EUROMOD: AN INTEGRATED EUROPEAN TAX-BENEFIT MODEL AND INDICATORS OF WORK INCENTIVES

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1. Introduction

Wage levels together with taxes and social benefits determine the financial attractiveness of different employment options. More generally, the choice among alternative uses of time – including paid and unpaid work as well as leisure activities, is influenced by the net returns to work. These links have been at the centre of policy debates in the European Union and there has therefore been considerable interest in methods for a comprehensive and reliable evaluation, comparison and monitoring of financial work incentives across countries and through time. This paper discusses the usefulness of tax-benefit microsimulation models for

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The data used here are from eleven different sources for fourteen countries. These are the European Community Household Panel (ECHP) User Data Base made available by Eurostat; the Austrian version of the ECHP made available by the Interdisciplinary Centre for Comparative Research in the Social Sciences; the Panel Survey on Belgian Households (PSBH) made available by the University of Liège and the University of Antwerp; the Income Distribution Survey made available by Statistics Finland; the Enquête sur les Budgets Familiaux (EBF) made available by INSEE; the public use version of the German Socio Economic Panel Study (GSOEP) made available by the German Institute for Economic Research (DIW), Berlin; the Living in Ireland Survey made available by the Economic and Social Research Institute; the Survey of Household Income and Wealth (SHIW95) made available by the Bank of Italy; the Socio-Economic Panel for Luxembourg (PSELL-2) made available by CEPS/INSTEAD; the Socio-Economic Panel Survey (SEP) made available by Statistics Netherlands through the mediation of the Netherlands Organisation for Scientific Research - Scientific Statistical Agency; and the Family Expenditure Survey (FES), made available by the UK Office for National Statistics (ONS) through the Data Archive. Material from the FES is Crown Copyright and is used by permission. Neither the ONS nor the Data Archive bear any responsibility for the analysis or interpretation of the data reported here. An equivalent disclaimer applies for all other data sources and their respective providers cited in this acknowledgement.
this purpose. It provides illustrations of different types of work incentive indicator for the European Union using the EUROMOD tax-benefit model.

2. Tax-benefit models

Tax-benefit microsimulation models are useful tools for assessing the terms of the trade-offs between different work situations. They combine information on relevant policy rules with detailed and representative data on individual and household circumstances, typically drawn from household income surveys. For each observation in these data, it is possible to alter the observed employment behaviour and then use the model’s tax-benefit algorithms to assess the resulting net income for each alternative employment state. The income difference between different employment states can then be used as the basis for work incentive indicators. The income differences can be of interest per se or they can be related to observed behaviour in order to study its responsiveness to policy changes.

The great advantage of calculations for nationally-representative samples of households over calculations for particular “typical” household types is that the former capture the diversity of living situations, with each situation given the appropriate weight, so that indicators have relevance across the entire population. This is particularly important for cross-country comparisons since the compositions of national populations differ in relevant respects.

3. EUROMOD

EUROMOD is an integrated microsimulation model of the tax-benefit systems in the fifteen (pre-2004) EU Member States.\(^2\) The model permits common definitions of income concepts, units of analysis, sharing ‘rules’, etc. to be used across countries and therefore is a suitable instrument for computing work incentive measures on a comparable basis. EUROMOD captures the full range of institutional features of tax and benefit systems. This includes detailed income definitions (such as taxable income or the assessed income for income-tested benefit entitlement calculations), definitions of assessment units (such as who counts as a “child” for the purpose of a particular tax or benefit rules), thresholds, floors, ceilings and relevant tax rates as well as specific eligibility rules, withdrawal rates or income disregards used in computing benefit entitlements. The considerable level of detail makes it possible to derive a finely grained picture of tax burdens and benefit entitlements and how these vary with individual and family characteristics. Depending on the country, sample sizes range from 2,500 to over 11,000 households. The datasets used for the illustrations in this paper are listed in Annex 1. For a validation of model results against other sources see Mantovani and Sutherland (2003). Further information on EUROMOD can be found in Immervoll, et al., 1999, Sutherland, 2001 and at [http://www.econ.cam.ac.uk/dae/mu/emod.htm](http://www.econ.cam.ac.uk/dae/mu/emod.htm).

