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**WELFARE BENEFITS AND WORK INCENTIVES
AN ANALYSIS OF THE DISTRIBUTION OF NET
REPLACEMENT RATES IN EUROPE USING
EUROMOD, A MULTI-COUNTRY
MICROSIMULATION MODEL**

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Abstract

This paper considers the methodology of measuring replacement rates, comparing simulation based approaches, which simulate replacement rates for a representative sample of the population, with other approaches that simulate replacement rates for "typical" families or are entirely based on recorded household data. We emphasise the advantages of the first method. Utilising a cross-country microsimulation model for Europe, EUROMOD, we generate the distribution of replacement rates for four European countries, Denmark, France, Spain and the UK. In particular we show the important role of household composition and the presence of other household members' incomes in preserving the standard of living while out of work. We argue that, given this strong influence of primary incomes, replacement rates are not necessarily the best indicator of the impact of the tax-benefit system in this respect. To isolate the effects of the tax-benefit system on both work incentives and the degree of social protection for the out-of-work population, we therefore introduce a new measure, the "tax-benefit-to-earnings ratio".

Keywords: Net Replacement Rate; Unemployment Benefits; Work Incentives; European Union; Microsimulation.

JEL Classification: H31; J65; E60; C81

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1. Introduction and Motivation

The level and structure of European taxes and transfer payments have been the subject of much attention and discussion in recent years. There has been considerable pressure to reduce budget deficits in order to meet national or European targets. On the revenue side, room for manoeuvre was limited due to tax burdens which are already considered too high in many European countries. As a result, the reduction of public expenditures associated with existing social protection systems is argued to be the most likely route towards achieving 'sound' public finances (Buti *et al.*, 2000). Furthermore, certain state transfers have frequently been criticised as giving rise to adverse incentive effects and have - next to labour market 'rigidities' and over-regulation - been named as one of the main causes of slack economic growth and unemployment (European Commission, 2000a; IMF, 1999; OECD, 1994a; Bean 1994).

In particular, there is a concern that by intervening in the labour market, tax-benefit systems create incentives that negatively affect the behaviour of both employees and firms. On the demand side, high tax burdens increase the cost of labour while on the supply side, high

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marginal tax rates reduce the reward for additional work efforts. In addition generous out of work benefit payments are seen to lead people to reduce their efforts to remain in work or to seek gainful employment (Snower, 1997; Björklund *et al.*, 1991).

There is no consensus as to the quantitative significance of these effects[2] and, in any case, any negative implications of state interventions in the market have to be weighted against their success in achieving economic and social policy goals for which they were originally designed (Atkinson, 2000). For example, in Southern Europe, there have been concerns that the state does not provide protection against contingencies such as long term unemployment. While excessively high replacement rates may give rise to adverse *incentive effects*, very low degrees of *income maintenance* will have negative consequences from both an economic and a social policy perspective. In measuring and discussing the coverage and generosity of benefits, it is therefore essential to take both dimensions into account.

Whether or not one thinks that the role of the state in this area should be reduced, it is essential to carefully measure the extent of these interventions in order to be able to study their effects. In this paper, instead of addressing the question whether transfer payments should be more or less generous, we establish their impact on household incomes. More specifically, we are concerned with measuring the levels of benefits that are available to the unemployed and, more generally, individuals who are out of work.

From a social policy point of view, the *absolute* level of out of work income is important since it determines the minimum living standard that people are able to secure during periods of unemployment. Of course, the absolute benefit level also determines the public expenditure necessary to finance benefit payments. Because the burden of financing is to a large extent borne by employers and employees, generous benefits raise the cost of labour, which may in itself lead to decreasing employment.[3] Moreover, generous benefits tend to improve the relative bargaining position of employees and may therefore lead to higher wages (Layard *et al.*, 1991). On the other hand, the level of income out of work measured *relative* to in-work income (the replacement rate) is a measure of the relative drop in living standards that people experience when losing their job. This latter measure is also the relevant one for looking at work incentives. Is there enough potential financial gain from employment to make it worthwhile for unemployed people to look for jobs? And, looking at the same issue from a different and rather more pointed perspective, is the hardship caused by being out of work 'sufficient' to make work and the efforts needed to secure employment the more attractive alternative?

There are, of course, other dimensions to the situation of being unemployed that will be equally or more relevant for decisions of whether or not to seek or stay in employment. Among them are non-financial rewards (both of being in work and out of work), the negative stigma of being unemployed (whether with or without benefits), people's perception as to the availability of benefits and the likelihood of finding a suitable job, as well as other aspects of benefit systems such as eligibility conditions or duration of entitlement (for the latter, see Atkinson and Micklewright, 1991). There is a danger that because benefit levels are relatively

[2] Buti *et al*. (2000), Nickel and Layard (1997), Scarpetta (1996).

[3] Carey and Tchilinguirian (2000) provide recent estimates of taxes on labour in OECD countries.

straightforward to measure (and because they are often the only dimension of benefit systems featuring in economic models) they would receive too much attention by both researchers and policy makers while other determinants of work incentives are ignored.

However, even with replacement rates, there has been considerable disagreement about what is the most appropriate measurement method. In addition, the identification of unemployment as a Europe-wide problem has led to increasing demands for measures that are comparable (ideally) or reconcilable (at least) across countries (European Commission 2000b, ch. 5). Consistent measurement of replacement rates across countries is a prerequisite for addressing related policy questions at the European level.

In this paper, we discuss how an integrated European tax-benefit model, EUROMOD, can be used to improve on previous approaches to study replacement rates across Europe. In the following section we review existing approaches and explain how ours differs from them. The microsimulation model used in this paper provides a large degree of flexibility and therefore allows the sensitivity of estimates with respect to different assumptions to be assessed. Some of these assumptions and their implications are discussed in section 3. As an illustration of the approach, we compute distributions of replacement rates for four different countries: Denmark, France, Spain and the UK. The model and simulation details are discussed in section 4. In section 5 we briefly describe the national tax-benefit systems. Simulation results are presented in section 6. In section 7 we take a closer look at what income components drive the distribution of replacement rates. Based on these results, we conclude that the replacement rate concept is not an ideal measure for isolating the influence of taxes and benefits. In section 8 we therefore introduce a different measure, the tax-benefit-to-earnings ratio that more narrowly focuses on the effect of the tax-benefit system on incentives. The final section emphasises some caveats and discusses how they could be addressed in future research.

2. Measuring Replacement Rates

Social and fiscal policy instruments face a fundamental trade-off. An instrument that performs well from an income maintenance perspective may have unintended behavioural consequences. For example, if the operation of the tax-benefit instrument depends on characteristics that people can influence then this link will have a potential impact on people's behaviour. In many cases, changing people's behaviour is an intended consequence of the policy and is, thus, desirable. Examples include taxes and fines on activities, which negatively affect others, the tax-deductibility of charitable donations or unemployment benefits enabling job seekers to undertake a more thorough search process.[4] Frequently, however, the incentives that such instruments give rise to are unintended. For instance, high marginal tax rates caused by either the tax system or the withdrawal of benefits reduce the net gain from any additional income and will, thus, make efforts to increase incomes less attractive. Similarly, benefits or taxes that depend on a certain status of the recipient/taxpayer (such as being unemployed) have an impact on the desirability of entering or leaving this status.

Replacement rates are a measure of the degree to which individuals' (and their households) standard of living while in work is maintained during periods of unemployment. The higher a

[4] On the latter, see Acemoglu and Shimer (1999) who discuss under which conditions unemployment insurance systems increase economic efficiency.

household's replacement rate, the more protected they are from the impact of losing work income. At the same time, however, high replacement rates may reduce peoples' efforts to secure employment. This paper does not try to answer the question as to where the dividing line between achieving the objectives of income maintenance and reducing work incentives might be. We merely report on the size and distribution of replacement rates. It is a matter for labour micro-econometricians to evaluate what role different levels of replacement rate play in labour supply decisions.

These effects are at the heart of concerns that out of work benefits may lead to insufficient efforts to escape unemployment or avoid slipping into it. The opportunities that unemployed people face may be such that accepting jobs offered to them would not result in any financial gain. They are thus locked into unemployment - a situation often referred to as the unemployment trap - with prospects of finding a job deteriorating as time passes. Similarly, those currently employed may not lose much by entering unemployment. In this context, the replacement rate can be relevant even if, as is often the case, benefits are not paid if termination of an employment relationship is judged to be 'voluntary': Employers may use the unemployment insurance to smooth over demand cycles by laying off people when demand is weak and re-employing them when business is stronger.[5]

Individual replacement rates depend strongly on the individual situation. Obviously, the current or prospective wage level plays a decisive role. For a given level of benefit, lower wages will generally correspond to higher replacement rates. There will generally also be other incomes, received either by the same person or by other persons in the household, which have an influence on total household income and, thus, the (household based) replacement rate. In addition, expenses which have to be incurred in one labour market situation but not the other may have an important effect on disposable income (e.g., union fees, costs of commuting to work, costs of providing care for dependants during working hours, job search costs, etc.). However, in terms of policy makers' control, all these income components are less readily accessible than taxes and benefits. Partly for this reason and because policy makers have more control over tax and transfer policy than over household decisions, the influence of tax-benefit systems has received most of the attention.

Early studies have analysed the level of (gross) unemployment benefits as a fraction of employment income in isolation from the rest of the tax-benefit system (OECD, 1994b). It has since been recognised that the omission of taxes and benefits other than unemployment benefit produces over-simplified results that can be seriously misleading. People are concerned about their total net incomes and the measurement concept needs to reflect this. Progressive income taxes on earnings combined with a favourable or tax-free status of benefit payments mean that replacement rates before taxes are markedly lower than the so-called net replacement rates which are measured net of tax and contribution payments (OECD 1997a). Equally important is the fact that the more extreme values of replacement rates found for some people are frequently caused by very complex (and sometimes unintended) interdependencies between parts of the tax-benefit system which have been introduced at

[5] There has been some evidence that such temporary layoffs are important phenomena especially in the US but also in some European countries. See Fitzroy and Hart (1985); Jensen and Westergard-Nielsen (1989); and Felli and Ichino (1988).

different times, with different objectives or are administered by different authorities or agencies. Unless all relevant parts of the tax-benefit system are taken into account, these ‘anomalies’, which can have very serious implications for work incentives, will not show up in the resulting replacement rate calculations.

In looking at different approaches to measuring replacement rates, it is useful to distinguish between calculations that are based on empirical data and those based on stylised households. Approaches based on empirical household data can either look at labour market transition that are actually observed in the data or they can extend the analysis to those who have not in fact changed their labour market status by trying to simulate what their incomes would be if they had.

2.1 Replacement rates of stylised households

Tax-benefit calculations for stylised households have been widely used in international comparisons of many different aspects of tax-benefit systems. Comparing situations of similar household types, they provide valuable information about differences in national systems and illustrate some of the effects of actual or hypothetical policy changes. The most common type of calculations assume a set of average characteristics (e.g., in-work income of an average production worker) which is considered appropriate for the household type under consideration and apply the relevant tax and benefit rules to find net in-work and out of work income (OECD, 1998; OECD, 1999; Seven Countries Group, 1996; Central Planning Bureau, 1995; OECD, 1994b).[6]

There are, however, problems with this approach because it attempts to reduce complex tax-benefit systems to single (or a few) point estimates. By using “average household” characteristics, the analysis is likely to miss many of the important features of the tax-benefit system which, although not applicable to the "average household", may affect a significant part of the population. By computing taxes and benefits for a wide range of stylised households this problem can partially be dealt with. Instead of obtaining results for, say, only a few income levels, one can generate an entire data set of stylised households and use this approach to investigate the mechanics of tax-benefit systems across the full range of incomes (see Immervoll *et al.*, 2001). However, despite the larger number of households, it is still difficult to anticipate the heterogeneity of characteristics that seemingly similar households have such as the combination of incomes from different sources and different household structures. Clearly, in the case of replacement rates, one is not only interested in the design of the tax-benefit system *per se* but in how it applies to actually existing populations. The 'stylised' approach does, by definition, not take into account the details of the structure of the population and is thus problematic if used as a basis for summarising the actual situation in a given country.

2.2 "Data driven" replacement rates

[6]There is also an 'empirical' version of the stylised approach whereby a replacement rate is calculated by dividing the average receipt of Unemployment Insurance or Unemployment Assistance by average earnings per employee. An example is McGettigan and Browne (1993). As an indicator of income maintenance or labour market incentives, this approach is even less satisfactory since it does not take into account different family situations and other household characteristics which may be important determinants of individual replacement rates.

Obviously, studies based on representative household microdata do not run into the kinds of problems stated above. The most straightforward approach is to look at time-series information on individuals (panel data) and record their incomes in different employment states. Often, however, panel data are not available or do not cover time periods long enough to record a statistically meaningful number of status changes. There have therefore been attempts to extract the necessary information from cross sectional data.

One recent study by the European Commission used the first wave of the European Community Household Panel (ECHP) (Salomäki and Munzi, 1999). The authors attempt to match characteristics of the unemployed with those of similar employed individuals assuming that the income situation of the latter group is a good approximation of the potential in-work income of the former. Whether this is realistic will depend on numerous factors. Among them are the statistical quality of the match and the degree to which potential earnings of the unemployed differ from those with uninterrupted work histories. A critical assumption is that the taxes and benefits of one group are representative of those that would apply to the other. Yet, the large number of characteristics relevant for determining taxes and benefits mean that many different characteristics need to be distinguished for the matching process. This is especially difficult for the group of unemployed, which, due to the limited number of observations in the data, may not represent a statistically meaningful number of each relevant family type. As the authors note, the replacement rates thus measured are therefore often based on very small sub-samples.

Moreover, by comparing observed in-work and out-of-work individuals the approach measures a mix of *short-term* and *longer-term* effects, which may not be appropriate if the replacement rates are to be interpreted as a measure of work incentives. In the case of becoming unemployed, long term effects may include adaptations of a large number of important characteristics that will usually be unaffected in the short-term. For instance,

- the partner of the unemployed may take up paid work or seek to increase working hours (which may frequently have an impact on the level of unemployment benefit);
- children may abandon or interrupt their education;
- the family may be forced to seek more affordable accommodation or may reduce other expenses which have an influence on benefit levels (e.g., housing benefit) or tax burdens.

These longer-term changes will, however, often not be foreseeable for people currently in work. It could therefore be argued that they would not play a role in the decision whether or not to work. More importantly, however, mixing short- and long-term replacement rate concepts will cloud the overall picture.

A more fundamental problem with the approach is that even though one motivation for this kind of study is a concern about disincentive effects stemming from high replacement rates, the method implicitly assumes that replacement rates *do not* have any impact on people's behaviour. By treating employed and unemployed individuals as the same entity, the only difference being the employment status, one assumes away any explanatory power of the replacement rate. Put differently, if employed individuals face the same replacement rate as 'similar' unemployed individuals then the only explanation why unemployed individuals are not in work while employed individuals are is that the incentives that replacement rates give rise to are *not* the decisive factor in choosing whether or not to work. It is of course possible that this is in fact the case but it needs to be tested and should not be assumed.

Another study also used one cross-section of the ECHP (European Commission, 1998). But instead of matching individuals with different employment status, it exploited information about the duration of income receipt during the year, producing a quasi panel covering twelve months and identifying individuals whose employment status changed during the year. The authors then computed replacement rates only for this group of individuals. Since the direction of the status change cannot be observed, replacement rates measured this way are a combination of 'in work' to 'out of work' (we will call this the 'in work' replacement rate) and 'out of work' to 'in work' (we will call this the 'out of work' replacement rate) replacement rates. From an income maintenance point of view, however, it is clearly relevant to know what proportion of income is preserved when people lose their job. This aspect, however, can only captured by looking at in work replacement rates in isolation. As will be discussed below, the distinction between in work and out of work replacement rates is also essential for capturing the financial incentives people are facing.

The 'quasi panel' approach can be criticised for another reason. By only looking at people whose status *changes* during the year and excluding those for whom it does not, a sample selection problem arises. In order to determine whether replacement rates have an impact on employment decisions it is necessary to measure them for both groups. If replacement rates have an influence on people’s behaviour and people whose status remains unchanged face different replacement rates than those who experience transitions into or out of employment, then excluding one of these groups will result in a systematic bias. For example, if high out of work replacement rates make it less likely for someone currently unemployed to seek employment then only measuring them for people who do decide to take up work will result in lower replacement rate estimates than if all people currently unemployed were taken into account. The same criticism would, of course, apply to studies computing replacement rates by looking at status changes recorded in 'real' panel data. One straightforward solution is to also compute replacement rates for people whose status does not change by simulating the income they *would* receive in the alternative labour market situation.[7]

2.3 Simulation based replacement rates

Tax-benefit models are computer programs that represent the rules governing a country's tax and benefit system. By applying these rules to a set of households that is representative of the population, it is possible to evaluate the effects of existing tax-benefit systems as well as policy changes in terms of income distribution and government revenue. However, it is also possible to explore the effects of changes in the underlying population while keeping the policy rules as they are. One example of this approach is the computation of effective marginal tax rates. By increasing the incomes of all or some individuals one can see how their effective tax burden (taxes minus benefits), and thus their overall income, would be affected.[8] Replacement rates can be seen as a special case of a marginal tax rate where the margin is the entire wage. For computing replacement rates, however, one also has to change other relevant

[7] Another possibility is to specify a two-stage econometric model (“hurdle” model).
[8] Immervoll (2000) uses EUROMOD to compute marginal effective tax rates for four European countries.

characteristics (such as working hours, employment status) in addition to income because these may also be relevant for determining taxes and benefits.

Using this approach, one can avoid the main problem of stylised calculations: Like the "data-based" approach described in the previous section, this method takes into account the actual structure of the population. In addition, the simulation method allows us to explore replacement rates of the entire (working-age) population rather than being restricted to look at those individuals whose change of employment status can be observed in the data. We can thus produce distributions of replacement rates for all people whose behaviour they can *potentially* affect. In terms of policy relevance, a most important feature of this method is that it permits analyses of the effects of policy *reforms* on replacement rates. Because tax-benefit models simulate the rules of a wide range of fiscal and social policy instruments, it allows an integrated approach to be taken in analysing replacement rates. Policy changes in many different areas (whether they are hypothetical or have actually taken place) as well as interactions between them can be examined in terms of their impact on replacement rates. By holding 'everything else' constant, the simulation approach isolates the effects of such policy changes - an important advantage vis-à-vis the "data-driven" approach where one is restricted to analysing policy changes that have actually taken place.[9]

While the treatment of unemployment as a European problem would clearly indicate an important role for comparable multi-country studies, most previous studies adopting the simulation approach have been limited to individual countries (ESO, 1997; Callan *et al.*, 1996; Atkinson and Micklewright, 1985). National tax-benefit microsimulation models are constructed with a view to satisfy national priorities. The structure, concepts and definitions used in these models therefore reflect very country-specific requirements, which makes informative comparisons of results across different models very difficult and frequently impossible. One of the few studies attempting to compare replacement rates derived from different national microsimulation models has been undertaken by the OECD (1997a). By discussing the numerous problems stemming from a multitude of different definitions and assumptions employed by the different country models this study illustrates the difficulties of making results from individual national models comparable. In addition it is often interesting, whether for practical or academic purposes, to explore effects of supra-national policy initiatives, particularly if the problem to be addressed by policy exists across countries. Again, the country-specific character of individual models inhibits their use for such purposes (Sutherland, 1997). As explained in more detail below, EUROMOD, being an integrated European tax-benefit model, avoids these problems.

