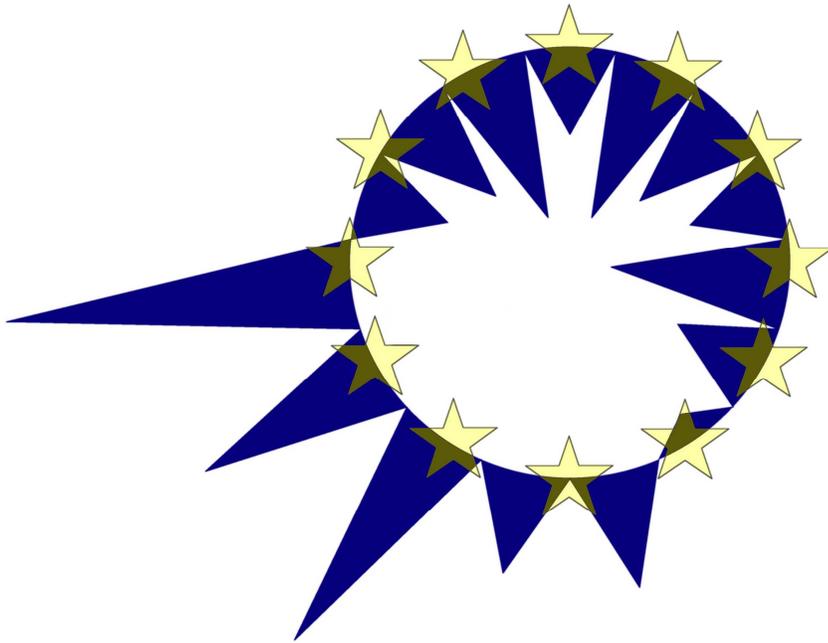


# EUROMOD

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**MODELLING THE REDISTRIBUTIVE IMPACT OF  
INDIRECT TAXES IN EUROPE: AN  
APPLICATION OF EUROMOD**

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# MODELLING THE REDISTRIBUTIVE IMPACT OF INDIRECT TAXES IN EUROPE: AN APPLICATION OF EUROMOD<sup>1</sup>

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## Abstract

This paper describes a model to simulate expenditure and indirect taxes in 12 EU countries within the EUROMOD tax-benefit model. The paper outlines the types of indirect taxes in the countries examined. Validation checks are made on the effectiveness of the expenditure models used. The redistributive effect of indirect taxes is decomposed into the tax resulting from different commodity groups. Lastly the progressivity and redistributive effect of indirect taxes are examined and compared with income taxes, social insurance contributions (employee and employer) and the main social benefit groupings with all EU countries.

*JEL:* C81, D31

*Keywords:* European Union; Microsimulation; Taxation, Redistribution.

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# MODELLING THE REDISTRIBUTIVE IMPACT OF INDIRECT TAXES IN EUROPE: AN APPLICATION OF EUROMOD

## 1. Introduction

The aim of this paper is to model indirect taxation in the European Union, to measure their progressivity, to consider the redistributive impact of these instruments and compare them with other redistributive instruments. The countries considered are Belgium, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the UK. Because of data access restrictions, it has not been possible to simulate indirect taxes for Austria, Denmark and Germany. Therefore we include these countries only for the comparative analysis of other redistributive instruments.

The paper utilises the EUROMOD 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.<sup>2</sup>

The core EUROMOD model simulates benefits and direct taxes and contributions and utilises data that contains labour market, demographic and income data. This data source however does not include expenditure required for the simulation of indirect taxes. This paper develops a modelling system within the EUROMOD model to simulate expenditure by consumption type and then simulates a range of indirect taxes (VAT, excise duties and Ad Valorem Taxes). The imputation of expenditure and budget shares is done through a series of regressions on the National Household Budget Surveys. Since many of these surveys are restricted to use inside their own country for security and privacy reasons, most of the regressions have been run by different individuals from each country, using a common regression program supplied

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<sup>2</sup> EUROMOD relies on income micro-data from 12 different sources for fifteen countries. These are the European Community Household Panel (ECHP) User Data Base made available by Eurostat; the Austrian version of the ECHP made available by the Interdisciplinary Centre for Comparative Research in the Social Sciences; the Panel Survey on Belgian Households (PSBH) made available by the University of Liège and the University of Antwerp; the Income Distribution Survey made available by Statistics Finland; the Enquête sur les Budgets Familiaux (EBF) made available by INSEE; the public use version of the German Socio Economic Panel Study (GSOEP) made available by the German Institute for Economic Research (DIW), Berlin; the Living in Ireland Survey made available by the Economic and Social Research Institute; the Survey of Household Income and Wealth (SHIW95) made available by the Bank of Italy; the Socio-Economic Panel for Luxembourg (PSELL-2) made available by CEPS/INSTEAD; the Socio-Economic Panel Survey (SEP) made available by Statistics Netherlands through the mediation of the Netherlands Organisation for Scientific Research - Scientific Statistical Agency; the Income Distribution Survey made available by Statistics Sweden; and the Family Expenditure Survey (FES), made available by the UK Office for National Statistics (ONS) through the Data Archive. Material from the FES is Crown Copyright and is used by permission. Neither the ONS nor the Data Archive bear any responsibility for the analysis or interpretation of the data reported here. An equivalent disclaimer applies for all other data sources and their respective providers cited in this acknowledgement.

by the authors. These are of course less than ideal working conditions, because there are many structural differences across countries that had to be neglected in order to apply a standardised imputation method to all datasets. However, we think that this paper demonstrates the value of including the study of indirect taxes in EUROMOD, so as to gain a more complete picture of the redistributive effects of the various tax-benefit systems in Europe.

While there is by now a relevant amount of evidence focussing on the distributional impact of indirect taxes in selected OECD countries (Creedy, 2001; Decoster and Van Camp, 2001; Liberati, 2001; Madden, 1995; Newbery, 1995; Redmond et al., 1998; Tsakoglou and Mitrakos 1998; Kaplanoglou and Newbery 2003), there is still a limited number of comparative studies on the differences in the distributional effects of indirect taxes among different countries. The basic reason is the lack of a sufficiently rich and homogeneous data base containing detailed information on several countries and on the specific tax instruments compared. EUROMOD provides such a framework.

The next section details the structure of indirect taxation in Europe. Section 3 discusses the methodology used in this paper, considering how to simulate total consumption, budget shares and indirect taxes and how to measure redistribution. Section 4 evaluates the expenditure model comparing results with national models for Italy and the UK, while section 5 evaluates the expenditure imputations for each country. Section 6 validates the simulated indirect taxes compared with aggregate statistics. Section 7 measures the redistributive effect and the progressivity of indirect taxes. We decompose the redistributive effect of indirect taxes into the impact of taxes levied on particular expenditure groups. In section 8, we compare the redistributive impact of indirect taxes with other policy instruments such as direct taxes, social insurance contributions and social benefits. Section 9 concludes.

## 2. Indirect Taxation in Europe

Three types of indirect taxation are considered in this paper:

- Valued Added Taxation (VAT)
- Excise Duties and
- Ad Valorem taxes

These taxes differ in the way they are calculated. Value added taxes (*Vat*) are levied on pre-tax expenditure ( $E_{pre-tax}$ ):

$$Vat = E_{pre-tax} * vatr$$

Excise Duties (AD) meanwhile are levied on quantity of consumption.

$$ED = C_{pt} * edr$$

The last type of indirect tax we consider is an Ad Valorem Tax (AVT). Ad Valorem taxes are indirect taxes on the retail price of the good ( $E_{retail}$ )

$$AVT = E_{retail} * avtr$$

Table 1 describes the system of indirect taxes in the European countries considered in this paper. The table reports the rules in 1998.

[Table 1 – Indirect Tax Structure]

We consider VAT rates first. The modal VAT rate varies from 15% in Luxembourg to 22% in Finland. Five countries have modal rates greater than 20%, Belgium, Finland, France, Ireland and Sweden. Luxembourg, Portugal and Spain have the lowest rates at 17% or below. Given the European Single Market and the possibilities for cross-border consumption, one might have considered that due to tax competition, rates of neighbouring countries might have harmonised to some extent. While Belgium and France, Finland and Sweden and Portugal and Spain have similar rates, Ireland and the UK, the Benelux countries and Spain and France have gaps of about 4%.

All of the countries operate a system of differential VAT rates. Typically necessities such as food, health care and education expenses operate VAT reductions, frequently in excess of 10%. Books and newspapers in most countries also have a reduced rate. Six countries have reduced rate VAT for Electricity, while most Southern countries have VAT reductions for restaurants. Portugal even has a 12% reduction for wine.

The pattern of excise duties and Ad Valorem taxes varies substantially across countries. Excise duties are reported as a percentage of typical sales prices. Spain is the only country not to have extra taxes in excess of 50% or higher in each of the countries. Motor fuels also have extensive extra taxes. Taxes on alcohol are very variable across countries.

### 3. Methodology

In order to simulate indirect taxes, we need information about expenditure. As outlined above, information is not available in all countries in the datasets used by EUROMOD. As a result, we need to simulate expenditure for each household in the model. This section describes the method used to simulate expenditure.<sup>3</sup> The imputation process is divided into two parts. Firstly total expenditure is simulated, and then the budget shares for specific groups are estimated.

#### *Total Expenditure*

We firstly estimate a model of total expenditure utilising for each country the corresponding national household budget survey (HBS). These datasets are described in table B.1 in appendix B. The functional form of the model to be estimated is described in equation (1).

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<sup>3</sup> Due to restrictions in access to national household budget surveys, the authors of this paper were not able themselves to run the regressions used for the imputation of total expenditure and the various budget shares. Instead, the authors prepared a standard STATA program containing all the codes necessary for the regressions, and then each national respondent adapted the program according to the characteristics of the survey data of his/her country, and ran the regressions, sending then the results to the authors. The names of the individuals that ran the regressions, to whom we are grateful, are listed in table B.1 in appendix B.

$$\ln C_{HBS} = \alpha + \beta \ln Y_{HBS} + \gamma X_{HBS} + u, \quad (1)$$

where C = consumption, Y = income and X = vector of socio-demographic characteristics, detailed below. The natural logarithm of consumption and income are used since, typically, both follow approximately a lognormal distribution. The presence of income among the regressors does not depend on any particular economic theory about the relationship between current income and current consumption, but simply on the need of reproducing, through the imputation, all the partial correlations significantly different from zero: even after taking account of a wide set of demographic characteristics, the partial correlation between current income and consumption remains positive and significant, and this must be reproduced in the EUROMOD dataset.

The estimated coefficients (indicated with a hat) are then applied to the EUROMOD data set so as to obtain an imputation of total consumption:

$$\ln C_{EM} = \hat{\alpha} + \hat{\beta} \ln Y_{EM} + \hat{\gamma} X_{EM} + u^*, \quad (2)$$

The problem of the lower variability of the imputed value of total consumption is solved through the generation of an error term to reproduce the same variance of consumption in the HBS. Thus, here  $u^*$  is an error term artificially generated at the moment of the simulation, normally distributed, with zero mean and a variance equal to the variance of the residual of the HBS regression. It is quite likely that results are affected by heteroscedasticity, but this problem however affects only the s.e. of the coefficients, not their estimated value. If we are willing to keep all the coefficients in the estimation, even those that appear not to be significantly different from zero, since the regressions are standardized for all countries, we can avoid the problem of testing for the presence of heteroscedasticity.

Total Consumption is defined as the monetary value of non-durable and durable goods and services purchased during the period of the survey. The definition of consumption adopted corresponds closely to the concept of “Strictly Monetary Expenditure” described in Eurostat (1996).

This definition does *not* include:

- The imputed rents for home owners, and thus does not include also the rents paid by tenants, other housing costs such as mortgage interest. The benefits in kind provided by the employer (not present in all HBS).
- The amounts paid for direct taxes or social security contributions.
- The value of home production
- The value of debt repayment (not present in all HBS)
- The value of gifts received (but includes money given to children, contribution to churches or associations, etc.).
- The value of houses eventually purchased.

