KU LEUVEN

DEPARTMENT OF ECONOMICS

Which way the pendulum swings?

Equity and efficiency of 26 years of tax-benefit reforms in Belgium

André DECOSTER, Sergio PERELMAN, Dieter VANDELANNOOTE, Toon VANHEUKELOM and Gerlinde VERBIST

FACULTY OF ECONOMICS AND BUSINESS

DISCUSSION PAPER SERIES DPS18.16

DECEMBER 2018

Which way the pendulum swings?

Equity and efficiency of 26 years of tax-benefit reforms in Belgium

André Decoster* Sergio Perelman† Dieter Vandelannoote ‡§
Toon Vanheukelom* Gerlinde Verbist§

December 10, 2018

Abstract

Belgium has seen major changes in its tax-benefit system over the past twenty-six years. These changes have, to a large extent, co-determined the evolution of disposable incomes of Belgian households on the one hand, and work incentives on the other. In this paper we assess changes in tax-benefit policies over the full course of 1992-2018 along three dimensions: equity, efficiency and budgetary impact. We construct counterfactual distributions of disposable incomes under alternative tax benefit systems by means of the arithmetic microsimulation model EUROMOD. We summarize distributional effects of changes in the tax benefit system by measuring the impact on inequality of pre tax and transfer income, and the impact on work incentives by aggregating the marginal tax rates at the intensive and extensive margin into the marginal cost of public funds. We find that most changes in the tax-benefit system have been pro-poor and that the redistributive power has -depending on the chosen benchmark- either been increased, or remained stable. Two reductions of personal income taxes eroded the redistributive power of the tax benefit system. Work incentives deteriorated under the tax hikes of the fiscal consolidation period in the nineties. The improvement of work incentives was considerable thanks to the introduction of an earned income tax credit, and the lowering of personal income taxes and social security contributions, but came at a large budgetary cost. Finally, the size of some of the effects crucially depends on the choice of the 'no policy change' counterfactual: either indexation with inflation or indexation with nominal wage growth.

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

JEL codes: H20; H21; J20

*Department of Economics, KU Leuven

†CREPP, HEC-Ecole de Gestion, Université de Liège

‡Federal Planning Bureau, Brussels

§Centre for Social Policy, University of Antwerp

1 Introduction

Inequality has regained centre stage of the public debate worldwide (see Wilkinson and Pickett 2010, Deaton 2013, Piketty 2014, Atkinson 2015, and OECD 2008, 2011, 2015, among many others). Inevitably, this renewed attention to increased inequality in the public sphere also raises the question as to what extent the government role, exerted through the redistributive tax-transfer system, has been co-responsible for this evolution. This paper contributes to this understanding by singling out the effect of one factor, the tax-benefit system, in one country, Belgium, over a well-defined time period, 1992-2018.

According to the OECD (2015, figure 1.3), Belgium, together with the Netherlands, France, Greece and Turkey, is one of the few countries where income inequality did not rise substantially in the last three decades. They report only a minor change in the Belgian Gini from 0.257 in 1983 to 0.264 in 2011. Also Van Rie and Marx (2014) conclude that Belgian income inequality has remained remarkably stable over the past thirty years. [1] This stability is noteworthy, given the political and economic shifts of the past decades and the fact that Belgium ranks among the most globalised countries in the world. It also does not square with the perception of the public at large, of journalists and opinion makers, and of many politicians who all seem to take for granted that also in Belgium, like in many other Western countries, income inequality is on the rise.[2]

The reasons for the divergence of the public perception from the results cited above can be manifold. Firstly, in the public debate, statements about inequality are not always clearly distinguished from statements about poverty. Secondly, different studies use different measures of inequality — Gini, Theil, top income shares — the different properties of which do not always trickle down into popularisations of results of inequality studies. Finally, the concept, the dispersion of which is analysed, also plays a crucial role. There is no prior reason why wage inequality, measured before taxes and transfers at the individual level, should evolve in line with inequality in disposable income measured at the level of the sociological household. For the latter, all income sources, also non-labour ones, are aggregated and taxes and transfers have played their role. The results cited above are all based on disposable income reported by respondents in surveys, such as SILC since 2004 (the European wide Survey on Income and Living Conditions). Since, for Belgium much less is known about the evolution of pre-tax income, and since it is the tax benefit system which links market incomes and disposable incomes, at least some additional - be it still incomplete - insight in the stability of disposable income inequality can be gained by isolating the effect of changes in the tax benefit structure as such.[3]

[1] Van Rie and Marx belong to the Herman Deleeck Centre for Social Policy (CSB) at the University of Antwerp, which has a long tradition of charting Belgian income inequality. According to the latest estimates from CSB based on survey data, Belgian income inequality was rather stable between 1985 and the late 2000s (Horemans et al. 2011, Table 2 on p.5, and Van Rie and Marx 2014). However, some degree of caution is needed, since the estimates are based on three different surveys, which use different income concepts and survey methodologies. If we restrict the evolution to subperiods covered by one and the same survey methodology, inequality of equivalised disposable income was either declining (from 0.281 in 1993 to 0.259 in 2000), or stable (from 0.255 in 2004 to 0.258 in 2007). Only between 1985 and 1997 was there a rise to be noted, with a rise in the Gini coefficient from 0.220 in 1985 to 0.233 in 1997.

[2] Illustrative of this is the series published in the newspaper De Standaard in 2014, under the heading 'De kloof' ('The Gap'). The conclusions from the newspaper were outspoken: "as in so many other countries, inequality in Belgium is also on the rise".

[3] Belgium is notoriously absent from the World Wealth and Income Database (http://wid.world/), the rapidly expanding international source of comparable data for research on income and wealth inequality. Decoster et al. (2017) report on a first attempt to correct and complete published data on net taxable incomes for the period 1990-2013 to comply with the standards set by the WID database. Their results show that inferring evolutions of the income share of the top 10% or 1% from published tables of net taxable income is highly misleading. After correction, there is little evidence that top income shares in Belgium have

To single out the effect of policy changes, we use the decomposition technique of Bargain and Callan (2010). The method boils down to calculations of counterfactual income distributions, in which different explanatory factors such as demographic structure, market incomes and tax benefit policies, are changed in sequence. Microsimulation models are pre-eminent tools to produce these counterfactuals, since they essentially apply a tax benefit structure on an underlying dataset with detailed information on pre-tax incomes. By varying the tax-benefit system, the underlying dataset on which it is applied, or the market incomes by using a behavioural model inside the microsimulation model, different 'what if' questions can be answered.[4] E.g. what would the income distribution have looked like in 2018, if, given unchanged characteristics of e.g. the 2015-population (including their market incomes of 2015), the tax-benefit system of, say, 1992 would have been applied. Because we do not (yet) dispose of comparable datasets covering the whole period of interest, in this paper we only vary the tax benefit systems over the period 1992-2018. We apply the different tax benefit systems on one dataset, i.e. EU-SILC 2015, containing gross incomes and household information of 2014-15. Since we simulate all counterfactuals on the same dataset, this paper definitely does not describe, let alone explain, the evolution of inequality in disposable incomes in Belgium during the period 1992-2018. We are unable to quantify the effect of changes in the socio-demographic structure of the population or of changes that drive the level and composition of market gross incomes, as explanatory factors for eventual changes in the income distribution since 1992.[5] Yet, if properly interpreted, the results in this paper give a clear picture of the policy orientations chosen during the time period 1992-2018. We look at the overall time period and at five different sub-periods, grouped by federal legislature[6]: (1) 1992-1999, two administrations of Prime Minister (PM) Dehaene I and II, broadly corresponding to an era of fiscal consolidation; (2) 1999-2007, under PM Verhofstadt I and II, corresponds to a period of economic upswing; (3) 2007-2011, with the governments of PM's Verhofstadt III, Van Rompuy, Leterme, are the years of the financial crisis; (4) 2011-2014 covers the government of PM Di Rupo; and finally (5) 2014-2018 is the most recent period of the government of PM Michel.

To simulate the effects of current and past tax-benefit policies we make use of the microsimulation model EUROMOD[7], extended with a newly developed Indirect Tax Tool to simulate changes in VAT and excises (see De Agostini et al., 2017). EUROMOD is an arithmetic model in that its standard version does not incorporate behavioural reactions to a change in the tax benefit system. The model produces so-called morning-after effects of the policy change on disposable income for all individuals and households in the dataset. These impact-effects are perfectly suited for a rich distributional analysis of policy shifts, and for

increased during the last 26 years. This is confirmed by a similar analysis in Valenduc (2017).

[4]For recent applications of this method to seven European countries see Hills et al. (2014) and, for the UK, Clark and Leicester (2004), Adam and Browne (2010) and Bargain (2012b). For the use of a labour supply model to further decompose the change in market incomes, see Bargain (2012a) and Herault and Azpitarte (2016).

[5]Although the relative importance of the policy-effect, as compared to the other terms of the decomposition, is evidently determined by the specific empirical case, we feel corroborated about the relevance of our partial analysis by the findings of Bargain (2012a,b) and Herault and Azpitarte (2016). In Bargain (2012a,b), tax benefit policies under the first Labour government almost completely counterbalanced the marked increase in market income inequality during that period. In Herault and Azpitarte (2016) changes in the tax-transfer system account for approximately half of the observed increases in disposable incomes in Australia 1999-2008.

[6]The tax-benefit changes by lower levels of government are included in this exercise. They are much less significant than the federal policies.

[7]The European EUROMOD microsimulation model is developed and 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 e.g. Sutherland and Figari (2013) and Lietz and Mantovani (2006), or http://www.iser.essex.ac.uk/euromod/.

a first estimate of the budgetary impact. Moreover, the lack of genuine behavioural reactions in EUROMOD (such as labour supply effects), does not imply a complete absence of indicators about potential behavioural effects. Indeed, a standard EUROMOD run does also produce marginal effective tax rates, both at the intensive and the extensive margin, for a given policy system. Changes in these marginal tax rates can be considered to be a shorthand - though evidently incomplete - description of changes in the monetary incentives for labour market participation and number of hours worked. In the absence of a behavioural model, we used these marginal effective tax rates to complement the description of policy shifts over the period 1992-2018 in terms of distributional and budgetary effects, with what we call an 'efficiency' indicator.

With unchanged market incomes, budgetary effects are obtained by simply adding-up the effect on disposable incomes for all households. Also aggregate indicators for the distributional effect of policy changes are easily obtained by deploying the standard and well established apparatus of measurement of inequality and (re)distribution (see Lambert, 2001 for an overview). To summarize the change in monetary incentives, we rely on the concept of 'Marginal Cost of Public Funds' (MCF). This concept has a long history in applied welfare economics, reviewed in extenso in Dahlby (2008), and essentially aims to measure the welfare cost of a distortionary tax system. In this paper, this is not the prime use of this concept. However, since the MCF has as one of its essential ingredients the marginal effective tax rates, an intelligible way to 'summarize' or 'aggregate' changes in monetary incentives for thousands of individuals is indeed, among probably other possibilities, the MCF.

The combination of indicators of distributional effects of policy choices with this indicator of changes in monetary incentives will allow us to frame policy choices made over the period 1992-2008 into the well-known axes of both equity and efficiency. The latter has to be understood as a mere summary measure of effective monetary incentives for participating in the labour market. Yet, two caveats are in order with this representation of changes in policy orientation. First, the so-called 'equity-efficiency trade-off' in this paper only serves a descriptive and presentational objective. It is *not* the articulation of a model-wise trade-off produced by a comprehensive behavioural model of the economy with heterogeneous agents, interacting in a general equilibrium setting.[8] Second, the empirical results will demonstrate that the policy changes were far from budgetary neutral. Our third descriptive indicator of the policy choices in the different periods will of course fully reflect this. But the absence of budgetary neutrality impedes an outright and conclusive welfare analysis of the policy changes made. But we are able to detect whether, over the course of these 26 years, significant shifts in policy orientation have occurred and whether the relative importance of the three broad objectives has changed.

