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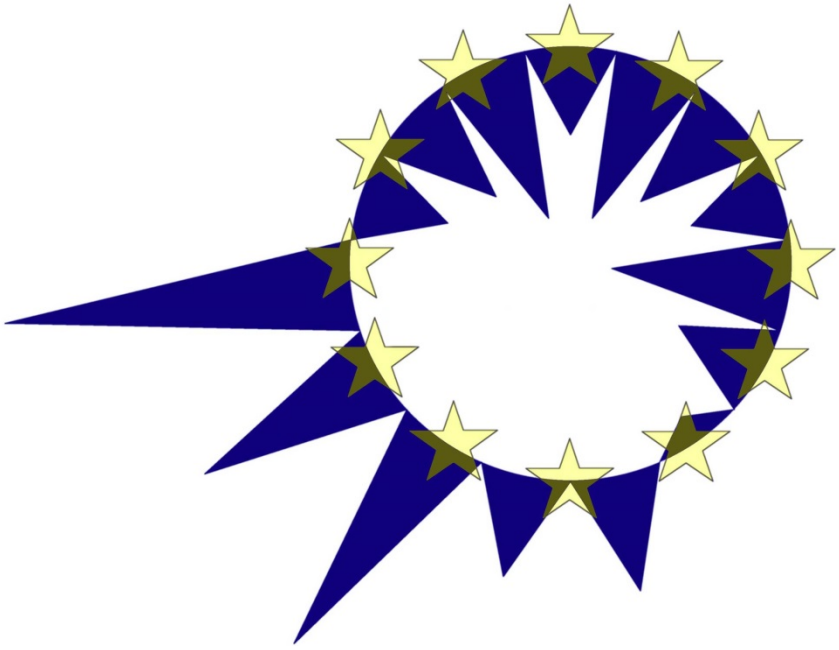

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The distributional effects of taxes and transfers under alternative income concepts: the importance of three 'I's

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THE DISTRIBUTIONAL EFFECTS OF TAXES AND TRANSFERS UNDER ALTERNATIVE INCOME CONCEPTS: THE IMPORTANCE OF THREE 'I'S [1]

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Abstract

This paper investigates how the distribution of income changes when the standard definition of disposable income is replaced by an extended income concept which takes into account the three 'I's: *indirect taxes*, *imputed rent*, and *in-kind benefits*. Second, it assesses how sensitive the distributional effects of each tax-benefit instrument are to the choice of income concept. The analysis covers three European countries (Belgium, Greece and the UK) characterised by substantially different tax-benefit systems, giving a stronger base for generalising the results. The main findings are that the overall redistributive effect of the tax-benefit systems depends heavily on the income concept considered and the differences across countries are smaller when considering the extended income distribution. Moreover, the common use of a narrower income concept, such as the disposable income, can lead to the overestimation of the redistributive effect of the cash tax-benefit instruments (in relative terms), the extent of this varying across countries, due to the size and distribution of three 'I's and the adoption of the needs-adjusted equivalence scale.

JEL Classification: C81; H23; D63.

Keywords: Imputed rent, indirect taxes, in-kind benefits, household income, EUROMOD.

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1. Introduction and motivation

The redistributive effects of personal taxes and public transfers across European countries are investigated in a number of recent studies (among else Immervoll et al. 2006, Paulus et al. 2009, Fuest et al. 2010). Most of the studies focus on the concept of household disposable (cash) income which, however, is not a comprehensive measure of household resources.

There are three major components (the three 'I's) which disposable income does not capture and are, hence, often neglected in international comparisons notwithstanding their importance. First, *indirect taxes* which significantly affect the real spending power of individuals. Indirect taxes represent typically around 30% of government revenue and are expected to be regressive with respect to household incomes (Decoster et al. 2010). Second, the *imputed rent* for owner occupied housing which is an important determinant of individual well-being. Third, across European countries, the economic value of public *in-kind benefits* represents about half of welfare state transfers, in the form of services such as education, health insurance, child and elderly care as well as public housing.

The main reason for excluding these three components is the lack of data combining information on monetary income, non-cash income and expenditures and, therefore, most of the existing cross-country studies are limited to one of these items at a time. An example of a recent analysis covering direct and indirect taxation, cash and in-kind benefits, is provided by Sung and Park (2011) but limited to a single country.

The aim of this paper is to fill this gap providing two main contributions. First, it investigates how the distribution of income changes when the standard definition of disposable income is replaced by an extended income concept which takes into account the three 'I's: indirect taxes, imputed rent, and in-kind benefits. Second, it assesses how sensitive the distributional effects of each tax-benefit instrument are to the choice of income concept. The analysis of the paper covers three European countries, giving a stronger base for generalising the results.

The individuals' command over resources depends not only on the available money but also on the value of commodities net of indirect taxes and other resources available through non-market mechanisms (as public and private in-kind benefits). The theoretical superiority of an extended income concept which also includes in-kind benefits is recognised in the literature (Atkinson and Bourguignon 2000, Canberra Group 2001, Smeeding and Weinberg 2001, Atkinson et al. 2002). Moreover, the extended income concept provides a more reliable picture of inequality differences across countries. In a recent contribution, Smeeding and Thompson (2011) refer to a "'more complete income' (MCI), which augments standard income measures with those that are accrued from the ownership of wealth". Their approach is an attempt to take full account of annual income from wealth, whether realised or not; however, such an approach is constrained by data availability on households assets as well as income, at least in the European countries. We follow more closely Smeeding and Weinberg (2001) and Atkinson and Bourguignon (2000) who focus on the importance of including in-kind benefits. In common with Smeeding and Thompson (2011), we consider imputed rent for owner occupied housing which is an important source of capital income though not counted in the standard analysis of monetary income as it is not directly observable.

We use EUROMOD, the EU-wide tax-benefit model which incorporates data on monetary income sources as well as non-cash income, expenditures and indirect tax rules for a selection of European countries (Belgium, Greece, and the UK).