The definition of income adopted approximates to the definition of disposable income available to a household less known expenditures in income surveys. It is defined as wage and salary income (excluding employer social insurance contributions) *plus* self-employment income *plus* property income (rents, dividends, interests, not imputed rents from owner-occupation) *plus* other cash market income and occupational pension income (regular private transfers, alimony and child maintenance, not one-off lump sum incomes) *plus* cash benefit payments (social insurance, disability, universal and social assistance benefits, including state pension payments and near-cash benefits) *less* direct taxes and social insurance contributions *less* maintenance payments made *less* private pension contributions *less* housing costs (mortgage interest, rent, service charges and other housing costs).

It does *not* include:

- Imputed rents from owner occupation.
- Home production.
- The value of benefits in kind and any other non-cash income.
- Capital gains or losses
- Irregular lump sum incomes.

The other explanatory variables X used are described in Appendix table B.2. Because car-owners are likely to have substantially different expenditure patterns to those without cars, different models are estimated for both groups. The coefficients are described in tables B.3 and B.4 in appendix B. Car owning households are identified utilising a logit model of car ownership with explanatory variables reported in table B.2 and coefficients in table B.5.

#### *Imputation of Engel functions*

Because typically indirect taxes are levied at different rates depending upon the type of good, we need to simulate expenditure for disaggregated sub-groups of expenditure. In choosing the categories, we have tried to use both our knowledge of the indirect tax treatment of the various goods in the EU, and to follow a standard system of classification of goods and services (see for example Eurostat (1996)). For comparability purposes we utilise 17 EUROSTAT expenditure definitions (described in table A.1 in appendix A). However because indirect taxes are often differentially levied on alcoholic drinks, we further decompose this group into beers, spirits and wines.

Consumption on particular goods is estimated as budget shares of total consumption, utilising Engle functions as outlined in equation (3).

$$w_i = \alpha + \beta \ln C_{HBS} + \gamma (\ln C_{HBS})^2 + \delta X_{HBS} \quad (3)$$

where  $w_i$  =  $i$ th budget share, C is consumption as defined above and X is the same set of demographic characteristics used above.

While this formulation of expenditure categories provides a certain degree of disaggregation, certain categories of goods and services that face different indirect tax rates are grouped together. For example we cannot identify petrol and diesel separately, nor can we identify adult and children's clothing or different types of spirits. Therefore, the choice grouped budget shares common to all countries doesn't allow us to always associate to each good its specific indirect tax rate, but has the following advantages:

- It reduces the impact of the zero expenditures problem (reported below), which could substantially undermine the results of OLS regressions.
- Results for different countries can be compared.
- In many cases the authors did not have access to the micro data on which the equations were estimated (in some cases, models were estimated on our behalf by the national statistical agencies or other national research institutes), grouping allowed less room for error.
- Estimates for smaller groups of goods could be unstable.
- In any case, 20 categories are a number sufficient to allow for a substantial degree of heterogeneity in tax rates and consumption behaviour. In Appendix A, we see in table A.2 that while in general this categorisation allows for differential VAT rates to be modelled, the level of aggregation sometimes results in inaccuracies. For example in the Food category in Italy, aggregating results in ignoring the variability of rates from 4 to 19 percent. While motor fuels have similar VAT rates, there is significant variation between petrol and diesel excise duties. However diesel consumption is relatively less important in the household sector and so this differential is likely to have less of an impact.

From these regressions carried out on the HBS, we use only the coefficients, not the residuals, in order to take into account the problem of zero expenditures due to infrequent purchases: reproducing a mean behaviour, the simple use of estimated coefficients attributes to nearly all households a positive share for each good. This is probably more sensible and realistic than allowing households to have zero expenditures on such essential goods as electricity, domestic fuel, non alcoholic beverages, or even food, due simply to the particular timing of expenditures.

A zero expenditure, can be due not only to infrequent purchases, but also to abstention from consumption: this is a problem reasonably relevant only for a few goods of our list (tobacco, motor fuels); we propose not to deal with this problem for tobacco, while for petrol and other motor fuels we use the information about car ownership described above to model separately motor fuel consumption by households without cars.

The method of OLS guarantees that the sum of the imputed shares is one, but some of them may be negative (the sum in absolute value is greater than one), which is not acceptable. We solve this problem by setting negative shares to zero, and correcting the others shares proportionally, so that the sum is still one for each household.

## Modelling Indirect Taxes

Indirect taxes are simulated in a similar way to that described in Redmond et al. (1998). As detailed above three indirect taxes are simulated: VAT, Excise Duties and Ad Valorem Taxes.

As detailed above VAT are levied on pre-tax prices. However the data on which our expenditure models are estimated are post tax prices ( $E_{retail}$ ). Hence, the simulated expenditures are based on post tax prices. To calculate VAT, we therefore use the following calculation:

$$Vat = E_{retail} * vatr / (1 + vatr) \quad (4)$$

Excise Duties (AD) are levied on quantity of consumption. However we only know the expenditures not the quantities. To produce quantities we divide by sample unit prices.<sup>4</sup>

$$ED = C_{pt} * edr = E_{retail} / unit\ price * edr \quad (5)$$

The calculation of an Ad Valorem Tax (AVT) is relatively straightforward:

$$AVT = E_{retail} * avtr$$

These calculations allow for baseline indirect taxes to be simulated. However one of the prime uses of a microsimulation model is to simulate reforms. If indirect taxes on goods change then the prices will change. Behaviour may then potentially change. The current version of the model does not incorporate a demand system to evaluate the extent of these behavioural changes. Instead the model allows the analyst to compare two extreme positions, (a) the assumption that quantity of consumption remains constant and (b) the assumption that expenditure remains constant before and after the tax reform.

## 4. Evaluation of the Expenditure Model

In this section we evaluate the expenditure model that has been estimated for the 12 countries in this study. As an aggregate measure of the effect of the expenditure model, we measure the simulated savings rate defined as (income – expenditure)/income. Table 2 reports the average savings rates for households in the 12 countries for each disposable income decile. The shape in each country is similar, with households at the bottom of the distribution being on average net spenders and those at the top on average net savers. However the degree of net spending/saving is quite different in the different countries. In the bottom decile, the country with the lowest savings rate is Sweden where the poorest decile expenditure exceeds income by twice income, while at the other extreme in Belgium, expenditure exceeds income by only 14 percent. At the top of the distribution, the French save 16 percent of their income, while the Finnish save 52 percent. The point at which expenditure approximately equals incomes varies as well. In France, Ireland and the UK only the top deciles spend less than their income, while at the other extreme in Belgium income exceeds expenditure for all deciles from the fourth higher.

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<sup>4</sup> It should be noted that unit prices for goods are sample prices. Actual unit prices of goods vary extensively from region to region, as well as from product to product.

[Table 2 – Savings Rates]

In order to evaluate the Engel functions designed to model budget shares, we compare the ensuing budget elasticities (percentage change in expenditure per percentage change in income) implied by the budget share equations. Table 3a outlines the budget elasticities for each of the 17 aggregate groups for each of the countries. The budget elasticity is defined as follows:

$$\eta_i = 1 + (\beta_i + 2\gamma_i \ln C) / w_i \quad (6)$$

where  $\eta_i$  is the budget elasticity of the i-th category,  $\ln C$  is the average of the logarithm (not the log of the average) of total expenditure and  $w_i$  is the average of the i-th budget share. Here we see that all goods are normal goods in that consumption increases with income. However goods with lower budget elasticities mean that consumption is relatively less sensitive to changes in income. Goods with low income-elasticities are mainly necessities. An elasticity of less than 1, means that a 1% increase in income will increase expenditure by less than 1%. Hence poorer people will have lower budget shares. An elasticity of greater than 1 means that as income increases, expenditure on the good or service increases at a faster rate than income. For example the budget elasticities for food, domestic fuels, electricity and communication have consistently low elasticities. As lower socio-economic groups are more likely to smoke, tobacco too has a relatively low budget elasticity. The average elasticity varies by country. Food is perhaps the most consistent of the low elasticity goods. Expenditure on transport has the highest average elasticity and is the most consistently high across countries. Clothing and footwear and other goods and services also have relatively high elasticities. Alcohol and motor fuels have elasticities of close to one in most countries. Private welfare services such as health and education have high elasticities as richer individuals are much more likely to supplement public provision. Restaurants and leisure activities also have elasticities of greater than one.

[Table 3a – Budget Elasticities]

Table 3b describes the average budget shares for each of the consumption goods, indicating the relative importance of each category. For each country the food consumption group has the highest budget share. However it varies in importance from 16.1% in the Netherlands to 34% in Portugal. This is consistent with the fact that the income elasticity is low. As richer people will consume proportionally fewer necessities, similarly richer countries will have more richer people and so on average will consume less. The other main consumption groups are household goods and services, other goods and services, transport and restaurants. Transport and household goods and services have higher budget shares in the richer countries of Northern Europe than in Southern Europe. Considering unhealthy consumption categories, alcohol and tobacco, Ireland and the UK have the highest budget shares, with Greece having high tobacco budget shares and Finland highest alcohol. Figures E.1 to E.20 in the Appendix further analyse the budget shares for different goods across the income distribution.

[Table 3b – Budget Shares]

## 5. Indirect Taxation: Aggregate Validation

In this section we evaluate the aggregate results produced by the model. Table 4 reports the aggregate VAT and excise duties simulated by EUROMOD and compares them with official statistics for 1998. We see that for VAT rates, the bulk of the countries simulate 70 to 85% of VAT revenues in each country. In Ireland and the Netherlands however this rate falls below 70 and in Belgium below 60%. Turning to excise duties, there is more variability, where the model simulates 30% or less of total excise duty revenues in Luxembourg, Portugal and Spain, but as high as 85% in Finland and Italy. This is consistent with the fact that expenditures on tobacco and alcohol, sources of excise duties are often under-reported in households budget surveys.<sup>5</sup> In Belgium we simulate significantly more than that reported by official statistics, which is difficult to explain as neither tax rates nor expenditure shares are extreme relative to other countries.

[Table 4 – Total Revenue EU]

There are a number of reasons why one would expect simulated indirect taxes not to equal total revenues from indirect taxes. Firstly not all indirect taxes are passed on to final consumers because for example some sectors do not pay VAT and so cannot claim VAT refunds. Also the household sector does not account for all final consumption on which VAT is incident. For example government activities and charities will pay VAT, but will not be included in the simulated VAT totals here. An incidence analysis employing an input-output table as per Scutella (1997) may help to identify the true incidence of indirect taxes. Excise duties paid on intermediate inputs will also not be modelled in this type of analysis.

A comparison with an existing tax-benefit model may be a better comparison, than against national accounts. In Table 5 we compare aggregate simulated indirect taxes for EUROMOD, POLIMOD and official statistics. We note that EUROMOD simulates more VAT than POLIMOD (118%), but less Excise Duties (89%). This is because some VAT free goods such as children's clothes are included in aggregated clothing and footwear headings in EUROMOD and also utilising more aggregated headings allows less discrimination in the simulation excise duties, resulting in a lower simulated excise duty revenue. Comparing with official statistics, we see that while EUROMOD simulates 82% of total VAT revenues, it only simulates 52% of excise duties.

[Table 5 – Revenue – Comparing Models]

## 6. Indirect Taxation Across the Income Distribution

We now turn to the main results of our analysis. Tables 6 and 7 show the incidence of VAT (Table 6) and of excise duties (Table 7) by deciles of equivalent disposable income, for each of the twelve countries considered. We report both tax types as percentage of total expenditure and as a percentage of total disposable income.

[Table 6 – VAT]

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<sup>5</sup> This may in part be due to the fact that alcohol consumption is likely to be included in the category C16, Restaurants etc.

The value added tax in each country generally increases as a percentage of total expenditure over the disposable income distribution. In most countries however, the difference in the average tax rate between the poorest deciles and the richest ones is very low. There are three countries for which the difference in the incidence between the first and tenth decile is at least one percentage point, Greece, Ireland and the UK. The reason for this is due to underlying expenditure patterns. Portugal, Luxembourg, and Spain have the lowest average rate as a percentage of expenditure at less than 10%, as they have the lowest modal VAT rates. Sweden and Finland have the highest at over 18 and 15 per cent respectively. Although Belgium is one of the countries with the highest modal rates, its average VAT rate as a percentage of expenditure is low. However its consumption patterns as observed in table 3b, together with the many exemptions and reductions seen in table 1 mean that overall, VAT as a proportion of total expenditure is low. In general, Belgium has a higher than average budget share for consumption groups with reductions or exemptions.

