Assessing policy reforms using output from the OECD tax-benefit model

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1. Introduction: the policy evaluation scoreboard

1. This report provides a step-by-step guide for reading and interpreting the results of policy reform assessments based on the output from the OECD Tax-Benefit model ("**TaxBEN**"). The assessments are based on a range of selected policy indicators which, together, aim to capture and summarise the mechanics of policy changes along different policy domains in an informative and succinct manner.

2. Indicators are organized in the so-called *policy evaluation scoreboard*. The scoreboard comes as an Excel workbook that contains figures and tables comparing indicators in the "before" and "after" scenario under analysis. The two scenarios can refer either to two past years or to two future hypothetical scenarios, e.g. to compare reforms options that that are debated or announced but not yet implemented. The scoreboard comes by default with six worksheets or "scorecards", each corresponding to a particular family type (single persons, lone parents, one-earner and couples with and without children, two-earner couple families with and without children). The six scorecards have a common structure to facilitate navigation and comparison of results between family types.

3. Results in each scorecard are organized in separate panels covering different areas that can be relevant for the policy assessment:

a) **Panel A:** "**Bird's eye view**" **of policy changes**. Comparison of each household income component across the earnings spectrum in the two scenarios;

b) **Panel B:** "**Redistributive design and targeting**". Percentage change in the net household income at the each decile point of the full-time earnings distribution. This panel includes also changes in the index of REdistributive Design (RED) as well as changes in other selected indicators of benefit adequacy for households claiming Guaranteed Minimum Income (GMI) benefits.

c) **Panel C: "Financial work incentives**". Changes in the incentive to undertake paid work, measured by the Participation Tax Rate (PTR), and changes in the incentive for an employee to increase their earnings, measured by the Marginal Effective Tax Rate (METR).

d) **Panel D: "Benefit generosity for unemployment benefit recipients"**. Change in the proportion of the net household income before the job loss that is maintained after 1, 2, 3 ..., 60 months of unemployment. This indicator is typically referred to as Net Replacement Rate (NRR);

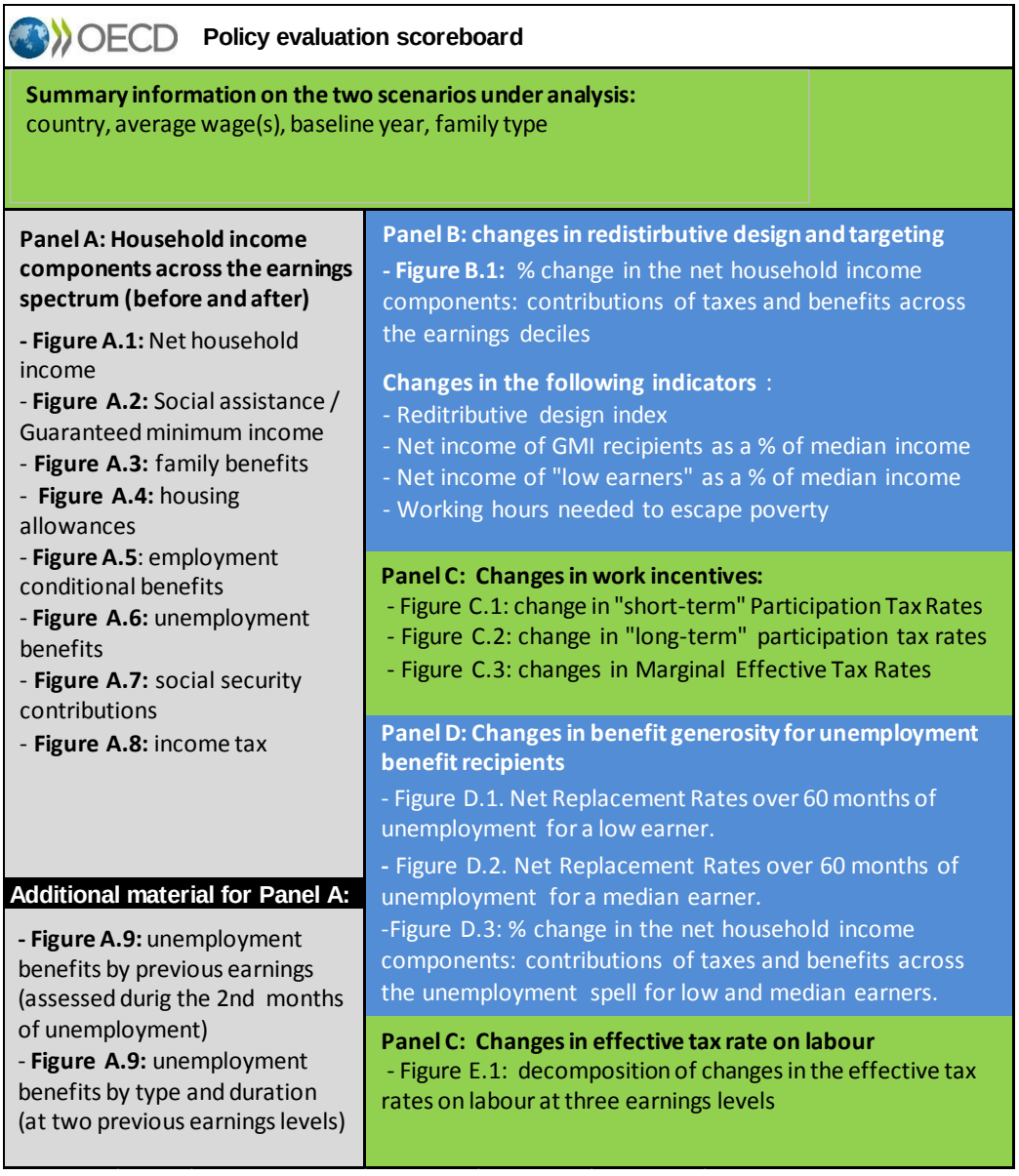
e) **Panel E:** "**Effective tax rate on Labour**". Changes in net taxes of full-time employees, i.e. total taxes and social security contributions paid less benefits received, expressed as a percentage of total labour cost for the employer at selected earnings levels.

4. The Scoreboard includes also a detailed README worksheet that provides information about the structure and the content of the overall Excel file, including direct links to each scorecard to facilitate the location and analysis of the results for each family type. Figure 1 shows a stylized example of the scorecard.

5. The remaining of this document is organized as follow. Section 2 provides an overview of the OECD tax-benefit model and sections 3 to 7 describe the five panels characterizing the Scoreboard as well as the indicators used in each panel.

Figure 1.1. Structure of the Policy Evaluation Scoreboard

Content of the Excel file for a given family type.



2. The OECD tax-benefit model

1. The OECD tax-benefit model incorporates detailed policy rules for tax liabilities and benefit entitlements as they apply to individual working-age families across OECD and EU countries. Its main use is to calculate the amount of taxes that people are liable to pay, and the government transfers they are likely to receive, in different family and labour-market situations. Income tax liabilities and benefit entitlements are calculated for a broad set of stylised families ("vignettes", e.g. a married couple of 40 years old adults with two children aged 4 and 6 respectively). Many characteristics of these synthetic families can be freely chosen and typically aim to illustrate the functioning of policy mechanisms as well as the consequences of policy reforms on relevant family and labour market situations.

2. The calculator considers the legal policy rules of all EU Member States and all OECD member countries except Mexico. For most of these countries, results are available for every year starting in 2001.The policy scope of the calculator is broad and includes the main taxes on employment income (earnings), social security contributions paid by employees and employers, the main cash and near-cash benefit programmes: unemployment benefits, family benefits, guaranteed minimum-income benefits, employment-conditional ("in-work") benefits and cash housing benefits for rented accommodations. Disability benefits, childcare support and parental leave benefits are included for a sub-set of countries and years. The most important policy areas that are outside the scope of the model include taxes on wealth, e.g. taxes on immovable and unmovable properties, indirect taxes, e.g. VAT, (early-) retirement benefits, sickness benefits and in-kind transfers, e.g. free school meals, subsidised transport and free health care.

3. The central output of the model is the tax-benefit position and total net household incomes calculated for "typical" households. The appropriate choice of these "typical" circumstances, e.g. levels of earnings, age and number of children, years of social security contributions, etc., depends, to a large extent, on the purpose of the analysis. For instance, a number of recent policy initiatives are targeted specifically towards low-wage workers and include measures aimed at "making work pay" or providing adequate income levels for those without a job. Immervoll and Pearson (2009) and Immervoll et al. (2010) have focused on these specific target groups and used output from the OECD tax-benefit calculator to show the consequences of reforms as well as possible trade-offs between different policy objectives. Other work based on the OECD tax-benefit calculator examined households at different decile points of the male and female earnings distributions (D'Addio and Immervoll, 2010) and studied the effect of the gender wage gaps on work incentives (Immervoll et al., 2015). OECD (2015) extended further the OECD tax-benefit model to include minimum wage policies whereas Browne and Neumann (2017) used the special childcare module of the calculator to analyse childcare policies in EU countries.