To the best of our knowledge, our paper provides the first cross-country comparison of the redistributive effects of the components of tax-benefit systems using an extended measure of income which augments standard disposable income with imputed rent, in-kind benefits and takes into account indirect taxes, all estimated at the individual level within the same framework. Previous studies have been either based on micro-level estimates but focusing only on public in kind benefits (Paulus et al. 2010), indirect taxes (O'Donoghue 2004; Decoster et al. 2010), or imputed rent (Frick et al. 2010), or based on aggregate imputations of indirect taxes and limited to a balanced budget analysis where only the aggregate amount of taxes corresponding to social benefits were considered (Garfinkel et al. 2006). In a recent contribution, Dolls et al. (2012) augmented EUROMOD data using external information about implicit tax rates on consumption and ratios between in-kind benefits and disposable income at the aggregate level, leaving scope for further improvements in the form of imputations at the individual level.

Moreover, we build on Aaberge et al. (2010a, 2010b, 2013) and Verbist et al. (2012) in order to take into account the conceptual and methodological challenges involved in the analysis of in-kind benefits as these might correspond to specific individual needs.

The paper is organised as follows. In Section 2 we explain the data used in the analysis and some methodological issues. Section 3 provides a snapshot of the composition of the extended household income across countries followed by the evidence on income inequality under different distribution of income in Section 4. In order to disentangle the mechanisms behind the differences in the equalising effect of the tax-benefit instruments across countries, in Section 5, we present the redistributive effect of each income concept (cash benefits, social insurance contributions, personal income tax, indirect taxes, imputed rent and in-kind benefits) considering the different steps of the transition from original income to the extended income. Section 6 concludes with the main lessons and policy implications learned in a cross country perspective.

2. Data and methodology

2.1 EUROMOD

This paper makes use of EUROMOD, the multi-country European wide tax-benefit model. EUROMOD is a static microsimulation model that draws on a comprehensive and detailed set of information on taxes and benefits, which, among else, facilitates their categorization in a comparable way across countries. Using the information available in the underlying datasets and on the basis of the tax-benefit rules in place, EUROMOD simulates cash benefit entitlements, direct tax, social insurance contribution and, for a selection of countries, indirect tax liabilities and in-kind benefits. Instruments which are not simulated (due to data constraints), as well as market incomes, are taken directly from the input datasets. For further information on EUROMOD, see Sutherland 2007. Baseline simulations are validated against administrative statistics[2] and the model has been tested through several other applications. For a review, see Bargain (2007) and Sutherland and Figari (2013).

Similar to previous studies (e.g. Immervoll et al. 2006), we focus only on the direct impact of existing taxes and benefits on income distributions and ignore possible indirect effects of

[2] This is documented in EUROMOD Country Reports, available at https://www.iser.essex.ac.uk/euromod/resources-for-euromod-users/country-reports/legacy

government policies through changes in relative prices and household behaviour (e.g. labour supply). We also assume full tax compliance and 100% of benefit take-up and our results can be interpreted as measuring the intended redistributive effects of the different components embedded in the tax-benefit systems. Third, as the underlying datasets are cross-sectional we are primarily concerned with redistribution among people rather than across each person's life-cycle.

The paper focuses on three European Union countries – Belgium, Greece and the UK – which are characterised by different tax-benefit systems, income distributions, housing markets and varying incidence of direct taxes, benefits and indirect taxes. The selection of countries included in the analysis is largely driven by the data availability.[3] Nevertheless, these countries represent three different tax systems (OECD 2011), welfare regimes (Arts and Gelissen 2002) and social assistance types (Gough 2001) which make the selection an interesting case study of different redistributive policies present in Europe. Belgium belongs to the Continental welfare regime with relative high tax burden and contributions-related public transfers combined with a universal income support scheme. Greece is an example of the under-developed Southern model of welfare state (Ferrera 1996) with a low level of general taxation and a strong contrast between those who are insured (e.g. pensioners) and those who are excluded from any type of social protection (due to the absence of a general social assistance scheme and limited availability of public services). The UK represents the prototype of the liberal welfare state regime with great reliance on the labour market mechanisms (favoured by a relatively low level of taxation) and means-tested benefits for those who are in need of social protection.

Table 1 gives basic information on the underlying income and budget surveys used in the analysis as well as the reference time periods. The tax-benefit system simulated in this paper is 2003 for Belgium and the UK, and 2004 for Greece. For these countries EUROMOD includes public and private imputed rent, publicly provided in-kind benefits and indirect taxes at the household level. The underlying imputations are described in the following two sub-sections.

<TABLE 1 AROUND HERE>

2.2 Income concepts

In our analysis we use primarily two income concepts: the standard disposable income (DPI) and an extended income (EI) concept, calculated as disposable income less indirect taxes plus (private and public) imputed rent and in-kind benefits (see Box 1). Disposable income is constructed as the sum of (gross) original income and social benefits less social insurance contributions and personal taxes. Note that employer social insurance contributions are also considered, i.e. included in original income and deducted together with employee and self-employed contributions when deriving disposable income.[4]

[3] The AIM-AP project which provided the data used in this analysis did not include expertise on any Nordic or Eastern European country and hence it is not possible to include such countries in the analysis.

[4] As in Fuest et al. (2010) and Dolls et al. (2012) we assume full incidence of employer social insurance contributions on employees and this needs to be borne in mind in the interpretation of the results.

Box 1: Main income concepts

Original income

Employment income (incl. employer contributions), self-employment income, income from property (rent), investment income, private pensions, private transfers

\+ Social benefits

Pensions, family benefits, health related benefits, unemployment benefits, social assistance benefits, housing benefits: here divided into (a) pensions, (b) non means-tested benefits and (c) means-tested benefits

– Social insurance contributions

Employer, employee, self-employed

– Personal taxes

National and local income taxes, other direct taxes

= **Disposable income (DPI)**

– Indirect taxes (*VAT and excises*)

= **Post-indirect-tax cash income**

\+ Imputed rent *(private and public)*

\+ In-kind benefits

Public education transfers and public health transfers

= **Extended income (EI)**

Source: Adapted from Jones et al. (2009).