Section 2 of the paper 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 3 we apply these two measures to give a description of the Belgian tax system in the benchmark year 2018. We trace the policy choices over the period 1992-2018 in section 4. Section 5 concludes.

2 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 and Callan (2010). It boils down to simulating disposable incomes using fixed household characteristics

[8]Moreover, the distributive effects will be measured as outcomes of the tax benefit system as a whole, whereas the marginal cost of public funds, on the other hand, describes the tax-benefit system in terms of different possible marginal changes in the system.

and market incomes, as observed in EU-SILC 2015, while applying the tax-benefit rules of 1992, 1999, 2007, 2011, 2014 and 2018. We explain the counterfactual methodology in section 2.1 and the data used in section 2.2. Section 2.3 briefly describes the output measures for the redistributive effect and the work incentives implied by the different tax-benefit systems.

2.1 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 pre-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 $x_h^{k,j}$:

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

where superscript k refers to the year in which incomes and characteristics are observed, and the superscript j to the policy year. In our application, the output scalar is disposable income (both at the individual and at the household level). Vector $\mathbf{p}^j$ denotes all nominal parameters of the tax-benefit system, e.g. thresholds of tax brackets, amounts of allowances, etc. Structural characteristics of the tax-benefit systems, other than nominal amounts, are captured by the function $d^j(.)$.

Equation (1) shows that a change in disposable income between period 0 and 1 can be the result of many different changes: a change in the tax-benefit system (either through changes in the parameters $\mathbf{p}^j$ or through a change in the function d^j), changes in market incomes between the two periods, or changes in socio-demographic characteristics of the underlying population. Using the conceptual framework put forward by Bargain and Callan (2010), we decompose a change in disposable income between period 0 and period 1, i.e. from $x_h^{0,0}$ to $x_h^{1,1}$, as follows:

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

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

The first term at the right-hand side of equation (2) isolates the effect of changes in the tax-benefit system by keeping pre-tax and -transfer incomes, $\mathbf{y}_h^1$, and demographics, $\mathbf{z}_h^1$, constant. The superscripts of $\mathbf{y}_h^1$ and $\mathbf{z}_h^1$ reveal that the policy effect of a change from $d^0(.)$ to $d^1(.)$ is calculated on the incomes and characteristics observed in period 1. By including the uprating factor $\alpha^{0,1}$ in this first term, we allow to pin-down the underlying default of "no policy change" as one out of two options, reflecting an important element in the public debate on tax-transfers systems: how should the tax and transfer system be connected with the evolution of market incomes? In the first option, the design of the tax-benefit system only safeguards against erosion of benefits through inflation and against an increase of tax liabilities when real taxable income does not increase. This is guaranteed by defining the default policy as an indexation of all nominal parameters with inflation. Hereafter we call

this 'price uprating'. In equation (2), this is implemented by choosing a price index as the uprating factor $\alpha^{0,1}$. The second possibility is an implicit social contract concerning the tax and benefit system in which one wants benefits to keep pace with increasing market incomes, and in which even increasing real taxable incomes would not lead to increasing average tax rates. In equation (2), this is implemented by choosing an index for nominal wage growth as the uprating factor $\alpha^{0,1}$. Below, we call this 'wage uprating'.

In case actual policies deviate from the chosen default indexation, this shows up as changes in the disposable income in the simulated counterfactuals. Assume, as an example, that we observe actual positive real wage growth during the period of analysis, and that policies consisted of an indexation of tax-benefit parameters with inflation only. In the case we have defined the 'default' as a tax-benefit system which should keep pace with nominal wage growth and therefore use a wage index as the uprating factor $\alpha^{0,1}$, the actual policy will show up as a decrease of simulated counterfactual disposable incomes. This decrease then reveals that, if one adheres to 'wage uprating' as a benchmark, real disposable incomes lagged behind. If we would have used 'price uprating' as the benchmark, we would have found no decrease in real disposable incomes due to policies. In that case, neither the fact that benefits lagged behind with respect to wages will be revealed as a decrease in benefits, nor will the increasing average tax rate of increasing taxable incomes show up in a decrease of real after tax income. 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.[9]

The second term of equation (2) captures the effect of changes in real market earnings ($\mathbf{y}_h^0$ to $\mathbf{y}_h^1$) and of changes in socio-demographic characteristics ($\mathbf{z}_h^0$ to $\mathbf{z}_h^1$). 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 $\alpha^{0,1}$, a non zero third term captures 'real' fiscal drag.

We do not dispose of comparable datasets covering the whole period of interest. Therefore, in this paper we only calculate the first term of equation (2) using a single dataset (EU-SILC 2015) containing gross incomes and household information of 2014-15. 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 begin and end point of the period of analysis. Hence, we cannot assess the relative importance of this single factor, as compared to the other two factors. 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-benefit system on the disposable incomes of all households.

2.2 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. We rely on EU-SILC 2015 data (with 2014 incomes), containing extensive information on demographic and socio-economic characteristics as well the reported incomes of 6,006 households (14,145 individuals). The dataset is validated for the microsimulation model EUROMOD (Hufkens et al., 2017).

The EU-SILC dataset lacks retrospective career information, which makes it impossible

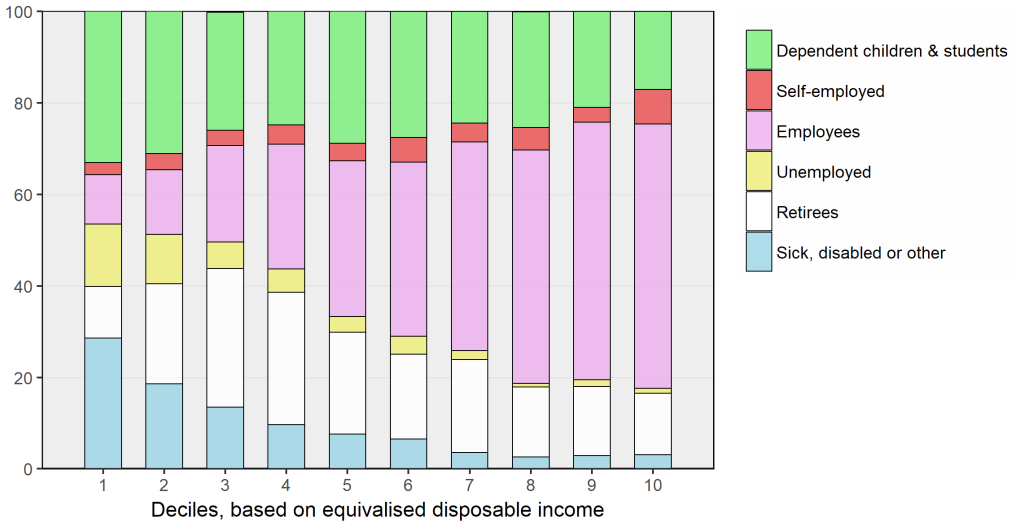
[9] Sutherland et al. (2008) provide an extensive analysis of this issue in policy evaluations.

to simulate unemployment and pension benefits, and explains why these benefits are not parametrised in EUROMOD. However, as a substitute we do mimic as closely as possible the effects of actual policy changes for pensions and unemployment benefits in the 1992-2018 period. Changes in the pension system were predominantly welfare adaptations. For pensioners observed as a pension recipient in 2014, we obtain pension benefits in the counterfactual situations in 1992, 1999, 2007, 2011, and 2018 by recalculating their pension as if welfare adaptations would not have taken place. We do not take into account the gradual increase in the minimum pension age for women from 60 in 1996 to 65 in 2009, nor changes in eligibility criteria. For unemployment benefits we follow a similar procedure: we derive a nominal growth index from the changes in the average change of the minimum and maximum amounts. Again this will not pick up changes in the eligibility criteria for receiving an unemployment benefit.

For social assistance benefits, we take into account a correction factor for non-take up of 55% (Bouckaert and Schokkaert, 2011), and assume this factor unchanged over the period of analysis. 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.

Figure 1 allows a brief glance to the composition of our sample in EU-SILC 2015. We show the variation in socio-economic composition of the Belgian population across the distribution of deciles based on equivalised disposable household income in 2014. Disposable income is the one simulated by EUROMOD under the 2014 tax benefit system. We use the OECD scale to correct for household size, and each decile consists of 10% of the population of individuals, ranked on the basis of the equivalised disposable income of the household to which the individual belongs.[10]

Figure 1: Socio-economic status of all individuals in Belgium, 2015 (% of population)



Source: EU-SILC 2015.

Figure 1 confirms the importance of employment status for determining the position in the distribution. Pensioners are mainly found in the bottom half of the income distribution, but the income gradient is still more outspoken for unemployed and sick or disabled persons, who are predominantly present in the first income decile.

[10]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.

We do not 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. Table 1 shows the size of the resulting subsample as compared to the full population. We calculate work incentives at the individual level and will match them with labour supply elasticities to calculate the MCF. Since the labour supply elasticities vary with the level of gross wages, we construct deciles for this subsample on the basis of gross hourly wages. For those available for the labour market, but currently not working, we do not observe a gross hourly wage. In that case we use imputed values, and we refer to the appendix for details on the imputation method.

Table 1: Data selection for redistributive effect and estimation of work incentives

	Number of observations	Population
Individuals	14,145	11,028,726
minus people younger than 18 older than 59, sick and disabled & early retirees		
Labour force population	6,688	5,389,893

2.3 Output measures

Besides the budgetary impact of policy changes, we compare the policy stance with respect to redistribution and monetary work incentives. We chose one general measure for the redistributive effect of the tax-benefit system, the Reynolds-Smolensky index (Reynolds and Smolensky, 1977) and one measure which summarizes work incentives, the marginal cost of public funds (MCF). In the next two subsections, we explain how these two measures are calculated.

2.3.1 Redistributive effect

To show the distributional impact of policy changes, we first calculate changes in purchasing power at the individual level, as percentage changes of equivalised disposable income due to the policy change. Disposable income is 'original' household income minus social insurance contributions and personal income taxes, plus social benefits. Original household income is defined here as the total of earnings and incomes from capital. Social benefits consist of pensions, unemployment benefits, social assistance, family allowances and sickness and disability benefits. As mentioned above, we used the OECD equivalence scale to correct for household size.

