages. In the following years, benefits never caught up again. Secondly, because personal income tax parameters were, by default, indexed using prices, tax creep led to higher taxes. The 2001 tax reform has not compensated fully for this bracket creep. Our simulations hence show that, from a policy perspective only, increases in personal income taxes and social insurance contributions have outweighed the growth in wages. Pensions and family benefits did not keep track with average wage growth. Unemployment benefits only marginally outpaced wage growth.

Not surprisingly, the difference in results using either price uprating or wage uprating as 'no policy change' is also reflected in the *level* of the implied income changes across the deciles. Yet, the decile gradient itself looks strikingly similar. In the case of price uprating, we see much higher increases in disposable income at the bottom decile than at the top. The overall policy stance has been progressive. Remarkably, changes in the personal income tax system have also benefited the lower deciles, although the removal of the highest PIT-rates of 55% and 52.5% produce a small regressive effect at the very top (the highest decile enjoys a larger gain than the 8th and 9th one). Increases in pensions and unemployment benefits were more important for the bottom deciles. In the upper half of the distribution, increases in social security contributions are the main driver for decreases in real disposable income. The exception is the decrease in social security contributions at the bottom of the distribution, by means of the social work bonus, which has significantly contributed to the increase in real disposable income of the bottom decile. Finally, the increase in indirect taxes eroded purchasing power for all deciles, and did so proportionally.

In the case of wage uprating (right panel of figure 4), the decile picture looks strikingly similar. Now, all deciles, except for the first, experience a decrease in counterfactual disposable incomes. For deciles 5 to 9 this is mainly due to bracket creep in personal income taxes and increases in social security contributions. Note that both personal income taxes and social security contributions have improved the relative position of the bottom two deciles. If the bottom half of the distribution has witnessed a relative deterioration of its situation compared to a benchmark of nominal wage growth, it was mainly due to the lack of welfare adjustments of pensions and child allowances and to indirect taxes.

We conclude that the policy stance in Belgium during the period 1992-2012 has pre-dominantly been progressive, and that this conclusion is robust with respect to the choice of benchmark

(either price or wage uprating). In the next subsections we decompose the effects further for the three time periods under review: 1992-2001, 2001-2007 and 2007-2012.

5.2.1 Evolution from 1992 to 2001

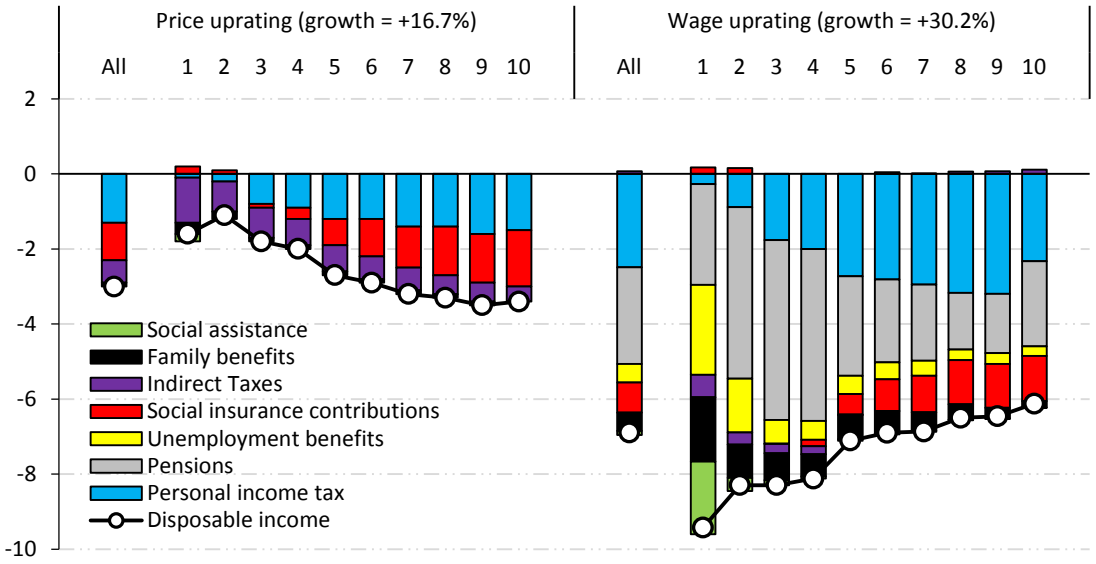
Figure 5 shows results for the first sub-period, which covers the administrations of Dehaene I (1992-1995) and II (1995-1999), and the first years of Verhofstadt I (1999-2001). Both the recession of 1993 and the attempt to comply with the entrance conditions of the monetary union as stipulated in the Maastricht Treaty made fiscal consolidation the prime objective of both Dehaene administrations.

The left panel of Figure 5 (using price uprating as the benchmark) reveals that social insurance contributions and personal income taxes were increased proportionately, lowering average disposable incomes by 2.3% on average. Higher indirect taxes, most notably the increase of the VAT rate from 19.5% to 21%, lowered household disposable income on average by another 0.6%. The increase of indirect taxes was clearly regressive, decreasing net disposable income by 1.2% for the poorest decile versus 0.4% for the richest decile. It is one of the few regressive policy choices found in this paper. Social transfers remained by and large unchanged in real terms.

The right panel of Figure 5, which uses nominal wage growth as the benchmark, testifies both the importance of exploring different subperiods and using two separate benchmarks. Indeed, in the 1992-2001 period, the distributional pattern of the policies is very different looking at two different benchmarks. Policy makers who take protection of the purchasing pattern as the final touchstone might be comforted that the left panel shows a smaller erosion of purchasing power for poor than for rich households. But someone adhering to a social contract in which one tries to limit divergence between welfare levels of workers and non-workers will find evidence in the right panel of Figure 5 that policies taken made the bottom half of the income distribution lag more behind than the upper half. As the grey and yellow bars show, this mainly stems from the lack of welfare adjustments of pensions and unemployment benefits and, for the bottom decile, additionally from the erosion of child benefits and minimum income protection. Note however, that also the upper part of the income distribution witnessed a decrease in real disposable income compared to the wage increase, which was mainly due to the fact that not only CPI-indexation of the PIT-brackets was suspended, but also not adjusted for real growth of taxable incomes.

Finally, note that in 2000, one year into the administration of Verhofstadt I, a first and modest make-work-pay policy was introduced which lowered the social insurance contributions at the lower end of the income distribution. As a result, the bottom two deciles experienced lower social insurance contributions than before the Dehaene increase, leading to a slight overall increase in their disposable income.