When we look at VAT as a percentage of disposable income, we see the opposite trend. Now for each country, the bottom deciles have higher VAT rates than the top deciles. This results from the fact that although those in the bottom have lower average VAT rates on their expenditure, they spend more as a proportion of their income than those at the top of the income distribution as we saw in table 2. The countries with amongst the highest dissaving rates at the bottom of the distribution (i.e. expenditure is very high relative to income). France with high dissavings rates, combined with relatively high VAT as a percentage of total expenditure now has the highest VAT as a proportion of disposable income, passing out Sweden which has a positive average savings rate. Finland with the highest VAT as a proportion of expenditure has the highest observed savings rate and so drops down to about average across the countries when based as a percentage of disposable income. In terms of the ratio of expenditure rate in the bottom decile relative to the top, Sweden has the most regressive VAT rates with the VAT rates as a percentage of income being 5.6 times as much as in the bottom decile as the top primarily because of the level of dissaving in the lower part of the distribution. Portugal and Finland are next using this measure followed by Spain, Italy and Greece.

[Table 7 - Excise Duties]

Unlike VAT, excise duties (Table 7) are regressive (when evaluated as a percentage of expenditure) in all EU countries. The regressive impact as measured by the ratio of the excise duty to expenditure rate of the bottom decile to the top decile is highest in France, Greece, Spain and Italy. In France and Italy, budget elasticities for goods that have excise duties such as tobacco, motor fuels and electricity are low. In Greece the budget elasticity does not capture the fact that average excise duties are low for the top decile but much higher for the next decile.

While VAT represents a fairly homogeneous share of total expenditure in all examined countries, the quantitative importance of excise duties differs significantly: for example while they represent only 1.9% of total expenditure in Spain and Sweden, this ratio goes up to 5.6% in Greece, and 8.7% in Ireland. In this country, in particular, 10% of total expenditure of the poorest decile group goes to excise duties. However this is primarily due to the importance of excise duties combined with the highest budget shares for alcohol and tobacco in Ireland.

When we consider excise duties as a percentage of disposable income, the picture becomes much more regressive. Belgium has the least regressive excise duties. Because expenditure is closer to disposable income across the income distribution, excise duties do not differ that much as percentage of disposable income as they do as a percentage of expenditure. Ireland still has the highest rate of excise duties and Sweden, France, Portugal, the UK, Greece, Finland and Italy have amongst the most regressive excise duties.

## 7. Redistribution and Progressivity of Indirect Taxation

This section measures the redistributive effect and the degree of progressivity of indirect taxation. In this section, we use measures based on the Lorenz Curve to examine the degree of these phenomena.<sup>6</sup> The Lorenz Curve for pre-tax market income is simply a graph of the cumulative population share versus the cumulative income for population ranked by order of their income. The Gini coefficient is a standard index of inequality, defined in equation (7):

$$G_M = 1 - 2 \int_0^1 L_M(p) dp \quad (7)$$

where  $p$  is the cumulative population share and  $L_M(p)$ , the Lorenz Curve at point  $p$ . A population with no income inequality would have a Lorenz Curve of  $45^\circ$  and therefore a Gini of 0. If Lorenz Curve A lies completely inside curve B, then it is possible to say that population A has greater inequality than population B, with  $G_A > G_B$ . However if the Lorenz Curves cross, it is not possible to make inequality comparisons without using a value judgements.

The objective of this paper is to examine the redistributive impact of the indirect taxes, and other tax-benefit instruments. The measure used here is the generalised Reynolds-Smolensky index, which is defined as the difference between the generalised Gini coefficients for market income and post-instrument income, defined in equation (8).

$$\Pi_A^{RS} = G_M - G_{M+A} = 2 \left( \int_0^1 [L_M(p) - L_{M+A}(p)] dp \right) \quad (8)$$

This effect is known as the redistributive effect. Palme (1996) however argues that it should be known as an equalising effect. This because the difference of two Gini-coefficients does not imply a redistribution of income as it is not necessarily the case that both Lorenz Curves on which they are based, have the same ordering of units.

The Reynolds-Smolensky index of redistribution can be transformed in equation (9) into three components, the progressivity (or departure from proportionality) ( $\Pi^K(v)$ ), the relative size of the instrument in question ( $a/(1+a)$ ) and the horizontal or reranking effect ( $D(v)$ ) (see Kakwani, 1984).

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<sup>6</sup> The methods described here are standard methods for examining the degree of redistribution and progressivity in tax-benefit system (See for example Palme 1996).

Progressivity is a measure of the difference between the level of redistribution of an instrument relative to an instrument with the same revenue effect but where the effect is proportional to income. It is therefore a measure of the incidence of an instrument. If an instrument is disproportionately targeted on the lower (upper) half of the distribution, then it is *regressive* (*progressive*). If an instrument is regressive (progressive), the concentration curve for the instrument will fall outside (inside) the Lorenz curve of market income. If the instrument is proportional to income, the concentration curve will be exactly the same as the Lorenz curve for market income. In terms of income taxes, progressivity relates to the ability-to-pay principle, whereby those with higher incomes are more able to pay higher taxes. A progressive income tax is therefore redistributive and thus inequality reducing. On the other-hand, benefits are redistributive if they are targeted more at the bottom of the distribution, so that those with lower incomes receive higher benefits. In this paper we use the Kakwani index of progressivity, which is the difference between the Lorenz curve for income and the concentration curve for the instrument in question.

$$\begin{aligned}
 \Pi_A^{RS} &= G_M - G_{M+A} \\
 &= (G_M - C_{M+A}) + (C_{M+A} - G_{M+A}) \\
 &= \frac{-a}{1+a} \Pi_A^K + D
 \end{aligned} \tag{9}$$

If tax-benefit instruments are based on characteristics other than income then income units may have a different order of incomes before and after the operation of the instrument. For example in France, income taxes are levied on family units so that families will face lower tax rates than single individuals. After the operation of this tax, families will shift up the distribution relative to single people. Similarly, the existence of joint taxation may result in lower tax liabilities for married couples than single people with the same income. This type of redistribution is known as horizontal redistribution. Changes in the order of income units in a distribution will result in the Lorenz curve of post instrument income being different to its concentration curve. The Atkinson-Plotnick reranking index, which is the difference between the Lorenz and concentration curves, is the measure of horizontal equity we use.

Aronson et al. (1994) however question the interpretation of the reranking measure as a true measure of horizontal redistribution. They argue that the reranking effect is a measure of the redistribution between unequals, while they decompose the remaining redistributive effect into a vertical effect and a horizontal effect, which measures the redistribution between equals. However the method is computationally intensive and has been ignored in this comparative study. We persist with the decomposition into redistributive and reranking components as other studies such as Decoster and Van Camp (2001) have done.

Table 8 reports the redistributive effect of VAT and Excise duties as measured by the Reynolds Smolensky Index.<sup>7</sup> In Appendix C we report the decomposition of the redistributive

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<sup>7</sup> Monetary values have been equivalised using the equivalence scale 1/0.5/0.3, where children are aged 17 or under.

impact into the progressivity of VAT and Excise duties as measured by the Kakwani Index and the average equivalised tax to disposable income ratios.

[Table 8 – Redistributive effect of VAT and Excise Duties]

For all countries, VAT and excise duties are negatively redistributive, taxing the poor proportionally more than rich. VAT has the highest redistributive impact in France resulting in a rise in the Gini coefficient of income by 3.3 points.<sup>8</sup> Portugal is next with a fall of 2.9 points followed by Finland (2.7) and Italy (2.2). The smallest redistributive effect is Belgium with a fall of 0.3. Although France does not have the highest modal VAT rates, it does have the highest average VAT rate due in part to the fact that it has one of the most regressive regimes due to the fact that dissaving rates are amongst the highest. At the other end of the spectrum, as before, Belgium has the lowest redistributive effect because of the low differential in the savings rate between the top and the bottom of the distribution.

We now turn to the redistributive effect of VAT for particular groups as measured by the change in inequality due to the tax.<sup>9</sup> Across countries, the groups with the largest redistributive effects are Food, Household Goods, Clothing and Footwear, Other Goods and Services and Transport. These goods because the redistributive effect is negative, increase inequality by the most. In general, as in this case, the goods with highest redistributive effect are the ones with the largest budget shares. However the sector with the least redistributive effect is education due to the zero rate in most countries, but has also one of the lowest budget shares. Alcoholic Beverages, although with generally high VAT rates, have low budget shares. We must note however that the degree of redistribution depends upon the base one with which one is comparing. For example in the case of the UK, because food is zero rated, redistribution compared with disposable income is zero. However if one considered the alternative case as a uniform tax rate across all goods, this result would be positive.

Considering Excise Duties in total, we find in general that the redistributive effect is smaller (-0.2 – -1.6) than for VAT (-0.6 – -2.5). Here Ireland has the highest redistributive effect at – 2.1, the same as the redistributive effect of VAT. We saw above that Ireland had substantially higher Excise Duties than in other countries. Similarly the redistributive effect is much higher in Ireland –0.4 more than the second most redistributive countries, and the UK with –1.7. Finland, France and Greece have redistributive effects of greater than -1.0. The Benelux countries have the lowest redistributive effect. However although Excise Duties are more important in Luxembourg, excise duties are less regressive in the Netherlands (see Table 7) and so the redistributive effect is lower.

## **8. Redistribution and Progressivity of Indirect Taxation Compared with Other Redistributive Instruments**

In this section, we compare the importance of redistributive impact of indirect taxes with other the redistributive instruments such as direct taxes, social contributions and social

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<sup>8</sup> By redistributive impact we mean the change in Gini coefficient as measured by the Reynolds Smolensky Index. Although taxes do not in themselves redistribute income, given a fixed revenue requirement, a more progressive tax will be more redistributive than a less progressive one.

<sup>9</sup> The base income category in each case is disposable income before indirect taxes are subtracted..

transfers. We now incorporate the other EU countries, for which we could not simulate indirect taxes. Table 9 reports income inequality measures for different income definitions, starting with market income before the operation of the tax-benefit system and finishing with final income after benefits have been added and income taxes, social contributions and indirect taxes have been subtracted. Tables 10a-10c describe the decomposition of the redistributive impact of these instruments into the rate effect, the progressivity, and the redistributive effect of each instrument. The measures are based upon equivalised income and take as their base disposable income without taking account of the instrument of interest. For this reason, the denominator is different for every instrument and so that the sums of the individual instrument rates do not sum to the net tax-benefit rate.

### *Inequality*

In table 9 we look at the impact of different tax-benefit instruments on redistribution or the reduction of income inequality, comparing these instruments with the impact of indirect taxes. In the first part we look at the impact of different groups on income inequality as measured by the Gini coefficient. The first measure describes the inequality of market income (as measured by incomes before social contributions, income taxes and benefits have been included.) Unlike other papers, because we use a simulation model that can identify employer social insurance contributions, our measure of market income is defined as incomes before employer contributions have been paid. We assume that employer contributions are incident on the employee. The country with the lowest level of market income inequality is the Netherlands, with a Gini of less than 50. The other countries have Gini coefficients in the range 50-60. Amongst the highest inequality levels are the countries with the highest levels of inequality for each of the income measures, Greece, Ireland, Spain and Portugal reflecting wider levels of inequality in these countries. Belgium however has the highest level of market income inequality. As we shall see below, employer contributions are quite important redistributive instruments in Belgium, being quite progressive. However if these instruments are not in fact fully incident on employees due to for example minimum wages, then this definition of market income may over-state the level of market income inequality in Belgium versus other countries.

Adding benefits and pensions to market income we have what we define as gross income. The ranking of countries is largely the same, however the importance of redistribution due to benefits and pensions in Belgium and Finland, result in their ranking improving, with Belgium, moving the to 10<sup>th</sup> from 15<sup>th</sup> and Finland moving to 2<sup>nd</sup> from 9<sup>th</sup> and Sweden moving to 5<sup>th</sup> from 11<sup>th</sup>. The lack of redistribution due to these instruments in Greece and Italy, reflecting the low coverage and small value of benefits and pensions, results in these countries moving from 10<sup>th</sup> to 14<sup>th</sup> and from 7<sup>th</sup> to 12<sup>th</sup> respectively. The smallest change in the Gini at this level occurs in another Mediterranean country, Portugal. In the Netherlands, due to high employment rates that result in a low market income inequality and also the high degree of private provision in pensions benefits and pensions reduce inequality by a relatively small amount.