4. Tax liabilities and benefit entitlements in most countries depend on more than just household composition and earnings levels: other factors such as housing costs, tax-deductible expenditures, social security contribution records, participation in employment activation programmes, unearned income and assets held are often also taken into account. Presenting results that varied along each of these dimensions would rapidly become intractable. For this reason, the OECD tax-benefit calculator works by making a series of standard assumptions in all these and other areas as needed, so as to keep the number of outputs and the related analysis manageable. Although most of these assumptions can be changed in principle, they are useful as a conceptual anchor that enables consistent comparisons of policy indicators across countries and over time.

5. Key standard assumptions are outlined in Box 2.1 below. A detailed illustration and discussion of the assumptions underlying the OECD tax-benefit model can be found in this methodology document.

Box 2.1. Standard assumptions of the OECD tax-benefit calculator

Calculating tax liabilities and benefit entitlements requires information on a wide range of household and individual characteristics. The calculator is typically used to produce outputs for a variety of income levels and household compositions, but leaves other characteristics fixed so as to keep the number of outputs manageable. In some cases, simplifying assumptions are made to enhance easy understanding of the model outputs or to facilitate cross-country comparison. For example:

- Households are assumed to have no unearned income or assets (or at least, have a low enough level of unearned income and assets that their tax-benefit position is unaffected);
- Households are assumed no to use "itemized" tax deductions that may be available for specific expenditure categories, such as commuting costs (where available, standard tax deductions are applied instead);
- In cases where the extended family or a former spouse is expected to provide financial support to those with no resources of their own, it is assumed that such support is not forthcoming.

In other cases, the model assumes "common" values for certain characteristics, or characteristics that are well-suited for illustrating relevant policy mechanics. Most notably:

- In most scenarios, adults are assumed to be 40 years old whereas families with children have typically two children aged 6 and 4.
- Individuals who are out of work and entitled to contributory unemployment benefits are assumed to have been in work and making social security contributions for a "long" time to ensure that they meet the conditions of a full contribution record.
- Housing costs are assumed to be 20% of the national average wage for all household types. While this may be "high" for some low-income households in particular, it allows the model calculation to capture any applicable ceilings to the housing costs that are applicable to housing-benefit claims in some countries.
- All adults in the household are assumed to comply with any job search conditions for receiving benefits.

- In countries with regional differences in the operation of the tax-benefit system, the model uses the default scheme set by central government where that exists, or else takes the scheme operating in a 'typical' region or state.

These are all reasonable assumptions to make and small variations often make little difference to the results. Assumptions can also be changed in situations where this is necessary (for example, when analysing the impact of childcare costs on parents' financial work incentives, younger ages of children are assumed, and the model is frequently also run without housing costs to examine the position of owner-occupiers).

Finally, the calculator provides results for a range of scenarios which should be read in conjunction (for instance, net replacement rates are typically calculated both with and without contributory benefits to account for the situations of those with short contribution records or who may not comply with relevant job-search conditions). Nonetheless, it is important to keep these assumptions in mind when interpreting results. For instance, job-losers with very short contribution records will frequently receive much lower (or no) unemployment insurance benefits.

2.1.1. Population versus household-based simulation models

6. The OECD tax-benefit calculator uses a synthetic household approach, that is to say, it simulates taxes and transfers for a broad set of hypothetical households. An alternative approach is to use population-based microsimulation models, which simulate tax liabilities and benefit entitlements for all possible individuals and households included in a particular survey.[1]

7. Using microsimulation models in conjunction with representative survey data allows estimating impacts of policy reforms on the whole population rather than on selected household types. Results are therefore particularly useful to estimate the budget implications of policy reforms as well as impacts on poverty and overall income inequality. However, since policy impacts depend on the population to which they are applied – for example, a progressive tax schedule will achieve more redistribution in a country where market income inequality is higher – cross-country comparisons of the impacts of policy reforms will reflect both differences in the policies themselves *and* population differences.

8. Household-based simulation models do not require the use of survey data and are therefore suited for studying how tax-benefit policies work and interact with one another. This makes these models particularly useful for cross-country comparisons as policy differences can be shown for the same household situations across countries. As household types can easily be held constant also over time, these models can be used to identify the "pure" policy effects of reforms introduced over a particular time period.[2] Also, they are valuable for monitoring exercises and for statistical analyses to explore associations or causal links between different socio-economic outcomes (e.g. labour-force participation) on one side and policy configurations (e.g. the generosity of out-of-work support) on the other.

[1] Microsimulation models can be developed also using administrative data or mixed survey-administrative data.

[2] Models that use survey or administrative data need to employ complex decomposition techniques in an attempt to separate reform effects from demographic and labour-market changes that are occurring in parallel.

9. Because of their focus on policy mechanics, standard output of synthetic-household simulation models are *policy* indicators, i.e. indicators of the *design* of policies rather than their *outcomes*.[3] Widely used indicators derived from the OECD tax-benefit calculator include Net Replacement Rates (NRRs), Participation Tax Rates (PTRs) and Marginal Effective tax Rates (METRs). These and other indicators form an integral part of policy-evaluation exercises and formulation of policy reform proposals, or are used to compare policy features between countries and across time (Immervoll et al., 2004). Many of these indicators are regularly updated and published in the OECD and Eurostat websites.[4]

10. In practice, household simulation models and survey-based microsimulation models are useful complements. The former facilities the understanding of key policy mechanics and interactions but this information is limited to the hypothetical households under consideration; the latter can offer results that are representative for the whole population, but are more difficult to interpret because of the interactions between policy mechanics and the composition of the underlying population. Also, hypothetical household simulation models provide further insights for specific population groups that are typically underrepresented in standard survey data. They are also useful when the lack of survey information prevents the simulation of certain benefits (e.g. the lack of the whole contribution record for the calculation of unemployment benefits).

11. The remaining of this report describes how to interpret changes in the policy indicators included in each panel of the policy evaluation scoreboard.

[3] The Gini index of income inequality and the poverty head count ratio are examples of outcome indicators. Differently from policy indicators, outcome indicators require information on, and are therefore dependent to, the population to which they refer to.

[4] See e.g. the project website and the Tax and Benefit Indicators Database of the European Commission.

3. Panel A: "Bird's eye view" of policy changes

12. A simple visual inspection of the tax-benefit schedules across the whole earnings range before and after the reform can be informative for the evaluation of a reform. For this reason the left part of the scorecard shows graphically each sub-component of the net household income (vertical axis) as a function of the gross household earnings (horizontal axis) in the two scenarios under consideration. The following income components are considered:

- Figure A.1: Overall net household income
- Figure A.2: Social Assistance entitlements
- Figure A.3: Family Benefits
- Figure A.4: Cash housing supplements
- Figure A.5: Employment-conditional ("in-work") benefits
- Figure A.6. Unemployment benefits entitlements
- Figure A.7: Employee social security contributions payments
- Figure A.8: Income tax liabilities

13. Income amounts illustrated in each figure are typically the algebraic sum of "similar" benefit programmes or "similar" taxes. For instance, social security contributions payments include typically health and unemployment insurance contributions. Similarly, tax allowances are subtracted from the overall Income tax liabilities whereas family benefits can include e.g. a basic child allowance for families with children and a special support allowance for families with many dependent children. The exact content of each income component is described in the online policy documentation of the OECD tax-benefit calculator.