Despite the advantages of the simulation approach, there are many problems to be addressed. The nature of simulation implies that important aspects of the scenarios to be explored are not actually observed in reality. In terms of computing replacement rates it is, for example, not clear whether people becoming unemployed will actually take up all the benefits to which they are entitled. There are numerous other uncertainties including, for instance, the level of

[9] Moreover, a "data driven" analysis of policy changes is only possible after some delay since one has to wait for the changes to feed through to the data and then for the data to be collected and processed. Even then, one cannot easily isolate the effect of the policy change since along with the tax-benefit rules of interest, many other effects will potentially have influenced replacement rates as well.

income an unemployed person could earn if they took up employment, the duration of unemployment, the level of detail people take into account when evaluating their incomes in the relevant employment states, or the take-up of in-work benefits. All these dimensions have important implications for the 'correct' way to measure replacement rates. As will be discussed below, different assumptions may be appropriate for different purposes. On the other hand, one strength of the simulation technique lies in its ability to evaluate the effects of *different* assumptions. It can thus contribute to a better understanding of which dimensions are critical and which are less important, an understanding which is important for both research and policy purposes.

3. Conceptual Issues

In this section, we will outline the issues that have to be resolved before measuring replacement rates in practice. Notwithstanding the fact that the replacement rate is a relatively simple concept in theory, it will become apparent that the number of issues and the number of alternative approaches of dealing with them make actual measurement quite difficult. For each of the issues raised, we will indicate how we have addressed them in this study. Even though we have tried to base our decisions on conceptual considerations wherever possible, in some cases our choices will seem arbitrary. We should stress that rather than aiming at exploring the effects of the full range of alternative assumptions, the present study is an illustration of the kind of analyses that can be performed with EUROMOD. In addition, in some cases, our choices are simply based on practical modelling considerations that may limit the range of feasible assumptions.

3.1 Direction of transition

Every individual of working age faces a set of feasible labour market states. Each of them is characterised by, among other things, a certain level of income (either actual or perceived: see below) that plays a part in determining the relative attractiveness of this state. Many studies of replacement rates have focused exclusively on the unemployed and have computed their current income as a fraction of the prospective income they would earn if entering employment (e.g., Salomäki and Munzi, 1999; European Commission, 1998; Central Planning Bureau, 1995). At first sight this focus on what we call the out of work replacement rate is justified if one considers the evidence suggesting (a) that EU rates of outflow from unemployment are low; and (b) that most of the changes in European unemployment is caused by fluctuations in the *outflow* from unemployment (Burda, 1988; OECD, 1997b; Pissarides, 1986). However, the importance of outflow from unemployment to employment in different countries will critically depend on several issues. One is the definition of the unemployed. Does this include all people looking for work (possibly including so-called discouraged workers who would be available for work but have given up looking for a job) or is a narrow definition adopted whereby only those registered as unemployed or only those actually receiving unemployment benefits are counted? Another issue concerns the destination of the move out of unemployment. In their review of unemployment compensation and labour market transitions, Atkinson and Micklewright (1991) stress that it is not appropriate to reduce the large number of possible labour market states to a simple dichotomy in-work versus out of work. People may take up part-time employment; they may leave unemployment for education or training (e.g., as a result of active labour market policy measures); they may withdraw from the labour force entirely (becoming 'inactive', taking up unpaid work; retiring or claiming benefit under a different scheme, e.g., disability); or they may engage in alternative income-generating activities (self-employment or work in the informal sector).

Clearly, to comprehensively measure the financial incentives related to these different transitions, one would need to compute a replacement rate for each of the cells in a matrix representing all sources and destinations of feasible labour market transitions. While this is possible in principle, there are several reasons why we have been less ambitious in our example calculations. The most important relates to the micro data used in our model. Lacking information about people's insurance histories, we are, for instance, unable to simulate the income someone would receive from a contributory pension if they retired. Similarly, our model does not allow us to compute educational grants people may receive if they participate in training or similar active labour market programs. Also, it is, for obvious reasons, very difficult to estimate potential incomes in the informal sector. In this paper we therefore limit our analysis to the following labour market states: (A) employed or self-employed; (B) unemployed; (C) out of work other than unemployed. The transitions we consider are:

- from B to A (we will call this replacement rate RR_{ba});
- from C to A (RR_{ca});
- from A to B (RR_{ab}).

RR_{ba} and RR_{ca} thus represent what we call out of work replacement rates. RR_{ba} is the out of work replacement rate applying to those who are currently receiving unemployment benefits or who classify themselves as ‘unemployed’ in the response to the questionnaire underlying our data (see section 4 for further details). RR_{ca} denotes the level of current (net) income relative to the prospective (net) employment income of someone currently out of work but not ‘unemployed’ according to the above definition. It is, in other words, the out of work replacement rate faced by working age individuals who receive neither income from work nor unemployment benefits (e.g., ‘inactive’ people; those engaged in unpaid care or domestic work; recipients of pensions, disability benefits or social minimum benefits).[10] It is an advantage that we can investigate the ‘inactive’ group separately, however one must be cautious in drawing conclusions for this group as a whole as it is very heterogeneous. RR_{ab} measures the *initial* unemployment benefit that people currently in work would receive if they became unemployed relative to current in-work income. In computing RR_{ab} we have to make assumptions about eligibility to unemployment insurance benefit. Lacking, again, information about contribution records in the data, we assume that, subject to being old enough to plausibly have a sufficient work history, people satisfy the contribution conditions required for the maximum benefit amount/duration (we are, however, able to take into account many other dimensions which influence benefit entitlements such as previous hours of work, age, income levels or household composition). Clearly, this assumption can be improved upon and the model used allows one to explore the effect of different contribution record assumptions. Notably, an important question to be addressed in future analyses is what RR_{ab} could be for

[10]It may, for policy purposes, be interesting to look at the different groups of benefit recipients separately. Since the data contain information on who receives which benefit, it is possible to analyse the distribution of replacement rates for each of these groups (in education, disabled, sick, etc.) in isolation.

people who do not qualify for unemployment insurance at all and could therefore only receive means tested social minimum benefits.

3.2 Unit of analysis

Although the transition from one labour market state to another is a process at the individual level, the subsequent change in income potentially affects the well-being of other household members as well. Both from an income maintenance and from a work incentive point of view, it is therefore not appropriate to only evaluate the alternative income situations of the person whose labour market status changes. In this paper, we compute replacement rates at the household level.

Our choice of the household as the unit of analysis is mainly a result of three considerations. First, and as asserted above, the level of resources available in the household as a whole will affect each household member's standard of living. Secondly, the employment status and incomes of individual household members can have important consequences for the amounts of taxes paid or benefits received by other household members (e.g., because of a joint income tax system or the assessment of total household income for computing means tested benefits). While we would ideally want to take into account how such joint taxes and benefits are actually shared within the household, we do not have the required information to identify such sharing arrangements.[11] An analysis at the household level avoids having to specify arbitrary sharing mechanisms.[12] Third, in the empirical part of this paper, we compare replacement rates across different countries. The generosity and coverage of unemployment insurance benefits varies across countries and, where benefits are more limited, the household assumes an important "insurance" function, substituting or complementing social insurance schemes. The extent to which households are, in fact, able to provide income security for those experiencing spells out of work can only be uncovered by computing replacement rates at the household level.[13]

However, even though we compute household based replacement rates, we *separately* consider *each household member* who is of working age. If there is more than one person of working age, we thus compute more than one replacement rate for this household. Depending on the member of household's current labour market status, we compute a household based RR_{ab}, RR_{ba}, or RR_{ca} in turn for each person by computing the before- and after transition household income. For example, for a two-parent single-earner household with one child of working age who is currently looking for work, we would compute one RR_{ab} (for the earner),

[11] In computing one measure for the entire household, we implicitly assume equal sharing of resources within the household. One of the features of EUROMOD is that it supports analyses at many different levels. It would, for example, be possible to vary assumptions about the unit of analysis and compute replacement rates at the family level instead of the household (using different definitions of "family"). It is also possible to vary the assumptions about intra-household sharing. See Immervoll and O'Donoghue (2001) for a detailed description of the model framework on which EUROMOD is based.

[12] As we understand it, Salomäki (2001) computes individual-level replacement rates by assuming that any benefits accrue (only) to the person reporting them in the underlying micro-data (normally the 'head of household'). Clearly, the results obtained this way are rather sensitive to who reports benefits where entitlement is established for the family or the household as a whole (e.g., family benefits, minimum income schemes or housing benefits).

[13] For policy purposes, it is clearly relevant to know whether a certain level of income maintenance is due to out of work benefits or to incomes provided by other household members. This point of how to decompose replacement rates is taken up in sections 7 and 8 below.

one RR_{ca} (for the inactive spouse) and one RR_{ba} (for the unemployed child). In doing so, the incomes of all members of household can enter the calculation of taxes and benefits (relevant in cases where benefits or taxes depend on couple, family or household income). At the same time, it is assumed that all income components other than the simulated taxes and benefits remain unaffected for members of households whose labour market status does not change (i.e., the income of the child and spouse is held constant when evaluating RR_{ab} for the earner, etc.).

3.3 Purpose of replacement rate

As already discussed, there are two main reasons why we are interested in replacement rates. One is to measure the performance of tax-benefit systems in providing substitute income for those out of work. The second is the concern about possible disincentive effects of high replacement rates. The choice of the appropriate concept of replacement rate depends on what question is to be addressed. The dimensions that are relevant in this context are:

1. Which incomes to include in the numerator and the denominator of the replacement rate;
2. Which direction of labour market transition to compute the replacement rate for; and
3. For whom to compute the replacement rates.

In measuring the degree of income maintenance, we have two main alternatives regarding dimension (1). If we see out of work benefits as an insurance system then one could be interested to measure the extent to which in-work incomes are insured. In this case, the numerator would be (net) out of work benefit income and the denominator would be (net) income from work. Only incomes of the person whose labour market status changes would be taken into account while all other household members' incomes would be disregarded. Or one could be interested in the living standard out of work as opposed to in work. In this case, both numerator and denominator would also include all other incomes including, for example, investment income, benefits which are independent of work status, and the incomes of all other members of household. We adopt the latter type of calculation since we regard the question of relative living standards the more interesting one. As regards dimension (2), we are, in addressing questions of income maintenance, only interested in the transition from in-work to unemployment (RR_{ab}). A more interesting question is for whom to compute RR_{ab}. To give an accurate picture of the level of income maintenance across the entire population, one has to compute RR_{ab} for those currently in work *and* those currently out of work who have had a job previously. Limiting the analysis to those in-work may potentially introduce a sample selection bias since people who have *actually* experienced job loss and the income and lifestyle associated therewith are not taken into account. In the present analysis we are, however, unable to compute RR_{ab} for those currently out-of-work as we generally do not observe previous earnings in the underlying micro-data.

Because incentive effects are relevant for all types of labour market transitions, the replacement rates to be computed under this heading are more varied. Since we are interested in all three directions of labour market transitions discussed in section 3.1, we compute RR_{ab}, RR_{ba}, and RR_{ca}. In our calculations, we use the same formula as for the 'income maintenance' replacement rates, i.e., with total disposable household income in both numerator and denominator. However, since transitions into work (RR_{ba}, RR_{ca}) are computed only for those who are currently out of work, we now have to estimate income from work. Basically, there are three approaches we can choose from. We can use (1) an arbitrary earnings level (such as the minimum wage, if it exists in the country under consideration); (2) actual previous in-work income or (3) estimate an earnings equation. If we were to use previous in-work income, we could only compute RR_{ba} and RR_{ca} for those who have previously been in work rather than for all people for whom the decision whether or not to enter work is relevant. There is also a theoretical argument for using a general earnings equation. In terms of economic models explaining job search behaviour, it is the *distribution* of job offers (characterised by the associated wage level) which is crucial in determining the probability of someone accepting a job.[14] This distribution might be better represented by a statistically estimated earnings equation than by an arbitrary earnings level or by actual previous in-work income which, in terms of the distribution of offers, may be an outlier. Lastly, in the microdata underlying our simulations we do not in fact observe previous work income for all unemployed individuals. For these reasons, we are using a standard earnings equation to estimate in-work income for those currently out of work, utilising the Heckman procedure to account for sample selection bias (Heckman, 1979).[15] In the earnings equation, we use years of education, age, "experience", as well as some regional and occupational dummies as explanatory variables (table 2). The "Heckman" method adjusts the coefficients in the model in order to account for any selection bias associated with the fact that we only observe earnings for those who work. This is done through the use of an extra variable in the earnings equation, known as the inverse Mills ratio λ, generated from a (probit) participation equation. In this study, because we are trying to simulate the potential earnings for the group who are not working, we define the inverse Mills ratio as

$$\lambda = -\frac{\phi(bx)}{\Phi(bx)} \text{ [16]}, \qquad (1)$$

where $\phi(bx)$ is the normal probability density function, $\Phi(bx)$ is the normal cumulative distribution function and bx is the probability value of being in work as predicted from the participation equation. In predicting potential entry wages, we also include the stochastic error term in our model in order to capture the variability introduced by unobserved characteristics.

For RR_{ab}, we do not face these issue since in-work replacement rates are only computed for those currently working. The counterfactual out of work income is then computed by setting in-work incomes to zero, altering all work related variables to indicate that this person is now unemployed and then applying the tax-benefit model to find all relevant taxes and benefits for the entire household (more details on the simulation technique are given in section 4).

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[14]see Atkinson and Micklewright (1991) for a summary and critique of these and other popular economic models underlying theories of labour market transitions.

[15] We thus assume that the selection bias is the same for all 'out of work' groups whereas it may be more conceptually appropriate to treat different 'out of work' groups such as involuntary unemployed differently from, e.g., those on early retirement or home-workers. However, for cross-country studies like the present one, the use of a single participation equation seems preferable to us on transparency grounds.

[16] If we were simulating earnings for the in-work group, then we would use $\lambda = \frac{\phi(bx)}{[1-\Phi(bx)]}$.

In table 1 we summarise the discussion of the properties of different replacement rates. The table shows alternative choices for each of the dimensions considered above. The approach adopted in our simulations is indicated using **bold** typeface.

3.4 Time dependence of replacement rates

In measuring replacement rates, we need to make a decision about the time period relevant for determining the replacement rate. We are concerned with the income of one situation relative to another. Income, however, is a flow-concept. As a result, one needs to be clear about the time period over which it is measured. Because both in-work and out of work incomes can change over time, the replacement rates will potentially be different depending on the time period we chose for measuring them. Since for three of the four countries we are looking at, our data contain annual incomes (the exception is the UK where data are weekly), we have chosen the year as the relevant period. More precisely, it is the twelve months following the transition.

It follows that what we are measuring is a short- to medium-term replacement rate. Due to the limited duration of most unemployment insurance benefits, out of work income will generally decrease after a certain period of unemployment. As a result, RR_{ab} would be lower if measured over a longer period. Apart from questions about the relevance of long-term replacement rate considerations for most people (see below), there is also a more practical reason why we do not consider long-term replacement rates. It is likely that, in the longer term, certain household characteristics which are important for determining taxes and benefits will change as a result of changes in income. Being hypothetical, however, these changes cannot be directly observed in the data. Taking them into account would require a dynamic specification of the microsimulation model rather than a static model which we are using here.[17]

Another consequence of the year as the measurement period of choice is that if someone has more than one employment status during the year, the data will contain, say, both unemployment benefits and employment income. Since we do not know whether this person switched from employment to unemployment or vice versa (or whether more than one transition occurred during the year), we will compute both in-work and out of work replacement rates for him/her. In order to capture the replacement rate the person was facing in each of the labour market states, we have to reconstruct the income at each of the relevant switching points. By using a duration-of-receipt variable provided in the data, we construct hypothetical annual incomes by assuming that the income which is relevant in the labour market state before the switch had been received for the entire year. In computing the replacement rate, we are thus able to compare annual incomes.[18]

[17] We should stress, though, that taking one year as the relevant period may provide a distorted picture if most people are, for example, unemployed for less than a year. This may be particularly relevant in countries such as Britain, where (contributory) Job Seekers Allowance is only available for six months. Since any benefits available after these six months may be lower, assuming (as we do) an unemployment duration of one year in a situation where most people are unemployed for a shorter period will produce in-work replacement rates (RR_{ab}) that are lower than those actually experienced.

[18] For the UK, incomes are annualised by simply assuming that the weekly incomes reported in the data have been received during all 52 weeks of the year. The 'week' period is sufficiently short to render any adjustments for status changes occurring during the reporting period unnecessary.

One further complication arises if incomes relevant for determining taxes or benefits are measured in relation to certain reference dates during the year. The most important example in this respect is income tax. Clearly, whether someone becomes unemployed during the first month of the tax-year as opposed to the final month can make an important difference to this person's tax liability. Atkinson and Micklewright (1985) explore different switching points during the year and demonstrate that assumptions regarding the timing of switching points have important consequences for the resulting replacement rate.[19] Since we do not observe at what point during the year employment status changes occur, all results reported in this paper are based on the assumption that the 'switch' takes place at the beginning (on the first day) of the tax year.

However, in terms of incentive effects, the relevant question is, what time period people actually consider when evaluating the financial effects of alternative labour market states. This is a very difficult question to answer (see also section 3.5 below). While we are aware that only looking at the impact on annual income of switching labour market states at the beginning of the tax year is a rather simplistic solution to this problem, it has the advantage of being relatively easy to grasp - which may, in fact, be a most important feature given that, in assessing the possible influence on behaviour, we are concerned about how people *perceive* incentives. It has, for instance, been questioned whether "[...] people can be supposed to choose consistently in a context in which it is difficult even to write down formally the problems that they face".[20] And even if they can, other influences on their behaviour may render the differences between a theoretically correct model (incorporating an infinite time horizon, proper discounting, etc.) and a 'rule-of-thumb' model irrelevant. The overriding concern of people, especially the unemployed, may, for example, not be the maximisation of the present value of income streams but rather their immediate financial position. It is hard to argue that unemployed people face no restrictions on the amounts of money they can borrow. In other words, people may experience severe cash-flow problems leading them to adopt more short-term decision rules (Atkinson and Micklewright, 1985). Considering one year as the relevant time period therefore seems to be a reasonable route to take.

A final timing issue concerns the duration of benefit receipt. In simulating benefits, we have to take into account that some of them are only available for a limited time. Since for unemployment benefits we assume (as discussed above) that, subject to their age, everybody satisfies the contribution conditions for maximum duration of entitlement, this is not a problem where the maximum duration is greater than or equal to one year (Denmark, France, Spain). For the UK, however, we simulate unemployment benefits such that the insurance benefit is received for only six months (the maximum period).[21] The simulation of annual out of work income also takes into account any waiting periods that apply before a benefit can be received (see section 4 for details).

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[19] As the authors note, the seriousness of the problem depends on whether or not benefits are taxable. In countries where benefits are included in the tax base or where, as in Germany or Austria, they are not part of the tax base but are still taken into consideration for determining the tax-rate to be applied to the base ('Progressionsvorbehalt'), the consequences of any mis-representation of switching points will be less severe.