Subtracting direct taxes, employer social insurance contributions and employee contributions, we have disposable income. The most redistributive direct taxation occurs in Germany, Austria, Denmark, Belgium, Luxembourg, Sweden, Finland and the Netherlands, resulting in

these countries being the countries with the lowest disposable income inequality. Greece, Italy and France have the lowest change in the Gini due to direct taxes.

Subtracting indirect taxes from disposable income, results in what we define as final income. We only report final income inequality for 12 countries, due to data restrictions. Here, the low level of negative redistribution due to indirect taxes observed in Belgium, results in Belgium now have the lowest level of inequality followed by Luxembourg and the Netherlands. Relatively regressive indirect taxes see Finland moving from the lowest disposable income inequality level to 4<sup>th</sup> in final income inequality, even with the relatively low inequality countries of Austria, Denmark and Germany being excluded. As in the case of disposable income Portugal, Greece and Italy occupy the 3 worst rankings, with regressive indirect taxation in Ireland, swapping places with Spain to go 8<sup>th</sup>. France and the UK consistently have stayed upper-middle ranked in terms of inequality.

[Tables 9] Inequality

#### *Relative Size of Benefit Expenditures and Tax Revenues*

One of the driving forces of redistribution is the importance of the instrument. In table 10a we report the size of the instrument as a proportion of final income excluding the instrument itself. Because of this the denominator is different for every instrument and so one cannot add the rates together to produce aggregates.

We see from table 10a that Northern and Central European countries tend to have benefits exceeding 30% of total disposable income with the UK, Ireland and Southern countries in general with benefits expenditure less than 30% of disposable income. Italy is an exception due to relatively high public pensions and social assistance (mainly the social minimum components of public pensions). The Netherlands, on the other hand, has lower total benefits than other countries in the Northern and Central Europe.

Except in the case of Ireland, where means-tested social assistance benefits dominate, expenditures on contributory pensions (the main part of the “other benefit” category) are the largest group. The countries with the highest benefits in this group are Austria, Belgium France, Italy, Luxembourg, Finland and Sweden with other benefit rates of over 40%. Four countries have other benefit rates of less than 30%, including Ireland, the UK, the Netherlands, all of which have significant private provision and Denmark.

Denmark, Finland, Sweden and Belgium have the largest expenditure on social insurance unemployment benefits, followed by Germany, France and the Netherlands. The remaining countries have low unemployment benefit expenditure for a variety of reasons such as low unemployment as in the case of Luxembourg, low benefit payments as in the case of the UK, low coverage or duration in the case of Greece and Italy.

Turning to the social assistance benefits heading, we find the largest shares in Ireland and the UK. Ireland stands out in particular. Means-testing there is important because of a combination of factors such as the lack of earnings related benefits, coverage gaps and low durations of insurance benefits. After the short entitlement to unemployment benefits in the UK, unemployed individuals living in low-income household become eligible to Income

Support. Income Support in the UK can also top up family incomes to the social minimum while in receipt of (flat amount) unemployment benefits or old age benefits. In most other countries, individuals exhausting their entitlement to social insurance unemployment benefits also become eligible for means tested unemployment (Austria, Germany and the Netherlands) or social assistance benefits. In other countries, social assistance benefits perform the mechanism of topping up insurance benefits as in the case of social minimum pensions in Italy and Spain. In some countries, another important determinant of income when out of work (or in low-paid jobs) are means tested housing benefits, especially in the UK, Denmark and France. As an expenditure group, they are not significant in other countries.

Family benefits are an important income source particularly for those of working age. In most countries however it is the third or fourth most important benefit source. In Austria and Luxembourg however, it is the second most important expenditure group.

On the revenue side, we classify four types of instruments: indirect taxes and income taxes and social insurance contributions paid by employees (or benefit recipients) and employers. We group the latter three under the heading “direct taxes”.

Total taxes are highest in Sweden followed by France, Belgium, Finland and Italy. Ireland, the UK and the Southern Countries have total tax rates (tax divided by final income minus tax) of less than 40%. Luxembourg is the only Northern country with a tax rate in this range. Spain has the lowest tax rate.

While in general indirect taxes are amongst the least important revenue raising instruments, using our rate measure, in the UK, Ireland and Greece, they are the most important, while in France and Luxembourg they are the second most important revenue raising group.

The structure of direct tax revenue raising instruments varies a great deal across countries. Amongst the English speaking countries, Ireland and the UK, income taxes are large but social insurance contributions are very low. In Scandinavia, income taxes (containing a high proportion of local income taxation) are the most important, followed by employer social insurance contributions in Finland and Sweden, while employee contributions are second most important in Denmark. Except for Portugal income taxes are the most important of the direct tax based instruments. Employee contributions are the least important of these in Italy, Portugal and Spain. In central Europe, the revenue raising structure varies a lot. In Belgium and France, employer contributions are the most important, while in Austria, Germany and Luxembourg, income taxation is the most important, with employee contributions being the most important revenue-raising instrument in the Netherlands.

[Tables 10a] Tax and Benefit Rates

### *Redistribution*

In table 10b, we also look at the redistributive effect of different instruments. We immediately notice that while indirect taxes are negatively redistributive, all other instrument groups are positively redistributive, reducing income inequality. In general the combined effect of both indirect tax groups are more redistributive than either employee or employer social insurance

contributions and also either, unemployment, family or housing benefits. However combined the other policy groups are more important.

As in general the most important expenditure group, the most important redistributive instruments are other pensions and benefits, consisting of social insurance benefits and other long-term state benefits.

Next in general is income taxation. In Belgium, employer contributions are the next most important redistributive mechanisms (assuming that employer contributions are incident on employees).

In Ireland however, where means testing is important, social assistance benefits have the most important redistributive impact. In the UK and Italy, social assistance benefits are the second most important redistributive instrument. While as an Anglo-Liberal welfare state, the UK might be expected to be in such a position, the importance of social assistance benefits in Italy is surprising. The reason is that we incorporate social minima within the social insurance system as part of our definition of social assistance benefits. Similarly Spain and Greece have relatively important social assistance systems in terms of importance in terms of redistribution. In the former case although coverage is low, being targeted only at sub-groups of the unemployed population, unemployment assistance is important because of the size of the unemployed population. In the latter case, we incorporate anti-poverty instruments targeted at retired farmers that are quite an important transfer mechanism in Greece. In the Netherlands and Belgium, social assistance benefits are also in the top 4 redistributive instruments. Unemployment benefits, except in the case of Finland and Belgium are generally less important in terms of overall redistribution. In France and Luxembourg, family benefits reduce inequality (as measured by the Gini) by at least 1.5 percentage points and are amongst the three most important redistributive instruments. Except in the case of the UK and to a lesser extent France, Finland and the Netherlands, housing benefits are amongst the most important redistributive instruments. In fact for most countries it is the least important instrument together with Excise Duties. VAT is typically the fourth most important group.

[Tables 10b] Redistribution

### *Progressivity*

The degree of redistribution within a tax-benefit system depends not only on the size of the instrument, but also on the degree of targeting or progressivity. The Kakwani index in table 10c, shows that, when evaluated with respect to the income distribution, both forms of indirect taxes (VAT and excise duties) are regressive in all countries. Tables 6 and 7 have already shown that these taxes are progressive on consumption; the difference in these results is typical in studies of this kind. Portugal has the most regressive indirect taxation, with Belgium having the least regressive.

While indirect taxes are regressive, most of the direct taxes and contributions are progressive, with typically income taxes being more progressive than employer contributions which are in turn more progressive than employee contributions. There are a number of exceptions to this. In Finland, employer contributions are more progressive than income taxes, while in Ireland,

employee contributions are more progressive than employer contributions. In Italy income taxes are not very progressive, being less progressive than either employee and employer contributions. In Luxembourg employee contributions are slightly more progressive than employer contributions.

Luxembourg has the most progressive income taxation of the countries studied, followed by Germany, France and the Netherlands. While Luxembourg has the most redistributive income taxation, France has amongst the least redistributive income taxation, despite being quite progressive, due primarily to the fact that income taxes are the least important in France as is outlined in table 10a. Belgium on the other hand has one of the lowest levels of progressivity, but because income taxes are the fifth most important in Belgium of the countries considered, the redistributive impact of the instrument is amongst the most important. High levels of income taxation combined with relatively less progressive taxes increase the redistributive capacity of income taxation also in Finland and Ireland. In the remaining countries, the ranking in terms of redistribution reflects the degree of progressivity of the national systems.

Belgium has the most progressive employer and employee contributions and together with relatively high contribution rates has the most redistributive instruments. Although with about average progressivity, France because of the importance of these instruments, has quite redistributive contributions. The same applies for employer contributions in Portugal. In Ireland the opposite applies, where despite high progressivity, low contribution rates result in these instruments having a relatively minor redistributive effect.

Lower or more negative Kakwani indices for benefits mean that an instrument is more targeted at the poor. In terms of the Kakwani index, social assistance benefits and other benefits and pensions have in general the highest degree of targeting. Targeting in this case refers to targeting versus income before receipt of the instrument. Means-tested social assistance benefits because they are designed to be inversely related to the income of the benefit unit, are typically only received by poor households and so are well targeted. Other, mainly contributory, benefits surprisingly are also highly targeted. Part of the reason for this is that for many groups such as the retired and the invalid, receipt of these, primarily income replacement, benefits is their main source of income and so their pre-transfer income would be low. Because of reranking, many of these households may move up the income distribution as a result of these transfers. Sweden, France, Belgium and Finland have the most negative Kakwani index for other benefits and pensions. The UK has the least negative Kakwani for these benefits. Unemployment benefits, also as primarily income replacement benefits have large negative Kakwani indices, indicating that these instruments are the prime income sources of the recipients of these instruments.

Portugal and the Netherlands have the most targeted social assistance benefits with a Kakwani index of less than -150. Ireland, Luxembourg, Sweden and Denmark have Kakwani indices in the 120-130 range for social assistance benefits. Finland has the smallest Kakwani index indicating the lowest degree of targeting for social assistance in Finland. In the English speaking countries, housing benefits as means tested benefits have strongly negative Kakwani indices, indicating again the highly targeted nature of these instruments. In Greece and Spain, where these instruments are very minor and are paid only for certain groups of people and in

certain areas, the instruments are much less targeted. Austria and Denmark also have relatively weakly targeted housing benefits.

Turning now to family benefits, we see that Italy and Spain have the most targeted instrument having the lowest Kakwani indexes, as a result of the high degree of income testing in the policy design of these instruments in these countries. Despite however having the second highest targeting in Spain, the very low level of these benefits, the lowest amongst the countries, results in Spain having the second lowest level of redistribution after Greece resulting from family benefits. Italy too has amongst the lowest rates of family benefits, but the very high targeting results in Italy having amongst the most redistributive family benefits. Denmark, Finland, Belgium and Greece have the least targeted family benefits, but while high benefit rates in the Belgium result in above average redistribution, the opposite is the case for Greece. In Denmark and Finland, even high expenditure rates do not result in much redistribution.

[Tables 10c] Progressivity

### *Redistribution and Inequality by Welfare State Regime*

Grouping countries into welfare-state regimes, Conservative (At, Be, Fr, Ge, Lu, Nl), Universal (Fi, Dk, Sw), Mediterranean (Gr, It, Pt, Sp) and Liberal (Ir, UK), we can observe some patterns (See Table 11). This table describes the average Gini index for different income measures and the average change in the Gini or Reynolds Smolensky index for countries within welfare state regimes.

Inequality in market income is slightly less amongst Conservative regimes than Universal regimes, which are in turn lower than Liberal and Mediterranean regimes. In terms of redistributions, benefits are by far the most important redistributive instruments in each regime, with redistribution being highest in the Universal regimes, so that gross income inequality is lower than for the Conservative regimes. Having more redistribution than the Liberal, which in turn is greater than the Mediterranean regimes, the gap is widened. However redistribution due to taxation is greater in Conservative regimes than Universal regimes, resulting in Final Income inequality being the same. However again as the redistribution is twice that of the other regimes, the gap in inequality widens again. Much of the difference in the redistribution due to taxes between Conservative and Universal regimes is due to the greater regressive impact of indirect taxation. Indirect taxes are even more regressive in the Liberal and Mediterranean regimes.