4. What type of incentive indicators?

Individuals face many different types of financial incentives. Their employment behaviour affects their current earnings, tax liabilities and benefit entitlements. It is also likely to have an impact on future income streams and it can affect the incomes of other household members. Moreover, there are different aspects to employment behaviour, notably whether to work at all and, if so, how much and in what type of job. Different indicators are appropriate to investigate how policies shape the trade-offs associated with these different labour supply choices.

\(^2\) At the time of writing, the Swedish part of EUROMOD was being finalised.
EUROMOD offers the flexibility needed to compute a range of different work incentive measures. The precise definition of the indicators can be customised to fit the research question at hand. The choices to be made in deriving the resulting work-incentive measures have important implications for the interpretation of the results and thus require some consideration.\(^3\)

First it is, quite obviously, necessary to decide whose work incentives one is interested in. The detailed micro-databases underlying tax-benefit microsimulation provide considerable flexibility in this respect and support a break-down of results along many different dimensions including demographic, social and economic characteristics. Additional measurement choices need to be made regarding (1) the types of taxes and benefits to take into account; (2) the unit of analysis and, related to it, the sharing of incomes within the unit; and (3) the nature and size of the income “margin” to be used for assessing the marginal effects of employment behaviour. Each of these will be discussed in turn.

4.1. Tax-benefit instruments and definition of income base

It is often desirable to provide broad measures of work incentives that take into account all policy instruments that might potentially impact on the attractiveness of employment. Yet, the precise choice of tax and benefit instruments to be incorporated in such a measure is not self-evident, particularly when a multi-country perspective is required.

On the tax-side, most studies consider taxes and ‘tax-like’ payments. However, it is not at all clear that social insurance contributions (SIC) are, for example, equivalent to income taxes and it is undoubtedly the case that the degree of equivalence differs widely across countries. While, in principle, SIC are payments made in return for insurance coverage the link between income taxes and public services is not as direct. However, cross subsidisation between the various ‘pots’ of public finances often make such a distinction less meaningful. In addition, social insurance schemes are, for the most part, compulsory and not characterised by a strict actuarial link between the value of insurance services and SIC paid. The discrepancy can be seen as performing functions (such as raising revenues or redistribution) normally associated with income taxes.

Comparability issues due to different institutional settings across countries also arise on the benefit side. A multitude of different cash benefits can cushion or exacerbate the income consequences of changes in people’s working time or status. Tax-benefit models that allow an integrated view on the tax-benefit system as a whole are therefore useful. There are, however, limitations nonetheless since, as a result of data limitations, these models usually focus on cash incomes. It can therefore be difficult to compare results between countries where, say, childcare payments or housing benefits are paid in cash and those where these services are provided ‘in-kind’ through access to subsidised childcare or housing. A related question concerns the appropriate time-horizon of the work incentive calculations: Should some measure of future benefits financed by current SIC be taken into account? In addition to conceptual considerations, this is to some extent a pragmatic decision as one needs to weigh any information gain against the uncertainty involved in trying to estimate the consequences of current employment decisions on income streams in the distant future.

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\(^3\) The discussion draws on Immervoll (2004).
4.2. Unit of analysis and unit of income sharing

A natural question to ask is whose effective tax rates we are interested in. There are in fact two parts to this question. First there is the issue of the level at which we wish to consider the work incentive. Since it is individuals who work (whether or not they make decisions jointly with others about whether and how much to do so) it makes sense to focus on each individual’s financial incentive. This is discussed further below in relation to the choice of the “unit of analysis”. The second part to the question is the level at which incomes are considered to be relevant, or the “sharing unit”. Depending on the purpose, we may want to look at tax/benefit payments made to the individual, at the level of the formal tax unit or some other notion of family or household. For distributional studies concerned with household welfare the household level is generally considered appropriate (Canberra Group, 2001).

Given that one distinguishing feature of households is the sharing of common resources (and since we do not observe the precise sharing arrangements) studying units of analysis smaller than the household can be problematic. A particular issue arises due to the assessment unit built into statutory tax and benefit rules. These can be quite different for any particular type of policy instrument across countries and also for different instruments within countries. Although recent decades have, at least in the EU, seen a trend towards individual taxation, joint tax filing is current practice in a considerable number of countries (O'Donoghue and Sutherland, 1999). Notions of family or household are even more important in determining entitlements to social benefits. With the important exception of insurance-based benefits, very few benefit payments are targeted directly towards individuals. Instead, the structure of families or households as well as their members’ characteristics and incomes are crucial determinants of benefit amounts. Even insurance-based benefits formally paid to the insured person often take into account family circumstances.