[20] Bliss (1975), p. 323, cited in Atkinson and Micklewright (1985).

[21] If family income is sufficiently low, the unemployed person is entitled to receive means tested assistance benefits thereafter. This is taken into account in the simulations.

3.5 Other modelling assumptions

While limiting the analysis of replacement rates to the year following the transition may be regarded as a simplification there are other aspects of our approach, which may in fact be 'too precise'. The tax and benefit rules modelled in a tax-benefit microsimulation model are very detailed - often exceeding any information which may be easily available to non-expert individuals (e.g., from information brochures.). In fact, individuals may not even be aware that some of the simulated instruments exist. Since most benefits or tax reductions are not available automatically but have to be applied for, this leads to the issue of non take-up of benefits, where individuals do not claim benefits to which they are entitled. The bias introduced by any non take-up issues is not *a priori* clear since benefits and tax reductions may be available only while in work, only while out of work or independent of income and employment status. In addition the quality of information about taxes and benefits that people have access to may be different in different labour market situations. The importance of these issues will also depend on whether labour market transitions are planned individually or in association with the employer or a union (e.g., in the case of temporary lay-offs). There is, however, clear evidence that the issue of take-up is an important one.[22] While EUROMOD permits the effects of different take-up assumptions to be explored we assume 100% take-up (and no tax-evasion) in the simulations reported here.

4. Simulations

The model used is EUROMOD, an integrated European tax-benefit model. EUROMOD provides us with a Europe-wide perspective on social and fiscal policies that are implemented at European or national level. It is also designed to examine, within a consistent comparative framework, the impact of national policies on national populations or the differential impact of co-ordinated European policy on individual Member States. Within the context of the present paper, the most relevant feature of EUROMOD is that it can provide conceptually consistent and, thus, comparable output for different countries. See Immervoll *et al*. (1999) and Sutherland (2001) for more details.

Simulations are run for four countries: Denmark, France, Spain and the UK. The micro data sets underlying the simulations are derived from wave 3 (Spain) and wave 2 (Denmark) of the ECHP (User Database), the 'Family Budget' (BdF) survey 1994-95 (France) and the UK 1995/6 Family Expenditure Survey. As mentioned above, we consider the replacement rates of working-age individuals (in work (RR_{ab}), unemployed (RR_{ba}) or 'inactive' (RR_{ca})). Those currently in-work are defined for the purposes of this study as those who had income from employment or self-employed during the year, while the 'unemployed' are classified as either declaring themselves as unemployed and seeking work or receiving unemployment benefits in the data. Working-age individuals who are neither working nor unemployed are considered 'inactive'. This includes people who are in education, disabled or have taken early retirement. Table 3 reports the weighted and unweighted sample size for each of the groups. For more detailed information regarding sample sizes, coverage, non-response, etc. the reader is referred to Sutherland (1999).

[22] See, for instance, Atkinson (1989) and Department of Social Security (2000) for the UK, and Riphahn (2001) for Germany.

The simulations are based on the systems of tax and benefit rules current in June 1998 and all monetary variables in the micro-data are updated to this year using the most appropriate uprating index available for each type of variable. The standard instruments simulated in EUROMOD and relevant for this exercise are income taxes, social insurance contributions, child benefits and other family benefits, and income-tested benefits. For the present study we also simulate unemployment benefits. For those currently unemployed (RR_{ba}) or inactive (RR_{ca}), we simulate a transition into employment in the service sector (white-collar worker) working full-time. Prospective earnings are imputed using Heckman type earnings functions estimated separately for men and women and accounting for selection bias through the use of a participation equation, as described in table 2. For those currently in work (RR_{ab}), we simulate a transition into unemployment. We exclude those under 18 or in education and those aged 59+ from this transition. In considering civil servants, we are faced with a choice to include or exclude. In two of the countries examined (Denmark and the UK), civil servants are covered by unemployment benefits as there is a possibility of unemployment, while in France and Spain, civil servants are not covered because as a result of their employment contracts, they are assumed not to face this risk. For comparability reasons we have opted to exclude civil servants in the results reported here.
In simulating unemployment benefits and computing the relevant replacement rates, a number of noteworthy assumptions are made:

- Past unemployment insurance contributions of individuals currently in work are 'sufficient' to be eligible for the (maximum duration of the) benefit;
- We disregard any provisions made for unemployment compensation in collective agreements;
- We disregard any special legal provisions for seasonal unemployment;
- We assume that all transitions into unemployment are *involuntary*;
- We disregard any temporary back-to-work measures (such as delayed phase-out of benefits once a job is accepted) but do take into account in-work benefits such as the UK Family Credit (in 1998, now Working Families Tax Credit);
- We assume that in the case of transitions from work to unemployment, individuals have been made unemployed at the start of the current tax year;
- In computing incomes we do not include *in-kind* benefits such as the provision of social / subsidised housing or child-care. Also not taken into account are work-related expenses (union fees, costs of commuting to work, costs of providing care for dependants during working hours, etc.), expenses incurred only by the unemployed (job search costs) and any discounts or rebates that may be available to benefit recipients (e.g., on utility and phone bills, public transport, medical expenses, or school-related expenses such as books or uniforms).

Replacement rates are then calculated by simulating, for each individual in turn, the household disposable income for their original state (in-work, inactive or unemployed). After changing their relevant status and income variables in the micro data to the counterfactual state, the tax-benefit model is again used to recalculate household disposable income in the new state. When simulating the transition from work to unemployment, we utilise in-work income as previous income. Occasionally, part-time work reduces entitlement to unemployment benefit. Also some individuals are ineligible for unemployment benefits because they were self-employed, have worked too little hours or do not qualify for other reasons (age, income limits, etc.). Our simulations take these issues into account. For transitions into work, we utilise the earnings equations described above to find potential in work gross income. The definition of replacement rates used is the ratio of the household disposable income out of work over the household disposable income in work, where disposable income is defined as gross incomes from market activities, plus social benefits, minus income taxes and own social insurance contributions.

5. National Tax-Benefit Systems

We have selected four countries that represent different regions in Europe and different welfare state regimes: Denmark, a Scandinavian country and a 'universal' welfare state; France, a central European country with a 'conservative' welfare state; Spain, a Mediterranean country with a southern welfare state model and finally an example of an Anglo-liberal welfare state, the UK. Table 4 shows the importance (as a % of total disposable income in the household sector) of different components of the tax-benefit systems in each of the countries. Focusing on benefits and public pensions, France shows the highest proportion, followed by Denmark, Spain and the UK. This reflects the relative lack of development of state benefits in Spain and the importance of private provision (especially in the case of pensions) in the UK. In terms of revenue raising, Denmark places relatively little emphasis on employer contributions, with income taxes the highest percentage of all four countries. In France employee and employer contributions are the most important. In Spain, social contributions are also important, with income taxes having a relatively higher share of total revenues than in France.

Denmark, France and Spain operate earnings related unemployment benefits, while in the UK they are flat rate. Coverage of the benefits is limited to insured workers. In France and Spain, the self-employed are excluded. However in France only about 9% of workers we examine are self-employed, compared with nearly 20% in Spain, indicating that social insurance coverage will be lower in Spain. In Denmark, France and the UK, individuals who are not eligible for unemployment benefits may be eligible for social assistance, while in Spain, there is no comparable instrument. Once French unemployed exhaust entitlement to unemployment benefits, they are eligible for unemployment assistance. Certain older workers and those with children in Spain may be eligible for unemployment assistance, but entitlement is generally quite limited. In the UK, unemployment benefits are payable only for at most 6 months, after which individuals may be eligible for social assistance. Social assistance can also top up family incomes to the social minimum while in receipt of unemployment benefits. In the UK and France, social assistance is also available to low-earning workers while in Denmark, only "social events" (unemployment, sickness, divorce, etc.) can trigger eligibility for the social minimum benefit. Another important determinant of income when out of work (or in low-paid jobs) are housing benefits which exist in Denmark, France and the UK.

Turning to income taxation, Denmark and the UK employ largely an individual income tax[23], while France and Spain employ joint tax systems where income taxes potentially depend on the incomes of more than one member of the household. Other instruments that depend on the incomes of other members of household include means-tested benefits. These instruments are

[23] However, there exist substantial tax free allowances in Denmark which are transferable between spouses.

important examples of how household composition impacts on the operation of the tax-benefit system and, thus, the net replacement rate.

6. Distribution of Replacement Rates

Table 5 contains the four countries, broken into five bands of replacement rate levels, and shows the proportion of the relevant target group facing replacement rates within each band.[24] The top section shows the distribution of replacement rates for those currently in work (RR_{ab}). We notice that France has a higher incidence of 'high' in-work replacement rates than the other countries. 79% of workers face in-work replacement rates of 80% or more while for 95% of workers the household income would, in the event of becoming unemployed involuntarily, be at least 60% of its current level. Denmark has the next highest incidence of 'high' replacement rates with 61% of workers with rates of 80% or more and 89% with 60% or more. Next comes Spain with 58% (80%) with replacement rates of 80% (60%) or more. For the UK, where unemployment benefits are not earnings related, we see a much less concentrated distribution and markedly lower replacement rates with only 25% (55%) of workers having replacement rates of 80% (60%) or higher.

Turning to the second part of table 5 and to those who are currently unemployed, we find a very different distribution of replacement rates (RR_{ba}). It is much more similar across countries than the distribution of RR_{ab}'s discussed above. About 53% (80%) of French unemployed face out of work replacement rates of 80% (60%) or higher compared with 52% (79%) of Danish, 46% (72%) of Spanish, and 22% (58%) of British unemployed.

Clearly, compared to those in work, fewer unemployed in Denmark, France and Spain have very high replacement rates (≥ 80%) while in the UK, the difference goes in the opposite direction (and is less pronounced). There are a number of reasons for this. Firstly our in-work replacement rates (RR_{ab}) measure the replacement rate in the first year of unemployment assuming that people are in fact entitled to unemployment insurance benefits. As the duration of entitlement to unemployment benefits (UB) is normally limited, those who have been unemployed for longer may cease to be eligible for these benefits. They may then become eligible for lower valued unemployment- or social assistance benefits (France, UK) or nothing as in the case of many unemployed in Spain. In Denmark, where membership in the unemployment insurance scheme is voluntary, those who are observed to be unemployed in the data and are not members of the insurance scheme will not be receiving any unemployment benefits at all (in cases where family income is "low", they would receive social assistance instead). Secondly, UB may fall in value over time as in the case of France. Consequently, even for those long-term unemployed who are still in receipt of UB, benefit levels may be lower. In the UK, benefits become means tested after 6 months and may thus also fall in value. In short, because the duration of unemployment will often be higher for our unemployed sample (RR_{ba}) than those who we "make" unemployed in our simulations (RR_{ab}), institutional factors such as duration dependent eligibility and benefit amounts will result in lower replacement rates for the sample of unemployed compared with the sample of working individuals.

[24] All results have been derived using weighted data. For details on the weights used see Sutherland (2001).

On the other hand, the earnings we predict for those moving into work (RR_{ba}) will be an important factor. Potential earnings of the unemployed going into work will often be lower than earnings of those currently in work. The unemployed will typically have lower education levels and/or frequently be younger on average than the population in work. These factors influencing potential earnings will be picked up by our earnings model: It will predict lower earnings for those currently unemployed. This will result in a lower denominator and thus higher replacement rates. The two effects therefore run in opposite directions, with the 'earnings' effect being relatively stronger in the UK (median RR_{ab} < median RR_{ba}) and the institutional factors dominating in Denmark, France and Spain (median RR_{ab} > median RR_{ba}).
The third type of replacement rates we examine concerns those who are currently inactive (RR_{ca}, bottom part of table 5). Again, we compare net household incomes in the current (out of work) situation with net household incomes that would result if the inactive individual would move into work. Here, Spain shows the highest proportion of currently inactive people (41% and 71%, respectively) with replacement rates of 80% (60%) or more compared to France with 38% (74%), Denmark with 38% (80%) and the UK with 25% (66%). The median values as well as the incidence of very high replacement rates (≥ 80%) are generally lower than for the unemployed group. This is not true, however, for the UK. Upon first inspection, this may seem peculiar as one may not expect inactive people to be eligible for benefits. However in many cases inactive people are in receipt of disability benefits or early retirement pensions that are often more generous than unemployment benefits (which are generally clearly lower in the UK than in the other countries). Also they are likely to have lower potential earnings than the unemployed, whose in-work "experience" is typically higher than for the inactive group.[25] In general, and as mentioned before, one must be cautious in drawing conclusions based on replacement rates computed for the "inactive" group as a whole as it is very heterogeneous.

7. What Drives Replacement Rates?

In this section we consider the factors that influence replacement rates, by separately looking at different demographic groups as well as income components that influence household incomes in and out of work.

Table 6 describes the distribution of replacement rates decomposed by gender. We see that for those currently in work, women's replacement rates (RR_{ab}) are higher than men's in all four countries. In absolute percentage terms we find that Denmark and Spain exhibit the largest differentials of very high replacement rate (80% or more) with a difference of 31 and 34 percentage points respectively. In relative terms, the UK has the highest differential: the percentage of working women with very high replacement rates is 2.6 times the percentage of males. There are a number of reasons for these differentials. Firstly, it is important to note that they are not due to more generous benefits for women. Rather, women are likely to have lower earnings, both in terms of their hourly wage rates and because of shorter working hours. In addition, and as we shall see below, household composition plays an important role, with working women having a high probability of living with partners who have higher earnings. If

[25] In our earnings model, we use "potential experience" as an explanatory variable since we do not observe "actual experience" in our data (see table 2). Notwithstanding the argument that "inactive" people will, in reality, often have lower (re-)entry wages than the unemployed, our simulations will therefore not generally be able to pick up this effect. The exception are those "inactive" people who are still in education (where our definition of "potential experience" is likely to be a very good proxy of "actual experience").

the husband's earnings are the main source of household income then income will, in relative terms, not fall by very much if the woman loses her job. The (household based) replacement rate she is facing will therefore be relatively high.

For the unemployed (RR_{ba}), the absolute difference between men and women is again greatest in Denmark and Spain with 16 and 13 percentage points differences respectively in the very high replacement rate category. For inactive women (RR_{ca}), the differential is generally lower than for the unemployed. Indeed, in France and Spain the differential is going in the opposite direction, with more men having higher replacement rates. The explanation for this is related to our broad definition of "inactivity": While men may be more likely to be inactive and receiving disability benefits, inactive women will more often be (unpaid) home worker.

Table 7 decomposes the distribution of replacement rates by age group. Here we note that the replacement rate for the under 25s in work are in general much higher than for older age groups. The reasons are similar to those for observing higher replacement rates for women. Firstly, younger people will have lower predicted in-work income than older people and thus have higher replacement rates as unemployment benefits typically provide minimum payments ("floors") that younger people are more likely to benefit from. This effect is particularly strong in the UK (where benefits are flat rate) and in Denmark. Secondly, they are more likely to live at home with other earners. Again, if young people living at home are made unemployed then the effect on overall household income is likely to be small.

The age group differences for unemployed people are smaller than for the in work group. One of the reasons is that average out of work benefits will, relative to their potential earnings, often be lower for younger unemployed people than for older individuals because young people may not have built up sufficient contributions to be entitled to unemployment benefits.[26] In the case of both Spain and France, they will, due to age restrictions, then not be eligible for unemployment assistance or social assistance benefits either. For the inactive group, we find that age differentials generally lie in-between those for the in-work and unemployed groups. These results reflect the variation in the two main determinants of replacement rates for young people, benefit rules and household structures. The variation in these dimensions tends to be more pronounced between in-work and out of work groups than it is for older individuals.

To see more directly to what extent household composition, and particularly the presence of other adults or earners in the household, have an effect on the levels of replacement rates, we now decompose the distribution of replacement rates by the number of adults per household (table 8). For in-work individuals, the number of adults in a household has the biggest influence on the extent of very high replacement rates (80% or more) of the four classifications explored here (gender, age, number of adults, number of children). Spain exhibits the largest absolute differential. While 59% of workers in households with two or more adults face very high replacement rates of 80% or higher, this is true for only 9% of single adult households. France is second with 83% versus 51%. In Denmark the figures are 65% and 40% followed by the UK with 27% and 11%. In relative terms, the percentage of

[26] Note, again, that this is only relevant for the out of work groups (RR_{ba}, RR_{ca}) since, in computing potential UB for the in-work group (RR_{ab}), we assume that everybody has built up sufficient contribution payments.

households with two or more adults facing very high replacement rates is about 6.4 and 2.5 times the percentage for single adult households in Spain and the UK respectively compared with 1.6 for Denmark and France. For unemployed and inactive people, the direction of the differential is the same although it is generally smaller.

The influence on replacement rates of children in the household is not as strong. Yet we see from table 9 that for Denmark, France and the UK, the incidence of very high replacement rates for individuals in households with children is, for all types of transitions considered here, generally higher than for households without children. The differential is quite small however. In the case of Spain, however, the presence of children in the household is associated with a lower percentage of individuals with very high replacement rates (for the unemployed group, the percentages are practically the same). The presence of children has often been seen as a reason for high replacement rates as out of work benefits often include extra amounts paid for dependent children, while in-work incomes do not. Consequently, out of work incomes should be relatively higher than in-work incomes for those who have children. The extent to which this is true depends, of course, on the size of any child-related benefit payments. Policies such as the Family Credit in the UK (now replaced by the "Working Families Tax Credit") and other family related *in-work* benefits aiming to increase the financial incentives of employment will reduce this differential. Although it is the case in our results that more families with children have higher replacement rates, the differential is greater for other characteristics such as gender, age or the number of adults.

Apart from demographic influences on replacement rates, it is of course interesting to analyse to what extent the size of benefit incomes determines the degree to which household incomes are preserved in the case of unemployment or inactivity. To address this question, we now turn to a decomposition of replacement rates in terms of the incomes that drive them. Figure 1 describes the decomposition used. The replacement rate calculation consists of four parts; (C) incomes out of work *less* (D) taxes and contributions out of work divided by (A) incomes in work *less* (B) taxes and contributions in work. In this figure, in-work and out of work components are shown in separate bars representing household incomes in the relevant in-work and out of work situations. The bars are then further split up into the main sub-components; benefits, spouse's earnings, other market income (such as investment income), own earnings, others' earnings (i.e., earnings of other household members other than the spouse), social insurance contributions and income taxes. In comparing the out of work bar with the in work bar, own earnings, taxes and contributions will fall on average while benefits should rise. Other market incomes and other household members' incomes are, by assumption, not affected by the transition and will therefore remain unchanged.

In figures 2 to 4, we decompose the distribution of replacement rates into the sub-components described above. Incomes are in national currencies per month (1998) and at the household level (left hand scale). Breaking replacement rates up into bands as in tables 5 to 9, the graphs show, for each replacement rate band, the composition of household incomes for the in-work (left hand bar) and out of work (right hand bar) situation averaged across all people in the relevant band (the vertical dotted lines separate the different replacement rate bands). Average gross incomes are represented by the height above the axis and average taxes/contributions are given below the axis. Average disposable incomes can thus be derived by subtracting the bar below the axis from the bar above. The relationship between the (net) in work and out of work bar is the replacement rate: The higher the out of work income, the lower out of work taxes/contributions, the lower in-work income or the higher in-work taxes/contributions, the higher the overall replacement rate. Figures 2 to 4 represent, respectively, those in work, unemployed and inactive (replacement rates RR_{ab}, $RR_{ba,}$ RR_{ca}). The bold line in each graphic shows again the distribution of replacement rates from table 5 by replacement rate band (right hand scale).