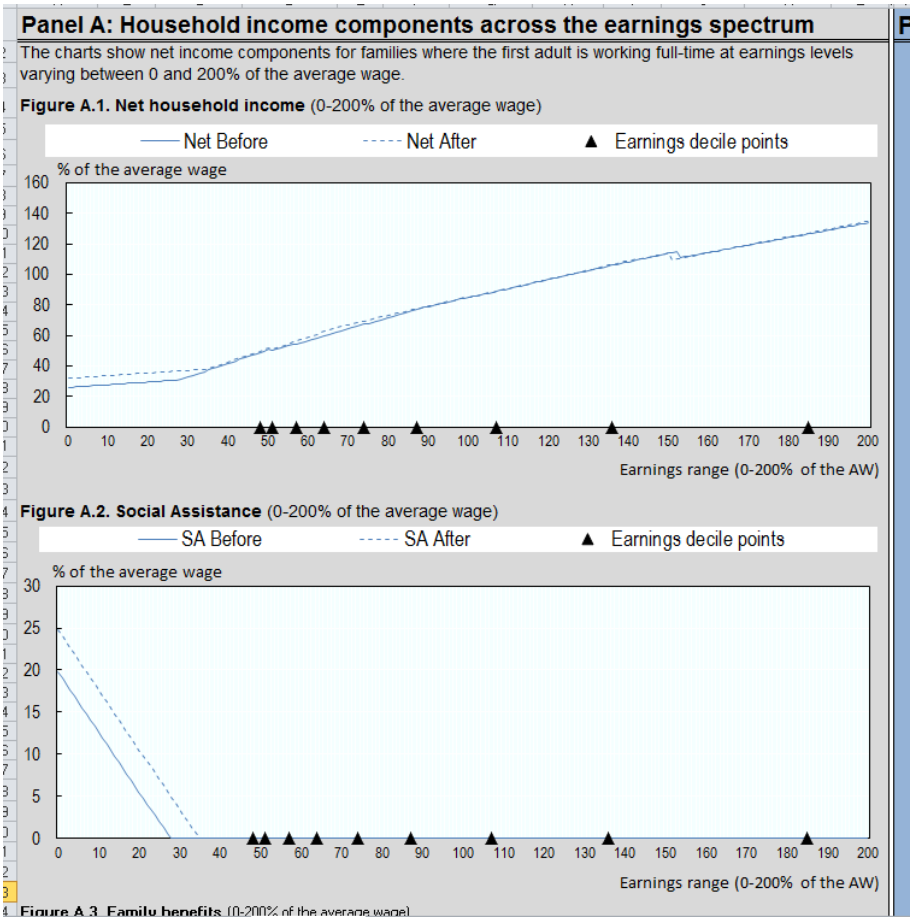
14. Axes of Figures A.1 to A.8 are expressed as a function of the Average Wage (AW). The horizontal axis ranges between 0 and 200 per cent of the AW for both singe-adult families and one-earner couple families, and between x and 200 + x per cent for two-earner couple families, where x is the (fixed) earnings level of the "second adult" family member.[5]

[5] Following the terminology used in the methodology document of the OECD tax-benefit model, adult household members are referred to as the "first" and the "second" adult. Sometimes, the first adult is referred to as the "principal" whereas the second is the "spouse". The two types of adults have a different role in the OECD tax-benefit model. The first adult is always the person whose situation can change with respect to a particular model parameter, e.g. the months of unemployment, the earnings levels, the hours of work, etc. The second adult does not perform any particular action within the model. If the second adult is not working then this person is assumed to comply with any existing behavioural requirement needed for benefit eligibility. For instance, if the employment record of the second adult is relevant for defining benefit eligibility then this requirement is assumed to be met.

15. An important assumption to consider when reading these figures is that working adult household members are employed *full-time* and that the household can be entitled to social assistance and cash housing support as applicable.[6]

16. Figure 3.1 shows a screenshot of Figures A.1 ("overall net household income") and A.2 ("social assistance") for the case of an hypothetical reform assessment. The black markers shown in the horizontal axis are the nine earnings decile points of the earnings distribution. These points are calculated using the methodological framework developed in D'Addio and Immervoll (2010) and refer to the overall individual distribution of full-time earnings.[7] The hypothetical reform considered in this example increases net household incomes at low earnings levels. From Figure A.2 one can see that this is the result of higher social assistance entitlements.

Figure 3.1. Screenshot of Panel A – Figures A.1 and A.2



[6] The figures in this part of the scorecard assume that the person is working at 100% of the statutory full-time working hours.

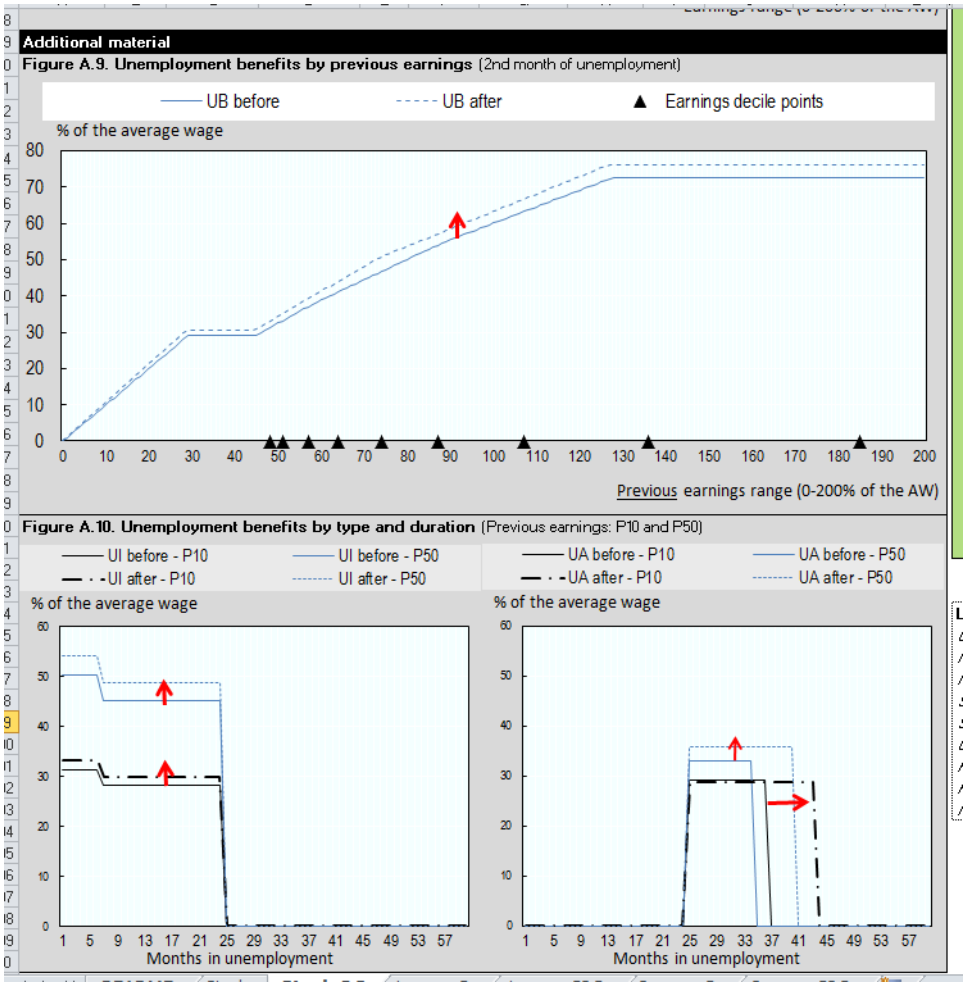
[7] For two earner families the location of the deciles points depends on the earnings of the second adult. For instance, if the earnings level of the second adult is 67 per cent of the average wage and the first decile point is 40 per cent of the average wage, then the location of the first black marker is at 107 per cent of the average wage.

17. Two additional figures complete the information provided in this part of the Scoreboard. Both figures consider the case of a jobseeker who claims unemployment benefits in different circumstances:

- Figure A.9: Unemployment benefit entitlements calculated during the 2nd month of unemployment by previous earning levels.
- Figure A.10: Unemployment benefit entitlements by type, i.e. unemployment insurance and unemployment assistance, and duration of unemployment. Results are provided for two (previous) earnings levels: the "P10", i.e. first decile of the full-time earnings distribution, and the "P50", i.e. the fifth decile (the median) of the full-time earnings distribution.

18. Figure 3.2 shows a screenshot of Figures A.9 and A.10 for the case of a hypothetical reform of unemployment benefits. Results show that the fraction of previous earnings used to calculate unemployment benefit entitlements during the second month of unemployment were increased after the reform (Figure A.9). This result is in line with those in Figure A.10, which shows entitlements by type (unemployment insurance and assistance benefits) and duration (from the first to the 60th month of unemployment). Figure A.10 shows that the reform increased unemployment insurance entitlements as well as the duration of the unemployment assistant programme. For those with median earnings before the job loss the reform increased also the amount of unemployment assistance.

Figure 3.2. Screenshot of Panel A – Figures A.9 and A.10



4. Panel B: Redistributive design and targeting

19. The OECD tax-benefit model can be used to provide an indication about the extent of redistribution performed by tax-benefit systems and how redistribution patterns change following tax-benefit reforms.