Whenever taxes or benefits are explicitly or implicitly targeted towards more than one person, the question how these payments are shared between members of an assessment unit is crucial if the unit of analysis is smaller than the unit of assessment. Should benefits be shared equally among all members of the household, or just among adults, or should payments be assigned according to some equivalence scale? Similarly, what is the best basis for sharing jointly paid income taxes? Should it be in proportion to the tax base or should those with higher income pay progressively more? The limited empirical evidence on sharing arrangements make these decisions arbitrary to some extent. One attraction of calculations based on micro-data lies in raising the issue in the first place and forcing analysts to be explicit about the assumptions they adopt.

4.3. Nature and size of the “margin” used for computing net income differences

Additional issues arise in computing the income consequences of employment changes. They relate to the exact features of the change being simulated. Two types of indicators are commonly used.

The first compares net income levels directly, e.g. net replacement rates. However, being affected by initial income levels, replacement rates measured at the household level will tend to be higher for two-earner households than in the one-earner case. Clearly, relative changes of household incomes represent relevant information, especially when considering the degree of income maintenance for those facing job loss. Yet, when the size of family units differ, it can be difficult to compare work incentives using replacement rate measures as a basis.4

4 This would not be a problem if net replacement rates were measured by comparing net incomes at the individual level. However, such an indicator would only be feasible if there
This potential problem is avoided by the second type of measure which relates to the earnings situation of the individual whose employment status changes (rather than to household income as a whole). An example is the marginal effective tax rate (METR). This measure shows what fraction of an earnings increase is effectively “taxed away” by the combined effects of tax increases and benefit withdrawals (or, vice versa, how taxes and benefits cushion a drop in earnings).

While marginal tax rates could in principle be found analytically by taking first differences of the relevant effective tax schedule this is not possible in practice as tax-benefit systems are characterised by discontinuities. The most direct approach is to look at each observation separately and ask what would happen to taxes if income were to change by a certain amount. METRs can thus be found numerically by altering income, using a tax-benefit model to recompute relevant taxes and benefits and comparing the results with the original situation:

\[
METR = 1 - \frac{\Delta y_{\text{net}}}{\Delta y_{\text{gross}}} \quad (1a)
\]

\[
METR = 1 - \frac{\left( y_1 + \Delta y_{\text{gross}} \right) \left( 1 - t_2 \right) - y_1 \left( 1 - t_1 \right) }{\Delta y_{\text{gross}}} \quad (1b)
\]

where \( y_1 \) is original pre-tax-benefit income as observed in the micro-data, \( \Delta y_{\text{gross}} \) is the margin and \( t_1 \) and \( t_2 \) are the effective tax rates applying, respectively, to \( y_1 \) and \( y_1 + \Delta y_{\text{gross}} \). The two terms in the square bracket are therefore the incomes after taxes and benefits (after and before the income change). As discussed above, decisions need to be made about the definition of \( y_1 \), the tax-benefit instruments to be taken into account in computing \( t_1 \) and \( t_2 \), as well as the unit of analysis used for measuring incomes. In addition, the size (and direction) of \( d \) is important and leads to different interpretations of resulting METRs. One will often be interested in a small income change, such as a small fixed percentage rise in earnings or the rise in gross earnings due to an additional hour of work. However, the margin can also be earnings as a whole in which case it measures the fraction of in-work income that is “taxed away” when moving into work. Regardless of the size of the margin, equation (1) is still applicable. Yet, since the earnings change is no longer “marginal” when a transition into work is considered, this measures has variously been referred to as Average Effective Tax Rates (OECD, 2004), Unemployment/Inactivity Trap indicator (Carone, et al., 2004) or Participation Tax Rate (Immervoll, Kleven, et al., 2004). Depending on the intended purpose of such measures, different terms can be useful. Since our illustrations are taken from the latter study, we follow its terminology (Participation Tax Rate) while also explaining relevant differences to the Unemployment/Inactivity Trap indicators used in recent Commission-supported work.