An important finding relates to the role of spouse's and other household members' earnings relative to benefits. For most countries, we see that for those with high replacement rates, spouses' and others' earnings are often more important components of (out of work) income than benefits. This is particularly true for potential out of work incomes of individuals currently in work (RR_{ab}). Thus other people's earnings would on average do more to preserve a household's living standard than benefits, confirming our argument above that a household perspective is essential when looking at living standards in and out of work across countries. It is also consistent with our earlier finding that the presence of more than one adult in a household is an important factor behind high replacement rates. In most cases, spouses' earnings stand out as the most powerful preserver of household income. However, we see that other household members' earnings are also important. These typically are the earnings of parents of young people living at home. The parents' incomes are, in many cases, much higher than the relatively low in-work incomes of young people (see the discussion of table 7 above). Spain provides the most striking example in this respect.

8. Isolating the Impact of Tax-Benefit Systems: The Tax-Benefit to Earnings Ratio

Our main conclusion from the decomposition of replacement rates is that as a measure they are not necessarily a good indicator of the operation of the tax-benefit system. The objective of such a measure would be to assess how well the *tax-benefit system* maintains income when out of work and give an indication of the effect the system has on work incentives. However, as we have seen, the incomes of others in the household are often more important determinants of high replacement rates. Replacement rates are a good measure for assessing the overall income situation out of work versus in work. By decomposing them, one can assess the importance of the tax-benefit system relative to other determinants of household incomes. However, if the aim is to analyse the performance of tax-benefit systems *per se* in terms of income maintenance or incentive effects, replacement rates are clouded to some degree by the presence of these other incomes as part of the measure. In this section we therefore attempt to construct and use a new measure that is able to isolate the effects of the tax-benefit system. We call this measure the tax-benefits-to-earnings ratio (TBER). It is defined as follows:

$$TBER = \frac{(B-T)_{out} - (B-T)_{in}}{E_{in} - E_{out}} \qquad (2)$$

where *B*, *T* and *E* are total benefits, total taxes/contributions and gross earnings, respectively. The subscripts *out* and *in* relate to income components when out of work and in work. As for replacement rates, we evaluate all income components at the housheold level. TBER therefore represents the change in taxes and benefits in work versus out of work compared to the loss in earnings and thus ignores the impact other incomes have on household living standards during the transition. It is a narrower measure that does not consider the relative standard of living, but instead simply examines to what degree the tax-benefit system replaces lost earnings.

By decomposing the TBER, we can show the change in each relevant tax-benefit component relative to the change in earnings (figure 5). We distinguish between Housing Benefits (HB), Family Benefits (FamB), Social Assistance Benefits (SAB), Unemployment Benefits (UB), Other Benefits (OthBen), (own) Social Insurance Contributions (SIC) and Income Taxes (Tax). A positive value (the relevant bar is above the axis) indicates that the income component increases (decreases) when earnings decrease (increase). Thus, if somebody loses his job and his/her earnings fall from *E* to 0 then a benefit increasing from 0 to *B* will show up as a positive value *B*/*E*. On the other hand, taxes and contributions (which are negative income components), will show up as positive values if their absolute value decreases (increases) as earnings decrease (increase). Negative bars are associated with income components that change in a way that decreases disposable income *further* as earnings fall (e.g., increasing taxes or decreasing housing benefits after a transition from work to unemployed/inactive). The net height of the bar (positive components minus negative ones) show the average TBER for the relevant band.

Figures 6 to 8 show the results for the four countries (again for in-work ($TBER_{ab}$), unemployed ($TBER_{ba}$) and inactive ($TBER_{ca}$) individuals respectively). An important difference vis-à-vis the distribution of replacement rates is that TBERs (bold line) are typically lower. For those in work, this is especially obvious in the case of the UK where, compared to the other countries, the lack of income insurance provided by the tax-benefit is striking. Decomposing into tax-benefit components, we see that in Denmark, UB are generally the most important determinant of the TBER. Note that, in all countries, the number of people benefiting from TBERs greater than 100% is pratically zero and, as a result, no reliable conclusions about possible contributing factors (in terms of the decomposition) can be drawn. Depending on the country, the same may hold for other TBER bands (e.g., 0-20% in Denmark). In France, a similar pattern emerges. In Spain UB are the most important driving force, while in the UK, where UB are flat rate and of short duration, SAB are more important and HB play a role as well.

Looking at the unemployed population, the TBERs are also lower on average than replacement rates. Decomposing, we again see the importance of UB as being the biggest driving force in high TBERs in each country except the UK. In the UK, SAB again have the largest effect and HB play a more important role than for the in-work population. We also notice that the impact of lower taxes and contributions are also somewhat important.

The TBER for inactive people is in general much lower than the equivalent replacement rate because this group will often not be entitled to benefits while inactive. In the decompositions we see that in Denmark, there are few people with very high TBERs (80% or more), but that for those with TBERs between 20 and 60%, increasing tax and social insurance contributions on moving into work have the strongest effect. In France and the UK, because many inactive people are in households where the spouse is in receipt of means tested benefits, the impact of moving into work, will result in a reduction of social assistance and housing benefits paid to this household. The possible loss of income replacement benefits for disabled people or the early retired is also important. In Spain the picture is different. The principal effect here is the loss of Other Benefits at the very top of the distribution. However, for the vast majority of inactive people in Spain, benefits and TBERs are quite low. Increasing taxes and contributions are therefore the most important factors for the majority of people moving from inactivity into work.

9. Concluding Remarks

In this paper, we have discussed the advantages of the simulation approach in calculating net replacement rates. Compared with approaches that use transitions as observed in micro data ("data driven" methods), the simulation method can examine the replacement rates of all those who could *potentially* change states as opposed to limiting the analysis to those who actually do make the transition. The method therefore allows analysts to study the effect of any type of transition into or out of work. Because we do not only look at individuals whose behaviour does in fact change, we avoid sample selection problems that would arise in a "data driven" approach. By showing, for each relevant unit of analysis, the income trade-offs that they face, the simulation method is therefore better suited for studying if, and to what extent, replacement rates affect people’s behaviour. Another important advantage of the method is that simulation methods allow one to compare changes in replacement rates as a result of social and fiscal policy *reforms*. The use of a multi-country microsimulation model (EUROMOD) allows replacement rate calculations to be made in a methodologically consistent and thus more comparable manner for different countries.

We produce detailed distributions of net replacement rates for four countries (Denmark, France, Spain and the UK) showing how many people in each country face different levels of replacement rates. Using the tax-benefit model, we are also able to isolate the influence of demographic and policy influences which determine the level of out of work income versus income when in work. Our analysis of the factors contributing to the level of replacement rates points to the importance of household composition and the presence of other income earners in the household. For the majority of people with very high replacement rates, the tax-benefit system is not in fact the main "preserver" of household income. This is particularly true for women and other groups with a less than average earnings potential. As a result, replacement rates may not necessarily be the best indicator of the isolated impact of taxes and benefits on income replacement. We therefore introduced a new measure, the Tax-Benefit to Earnings Ratio (TBER), in order to isolate the effects of the tax-benefit system.

We also found marked differences between the distributions of replacement rates faced by those currently in work versus those who are currently unemployed or 'inactive'. By separately showing the various income components that are driving replacement rates, we can clarify if this discrepancy is mainly due to different earnings prospects of those currently out of work or whether they are due to differences in eligibility to and coverage of out of work benefits. The significantly different replacement rates faced by employees and unemployed also have implications for studies aiming at modelling the actual response to work (dis-)incentives that various levels of replacement rates give rise to. They highlight the important role of the microsimulation technique in the estimation of labour supply models. "Data driven" methods extract the 'budget set' of individuals from observations in the dataset. In doing so, they take combinations of income and hours of work from different individuals and assume that they resemble the actual income-versus-leisure trade-off faced by a representative individual. However our results show that the *potential* out of work income situation of the currently employed often differs markedly from the *actual* income situation of the currently unemployed. Constructing budget sets by 'pooling' income/working hours combinations from different individuals is therefore problematic.

The analysis presented here necessarily draws on several important assumptions which have been discussed in considerable detail. It would clearly be desirable to perform a more thorough analysis of the sensitivity of results with respect to these assumptions. In particular, it is important to note that the replacement rates computed for those currently unemployed are strongly influenced by the earnings model we use. We recognise that the assignment of potential in-work earnings is an area that one could usefully explore further. Apart from potential technical improvements it would, in future extensions of the present work, be interesting to consider the replacement rates of individuals with longer spells of unemployment. It would also be worthwhile to consider the degrees of income maintenance that are associated with transitions from work into other states such as home-work or early retirement. As we have argued above, the detailed replacement rates produced using the microsimulation technique would be an appropriate input into studies aiming to clarify the actual relevance of replacement rates for labour supply decisions.

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Tables and Figures

Table 1. Replacement rate concepts.

	Income Maintenance		*Incentive Effects*	
	out of work	in-work	out of work	in-work
Incomes	B_{UE} $\boldsymbol{B_{UE}+B_{oth}+Y_{oth}}$ $\mathbf{+Y_w+B_{oth}+Y_{oth}}$	Y_w $\boldsymbol{Y_w+B_{oth}+Y_{oth}}$ $\mathbf{+Y_w+B_{oth}+Y_{oth}}$	$\boldsymbol{B_{UE}+B_{oth}+Y_{oth}}$ $\mathbf{+Y_w+B_{oth}+Y_{oth}}$	RR_{ab}: $\boldsymbol{Y_w+B_{oth}+Y_{oth}}$+ $\mathbf{Y_w+B_{oth}+Y_{oth}}$ RR_{ba}: $\boldsymbol{E_w+B_{oth}+Y_{oth}}$+ $\mathbf{Y_w+B_{oth}+Y_{oth}}$ RR_{ca}: $\boldsymbol{E_w+B_{oth}+Y_{oth}}$+ $\mathbf{Y_w+B_{oth}+Y_{oth}}$
Direction	**in-work to unemployment** (RR_{ab})		**in-work to UE** (RR_{ab}) in-work to out of work (other than UE) **UE to in-work** (RR_{ba}) **out of work (non UE) to in-work** (RR_{ca})	
Sample	working age currently in work plus those out of work who had worked previously **working age currently in work**		**working age currently in work** (RR_{ab}) **working age currently UE** (RR_{ba}) **working age currently out of work (non UE)** (RR_{ca})	

Notes:
UE means unemployed. The notation for the income components is as follows. B_{UE}: Unemployment benefit simulated for the person whose replacement rate is to be calculated; B_{oth}: benefits other than B_{UE} (e.g., child benefits); Y_w: Actual income from work as recorded in the data. E_w: Income from work as predicted by the earnings equation; Y_{oth}: Primary income other than Y_w (e.g., investment income). All income components are net of taxes and contributions payable on them. Income components shown in *italics* are incomes of the person for whom the replacement rate is calculated while non-italics are for those of all other household members. **Bold** entries indicate the chosen alternative(s) where more than one modelling alternative exists.

Table 2. Coefficients of the Heckman "Two-Step" Earnings Model.

Variable	DK		FR		SP		UK	
	Coef.	StDev.	Coef.	StDev.	Coef.	StDev.	Coef.	StDev.
Women								
Earnings								
Years in Education	0.041	0.012	0.084	0.004	0.044	0.011	0.049	0.005
Experience	0.062	0.008	0.050	0.005	0.067	0.009	0.031	0.003
Experience squared	-0.001	0.000	-0.001	0.000	-0.001	0.000	-0.001	0.000
Part-time dummy	0.218	0.043	-0.132	0.021	0.334	0.050	-0.126	0.019
Constant	3.017	0.280	2.553	0.215	4.677	0.275	0.662	0.101
Inverse Mills Ratio	-0.271	0.197	-0.197	0.070	-0.423	0.112	-0.033	0.044
Participation								
Married	0.297	0.085	0.004	0.042	-0.156	0.054	0.329	0.049
Cohabiting	0.170	0.090	0.323	0.055	0.425	0.142	0.291	0.078
Years in Education	0.117	0.013	0.082	0.005	0.127	0.006	0.074	0.009
Experience	0.053	0.012	0.152	0.006	0.142	0.007	0.075	0.008
Experience squared	-0.001	0.000	-0.003	0.000	-0.003	0.000	-0.002	0.000
Regional Unemployment Rate	0.000	0.000	-4.486	0.607	-0.649	0.336	-0.791	1.670
Number of Children Aged 0-5	-0.302	0.060	-0.193	0.028	-0.280	0.047	-0.657	0.037
Number of Children Aged 6-10	-0.046	0.069	-0.179	0.030	-0.240	0.045	-0.341	0.037
Number of Children Aged 11-17	0.011	0.066	-0.302	0.026	-0.306	0.036	-0.203	0.035
Constant	-1.243	0.177	-0.997	0.116	-2.232	0.149	-0.742	0.174
Men								
Earnings								
Years in Education	0.036	0.009	0.075	0.002	0.056	0.005	0.041	0.004
Experience	0.050	0.007	0.035	0.005	0.049	0.008	0.044	0.004
Experience squared	-0.001	0.000	0.000	0.000	-0.001	0.000	-0.001	0.000
Part-time dummy	0.058	0.079	-0.001	0.026	0.304	0.074	-0.008	0.043
Constant	3.432	0.175	2.946	0.153	5.140	0.157	0.437	0.000
Inverse Mills Ratio	-0.573	0.149	-0.677	0.051	-0.664	0.083	-0.369	0.062
Participation								
Married	0.815	0.108	0.912	0.059	0.904	0.067	0.819	0.065
Cohabiting	0.390	0.104	0.867	0.072	0.641	0.173	0.509	0.087
Years in Education	0.082	0.015	0.038	0.006	0.056	0.007	0.036	0.010
Experience	0.050	0.013	0.151	0.006	0.128	0.007	0.065	0.008
Experience squared	-0.001	0.000	-0.003	0.000	-0.003	0.000	-0.002	0.000
Regional Unemployment Rate	0.000	0.000	-3.906	0.928	-1.306	0.468	-4.801	1.315
Number of Children Aged 0-5	-0.029	0.084	0.061	0.046	-0.023	0.063	-0.238	0.043
Number of Children Aged 6-10	-0.119	0.093	0.074	0.050	0.047	0.061	-0.160	0.046
Number of Children Aged 11-17	-0.054	0.079	-0.264	0.048	-0.435	0.056	-0.338	0.053
Constant	-0.683	0.196	-0.735	0.135	-1.148	0.137	0.059	0.191

Source: Authors' calculations.

Notes: Dependent variable is the logarithm of the hourly wage. Self-employment incomes are disregarded. Experience is defined as Age – Years in Education – 6. Part-time dummy is 1 if 0 < weekly hours < 30. Other Variables in model include occupation and regional dummies.

Table 3. Sample Sizes.

	DK	FR	SP	UK
In-Work				
Unweighted	2238	9856	4905	6101
Weighted	1.88	19.69	10.61	23.33
Unemployed				
Unweighted	627	2054	1778	582
Weighted	0.53	4.26	4.02	2.49
Inactive				
Unweighted	337	3692	3461	2555
Weighted	0.52	9.20	15.95	11.26

Source: EUROMOD.

Note: Weighted Numbers are in millions.

Table 4. Characteristics of Tax-Benefit Systems[1]

	DK	FR	SP	UK
Average (per-capita) amounts as % of per-capita disposable income				
Employer Soc. Ins. Contributions	3.2	28.1	13.1	6.3
Income Tax	51.9	11.0	15.1	20.0
Own Soc. Ins. Contributions	13.5	18.6	5.3	5.5
Benefits and Public Pensions	31.0	33.4	28.5	21.3

Source: EUROMOD.

Notes: 1. Disposable income is defined as market incomes minus income taxes and (own) social insurance contributions plus all public pensions and cash benefits. Per-capita amounts have been computed by equivalising total household values using the "modified" OECD equivalence scale: 1/ 0.5/0.3, head/adult dependants/children aged under 14.

Table 5. Distribution of Household Replacement Rates (working-age individuals)

	DK	FR	SP	UK
In-Work				
Median Rep. Rate	85.0%	87.0%	84.0%	62.0%
Sample Size	2238	9856	4905	6101
% of Total Population (individuals)	31.7%	33.6%	26.0%	38.4%
Replacement Rate [%]				
0-20	0.5	0.8	6.3	3.2
20-40	1.9	1.8	5.3	11.9
40-60	8.3	2.5	8.1	30.1
60-80	28.2	15.8	22.8	29.6
80-100	46.7	74.2	52.6	22.9
100+	14.3	4.9	4.9	2.4
	100.0	100.0	100.0	100.0
Unemployed				
Median Rep. Rate	81.0%	81.0%	77.0%	64.0%
Sample Size	627	2054	1778	582
% of Total Population (individuals)	8.9%	7.2%	9.7%	3.9%
Replacement Rate [%]				
0-20	2.9	0.5	3.0	1.5
20-40	5.7	5.4	9.0	11.8
40-60	12.6	14.4	15.9	28.3
60-80	27.0	26.6	25.5	36.6
80-100	34.0	34.5	31.1	20.5
100+	17.7	18.5	15.4	1.3
	100.0	100.0	100.0	100.0
Out Of Work but not Unemployed ("inactive")				
Median Rep. Rate	76.0%	74.0%	74.0%	68.0%
Sample Size	337	3692	3461	2555
% of Total Population (individuals)	5.6%	12.4%	17.9%	15.8%
Replacement Rate [%]				
0-20	1.5	0.7	3.9	1.4
20-40	3.9	6.0	7.9	8.0
40-60	15.0	18.4	17.3	24.1
60-80	42.0	37.4	30.1	41.1
80-100	37.5	31.4	36.2	23.8
100+	0.0	6.1	4.7	1.5
	100.0	100.0	100.0	100.0

Source: EUROMOD.

Note: Target sample sizes refer to the number of persons aged 18-59. The in-work/unemployed/inactive groups are not mutually exclusive as it is possible to have different states in a particular year.