20. An assessment of the redistributive impact of a reform can be inferred from the comparison of the net household income before and after the reform for families at different points of the earnings distribution. The policy evaluation scoreboard follows this approach and shows graphically in **Figure 1.B** the percentage change in the net household income calculated at the nine earnings decile points of the full-time earnings distribution and at the "zero earnings" point. The "zero-earnings" point refers to a situation where the first adult is not working and unemployment benefits are either expired or not available. As in this circumstance a family is typically entitled to Social Assistance or Guaranteed Minimum Income (GMI) benefits, the "zero earnings" point in Figure 1.B is particularly useful to analyse changes in minimum income policies.

21. The nine earnings decile points shown in Figure 1.B correspond to the black markers shown also in Panel A. These points are labelled in Panel B as "P10" (the 10th percentile point), "P20" (the 20th percentile point), etc. Figure B.1 uses black diamond markers to show the overall percentage change in net household income. The coloured bars provide instead the exact contribution of each income component to the overall change in the net household income. These bars facilitate the identification of the policy levers that drive the observed changes in the net household income.

22. The exact contribution of taxes and benefits to the overall change in net incomes is calculated as the difference of each income component in the two scenarios (e.g. benefit entitlements in year t+1 minus benefit entitlements in year t) relative to the overall net household income in the baseline scenario (e.g. year t). Let us consider a tax-benefit system with only one tax (T) and one benefit (B). The percentage change in the net household income (Net) for a family with a given earnings level (Gross) can be decomposed as follows:

$$\frac{Net_{t+1} - Net_t}{Net_t} = \frac{Gross_{t+1} - T_{t+1} + B_{t+1}}{Net_t} - \frac{Gross_t - T_t + B_t}{Net_t} = \quad [1]$$

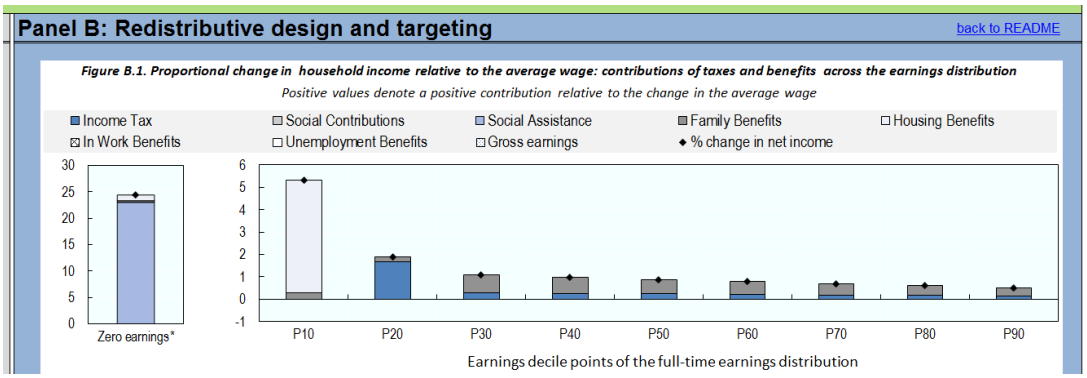
$$= \left(\frac{Gross_{t+1} - Gross_t}{Net_t}\right) - \left(\frac{T_{t+1} - T_t}{Net_t}\right) + \left(\frac{B_{t+1} - B_t}{Net_t}\right)$$

23. Results in figure 1.B are organised in a way that positive values refer to an increase in incomes *relative to the change in the average wage* between the two scenarios. This should be kept in mind when the assessment is between two past years in countries with significant earnings growth. In this case the increase in benefit entitlements can show up with a negative coloured bar if this increases in benefit entitlements is lower than the increase in the average wage.

24. The exact decomposition of the proportional change in the net household income depends also on the change in the distribution of gross earnings (see Equation 1). For instance, if market incomes increase more quickly at the top of the earnings distribution, then $Gross_{t+1} > Gross_t$ for higher earnings levels and this will result in a positive change in net incomes (other things being equal). Similarly, since the quantities in Equation 1 refer to the household as a whole, the results in Figure 1.B for the case of a two-earner couple will depend also on the change in the gross earnings level of the second adult. For instance, if the second adult is working at the minimum wage and a reform modifies the statutory minimum wage level, this reform will probably affect the net household incomes of this family. The scorecards for two earner couples generally assume that the second adult is working full-time at median earnings.

25. **Figure 4.1** shows a screenshot of Figure 1.B for the case of a hypothetical reform assessment. The positive black markers means that the overall change in net income is positive relative to the average wage. The increase in net incomes is particularly pronounced at the bottom of the earnings distribution and especially at the zero-earnings point where the overall change is about 25%. Looking at the change in the individual income components, one can see that results are driven by lower income tax liabilities (dark-blue bars) for low earners (see e.g. the P20 value in Figure 4.1, which refers to the 20th percentile of the earnings distribution) and by higher family and housing benefit entitlements (dark-grey bars and smoked-white bars). Families at the zero-earnings point are significantly better off after the reform as a result of the increase in GMI benefit entitlements (light-blue bar)

Figure 4.1. Screenshot of Panel B – Figure 1.B



26. As a hypothetical household simulation model, the OECD tax-benefit calculator cannot be used to estimate the distributional effects of a policy among the whole population.[8] Calculating summary measures of tax progressivity (Kakwani, 1977), income inequality (Gini, 1912) and redistribution (Reynolds and Smolensky, 1977) requires the use of large-scale microsimulation model in conjunction with representative data on the household population. However, it is also possible to compute these measures using only a limited number of data points, but it is important not to use these results to

8. To estimate the distributional impact of a reform for the whole household population using the OECD tax-benefit calculator one would have to take into account the differential impact of the reform *between* household types and the distribution of the household types across the income range, as well as the distributional impact within households of the same type at different income levels.

Source: OECD (2016)

making an inference on a population broader that than those from which the results originate (e.g. for other household types or for the population as a whole).[9] With this key caveat in mind, the Scoreboard provides in a separate table of Panel B a summary index of REdistributive Design ("*RED*" index), adapted from Reynolds and Smolensky (1977), and computed using the same ten data points shown in Figure B.1. **Box 2** describes the main features of the RED index.

27. The *RED* index provides a useful summary measure of the redistributive design of tax-benefit policies for specific household types (e.g. one-earner couples with children *only*) across the earnings distribution. Positive changes after a policy reform imply a greater degree of redistribution through the tax-benefit system for a selected household type, while negative changes mean that the reform is regressive. The *RED* index can be decomposed into policy levers and, for each of lever, one can compute the two components driving the overall redistributive design: "the size" (or "incidence") and the "progressivity":

- The size component of the *RED* index is a function of the average tax (or benefit) rate. This rate is computed as total tax liabilities (or benefit expenditures) divided by total amount of gross income. Higher values indicate higher benefit spending or lower tax revenues.
- The progressivity component is measured by the *Kakwani* index. Positive values denote a higher concentration of the policy instrument (tax or benefit) at high income levels (this is typically the case for progressive taxes), whereas negative values indicate a higher concentration at low income levels (this is typically the case for social benefits).

Box 4.1. The RED index

The RED index draws on the measure of redistribution developed by Reynolds and Smolensky (1977) and is computed as follows:

$$RED = \underbrace{\frac{t}{1-t}}_{Incidence} \cdot \underbrace{K}_{Progressivity}$$

Where *t* is the average tax (or benefit) rate, and *K* is the Kakwani index. The Kakwani index is a well-known measure of progressivity (or "targeting") and is calculated as the difference between the concentration index of tax liabilities and the Gini index on the gross income distribution. The average tax rate, t, is calculated as the total tax liabilities divided by the total gross income of the selected households. Benefit entitlements enter the index as negative taxes (– *t*).

The key difference between the RED index and the original index described in Reynolds and Smolensky (1977) is that the RED index does not consider the

9 . Consider the case of an increase in the tax-free threshold in an individual-based income tax system that reduces income tax liabilities for each taxpayer by a fixed cash amount. *Within* any given household type, this fixed cash amount will represent a larger percentage of income for lower-income households. But two-earner couples, who tend to be found at higher levels of the household income distribution, will benefit twice as much as single-earner couples who are typically found lower down. The impact on overall income inequality in the population is therefore ambiguous.

(residual) change in redistribution driven by the re-ranking of some households as a consequence of the tax-benefit rules. This residual component has little scope in an evaluation framework based on few households located at different earnings decile points.