FIGURE 5: CHANGE IN DISPOSABLE INCOME 1992-2001



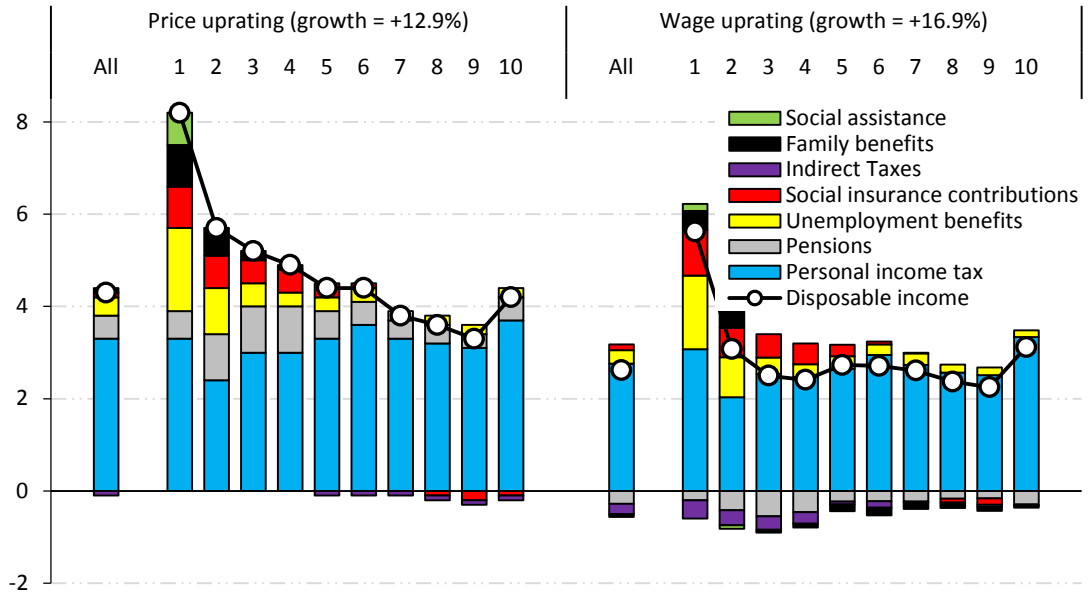
Source: EU-SILC 2010; own calculations using MEFISTO-EM; deciles of equivalent household income using the 1992 tax-benefit system.

5.2.2 Evolution from 2001 to 2007

Figure 6 covers the most important policy changes introduced by the administrations of Verhofstadt I (1999-2003) and II (2003-2007). Both the left and the right panel are dominated by the blue bars, representing the 'Reynders'-reform' of the personal income tax system (lowering of top marginal tax rates and introduction of a number of important tax credits and the reform of the basic allowance) and the introduction of a regional tax credit (the '*jobkorting')*.

Using price uprating (left panel), we find that households' real disposable income increased by an average 4.4%, mainly due to generous tax policies. The increase was largest at the bottom (+8.2%) but remained significant throughout the income distribution (ranging from +3.4% to +5.7% for the other deciles). The lowering of the personal income taxes benefited more or less all income groups proportionately. The significant extension of the *work bonus* for low wages also increased incomes for the bottom four deciles. During this period a number of welfare adaptations of social benefits, most notably of unemployment benefits, pensions and—to a lesser extent—social assistance took place. Reform of child benefits benefited the bottom two deciles.

FIGURE 6: CHANGE IN DISPOSABLE INCOME 2001-2007



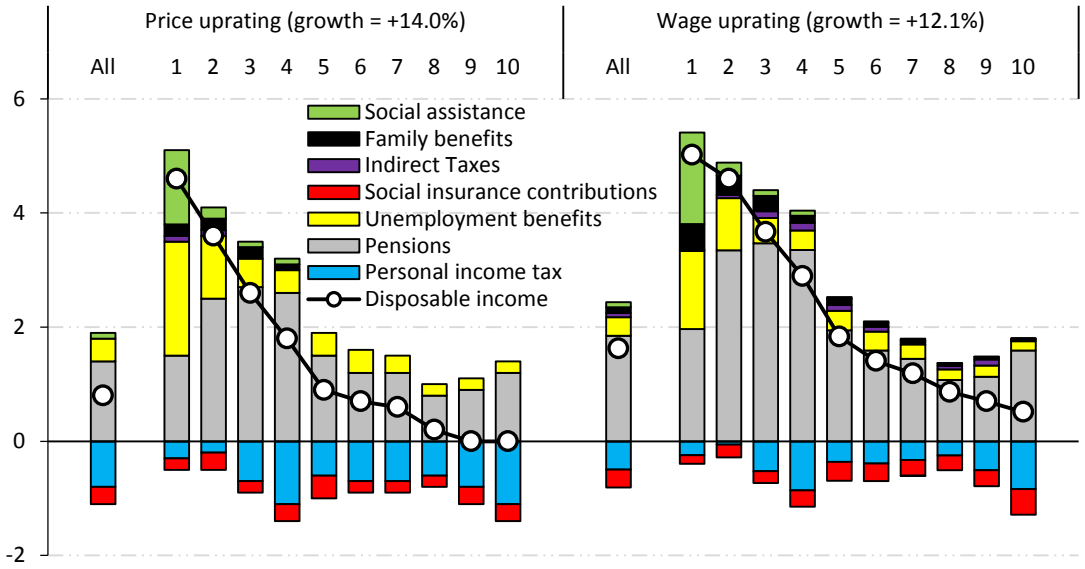
Source: EU-SILC 2010; own calculations using MEFISTO-EM; deciles of equivalent household income using the 1992 tax-benefit system.

Contrary to the previous subperiod, the distributional picture on the right-hand side of Figure 6 is now very similar to the left-hand side. The reason is that real wage growth was relatively low in this period (see figure 15 in appendix for more information). Yet, the simulations of the counterfactuals show that the welfare adaptations of pensions were not sufficient to keep track with this modest wage growth.

5.2.3 Evolution from 2007 to 2012

Figure 7 reveals that during and after the financial crisis, tax-benefit policies on their own increased household disposable income by an average of 0.8. Comparable to the previous period, our simulations unveil one main driver. The main policies that contributed positively to this increase were the welfare adaptations of pensions (+1.4%). Also welfare adaptations of unemployment benefits (+0.4%) and social assistance (+0.1%) played a role. The repeal of some generous tax policies, most notably the Flemish *jobkorting*, gave rise to a decrease in household disposable incomes of around -0.8% and a slight increase in social insurance contributions, decreasing income on average by 0.3%. Poor households on average were 4.5% better off, while persons at the top of the income distribution did not gain.

FIGURE 7: CHANGE IN DISPOSABLE INCOME 2007-2012



Source: EU-SILC 2010; own calculations using MEFISTO-EM; deciles of equivalent household income using the 1992 tax-benefit system.

Therefore, we conclude that the policy orientation was explicitly progressive in this period. Note that the average changes in household income conceal differences in changes between households with working members and households where no one works: the former lose due to higher taxes and contributions, while the latter gain more thanks to the welfare adaptations of social benefits. From 2007 to 2012 prices grew more than wages did, amplifying the effects when applying wage uprating (as can be seen at the right-hand side of Figure 7). The general distributional picture remains unchanged however.