For questions related to financial incentives the appropriate choice of unit of analysis is particularly important. If a person’s additional earnings reduce the household’s entitlement to housing benefits then this is likely to be a consideration she will take into account. Similarly, an important consequence of joint taxation of married couples is that, from the couple’s point of view, the lower earning spouse faces, for a lower level of earnings, the same marginal tax rate as her higher earning partner. Clearly, to bring out these facts, METRs need to be computed for the household as a whole. For multi-person units, however, another decision to be made is to whom to attribute \( \Delta y_{\text{gross}} \). Since for the unit as a whole, METRs will be different depending on who earns the additional amount, it will often be appropriate to evaluate METRs for each person/adult in the family by attributing the additional income to each relevant household member in turn.

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was a satisfactory empirical basis for deciding how non-individual incomes and expenses are shared between household members.
5. Work incentive measures for EU Member States: Evidence from EUROMOD

This section presents evidence on all three types of incentive indicators measures discussed above: net replacement rates, marginal effective tax rates on increasing earnings for those in work, and on participation. The illustrations relate to the year 1998 and are taken from three separate studies (Immervoll and O'Donoghue, 2003; Immervoll, 2004; Immervoll, Kleven, et al., 2004).

5.1. Illustration 1: Net ReplacementRates

The ratio of net income out of work over net income while in employment (net replacement rates, NRRs) provide a useful starting point for identifying to what extent workers are protected from income loss due to unemployment. This is important in order to evaluate whether benefit systems provide households with a sufficient amount of resources during periods of employment transitions. At the same time, NRRs allow us to address the question whether the financial gains to employment may be insufficient and, importantly, why this may be the case.

Replacement rates measure the degree to which an individual’s (and her household’s) standard of living while in work is maintained during periods of unemployment. The higher a household’s replacement rate, the more protected it is from the impact of losing work income. At the same time, high replacement rates may reduce peoples’ efforts to seek or maintain employment.

Obviously unemployment benefits play an important role in this. In addition to unemployment benefits, many other features of the tax-benefit system will determine the difference between incomes in and out of work. A progressive tax system can dampen the income loss by making net incomes less variable than gross incomes. For example, progressive income taxes on earnings combined with a favourable tax treatment of benefits mean that replacement rates before taxes are markedly lower than NRRs, which are measured net of tax and contribution payments (OECD 1997a). Benefits that do not depend on income or on employment status also reduce income differences between in- and out of work and hence smooth the transition. On the other hand, benefits (or tax rebates) that are conditional on employment or a certain minimum number of working hours can serve to increase the difference between in-work and out-of-work incomes. NRRs capture all these influences by taking into account all relevant tax- and benefit changes following an employment transition.

The two basic dimensions that are relevant in this context are (1) which income components to include in the numerator and the denominator of the replacement rate and for whom; and (2) which type of labour market transition to compute the replacement rate for.

In this illustration the definition of income considered is disposable income, defined as market incomes (employment plus other market incomes) plus benefits minus social insurance contributions minus income taxes. For measuring incomes, we have chosen the year as the relevant period (and thus take into account if, as in the UK, unemployment benefit levels change during the course of the first 12 months out of work). The transition is assumed to take place at the start of the fiscal year (with the employment status remaining unchanged thereafter). As mentioned above, we compare income situations in- and out of work over a full year. As a result, we do not currently take into account any changes in benefit levels that may occur after a period longer than 12 months following the transition.

For all transitions, all income components other than the simulated taxes and benefits remain unaffected for members of households whose labour market status does not change. In addition, we assume that all other household characteristics remain unchanged so that any
behavioural adaptations (such as the use of childcare services, finding more affordable housing or altering other living arrangements) to the new employment situation are ignored.

The presence of other household members will influence NRR results in two ways. First, the larger the number of other household members with incomes, the smaller will be the income difference if one person changes between work and unemployment. In comparing results across countries one will therefore have to bear in mind differences such as the number of two-earner couples or adult children living with their parents. A second influence will be due to the tax-benefit system: the employment status and income of one person may affect taxes and benefits of other household members and, thus, total household incomes in- and out of work.