In order to disentangle the redistributive effects of public intervention, social benefits are further divided into three groups: pensions, non means-tested benefits and means-tested benefits. Pensions include public old-age pensions, survivors' pensions, invalidity pensions and means-tested pension top-ups, received by those aged 65 or more. Pensions are added straight after original income though one could argue that these two income sources should not be separated as public pensions represent enforced savings for retirement which contribute to the intra-individual redistribution over the life-cycle rather than to the inter-individual redistribution of resources at each point in time. Moreover, the incidence of private pension schemes varies a lot across countries, from being an important pillar of the British pension system to being almost ignorable in Greece. In order to enhance cross-country comparability and to reflect the living standards of overall population at a given point in time, in our analysis, contributions to private pension schemes are deducted from market income. An overall assessment of the living standards in retirement should also consider net wealth position of elderly people (Frick and Heady 2009), although this is out of the scope of our

paper due to the lack of available data. Other public transfers are differentiated by whether they depend on other resources (i.e. income and/or assets) benefit recipients may have. Non means-tested benefits usually include unemployment benefits, some invalidity benefits and universal family benefits. Means-tested benefits are targeted at those with largest needs or lowest resources, such as social assistance benefits, housing benefits, and family benefits. Detailed information on how individual benefits in each country were categorised can be found in Paulus et al. (2009).

Indirect taxes (value added tax and excises) are subtracted from disposable income giving us a measure of post-indirect-tax cash income which represents the value of consumption of goods and services in real terms (i.e. net of taxes) plus any savings (which can be either positive or negative). Savings differentiate current income and expenditure (the tax base of indirect taxes), raising a number of issues related to consumption smoothing as well as potential measurement errors, which may affect income and expenditures reported in the surveys (and possibly in different ways). In the conclusions, we return to the reasons why one could evaluate the individual well-being in terms of expenditure rather than considering income. However, given the interest in comparing the redistributive effects of the different tax-benefit instruments and following previous empirical analysis (among else, Barnard 2009) we focus on the income as the key concept of analysis. Imputed rent (private and public) and in-kind benefits in the form of public education and health services are then added to obtain the extended income, which represents our comprehensive measure of individuals' command over resources and captures the value of commodities net of indirect taxes as well as other resources available through non-market mechanisms.

The sequence adopted above is one of several possibilities. We have chosen to follow the logic embedded in the tax-benefit systems to derive the extended income from original income. We consider social benefits after original income as some of them depend on the level of earnings and other resources available to the household. Moreover, some social benefits are taxed and hence should be considered before taxes. We deduct indirect taxes from disposable income in order to consider all cash components first and consider imputed rent and in-kind benefits in the last step. Alternatively, indirect taxes could be taken into account after everything else on the basis that they are based on consumption rather than disposable income directly, and (cash) expenditures can be also affected by the availability of non-cash public services. In the countries included in our analysis, imputed rent is basically not taxed, otherwise it would be natural to add it together with (cash) market incomes. This raises the issue of the potential taxation of imputed rent which is now a central point in the policy debate in the European Union and can have important implications on income distribution (Figari et al. 2012).

2.3 Imputation of expenditure data and simulation of indirect taxes

Most income surveys do not include information on consumption, preventing micro-level analysis of the combined effect of direct and indirect taxation. One solution to overcome this data limitation for surveys containing detailed socio-demographic characteristics and income values like those underlying EUROMOD (Table 1) is to impute information on expenditures - see Decoster et al. (2010) and references cited there on the methodological challenges faced in the imputation procedure. This is done with the help of national expenditure surveys which contain a list of very detailed expenditure variables. The goods have been aggregated according to the highest level of the Classification of Individual Consumption by Purpose

(COICOP), identifying, for example, aggregates such as food, private transport, durables etc. The imputation of expenditures into income surveys has been done by means of Engel curves based on the same variables present both in income and expenditure datasets. Individual indirect tax liability has been simulated according to the VAT and excise legislation in place in each country, considering a weighted average tax rate for each COICOP category of goods imputed in the data.

The VAT structure differs across countries quite substantially (Decoster et al. 2010). The standard rate, in the period considered in the analysis, is 17.5% in the UK, 18% in Greece, and 21% in Belgium, and the budget share spent on goods subject to these rates is 42% in Belgium, 47% in Greece and 58% in the UK. However, there are notable differences in the reduced rates and the share of goods exempted from VAT. There are two reduced rates in Belgium (6% and 12%) and Greece (4% and 8%) and a single reduced rate in the UK (5%). In Greece only 16% of goods are exempted from VAT while in Belgium and the UK the share of goods exempted from taxation is nearly 40%. A synthetic measure of the coverage of VAT is given by the C-efficiency indicator which shows the proportion of actual VAT revenues compared to what could be raised if the standard VAT was applied on all goods. The C-efficiency indicator is around 60% for Greece and the UK, while less than 50% in Belgium (Decoster et al. 2010).

Alcoholic products, fuel and tobacco constitute the largest part of the tax base for excises across these countries. However, the value of excises differs substantially across countries with the highest values in the UK and the lowest in Belgium (with the exception of alcoholic products which are taxed the least in Greece).

2.4 Estimation of imputed rent

The imputed rent related to the main accommodation is one of the most important non-cash income concepts (Frick et al. 2010). Following the EU Commission guidelines the imputed rent can be defined as “the value that would be paid for a similar dwelling as that occupied, less any rent actually paid, subsidies received, minor repairs or refurbishment expenditure incurred” (EU Commission Regulation No. 1980/2003).

There are different reasons why imputed rent should be considered to achieve a more comprehensive picture of individual well-being. On the one hand, home owners benefit from private imputed rent, facing reduced current housing costs and enjoying a rate of return on their private investment plus potential capital gains and other benefits associated with their assets. On the other hand, families living in subsidised houses clearly benefit from a measure of imputed rent if they pay below-market rent or no rent at all.