The decomposition of the RED index above shows that a tax has some redistributive power as long as is progressive. A tax schedule that is exactly proportional to gross income will have a *K* equal to zero, as the concentration of tax liabilities would be exactly the same as the distribution of gross income. Instead, a tax schedule that generates larger tax liabilities as a percentage of gross income for higher-income groups will have a positive effect on redistribution.

The decomposition shows also that the overall redistributive effect of a tax / benefit depends on its size / incidence: a "small" benefit amount will not change the difference between the Gini coefficients before and after the benefit, even if that benefit is highly progressive.

The RED index can be conveniently decomposed into the sum of the progressivity and incidence components of each individual element of the tax-benefit system. Assuming a tax-benefit system with only one benefit (b) and one tax (t), the RED index can be written as:

$$RED = \frac{1}{1-(I_t - I_b)} \cdot (I_t K_t - I_b K_b)$$

Where I_t is the incidence of the tax, i.e. $I_t = \frac{t}{1-t}$, I_b is the incidence of the benefit, i.e. $I_{\mathrm{b}} = \frac{-b}{1+b}$, K_{b} and K_{t} are the *Kakwani* indices computed for benefit *b* and tax *t*, respectively.

Recent contributions using the RED index to analyse the effect of tax-benefit reforms on redistribution policies are Immervoll et al. (2015) and Browne and Immervoll (2018).

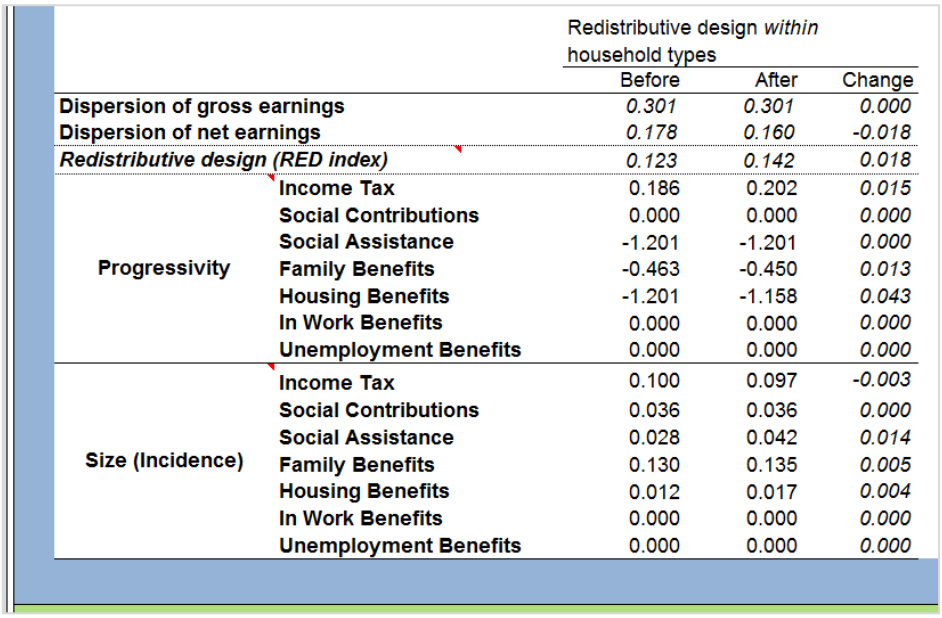
28. **Figure 4.2** shows the individual components of the RED index for the hypothetical reform illustrated in Figure 4.1. Overall, after the reform, the RED index increased from 0.123 to 0.142, leading to a lower dispersion of net incomes (from 0.178 to 0.160).[10] The decomposition of the RED index into policy components shows that social assistance, family and housing benefits have all a negative progressivity parameter. This is what one would expect when benefit entitlements are more concentrated at lower earnings levels. More generally, positive values of the progressivity parameters point to a higher concentration of tax liabilities / benefit entitlements at high earnings levels (this is typically the case for progressive tax systems), whereas negative values indicate a higher concentration at low earnings levels (this is typically the case for targeted benefits). The reform under analysis increases the progressivity of family and housing benefits (the progressivity parameter of family benefits increases from –0.463 to –0.450), and also of the income tax (the progressivity parameter increases from 0.186 to 0.202).

29. The size (or "incidence") parameter of the income tax shown in the lower part of Figure 4.2 is calculated by dividing the overall tax burden with the overall gross income

[10] Income dispersion is calculated using the Gini index.

of the ten family circumstances considered in Figure 1.B.[11] In general, higher (lower) values of the incidence parameters are associated with higher (lower) benefit entitlements and / or higher tax liabilities. Results in Figure 4.2 show that tax revenues decreased after the reform while spending for social assistance, family and housing benefits was increased.

Figure 4.2. Screenshot of Panel B – the RED index



		Redistributive design *within* household types		
		Before	After	Change
Dispersion of gross earnings		*0.301*	*0.301*	*0.000*
Dispersion of net earnings		*0.178*	*0.160*	*-0.018*
Redistributive design (RED index)		*0.123*	*0.142*	*0.018*
Progressivity	**Income Tax**	0.186	0.202	*0.015*
	Social Contributions	0.000	0.000	*0.000*
	Social Assistance	-1.201	-1.201	*0.000*
	Family Benefits	-0.463	-0.450	*0.013*
	Housing Benefits	-1.201	-1.158	*0.043*
	In Work Benefits	0.000	0.000	*0.000*
	Unemployment Benefits	0.000	0.000	*0.000*
Size (Incidence)	**Income Tax**	0.100	0.097	*-0.003*
	Social Contributions	0.036	0.036	*0.000*
	Social Assistance	0.028	0.042	*0.014*
	Family Benefits	0.130	0.135	*0.005*
	Housing Benefits	0.012	0.017	*0.004*
	In Work Benefits	0.000	0.000	*0.000*
	Unemployment Benefits	0.000	0.000	*0.000*

30. Panel B of the Scoreboard provides another set of summary measures that can help assess the impact of the reform on income adequacy for those who are out of work receiving minimum income benefits as applicable, and for those who are in low-paid work:

a) Equivalised net household income of jobless individuals who are not entitled to unemployment benefits expressed as a percentage of the equivalised median disposable income in the population.[12] This indicator can be used to measure the "distance" of the family income from a poverty line defined as a fixed percentage of the median disposable income. For instance, a value below 60 implies that the net family income is below 60% of the median equivalised disposable income in the population, which is the standard poverty line used by Eurostat to calculate the at-risk-of-poverty rate. The equivalence scale used in the calculations is the square root of the household size.

b) Hours of work per week a family has to work at the minimum wage to escape poverty. In countries without a statutory minimum wage this indicator is computed using the 10th percentile of the full-time earnings distribution.

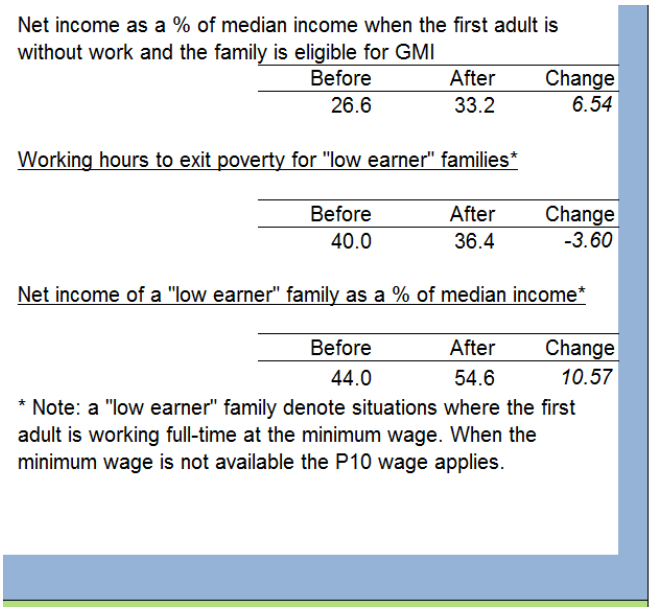
[11] Incidence parameters related to benefits rather than taxes are calculated in a similar manner as a benefit can be considered as "negative" tax

[12] Information on the distribution of disposable incomes in the population is from the OECD Income Distribution Database..

c) Equivalised net household income of a low-earner employee working full-time at the minimum wage expressed as a percentage of the equivalised median disposable income in the population.

31. Figure 4.3 shows that the hypothetical reform considered previously increased benefit adequacy for minimum income benefit recipients. Also, the reform reduced the number of hours necessary to work at the minimum wage to exit poverty from 40 to 36.4. Finally, the last results reported in Figure 4.3 shows that the net income of a "low-earning" family increased from 44 to 54.6% of the equivalised median income.