In order to compute the counterfactual income situation for a household, we have to decide for which of the household members we want to simulate the employment transition. The individuals we consider for the transition are those of working age (18-59). We exclude civil servants since they frequently do not face the same unemployment risks and would thus complicate comparisons across countries. People in education are also excluded. In this illustration we only consider one type of transition: from employment to unemployment. Replacement rates are therefore only computed for individuals who are employed according to the micro-data used for the calculations. (Immervoll and O'Donoghue, 2003 also consider transitions into work of both unemployed or labour market inactive individuals.)

![Figure 1. Net replacement rates](image)

Initial 12 months following a transition from employment to unemployment, 1998

Source: Immervoll and O'Donoghue, 2003; revised using a later version of EUROMOD.

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5 As explained above, in computing one measure for the entire household, one implicitly assumes equal sharing of resources within the household. Where this is not appropriate (e.g., in certain cases where two family units share one physical household) the resulting replacement rates will tend to underestimate the change in living standards due to employment transitions.
Figure 1 presents average NRRs as well as the proportion of employees with replacement rates of less than 40%, 40-80% and 80% or higher. The calculations assume that employees are entitled to receive unemployment benefits when becoming unemployed; replacement rates for ineligible individuals can be much lower (see Immervoll and O'Donoghue, 2003). The countries with the highest replacement rates (of over 80% on average) are primarily those operating well-funded social insurance systems (Austria, France, Benelux countries). In addition, benefit floors (operated for instance in Denmark and Portugal) can cause high replacement rates for earners of very low wages during the initial period of unemployment. With averages below 70% the lowest in-work NNRs are found in Italy, Greece and the UK. Germany, Ireland and Spain come in between with average replacement rates in the 70-80% range.

5.2. Illustration 2: Marginal Effective Tax Rates

METRs are useful for assessing to what extent social and fiscal policies reduce the payoff from working longer hours or from obtaining a better-paid job. One way of computing METRs is to increase earnings for all employees by a fixed percentage, re-compute taxes and benefits in the situation following that earnings change and then assess METRs as in equation (1).

The margin considered here is +3% of gross earnings (excluding employer-paid SIC). The results show the gain in current cash income resulting from an increase in working hours or work effort. That is, \( y_1 \) from equation (1) includes employment income, capital income, cash social benefits, income taxes and employee-paid social contributions but excludes non-cash incomes (such as benefits in-kind), employer social contributions or the value of future income entitlements (such as pensions). This is in line with most empirical studies on labour supply, which tend to investigate labour supply responses in relation to budget sets that show the feasible combinations of working hours and current cash income (“take-home pay”).

For households with more than one earner, METRs are computed for each of them with the 3% earnings increase going to each earner in turn. Results are presented for the working population aged 18-64, including civil servants, the self-employed, and those with more than one labour market status during the observation period.

The effects of an earnings increase for a particular employee are, for reasons stated in Section 4.3, evaluated for the household as a whole. That is, the resulting METRs capture changing tax burdens or benefit entitlements that result from the earnings change even if they affect household members other than the person whose earnings are being altered. While changes in net taxes are summed across all members of the household they will generally be different depending on whose earnings are changing. This is particularly important when

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6 Comparisons of these EUROMOD NRR calculations with those using the OECD’s typical household approach are provided by Immervoll, Marianna, et al. (2004).

7 There choice of the margin is not self-evident. It should arguably be sufficiently large to correspond to a meaningful change in work effort but small enough to capture all relevant kinks and spikes in the employee’s budget constraint. One attractive alternative option would be to take as the margin the change in gross earnings resulting from an additional hour worked. However, the micro-data used in this exercise are not taken from labour force surveys and information on working hours is thus rather imprecise. For instance, it is often not clear if the number of hours worked relates to “usual”, “actual” or “contractual” working hours. Faced with this situation, the +3% margin seems a reasonable choice as it corresponds to slightly above one additional working hour for the typical full-time employee.

8 Calculated METRs are therefore not directly affected by employer social insurance contributions.
evaluating financial incentives of first and second earners to increase earnings. To capture these differences, and since women represent second earners in the majority of two-earner households, METRs can be presented separately for men and women.

Results for the entire working population aged 18-64 are shown in Figure 2. Median METRs range between under 30% (Greece, Portugal and Spain) and more than 50% (Denmark, Germany). Given the large number of determinants of METRs (benefit withdrawal rates, income tax, social contributions), it is not surprising that variability of METRs is sizable. Large standard deviations are, for instance, observed for countries with steep income tax or SIC rate schedules, such as the Netherlands. The inclusion of benefits, which are often subject to very high withdrawal rates, also increases METR variability considerably.