Table 6. Distribution of Household Replacement Rates Decomposed by Gender

	DK		FR		SP		UK	
	women	men	women	men	women	men	women	men
In-Work								
Sample Size	887	1351	4207	5649	1644	3261	2900	3201
Replacement Rate [%]								
0-20	0.0	0.8	0.2	1.3	1.7	8.7	1.1	4.9
20-40	0.2	3.0	0.7	2.5	1.7	7.1	4.8	17.9
40-60	3.0	11.7	1.1	3.6	3.5	10.5	19.8	38.7
60-80	17.0	35.3	9.6	20.4	13.1	27.7	36.2	24.0
80-100	59.9	38.4	83.1	67.7	70.6	43.4	34.7	13.0
100+	20.0	10.8	5.3	4.6	9.3	2.7	3.4	1.6
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Unemployed								
Sample Size	338	289	1058	996	818	960	236	346
Replacement Rate [%]								
0-20	1.0	5.1	0.4	0.6	0.6	5.2	0.0	2.3
20-40	2.5	9.3	4.2	6.8	7.4	10.5	3.1	16.7
40-60	7.4	18.4	13.9	15.0	12.9	18.7	22.0	31.9
60-80	29.6	24.1	26.8	26.4	26.0	25.1	50.5	28.8
80-100	34.6	33.3	36.0	32.9	36.5	26.1	23.6	18.8
100+	24.9	9.8	18.6	18.4	16.6	14.4	0.8	1.6
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Out Of Work but not Unemployed ("inactive")								
Sample Size	195	142	2358	1334	2566	895	1647	908
Replacement Rate [%]								
0-20	1.2	2.0	0.5	1.1	2.5	7.5	0.7	2.5
20-40	2.8	5.3	5.7	6.6	7.6	8.7	3.4	15.0
40-60	12.4	18.6	17.7	19.8	18.3	14.2	22.2	27.1
60-80	42.7	41.1	39.3	34.1	32.0	25.0	48.0	30.7
80-100	40.9	33.0	32.6	29.3	36.3	36.0	24.3	23.1
100+	0.0	0.0	4.3	9.1	3.2	8.6	1.5	1.6
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: EUROMOD.

Note: Target Sample Sizes refer to the number of persons aged 18-59. The in-work/unemployed/inactive groups are not mutually exclusive as it is possible to have different states in a particular year.

Table 7. Distribution of Household Replacement Rates Decomposed by Age

	DK		FR		SP		UK	
	<25	>=25	<25	>=25	<25	>=25	<25	>=25
In-Work								
Sample Size	475	1763	1275	8581	894	4011	825	5276
Replacement Rate [%]								
0-20	0.0	0.6	0.0	0.9	1.0	7.4	0.6	3.6
20-40	2.3	1.8	0.5	1.9	0.7	6.2	4.1	13.3
40-60	5.8	9.0	0.5	2.8	0.6	9.6	15.3	32.7
60-80	11.9	32.9	6.3	17.2	6.2	26.1	36.1	28.4
80-100	39.7	48.8	85.5	72.5	81.2	46.8	41.9	19.5
100+	40.3	6.9	7.3	4.5	10.3	3.8	1.9	2.5
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Unemployed								
Sample Size	131	496	532	1522	521	1257	144	438
Replacement Rate [%]								
0-20	1.3	3.4	0.0	0.7	2.4	3.2	0.0	2.0
20-40	4.8	6.0	1.7	6.7	3.5	11.1	4.0	14.6
40-60	11.5	13.0	10.0	15.9	11.0	17.8	23.0	30.3
60-80	23.3	28.0	23.6	27.7	27.0	25.0	37.4	36.3
80-100	43.4	31.5	45.1	30.9	44.7	25.9	34.5	15.5
100+	15.8	18.2	19.7	18.1	11.5	16.9	1.1	1.4
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Out Of Work but not Unemployed ("inactive")								
Sample Size	75	262	489	3203	726	2735	362	2193
Replacement Rate [%]								
0-20	0.5	1.8	0.8	0.7	3.5	3.9	0.2	1.6
20-40	0.4	4.8	2.1	6.6	2.1	9.3	5.6	8.5
40-60	11.4	16.1	11.3	19.6	8.4	19.4	16.9	25.4
60-80	31.2	45.0	30.0	38.5	26.2	31.1	40.2	41.3
80-100	56.5	32.2	49.8	28.6	58.5	30.9	36.7	21.5
100+	0.0	0.0	6.1	6.1	1.2	5.5	0.5	1.7
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: EUROMOD.

Note: Target Sample Sizes refer to the number of persons aged 18-59. The in-work/unemployed/inactive groups are not mutually exclusive as it is possible to have different states in a particular year.

Table 8. Distribution of Household Replacement Rates Decomposed by Number of Adults

	DK		**FR**		**SP**		**UK**	
	1	2+	1	2+	1	2+	1	2+
In-Work								
Sample Size	415	1823	1094	8762	162	4743	639	5462
Replacement Rate [%]								
0-20	1.5	0.3	1.2	0.8	19.6	6.0	11.2	2.0
20-40	5.1	1.3	2.4	1.7	10.2	5.2	33.0	8.8
40-60	20.6	5.8	2.0	2.6	14.4	8.0	32.7	29.7
60-80	32.9	27.3	43.9	11.6	46.7	22.2	12.3	32.1
80-100	25.0	51.1	45.3	78.6	7.4	53.6	9.4	24.9
100+	14.9	14.2	5.3	4.8	1.7	5.0	1.5	2.5
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Unemployed								
Sample Size	167	460	282	1772	28	1750	113	469
Replacement Rate [%]								
0-20	10.0	0.5	2.3	0.2	21.9	2.8	4.2	0.6
20-40	8.1	4.9	17.0	3.3	19.5	8.9	28.1	6.5
40-60	15.0	11.8	20.8	13.3	14.9	16.0	38.5	25.0
60-80	22.4	28.6	21.3	27.6	18.5	25.6	16.9	43.0
80-100	23.8	37.5	18.4	37.5	1.8	31.3	9.3	24.2
100+	20.8	16.7	20.2	18.2	23.4	15.4	3.0	0.8
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Out Of Work but not Unemployed ("inactive")								
Sample Size	81	256	225	3467	50	3411	459	2096
Replacement Rate [%]								
0-20	7.1	0.0	2.8	0.5	24.7	3.6	2.5	1.1
20-40	4.7	3.6	17.5	5.1	21.4	7.7	17.5	5.7
40-60	22.2	13.0	21.7	18.2	8.7	17.4	31.9	22.2
60-80	50.8	39.6	20.8	38.6	9.5	30.4	35.3	42.6
80-100	15.2	43.8	19.3	32.4	1.0	36.7	11.3	26.9
100+	0.0	0.0	17.9	5.1	34.7	4.2	1.6	1.5
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: EUROMOD.

Note: Target Sample Sizes refer to the number of persons aged 18-59. The in-work/unemployed/inactive groups are not mutually exclusive as it is possible to have different states in a particular year.

Table 9. Distribution of Household Replacement Rates Decomposed by Number of Children

	DK		FR		SP		UK	
	0	1+	0	1+	0	1+	0	1+
In-Work								
Sample Size	1426	812	5370	4486	3019	1886	3743	2358
Replacement Rate [%]								
0-20	0.7	0.0	0.9	0.7	5.1	8.1	3.5	2.6
20-40	2.1	1.6	2.1	1.4	4.7	6.2	13.2	9.3
40-60	9.3	6.6	2.6	2.5	7.3	9.4	30.6	29.0
60-80	27.9	28.8	20.3	9.9	17.9	29.8	30.4	28.0
80-100	43.3	52.7	67.9	82.5	60.7	40.8	20.7	27.4
100+	16.7	10.3	6.3	3.0	4.4	5.7	1.8	3.7
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Unemployed								
Sample Size	388	239	1174	880	1127	651	333	249
Replacement Rate [%]								
0-20	3.9	1.5	0.8	0.1	2.5	3.8	2.0	0.4
20-40	7.4	3.2	7.4	2.5	9.1	8.9	16.1	3.7
40-60	14.0	10.6	14.6	14.3	15.0	17.6	31.0	23.4
60-80	25.7	28.9	26.7	26.5	27.4	22.3	29.7	49.6
80-100	31.8	37.4	32.1	38.0	31.8	29.9	19.6	22.3
100+	17.3	18.3	18.4	18.6	14.2	17.5	1.6	0.7
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Out Of Work but not Unemployed ("inactive")								
Sample Size	255	82	2094	1598	2138	1323	1302	1253
Replacement Rate [%]								
0-20	2.1	0.0	1.0	0.2	3.7	4.2	1.8	0.9
20-40	2.6	7.6	7.3	4.3	7.7	8.3	11.3	3.6
40-60	13.9	18.3	19.4	17.2	15.7	20.0	26.5	21.0
60-80	45.0	33.1	34.2	41.8	30.3	29.8	35.4	48.8
80-100	36.4	41.0	29.3	34.4	36.7	35.3	23.1	24.7
100+	0.0	0.0	8.8	2.1	5.9	2.4	1.9	1.0
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: EUROMOD.

Note: Target Sample Sizes refer to the number of persons aged 18-59. The in-work/unemployed/inactive groups are not mutually exclusive as it is possible to have different states in a particular year.

Figure 1. Decomposing Replacement Rates

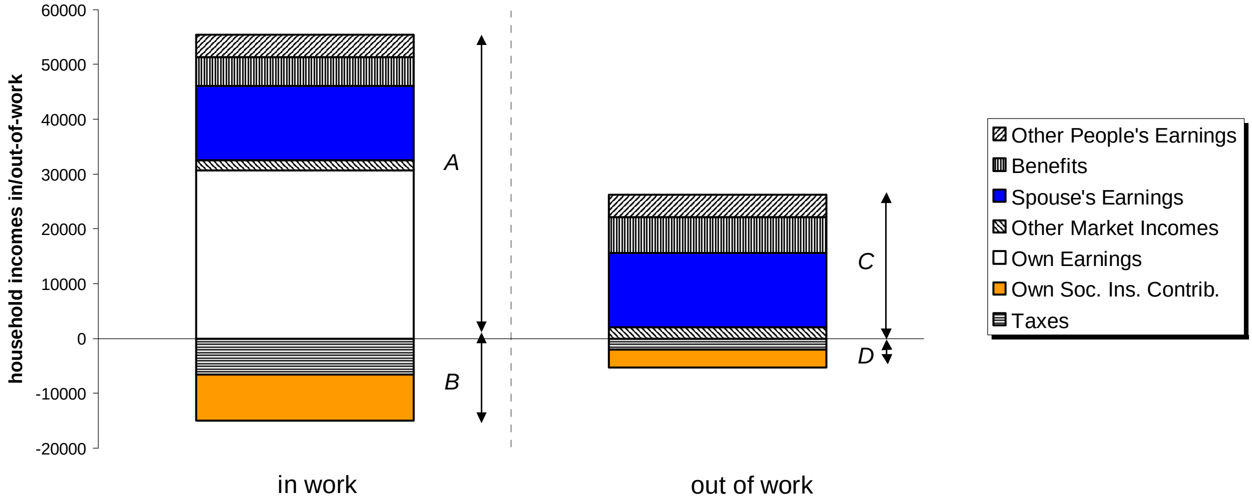
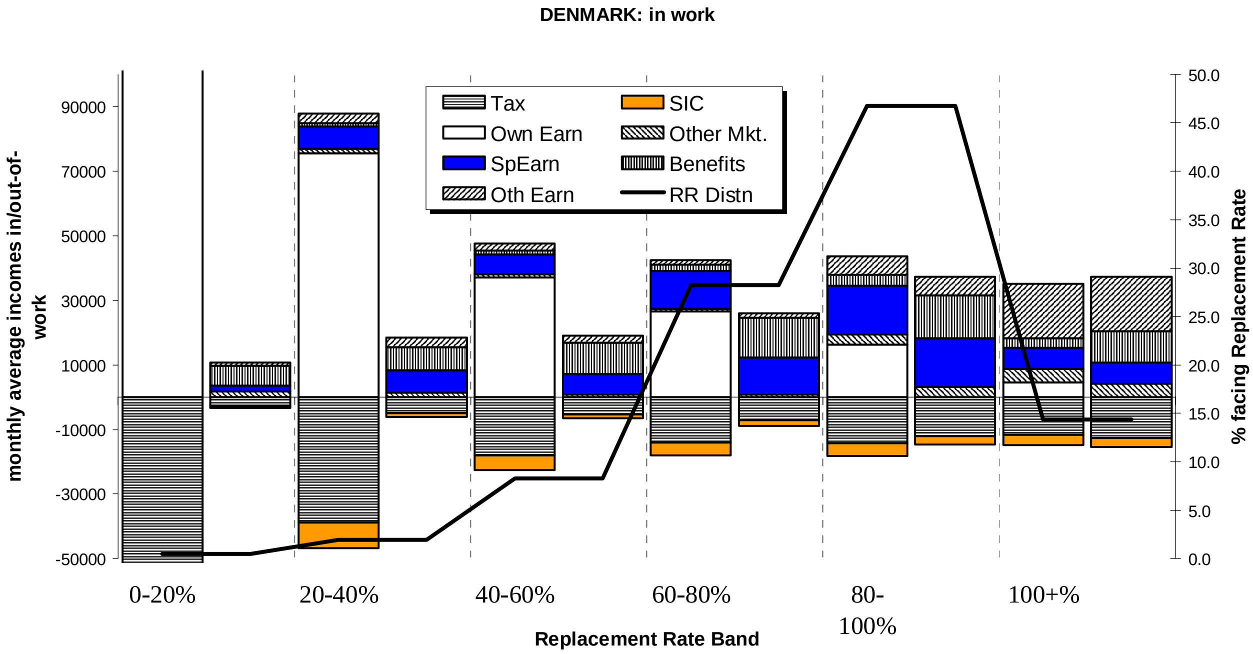
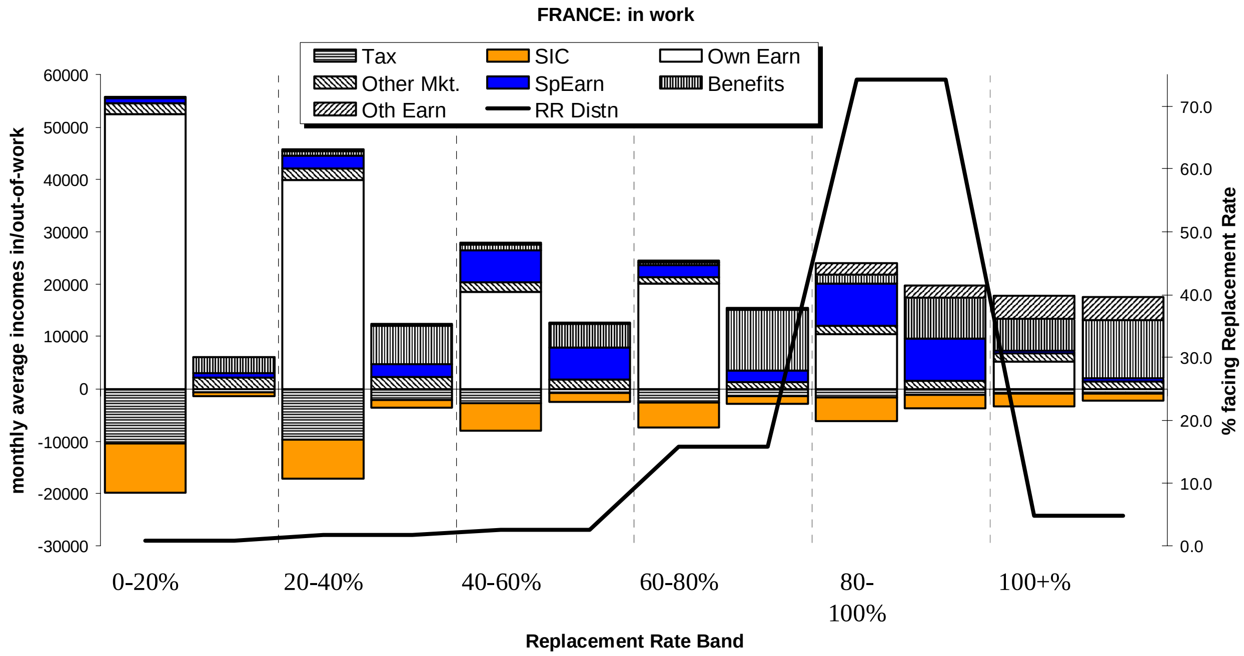


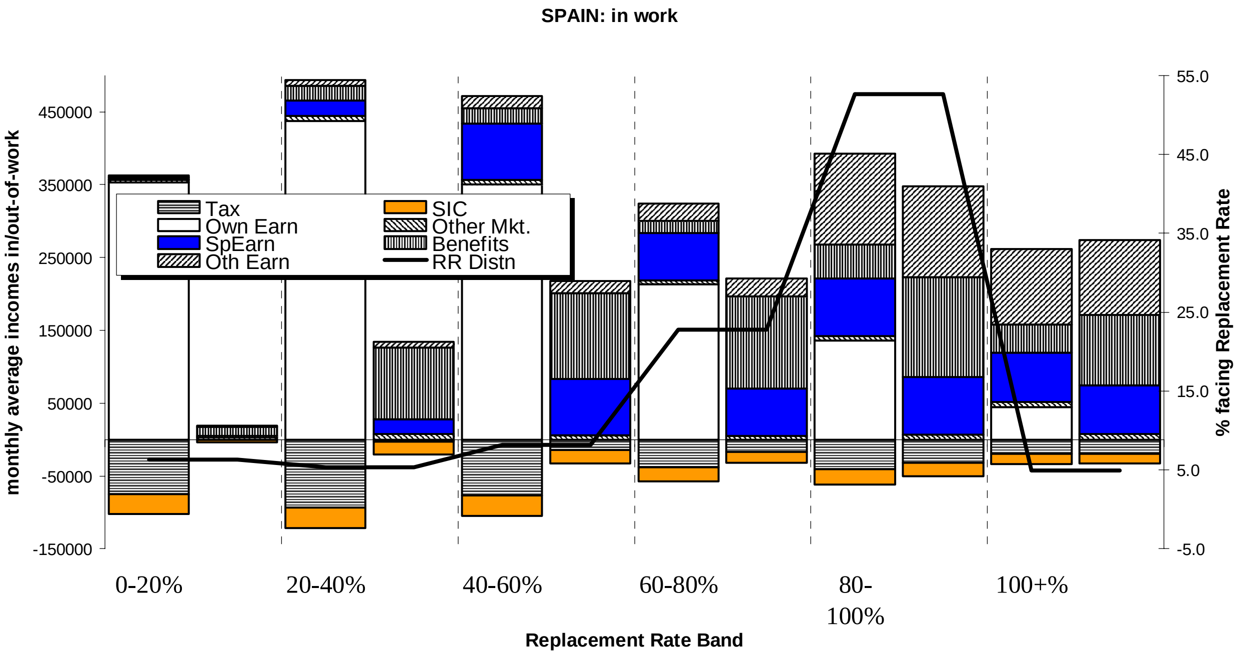
Figure 2. Replacement Rate Decomposition In-Work
Denmark