Figure 4.3. Screenshot of Panel B – Income adequacy indicators



Net income as a % of median income when the first adult is without work and the family is eligible for GMI

Before	After	Change
26.6	33.2	*6.54*

Working hours to exit poverty for "low earner" families*

Before	After	Change
40.0	36.4	*-3.60*

Net income of a "low earner" family as a % of median income*

Before	After	Change
44.0	54.6	*10.57*

* Note: a "low earner" family denote situations where the first adult is working full-time at the minimum wage. When the minimum wage is not available the P10 wage applies.

32. The analysis provided in this part of the scorecard only accounts for the mechanical change in households' incomes from tax-benefit changes: the model assumes that households do not respond to the changes in incentives that result from changes to the tax and benefit system that might induce them to move into paid work or increase their earnings. The scorecard therefore also includes an analysis of how tax and benefit changes affect summary measures of work incentives, which provides an indication about the likely nature and size of any behavioural responses.

5. Panel C: Financial work incentives

33. Panel C of the Scoreboard provides two measures of work incentives: the financial incentive to move into paid work (as opposed to not working), measured by the Participation Tax Rate (**PTR**), and the incentive for an employee to increase their earnings, measured by the Marginal Effective Tax Rate (**METR**). The Scoreboard shows *PTRs* and *METRs* before and after the reform and provides an exact decomposition of the change in these measures into tax and benefit components.

34. *PTRs* and *METRs* measure the fraction of any additional earnings that is lost to either higher taxes or lower benefits when individuals take up a new job (*PTR*) or increase their number of working hours (*METR*). Increasing working hours are given as a percentage of statutory full-time work. For instance, a METR in Panel C with label "33>>67" means that the worker makes a transition from about 13 hours per week to 27 hours per week.[13] PTR and METR are calculated as follows:

$$PTR/METR = 100\% - \frac{\Delta y_{net}}{\Delta y_{gross}}$$

35. Where Δy_{net} and Δy_{gross} denote the change of net and gross household income after the transition from one state to another. Higher PTRs/METRs indicate *weaker* work incentives.

36. *PTRs* are shown in the Scoreboard for jobless individuals who are not eligible to unemployment benefits (e.g. because their entitlements have expired) and who can receive social assistance and housing benefits subject to relevant eligibility conditions. Two sets of PTRs are provided in the Scoreboard: "short-term" *PTRs* (**Figure 1.C**) capture financial incentives to undertake paid work assuming availability of any temporary ("transitional") benefit paid to individuals who makes a transition into paid work (as applicable). When available, these temporary into-work benefits are calculated on an annualized basis assuming two months of work in the new job. "Long-term" *PTRs* (**Figure 2.C**) consider cases where the employee is not eligible to any temporary payments for moving into work. Both long-term and short-term PTRs assume full-time employment and are calculated at the 10th, 20th, 30th, 50th and 70th percentiles of the full time earnings distribution.

37. *METRs* are computed assuming a fixed hourly wage rate for the case of a median full-time earner. Social assistance and housing benefits are assumed to be available subject to relevant eligibility conditions. **Figure 3.C** in the Scoreboard shows the following METRs (expressed as a percentage of statutory full-time work): i) from 33 to 67%; ii) from 67 to 100% iii) from 50 to 100%, and from 100 to 150%.

[13] *PTRs* and *METRs* should not be confused with the indicator "Effective Tax Rate on Labour" described in Panel E. This indicator measures the net taxes for a particular employee as a percentage of total labour cost for the employer and does not relate *to a change* in earnings or hours worked.

38. Changes in PTRs and METRs are shown in Figures from 1.C to 3.C using black diamond markers. Similarly to Figure 1.B, these changes are decomposed into policy components (coloured bars) to facilitate the calculation of the exact contributions of each policy lever to the overall change in work incentives. Box 3 illustrates the decomposition of changes in PTRs and METRs.

Box 3. Decomposition of changes in participation and marginal effective tax rates into income components

This Box illustrates the decomposition of changes in PTRs / METRs into policy components and describes how to interpret the results. Let us consider a tax-benefit system with just one benefit (BEN) and one tax (TAX). The METR / PTR for an increase in gross earnings from level A to level B in period T is:

$$METR_T = 1 - \frac{\Delta NetY_{B>A}}{\Delta Gr_{B>A}} = 1 - \frac{Net_{B,T} - Net_{A,T}}{Gr_{B,T} - Gr_{A,T}} = 1 - \frac{(Gr_{B,T} + BEN_{B,T} - TAX_{B,T}) - (Gr_{A,T} + BEN_{A,T} - TAX_{A,T})}{Gr_{B,T} - Gr_{A,T}}$$

$$= 1 - \frac{(BEN_{B,T} - BEN_{A,T}) - (TAX_{B,T} - TAX_{A,T})}{Gr_{B,T} - Gr_{A,T}} = 1 + \frac{(TAX_{B,T} - TAX_{A,T}) - (BEN_{B,T} - BEN_{A,T})}{Gr_{B,T} - Gr_{A,T}}$$

$$= 1 + \frac{\Delta TAX_T}{Gr_{B,T} - Gr_{A,T}} - \frac{\Delta BEN_T}{Gr_{B,T} - Gr_{A,T}}$$

This equation shows that METRs / PTRs can be decomposed into policy components where each component measures the change in a particular tax or benefit amount relative to the change in gross earnings. The equation shows also that a means tested benefit, i.e. a benefit where $BEN_{B,T} - BEN_{A,T} < 0$, tends to increase the METR as $(BEN_{B,T} - BEN_{A,T})$ enters the METR equation with a negative sign.

Let us now consider the difference between METRs in period T+1 and in T:

$$METR_{T+1} - METR_T = \frac{[(TAX_{B,T+1} - TAX_{A,T+1}) - (TAX_{B,T} - TAX_{A,T})]}{Gr_{B,T} - Gr_{A,T}} - \frac{[(BEN_{B,T+1} - BEN_{A,T+1}) - (BEN_{B,T} - BEN_{A,T})]}{Gr_{B,T} - Gr_{A,T}}$$

$$= \frac{[\Delta TAX_{T+1} - \Delta TAX_T]}{Gr_{B,T} - Gr_{A,T}} - \frac{[\Delta BEN_{T+1} - \Delta BEN_T]}{Gr_{B,T} - Gr_{A,T}}$$

This equation shows that the change in METRs / PTRs is the sum of changes in each income component relative to the change in gross earnings.

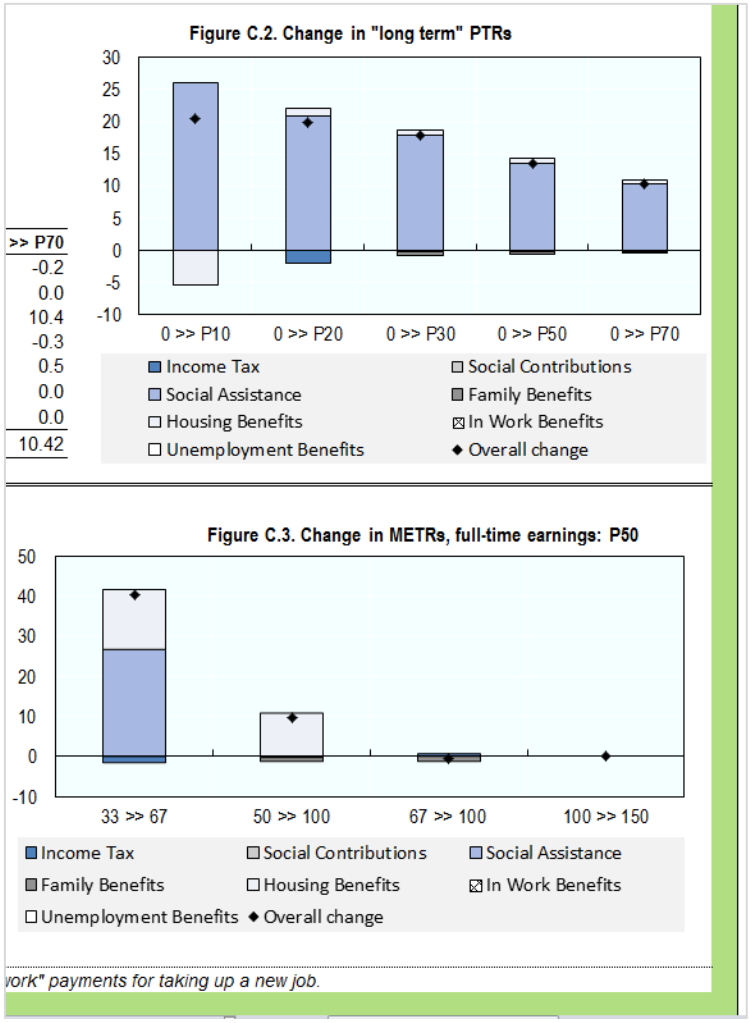
Consider a means tested benefit such that $\Delta BEN_T = (BEN_{B,T} - BEN_{A,T}) < 0$. In such case, a policy reform in period T+1 that increases this benefit for individuals with earnings equal to level A, i.e. $BEN_{A,T+1} > BEN_{A,T}$, will imply that $\Delta BEN_{T+1} = (BEN_{B,T+1} - BEN_{A,T+1})$ becomes larger in absolute terms compared to period T. As $\Delta BEN_{T+1} - \Delta BEN_T$ increases in absolute terms, this induces a positive change in the METR from period T to period T+1.