A more detailed picture of the distribution of METRs across the population is provided by the density graphs in Figure 3 (modal values are shown as framed bars). By far the largest number of earners facing METRs in excess of 50% is found in Denmark (85%) followed by Germany (60%). In a number of countries, a sizable group of employees and self-employed may benefit little or not at all from a small earnings increase (METRs close to or above 100%). At the other end of the spectrum, roughly one-fifth of earners in Greece would retain the full amount of a 3% earnings increase. Denmark and the UK have the most concentrated distributions of METRs with 52% and 49% of the entire working population located in just one single 5 percentage point band (50 to 55% in Denmark; 30 to 35% in the UK).

Whether it is high- or low-income households who face higher METRs is a critical question. Very high METRs mainly affect those in low income households where income-tested benefits are withdrawn at very high rates but social insurance contributions can play a role here too. In many countries, workers in poor families are much more likely to face relatively high METRs that those in higher-income families (Figure 4). In the UK it is those on the margins of poverty or with slightly higher incomes who face the highest METRs. In other countries, such as Denmark, Luxembourg, Italy and Spain it is those with the highest incomes who face the highest rates.

Breaking down the results by gender shows that, across the working population as a whole, METRs are generally lower for women. But a more diverse picture emerges once one controls for earnings differentials between men and women. This is done in Figure 5, which compares average METRs faced by men and women belonging in the same earnings decile group. In most couples, working women have lower earnings than their partner. In countries with joint income tax filing, these women therefore tend to face higher METRs than men in the same earnings group (markers below the “45-degree” line; e.g. in France, Germany, Ireland, Luxembourg, Portugal, Spain). For some decile groups, noticeable gender differences also exist in countries that, while not formally employing a joint tax base, allow sizable parts of

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9 Negative METRs, while rare, can result from tax concessions or benefits which are contingent upon having income of at least a certain level. Those with income just below that level will see their after-tax-benefit income rise by more than the 3% earnings increase. In addition certain SIC schemes (e.g., health insurance contributions in the Netherlands) do not cover earners of high incomes. Above a certain earnings limit, people will therefore no longer have to pay any SIC. Clearly, this will cause METRs of some high-income earners to be negative. Of course, people no longer covered by the compulsory social insurance scheme will normally continue to pay contributions to public or private insurance schemes on a voluntary basis. This important qualification of all effective tax rate results based exclusively on compulsory taxes and SIC applies also to the results presented in this paper.

10 Immervoll (2004) decomposes METRs in each country to show the separate influence of taxes, contributions and benefit claw-backs.

11 See Immervoll (2004) for more on this.
unused tax concessions to be transferred from the lower- to the higher-earning spouse (Belgium, Denmark, the Netherlands).

**Figure 2. Marginal effective tax rates (METR) faced by working population**


Figure 3. Marginal effective tax rates (METR) faced by working population distributions, 1998.

Figure 3. (continued)

Figure 4.

Adults in paid work with high (> 50%) marginal effective tax rates 1998

Note: Poverty is defined as living in a household with income below 60% of the median.

Figure 5. Median METR by gender
Men and women in the same earnings decile group, 1998

5.3. Illustration 3: Participation Tax Rates

Persons considering the financial attractiveness of working at all face different trade-offs. This section quantifies the extent to which tax-benefit systems diminish the payoff from employment versus unemployment. The reduction of the return to work can be seen as a tax on participation. In the illustrations that follow, participation tax rates (PTR) are assessed as in equation (1). The difference to the previous section lies mainly in the size of the “margin”: $\Delta y_{\text{gross}}$ is now gross earnings as a whole and $y_1$ is the pre-tax benefit income in the unemployed situation. Similar to the METRs shown in the previous section, PTRs again capture all relevant incomes for the household as a whole ($y_1$ can therefore be greater than zero in multi-person households).