Different methods have been applied in the literature to derive a measure of imputed rent: i) rental equivalent or opportunity cost approach, ii) user cost or capital market approach, iii) self-assessment approach. The rental equivalence approach estimates the opportunity cost of housing in a non-subsidized rental market. This is done through a two-step procedure, correcting for selection bias into the owner status if needed. In the first step, the rent is estimated as a function of dwelling characteristics and household income based on a sample of tenants in the private market. In the second step, rent is imputed to home owners based on the same set of characteristics. The user cost approach focuses on the alternative use of capital which can be used to purchase a dwelling or invested into equal risk-adjusted financial assets. A drawback of this approach is that it is based on the homeowner’s subjective estimation of

the current market value of their home, which possibly suffers from distortions and, further the results can be sensitive to the assumptions about the interest rate. Finally, the self-assessment approach is based on the respondents' subjective estimates what the rental value might be and as such can be also biased. See Frick et al. (2010) for further details on the theoretical foundations of imputed rent, different methodological approaches and a review of the empirical studies on the impact of imputed rent on income distribution.

In this paper, we use a measure of net imputed rent (i.e. deducting operating and maintenance (excluding heating) costs, mortgage interest payments and property taxes), based on the opportunity cost approach, and in the case of Belgium and Greece, with a correction for the selection bias (by applying the Heckman selection correction). Furthermore, we distinguish between the private imputed rent, i.e. the net benefit that home-owners can enjoy by living in their own house, and public imputed rent, i.e. the benefit enjoyed by families living in accommodations rented from the public sector at a below-market price or living in houses provided for free.

2.5 Estimation of the value of public education and health services

The economic value of public in-kind benefits represents a relevant part of the household resources gained through non-market mechanisms. In the European Union, the in-kind benefits count for about half of welfare state transfers, through services such as education, health insurance, child and elderly care and public housing (OECD 2009). Due to data availability, we focus on public education and health services (besides public housing which was discussed in the previous section), making use of external information matched with EUROMOD underlying datasets.

The value of public education services has been imputed on the basis of per capita spending in primary, secondary and tertiary education (OECD 2006). The average cost of providing these services (by education level) is assumed to reflect their value to students enrolled in public schools, and further assuming that the students would have financed their studies themselves if public schooling had not been available. R&D expenditures (for tertiary education) are not included in the estimates, since it is assumed that students are not the primary beneficiaries of this type of public spending.

With respect to public health care services, the estimates are based on the risk-related insurance value approach. This considers public health care services equivalent to purchasing an insurance policy with the same cost for individuals who have the same characteristics (e.g. age). The insurance premium would have to be sufficient to cover all claims by such group of people. The cost is assumed to correspond to the per capita expenditure by age group which is derived from the OECD Health Data and includes all public expenditure on health care, among else, expenditure on in-patient care, ambulatory medical services, pharmaceutical goods as well as prevention (OECD 2007).

2.6 Needs-adjusted equivalence scale

The public provision of education and health care services is associated with specific needs of the target population groups, which the standard equivalence scale for cash incomes is unlikely to capture properly. For this reason, we construct needs-adjusted equivalence scales which are more appropriate for extended income. We follow the approach in Aaberge et al.

(2010b), Verbist et al. (2012) and Aaberge et al. (2013), which draw on the theoretical framework introduced by Aaberge et al. (2010a). They derive needs-adjusted (*NA*) scales from cost functions and show that for household *h* it is a weighted average of scales for cash income (*CI*) and non-cash income (*NC*).

$$NA_h = \theta_r CI_h + (1 - \theta_r) \sum_j n_{hj} NC_j \quad (1)$$

Here, θ_r is the ratio of (median) cash income to the (median) extended income of the reference group *r* and n_{hj} is the number of members (of household *h*) in the target group *j*. (CI is in our case the modified OECD scale). The scale for non-cash income is derived as the total expenditure on non-cash services ($\hat{u}_j$) for the target group j relative to the reference group.[5]

$$NC_j = \hat{u}_j / \hat{u}_r \quad (2)$$

We define target groups on the basis of gender, age groups and the education level a person is attending, further distinguishing single person households from the rest. The reference group is defined as a single male person, aged 35-39 and not in education. For all three countries, the resulting household needs-adjusted scales vary slightly more (from 1 to 5.5-7.3) than the OECD scales (from 1 to 5-5.6). NA scales are naturally higher for households receiving more public education and health services (e.g. families with children and elderly people). As the results across countries are very similar for the same target groups, we chose not to enforce common scales at the cross-country level.

2.7 Methodological approach for the redistributive analysis

In order to analyse the redistributive effect of each tax-benefit instrument we make use of the "benefit incidence" method which evaluates the effect on the basis of marginal change in income inequality when a given component is added to the income distribution (see, among else, Immervoll et al. 2006, Mahler and Jesuit 2006, OECD 2008, Paulus et al. 2009). We consider in turn the redistributive effects of each income component on the basis of the distribution of standard disposable income as well as the extended income, in order to assess the relevance of alternative income measures. Components are added sequentially and therefore the order in which components are considered matters. We have adopted a sequence which follows the logic behind the tax-benefit systems determining the extended income on the basis of original income[6], as shown in Box 1.

We evaluate the redistributive effect of each income concept using the Reynolds-Smolensky index (1977) based on the variation in the Gini coefficient achieved by the tax or benefit:

[5] One of the advantages of this approach is that scale invariant inequality and poverty measures are not affected by the choice of the reference group.

[6] In addition to progressing from original income to the extended income, one could also compare the extended income before and after the exclusion of a given income concept (Immervoll et al. 2006, Paulus et al. 2009). This approach imposes weaker assumptions about the order of components but does not follow the sequential logic of the tax-benefit system.

$$RS = (G_{before} - G_{after}) = VE - reranking\ effect \quad (3)$$

where the vertical redistribution (*VE*) is given by the difference between the Gini index and the concentration index of the income distributions, respectively, before and after the inclusion of a given income concept. The reranking effect is given by the difference between the Gini index and the concentration index of the income distribution after the inclusion of a given income concept.