5.2.4 Redistributive effect of the tax benefit system for the subgroup of the labour market population

Table 7 shows the result by using aggregate statistics of progressivity and redistributive effects. We present these statistics for the entire population, based on equivalent disposable household income, and for individuals available for the labour market only. The results for the latter will be used to compare the redistributive effects with the changes in work incentives for the working age subpopulation.

TABLE 7: REDISTRIBUTIVE EFFECT, PROGRESSIVITY AND AVERAGE TAX RATE (X100)

	Price uprating				Wage uprating			
Progressivity (Π^K)	1992	2001	2007	2012	1992	2001	2007	2012
	Population available for the labour market (level of the individual)							
Progressivity (Π^K)	27.4	26.7	33.5	34.0	33.8	27.9	33.2	34.8
Average tax rate (t)	30.9	32.4	29.2	29.3	27.9	31.8	29.3	29.1
Redistribution (Π^{RS})	9.9	10.4	11.3	11.4	10.3	10.5	11.3	11.6
Gini original inc. (+pensions)	49.0	49.0	49.0	48.9	48.8	48.9	48.9	48.9
Gini disposable income	38.8	38.3	37.4	37.1	38.2	38.1	37.3	37.0
	Total population (level of the household)							
Progressivity (Π^K)	43.2	40.9	48.8	49.1	52.0	42.4	48.5	50.0
Average tax rate (t)	27.0	28.6	25.6	25.7	24.0	28.0	25.7	25.4
Redistribution (Π^{RS})	14.2	14.6	15.0	15.1	14.6	14.7	14.9	15.2
Gini original inc. (+pensions)	44.9	44.9	44.8	44.4	44.0	44.7	44.8	44.3
Gini disposable income	30.1	29.6	29.3	28.7	31.3	31.5	31.0	30.6

Source: Own calculations using EU-SILC 2010 and MEFISTO-EM. See footnote 13 for the reason why the redistributive effect on the third row is not equal to the difference between the Gini of original and disposable income in row 4 and 5.

We start by discussing the results for the subpopulation of people available for the labour market. If constant purchasing power is taken as benchmark, the second line shows that, over the whole period, the average net tax rate decreased from 30.9% to 29.3%. This decrease mainly occurred in the second period through the personal income tax reform, which was able to compensate the tax increases of the previous period. Ceteris paribus, this tax decrease could lead to a decrease in the redistributive power of the tax benefit system. Yet, the Reynolds-Smolensky index (third line), which is approximately equal to the change in the Gini coefficients on the bottom two lines of Table 7, increased from 9.9 for 1992 to 11.4 for 2012. This means that starting from the same pre-tax inequality of 49.0, the tax benefit system in 2012 reduces inequality by 1.5 percentage points more than it did in 1992. This increase in redistributive power was mainly driven by the increased progressivity of the large personal income tax reform of 2002-2005, the introduction of a working tax credit and the welfare adaptations of unemployment benefits and social assistance.

When simulating policy effects against the background of increases in nominal wages as the 'no policy change'-benchmark, we observe a similar increase in redistributive power as with the CPI-uprating counterfactual: from 10.3 to 11.6 (third line). However, the increase in redistributive effect is now driven by an overall increase of net average taxes (second line: from 27.9 to 29.1) and much less by an increased progressivity (first line: from 33.8 to 34.8).

We observe similar changes in progressivity and redistribution for the entire population. Progressivity decreased considerably between 1992 and 2001. This while the average tax rate increased. Redistribution improved slightly taking price uprating as benchmark (14.2 to 14.6), but remained almost stagnant using wage uprating (14.6 to 14.7). Between 2001 and 2007 progressivity increased significantly, whereas the average tax rates decreased. Redistribution on

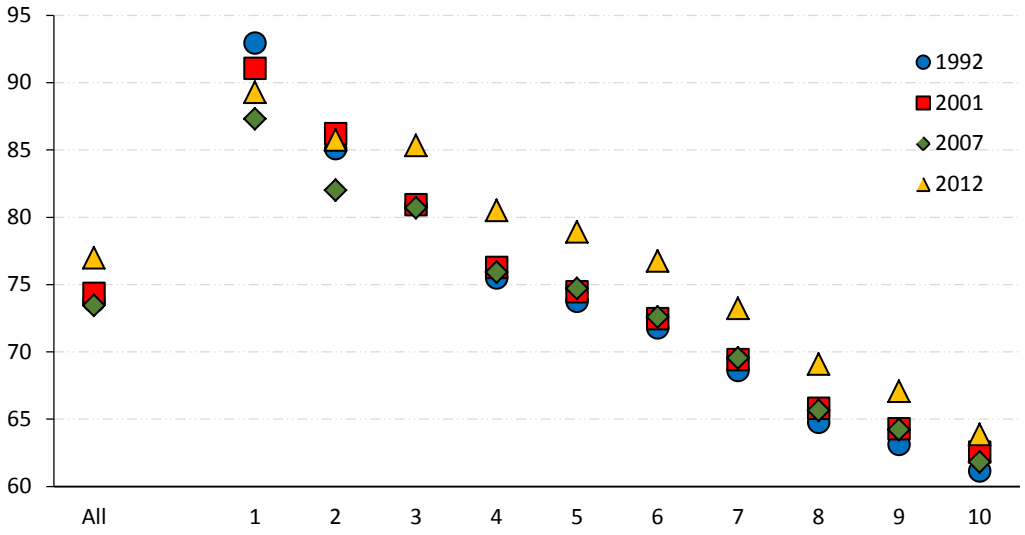
the other hand improved slightly (14.6 to 15.0 using price uprating, 14.7 to 14.9 using wage uprating). From 2007 to 2012 progressivity grew only by a margin according to price uprating, somewhat stronger using wage uprating. Average tax rates remained broadly unchanged. Redistribution also did not change much using price uprating (15.0 to 15.1), while it did increase more using wage uprating (14.9 to 15.2).

5.3 Work incentives

5.3.1 Participation tax rates

Figure 8 shows the level of the participation tax rates in the four periods (total 1992-2012 period and the three subperiods), whereas Figure 9 displays the same information in terms of changes.[18] The average marginal tax rate at the extensive margin equals 73.8% in 1992, then increased half a percentage point to 74.3% in 2001 and decreased again to 73.4% in 2007, after which it increased strongly to 77.0% in 2012. Over the entire twenty years the PTR was significantly reduced for the lowest wage decile (minus 3.7 percentage points). For the other deciles, the PTR went up between 0.7 and 5.2 percentage points.