[Tables 11] Inequality and Redistribution by Welfare State Regime

## **9. Conclusions**

In this paper we described a model used to simulate indirect taxation with the European tax-benefit model, EUROMOD. The model simulates separately Valued Added Taxation (VAT), Excise Duties and Ad Valorem taxes. Because the data underlying EUROMOD does not in general contain expenditure variables, these too have to be simulated. This is done using a four step-procedure, firstly simulating car-ownership, then simulating total household

expenditure before simulating Engel functions for each of 17 expenditure groups. Lastly the alcoholic beverages group is further disaggregated into 3 sub-groups.

Applying the expenditure models, we reported the structure of savings rates across the income distribution, with in general the lowest deciles being net spenders and the top deciles being net savers. As is a feature common to household budget surveys, in most of the countries, the expenditure of the household sector is higher than disposable incomes, which can partially be put down to income under-reporting.

Transforming the coefficients of the budget equations, one can derive the budget elasticities for different expenditure groups. Necessities such as food, electricity, communications and domestic fuels and goods such as tobacco on which poor spend proportionally more, have lower budget elasticities, while luxury goods such as restaurants, leisure activities and private sector welfare services have higher budget elasticities.

In validating the simulated indirect taxes, the model was found for most countries to simulate in the region of 70 to 85% of VAT receipts. This compares favourably with the results of other tax-benefit models due to the fact that household sector VAT does not account for all final demand VAT receipts as sectors such as charity, clubs and government sectors are not included. The performance is worse for excise duties and ad-valorem taxes, where in 3 of the countries less than half of excise duties are simulated. This is consistent with the fact that expenditures on tobacco and alcohol, the main source of excise duties are often under-reported in household budget surveys. Also excise duties paid on intermediate goods will not be captured by this analysis. Therefore excise duties are likely to be under-estimated. An input-output based final incidence analysis may help to identify the final incidence of these taxes. It is difficult to assert the distributional impacts of this under-statement and to conclude how it may impact upon our distributional results. However this is a problem that affects other fiscal incidence studies and so in our paper, we merely note this issue for readers to be aware of when considering the results.

Indirect taxes were found to be regressive across the countries considered in this study. Although VAT as a percentage of total expenditure rose slightly in most countries with income, because poorer households were more likely to consume goods with reduced VAT rates, because poorer households were less likely to save and in fact more likely to draw upon savings, as a percentage of income VAT in general fell with income. Belgium had the least regressive VAT, with Portugal having the most regressive. However given the importance of the expenditure – disposable income relationship, differing quality of data in the different data-sets is likely to have an influence on the results. Excise duties were in general more regressive than VAT. This is because excise duties are primarily levied on goods such as alcohol and tobacco where there are higher budget shares amongst poor households. Although Portugal has the most regressive VAT, there is a stronger negative redistributive effect in France, due to the higher tax rates that exist there. Belgium, with the least regressive indirect taxes also has the smallest redistributive effect, with indirect taxes and VAT in particular having a broadly neutral impact on the income distribution.

We also compared the redistributive properties of other instruments with the performance of indirect taxes. Although redistribution has often a lower profile in public debate in Europe,

the tax-benefit system still has an important effect on income inequality, reducing average inequality by about 40% from pre tax-transfer income to final income. Benefits and pensions generally have the largest impact on inequality, followed by direct taxation, with indirect taxation in general although having a relatively low redistributive effect, because of the regressive nature of the instrument, it tends to widen the income distribution.

Amongst the different welfare regimes redistribution was highest in the Universal regimes, where there is a higher emphasis on high value universal benefits, followed by Conservative regimes which tend to rely on earnings related contribution based instruments. With greater benefit expenditure, they have more redistribution than means-tested benefits in Liberal regimes, which in turn have more redistribution than in the Mediterranean regimes where coverage and benefit rates tend to be lower. Redistribution due to taxation is greater in Conservative regimes than Universal regimes, due primarily to the greater role of regressive indirect taxation in the Universal welfare state regimes. However the redistribution due to taxation is twice that of the other regimes, widening in the gap in income inequality.

This paper has developed the methodology for examining the degree of redistribution within the tax-benefit systems of the EU, allowing analysts to measure the redistribution of all cash based instruments from employer contributions to indirect taxes including direct taxes, employee social contributions and benefits normally included in analyses of this kind. It lays the groundwork for future work that is planned.

In particular although we have quantified the level of redistribution, by decomposing in more detail we can analyse the impact of particular policy designs such as the impact of allowances, means tested structures etc. rather than simply examining the impact of policy structures in terms of child benefits, income taxation etc. on redistribution, extending the work of Wagstaff and Van Doorslaer (1997) and Wagstaff et al. (1999).

We can also apply theoretical constructs from optimal taxation to identify optimal directions of reform, particularly in the area of indirect taxation applying the work developed by Ahmad and Stern (1984) in the field of marginal tax reform.

Utilising the expenditure functions estimated for this paper and some relatively simple adjustments and assumptions (as per Creedy, 2001), one can improve cross-national welfare measurements (see Pendakur, 2002).

Utilising assumptions about the response of individuals to price changes due to indirect tax changes, we can employ the framework to consider indirect tax reform and improve the redistributive impact of indirect taxes.

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**Table 1 Indirect Tax Parameters**

Parameter	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
VAT												
Food	0.063	0.170	0.055	0.080	0.006	0.085	0.030	0.060	0.074	0.040	0.120	0.000
Non-Alcoholic Bev.	0.210	0.170	0.055	0.080	0.155	0.162	0.030	0.060	0.125	0.070	0.120	0.000
Tobacco	0.210	0.220	0.206	0.180	0.210	0.190	0.120	0.175	0.170	0.160	0.250	0.175
Clothing/ Footwear	0.210	0.220	0.206	0.180	0.210	0.161	0.150	0.175	0.170	0.160	0.250	0.175
Domestic Fuel	0.203	0.220	0.206	0.180	0.125	0.179	0.120	0.175	0.050	0.160	0.250	0.050
Electricity	0.210	0.220	0.206	0.180	0.125	0.100	0.060	0.175	0.050	0.160	0.250	0.050
Household Goods	0.209	0.220	0.206	0.180	0.172	0.187	0.150	0.175	0.146	0.160	0.250	0.175
Health	0.007	0.050	0.000	0.000	0.024	0.044	0.030	0.030	0.023	0.040	0.250	0.175
Motor Fuels	0.210	0.220	0.206	0.180	0.210	0.190	0.120	0.175	0.170	0.160	0.250	0.175
Transport	0.164	0.137	0.206	0.180	0.130	0.158	0.150	0.175	0.158	0.070	0.250	0.175
Communications	0.150	0.220	0.206	0.180	0.196	0.156	0.150	0.175	0.169	0.160	0.250	0.175
Leisure	0.157	0.156	0.055	0.180	0.166	0.153	0.120	0.175	0.147	0.070	0.250	0.175
Books	0.045	0.206	0.130	0.040	0.095	0.040	0.030	0.060	0.051	0.040	0.250	0.000
Education	0.000	0.000	0.000	0.180	0.000	0.035	0.000	0.090	0.000	0.000	0.165	0.000
Restaurants	0.188	0.205	0.206	0.180	0.179	0.100	0.030	0.175	0.120	0.070	0.250	0.175
Other Goods/Services	0.080	0.169	0.206	0.180	0.089	0.172	0.150	0.090	0.094	0.160	0.250	0.175
Beer	0.210	0.220	0.206	0.180	0.210	0.190	0.150	0.175	0.170	0.160	0.250	0.175
Spirits	0.210	0.220	0.206	0.180	0.210	0.190	0.150	0.175	0.170	0.160	0.250	0.175
Wines	0.210	0.220	0.206	0.180	0.210	0.190	0.120	0.175	0.050	0.160	0.250	0.175
Excise Duty	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
Non Alcoholic Bev.	0.000	0.090	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Tobacco	0.188	0.500	0.038	0.590	0.421	0.036	0.066	0.360	0.244	0.040	0.382	0.480
Motor Fuels	0.525	0.562	0.632	0.427	0.492	0.603	0.547	0.572	0.512	0.522	0.657	0.710
Beer	0.150	0.450	0.239	0.030	0.304	0.038	0.000	0.156	0.078	0.009	0.249	0.157
Spirits	0.330	0.679	0.871	0.334	0.109	0.250	0.240	0.442	0.163	0.114	0.645	0.261
Wines	0.094	0.311	0.030	0.000	0.497	0.000	0.000	0.108	0.000	0.000	0.347	0.206
Domestic Fuel	0.000	0.000	0.000	0.420	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ad Valorem Tax	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
Tobacco	0.500	0.000	0.545	0.000	0.175	0.534	0.510	0.211	0.400	0.000	0.178	0.210
Electricity	0.000	0.509	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transport	0.000	0.000	0.000	0.000	0.225	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: EUROMOD Country Partners

**Table 2 Savings Rates by Equivalised Disposable Income Decile**

Decile	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
1	-13.6	-74.3	-109.1	-131.4	-64.7	-97.7	-50.6	-47.9	-202.7	-164.6	-209.6	-119.6
2	-11.0	-27.8	-80.6	-60.1	-43.9	-51.7	-31.6	-14.8	-103.5	-73.6	-31.0	-87.7
3	-3.5	-16.0	-68.2	-35.7	-39.9	-40.8	-18.8	-12.2	-74.8	-54.6	-20.4	-62.6
4	0.1	-6.4	-54.8	-29.5	-46.7	-29.4	-16.0	-6.5	-61.7	-40.1	-12.5	-52.0
5	4.4	-0.7	-43.9	-19.0	-42.1	-20.4	-6.9	-4.6	-49.5	-31.3	-6.0	-34.4
6	7.6	6.1	-35.2	-11.2	-34.8	-7.6	-1.5	-1.8	-37.0	-24.1	-0.5	-34.7
7	8.8	12.8	-31.7	-3.9	-20.9	-3.9	1.8	5.4	-16.4	-14.8	5.0	-22.8
8	12.6	21.7	-21.6	2.4	-10.6	6.0	7.0	10.6	-6.8	-4.2	11.2	-14.3
9	15.0	29.5	-9.9	9.7	-2.7	12.3	14.1	17.9	4.8	1.7	16.9	-6.2
10	22.0	52.0	16.3	27.5	27.4	38.4	30.2	33.7	35.4	20.9	47.5	20.5
Total	9.5	12.1	-26.6	-3.3	-12.7	1.8	3.4	7.5	-16.0	-14.7	9.6	-19.3

Source: EUROMOD

**Table 3a Budget Elasticities for Simulated Expenditure Groups**

Code	Name	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
C1	Food	0.59	0.53	0.58	0.56	0.48	0.54	0.47	0.62	0.58	0.59	0.46	0.56
C2	Non-Alcoholic Bev.	0.55	0.75	0.63	0.76	0.60	0.59	1.36	0.70	0.81	0.72	0.55	0.67
C3	Alcoholic Bev.	0.98	1.14	0.76	1.05	1.06	0.83	1.10	0.87	0.64	0.88	1.09	0.94
C4	Tobacco	0.35	0.74	0.49	0.57	0.56	0.74	0.31	0.61	0.72	0.58	0.40	0.57
C5	Clothing/ Footwear	1.08	1.59	1.18	1.36	1.77	1.23	0.99	0.98	1.10	1.33	1.22	1.37
C6	Domestic Fuel	0.43	0.32	0.43	0.43	0.56	0.25	0.14	0.14	0.89	0.65	0.53	0.38
C7	Electricity	0.35	0.35	0.40	0.31	0.34	0.80	0.10	0.22	0.34	0.29	0.24	0.27
C8	Household Goods	1.23	1.09	1.22	1.19	1.70	1.37	1.19	1.16	1.44	1.37	1.23	1.31
C9	Health	0.92	0.92	1.04	1.44	1.33	1.24	0.73	1.16	1.22	1.11	0.91	1.45
C10	Motor Fuels	0.97	1.18	0.80	0.98	0.86	0.82	0.88	1.01	1.09	0.93	0.60	0.87
C11	Transport	2.07	2.24	1.61	1.72	1.60	2.21	1.79	1.82	2.32	1.81	2.28	1.29
C12	Communications	0.48	0.59	0.50	0.48	0.62	0.47	0.41	0.37	0.62	0.52	0.94	0.98
C13	Leisure	1.17	1.08	1.26	1.17	1.08	1.30	1.02	1.07	1.26	1.16	1.22	1.26
C14	Book	1.12	0.62	0.96	1.06	0.68	1.07	0.69	0.65	1.03	1.23	0.89	0.57
C15	Education	1.21	1.01	1.29	1.02	1.77	1.51	1.65	0.94	1.57	1.14	1.31	1.69
C16	Restaurants	1.31	1.12	1.12	1.06	1.25	1.36	1.17	1.34	1.16	1.18	1.24	1.61
C17	Other Goods/Services	0.96	1.52	1.23	1.63	1.17	1.37	1.11	1.07	1.21	1.21	0.96	1.25