We then present this distributional impact in two ways. First we show the distributional effect of changes in the tax benefit system as changes in purchasing power across the decile distribution of equivalised disposable income for the whole population. Next, we summarize the overall redistributive effect of the tax-benefit system by means of the Reynolds-Smolensky index, Π^{RS}. which is the change in the Gini when moving from income before taxes and benefits to disposable income. This index thus measures the impact on inequality due to the working of the tax-benefit system.[11]

[11] By using the Gini of post tax income, which orders individuals on the basis of post-tax income, we also incorporate the eventual re-ranking effect. An alternative would have been to keep the ranking of individuals fixed on their pre-tax income rank, and use the concentration index of post-tax income instead of the Gini-coefficient. The difference between the Gini of pre-tax income and the concentration coefficient of post-tax income is sometimes called the 'vertical equity' effect, to distinguish it form the closely related 'redistributive effect'. The two are related by $\Pi^{RS} = \text{VE} - \text{R}$, where the re-ranking component R equals the difference

2.3.2 Work incentives

Labour market research of the last two decades has highlighted the importance of the extensive margin of behaviour (to work or not), in addition to the intensive margin (how much to work). We therefore first explain how we compute the marginal tax rates at both the extensive and the intensive margin, referred to respectively as the participation tax rate τ_i and the the marginal effective tax rate m_i. We calculate these effective tax rates at the individual level for the subpopulation of working age persons available for the work force. Finally, we turn to the definition of the marginal cost of public funds as a way to aggregate work incentives for each individual in the population 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. It answers the question 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. Formally, let taxes and transfers be a function $T(w_i h)$ of gross labour income $y_i = w_i h_i$, earned from working h_i hours at wage rate w_i.[12] The budget constraint relating disposable income c_i to gross earnings y_i, the tax liability $T(w_i h)$ and non-labour income I_i reads as:

$$c_i = c\left(y_i\right) = w_i h_i - T\left(w_i h_i\right) + I_i. \tag{3}$$

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

$$\tau_i = \frac{T(w_i h_i) - T(0)}{w_i h_i}, \tag{4}$$

or alternatively, using (3):

$$\tau_i = 1 - \frac{c_i^{IW} - c_i^{OW}}{w_i h}, \tag{5}$$

---

between the post-tax Gini and the concentration coefficient of post tax income. The vertical equity effect can be decomposed into the effect from the average tax rate t and the effect from the disproportionality of tax and benefit instruments. The average tax rate is calculated as total net revenues divided by total original income. The disproportionality of net taxes, often abbreviated as the 'progressivity of the system', is measured by the Kakwani-index denoted Π^K, i.e. the difference between the Gini before taxes and transfers and the concentration index of taxes and transfers. This is a measure of how much the system deviates from proportionality: a negative Kakwani indicates that the system is regressive (i.e. pro-rich), while a positive index points to a progressive (i.e. pro-poor) system. The relationship between the vertical equity effect and progressivity is described by $\text{VE} = \left(\frac{t}{1-t}\right)\Pi^K$. In focussing on the combined effect of taxes and benefits, we are constrained to confine the measurement to the redistributive effect since, to quote Lambert (2001, p.274):

> "Since net tax can be negative for some income recipients and positive for others, and may be zero, positive or negative in total, the 'concentration of net tax ' is a problematic concept, and measuring disproportionality in it is so *a fortiori*. However, no conceptual problems exist for measuring the concentration of final income".

[12] For ease of notation, we suppress all factors, other than gross labour income $w_i h$, which co-determine tax liabilities. We also keep non-labour income I_i outside the tax-function, although in practice also I_i will often influence the tax liability. This is for exposition purposes only, since the arithmetic microsimulation model does take into account these interactions

where superscripts IW and OW denote the labour status 'in-work' and 'out-of-work' respectively. Equation (5) shows how the difference in disposable income between 'in-work' and 'out-of-work', as a fraction of gross income from employment $w_i h_i$, determines the participation tax rate. Since we consider different time frames, we take into account the evolution of real wages in the numerator of equation (4) to capture changes in incentives for people out-of-work to take on a job. Although both social assistance and unemployment benefits have been used as out-of-labour income in the literature, we only compute PTRs using unemployment benefits.

Marginal effective tax rates

Marginal effective tax rates (METRs) measure the incidence of the tax-benefit system on a marginal increase in earnings, providing 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). Formally, the marginal effective tax rate can be written as:

$$m_i = \frac{\partial T(w_i h_i)}{\partial (w_i h_i)}, \tag{6}$$

or, approximating the change in the denominator numerically by increasing pre-tax earnings from y_i to $y_i + \Delta y_i$, the METR for an individual i can be rewritten as:

$$m_i = 1 - \frac{c(y_i + \Delta y_i) - c(y_i)}{\Delta y_i}. \tag{7}$$

In practice, we simulated an increase of gross earnings of 5% to calculate the METR's of equation(7).

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 rely on the well-known concept of the marginal cost of public funds (MCF).[13] 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 euro). In this paper, we use the formula for the MCF, introduced by Kleven and Kreiner (2006) who – in the spirit of Saez (2002) - extend standard empirical excess burden formulas with the integration of the extensive margin of labour supply[14]:

$$MCF = \frac{1}{\sum_{g=1}^{G} [1 - \frac{m_g}{1-m_g}(\phi_g \varepsilon_g^c - \theta_g) - \frac{\tau_g}{1-m_g}\eta_g] s_g} \tag{8}$$

in which the marginal tax rates at the intensive and extensive margin, denoted respectively by m_g and τ_g for subgroup g, appear in the denominator. We switched from the individual level i to a grouping in (wage) deciles, denoted by the subscript g, to make the link with the elasticities, which are difficult to conceive at the level of the individual. We calculate the participation tax rate and the marginal effective tax rate at the level of the wage decile as the

[13] See Dahlby (2018) for an overview of the marginal cost of public funds.

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

arithmetic mean of the individual marginal tax rates. Behavioural effects appear as elasticities at the intensive and extensive margins, denoted respectively by ε_i (the earnings elasticity) and η_i (the participation elasticity). In (8), 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:

$$\varepsilon_i = \varepsilon_i^c - \theta_i. \tag{9}$$

We will disregard the income effect (or equivalently, assume $\theta_i = 0$), such that we can use uncompensated elasticities ε_i's in equation (8). The MCF relates to a marginal change in the tax benefit system which generates additional revenue. There are of course numerous possibilities to specify such a marginal change. One additional euro can be collected by e.g. changing the demogrant element of a linear system, by changing one marginal tax rate, or by changing all marginal tax rates of a non-linear system. Parameter ϕ_i in (8) is a measure of the progressivity of the marginal change in the tax system. In this paper we have chosen a one percentage point increase of the social security contribution rate and each of the personal income tax rates. This 'proportional' tax increase implies $\phi_i = 1$. Finally, the expression in square brackets in the denominator of equation (8) is weighted by s_g, which is the share of each decile in the additional revenue generated by the tax increase.

Disregarding the income effect ($\theta_i = 0$), and with this specific choice of a marginal change in the tax system ($\phi_i = 1$), equation (8) for the MCF reduces to:

$$MCF = \frac{1}{\sum_{g=1}^{G} [1 - \frac{m_g}{1-m_g}\varepsilon_g - \frac{\tau_g}{1-m_g}\eta_g]s_g}, \tag{10}$$

Both equation (8) and (10) clearly illustrate that the MCF can be interpreted as a way to aggregate marginal effective and participation tax rates, into one general measure of distortion. The weights to be used are labour supply elasticities at the intensive and extensive margin, and the marginal contributions of the deciles in the additional revenue. For the behavioural elasticities, we use stylised values inspired by Kleven and Kreiner (2006), whereby the elasticity at the intensive margin, ε_i is assumed 0.1, and the elasticity at the extensive margin η_i ranges from 0.4 for the quintile of the lowest wages, 0.3 for the second quintile, 0.2 for the third, 0.1 for the fourth, and 0 for the 20% highest wage earners.

3 Redistribution and incentives in the tax-benefit system of 2018

In this section we describe the counterfactual tax-benefit system of 2018. We limit the exposition to the counterfactual based on the CPI as default uprating. Table 2 shows the budgetary aggregates for each of the policy instruments simulated in this paper. Total simulated government revenue equals 83.4 billion (bn) euros. The biggest revenue source consists of the personal income tax, i.e. 41.1 bn euros. Social insurance contributions paid by employees add another 23.5 bn euros. Finally, private households contributed another 18.9 bn euros to government revenue in value added taxes and excises, grouped here as indirect taxes. Measuring progressivity of a tax instrument as the increase of the shares of total revenue across the income range, personal income taxes come out as the most progressive instrument. As expected indirect taxes are least progressive.[15]

[15]Note again that the pattern of the shares in Table 2 cannot directly be related to a standard measure of progressivity, such as the Kakwani-index, since we use deciles of disposable income here, and not deciles of the taxable base of the tax instrument.

Table 2: Revenue and expenditures (2018, price uprating)

	Shares in row total across equivalent disposable income deciles (%)										All
	1	2	3	4	5	6	7	8	9	10	bn euros
SIC (employee)	0.7	2.1	3.3	5.7	7.6	9.6	11.8	14.1	17.8	27.3	23.5
Personal inc. tax	-0.4	0.2	1.6	3.7	5.4	7.3	10.1	13.7	19.6	38.9	41.1
Indirect taxes	5.5	7.2	8.4	9.0	9.6	10.0	10.9	11.4	12.7	15.3	18.9
Total revenues	1.2	2.3	3.5	5.4	7.0	8.6	10.8	13.3	17.5	30.3	83.4
Pensions	4.9	11.3	15.5	13.5	11.1	9.2	8.7	9.0	8.1	8.6	49.2
Unemploym. benef.	28.4	16.9	8.2	7.4	5.0	5.0	2.9	2.3	4.9	19.1	7.4
Social assistance	53.9	11.8	4.7	7.7	7.1	4.0	0.9	2.6	2.9	4.4	1.2
Family benefits	14.3	12.0	10.8	9.5	11.0	11.0	8.9	8.7	7.8	6.1	6.1
Total expenditures	9.5	12.0	14.0	12.3	10.3	8.8	7.9	8.1	7.6	9.5	63.9

Source: EU-SILC 2015; own calculations using EUROMOD.
Note: The deciles each consist of 10% of individuals, ranked according to equivalised disposable income.

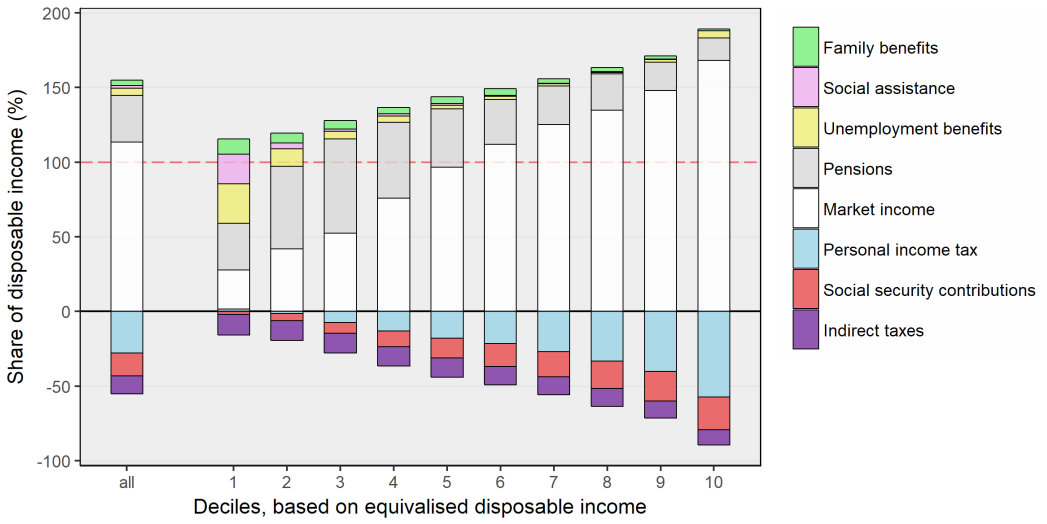
At the expenditure side, simulated cash transfers to households sum up to 63.9 bn euros. Pensions, 49.2 bn euros, are by far the largest category, followed by 7.4 bn euros in unemployment benefits and 6.1 bn euros in family benefits. The simulated budget for social assistance benefits is smaller: 2.9 bn euros. Pensions are most evenly distributed across the deciles of equivalised disposable income. Not surprisingly, expenditures for social assistance are most 'pro-poor', with more than half of the expenditures for this category found in the bottom decile. The universal family benefits are more evenly distributed than unemployment benefits.[16] Adding up revenues and expenditures, the bottom five deciles are, in this static framework, net beneficiaries, whereas the upper five deciles are net contributors to the 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 income distribution.[17] The bars show the relative importance of market earnings and the separate components of the tax-benefit system in total disposable household income. The choice of disposable income as the variable to order households, and not pre-tax income or some kind of taxable base, is motivated by the fact that we will present the distributional effects of changes in the tax benefit system in section 4.2 in terms of disposable income.

[16]The high share of unemployment benefits (19.1%) at the top is the result of the EU-SILC grouping employee's severance payments with social security as unemployment benefits.