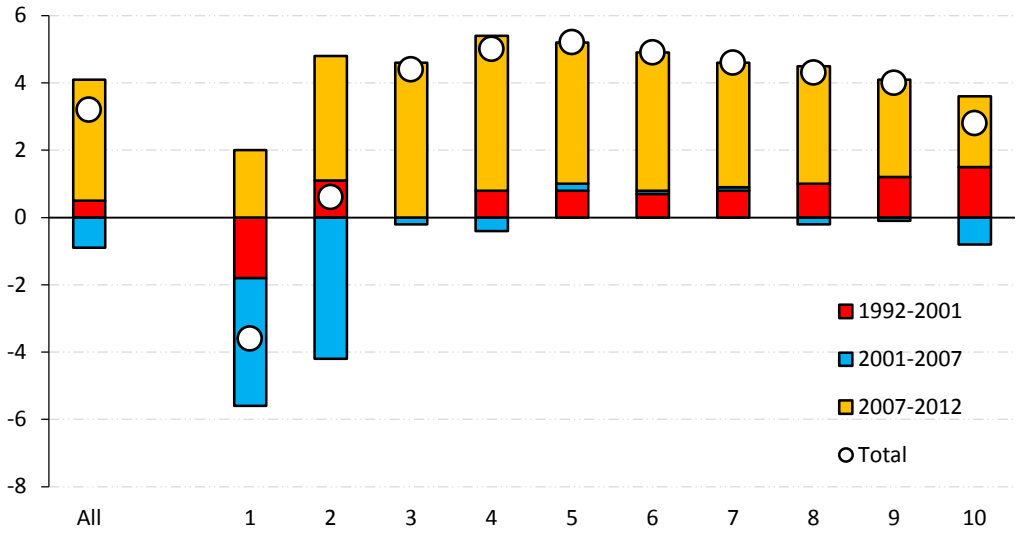
FIGURE 8: PARTICIPATION TAX RATE PER WAGE DECILE (%)



Source: SILC 2010; own calculations using MEFISTO-EM; wage deciles.

[18] As explained above when discussing equation (5), we took into account the evolution of real wages in the numerator of the PTR. In this way we captured the growing attractiveness of working compared to the non-work alternative, as real wages increase. For the marginal tax rates at the intensive margin however (section 5.3.2), we only accounted for inflation uprating. That means that real bracket creep will not show up in higher marginal tax rates here.

FIGURE 9: CHANGE IN PARTICIPATION TAX RATE PER WAGE DECILE (PERCENTAGE POINTS)



Source: SILC 2010; own calculations using MEFISTO-EM; wage deciles.

The overall increase in PTRs is almost entirely driven by the increase in generosity of the unemployment benefits[19]. This higher out-of-work income implies a larger financial disincentive to work, adding between 6.1 and 8.6 percentage points to the PTR between 1992 and 2012 across the five lowest wage deciles. Meanwhile, also social security contributions were increased proportionately in the early nineties, leading to slightly higher PTRs. Most important for the change in participation taxes was the introduction of the social work bonus in 2000 and its extensions later on. The introduction of this instrument was the main driver behind the reduction of the PTR of 9.4 percentage points for the lowest wage decile and a smaller decrease of 1.8 percentage points for the second decile.

5.3.2 Marginal effective tax rates

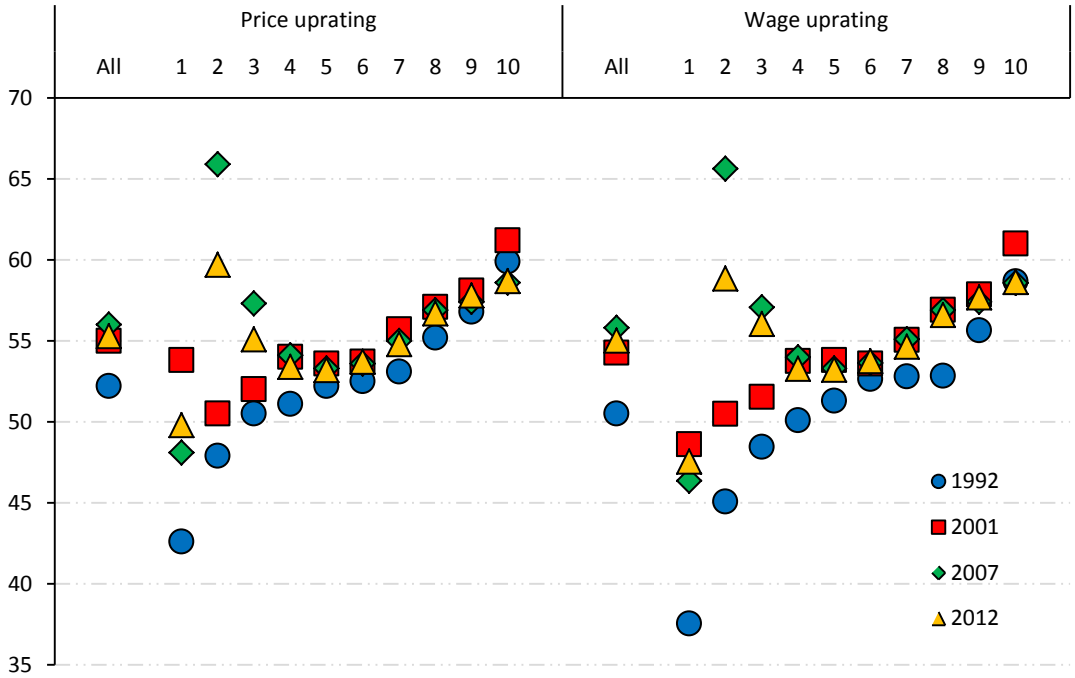
Figure 10 and Figure 11 display the same information for marginal effective tax rates at the intensive margin, with on the left-hand side the results for the counterfactuals with CPI uprating and on the right-hand side the ones with nominal wage uprating. The METRs calculated with wage uprating also include the effect of fiscal drag: when tax brackets are only indexed with prices and people earn higher real incomes over time, they are gradually taxed at higher marginal rates.

On average, the METRs have increased: between 1992 and 2001 the METR moved up from 52.2% to 55.3% using price uprating, and from 50.5 to 55.0% using wage uprating. In the 2001-2007 period, they increased another percentage point to reach 56.0%, to then fall by 0.7 percentage points between 2007 and 2012. Comparing the average METR from price uprating

[19] Recall from paragraph 5.1 that, like unemployment benefits, social assistance also increased in real terms. Therefore, taking social assistance instead of unemployment benefits as the out-of-work income for the calculation of our PTR would not alter the outcome.