Another difference between this illustration and those in the previous section is the scope of the tax-benefit calculations. First, taxes taken into account here include indirect taxes assuming that all income is spent in the same period. They now also include employer contributions, which are often sizable, exceeding contributions paid by employees in some countries. Compared to otherwise similar measures, such as the Unemployment/Inactivity Trap indicators shown in Carone, et al., 2004, the inclusion of both these taxes will push PTRs upwards as they reduce the fraction of gross earnings that effectively adds to family budgets. Second, since the calculations involve a comparison of household incomes with and without employment, it is also necessary to calculate out-of-work benefits for unemployed individuals. This takes into account that some people are entitled to unemployment insurance benefits while others have to rely on less generous assistance benefits as a result of insufficient contribution records. Full details on the calculations are provided in Immervoll, Kleven, et al., 2004.

Figure 6 reports PTRs for 14 EU Member States according to the level of individual gross earnings. Countries are divided into two groups of seven countries. The first group is continental and Northern Europe (Austria, Belgium, Denmark, Finland, France, Germany, and the Netherlands). Average tax rates for this group are high. The second group is composed of all the other countries with lower tax rates: Southern Europe (Greece, Italy, Portugal, and Spain), Anglo Saxon European countries (Ireland, the United Kingdom), and also Luxembourg.

In a number of countries, the structure of tax rates across deciles is strikingly flat. For example, in the Netherlands the participation tax rate is between 40 and 50% for all decile groups. Belgium, Finland, Germany, Italy, and Portugal have also relatively flat rate structures. Joint tax systems as in France or Germany can result in high PTRs for low-wage spouses of high-income earners. In addition, generous unemployment and income-related benefits can increase effective tax rates at the bottom and SIC schedules are often characterised by discontinuities such as earnings thresholds, which can give rise to very high PTRs for some low-wage earners. At the same time, caps on the contribution base can reduce effective SIC rates for high-income employees. Finally, indirect taxes, the rates of which are rather uniform across decile groups, also contribute to a flattening of the PTR graphs.

In some countries such as Denmark, participation tax rates are largest at the bottom because of the existence of relatively generous minimum income benefits which increase the part of in-work earnings that are effectively "taxed away" upon entering employment. Also, unemployment benefits are subject to a floor meaning that replacement rates can in some cases be very high. In contrast, countries such as Greece, Luxembourg, Spain, and the United Kingdom have relatively lower tax rates at the bottom because minimum income programs do not exist or are modest relative to in-work earnings, because tax burdens on employment incomes are small and/or because they operate in-work benefits which counter-balance the loss of social assistance or unemployment benefits.
Figure 6. Average participation tax rates
Including employer contributions and indirect taxes; by earnings decile, 1998

Low Tax Countries

High-Tax Countries

Conclusions

EUROMOD offers the flexibility needed to compute a range of different work incentive measures. We have provided some illustrations of the possibilities but they are by no means exhaustive. Others include:

- Analysis of the existing indicators with particular policy issues as the focus. One example is the exploration of gender differences in METRs by examining the differences across countries in the extent of within-couple discrepancies in METR (rather than for men and women generally as in Figure 5).
- Analysis of the existing indicators to explore the driving factors behind the cross-country differences (see Immervoll, 2004 and Immervoll and O’Donoghue 2003)
- Extension to the income measure that is used to include the quasi “voluntary” costs of working. Some of these such as travel-to-work costs might affect only the incentive to work at all; others, such as child-care costs, might affect the incentive to work longer hours.

In addition, EUROMOD has been constructed as a multi-function tool for the analysis of policy changes. So it could be used to examine the effect of reforms to tax or benefit systems on work incentives. These reforms might be actual or proposed reforms, or reform scenarios constructed as analytical devices to illuminate cross-country differences in underlying characteristics such as labour market conditions. Moreover, as well as indicators of incentives, EUROMOD can be used to calculate the first round effect of changes in policies on the size of government budgets and on indicators of income poverty and inequality. Use of EUROMOD allows a triangulation of indicators of (a) distribution, (b) incentives and (c) budgetary cost within a consistent framework. It therefore offers enormous scope as a tool for policy design as well as for the analysis the status quo.
References


## ANNEX 1. DATA SOURCES.

<table>
<thead>
<tr>
<th>Country</th>
<th>Base Dataset for EUROMOD</th>
<th>Sample size (households)</th>
<th>Date of collection</th>
<th>Reference time period for incomes</th>
</tr>
</thead>
<tbody>
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<td>Austria</td>
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