[17]We use deciles of the counterfactual distribution in 1992 here, because in the next sections 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.

Figure 2: Income source w.r.t. disposable income (%, 2018, price uprating)



Source: EU-SILC 2015; own calculations using EUROMOD.

The composition of total disposable household income reveals that market income constitutes only 26.1% of disposable income for the lowest income decile, as compared to 168.3% for the highest decile. Pensions are the largest source of income for deciles 2, 3 and 4, and overall represent 31.3% of disposable income. Unemployment benefits and social assistance comprise on average respectively 26.2% and 20.2% of disposable income for the lowest decile. This share gradually decreases when households become richer. Child benefits are also more important at the bottom (10.3%) than at the top (1.2%). The relative role of the different taxes across the distribution is as expected: personal income taxes strongly increase with (disposable) income. Whereas the top decile pays personal income taxes amounting to 57.2% of its disposable income, the bottom decile even receives a refund of up to 1.8% of disposable income.[18] Also social insurance contributions are, to a lesser extent, increasing in terms of disposable income: they amount to on average 2.1% of disposable incomes in the 1st decile, gradually rising to 21.9% of disposable income in the 10th decile. Indirect taxes are somewhat regressive: they account for 13.6% of disposable income for the lowest decile, gradually decreasing in disposable income to 10.3% for households in the top decile.[19] Overall the combined tax benefit system reduces the Gini of original income from 0.4763 to 0.2233, leading to a Reynolds-Smolensky index of redistributive effect of 0.253. We are not so much interested in the magnitude of this level, since it is of course determined by the definition of original income.[20] Our main interest here is in charting the change of this redistributive effect trough

[18] As explained in footnote 11 we will not show indices of progressivity for the net tax system because of conceptual measurement issues. We can of course calculate the Kakwani-index of the personal income tax separately, where households are ordered on their taxable income (instead of on disposable income, or on original income). In that case the Kakwani-index of disproportionality in the 2018 system amounts to 0.2877, and the average PIT-rate to 0.2051. The redistributive effect of PIT is 0.0716, reducing the Gini index of (equivalised) taxable income from 0.3030 to 0.2314.

[19] The Kakwani index of disproportionality, measured with respect to original income amounts to -0.3471 in the 2018 tax benefit system. This outspoken regressivity of indirect taxes, in combination with an average tax rate in 2018 - again expressed in terms of original income - of 0.1008, has an inequality enhancing effect: ceteris paribus, this element of the tax benefit system, increased the Gini from 0.4755 to 0.5152.

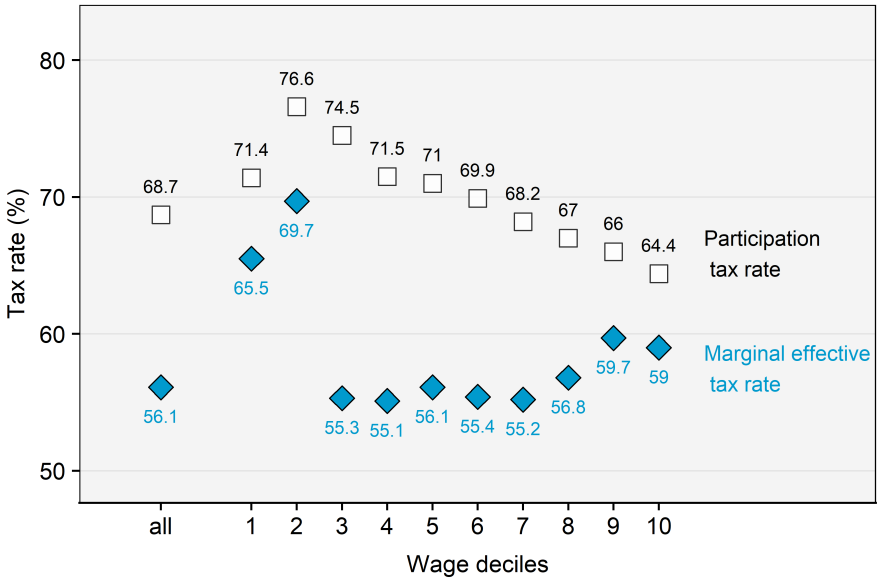
[20] Pensions e.g., which can at least partly be considered to be delayed labour earnings, are not included in original income. However, replacement incomes, such as pensions and unemployment benefits, are included in the taxable base for personal income taxes, which still enhances the conceptual measurement problems

time. What figure 2 - unsurprisingly - reveals, is the fact that the unequal distribution of market income, benefits and taxes will have an important effect on how policy changes affect disposable incomes across the income deciles. A proportional change in personal income taxes will have a larger effect in higher income deciles, whereas this will be less outspoken with changes of social security contributions. Changes in benefits generally have a larger impact for households in lower deciles than for those in higher income deciles.

Figure 3 shows the work incentives in the baseline system of 2018, as measured by the participation tax rate (PTR) and the marginal effective tax rate (METR) for the deciles of the wage distribution, using price uprating.

The average participation tax rate for the 2018 system is 68.7%. It implies that disposable income when employed is -on average- 32.3% higher than disposable income when unemployed. Except for the first two wage deciles, where the PTR is on average 71.4% and 76.6%, the PTRs are decreasing with the wage level, to 64.4% for employees in the top wage decile. At the intensive margin, the marginal effective tax rate for the 2018 system was on average 56.1%. The curve of the METRs is U-shaped, as it is highest for the lowest two deciles (65.5% for the first and 69.7% for the second wage decile). It is significantly lower for deciles 3 to 7 (between 55% to 56%), and increases again to 59.7% and 59.0% for the top two deciles. The high METR for the lowest deciles follows from the tapering away of the earned income tax credit. This so-called 'work bonus' causes employees to experience a decrease in the social insurance contribution reduction when their earnings increase.

Figure 3: Marginal tax rates (2018 system, %, price uprating)



Source: EU-SILC 2015; own calculations using EUROMOD.

4 Evolution of the tax-benefit system since 1992

In this section we discuss the three main output indicators of the counterfactual distributions of disposable income for the years 1992, 1999, 2007, 2011, 2014 and 2018: the impact on government net revenue (section 4.1), the distributional effects (section 4.2) and the effect on the monetary work incentives (section 4.3).

referred to in footnote 11, to assign relative contributions to the different elements of the tax benefit system.

4.1 Revenue effects

Table 3 shows that the policy choices since 1992 triggered important effects on public revenues and expenditures, and that these effects were different in the different subperiods. In the upper panel we show the changes in revenues (taxes and social contributions), benefits, and the resulting simulated net revenue from period to period. In the bottom panel we show the resulting level of taxes, benefits, and net taxes, calculated as a percentage of original income. Note that the changes reported in Table 3 only capture the changes in simulated policies, calculated on a fixed counterfactual socio-economic and demographic situation. Therefore, the numbers of Table 3 are only loosely related to actually reported budgetary figures. Similar to all results following in the next sections, the revenue effects reported here should be strictly interpreted as a measure of changes in policy orientation, *ceteris paribus*, and not as a description of actual changes of the governments' net surplus.

Table 3: Evolution of simulated public revenue and expenditures and implied tax and benefit rates

	1992	1999	2007	2011	2014	2018	1992-2018
Budgetary totals, change w.r.t. previous period (bn euros)							
			Price uprating				
Revenues		+5.0	-5.3	+1.7	-1.2	-3.4	-3.0
Expenditures		0.0	+1.7	+2.3	+1.2	0.0	+5.2
Impact budget		+5.0	-7.0	-0.5	-2.4	-3.4	-8.2
			Wage uprating				
Revenues		+6.9	-4.2	+1.3	-0.7	-3.9	-0.6
Expenditures		-5.4	-1.0	+3.4	+0.1	+0.6	-2.3
Impact budget		+12.2	-3.1	-2.1	-0.7	-4.6	+1.7
Average tax rates (%)							
			Price uprating				
Taxes	48.5	51.3	48.4	49.4	48.7	46.8	
Benefits	-33.0	-33.0	-33.9	-35.2	-35.9	-35.9	
Net	15.6	18.4	14.5	14.2	12.9	10.9	
			Wage uprating				
Taxes	47.1	51.0	48.6	49.4	49.0	46.8	
Benefits	-37.5	-34.5	-33.9	-35.8	-35.8	-36.2	
Net	9.7	16.5	14.8	13.6	13.2	10.6	

Source: EU-SILC 2015; own calculations using EUROMOD.

The first period (1992-1999) is markedly distinct from the subsequent periods. Policy choices led to a significant increase of 5.0 bn in public revenues in the period 1992-1999 under price uprating and to an increase of 6.9 bn under wage uprating. Social insurance contributions, personal income taxes and indirect taxes contributed to this outspoken revenue increase. Using price uprating, the average tax rate w.r.t. original market income went up from 48.5% to 51.3%, an increase due to a hike in social contributions (from 12.3% to 13.3%), and the personal income taxes (from 26.3% to 27.8%). Indirect taxes contributed less to the increase (from 9.9% to 10.2%). Expenditures during this period remained almost constant under price uprating, but decreased significantly with respect to wage uprating.

The benefit rate stayed constant at 29.4% under price uprating, but declined from 37.5% to 34.5% under wage uprating. Revenues and expenditures add up to a very important budgetary consolidation: +5.0 bn under price uprating and +12.2 bn using wage uprating. The resulting net tax rate went up from 15.6% in 1992 to 18.4% in 1999 under price uprating, and from 9.7% to 16.5% under wage uprating.

The subsequent period of 1999-2007 witnessed a reversal of these policies: important tax breaks and expenditures grew faster than inflation, although slower than nominal wage growth. This led to significantly lower net government revenues (-7.0 bn euros with price uprating, and -3.1 bn euros with wage uprating). The average tax and benefit rates reveal that the reversal mainly took place at the revenue side: under price uprating the tax rate went down from 51.3% in 1999 to 48.4% in 2007, a decrease with 2.9%-points; whereas the benefit rate only went up from 33.0% to 33.9%.

The period of 2007-2011 saw an increase in taxes (+1.7 bn with price uprating, and +1.3 bn with wage uprating), but an even higher increase of simulated benefits (+2.3 bn with price uprating and +3.4 bn with wage uprating), leading to a small net worsening of the simulated budget of 0.5 bn euros (-2.1 bn under wage uprating). During the period 2011-2014 revenues decreased (-1.2 bn euros under price uprating, -0.7 bn under wage uprating), and transfers increased under price uprating (+1.2 bn) but not under wage uprating. Overall the simulated budget worsened by 2.4 bn euros under price uprating and -0.7 bn euros under wage uprating. Finally, policy choices in the period 2014-2018 led to a substantial decrease in tax revenues (-2.4 bn euros under price uprating, and -3.9 bn under wage uprating), while also allowing for slightly higher transfer expenditures (+0.0 bn euros under price uprating, but +0.6 bn euros under wage uprating). For revenues, this implied a return to the implicit tax rate at the start of the period (1992): 46.8%. Compared with the starting point of the analysis, the implicit benefit rate in 2018 was higher under price uprating (35.9% in 2018 as compared to the initial 33.0% in 1992), but lagged behind wage growth over the whole period (36.2% in 2018 compared to 37.5% in 1992).

In the long run, the non-revenue neutrality, apparent from Table 3 might have important additional effects, both in the equity and in the incentive dimension. However, in the description in this paper, we discard these additional impacts.