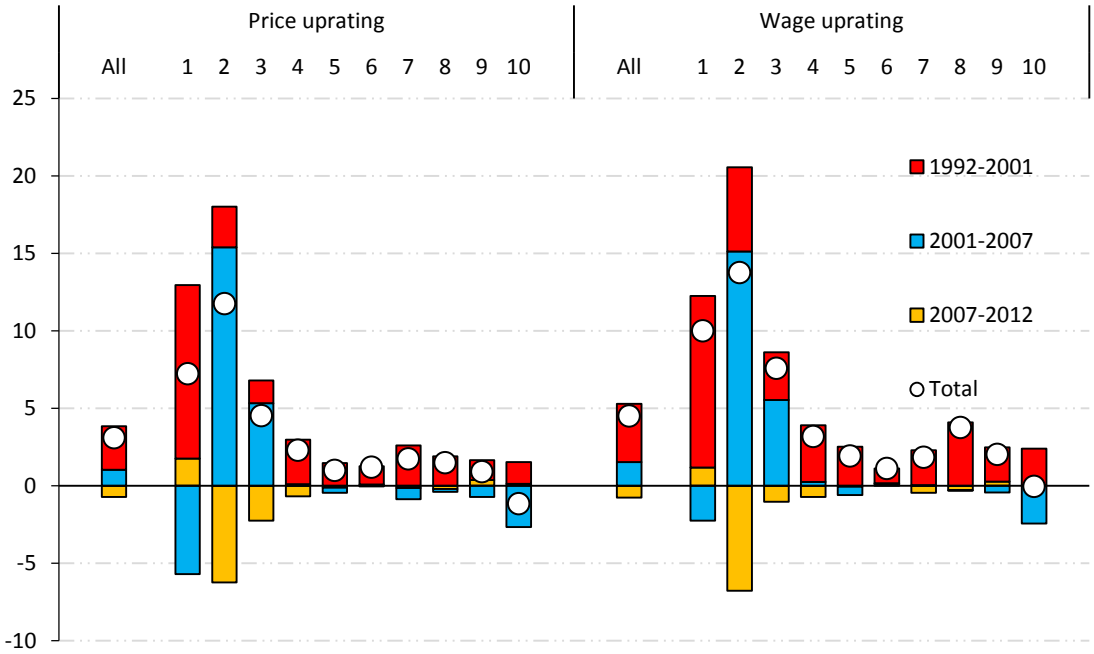
with the average from wage uprating we find that fiscal drag forced the average upwards by 1 percentage point between 1992 and 2001 and by another half of a percentage point in the second period. Fiscal drag played a larger role at the extremes of the wage distribution and less in the middle of the distribution.

FIGURE 10: MARGINAL EFFECTIVE TAX RATE PER WAGE DECILE (%)



Source: SILC 2010; own calculations using MEFISTO-EM; wage deciles.

FIGURE 11: CHANGE IN MARGINAL EFFECTIVE TAX RATES PER WAGE DECILE (PERCENTAGE POINTS)



Source: SILC 2010; own calculations using MEFISTO-EM; wage deciles.

Four important policy reforms explain the brunt of the changes in the METR across the distribution. First, the introduction of a crisis tax and a special social security contribution in the early nineties raised marginal effective tax rates for all wage groups. Second, the particular increase of the METRs for the lower deciles is the result of the introduction and the subsequent extension of the work bonus. Since the work bonus targets lower wages, lowly paid employees see the premium fade out as they earn more. The effect is most prominent for the first and second decile. Third, the personal income tax reform of 2001-2005. This lowered the top marginal tax rates and extended the base allowance. Finally, the repeal of the crisis tax induced a lowering of all marginal tax rates between 2001 and 2007.

5.3.3 Marginal cost of public funds

Using the stylized elasticities shown in Table 4 above, we find that the MCF, to be interpreted here as an aggregate measure of work incentives, has increased gradually over time. The MCF for the 1992 system, using price uprating, equals 1.399. The worsening of work incentives, due to increases in personal income taxes and social insurance contributions between 1992 and 2001, pushed the MCF up to 1.440 for the 2001 system. Interestingly, the divergent effects on work incentives over the 2001-2007 period singled each other out to a great extent: the MCF for the 2007 system remained stable at 1.444. Between 2007 and 2012, the MCF increased further to 1.453. As discussed in section 5.3.2, when using wage uprating we take into account the fiscal drag that results from real wage growth outpacing the adjustment of the nominal tax parameters, which leads in turn to higher marginal tax rates for people who become subject to a higher tax bracket. Applying wage uprating we indeed notice larger increases of the MCF in periods with positive real wage growth. This was especially the case in the 1992-2001 period and to a lesser extent in the 2001-2007 period.

We can conclude that, overall and over the whole period, work incentives in the Belgian tax-benefit system have not been improved. Bringing the distortions (at the margin) back to the level existing previous to the big consolidation by means of tax increases in the nineties was never successful.

TABLE 8: MARGINAL COST OF PUBLIC FUNDS

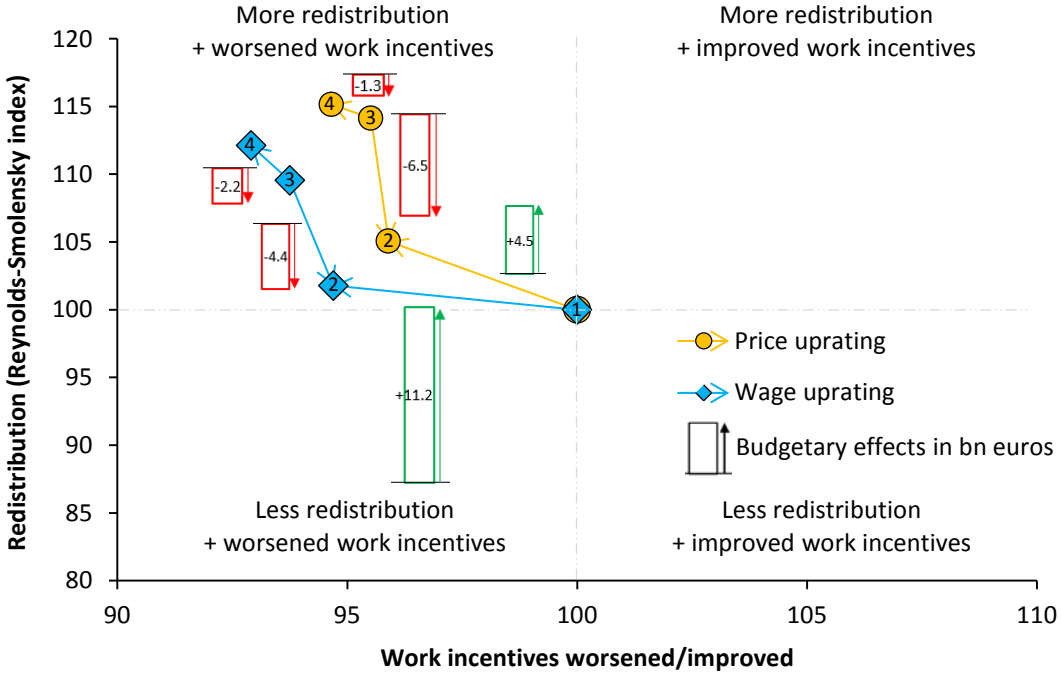
	1992	2001	2007	2012
Price uprating	1.399	1.440	1.444	1.453
Wage uprating	1.378	1.431	1.441	1.450

5.4 Policy orientations during 20 years of tax-benefit policy

Figure 12 summarizes our bird's eye view of 20 years of changes in tax benefit policy in one graph. On the horizontal axis we plot the value of $1-MCF$, and we normalised this indicator to 100 for 1992. A movement to the right reveals an improvement in work incentives, while a

movement to the left is a worsening of work incentives. On the vertical axis we plot the redistributive performance of the tax benefit system, as measured by the Reynolds-Smolensky index for the subpopulation available for the labour market (again normalised for base year 1992 at value 100). This normalisation produces four quadrants in the graph: the four different combinations of on the one hand work incentives which improve or deteriorate, and on the other hand redistribution of the tax benefit system which is either reinforced or diminished. We show the coordinates for the four data-points of the different time periods. Finally we complement the graph with information on the revenue effect by showing the change in net taxes (in billion euros) between two points in time (the red or green bars).