Source: EUROMOD

**Table 3b Average Budget Shares for Simulated Expenditure Groups**

Code	Name	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK	Average
C1	Food	0.176	0.273	0.205	0.275	0.245	0.288	0.168	0.161	0.340	0.319	0.203	0.237	0.244
C2	Non-Alcoholic Bev.	0.019	0.006	0.008	0.006	0.021	0.021	0.016	0.019	0.010	0.007	0.015	0.006	0.013
C3	Alcoholic Bev.	0.021	0.028	0.019	0.006	0.054	0.014	0.019	0.019	0.020	0.011	0.022	0.045	0.023
C4	Tobacco	0.015	0.021	0.014	0.036	0.039	0.017	0.012	0.016	0.019	0.016	0.021	0.031	0.021
C5	Clothing/ Footwear	0.069	0.052	0.056	0.093	0.056	0.075	0.107	0.073	0.068	0.105	0.064	0.055	0.074
C6	Domestic Fuel	0.018	0.021	0.031	0.042	0.049	0.026	0.030	0.043	0.016	0.016	0.034	0.033	0.030
C7	Electricity	0.050	0.038	0.029	0.026	0.028	0.048	0.025	0.024	0.047	0.028	0.023	0.038	0.035
C8	Household Goods	0.075	0.084	0.136	0.119	0.079	0.100	0.154	0.129	0.092	0.107	0.081	0.155	0.112
C9	Health	0.058	0.067	0.079	0.060	0.053	0.035	0.020	0.045	0.062	0.031	0.041	0.012	0.047
C10	Motor Fuels	0.034	0.048	0.041	0.031	0.040	0.069	0.028	0.031	0.033	0.036	0.053	0.038	0.039
C11	Transport	0.075	0.109	0.112	0.064	0.089	0.062	0.144	0.102	0.075	0.067	0.095	0.065	0.088
C12	Communications	0.024	0.037	0.027	0.025	0.027	0.032	0.019	0.030	0.029	0.017	0.032	0.005	0.025
C13	Leisure	0.067	0.095	0.053	0.022	0.050	0.052	0.070	0.097	0.021	0.038	0.073	0.048	0.056
C14	Book	0.087	0.034	0.013	0.015	0.022	0.018	0.015	0.019	0.007	0.009	0.027	0.019	0.023
C15	Education	0.009	0.002	0.004	0.019	0.017	0.005	0.016	0.026	0.008	0.014	0.008	0.008	0.012
C16	Restaurants	0.093	0.072	0.064	0.072	0.033	0.053	0.099	0.107	0.086	0.103	0.085	0.060	0.077
C17	Other Goods/Services	0.110	0.012	0.109	0.088	0.096	0.084	0.058	0.060	0.070	0.076	0.125	0.146	0.083
	Total	1	1	1	1	1	1	1	1	1	1	1	1	1

Source: EUROMOD

Note: The Average Budget Share is an unweighted average across countries and does not account for differences in population size.

**Table 4. Total Revenue from Indirect Taxes in EU12 (EUROMOD and Official Statistics, 1998)**

Eq. Disposable Income Decile	VAT			Excise Duties			Total		
	EM	Off. Stats	%	EM	Off. Stats	%	EM	Off Stats	%
Belgium	307885	586051	52.5	106903	23482	455.3	414787	949017	43.7
Finland	33204	38609	86.0	14345	16032	89.5	47549	65006	73.1
France	636757	807700	78.8	139298	155400	89.6	776056	1112500	69.8
Greece	2286248	2723321	84.0	1050477	1856100	56.6	3336725	5248393	63.6
Ireland	2425	4270	56.8	1947	2822	69.0	4372	7092	61.7
Italy	102661	131793	77.9	43458	50914	85.4	146119	257772	56.7
Luxembourg <sup>2</sup>	22270	31529	70.6	5020	23940	21.0	27291	61700	44.2
Netherlands	32229	53710	60.0	7935	15795	50.2	40164	93512	43.0
Portugal <sup>2</sup>	872443	1132610	77.0	231429	769320	30.1	1103872	2137000	51.7
Spain	3403232	4319425	78.8	747613	2376950	31.5	4150844	6949762	59.7
Sweden	110744	162600	68.1	27063	82236	32.9	137806	244800	56.3
UK	42368	51950	81.6	19133	36720	52.1	61502	92976	66.1

Source: EUROMOD and Official Statistics.

Note

1. Currency in annual terms in National Units (millions), except Italy and Germany in (billions)
2. 1995 data
3. EM: EUROMOD.

**Table 5 Total Revenue from Indirect Taxes in UK (EUROMOD, POLIMOD and Official Statistics, 1998)**

	EM	POLIMOD	Off. Stats	EM/POLIMOD	EM/Off. Stats
VAT	42368	35853	51950	118.2	81.6
Excise Duties	19133	21360	36720	89.6	52.1
Total	61502	57213	92976	107.5	66.1

Source: EUROMOD, POLIMOD

Note EM: EUROMOD.

**Table 6. Distribution of VAT Receipts**

Decile	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
As a % of Expenditure												
1	11.8	15.0	13.0	11.5	10.2	11.6	9.0	11.9	9.1	8.5	17.5	10.2
2	11.9	15.0	13.0	11.7	10.1	11.6	9.1	11.8	9.2	8.6	17.7	10.3
3	12.0	15.1	13.0	11.9	10.2	11.7	9.2	11.9	9.3	8.7	17.8	10.3
4	12.1	15.1	13.1	12.0	10.5	11.7	9.3	11.9	9.5	8.8	17.8	10.7
5	12.1	15.0	13.1	12.1	10.7	11.8	9.3	12.0	9.5	8.8	17.9	10.9
6	12.1	15.1	13.1	12.3	10.9	11.8	9.4	12.1	9.7	8.8	17.9	11.1
7	12.2	15.1	13.2	12.4	10.9	11.9	9.5	12.2	9.6	8.9	18.0	11.2
8	12.3	15.1	13.2	12.6	11.2	12.0	9.6	12.3	9.6	8.9	18.0	11.5
9	12.4	15.1	13.3	12.7	11.4	12.1	9.6	12.3	9.6	9.0	18.1	11.7
10	12.6	15.1	13.5	12.9	11.3	12.2	9.8	12.4	9.8	9.1	18.4	12.0
Total	12.2	15.1	13.2	12.4	10.9	11.9	9.5	12.1	9.5	8.9	18.0	11.2
As a % of Disposable Income												
1	13.5	26.2	27.2	26.6	16.9	22.9	13.6	17.7	27.7	22.5	54.3	22.4
2	13.2	19.1	23.5	18.8	14.6	17.6	11.9	13.5	18.8	15.0	23.1	19.4
3	12.4	17.5	21.9	16.1	14.2	16.4	10.9	13.3	16.3	13.5	21.4	16.8
4	12.0	16.0	20.3	15.6	15.4	15.2	10.8	12.7	15.4	12.3	20.1	16.2
5	11.6	15.1	18.8	14.4	15.2	14.2	10.0	12.6	14.2	11.5	19.0	14.6
6	11.2	14.2	17.7	13.7	14.7	12.7	9.5	12.3	13.2	11.0	18.0	15.0
7	11.1	13.1	17.4	12.8	13.2	12.4	9.3	11.5	11.2	10.2	17.1	13.8
8	10.7	11.8	16.1	12.3	12.4	11.3	8.9	11.0	10.3	9.3	16.0	13.1
9	10.5	10.6	14.6	11.5	11.7	10.6	8.3	10.1	9.1	8.8	15.0	12.4
10	9.9	7.2	11.3	9.4	8.2	7.5	6.9	8.2	6.3	7.2	9.6	9.5
Total	11.1	13.2	16.7	12.8	12.3	11.7	9.1	11.2	11.1	10.2	16.2	13.3
Ratio 1/10	1.4	3.6	2.4	2.8	2.1	3.0	2.0	2.2	4.4	3.1	5.6	2.4
Ratio 1/Ave	1.2	2.0	1.6	2.1	1.4	2.0	1.5	1.6	2.5	2.2	3.3	1.7

Source: EUROMOD.

Notes:

1. Deciles based upon Equivalised Household Disposable Income.
2. Income used for ranking purposes has been equivalised using the equivalence scale 1/0.5/0.3, where children are aged 17 or under.
3. Tax Rates as a percentage of Expenditure or Disposable Income are unequivalised.
4. Ratio 1/10 – Ratio of VAT as percentage of disposable income in decile 1 to rate in decile 10.
5. Ratio 1/Ave – Ratio of VAT as percentage of disposable income in decile 1 to rate on average.

**Table 7. Distribution of Excise Duties**

Decile	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
As a % of Expenditure												
1	5.1	6.0	4.3	5.1	10.0	6.0	2.7	3.3	2.0	2.4	2.4	6.2
2	5.1	5.8	3.6	4.5	8.8	5.4	2.4	2.9	2.2	1.8	1.8	5.5
3	4.9	6.0	3.4	4.3	8.9	5.2	2.4	2.9	2.5	1.9	1.9	5.3
4	4.8	5.9	3.4	4.3	8.9	5.3	2.3	3.0	2.7	2.0	2.0	4.9
5	4.7	6.1	3.3	4.2	8.8	5.3	2.2	2.9	2.7	2.0	2.0	4.7
6	4.5	6.3	3.1	4.1	8.7	5.2	2.2	3.0	2.8	2.0	2.0	4.7
7	4.4	6.4	2.9	3.9	8.7	5.2	2.2	3.0	2.8	2.0	2.0	4.5
8	4.3	6.2	2.5	3.7	8.8	5.1	2.0	3.0	2.7	2.0	2.0	4.1
9	4.2	6.2	2.2	3.5	8.8	5.0	1.9	3.0	2.5	1.9	1.9	3.6
10	3.7	5.9	1.8	2.9	8.1	4.2	1.7	2.8	2.4	1.7	1.7	2.9
Total	4.4	6.1	2.9	3.8	8.7	5.1	2.1	3.0	2.5	1.9	1.9	4.4
As a % of Disposable Income												
1	5.7	10.5	9.1	11.8	16.4	11.9	4.0	4.8	6.0	6.4	19.1	14.7
2	5.7	7.4	6.6	7.2	12.6	8.1	3.2	3.3	4.4	3.2	7.1	13.0
3	5.1	7.0	5.7	5.9	12.4	7.3	2.9	3.3	4.4	3.0	6.4	10.7
4	4.8	6.3	5.3	5.6	13.0	6.9	2.7	3.2	4.4	2.7	5.6	9.5
5	4.5	6.2	4.7	5.0	12.5	6.4	2.3	3.0	4.0	2.7	5.0	8.0
6	4.2	5.9	4.1	4.6	11.8	5.6	2.3	3.1	3.8	2.5	4.8	7.6
7	4.0	5.5	3.8	4.1	10.5	5.4	2.1	2.8	3.2	2.3	4.3	6.6
8	3.8	4.9	3.1	3.6	9.8	4.8	1.9	2.7	2.9	2.1	3.6	5.9
9	3.6	4.4	2.4	3.1	9.0	4.4	1.6	2.4	2.4	1.8	3.0	5.1
10	2.9	2.8	1.5	2.1	5.9	2.6	1.2	1.9	1.5	1.3	1.5	3.2
Total	4.0	5.4	3.6	4.0	9.8	5.0	2.1	2.7	2.9	2.2	4.0	6.5
Ratio 1/10	2.0	3.7	5.9	5.6	2.8	4.6	3.3	2.6	4.0	4.7	12.7	4.6
Ratio 1/Ave	1.4	2.0	2.5	3.0	1.7	2.4	2.0	1.8	2.1	2.8	4.8	2.3

Source: EUROMOD.