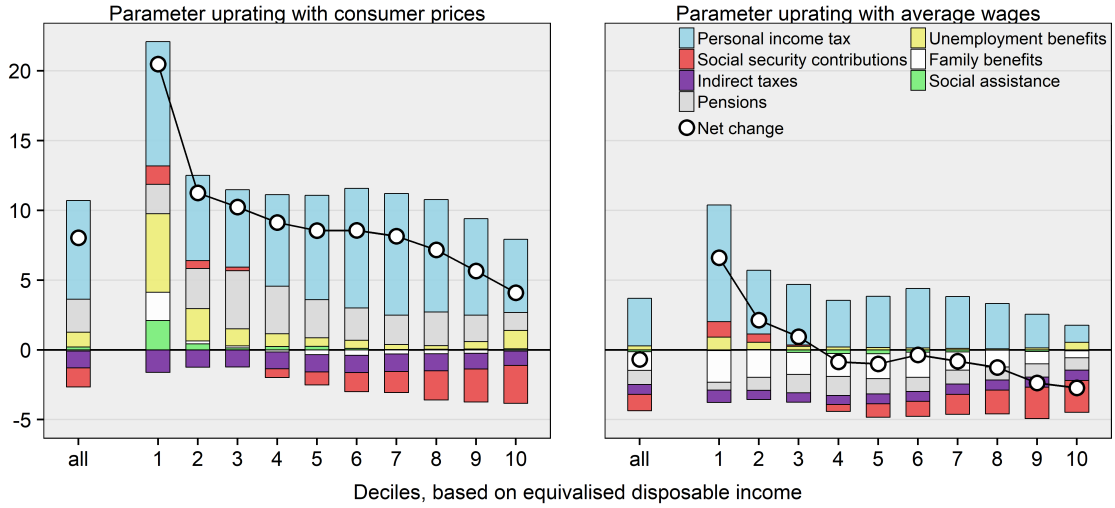
4.2 Distributional effects

Figure 4 shows the percentage change in disposable income per decile by moving from the 1992 tax-benefit system to the 2018 system. We express 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, left panel) or with respect to wage growth (when we use nominal wage growth as the uprating factor, right panel).

Comparison of the left and right panel of figure 4 highlights 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 2015 population, average real disposable income is 4.9% higher under the 2018 policy rules than it would have been if the tax-benefit system of 1992 was still in place. But with nominal wage uprating as the benchmark, the overall tax-benefit system caused a lagging behind of real disposable incomes compared to nominal wage growth (-1.7%). This large difference is 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 to prices only, tax creep led to higher average tax rates in real terms. The tax reforms of the Verhofstadt

(1999-2007) and Michel (2014-2018) governments have not fully compensated for this. Our simulations hence show that, from a mere policy perspective, 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.

Figure 4: Changes in counterfactual disposable income between 1992 and 2018 due to policy changes (in % of 1992 simulated incomes)

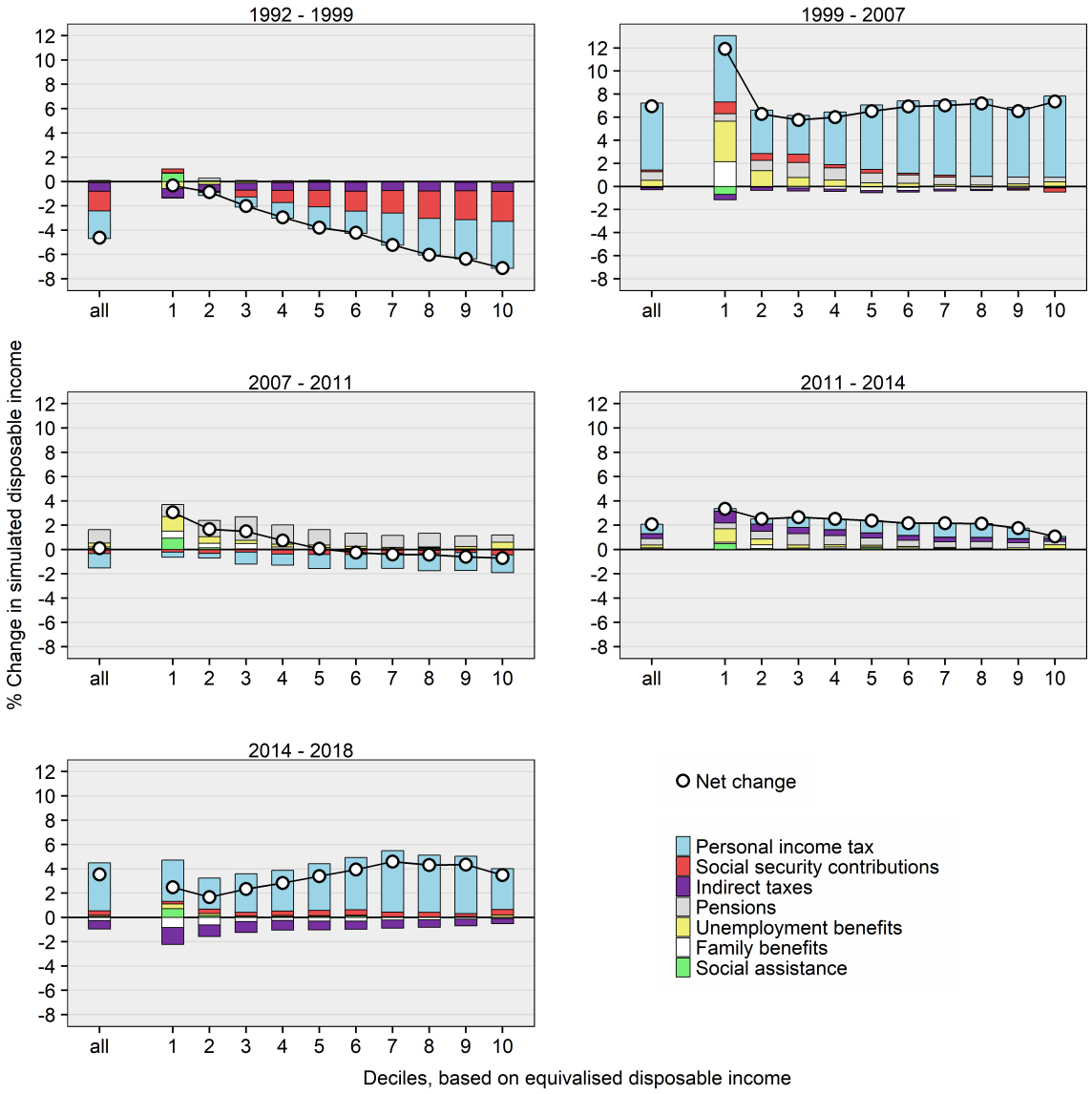


Source: EU-SILC 2015; own calculations using EUROMOD.
Note: Deciles of equivalent household income using 1992 tax-benefit system.

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. The pro-poor pattern, however, is broadly similar. In the case of price uprating, we find much higher increases in disposable income at the bottom deciles than at the top. Under wage uprating, the pro-poor gradient is retained, but to a lesser extent. Moreover all deciles, except the poorest one, are worse off under the 2018 system than under the 1992 system. For deciles 5 to 9 this is mainly due to bracket creep in personal income taxes and increases in social security contributions. Changes in personal income taxes and in 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 real increases of pensions and child allowances, and to the increases in indirect taxes.

We conclude that the policy stance in Belgium during the period 1992-2018 has predominantly been progressive, in that the %-change of disposable income was more positive (or less negative) for the bottom half of the distribution. This conclusion is robust with respect to the choice of the benchmark of either price or wage uprating. In figure 5 we now have a closer look into the policy changes for the separate periods 1992-1999, 1999-2007, 2007-2011, 2011-2014 and 2014-2018, to detect which changes contributed to the observed purchasing power variations in figure 4. We only discuss the results produced with price uprating as the benchmark. The results under wage-indexation are analogous and can be found in appendix 7.2 (figure 8).

Figure 5: changes in counterfactual disposable income by subperiod
(price uprating, % of 1992 simulated disposable incomes)



Source: EU-SILC 2015; own calculations using EUROMOD.
Note: Deciles of equivalent household income using 1992 tax-benefit system.

Dehaene I and II, which covers the period 1992-1999, was marked by the recession of 1993 and the attempt to comply with the entrance conditions of the monetary union, as stipulated in the Maastricht Treaty. This made fiscal consolidation the prime objective (see also Biascari et al., 2015) and the first panel of figure 5 reveals that social insurance contributions and personal income taxes were increased substantially to reach this objective. This translated into a sizeable decrease of average disposable of 5.3%. The increased social insurance contributions formed the largest hit on purchasing power (-3.9%), followed by an increase in personal income taxes (-1.4%). Social transfers remained by and large unchanged in real terms. Both tax increases were progressive as they hit the higher incomes significantly harder than the lower incomes. The reforms in the indirect tax system countered this progressive

effect only slightly (only visible in the first decile). Finally the government also increased social assistance benefits slightly over this period.

Comparing figure 5 with the results under wage uprating in appendix 7.2 (figure 8) again makes clear how important the choice of the benchmark counterfactual is, especially in a period of strong real wage growth. Income tax brackets were not only not adjusted for real income growth (which needs an explicit personal income tax reform), even the default indexation for inflation was suspended during this period. This magnifies the decrease of disposable income when measured against the benchmark of 'wage uprating'. For benefit recipients, the use of a wage uprating benchmark in figure 8 also unveils the erosion of benefits w.r.t. to the nominal wage growth, since benefits were only indexed with inflation. The overall distributional picture, though, remains unaffected: the upper part of the income distribution shouldered a larger burden in het fiscal consolidation than the bottom part.

Policies under Verhofstadt I and II, during the period 1999-2007, increased households' real disposable income by on average 5.6% under the price-uprating benchmark (2.5% under wage-uprating). This was mainly due to generous personal income tax policies (the so-called Reynders reforms of 2001-2005), but also because of increases above inflation of social transfers. The increase was largest for the bottom decile (+7.5%), but from decile 2 to 10, policies were slightly 'pro-rich', ranging from +4.5% in decile 2 to +6.6% in decile 10. The gains at the bottom are not only explained by a considerable increase in unemployment benefits and, to a slightly lesser extent, pensions, but - more surprisingly - also by gains in personal income taxes and social security contributions. This reflects the extension of the work bonus for low wages. Only the benefit of social assistance fell behind prices and wages, and also excise increases contributed to a net loss in purchasing power.

The period 2007-2011 saw economic and political turmoil: three prime ministers were at the helm of the federal government (Verhofstadt III, Van Rompuy, and Leterme), and the financial and economic crisis rocked the world economy. Yet, this is not reflected in huge swings of tax benefit policies. Unlike in many countries, tax-benefit policies changed only slightly: household disposable income increased by on average a mere 0.2%, as measured using inflation uprating, and a higher 1.4% when taking wage uprating.[21] The main policy that contributed positively to this increase are the real statutory uprating of pensions (+1.1%), unemployment benefits (+0.3%) and social assistance (+0.2%). The repeal of the in 2007 introduced 'jobkorting', a tax credit to employees in Flanders, gave rise to a decrease in household disposable incomes of around -1.2%. Poor households on average were 3.7% better off, while persons at the top of the income distribution did not gain. We conclude that, contrary to the previous period, the policy orientation became mildly progressive again.

The same limited changes in policy orientation occurred during the Di Rupo government between 2011 and 2014. Disposable incomes net of indirect taxes increased by 1.8% (only 0.5% under wage uprating), and was again mildly progressive, ranging from 3.2% for the lowest decile (1.0% under wage uprating) to 0.9% for the top decile (-0.3% under wage uprating). The most important tax-benefit changes were welfare adjustments for unemployment benefits, pensions and social assistance. The government also reduced the VAT-rate on electricity from 21% to 6%, leading to a small purchasing power increase of 0.2%.

The policy orientation of tax benefit policies rolled out by the Michel government, period 2014-2018, is markedly different. The reduction of the personal income tax, including a substantial increase of deductible expenses, an increase of the work bonus, and the abolition of the middle tax rate, increased disposable incomes by on average 3.2%. Part of the income gains from the personal income tax reduction were compensated by an increase in indirect taxes: the measure of the previous government to lower the VAT on electricity from 21% to

[21] The effect under wage uprating being higher than the one using price uprating results from the fact that nominal wage growth was negative during this period.