FIGURE 12: POLICY SHIFT 1992-2012: EQUITY, WORK INCENTIVES & BUDGETARY EFFECTS (1992=100)



Source: SILC 2010; own calculations using MEFISTO-EM; wage deciles.
Note 1: 1 = 1992 2 = 2001 3 = 2007 4 = 2012
Note 2: Budgetary effects in billion euros.
Note 3: Results for population available for the labour market.

Overall, policy changes over the last two decades have made the tax benefit system more redistributive in nature. As the results in section 5.2 have shown, both fiscal consolidation and generous policies (such as personal income tax reductions or increases in benefits) were progressively oriented. The reduction of the top marginal rates and the introduction of a proportional increase in the social insurance benefits only slightly eroded this increase in the redistributive power of the system.

Work incentives have not improved. The major deterioration occurred in the first subperiod, when personal income taxes and social security taxes were increased proportionately. It was the price tag attached to the fiscal consolidation target of the nineties. The worsening of work incentives during the last subperiod was mainly due to the increase in out of work benefits. It is striking that in the 2001-2007 period, the tax benefit system became both more redistributive,

while at the same time maintaining work incentives (and even improving them for the lowest wage deciles). This illustrates two things. First, it *is* possible to improve work incentives without paying a price in terms of redistribution, if one uses the right instruments. The introduction of a making-work-pay instrument improved the work incentives by reducing labour market distortions at the extensive margin. The targeting of this reduction in social security contribution at the lowest wage deciles also bought redistribution gains. Note of course that these policies did come with a serious bill attached to them. In contrast with a net revenue gain of 4.5 billion euros between 1992 and 2001, the policy choices between 2001 and 2007 came at a cost of 6.5 billion euros. Second, the movement between 2001 and 2007 also shows that Figure 12 should not be interpreted as the classic equity-efficiency frontier from theoretical analysis in welfare economics. As mentioned in the introduction, we do not calculate the frontier as such, since the variables on the vertical and horizontal axis are not really intimately connected in our analysis.

6. CONCLUSION

First, when evaluated against the background of keeping purchasing power constant (i.e. using CPI-uprating as the benchmark for 'unchanged policy'), Belgian policy makers seem to have consistently 'put equity first'. In all three subperiods (1992-2001; 2001-2007; 2007-2012), either when forced to make policy choices in an environment of fiscal consolidation, or in a more favourable economic environment with substantial economic growth, increases in real disposable incomes were larger at the bottom of the distribution and decreases of disposable incomes – in the fiscal consolidation period of the nineties - were less pronounced at the bottom than further up the income distribution. The fiscal consolidation in the nineties was more targeted to higher incomes and the poor were hit relatively less. In the 2001-2007 period, all income deciles gained from the large personal income tax reform. Increases in unemployment benefits and social assistance especially benefited the lower deciles. From 2007 to 2012 disposable incomes of lower deciles grew relatively stronger thanks to the welfare adaptations of public pensions.

Second, the change of definition of what constitutes the 'unchanged (or default) policy' is of crucial importance for the presentation, and hence assessment, of policy orientation. When one considers the safeguarding of purchasing power as a necessary, but not sufficient condition of default policy making in the tax benefit sphere, but also views the sharing of increasing prosperity between the working and non-working population as an essential ingredient of the social contract, the same counterfactuals are interpreted very differently. Evaluated against this other benchmark, the fiscal consolidation period of the nineties stands out as a period in which replacement incomes at the bottom of the income distribution lagged behind the evolution of labour market incomes. At the same time, labour market incomes were also seriously hit by the non-indexation of PIT-brackets, the crisis-tax and higher social security contributions. Both phenomena might explain the turn to more generous policies in the following two periods.

Third, as we wrote in the introduction, this paper does not describe whether inequality in Belgium *actually* increased or decreased in the period 1992-2012. But, our results do show that *if* empirical evidence would pop up that in line with findings in many other OECD-countries, inequality has also increased in Belgium, then this was probably not due to tax benefit changes.

Fourth, we find that some specific policies have improved work incentives for people at the bottom of the distribution, mainly due to the introduction of the social *work bonus*. This positive effect was partially crowded out by higher out-of-work benefits, the most important being unemployment benefits. The tapering away of the targeted work bonus increased marginal effective tax rates for the lowest deciles. Yet, the role of the intensive marginal tax rates at these wage levels should not be overrated. Anyhow, work incentives in general have mainly been negatively influenced by the increases in taxes and social insurance contributions in the nineties.

Fifth, neither budgetary consolidation nor budgetary expansion comes cheaply. A hard balance must be struck between safeguarding sound public finances on one hand and redistribution and work incentives on the other. The budgetary consolidation in the nineties improved the deficit – structurally – by 4.5 billion euros, but it also left households financially less well off. The tax cuts and expenditure increases between 2001 and 2012 led to a structural increase of the deficit of around 8 billion euros. Once more, we stress that these numbers only tell us what happened to budgetary aggregates of the simulated tax-benefit policies, under the strict assumption of a static population and economy. Yet, they do clearly indicate what the budgetary implications of choices made at the time by these several administrations were.

Finally, politics do matter. Not only have macro-economic conditions shaped policies and impacted household incomes, but ideologies clearly did so too. Shifting political alliances have generated important changes in policy. Each governmental administration has left its mark on the design of policies and the choice of instruments. Building an understanding of how past policies and instruments affected redistribution, work incentives and public finances may help us in designing better and more adequate policies in the future. It also raises the question of how current administrations' policies and policy proposals would compare in a similar (ex ante) exercise.