This equation shows also that changes in benefit entitlements do not have any effects on PTRs and METRs as long as benefit amounts do not depend on earnings. In this case $BEN_{B,T} = BEN_{A,T}$ and $\Delta BEN_{T+1} - \Delta BEN_T$ would be always equal to zero irrespective of reforms that change benefit entitlements in period T+1.

39. **Figure 5.1** shows that the effects of the hypothetical reform under consideration on work incentives. Increases in social assistance and housing benefit entitlements weaken work incentives to move into work (i.e. increase PTRs, see black diamond

markers in figure 5.1) as families now have more social assistance and housing benefit to lose when they take up employment. This is partly offset by lower income taxes (especially for those at the P20, dark-blue bars) and higher housing benefits in work (for those at the P10, smoked-white bars) since a lower proportion of earnings is lost due to higher income tax liabilities and lower housing benefit entitlements when moving into work at lower earnings levels. Marginal effective tax rates increase at low earnings levels (Figure C.3 in the screenshot below). This is because of the increase in social assistance and housing benefit entitlements, which means that these benefits now extend to higher income levels and so benefit recipients face benefit withdrawal at steep rates when they increase their earnings.

Figure 5.1. Screenshot of Panel C – Figures C.2 and C.3



6. Panel D: Benefit generosity for unemployment benefit recipients

40. This part of the Policy Evaluation Scoreboard shows the **Net Replacement Rate** (*NRRs*) over the length of an unemployment spell, i.e. the proportion of the net household income *before* the job loss that is maintained after 1, 2, 3 ..., 60 months of unemployment. Net income is defined in relation to the household as a whole after consideration of all relevant types of taxes and benefits.[14] NRRs are defined as follows:

$$NRR_t = \frac{y_{out\ of\ work,t}}{y_{in\ work}}$$

41. Where $y_{in\ work}$ is the net household income before the job loss and $y_{out\ of\ work,t}$ is the net household income while out of work calculated after *t* months of unemployment for a person who made a transition from employment to unemployment.

42. **Figure D.1** in the Scoreboard shows *NRRs* over 60 months of unemployment calculated assuming full-time employment at median earnings before the job loss. In **Figure D.2** previous earnings correspond to the 10th percentiles of the full-time earnings distribution. Unless otherwise specified, net incomes are defined after taxes and benefits including social assistance and housing benefit supplements. Taxes are computed under the assumption that benefits (in the case where the individual is unemployed) and earnings (in the in-work case) remain unchanged during the entire fiscal year.

43. **Figure 3.D** in the Scoreboard shows the percentage changes in the net household income across the unemployment spell of the first adult member assuming the same (previous) earnings levels considered in Figures D.1 and D.2. This figure is similar to Figure 1.B: the black markers show the percentage change in net household incomes calculated in different months of unemployment. The coloured bars provide the exact contribution of each income component to the overall change in the net household income. Given the similarities between Figures 1.B and 3.D, the same considerations and caveat applies (see Chapter 4). In particular, it is worth to keep in mind that results are organised in a way that positive values refer to an increase in incomes relative to the change in the average wage between the two scenarios. This means that an increase in benefit entitlement that does not keep pace with the change in the average wage will show up in Figure 3.D with a negative value.

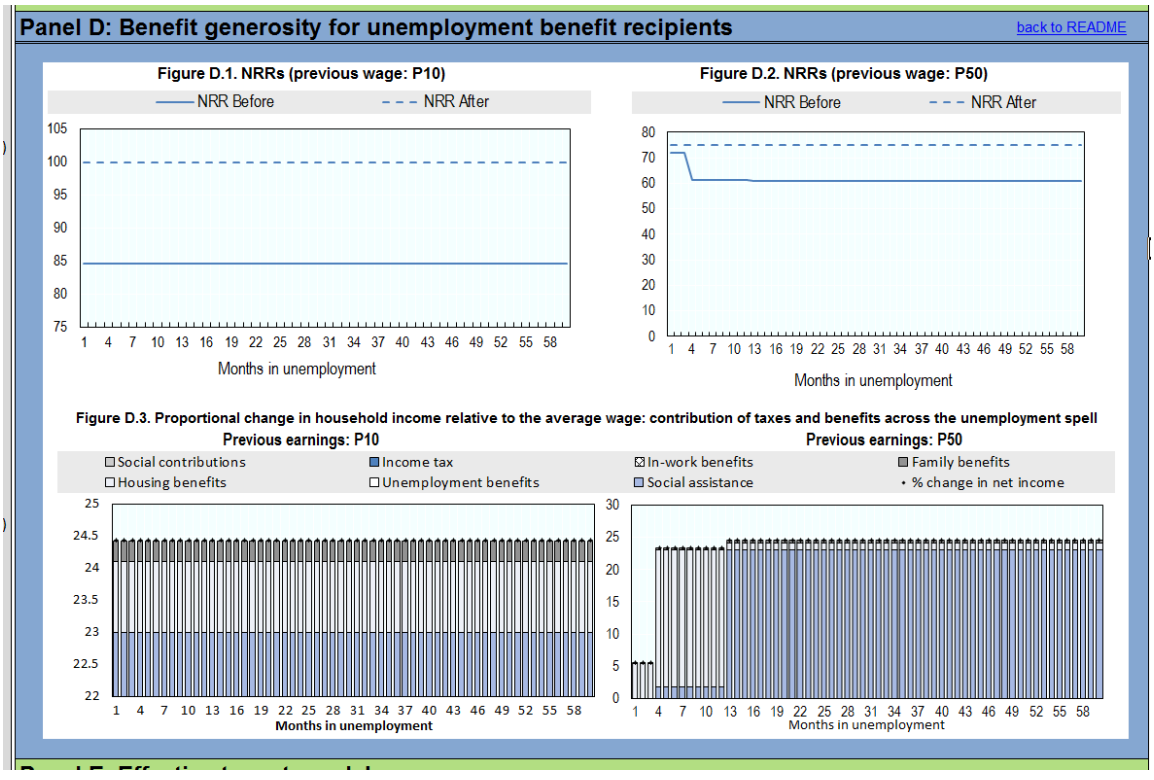
44. Because of the mathematical formulation of the NRRs, an exact decomposition of the change in the NRRs into income components (similar to the decomposition of METRs and PRTs described in Box 3) is not possible. However, the P10 and P50 points shown in Figure 1.B and the information contained in Figure 3.D can be used to disentangle changes in the NRRs across the unemployment spell. In fact, the P10 and P50 points

14. NRRs compare total family resources across two different work situations of the first adult member. As a result, NRRs for two-earner couples are, to a large extent, driven by the employment income of the second earner, whose employment status and hours of work are assumed to remain unchanged following the job loss of the other spouse.

shown in Figure B.1 refer to the (fixed) net household incomes used in the denominator of the NRRs illustrated in Figures D.1 and D.2. Thus, with some degrees of approximation, one can fairly conclude that a NRR will fall if the change in the net income while in work (Figure B.1) is higher than the change in the net income while out of work.