A criticism to a static redistributive analysis as the one performed in this paper is that it does not consider potential behavioural changes of individuals due to the receipt of a particular benefit or the payment of a given tax. However, as Bargain et al. (2012) show the overall population labour supply elasticities tend to be small both in Europe and the US, implying only relatively small effects on the income distribution. Furthermore, individuals might not evaluate non-cash incomes (e.g. in-kind benefits and imputed rent) at their monetary amount in their utility maximization process, though, for example, Garfinkel et al. (2006) argue for the opposite.

An alternative method is the "behavioural approach" which estimates the value of net public support on the basis of demand functions, measuring the consumption changes induced by reforms in public transfers (Ravallion et al. 1995). However, there are serious limits in getting unbiased estimators due to simultaneity and omitted variables (van de Walle 1998). Moreover, the computational burden implied by this method has led to more widespread empirical applications of the "benefit incidence", in particular for cross-country comparative analysis.

3. Composition of household income

Before analysing the redistributive effect of each income concept listed in Box 1, we focus on the composition of household income, looking at the average size of income components at the household level expressed as a percentage of average extended income (Table 2). The same information is provided for all households, and separately for those in the bottom and top income decile. Positive numbers refer to benefit payments (or tax refunds as in Greece for the individuals in the bottom decile) while negative numbers express tax burden. The composition of household income allows us to have an overview of the magnitude and the incidence along the income distribution of different resources available to individuals which determine the inequality of the extended income distribution.

Overall, original income exceeds the extended income in Belgium meaning that taxes and social contributions are larger than cash and in-kind benefits. The opposite is true in the UK and in particular in Greece due to relatively generous public pensions. Focusing on the poorest households, the share of original income is much lower than the extended income, with Greece standing out for the larger importance of original income than in Belgium and the UK. This is due to a higher prevalence of (low-paid) employees in the first decile group relative to pensioners and individuals receiving non means-tested benefits (e.g. disability pensions) compared with other countries. As expected, at the top of the distribution, original income is higher than the extended income in all countries, with social contributions and taxes reducing substantially the resources available to individuals. The relatively generous pension system in Greece makes the average public pensions larger than in other countries even among the richest individuals.

Differences between welfare systems are characterised by the channels through which the public support is implemented. Bismarkian and Mediterranean countries, such Belgium and Greece, show higher relevance of public pensions and other non means-tested benefits (e.g. disability, health related, early retirement benefits), while Beveridgean countries such as the UK rely more on means-tested benefits (as well as private pensions which are considered here as part of original income). By construction, means-tested benefits are targeted at households in the lower part of the income distribution (in the UK they represent 40% of the extended income). However, even non means-tested benefits determine a relatively generous support at the bottom of the distribution (in Belgium they represent 30% of the extended income).

On the government revenue side, the combination of social contributions and income tax results in a much higher total burden in Belgium than in other countries, in particular due to the incidence of employer social insurance contributions. In Greece employee and self-employed social insurance contributions are more important than personal taxes, while in Belgium, and the UK it is the opposite. It is also evident that the overall tax burden of the households in the top decile group is much higher, ranging from 37% in Greece to 63% in Belgium of extended income. On the other hand, people in the bottom decile group can also face a relatively high tax burden: in Greece due to social insurance contributions and the UK due to the joint effect of income tax and the council tax on properties.

As expected from previous studies, the pattern of indirect taxes with respect to income tends to be regressive (for a recent review, see Warren 2008), even when we consider the extended income as a benchmark: the average tax burden for the poorest households is much larger compared to the richest households. However the cross-country differences are striking with much higher average tax rates in Greece (34% of the extended income) for the individuals at the bottom of the income distribution. There are three main factors which explain the incidence of indirect taxes: rate structure (i.e. how different goods are taxed), consumption pattern (i.e. relative importance of various goods consumed across income deciles) and propensity to consume (i.e. household expenditure compared to household income across income decile groups). Greece is characterized by the lowest percentage of expenditures being VAT exempt or taxed at a lower rate. Moreover, average expenditures in the bottom decile group exceed average income (see e.g. Decoster et al. 2010; Wolff and Zacharias 2007). This is expected when looking at cross-sectional data as people smooth their consumption over time. Although this relationship might be affected by measurement errors it still demonstrates the importance of considering the impact of indirect taxes which affect, in particular, the command over resources of the poorest individuals.

Considering non-cash resources, the average value of private imputed rent is around 11% of the extended income in Greece but much lower in the UK and Belgium, reflecting the prevalence of home ownership in the countries considered (74% in Greece, 70% in the UK and 66% in Belgium). The incidence of imputed rent is much higher at the bottom of the income distribution in particular in Greece and the UK, showing a decreasing relative importance of imputed rent along the distribution of extended income. As expected given the importance of social housing, public imputed rent is not negligible in the UK for the individuals belonging to the first decile group.

Public spending on education and health services is much larger in Belgium (8% and 14% of the extended income respectively) than in Greece and the UK, with health expenditures being larger than education expenditures in all countries considered. As expected due to socio-demographic characteristics (i.e. family with children overrepresented at the bottom of the income distribution and positive correlation between income and good health conditions), in-

kind benefits related to education and health services contribute proportionally more to the extended income of individuals in the bottom decile group than to the income of the overall population.

<TABLE 2 AROUND HERE>

4. Inequality of income distributions under different income concepts

In order to investigate how the distribution of income changes when instead of the standard definition of disposable income the extended income concept is used, we report inequality indices for these income concepts. First, we start in Table 3 with the main steps of the transition from original income to disposable income and post-indirect-tax cash income: these are monetary income concepts, all equivalised using the modified OECD scale. Second, in Table 4 we look at the transition from original income to the extended income which includes the value of in-kind benefits as well: in this case, the income concepts are equivalised using the needs-adjusted equivalence scale.

Inequality of income distributions is reported by means of the Gini index (which is more sensitive to changes in the middle of the distribution) as well as Atkinson (0.5) and Atkinson (1.5) inequality indices, which are more sensitive to changes close to the top and bottom of the distribution, respectively (Lambert 2001).