6%, was overturned, and most excises were increased. There was a welfare adjustments of social assistance and unemployment benefits, and non-indexation of family benefits. In sum, average disposable incomes, net of indirect taxes, increases by 2.6%, and similarly as in the period 1999 - 2007, the policy stance now became 'pro-rich'. Income increases are largest for the 6th until the 9th decile, with gains between 3.0% (decile 8) and 3.6% (decile 7). The distribution of relative gains is even more skewed to higher incomes when one takes wage indexation as the benchmark. The difference with period 1999-2007 is to be found at the very bottom. Under the governments of Verhofstadt unemployment benefits were increased above cpi, but also the character of personal income tax reforms, led to a relatively outspoken gain for the bottom decile. Under the government Michel this is no longer the case. Besides real increase of social assistance, indirect tax hikes, and the character of the personal income tax changes in the so-called 'Tax Shift' do not really benefit the bottom of the distribution. The gain of the two bottom deciles (1.8% and 1.4% respectively) are meagre compared to the more than 3% for the upper half of the distribution.

We summarize the distributional changes in Table 4. We show the Gini of original income, of disposable income after taxes and benefits, and the difference as the Reynolds-Smolensky index.

Table 4: Summary measures of the redistributive effect of policies 1992-2018 (Reynolds-Smolensky index)

	1992	1999	2007	2011	2014	2018	1992-2018
Price uprating	0.242	0.248	0.247	0.252	0.254	0.253	
Change over period		*+0.007*	*-0.002*	*+0.004*	*+0.003*	*-0.003*	*+0.012*
Wage uprating	0.251	0.252	0.247	0.253	0.254	0.252	
Change over period		*+0.001*	*-0.002*	*+0.006*	*+0.001*	*-0.002*	*+0.003*

Source: EU-SILC 2015; own calculations using EUROMOD.

Of the five subperiods considered, only two periods witness a - be it rather small - decline in the redistributive power of the tax benefit system: 1999-2007 and 2014-2018. Not accidentally, these are the two periods in which a substantial reduction of progressive personal income taxes was implemented (see the implicit tax rates in Table 3).[22] The largest increase in redistributive effect are found in two periods: 1992-1999 and 2007-2011. Yet, for these two periods, the choice for the default uprating does make a large difference. In the period 1992-1999, a switch from price to wage uprating erodes nearly completely the increase in the redistributive effect. It is explained by the serious reduction of benefit growth as compared to wage growth. In the period 2007-2011 by contrast, switching to wage uprating reinforces the redistributive effect of the tax benefit system. The reason is that the decline of real wages was not matched at the benefit side.

[22]Separate analysis of the personal income taxes shows that the loss of redistributive power for this specific element in the tax benefit system was exclusively due to the decrease in the average tax rate. Using price uprating as the default, the Kakwani-index of disproportionality of personal income taxes (comparing tax shares with shares in taxable income) rose from 0.2330 in 1999 to 0.2610 in 2007, and from 0.2629 in 2014 to 0.2877 in 2018. But the decline of the average tax rate from 0.2487 in 1999 to 0.2199 in 2007 and from 0.2205 in 2014 to 0.2052 in 2018 overcompensated this increase in progressivity, and led to a decrease in the Reynolds-Smolensky index (measured as reduction of the Gini of taxable income through the personal income tax system) of 0.0743 in 1999 to 0.0715 in 2007 and from 0.0721 in 2014 to 0.0716 in 2018. The results for wage uprating are qualitatively similar.

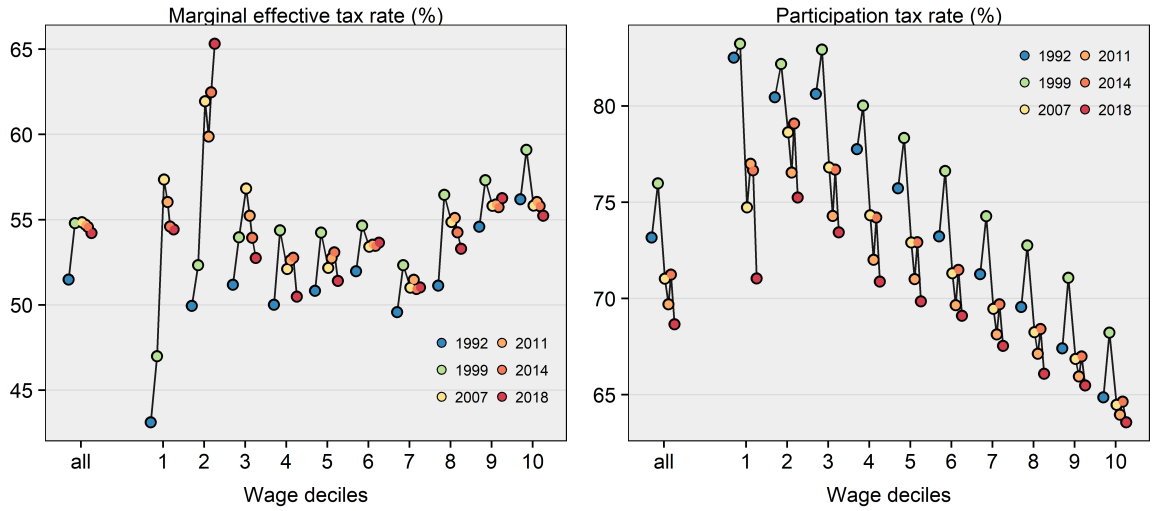
4.3 Efficiency and Work incentives

In this subsection we describe the changes in monetary work incentives which took place between 1992 and 2018. These effects are calculated for the subpopulation of individuals available for the labour market, as described in Table 1. The heterogeneity of the monetary incentives and the changes therein, is presented by decile of gross wage level.

4.3.1 Marginal effective tax rates at the intensive margin

Figure 6 presents the evolution of the marginal tax rates at the intensive margin (METR, left-hand panel), and participation tax rates (PTR, right-hand panel) over the course of the five periods. We again limit ourselves here to the discussion of the results under the price uprating benchmark. The results under wage-indexation can be found in appendix 7.2 (figure 9).[23]

Figure 6: Marginal effective tax rates (%, left) and participation tax rates (%, right), 1992-2018, under price uprating as benchmark policy



Source: EU-SILC 2015; own calculations using EUROMOD.

Using price uprating, the average METR moved up from 51.5% to 54.8% between 1992 and 1999, after which it remained virtually unchanged; decreasing by only 0.6 percentage points between 1999 and 2018. These averages, however, conceal important differences in levels and evolutions across the wage deciles. Connecting the blue dots for 1992, one observes the outspoken upward slope of METRs across the wage distribution. In 1992 the lowest wage decile faced a METR of – on average - 43.1%, while this was 56.2% for the highest wage decile. The tax increases in the 1992-1999 period led to general increases in METRs of between 2.4 and 5.3 percentage points. But the introduction of the work bonus in 2000, affecting by design only the low wages, and the general tax reduction from 2001-2005 targeted at the middle and upper deciles, caused a shift of the METRs across the distribution. The tapering of the work bonus lead to a stark increase in the METRs (to be considered the

[23]The METR's calculated with wage uprating also include the effect of fiscal drag: when tax brackets are only indexed with inflation and there is real income increase over time, the average tax rate gradually increases as people progressively enter brackets with higher marginal rates.

flipside of the reduction of the PTRs for these households, which we discuss below): +10.4 and +9.6 percentage points for wage decile 1 and 2 respectively. The tax reforms led to lower METRs for deciles 4 to 10, ranging from 1.2 percentage points for decile 6 and 3.3 percentage points for decile 10. The expansion of the work bonus consisted of a gradual increase of the basic amount and the wage limit. This led to a small decrease in the METRs for the lowest deciles in the period 2007-2018, as more and more wages in this decile were now eligible for the maximum benefit, and were no longer affected by the tapering. Meanwhile the METRs in the 2$^{\text{nd}}$ decile continued to rise precisely because of this expansion (+3.4 percentage points). The METRs for the first and third decile were reduced significantly after 2007 (-2.9 and -4.1 percentage points). Deciles 4 and 8 saw reductions of -1.6 percentage points; other deciles only experienced changes under one percentage point.

The right panel of figure 6 shows that the average PTR stood at 73.2% under the 1992 tax and benefit system, after which it increased with 2.8 percentage points to 76.0% in 1999. The 1999-2007 tax cuts and the introduction of the work bonus lowered PTRs significantly by 4.9 percentage points, to 71.0%. The period 2007-2011 saw the PTR decrease further with 1.3 percentage point, but was reversed from 2011 to 2014 (+1.5 percentage point). In the last period 2014 - 2018 the average PTR was again lowered to 68.7% (-2.6 percentage points).

The increase in PTRs in the period 1992-1999 was driven by the increase in personal income taxes and social insurance contributions. It was modest for the lowest wages (+0.7 percentage point for the 1$^{\text{st}}$ wage decile), but much more important - while less relevant - for the highest deciles (+3.7 and +3.4 percentage points for the 9$^{\text{th}}$ and 10$^{\text{th}}$ decile respectively). It is the 'making work pay'-policies of the 1999-2007 period which drastically lowered the PTR's, especially at the lower end of the wage distribution: -8.5 percentage points for the lowest wage decile. Remarkably a smaller -3.5 percentage points for the 2$^{\text{nd}}$ decile, as these employees fall slightly in between the initial reach of the work bonus and the reduction of the personal income tax, which is mainly paid by middle and upper incomes. The improvement in incentives for the remainder of the distribution was largest for the 3$^{\text{rd}}$ decile (-6.1 percentage points) to -3.8 percentage points for the top decile. Also the 2007-2011 period saw an overall reduction of the PTRs, between -2.5 percentage point for decile 3 and -0.5 percentage point for decile 10, with the exception of the bottom decile, as PTRs increased on average 2.3 percentage points in this decile. The 2011-2014 period saw almost the exact reversal of the previous period, with a smaller reduction of the PTR for the lowest decile than the prior increase (-0.3 percentage point). The decreases in the PTRs in the period 2014-2018 were once more substantial for the lowest deciles (-5.6 and -3.8 percentage points for deciles 1 and 2), and decreased gradually to -1.1 for the highest decile. Summing up, since 1999, the PTR for the bottom three wage deciles declined significantly from 83.2%, 82.2% and 82.9% to respectively 71.0%, 75.2% and 73.4%.

4.3.2 Marginal cost of public funds

Table 5 shows our aggregate measure of work incentives, the marginal cost of public funds (MCF), calculated with the stylized elasticities described above. We find that the policy choices in the nineties led to a substantial increase of the MCF. Using price uprating, the MCF for the 1992 system, equalled 1.391. The worsening of work incentives, due to increases in personal income taxes and social insurance contributions between 1992 and 1999, pushed the MCF up to 1.462. Subsequent reforms have then gradually reduced the MCF again. The policy reforms of the 1999-2007 period reduced the MCF by 0.025, to 1.437. The reduction of the MCF by the subsequent governments was less outspoken: between 2007 and 2011 there was a decrease of -0.013 to 1.424, which was largely offset by the increase in the 2011-2014 period: +0.009 to 1.433. The 2014-2018 period saw a larger reduction: -0.019 to 1.413.

Table 5: Marginal cost of public funds

	1992	1999	2007	2011	2014	2018	1992-2018
Price uprating	1.391	1.462	1.437	1.424	1.433	1.413	
Change over period		*+0.072*	*-0.025*	*-0.013*	*+0.009*	*-0.019*	*+0.023*
Wage uprating	1.392	1.452	1.439	1.428	1.432	1.417	
Change over period		*+0.060*	*-0.014*	*-0.010*	*+0.004*	*-0.016*	*+0.025*

Source: EU-SILC 2015; own calculations using EUROMOD.