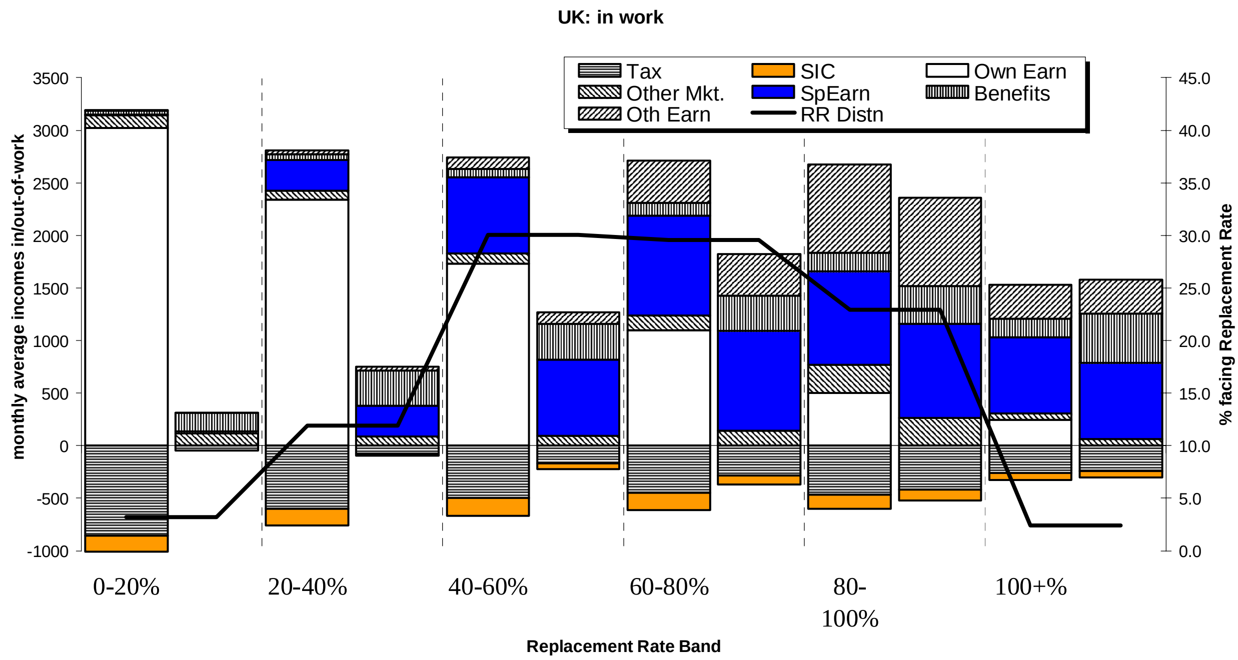
France



Spain

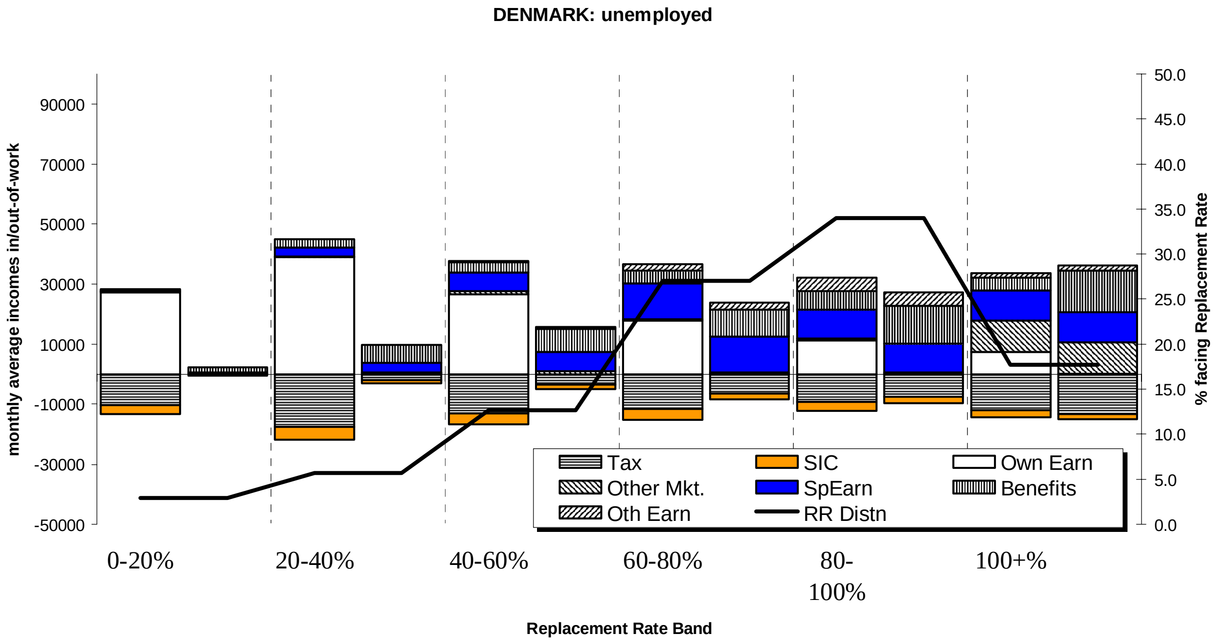


UK



Source: EUROMOD, Notes: Incomes are monthly, at the household level and in 1998 national currencies.

Figure 3. Replacement Rate Decomposition Unemployed
Denmark



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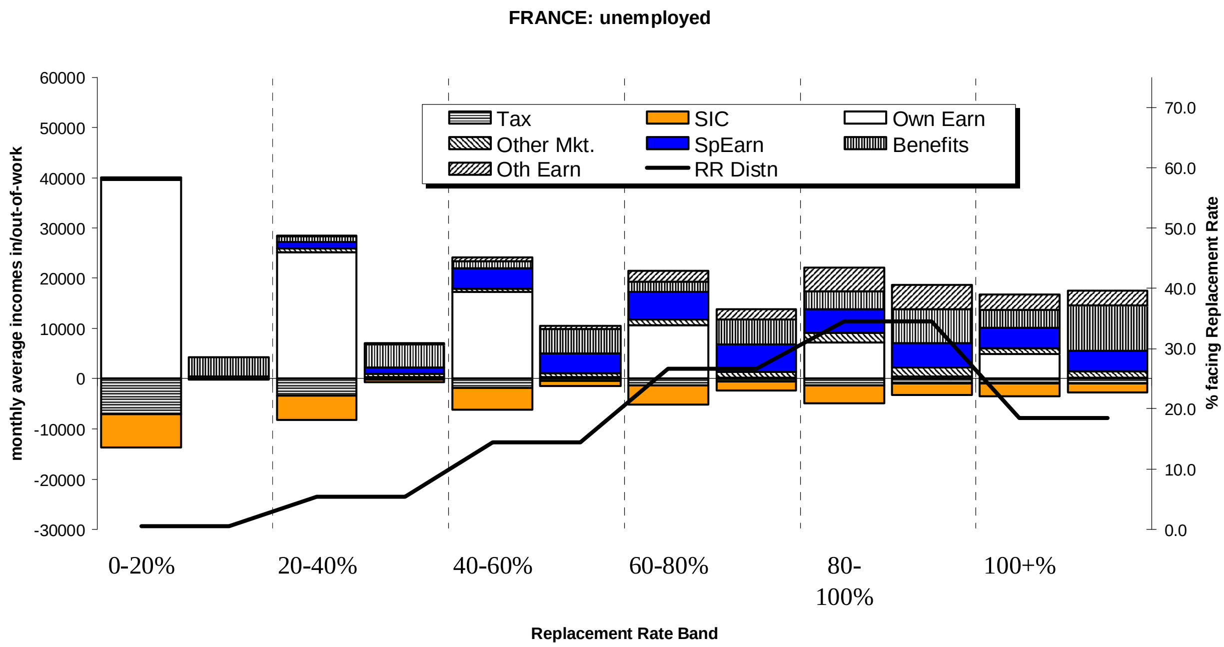

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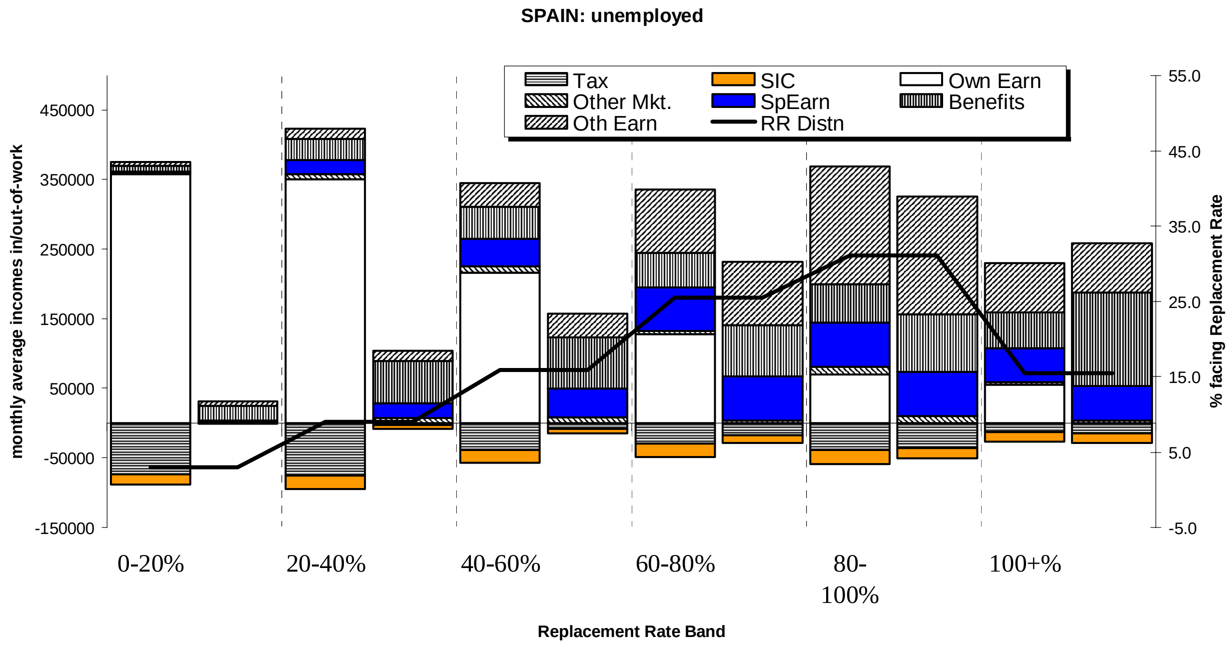

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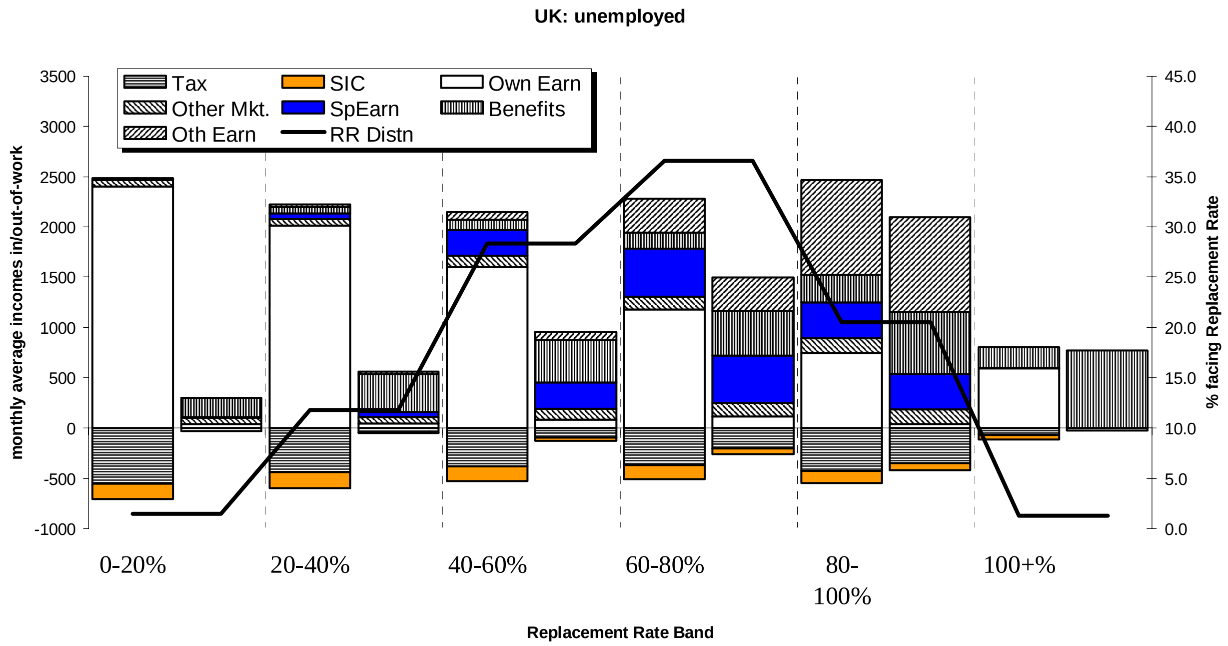
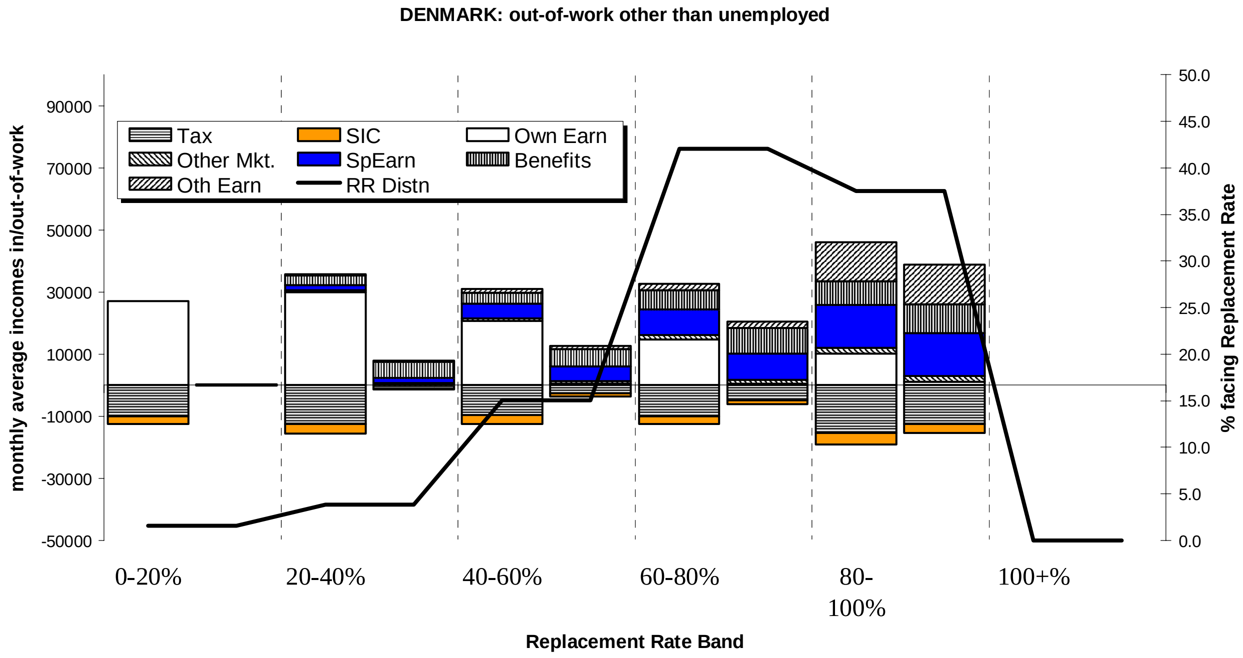


Source: EUROMOD, Notes: Incomes are monthly, at the household level and in 1998 national currencies.

Figure 4. Replacement Rate Decomposition Inactive

Denmark



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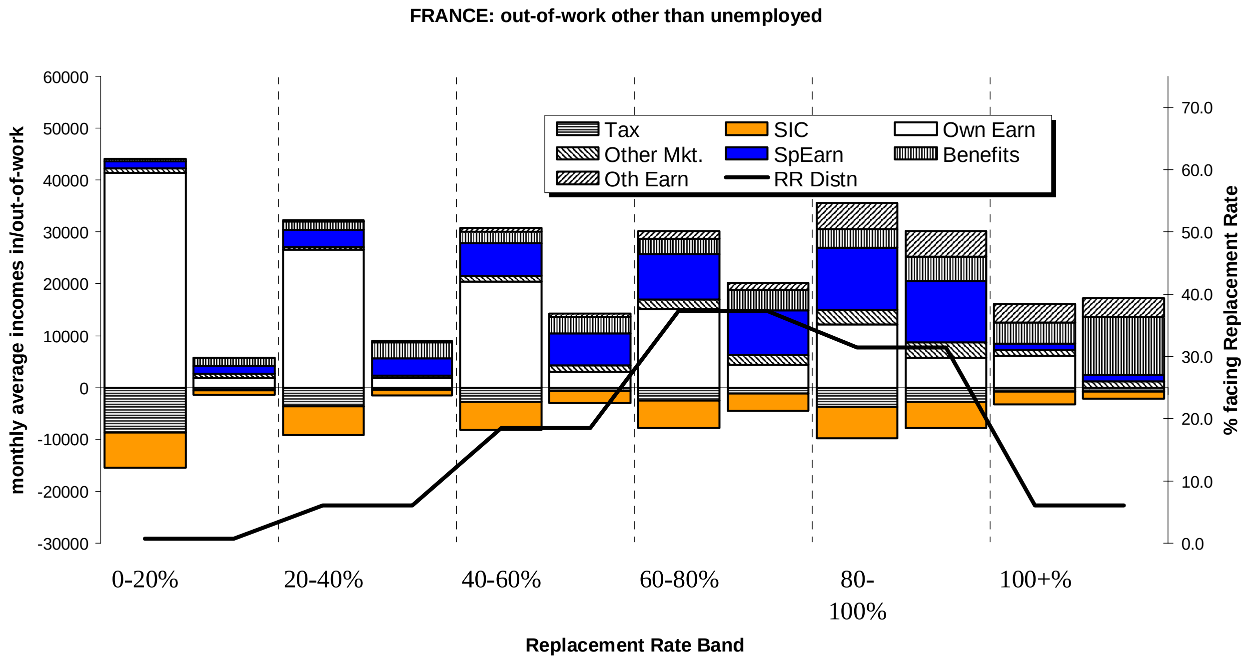
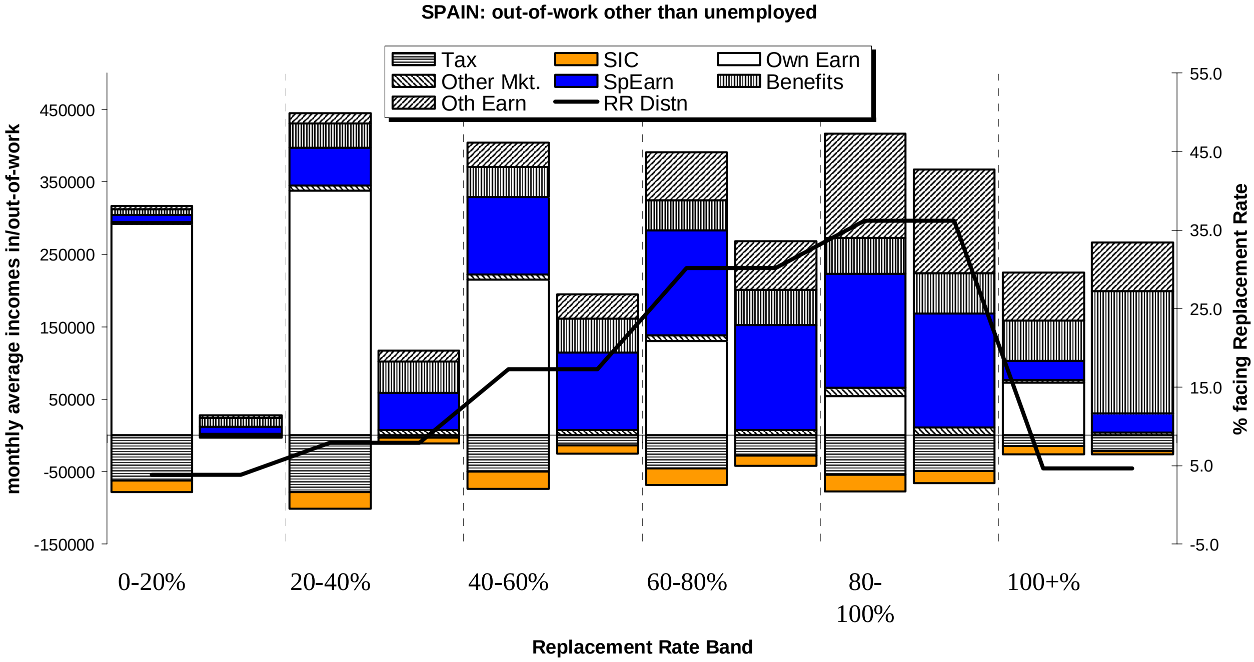