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8. APPENDIX

8.1 Appendix A – Table 9: Welfare adaptation of employee pensions

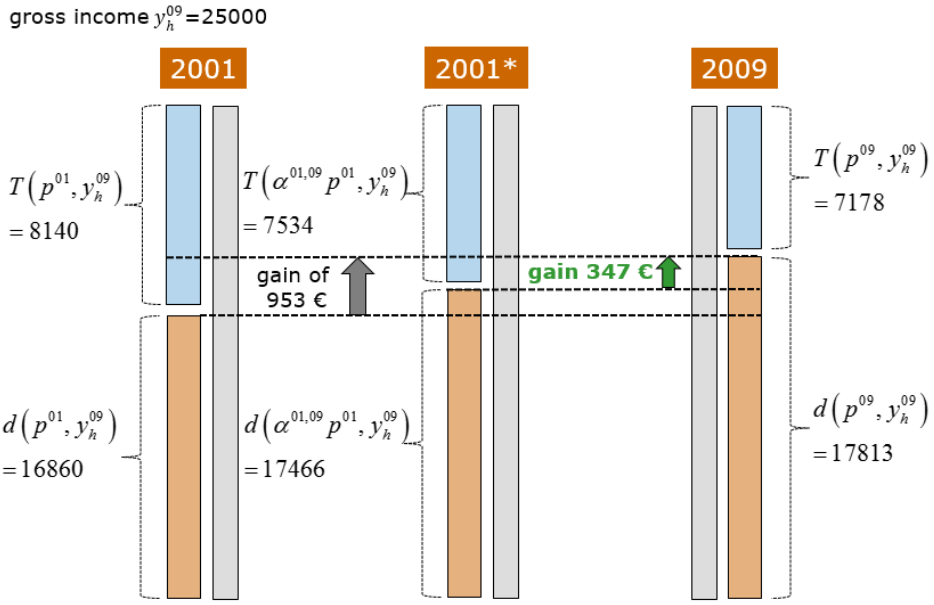
Date	Year of retirement	Men	Women
1 Jan 2002	… - 1992	1.01	1.01
1 Jan 2003	… - 1992	1.01	1.01
	1993 - 1995	1.02	1.02
1 Apr 2004	1996	1.02	1.02
1 Sep 2005	1997	1.02	1.02
1 Sep 2006	1998 - 1999	1.02	1.02
1 Sep 2007	… - 1987	1.02	1.02
	2000 – 2001	1.02	1.02
1 Sep 2008	1988 - 2003	1.02	1.02
1 Jun 2009	… - 1976	1.02	1.02
	1977 - 1993	/	1.02
	1994 – 2008	/	1.015
1 Sep 2009	2004	1.02	1.02
1 Sep 2010	2005	1.02	1.02
1 Sep 2011	2006	1.02	1.02
	…- 1996	1.0225	1.0225
1 Nov 2011	1996 – 2010	1.0125	1.0125
1 Sep 2012	2007	1.02	1.02

Source: FPS Social Affairs

8.2 Appendix B – Role of the uprating factor

Consider a person with a gross income, y_h^{09}, of 25 000 euro p.a. and, for the sake of simplicity, we assume a simplified tax system discarding the social insurance contributions. In 2009, the person then would have paid around $T(p^{09}, y^{09}, z_h^{09}) = 7{,}178$ euros in personal income tax in 2009, and disposable income $d(p^{09}, y^{09}, z_h^{09})$ is the difference between gross income $y_h^{09} - T(p^{09}, y^{09}, z_h^{09})$. Applying the 2001 system to her/his income would mean, however, that (s)he would have to pay $T(p^{01}, y_h^{09}, z_h^{09}) = 8{,}140$ euros in taxes, while a considerable share of this increase is due to the tax brackets that have been kept constant in nominal terms (see the 2001 system in Figure 13).

FIGURE 13: CONSTRUCTING COUNTERFACTUAL INCOMES – AN EXAMPLE



Note: PIT 2001 and 2009 are the actual 2001 and 2009 personal income tax systems; PIT 2001* is the counterfactual 2001 tax system.

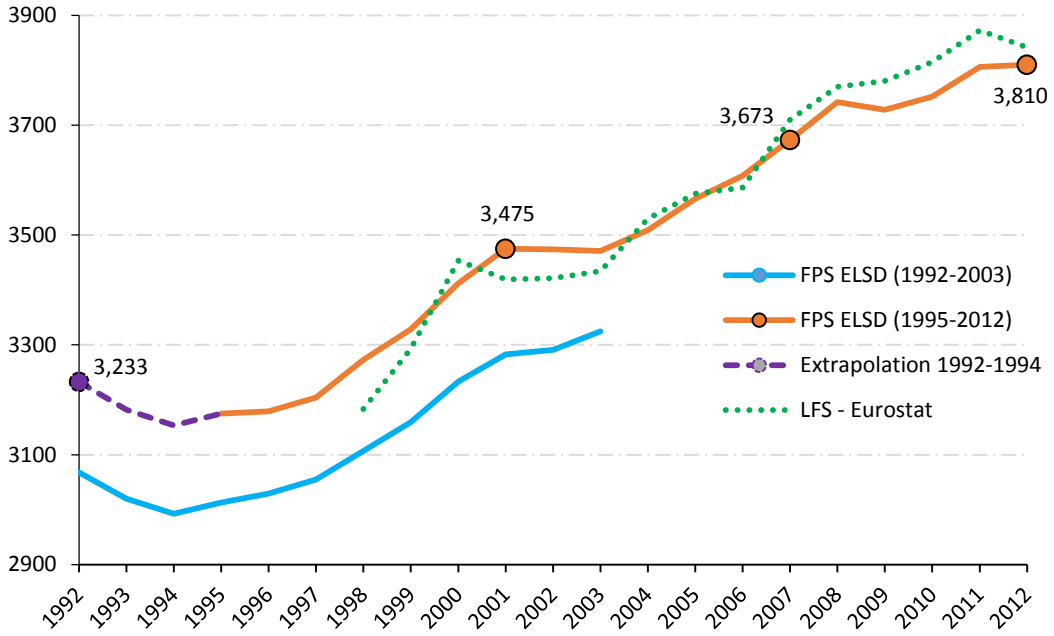
In this paper we adjust the nominal tax brackets to take into account rising consumer prices. We therefore multiply the 2001 parameters, in this example the tax brackets, by the uprating factor for year 2001, $\alpha^{01,09} = 1.195$, i.e. one plus the growth in prices between 2001 and 2009. Recalculating disposable income with uprated parameters, $d(\alpha^{01,09} p^{01}, y_h^{09}, z_h^{09})$, we find that the person's net income of taxes would be 17 466 euros under the 2001 tax system, which is almost 600 euros more than in the case where we do not account for rising prices.

8.3 Appendix C – Empirical average wage growth

Below we explain how we constructed the measure for average wage growth and how this relates to other measures. Unfortunately there is no readily available series of average wages for the entire period 1992-2012. We therefore construct a new series for wages before taxes and social insurance contributions, but after withholding employer contributions. First we determine the number of employees, using data provided by the Federal Public Service

Employment, Labour and Social Dialogue (FPS ELSD) and depicted in Figure 14 below. The FPS provides one series that runs until 2003, and another one that covers 1995-2012. We use the older series to extrapolate the number of employees for the years 1992, 1993 and 1994, to complete the more recent series. In green (dotted line) we show the results of the Labour Force Survey provided by EUROSTAT, which provides figures for the period 1998-2012. Based on the composite series we observe that the number of employees declined over the first two years from 3.23 million to 3.15 million, after which it grew on average by 1.1% each year, reaching 3.48 million in 2001, 3.67 million in 2007 and 3.81 million in 2012.