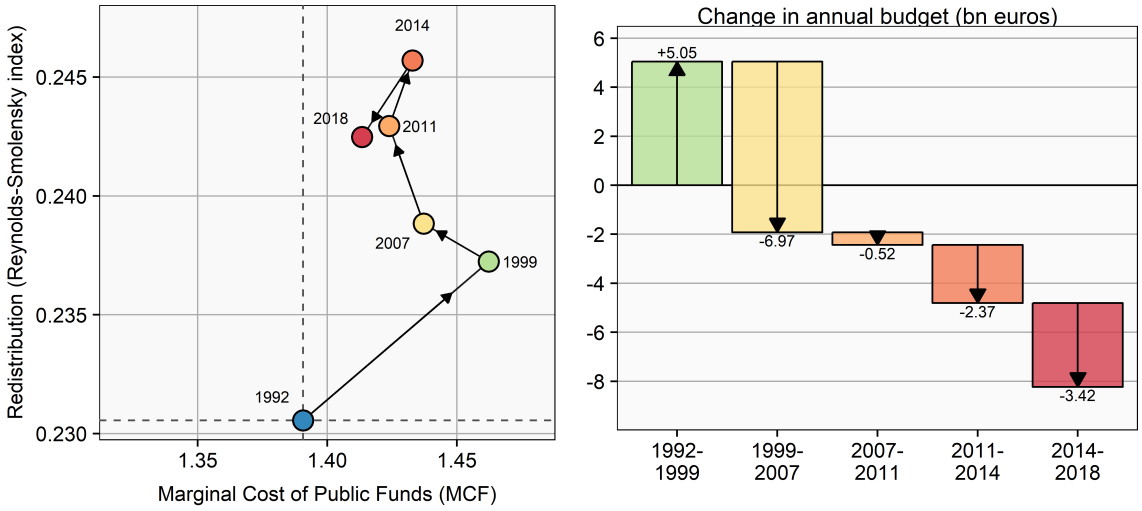
Applying wage uprating, we notice smaller changes of the MCF in absolute terms in periods with positive real wage growth. This was especially the case in the 1992-1999 period and to a lesser extent in the 1999-2007 period. Given that real wages grew only to a limited extent after 2007, differences with the results using price uprating are negligible. We conclude that, overall and over the whole 1992-2018 period, work incentives in the Belgian tax-benefit system have worsened.

4.4 A summary picture of policy orientations during 26 years of tax-benefit policy

Figure 7 summarizes our bird's eye view of 26 years of changes in tax-benefit policy in one graph. In the left panel we plot the levels of the MCF (on the x-axis) and the Reynolds-Smolensky index (on the y-axis). A movement to the right reveals a worsening of work incentives, while a movement to the left is an improvement. Shifts upward imply a higher redistributive power of the system, whereas a downward movement testifies a lowering of the redistributive properties of the tax benefit system. The right panel shows the changes in the net budgetary outcome of the simulated policies. The revenue effects for each period are shown as a difference with the preceding period. The results displayed in figure 7 concern the counterfactuals with the price uprating as benchmark. The results with the wage uprating as benchmark are found in figure 10 in appendix 7.2.

Overall, policy changes over the 26 year period have made the tax-benefit system more redistributive in nature. There are two downward movements: the periods 1999-2007 and 2014-2018, not coincidentally two periods in which major reductions of personal income taxes were implemented. This again highlights that the average net tax rate is as important in assessing the redistributive power of a tax benefit system as the progressivity stricto sensu. Also the strong increase in redistributive power between 1992 and 1999 is mainly explained by the strong hike in personal income taxes and social security contributions implemented during that period because of fiscal consolidation.

Figure 7: Policy shifts 1992-2018: redistribution, work incentives & budgetary effects (price uprating as benchmark policy)



Source: EU-SILC 2015; own calculations using EUROMOD.

Simultaneously, work incentives have worsened. The overall deterioration occurred in the nineties, when personal income taxes and social security contributions were increased substantially, and to a smaller extent in the period 2011-2014. Working incentives mainly improved over the course of the 1999-2007 period, reflected in a decrease of the MCF with -0.025. Also in the periods 2007-2011 and recently 2014-2018, policies have been put in place which reduced the marginal cost of public funds with -0.013. However, all these improvements of work incentives have only compensated for a little over half of the initial worsening of incentives.

The right panel of figure 7 clearly shows that the worsening of the work incentives mainly served a fiscal consolidation purpose, and that policies to improve work incentives did come with a large budgetary price attached. In contrast with a net annual improvement of 5.1 billion euros (12.2 billion euros when using wage uprating) between 1992 and 1999, the policy choices between 1999 and 2007 came at a cost of 7.0 billion euros (3.1 billion euros using wage uprating). The annual net simulated budget was more or less unaffected by policy changes during the crisis years (it worsened by 0.5 billion euros during the period 2007-2011). However both during the 2011-2014 and the 2014-2018 period, reforms in the tax benefit system were put in place which costed respectively 2.4 and 3.4 bn euros under price uprating (and 0.7 and 4.6 billion under wage uprating).

5 Conclusion

In this paper we charted how 26 years of policy choices concerning elements of the tax and benefit system had an impact on three dimensions: equity, efficiency and budgetary position. Our first conclusion is that 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. Yet, when evaluated against the background of keeping purchasing power constant (i.e. using price uprating as the benchmark for 'unchanged policy'), Belgian policy makers seem most of the

time to have 'put equity first'. In three of the five sub-periods (1992-1999; 2007-2011; 2011-2014) the redistributive power of the entire tax benefit system increased. When forced to make policy choices in an environment of fiscal consolidation, as in the 1992-1999 period, decreases of disposable incomes were less pronounced at the bottom than further up the income distribution. Also the years of financial and economic crisis witnessed a moderate pro-poor incidence of the limited changes in the tax benefit structure during this period. The two periods where the redistributive power of the tax benefit system declined (1999-2007 and 2014-2018), were periods in which two large reductions of personal income taxes were implemented.

However, the definition of what constitutes 'unchanged (or default) policy' is important for the presentation, and hence the assessment, of the chosen 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 will be interpreted 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, and depressed the redistributive power of the tax benefit system. Also the loss of redistributive power in the two periods mentioned above is enhanced, mainly for the period 1999-2007. Only during one period, i.e. the crisis years 2007-2011, does the switch from price to wage uprating, increase the redistributive effect of the tax benefit system. These are the years with negative wage growth, in which benefits seem to have been insulated from the economic adversity of these years.

Some specific policies have definitely improved work incentives for people at the bottom of the distribution. The most important one was the introduction of the work bonus. Together with the two large reforms of personal income taxes (in the periods 1999-2007 and 2014-2018), and the repeated lowering of social security contributions, this tried to restore work incentives to their pre-1992 levels. After all, it was the nineties consolidation period, with substantial increases in social security contributions and both nominal and real bracket creep in the personal income tax, which was the main culprit of the worsening of work incentives in the first place. The attempts to improve incentives were partially crowded out by higher out-of-work benefits, the most important being unemployment benefits. But anyhow, the attempt to improve incentives came at a large budgetary cost, and was far from revenue neutrally designed. In this sense it looks as if the two personal income tax reforms and repeated social security reductions simply reversed the nineties policies of fiscal consolidation.

We close with some caveats. First, as announced in the introduction, this paper did not describe actual changes in inequality or budgetary position during the period 1992-2018. The counterfactual tries to isolate the pure effect of policies alone. On the other hand, if, similarly to many other Western countries, new evidence would point to an increase in inequality of disposable incomes in Belgium, our tentative conclusion would be that this cannot primarily be attributed to large swifts in policy orientation. What our results tell about the underlying changes in primary incomes, is more difficult to tell. Measures of distributive power of a tax benefit system are inherently dependent on the underlying pre tax and transfer distribution. So, it is hazardous to conclude that unchanged inequality in disposable income in combination with more or less constant redistributive power of a tax benefit system, would also imply a more or less stable inequality in primary incomes. Second the non-revenue neutrality will definitely have additional distributional consequences in the long run. Finally, the same holds for the behavioural and more economy wide impacts of the changes in work incentives induced by some of the reforms.

6 References

Adam, S. and Browne, J. (2010) Redistribution, work incentives and thirty years of UK tax and benefit reform, Institute for Fiscal Studies Working Paper W 10/24.

Atkinson, A. B. (2015), Inequality : what can be done?, Harvard University Press.

Bargain, O. (2012a) Decomposition analysis of distributive policies using behavioural simulations, International Tax and Public Finance 19(5), 708–731.

Bargain, O. (2012b) The Distributional Effects of Tax-benefit Policies under New Labour: A Decomposition Approach, Oxford Bulletin Of Economics And Statistics, 74 (6), 856-874.

Bargain, O. and Callan, T. (2010) Analysing the effects of tax-benefit reforms on income distribution: a decomposition approach, Journal of Economic Inequality, 8(1), 1-21.

Bisciari, P. , Eugène, B., Melyn, W., Schoonackers, R., Stinglhamber, P., Van Meensel, L., Van Parys, S. (2015) 'Analyse van het beleid tot sanering van de Belgische overheidsfinanciën', NBB Economisch Tijdschrift, June, 79-98.

Bouckaert, N. and Schokkaert, E. (2011) 'Een eerste berekening van non-take-upgedrag bij leefloon', Belgisch Tijdschrift voor Sociale Zekerheid, 53(4), 603-627.

Callan, T., Crilly, U., Keane, C., Walsh, J.R., and Shúilleabháin, A.N., (2011) Tax, welfare and work incentives, Budget Perspectives 2012, 12-32.

Clark, T. and Leicester, A. (2004) 'Inequality and two decades of British tax and benefit reform', Fiscal Studies, 25(2), 129-158.

Dahlby, B. (2008) The marginal cost of public funds: Theory and applications, MIT Press Books, Cambridge, Massachusetts.

De Agostini, P., Capéau, B., Decoster, A., Figari, F., Kneeshaw, J., Leventi, C., Manios, K., Paulus, A., Sutherland, H. and Vanheukelom, T. (2017) EUROMOD extension to indirect taxation: final report, EUROMOD Technical Note 3.0.

Deaton, A. (2013) The great escape: Health, wealth, and the origins of inequality, Princeton University Press.

Decoster, A., Dedobbeleer, K. and Maes, S., (2017), Using fiscal data to estimate the evolution of top income shares in Belgium from 1990 to 2013, Faculty of Economics and Business KU Leuven, Discussion Paper Series DPS 17.18.

Decoster, A., Perelman, S., Vandelannoote, D., Vanheukelom, T., and Verbist, G. (2015). A bird's eye view on 20 years of tax-benefit reforms in Belgium. EUROMOD Working Paper EM 10/15

Hansson, I. and Stuart, C. (1985) 'Tax revenue and the marginal cost of public funds in Sweden', Journal of Public Economics, 27, 331-353.

Herault, N., and F. Azpitarte (2016), Understanding Changes in the Distribution and Redistribution of Income: A Unifying Decomposition Framework, Review of Income and Wealth 62(2), 266–282.

Hills, J., Paulus, A., Sutherland, H. and Tasseva, I. (2014) A lost decade? Decomposing the effects of 2001-11 tax-benefit policy changes on the income distribution in EU countries, ImPRovE Discussion Paper 14/03.

Hufkens, T., Maes, M., Van Cant, L., Vanhille J. and Vanheukelom T. (2017) EUROMOD Country Report – Belgium.

Horemans, J., Pintelon, O., en Vandenbroucke, P. (2011), Inkomens en inkomensverdeling op basis van Belgische enquêtegegevens: 1985-2007, CSB Berichten, Centrum voor Sociaal Beleid Herman Deleeck, Antwerpen.

Kleven, H. J. and Kreiner, C. T. (2006) 'The marginal cost of public funds: Hours of work versus labor force participation', Journal of Public Economics, 90(10), 1955-1973.