Spain



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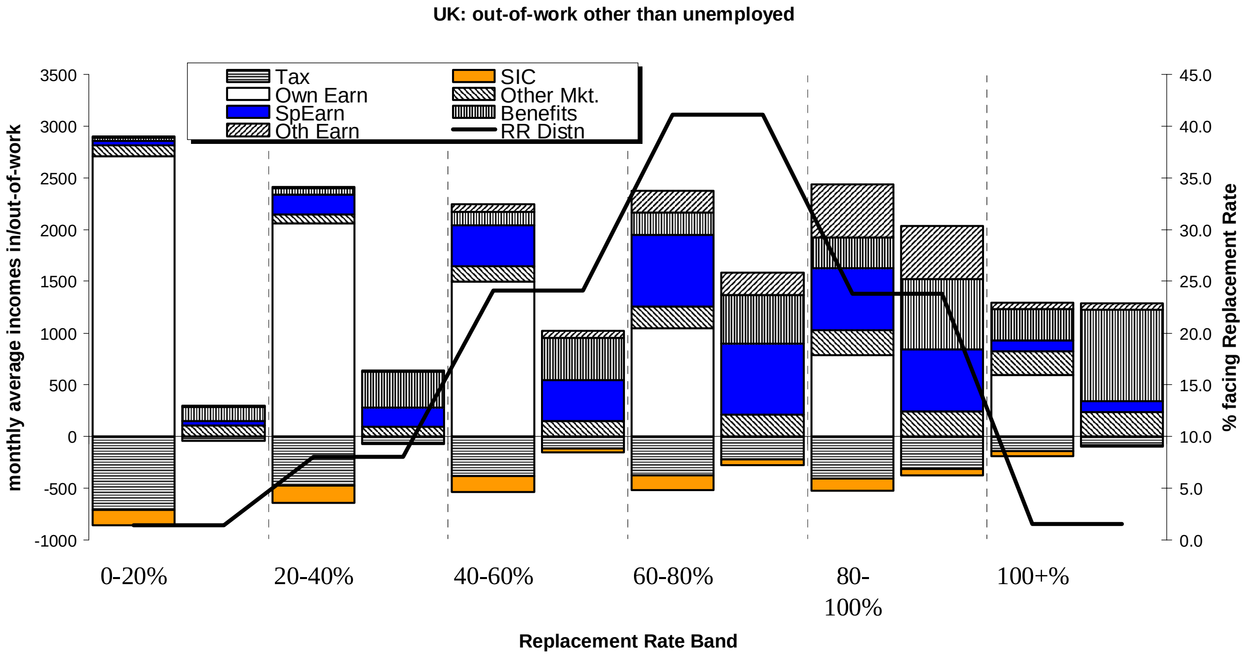


Source: EUROMOD, Notes: Incomes are monthly, at the household level and in 1998 national currencies.

Figure 5. Decomposing Tax-Benefit Earnings Ratio

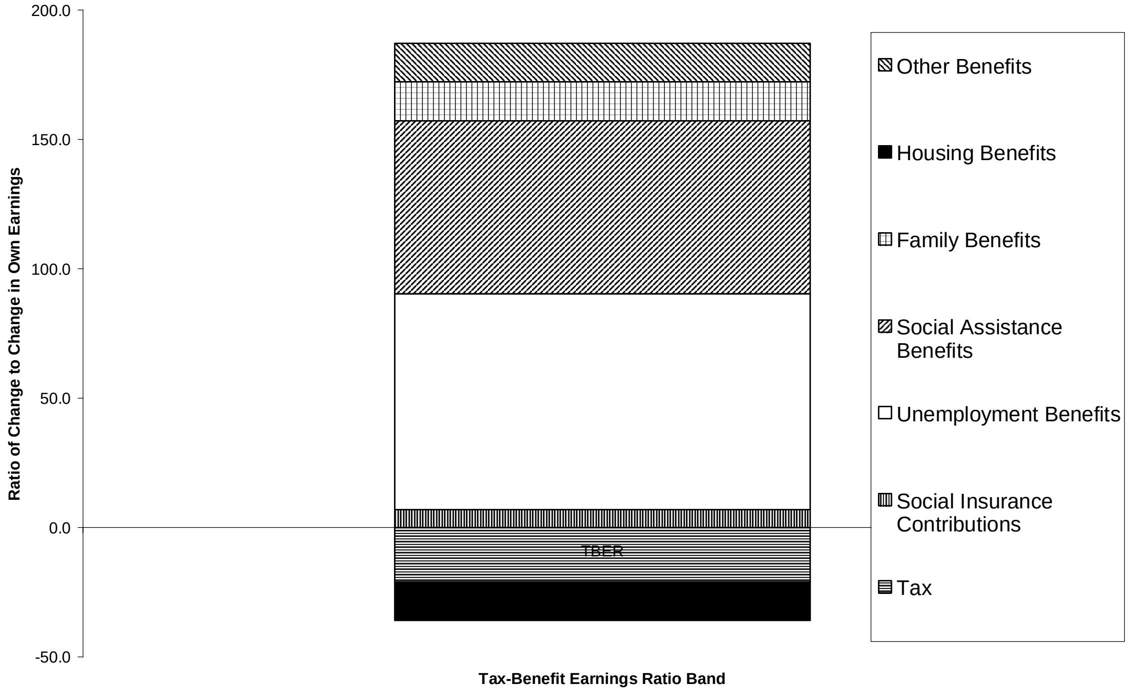
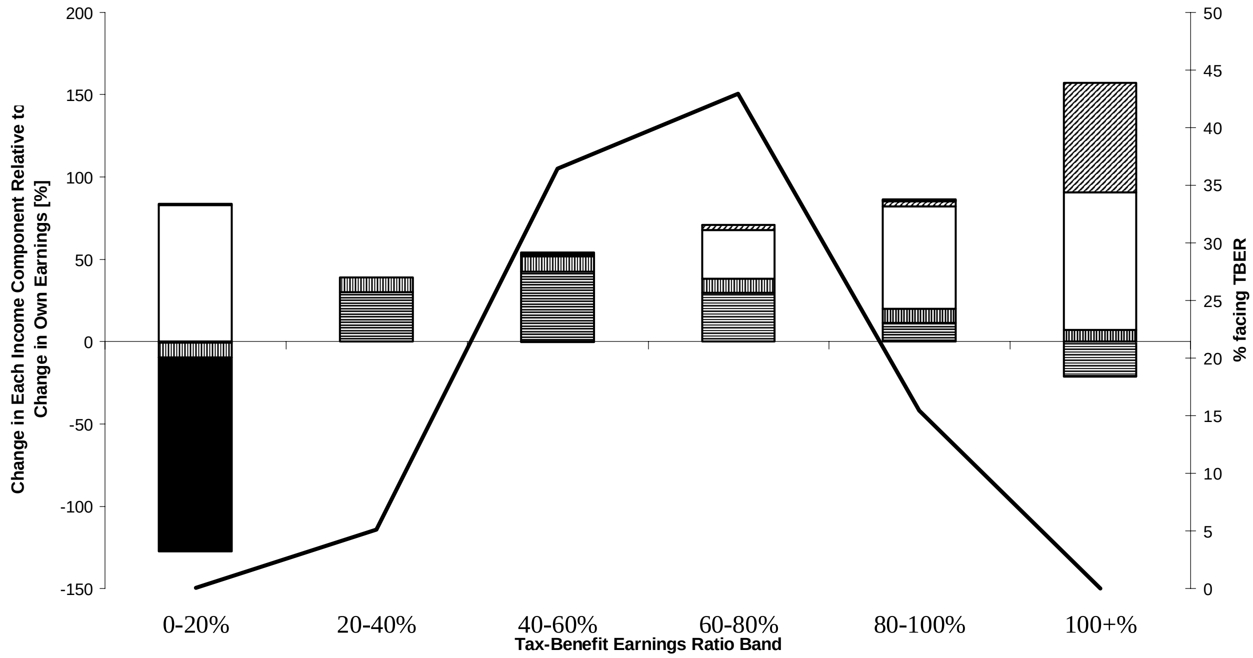


Figure 6. Tax-Benefit to Earnings Ratio Decomposition In-Work

Denmark



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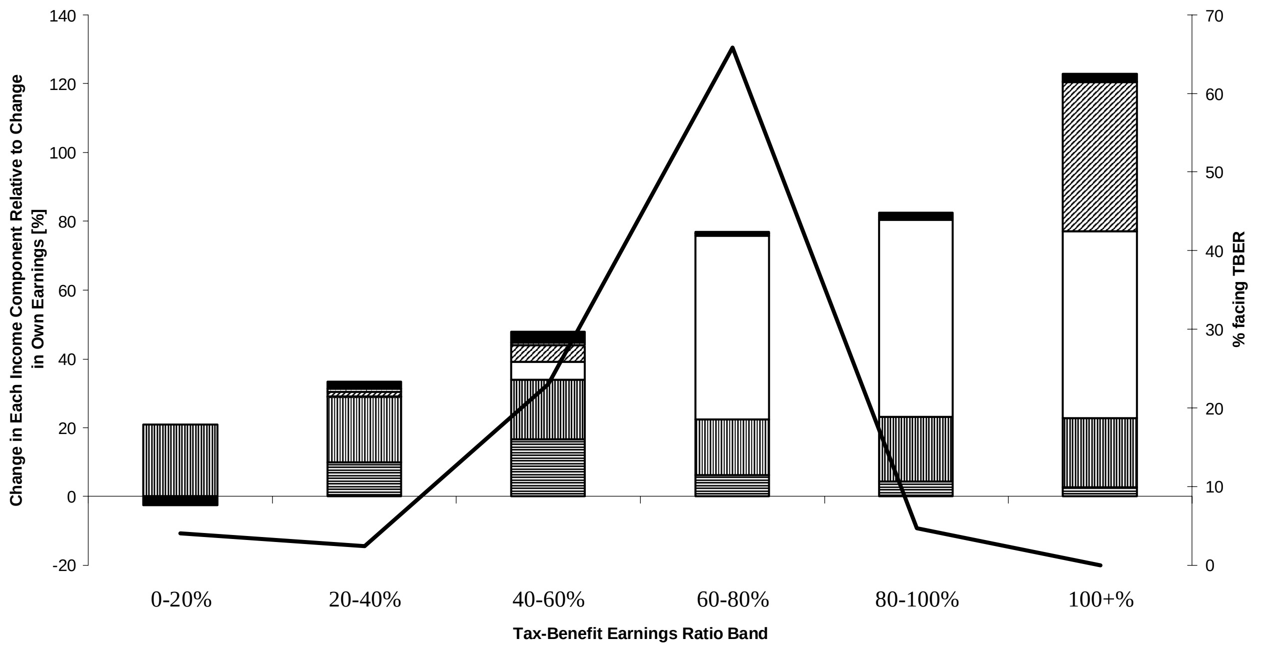

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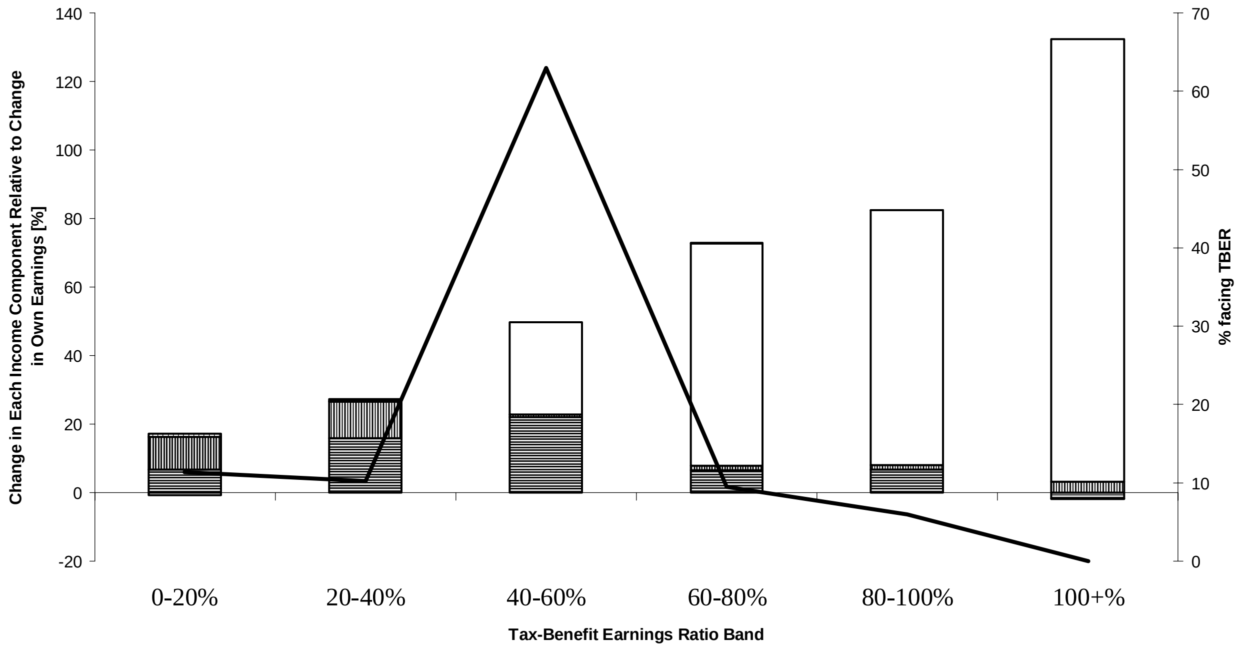

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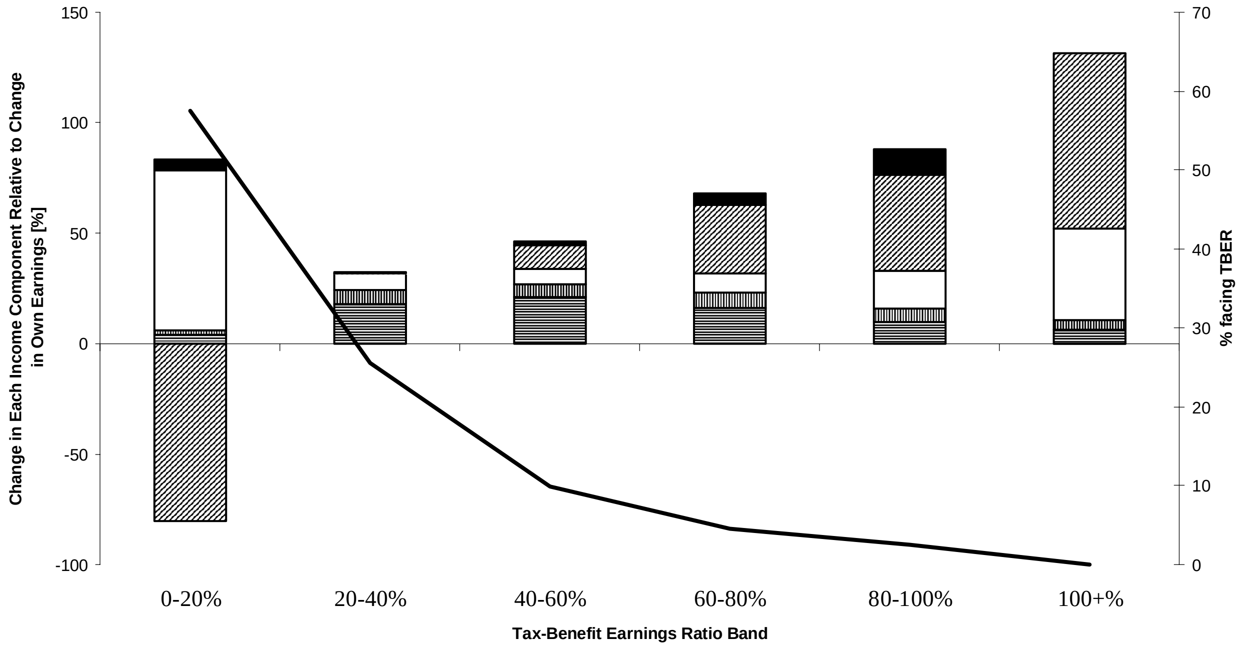
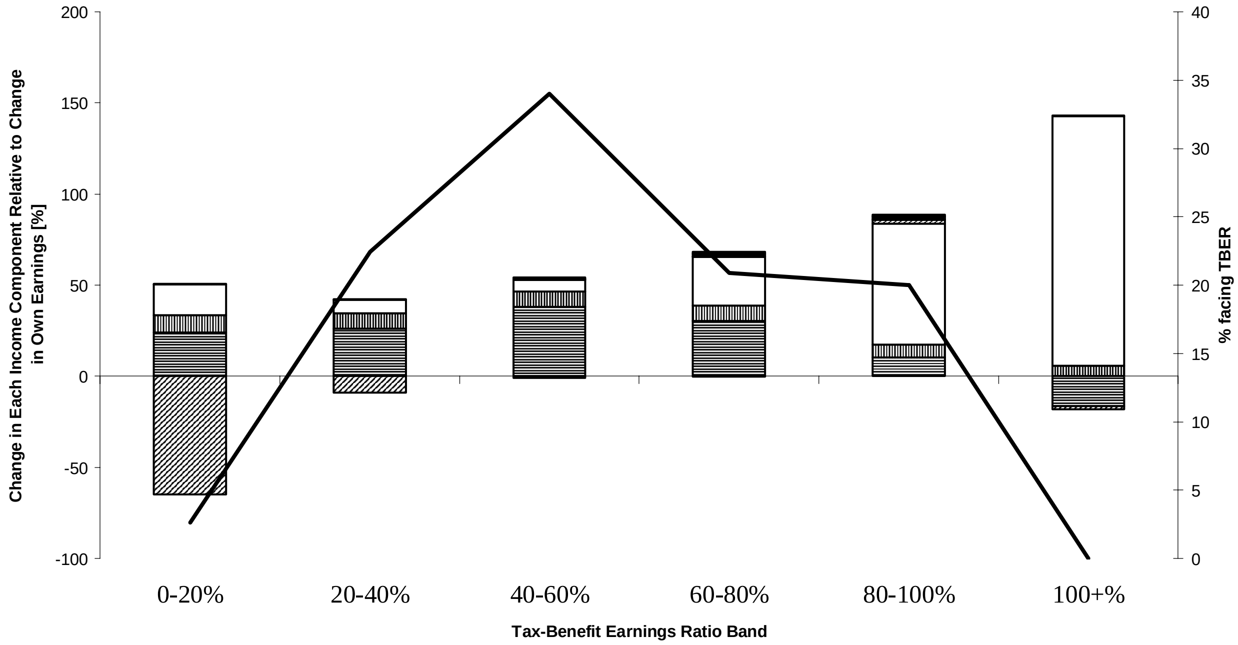


Source: EUROMOD. Note: The Legend for these figures can be found in figure 5.