Focussing on monetary income distributions (Table 3), the Gini index of original income is about 0.5 for all three countries. Altogether, public transfers (public pensions, non means-tested benefits and means-tested benefits) and direct taxes (social insurance contributions and personal taxes) contribute to the reduction in inequality resulting in the Gini index of disposable income ranging between 0.23 in Belgium and 0.32 in Greece and the UK. Indirect taxes (when deducted from disposable income) increase income inequality in all countries with the change in the Gini ranging from 0.6pp in Belgium to 3.2pp in Greece.

<TABLE 3 AROUND HERE>

When considering the extended income distribution and its components equivalised with the needs-adjusted equivalence scale (Table 4), two relevant aspects are worth highlighting. First, the Gini indexes of all income concepts from original income to post-indirect-tax cash income show an increase of 1pp across countries. Second, the extended income distribution shows a much smaller inequality with respect to the post-indirect-tax cash income distribution: the Gini index is 5pp lower in Belgium and 8pp lower in Greece and the UK. As expected, the inequality reduction comes in particular from changes at the bottom of the distribution where individuals benefit to a greater extent from in-kind benefits, as demonstrated by much larger reductions in the Atkinson (1.5) inequality index than in Atkinson (0.5).

<TABLE 4 AROUND HERE>

The redistributive effects associated with tax-benefit instruments vary greatly across countries and play an important role in shaping the extended income distribution. On the one hand, the inclusion of non-cash incomes does not make any change in the country ranking: Belgium is the country with the lowest inequality of disposable income and the extended income, and the opposite is true for Greece. On the other hand, the contribution of in-kind benefits to the overall redistribution is larger in Greece where the redistributive effect of taxes and cash income is weaker. As a consequence, the differences across countries in the income distribution are smaller considering the extended income distribution than the disposable income.

5. Redistributive effect of tax-benefit instruments

In order to assess how sensitive the distributional effects of each tax-benefit instrument are to the choice of income concept, we consider their contribution to the overall redistributive effect based on the standard disposable income and the extended income distribution, respectively. Table 5 reports the contribution of each tax-benefit component as a % of the overall Reynolds-Smolensky index. For the extended income (and its components), the needs-adjusted equivalence scales are used.

<TABLE 5 AROUND HERE>

Under both income distributions, the largest redistributive effects in relative terms are due to public pensions in Belgium (30% of total redistribution considering the disposable income distribution) and Greece (69%), while they are due to means-tested benefits in the UK (37%). Public pensions have also an important role in the UK (21%) and non means-tested benefits in Belgium and Greece (25-26%).

On the revenue side, personal income taxes represent between 20 and 30% of the overall redistribution. Social insurance contributions show a slightly regressive incidence in Greece (due to the proportional rate combined with a top ceiling) but an equalizing impact in Belgium and the UK. This is due to the fact that they are levied on earnings which are a more generous source of income with respect to others. Overall, the social insurance contributions (and affect individuals in the medium-top part of the income distribution and hence tend to reduce income inequality. However, in Greece the relevance of low paid employees is larger than in other countries.

Going beyond the disposable income, it emerges how the redistributive effect of direct taxes and cash transfers is counterbalanced with an inequality increasing effect of indirect taxes, which are particularly sizeable in Greece. We devote the next sub-section to a discussion about the regressivity of the indirect taxes.

The relative contribution of each cash component is smaller when evaluating the redistributive effects on the basis of the extended income distribution. Differences with the results in the case of disposable income vary across countries depending on the magnitude of in-kind benefits, their distribution and the adoption of the needs-adjusted equivalence scales. These are largest in Greece and the UK where in-kind benefits contribute more than 30% of overall redistribution. In particular, the role of public pensions (from 69% to 43%) and personal taxes (from 30% to 19%) is strongly downsized in Greece and that of means-tested benefits (from 37% to 25%) in the UK. The regressivity of indirect taxes is narrowed as well, in particular in Greece where it reduces from 22% to 14%.

Imputed rent reduces inequality and in particular in Greece and the UK. This is expected given that imputed rent is more pronounced at the bottom of the income distribution in Greece, as more than 70% of the individuals live in own accommodation even among the poorest, and in the UK, due to a large share of individuals living in social housing (Figari et al. 2012). Public education transfers and public health transfers make a similar contribution to the overall redistribution across countries, ranging from 10-11% (health related services) to 11-14% (education related services). Overall, this demonstrates that the common use of a

narrower income concept, such as the disposable income, can lead to the overestimation of the redistributive effect of the cash tax-benefit instruments (in relative terms).[7]

5.1 Are indirect taxes a regressive form of taxation?

The regressivity of indirect taxes is confirmed when we look at indirect tax payments as a percentage of disposable income by income decile groups (Table 6), which shows poorer individuals paying a much larger proportion of their income in indirect taxes compared to richer individuals.

<TABLE 6 AROUND HERE>

This is particularly true in Greece where the share of goods being VAT exempt or subject to a lower VAT rate is much smaller than in other countries and, on average, expenditures are higher than income at the bottom of the distribution (Decoster et al. 2010). Incomes are more volatile than expenditures and might represent a misleading indicator of individual well-being in a given point in time, while consumption pattern is smoothed through borrowing and saving. Because of this, expenditures might be a better measure of individual well-being, although the focus on income related tax-benefit instruments constrains most of the empirical analysis to use income distribution as a benchmark. Moreover, the use of expenditures rather than income as a welfare measure itself is controversial, and we return to this in the final discussion.