Lambert P. (2001), The Distribution and Redistribution of Income, Manchester University Press, 3rd ed.

Lietz, C. and Mantovani, D. (2006) 'A short introduction to EUROMOD: an integrated European tax-benefit model', Research in Labor Economics, 25, 1-26.
OECD (2008) Growing Unequal? Income distribution and poverty in OECD countries, Paris: OECD Publishing.
OECD (2011) Divided we stand. Why inequality keeps rising, Paris: OECD Publishing.
OECD (2015) In it Together. Why less inequality benefits all, Paris: OECD Publishing.
Piketty, T. (2014) Capital in the Twenty-first Century, Harvard University Press.
Reynolds, M. and Smolensky, E. (1977) Public expenditures, taxes and the distribution of income: The United States, 1950, 1961, 1970, New York: Academic Press.
Saez, E., 2002. Optimal income transfer programs: intensive versus extensive labor supply responses. Quarterly Journal of Economics 117 (3), 1039–1073.
Sutherland, H., Evans, M., Hancock, R., Hills, J. and Zantomio, F. (2008). The Impact of Benefit and Tax Uprating on Incomes and Poverty, Joseph Rowntree Foundation, York.
Sutherland, H. and Figari, F. (2013) 'EUROMOD: the European Union tax-benefit microsimulation model', International Journal of Microsimulation, 6(1), 4–26.
Van Rie, T. and Marx, I. (2014), Belgium: when growing background inequalities meet resilient institutions, Chapter 6 in: Nolan, B., Salverda, W., Checchi, D., Marx, I., McKnight, A., Tóth, I.G. and van de Werfhorst, H.G., Changing Inequalities and Societal Impacts in Rich Countries. Thirty Countries' Experiences, Oxford University Press, Oxford.
Valenduc, C. (2017), Distribution et redistribution des revenus: évolution des inégalités en Belgique, Courrier hebdomadaire CRiSP nr 2346-2347, Brussel.
Wilkinson, R. and Pickett, K. (2010) The spirit level: why equality is better for everyone, Penguin.

7 Appendix

7.1 The 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 and Browne (2010), we impute (potential) wages for the individuals who are not working.

First we estimate a Heckman regression for the log hourly wage equation for employees aged 18 to 59, earning more than 6 euros an hour, 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 and Browne (2010) we do not differentiate between individuals that work a different number of hours. In Table 6 we present the regression results.

Table 6: Heckman regression results for log hourly wage

	Log(wage)		z	Selection		z
Constant	1.83	***	22.53	-3.504	***	-17.822
Wallonia	0.074	***	5.98	0.261	***	6.042
Brussels	-0.009		-0.52	-0.18	***	-3.312
Gender	0.199	***	18.15	0.414	***	10.834
Potential experience	0.04	***	11.35	0.238	***	25.772
(Potential experience)^2	-0.001	***	-12.00	-0.004	***	-27.438
Years in education	0.048	*	1.59	0.811	***	9.734
(Years in education)^2	0.019	***	5.54	-0.027	***	-2.726
(Pot. exp.) * (Years in educ.)	0.001	*	1.49	-0.015	***	-11.291
Number of children				-0.107	***	-6.889

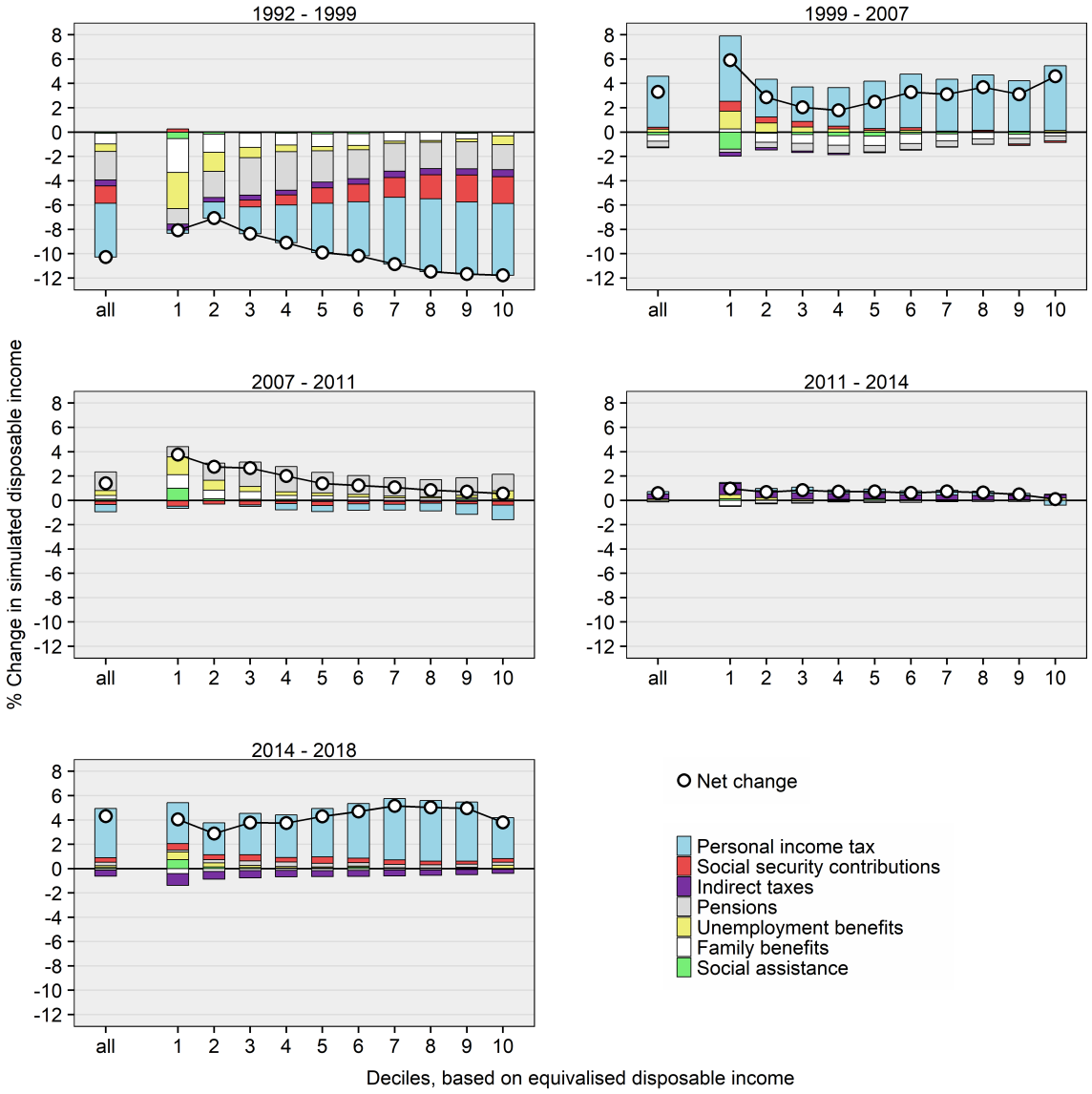
Source: EU-SILC 2015; own calculations using EUROMOD.

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.

7.2 Results under wage uprating

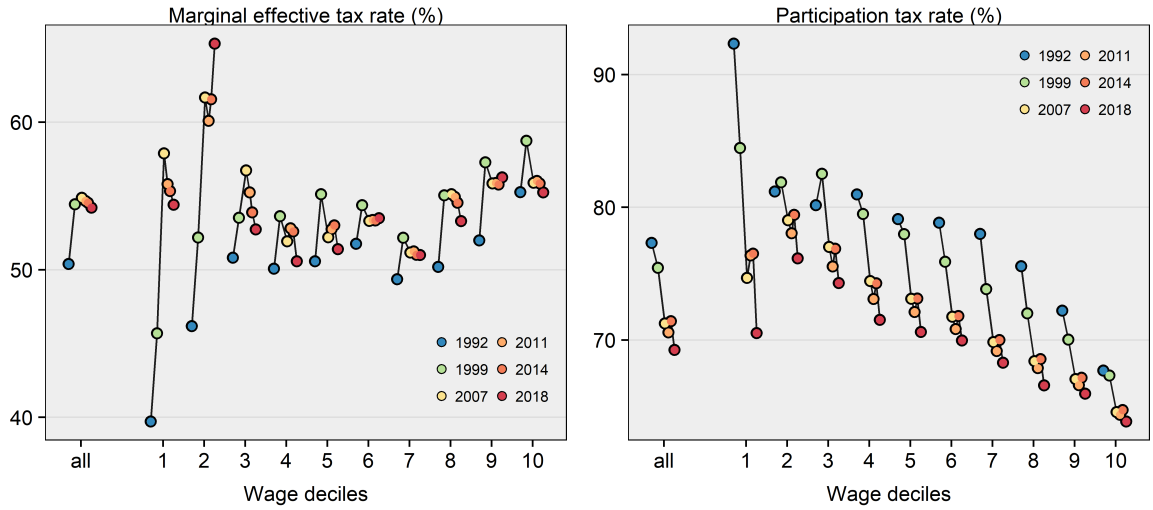
In this section we present the analogues to figures 5, 6 and 7 for the case in which the counterfactual is constructed with wage uprating as the default for 'no policy change'.

Figure 8: Changes in counterfactual disposable income by subperiod
(wage uprating, % of 1992 simulated disposable incomes)



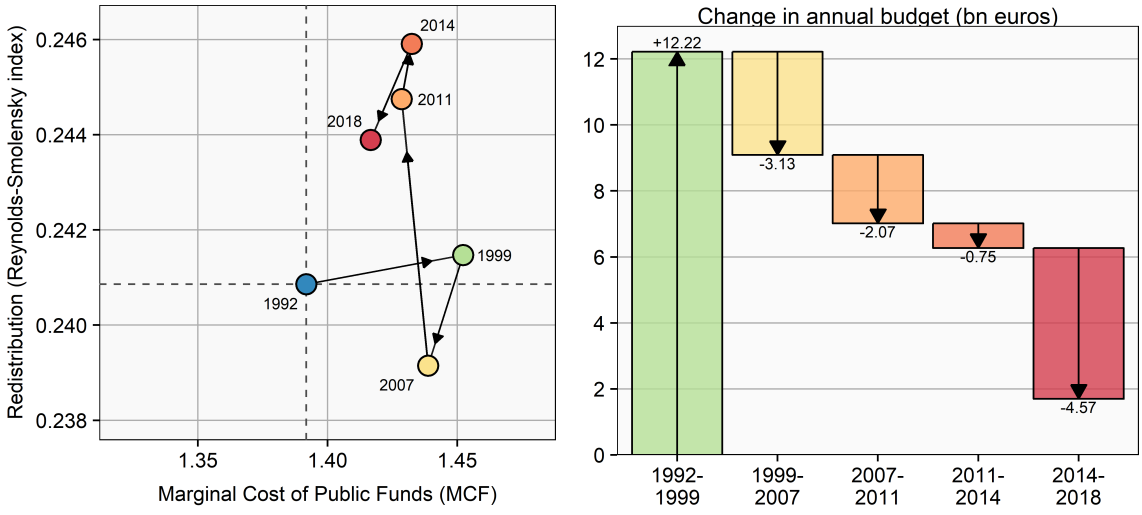
Source: EU-SILC 2015; own calculations using EUROMOD.
Note: Deciles of equivalent household income using 1992 tax-benefit system.

Figure 9: Marginal effective tax rates (%, left) and participation tax rates (%, right), 1992-2018, under wage uprating as benchmark policy



Source: EU-SILC 2015; own calculations using EUROMOD.

Figure 10: Policy shifts 1992-2018: redistribution, work incentives & budgetary effects (wage uprating as benchmark policy)



Source: EU-SILC 2015; own calculations using EUROMOD.