Notes:

1. Deciles based upon Equivalised Household Disposable Income.
2. Income used for ranking purposes has been equivalised using the equivalence scale 1/0.5/0.3, where children are aged 17 or under.
3. Tax Rates as a percentage of Expenditure or Disposable Income are unequivalised.
4. Ratio 1/10 – Ratio of VAT as percentage of disposable income in decile 1 to rate in decile 10.
5. Ratio 1/Ave – Ratio of VAT as percentage of disposable income in decile 1 to rate on average.

**Table 8. Redistribution of Indirect Taxes (Reynolds-Smolensky Index)**

	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
VAT	-0.3	-2.7	-3.3	-1.9	-2.1	-2.2	-0.9	-1.1	-2.9	-1.6	-1.3	-1.7
Excise Duty	-0.4	-1.2	-1.5	-1.1	-2.1	-1.2	-0.4	-0.3	-0.8	-0.4	-0.8	-1.7
VAT Groups												
Beer	0.0	-0.13	-0.01	0.0	-0.24	-0.01	-0.01	-0.01	-0.01	-0.01	-0.06	-0.11
Book	0.0	-0.09	-0.04	0.0	-0.06	-0.01	0.00	-0.01	-0.02	-0.01	-0.02	0.00
Clothing/ Footwear	0.0	-0.25	-0.89	-0.3	-0.25	-0.22	-0.15	-0.09	-0.33	-0.30	-0.05	-0.13
Communications	-0.1	-0.13	-0.15	-0.1	-0.12	-0.10	-0.03	-0.07	-0.12	-0.07	-0.09	-0.01
Domestic Fuel	-0.1	-0.05	-0.16	-0.2	-0.18	-0.09	0.00	-0.10	-0.02	-0.04	-0.06	-0.04
Education	0.0	0.00	0.00	0.0	0.00	0.00	0.00	-0.02	0.00	0.00	-0.03	0.00
Electricity	-0.1	-0.09	-0.09	-0.1	-0.09	-0.09	-0.03	-0.06	-0.06	-0.09	-0.07	-0.05
Food	-0.1	-0.64	-0.30	-0.6	-0.05	-0.59	-0.09	-0.14	-0.88	-0.30	-0.27	0.00
Health	0.0	-0.07	0.00	0.0	-0.02	-0.03	-0.01	-0.01	-0.05	-0.03	-0.12	-0.04
Household Goods	0.0	-0.42	-0.72	-0.3	-0.25	-0.29	-0.15	-0.17	-0.39	-0.23	-0.10	-0.40
Leisure	0.0	-0.32	-0.07	-0.1	-0.18	-0.14	-0.11	-0.14	-0.11	-0.04	-0.13	-0.15
Non-Alc. Bev.	0.0	-0.01	-0.01	0.0	-0.09	-0.08	-0.01	-0.02	-0.03	-0.01	-0.01	0.00
Other Good/Serv.	0.0	-0.02	-0.45	-0.2	-0.12	-0.28	-0.10	-0.05	-0.26	-0.29	-0.13	-0.36
Motor Fuels	0.0	-0.20	-0.18	-0.1	-0.18	-0.25	-0.04	-0.04	-0.12	-0.11	-0.19	-0.17
Restaurants	0.1	-0.34	-0.30	-0.2	-0.07	-0.07	-0.02	-0.10	-0.37	-0.12	-0.13	-0.11
Spirits	0.0	-0.02	-0.01	0.0	-0.04	-0.01	-0.02	0.00	-0.02	0.00	0.00	-0.03
Tobacco	-0.1	-0.08	-0.06	-0.1	-0.28	-0.10	-0.03	-0.04	-0.09	-0.04	-0.06	-0.17
Transport	0.1	-0.30	-0.41	0.0	-0.23	-0.10	-0.16	-0.12	-0.38	-0.05	-0.05	-0.17
Wine	0.0	-0.01	-0.03	0.0	-0.01	-0.04	-0.01	-0.01	-0.03	-0.02	0.00	-0.02

Source: EUROMOD.

Notes:

1. Base Income – Disposable income minus the instrument.
2. Income has been equivalised using the equivalence scale 1/0.5/0.3, where children are aged 17 or under.

**Table 9. Income Inequality in EU Countries (Gini Coefficient)**

	At	Be	Dk	Fi	Fr	Ge	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
Market Income	52.3	59.5	52.9	55.2	54.5	53.7	55.6	57.4	54.2	53.2	46.0	58.2	57.7	56.3	53.7
Gross Income	34.1	37.4	32.9	32.9	34.9	34.3	40.2	39.5	38.5	33.4	31.6	44.6	38.5	34.0	37.1
Disposable Income	27.1	25.6	25.7	24.6	28.3	26.3	36.6	33.1	33.9	26.5	26.4	38.2	33.2	27.1	31.8
Final Income		26.1		28.2	32.6		39.3	36.7	37.0	27.7	27.8	41.7	35.1	29.0	34.8

Source: EUROMOD.

Notes:

1. Income has been equivalised using the equivalence scale 1/0.5/0.3, children are aged  $\leq 17$ .
2. EESIC – Employee and Self-Employed Social Insurance Contributions, ERSIC – Employer Social Insurance Contributions, Income Tax – Local and National Income taxes, UB – Unemployment Benefits; SAB – Social Assistance Benefits.
3. Market Income - Income before Tax, Social Insurance Contributions (including Employer Contributions) and Benefits
4. Gross Income – Market income after benefits and pensions
5. Disposable Income – Gross income after direct taxes and social insurance contributions have been subtracted.
6. Final Income – Disposable income after Indirect taxes have been subtracted. In Austria, Denmark and Germany, where we have been unable to simulate indirect taxes, we cannot compute Final Income Inequality.

**Table 10a. Rate Effect of Indirect Tax compared with Other Instruments (Rate –as a % of Disposable Pre-Instrument Income)**

	At	Be	Dk	Fi	Fr	Ge	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
VAT		-10.0		-11.9	-16.6		-12.9	-12.5	-11.8	-8.5	-9.4	-10.8	-9.7	-12.0	-11.6
Excise Duty		-4.0		-5.1	-4.2		-4.4	-10.3	-5.3	-2.1	-2.5	-3.0	-2.1	-3.6	-6.2
Indirect Taxation		-13.2		-15.9	-19.6		-16.2	-20.5	-15.9	-10.3	-11.5	-13.3	-11.4	-14.7	-16.4
ERSIC	-17.1	-27.2	-3.0	-17.7	-24.8	-14.3	-6.7	-3.6	-16.6	-10.0	-12.2	-17.7	-12.1	-22.8	-6.8
EESIC	-13.8	-10.6	-11.5	-8.5	-18.2	-14.3	-10.3	-4.5	-8.4	-9.9	-21.3	-10.4	-4.9	-6.7	-6.0
Income Tax	-17.5	-22.3	-33.9	-27.0	-10.4	-16.8	-13.2	-18.5	-24.0	-17.3	-15.8	-14.9	-14.7	-29.5	-16.2
Direct Taxes	-36.6	-43.8	-40.3	-40.4	-40.1	-34.9	-25.3	-23.7	-37.8	-30.1	-37.4	-33.6	-26.6	-44.0	-24.8
All tax		-48.2		-46.4	-47.7		-34.8	-36.3	-44.3	-35.3	-42.1	-39.7	-32.9	-49.0	-34.5
Family Benefits	2.2	3.3	2.8	2.8	2.4	2.2	0.7	2.4	1.3	3.8	1.5	1.5	0.7	2.6	1.8
Housing Benefits	0.2	0.0	2.2	1.9	2.1	1.1	0.1	0.2	0.0	0.1	0.9	0.0	0.1	7.2	4.1
Other Benefits/Pensions	47.6	47.0	27.7	42.4	45.4	35.6	33.3	10.3	45.1	43.9	25.5	33.4	37.2	40.9	17.8
Unemployment Benefits	1.2	4.8	8.1	6.9	2.7	2.3	0.2	1.3	0.5	0.3	3.1	1.7	1.6	5.7	0.2
Social Assistance Benefits	1.6	3.4	0.9	7.5	1.5	2.3	2.4	15.7	5.8	0.6	2.1	0.5	4.0	7.4	6.9
Benefits	59.2	73.7	49.1	83.0	62.3	51.3	38.1	33.9	58.8	53.6	36.6	40.0	47.9	87.9	32.7
Tax-Benefit System	-13.8	-29.8	-22.8	-24.3	-31.9	-15.6	-17.9	-21.6	-25.2	-13.4	-28.3	-25.7	-11.7	-30.0	-22.4

Source: EUROMOD.

Notes:

1. Income has been equivalised using the equivalence scale 1/0.5/0.3, where children are aged 17 or under.
2. EESIC – Employee and Self-Employed Social Insurance Contributions, ERSIC – Employer Social Insurance Contributions, Income Tax – Local and National Income taxes, UB – Unemployment Benefits; SAB – Social Assistance Benefits.
3. Base Income – Disposable income minus the instrument.
4. It is not possible to sum the rates together to get an overall total as the denominators are different.

**Table 10b. Redistributive Effect of Indirect Tax compared with Other Instruments (Reynolds- Smolensky (With Reranking))**

	At	Be	Dk	Fi	Fr	Ge	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
VAT		-0.3		-2.7	-3.3		-1.9	-2.1	-2.2	-0.9	-1.1	-2.9	-1.6	-1.3	-1.7
Excise Duty		-0.4		-1.2	-1.5		-1.1	-2.1	-1.2	-0.4	-0.3	-0.8	-0.4	-0.8	-1.7
Indirect Taxation		-0.6		-3.6	-4.3		-2.8	-3.6	-3.1	-1.3	-1.3	-3.5	-1.9	-2.0	-3.0
ERSIC	1.8	7.6	0.4	3.6	2.4	1.4	-0.1	0.6	0.7	0.4	0.4	2.1	1.2	4.5	1.4
EESIC	1.4	2.3	2.2	1.0	1.4	1.4	-0.2	0.9	0.6	0.7	0.7	0.2	-0.3	0.4	0.9
Income Tax	5.9	6.5	6.0	4.8	3.5	6.2	4.0	5.8	2.1	7.3	5.6	4.6	4.9	3.3	4.6
Direct Taxes	6.9	12.7	7.2	7.4	5.9	7.9	3.3	6.7	2.8	7.0	5.2	5.7	5.1	6.8	6.2
All tax		11.3		4.6	2.4		0.9	2.8	0.6	5.7	4.1	2.9	3.3	5.0	3.2
Family Benefits	1.2	1.2	0.8	0.8	1.5	1.1	0.1	1.1	1.2	1.9	0.6	0.7	0.5	1.0	1.0
Housing Benefits	0.1	0.0	1.6	1.6	1.9	0.9	0.0	0.2	0.0	0.1	0.8	0.0	0.0	5.1	3.6
Other Benefits	22.0	25.3	19.9	22.3	21.3	19.8	16.7	8.4	16.7	23.6	15.6	14.9	19.7	21.2	11.3
Unemployment Benefits	0.7	3.4	5.3	4.4	1.8	1.7	0.1	0.8	0.4	0.2	1.8	1.0	0.8	4.1	0.2
Social Assistance Benefits	1.4	3.2	0.9	1.7	1.3	2.3	2.2	13.4	4.5	0.7	2.4	0.7	3.2	6.2	6.3
Benefits	25.9	33.4	28.3	32.7	27.4	26.6	18.8	22.9	23.2	26.5	20.7	17.5	24.5	37.9	21.1
Tax-Benefit System	25.2	33.3	27.2	27.0	21.9	27.4	16.2	20.7	17.2	25.5	18.2	16.6	22.6	27.2	18.9

Source: EUROMOD.