When we focus on indirect tax payments expressed as a percentage of household expenditure the overall picture changes completely. Table 7 shows that poorer individuals pay a slightly smaller proportion of their total expenditure in VAT and excises compared to richer individuals. The main reason for the lower incidence of indirect taxes at the bottom of the distribution is that the goods being VAT exempt or subject to a lower rate (e.g. food, power, domestic fuel, children's clothing) represent a much larger share of total spending of poorer individuals than of richer individuals. By looking at the incidence of indirect tax payments as a proportion of expenditure, these indirect tax systems do not seem to be regressive. However, one could argue whether VAT reductions and exemptions are an effective redistributive channel given that they are not well targeted to the poorest individuals.[8]

<TABLE 7 AROUND HERE>

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[7] In the interpretation of the results it should be borne in mind that we assume full tax compliance. However, it is well-known that the shadow economy in Greece is a widespread phenomenon which accounts for around 25% of GDP (Schneider et al. 2010). A recent study on Greece focusing on income taxes (Matsaganis et al. 2010) shows that overall inequality is higher when tax evasion is accounted for (with a percentage increase of the Gini index of disposable income equal to 3.5pp) and the personal income tax system being less progressive and hence less redistributive (with a percentage reduction of Reynolds-Smolensky index around 25pp) than otherwise. We are not aware of empirical studies on the redistributive effects of VAT evasion in the countries considered in our paper. However, as Matsaganis et al. (2010) suggest, the evasion of VAT and other taxes is likely to reinforce these adverse redistributive effects.

[8] Empirical evidence related to the UK (Crawford et al. 2010) shows that an introduction of a uniform VAT rate would be a regressive policy reform. However, if only part of the lost revenue due to VAT reductions and exemptions was used to increase the current income-related benefits, individuals in the lowest three deciles would gain on average while the top four deciles would experience highest losses, showing that there are better redistributive tax-benefit instruments than VAT reductions to support poor individuals.

6. Conclusions

Due to the differences in consumption patterns, housing markets and provision of public services, cross-country comparability of income distributions can be improved by using an extended income concept. The country ranking (although constrained by the limited number of countries considered in our analysis) does not change in terms of inequality levels when moving from disposable income to the extended income. However, the overall redistributive effect of the tax-benefit systems depends heavily on the income concept considered and the differences across countries are smaller when considering the extended income distribution. Moreover, the common use of a narrower income concept, such as the disposable income, can lead to the overestimation of the redistributive effect of the cash tax-benefit instruments (in relative terms), the extent of this varying across countries.

While public interventions reduce the inequality of disposable income it is important to recognise that there might be an indirect effect on the distribution of original income which is not captured by our analysis. There is a notable strand of literature on the relationship between inequality and economic growth with arguments as well as empirical evidence going in both directions. The argument that transfers and progressive taxation can reduce the inequality and hence favour economic growth is counterbalanced by the fact that generous benefits and high taxes can introduce inefficiency and economic distortions which may prevent economic growth. However, behavioural responses may not be large. For example, Bargain et al. (2012) show that income elasticities are relatively small in Europe and the US. It also matters how economic growth (or lack of it) shapes the distribution of market incomes which drives inequality of disposable income in all countries.

Furthermore, it matters which tax-benefit instruments are used as indirect and direct taxes can have a different impact on the distribution of original income. On the basis that the taxation of consumption is less distortionary than the taxation of labour, it can have a different impact on labour supply and hence on overall market income (Auerbach 2006; Capéau et al. 2009). The regressive effects of indirect taxes with respect to income could be lowered by applying lower tax rates on goods consumed relatively more by poor individuals (e.g. food). However, this would go against the efficiency aspects which suggest higher tax rates on goods with lower price elasticity and it would be less effective in terms of redistribution given the existence of other instruments with a larger redistributive impact like benefits and progressive income tax (Atkinson and Stiglitz 1976).

Overall, the inclusion of indirect taxes in the analysis of the redistributive effects of tax-benefit instruments, raises the important issue of the proper welfare concept and the normative setting for the analysis of individual well-being. On the one hand, expenditure represents a better indicator of individuals' standard of living than their income, which is more volatile over the life-cycle. On the other hand, the consumption pattern represents individual tastes rather than opportunities given by individual endowments for which individual are less responsible for (Decoster et al. 2010).

Our approach represents an enhancement of the studies on redistributive effects of tax-benefit instruments in a cross-country perspective by considering an extended income distribution which takes into account cash incomes, taxes on expenditures and in-kind benefits. Nevertheless, we have not been able to take into account the value of annual income from wealth, whether realised or not, due to the lack of data on households assets as well as capital income. The newly released survey by the European Central Bank (2013) offers a great potential for further research in this area.

From a policy perspective, the redistributive impact of indirect taxes, imputed rent and in-kind benefits need to be taken into account in the evaluation of actual or potential policy reforms. For example, a recent analysis by Avram et al. (2013) on the distributional effects of fiscal consolidation measures introduced in Europe as a response to the Great Recession shows the regressive incidence of the increases in indirect taxes, involving large losses for the individuals at the bottom of the income distribution (in particular in Greece and UK). Another example by Figari et al. (2012), in the context of an increasing debate on the necessity to extend the tax base of the personal income tax to cover private imputed rent, provides evidence that such a reform (either with increasing public revenue or shifting taxes away from labour income) might lead to a reduction in the overall inequality.

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TABLES

Table 1. Data sources and reference time periods

Country		Income survey	Budget survey	Tax-benefit system
BE	Belgium	EU-SILC 2004	HBS 2003	2003
EL	Greece	HBS 2004/5	HBS 2004/5	2004
UK	UK	Family Resources Survey 2003/4	Family Expenditures Survey 2003/4	2003

Note. EU-SILC: European Union Statistics on Income and Living Conditions. HBS: Household Budget Survey. In the EU-SILC data the reference time period for incomes is the year before the data collection (e.g. in the EU-SILC 2004 the incomes refer to 2003).