Figure 7. Tax-Benefit to Earnings Ratio Decomposition Unemployed

Denmark



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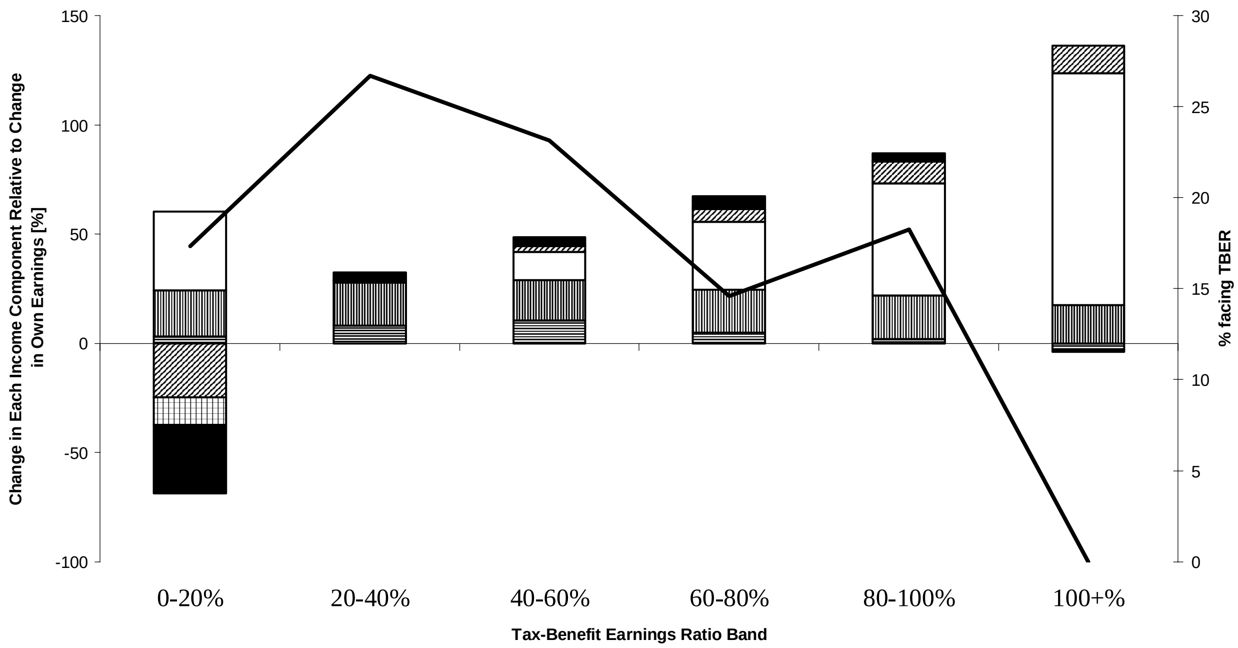

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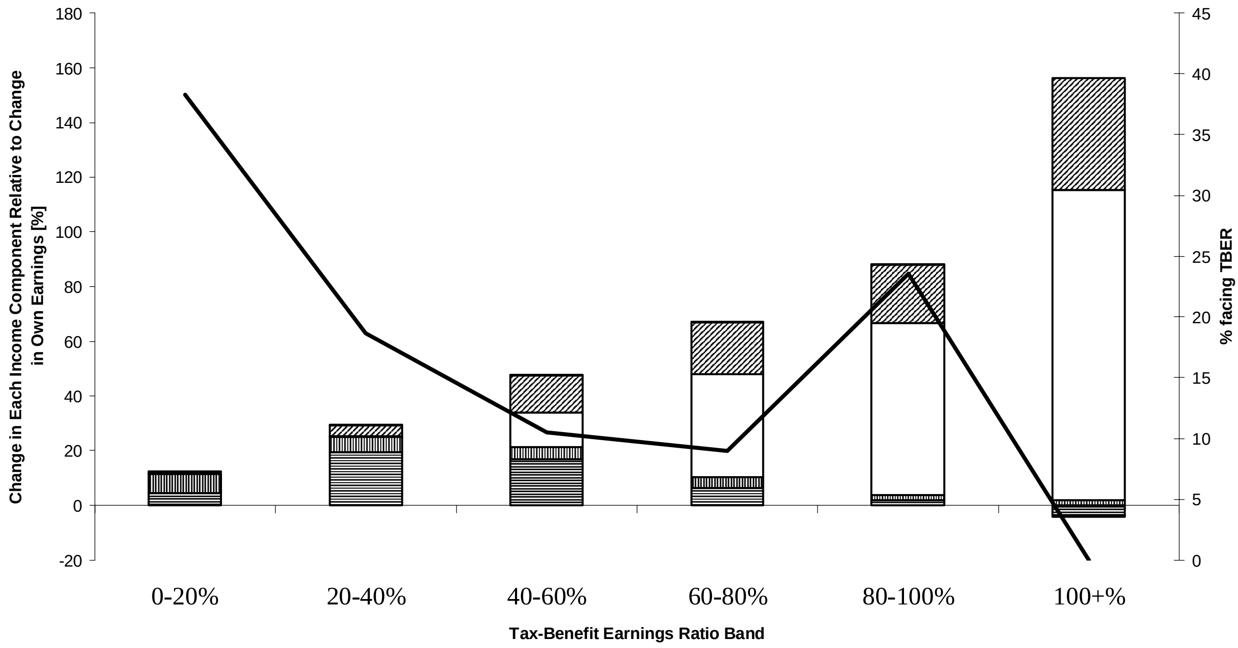

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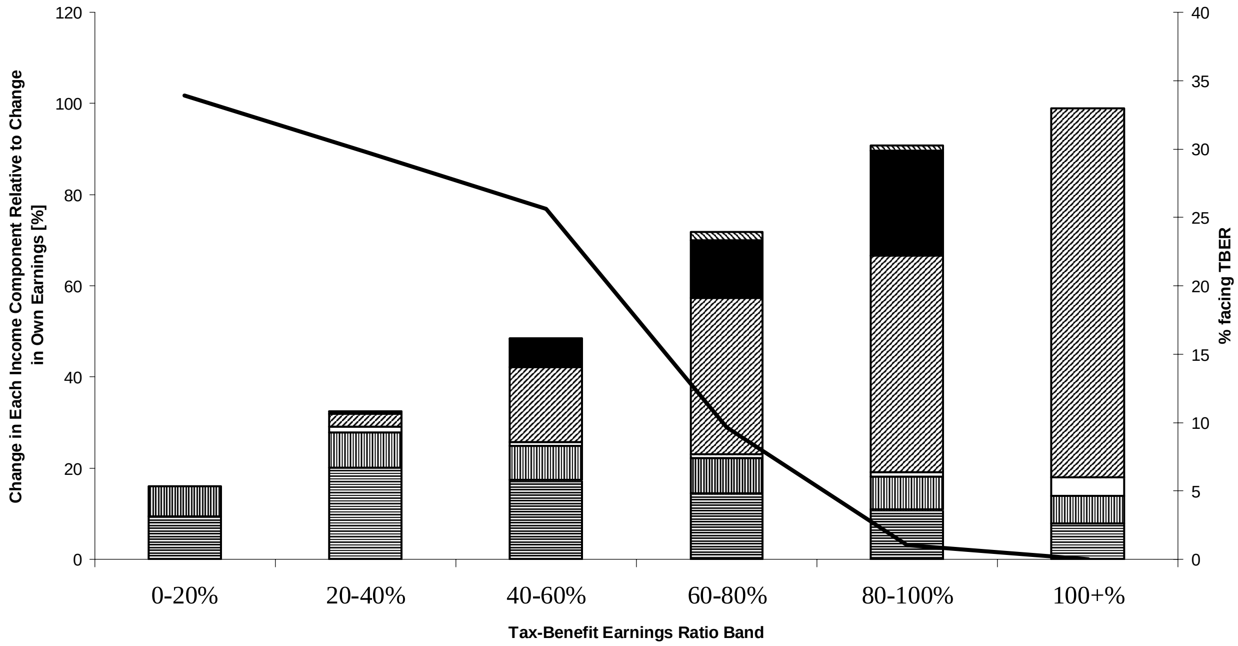
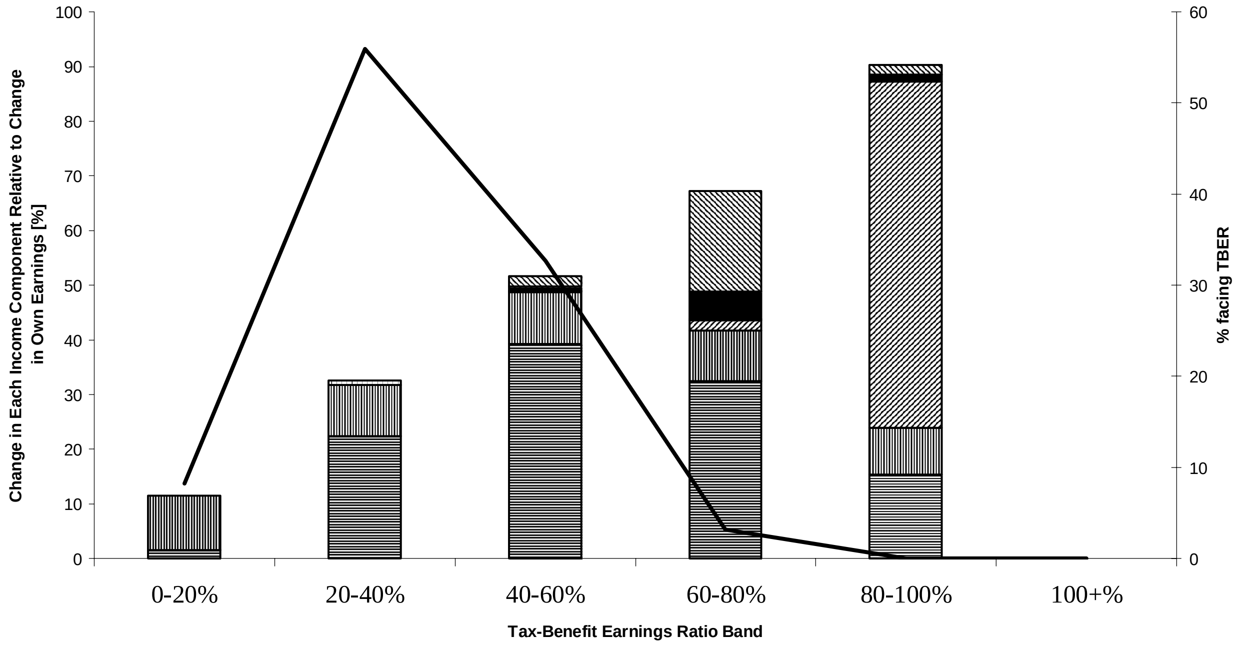


Source: EUROMOD. Note: The Legend for these figures can be found in figure 5.

Figure 8. Tax-Benefit to Earnings Ratio Decomposition Inactive

Denmark



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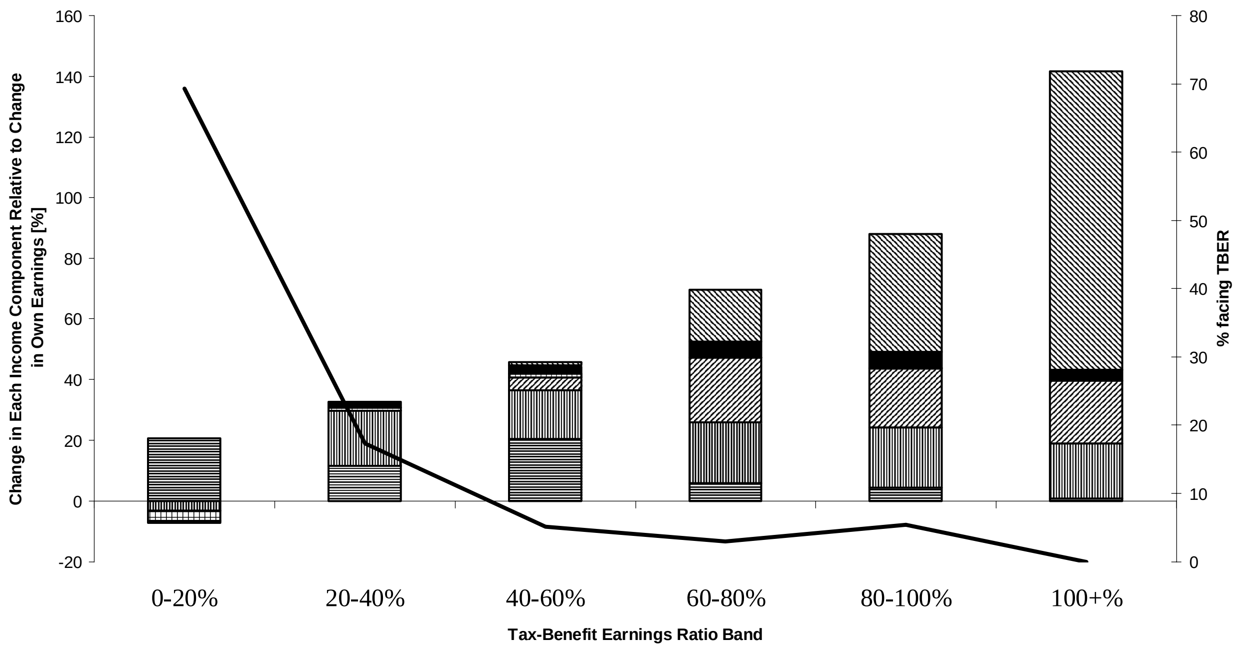

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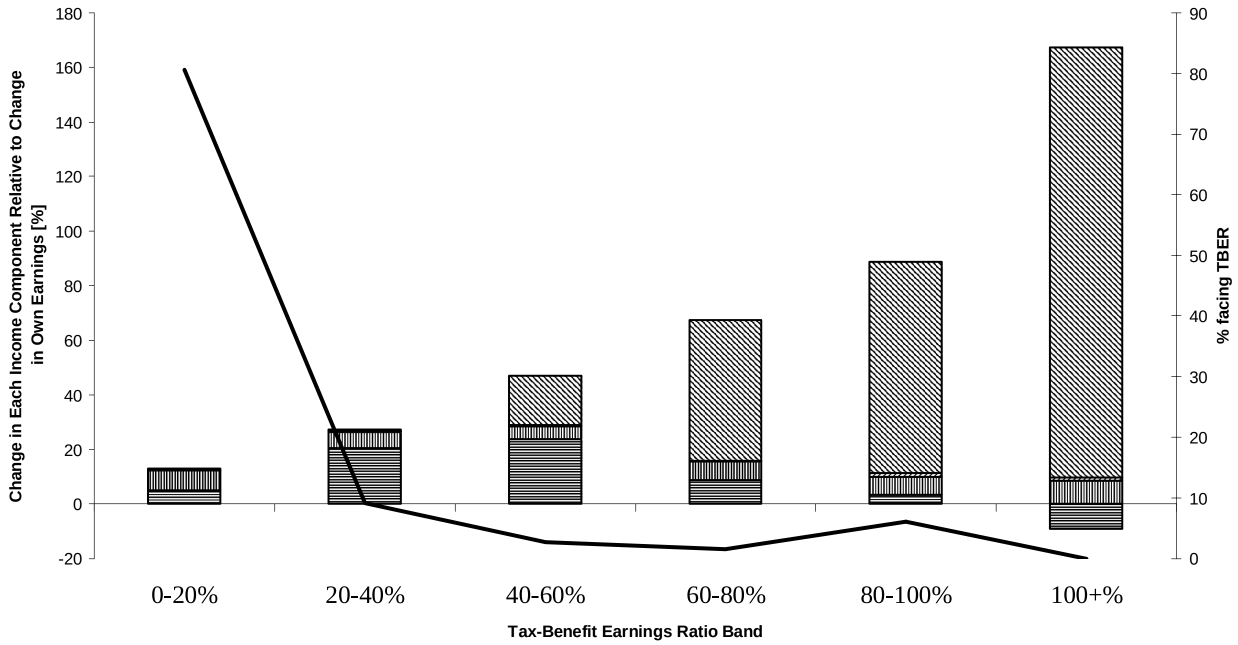
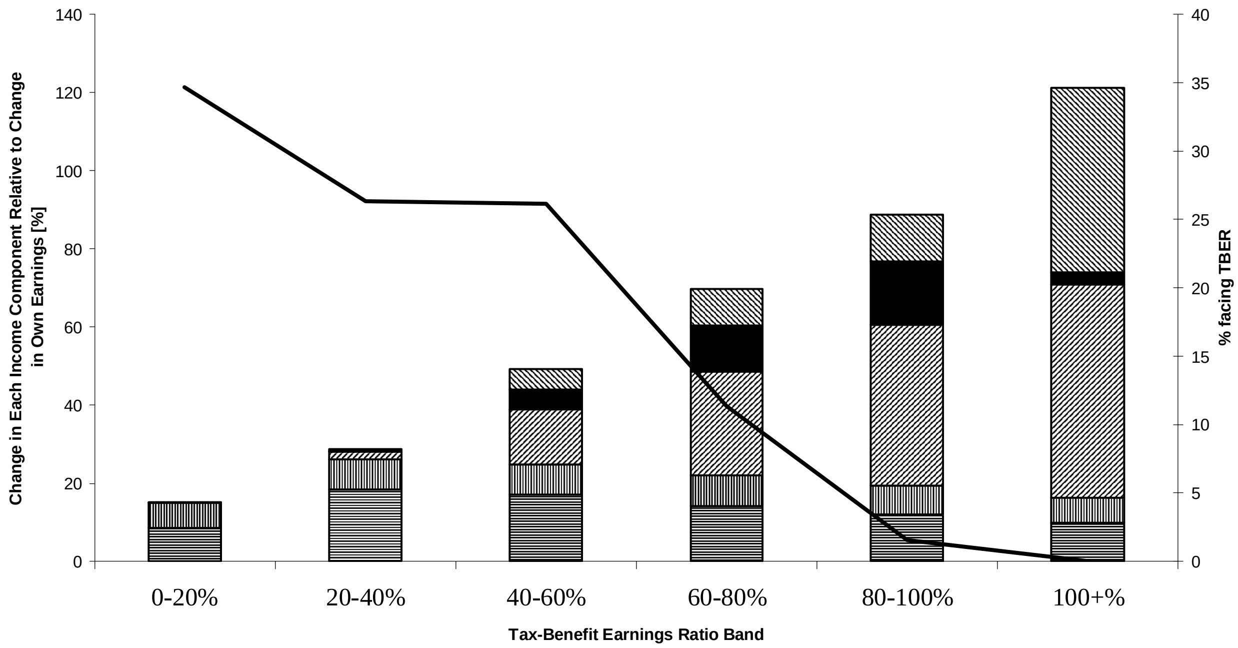


UK



Source: EUROMOD. Note: The Legend for these figures can be found in figure 5.