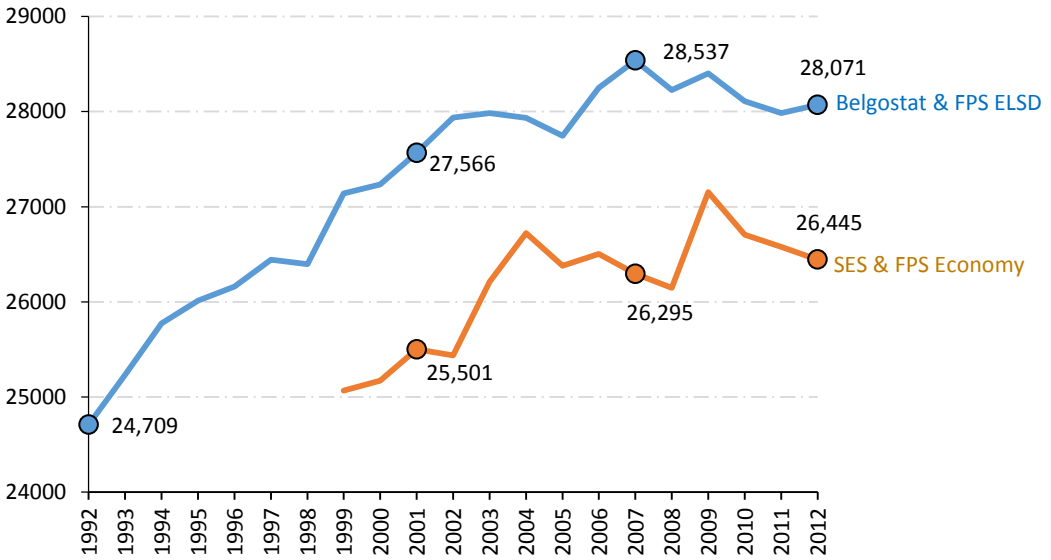
FIGURE 14: NUMBER OF EMPLOYEES (X 1000)



Source: Federal Public Service Employment, Labour and Social Dialogue; BELGOSTAT (National Bank of Belgium); Labour Force Survey (EUROSTAT)

We then compute the average wage for each year of the analysis using the national accounts, in turn based on the data provided by the FPS ELSD, subtracting the employer contributions from the total labour cost, and dividing this by the total number of employees. The resulting average gross wage follows broadly the same trend as the pattern in average wages reported by the Socio-Economic Survey (SES) of the FPS Economy for the period 1999-2012. Wages computed using the national accounts and those reported in the SES differ on three accounts: (1) wage levels are higher according to the national accounts, (2) the wage evolution is more volatile in the SES, and (3) according to the SES wages increased slightly in the last period, whereas according to the national accounts wages decreased somewhat. Since the figures of the national accounts include all employee incomes, while the SES does not include employees from very small enterprises, and since the national accounts covers a longer time period we opt for this series and not the one from the SES.

FIGURE 15: AVERAGE GROSS LABOUR INCOME EMPLOYEES (1999 PRICES)



Source: Federal Public Service Employment, Labour and Social Dialogue; BELGOSTAT (National Bank of Belgium); Socio-Economic Survey (FPS Economy)

8.4 Appendix D – Calculating PTR's & wage imputation

In order to compute the participation tax rates we need a person's in-labour and out-of-labour income. Work incentives at the extensive margin are of interest to the entire population available for the labour market, especially for those people who are without a job. Yet in the SILC data we only observe the wages for people effectively in work during the reference period. Therefore, following Adam & Browne (2010), we impute (potential) wages for those individuals who are not working.

First we estimate a simple log OLS[20] hourly wage equation for employees aged 18 to 59, earning more than 6 euros an hour[21], who do not have income from self-employment, and who have been in work during the entire reference year. We regress the log of hourly wages on region, gender, potential experience, and the level of education. Unlike Adam & Browne (2010) we do not differentiate between individuals that work a different number of hours. In Appendix A – Table 9 we present the regression results. The expected hourly wage for an uneducated Flemish woman with no work experience is 9.6 euros ($=e^{2.6}$). Men are expected to earn 19.8% more than women, and every year of potential work experience adds another 1.1% to the expected hourly wage. The dummies for the educational degree show that students attaining a high

[20] Although a Heckman procedure would be better to overcome the well-known selection bias, we lack good variables that on one hand predict the (non-)selection and on the other hand have no direct effect on hourly wages. We do observe lower predicted wages for the out-of-sample prediction because of a higher incidence of lowly educated, low-skilled female workers in the out-of-labour population.

[21] The limit of 6 euros per hour is set to eliminate hourly wages that lower than the legal minimum.

school degree may expect to earn between 9.2% and 26.2% more than someone without a high school degree. People with a lower tertiary degree may expect 43.4% more, and those with a higher tertiary degree 59.9% more. People with such a degree also seem to have an extra dividend from becoming more experienced and earn on average 0.7% more per year of experience.

TABLE 9: REGRESSION RESULTS FOR LOG (HOURLY WAGE)

Constant	2.259***	N=4330
	(0.041)	
Wallonia	0.028**	F = 196.74***
	(0.014)	
Brussels	0.012	Adjusted R^2=0.29
	(0.021)	
Gender (male)	0.198***	
	(0.012)	
Potential experience	0.011***	
	(0.001)	
Lower secondary education	0.092***	
	(0.033)	
Higher secondary education	0.262***	
	(0.032)	
Lower tertiary education	0.434***	
	(0.048)	
Higher tertiary education	0.599***	
	(0.044)	
Higher tertiary*potential experience	0.007***	
	(0.001)	

Source: SILC 2010; regression analysis using Stata 13

Secondly, we predict hourly wages for non-workers using the coefficients from the regression in the first step and adding error terms drawn from a normal distribution with zero mean and the estimated variance in observed wages. In a third step we keep observed hourly wages, and replace the missing values with imputed wages. We also replace observed wages with imputed wages for individuals who earn less than 6 euros per hour, who have income from self-employment, or who have experienced spells of unemployment. We use the newly created variable of 'potential' wage to construct new wage deciles. For the marginal tax rates, we only provide averages per decile of the in-work individuals. We do not calculate marginal tax rates for imputed wages.

As out-of-labour income we use the unemployment benefit. We simulate this benefit for each person given his/her earnings and assuming (s)he is actually entitled to receiving the unemployment benefit when unemployed. For the computation of the PTR we account for the status of the person: whether (s)he is single, head of household, or cohabitant. We do not differentiate for the duration of the unemployment spell. Instead we compute a simple average for respectively the replacement rates, the minimum and maximum benefit that apply for each

category. Increasing or decreasing the degressivity through time will be picked up by this average. We do not account for seniority supplements in the simulation of out-of-work income.