Table 2. Average household income by source, % of extended income

Income component	All households			Bottom decile			Top decile		
	BE	EL	UK	BE	EL	UK	BE	EL	UK
original income	***113.9***	***90.8***	***95.1***	***19.7***	***66.7***	***25.6***	***190.1***	***120.5***	***143.8***
public pensions	13.7	17.0	6.0	19.8	13.3	6.4	4.5	11.0	1.4
non means-tested benefits	13.5	8.8	5.5	29.7	10.0	11.7	6.2	7.0	1.2
means-tested benefits	1.3	0.1	7.7	5.9	0.7	40.2	0.1	0.0	0.2
SIC (employer)	-26.6	-8.0	-5.8	-3.9	-6.6	-0.9	-44.3	-5.6	-9.6
SIC (employee, self-employed)	-11.4	-11.8	-4.9	-1.9	-9.4	-1.0	-18.3	-11.7	-6.3
personal taxes	-22.1	-9.2	-19.1	-1.3	0.0	-8.3	-44.6	-25.2	-34.2
disposable income	***82.3***	***87.7***	***84.5***	***67.9***	***74.7***	***73.8***	***93.6***	***96.0***	***96.6***
indirect taxes	-9.1	-14.1	-9.1	-10.5	-34.0	-17.2	-9.2	-10.9	-7.8
post-indirect-tax cash income	***73.2***	***73.6***	***75.3***	***57.4***	***40.7***	***56.6***	***84.4***	***85.1***	***88.8***
imputed rent (private)	4.8	11.0	7.0	3.8	18.0	9.0	5.8	9.3	5.6
imputed rent (public)	0.2	0.0	0.8	0.5	0.0	2.7	0.1	0.0	0.0
non-cash public education transfers	8.1	5.3	5.7	10.8	15.4	9.9	2.9	1.4	1.3
non-cash public health transfers	13.7	10.1	11.2	27.5	25.9	21.8	6.8	4.2	4.4
extended income	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***

Notes: SIC stands for social insurance contributions; original income includes employer SIC; deciles are based on equivalised household extended income (using the needs-adjusted equivalence scale); public pensions include old age and health related pensions received by people aged 65+, war pensions, early retirement and non-integral social pensions are included in other benefits. Source: Authors' analysis based on EUROMOD D25.

Table 3. Inequality of cash income distributions

	Inequality measure	Original income	Gross cash income	Disposable income	Post-indirect tax cash income
Belgium	Gini	0.491	0.339	0.228	0.234
	A(0.5)	0.288	0.095	0.045	0.044
	A(1.5)	0.961	0.402	0.217	0.148
Greece	Gini	0.496	0.361	0.320	0.352
	A(0.5)	0.270	0.111	0.088	0.096
	A(1.5)	0.516	0.297	0.273	0.296
UK	Gini	0.522	0.374	0.318	0.332
	A(0.5)	0.298	0.114	0.083	0.090
	A(1.5)	0.979	0.302	0.241	0.258

Notes: All incomes are equivalised using the modified OECD scale. Source: Authors' analysis based on EUROMOD D25.

Table 4. Inequality of cash and non cash income distributions

	Inequality measure	Original income	Gross cash income	Disposable income	Post-indirect tax cash income	Extended income
Belgium	Gini	0.504	0.355	0.248	0.254	0.182
	A(0.5)	0.295	0.104	0.052	0.050	0.028
	A(1.5)	0.962	0.414	0.229	0.166	0.104
Greece	Gini	0.503	0.370	0.329	0.360	0.277
	A(0.5)	0.275	0.116	0.092	0.101	0.063
	A(1.5)	0.526	0.308	0.284	0.306	0.201
UK	Gini	0.533	0.390	0.334	0.347	0.260
	A(0.5)	0.306	0.123	0.091	0.098	0.058
	A(1.5)	0.980	0.322	0.260	0.274	0.152

Notes: All incomes are equivalised using the needs-adjusted equivalence scale. Source: Authors' analysis based on EUROMOD D25.

Table 5. Redistributive effects of tax-benefit components, as % of total Reynolds-Smolensky index

	Belgium		Greece		UK	
Income component	CI	NA	CI	NA	CI	NA
original income						
public pensions	29.8	23.0	68.8	43.2	21.1	14.0
non means-tested benefits	26.0	20.8	24.5	15.4	19.8	13.5
means-tested benefits	3.3	2.5	0.5	0.3	36.9	24.9
SIC (employer)	12.4	9.8	-0.5	0.0	5.8	4.0
SIC (employee, self-employed)	5.7	4.4	-0.8	-0.5	3.4	2.4
personal taxes	25.4	19.3	29.9	18.7	20.3	13.9
disposable income						
indirect taxes	-2.4	-1.8	-22.4	-13.9	-7.3	-4.7
post-indirect-tax cash income						
imputed rent		0.7		10.1		7.5
non-cash public education transfers		9.7		11.0		11.3
non-cash public health transfers		11.4		14.3		12.9
extended income						

Notes: SIC stands for social insurance contributions; CI is cash-income equivalence scale (the modified OECD scale), NA is needs-adjusted equivalence scale. Source: Authors' analysis based on EUROMOD D25.

Table 6. Indirect tax payments as % of disposable income by income decile

Decile	Belgium	Greece	UK
1	15.3	37.7	20.2
2	12.0	23.4	13.5
3	11.7	19.8	12.6
4	11.6	18.4	12.4
5	11.4	17.6	11.8
6	11.0	16.0	11.6
7	10.9	16.0	11.1
8	10.8	14.9	10.7
9	10.5	14.2	9.9
10	9.9	11.9	8.2
Total	11.1	16.0	10.8

Notes: decile groups are formed by ranking individuals according to equivalised household disposable income using the modified OECD equivalence scale. Source: Authors' analysis based on EUROMOD D25.

Table 7. Indirect tax payments as % of expenditures by income decile

Decile	Belgium	Greece	UK
1	11.3	13.5	13.9
2	11.8	13.9	14.0
3	12.1	14.3	13.8
4	12.5	14.2	13.8
5	12.7	14.2	14.1
6	12.8	14.1	14.3
7	13.1	14.6	14.5
8	13.3	14.2	14.7
9	13.5	14.3	14.6
10	13.9	14.1	14.4
Total	12.9	14.2	14.3

Notes: decile groups are formed by ranking individuals according to equivalised household disposable income using the modified OECD equivalence scale. Source: Authors' analysis based on EUROMOD D25.