45. Figure 6.1 shows Panel D of the Scoreboard for the hypothetical reform package considered in Chapters 4 and 5. The absence of the white bars in Figure D.3 means that the unemployment benefit amounts did not change in the two reform scenarios (or changed in line with the average wage in case of assessment of past reforms). The change in net incomes during the first three months of the unemployment spell for a jobseeker with median previous earnings (illustrated in the bottom-right figure at Panel D) was about 5%, whereas the change in the in-work income for an employee with median earnings was about 1% (see Figure 1.B). As a result, NRRs increased slightly during the first months of unemployment (from 72 to 76). From the fourth month onwards, the increase in housing benefit (Figure D.3, white-smoked bars) and social assistance entitlements (Figure D.3, light-blue bars) allows the jobseeker to maintain the same replacement rate as in the first three months of unemployment, whereas before the reform there was a significant drop in the NRRs (Figure 2.D).[15]

Figure 6.1. Screenshot of Panel D – Figures D.1 to D.3



[15] Unemployment benefit entitlements in this hypothetical country are constant during the first three months of unemployment, they then decrease and remain constant until month 12 when they are completely withdrawn. Figure D.3 shows that, even for jobseekers with median earnings, after the first three months of unemployment the level of unemployment benefits is below the minimum income threshold.

7. Panel E: Effective tax rate on labour

46. The final Panel of the scorecard (**Panel E**) shows an indicator of effective tax burden for low-earnings employees. This indicator is defined as net taxes (i.e. total taxes and social security contributions paid less benefits received) as a percentage of total labour costs for the employer:[16]

$$ETRL = \frac{(IT + EESC + ERSC) - (BEN)}{GROSS + ERSC}$$

47. Where "$GROSS$" are the gross earnings, "$ERSC$" the employer social security contributions, "$EESC$" the employee social security contributions, "IT" the income tax and "BEN" the sum of all benefit entitlements.

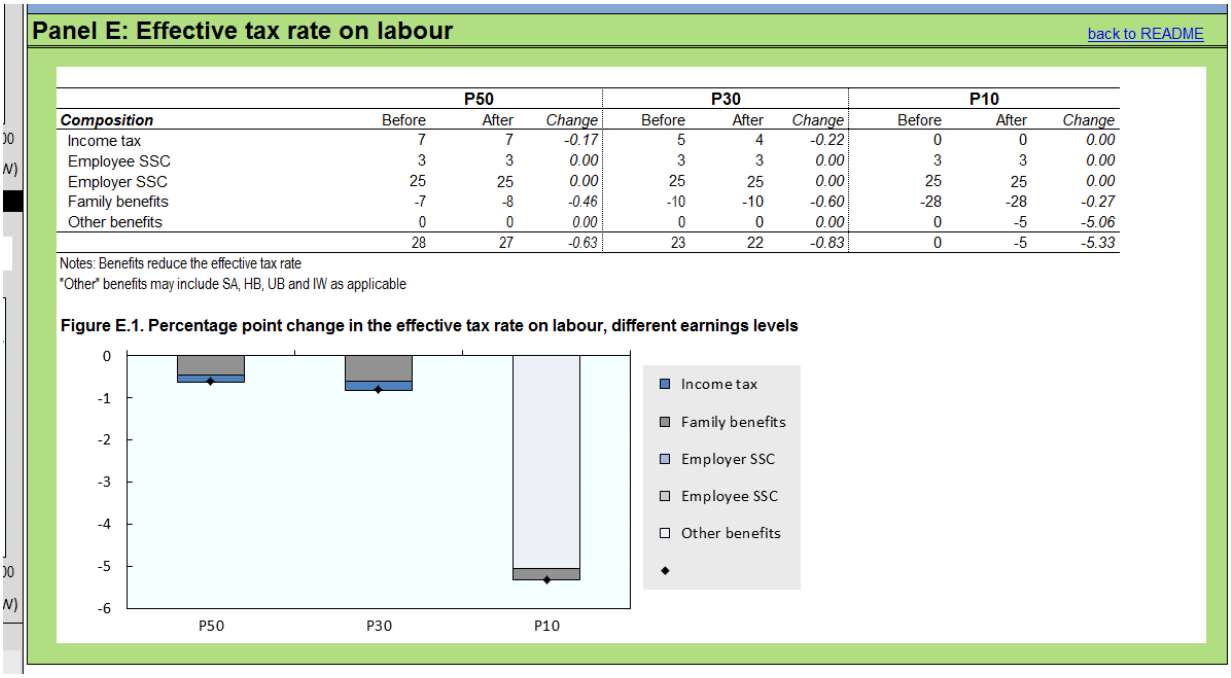
48. The Scoreboard shows for each scenario under consideration the Effective Tax Rate on Labour calculated at three earnings levels: the 10th, 30th and 50th percentiles of the full-time earnings distribution. The indicator is calculated at the family level, so the spouse's earnings enter the computation where applicable, and includes all benefits, including social assistance and housing benefit supplements where the family's income is low enough to be entitled to these benefits (eligibility to social assistance and housing benefit supplements is specified in the scoreboard top panel).

49. In line with the other parts of the Scoreboard, changes in the Effective Tax Rate on Labour are decomposed into income components to facilitate the identification of the policy levers driving the observed overall changes.

50. **Figure 7.1** below shows this part of the scorecard for the hypothetical reform considered previously. In the baseline scenario, the Effective Tax Rate on Labour for a employee working full-time at median earnings is about 28% of total labour costs. Employer social security contributions contribute to about 90% of the overall tax rate on labour while family benefits reduces it of about 7 percentage points. The reform reduces the Effective tax rate on labour calculated at median earnings by 0.63 ppts. This change is driven primarily by higher family benefits (dark-grey bars in Figure E.1 of the Scoreboard) and, to a lesser extent, by lower income taxes (dark blue bars in Figure E.1 of the scoreboard). For low earnings employees with work paid at the 10th percentile of the earnings distribution the Effective tax rate on labour becomes negative due to the higher housing supplements received after the reform at this earnings level (see also Chapter 4, Figure 4.1).

[16] Note that this indicator is similar but not identical to the OECD tax wedge indicator illustrated in the annual OECD publication series "Taxing Wages" (see e.g. OECD 2017). **Box 7.1** describes the main methodological differences in the calculations of the two indicators.

Figure 7.1. Screenshot of Panel E – Figure E.1



Panel E: Effective tax rate on labour

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	P50			P30			P10		
Composition	Before	After	*Change*	Before	After	*Change*	Before	After	*Change*
Income tax	7	7	*-0.17*	5	4	*-0.22*	0	0	*0.00*
Employee SSC	3	3	*0.00*	3	3	*0.00*	3	3	*0.00*
Employer SSC	25	25	*0.00*	25	25	*0.00*	25	25	*0.00*
Family benefits	-7	-8	*-0.46*	-10	-10	*-0.60*	-28	-28	*-0.27*
Other benefits	0	0	*0.00*	0	0	*0.00*	0	-5	*-5.06*
	28	27	*-0.63*	23	22	*-0.83*	0	-5	*-5.33*

Notes: Benefits reduce the effective tax rate

"Other" benefits may include SA, HB, UB and IW as applicable

Figure E.1. Percentage point change in the effective tax rate on labour, different earnings levels

Box 7.1. Methodological differences between the OECD Tax Wedge indicator and the Effective Tax Rate on Labour

While the calculation of income tax and social security payments used to calculate the Effective tax rate on labour are based on the same information used to calculate the OECD Tax wedge indicator, there are some methodological differences that may result in small discrepancies between the two indicators.

Scope – The calculations of the Effective Tax Rate on Labour consider a wider range of benefits, including unemployment benefits, in-work benefits, means-tested family benefits, housing benefits and social assistance benefits. These benefits are not included in the calculation of the tax wedge indicator. Hence, when these benefits interact with the tax system, there may be discrepancies in the income tax liabilities calculated in the two cases.

Also, the Tax Wedge indicator does not include non-tax compulsory payments (compulsory payments to schemes outside of government) as standard in the results, whereas the effective Tax Rate on Labour does. When these social contribution payments affect the amount of income tax paid, for example if they are deductible from taxable income, the Income Tax amounts of the two indicators may differ.

Timing – The Effective Tax Rate on Labour is calculated using the policy rules as they apply on 1st July (1st January from 2018 onwards). The system in place on this date is then annualised (monthly amounts x 12) to give an annual figure. The Tax Wedge indicator looks instead across the fiscal year, and accounts for any within-year changes. For example if a Social Security rate changes mid-year, then

six months of each rate would be included in the calculations whereas the Effective Tax Rate on Labour will be calculated on an annualised amount based on the rate in place on July 1st.

Family Types – For families with children, the Tax Wedge indicator considers two children aged between 6 and 11, with the most generous provision adopted within this range (excluding the case of twins) when benefit amounts vary. By contrast, the effective Tax Rate on Labour assumes fixed ages of 6 and 4. As a result, family benefit entitlements may differ, which could in turn affect the level of Income Tax paid in cases where family benefits and income tax interact.

Annex of OECD (2017) provides a detailed overview of the methodology undelaying the computation of the Tax Wedge indicator.

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