Notes:

1. Income has been equivalised using the equivalence scale 1/0.5/0.3, children are aged  $\leq 17$ .
2. EESIC – Employee and Self-Employed Social Insurance Contributions, ERSIC – Employer Social Insurance Contributions, Income Tax – Local and National Income taxes, UB – Unemployment Benefits; SAB – Social Assistance Benefits.
3. Base Income – Income in absence of instrument

**Table 10c. Progressivity Effect of Indirect Tax compared with Other Instruments (Progressivity – Kakwani Index)**

	At	Be	Dk	Fi	Fr	Ge	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
VAT		-1.9		-19.4	-15.4		-12.5	-13.7	-16.1	-9.4	-9.8	-23.1	-14.5	-9.0	-12.0
Excise Duty		-8.5		-21.9	-31.5		-23.6	-17.5	-21.8	-18.6	-13.0	-25.2	-18.4	-21.5	-24.6
Indirect Taxation		-3.1		-17.4	-16.6		-13.6	-12.3	-15.9	-10.4	-9.5	-21.6	-14.2	-10.6	-14.0
ERSIC	11.2	24.9	14.1	19.9	12.2	11.6	7.2	17.6	8.8	5.4	5.2	11.7	14.0	20.0	20.5
EESIC	10.3	21.7	17.8	12.0	8.2	11.6	-0.3	19.5	7.9	7.6	4.0	3.0	-2.3	7.9	15.7
Income Tax	27.1	25.4	12.2	14.0	30.8	32.8	27.5	26.3	7.1	35.5	30.5	27.1	29.2	10.1	23.4
Direct Taxes	13.1	19.0	11.3	12.4	11.8	18.0	12.4	22.7	6.5	17.2	10.2	12.9	16.2	11.3	19.6
All tax		14.3		6.9	5.1		3.5	6.3	2.4	11.3	7.0	6.1	8.6	7.3	7.4
Family Benefits	-60.5	-43.8	-38.8	-37.9	-72.3	-56.5	-25.3	-50.3	-96.8	-57.8	-45.9	-50.8	-90.2	-55.5	-56.7
Housing Benefits	-58.8		-83.2	-94.7	-99.5	-95.6	-6.1	-127.5		-109.4	-98.4	-87.4	-45.8		-105.9
Other Benefits/Pensions	-129.4	-148.7	-121.8	-140.7	-150.3	-111.7	-126.2	-126.9	-110.1	-125.9	-112.7	-114.4	-123.2	-151.7	-95.2
Unemployment Benefits	-83.4	-101.2	-110.8	-101.1	-103.7	-90.1	-74.2	-87.2	-111.0	-98.8	-113.6	-97.2	-73.6	-125.6	-93.0
Social Assistance Benefits	-95.9	-119.3	-127.3	-37.3	-105.5	-109.6	-118.0	-129.6	-101.3	-126.0	-160.8	-178.3	-93.5	-125.1	-119.0
Benefits	-120.8	-131.9	-120.8	-123.8	-140.3	-104.9	-123.6	-124.0	-113.2	-118.2	-114.7	-111.1	-121.5	-146.1	-121.4
Tax-Benefit System	-289.6	-131.4	-124.6	-138.7	-97.0	-254.5	-171.9	-112.0	-108.7	-273.6	-66.0	-99.0	-346.1	-106.4	-102.0

Source: EUROMOD.

Notes:

1. Income has been equalised using the equivalence scale 1/0.5/0.3, where children are aged 17 or under.
2. EESIC – Employee and Self-Employed Social Insurance Contributions, ERSIC – Employer Social Insurance Contributions, Income Tax – Local and National Income taxes, UB – Unemployment Benefits; SAB – Social Assistance Benefits.
3. Base Income – Disposable income minus the instrument.

**Table 11. Average Inequality and Redistribution by Welfare State Regime**

	Conservative	Universal	Mediterranean	Liberal
<i>Gini</i>				
Market Income	53.2	54.8	56.4	55.5
Gross Income	34.3	33.3	40.4	38.3
Disposable Income	26.7	25.8	35.5	32.5
Final Income	28.6	28.6	38.3	35.7
<i>Redistribution</i>				
Benefits	18.9	21.5	16.0	17.2
All Taxes	5.8	4.8	2.1	2.6
Direct Taxes	7.6	7.5	5.0	5.9
Indirect Taxes	-1.9	-2.8	-2.8	-3.3

Source: EUROMOD.

Notes:

1. Income has been equivalised using the equivalence scale 1/0.5/0.3, children are aged  $\leq 17$ .
2. EESIC – Employee and Self-Employed Social Insurance Contributions, ERSIC – Employer Social Insurance Contributions, Income Tax – Local and National Income taxes, UB – Unemployment Benefits; SAB – Social Assistance Benefits.
3. Market Income - Income before Tax, Social Insurance Contributions (including Employer Contributions) and Benefits
4. Gross Income – Market income after benefits and pensions
5. Disposable Income – Gross income after direct taxes and social insurance contributions have been subtracted.
6. Final Income – Disposable income after Indirect taxes have been subtracted. In Austria, Denmark and Germany, where we have been unable to simulate indirect taxes, we cannot compute Final Income Inequality.
7. Welfare State Regimes: Conservative (At, Be, Fr, Ge, Lu, NI), Universal (Fi, Dk, Sw), Mediterranean (Gr, It, Pt, Sp) and Liberal (Ir, UK).

## Appendix A. Components of total consumption

### Table A.1 Components of total consumption

BUDGET SHARE	DESCRIPTION	COICOP-HBS
C1 FOOD	All types of food; The category includes only those meals away from home consumed at the work place (canteens) or on a regular basis and connected to work; it does not include restaurants, etc.	Food: HE 01.1.1 Bread and cereals HE 01.1.2 Meat HE 01.1.3 Fish HE 01.1.4 Milk, Cheese and eggs HE 01.1.5 Oils and fats HE 01.1.6 Fruit HE 01.1.7 Vegetables including potatoes and other tubers HE 01.1.8 Sugar, jam, honey, syrups, chocolate and confectionery HE 01.1.9 Food products n.e.c. (not elsewhere classified). HE 11.1.2.1 canteens
C2 NON-ALCOHOLIC BEVERAGES	Mineral water, coffee, tea, fruit juice, etc.	Non-alcoholic beverages: HE 01.2.1 Coffee, tea and cocoa HE 01.2.2 Mineral waters, soft drinks and juices
C3 ALCOHOLIC BEVERAGES	Wine, beer, spirits.	Alcoholic beverages: HE 02.1.1 Spirits HE 02.1.2 Wine HE 02.1.3 Beer
C4 TOBACCO	Tobacco, cigarettes, cigars, etc.	Tobacco: HE 02.2 Tobacco HE 02.3 Narcotics
C5 CLOTHING AND FOOTWEAR	All kinds of clothing and shoes of all household members. It includes also repairs and sport clothes.	Clothing and footwear: HE 03.1 Clothing HE 03.2 Footwear
C6 DOMESTIC FUEL	Oil, gas, coal, other	Domestic Fuel: HE 04.5.2 Gas HE 04.5.3 Liquid fuels HE 04.5.4 Solid fuels HE 04.5.5 Hot water, steam and ice
C7 ELECTRICITY		Electricity:HE 04.5.1 Electricity

BUDGET SHARE	DESCRIPTION	COICOP-HBS
C8 HOUSEHOLD GOODS AND SERVICES	Services and durable and non durable household goods: Tools, paint, timber, furniture, beds, electric/gas appliances (excluding tv, video rec., hifi, musical instruments): cookers, heaters, washing machine, fridge, dishwasher, other electric tools; pots and pans, kitchen equipment, repairs and maintenance services, cleaning services and cleaning materials, gloves, laundry, garden tools, etc.	Household goods and services: HE 04.3 Regular maintenance and repair of dwelling: HE 04.3.1 Products for the regular maintenance and repair of dwelling HE 04.3.2 Services for the regular maintenance and repair of dwelling HE 04.4 Other services relating to the dwelling: HE 04.4.1 Refuse collection HE 04.4.2 Sewerage services HE 04.4.3 Water supply HE 04.4.4 Other services related to the dwelling n.e.c. HE 05.1 Furniture, furnishings and decorations, carpets and other floor coverings and repairs: HE 05.1.1 Furniture and furnishing HE 05.1.2 Carpets and other floor coverings HE 05.1.3 Repair of furniture, furnishings and floor coverings HE 05.2 Household textiles HE 05.3 Heating and cooking appliances, refrigerators, washing machines and similar major household appliances, including fittings and repairs HE 05.3.1.1 Refrigerators, freezers HE 05.3.1.2 Washing machines, drying machines, dish washing machines HE 05.3.1.3 Coolers HE 05.3.1.4 Heaters, air conditioners HE 05.3.1.5 cleaning equipment HE 05.3.1.6 sewing machines HE 05.3.1.7 other major household appliances HE 05.3.2 small electric household appliances HE 05.3.3 repair of household Appliances HE 05.4 Glassware, tableware and household utensils HE 05.5 Tools and equipment for house and garden HE 05.5.1 Major tools and equipment HE 05.5.2 Small tools and miscellaneous accessories HE 05.6 Goods and services for routine household maintenance HE 05.6.1 Non-durable household goods HE 05.6.2 Domestic services and care services

BUDGET SHARE	DESCRIPTION	COICOP-HBS
C9 MEDICAL AND HEALTH CARE	All medical expenses and fees: medicines, doctor fees, hospital charges, private health insurance, therapeutic equipments, spectacles, etc.	Medical and health care: HE 06.1.1 Medical products, appliances and equipment HE 06.1.1.1 Pharmaceutical products HE 06.1.1.2 Other medical products HE 06.1.1.3 Therapeutic appliances and equipment HE 06.2.1 Medical services HE 06.2.2 Dental services HE 06.2.3 Paramedical services HE 06.3 Hospital services HE 12.4.3.1 insurance connected with health
C10 PETROL, DIESEL AND OTHER MOTOR FUELS		Petrol, diesel and other motor fuels: HE 07.2.2 Fuels and lubricants
C11 TRANSPORT	Cars, motorcycles, bicycles, bus, train, air transport, taxi fares, accessories, parts, other vehicle costs, car insurance, car hire, parking, repairs, ...	Transport: HE 07.1.1 Motor cars HE 07.1.1.1 Purchase of new motor cars HE 07.1.1.2 Purchase of second hand motor cars HE 07.1.2 Motor cycles HE 07.1.3 Bicycles HE 07.2.1 spare parts and accessories HE 07.2.3 maintenance and repairs HE 07.2.4 other services in respect of personal transport equipment HE 07.3.1 passenger transport by railway HE 07.3.2 passenger transport by road HE 07.3.3 passenger transport by air HE 07.3.4 passenger transport by sea and inland waterway HE 07.3.5 other purchased transport services HE 12.4.4.1 insurance connected with transport
C12 COMMUNICATION	Telephone, mobile phone, postal service, etc.	Communication: HE 08.1.1 postal services HE 08.1.2 telephone and telefax equipment HE 08.1.3 telephone, telegraph and telefax services

BUDGET SHARE	DESCRIPTION	COICOP-HBS
C13 RECREATIONAL AND CULTURAL GOODS AND SERVICES	Radio, tv, hi-fi, video recorder, musical instruments, computer, photo, sport goods (not sport clothing), pets, pet food, participant and spectator sport, concerts, cinema, theatre, tv etc. repairs, tv and radio licence, toys, CDs, video cassettes, video rental, plants, seed, flowers, betting, stationery.	Recreational and cultural goods and services: HE 09.1.1.1 equipment for the reception, recording and reproduction of sound HE 09.1.1.2 television sets, video cassette players and recorders HE 09.1.2.1 photographic and cinematographic equipment HE 09.1.2.2 optical instruments HE 09.1.3.1 data processing equipment HE 09.1.4.1 recording media for pictures and sound HE 09.1.5.1 repair of audio-visual, photographic and data processing equipment and accessories HE 09.2.1.1 musical instruments HE 09.2.1.2 sports and leisure related equipments (not sport clothing) HE 09.2.2.1 repair of other major durable for recreation and culture HE 09.3.1.1 games, toys, hobbies and small musical instruments HE 09.3.1.2 equipment for sport, camping and open-air recreation HE 09.3.2.1 flower and gardens HE 09.3.3.1 pets HE 09.4.1.1 sporting and recreational services HE 09.4.2.1 cinemas, theatres, concerts HE 09.4.2.2 museums, zoological gardens, etc. HE 09.4.2.3 television and radio taxes and hire of equipment HE 09.4.2.4 other services HE 09.5.4.1 stationery and drawing materials
C14 BOOKS, NEWSPAPERS AND MAGAZINES	Books, newspapers, magazines.	Books, newspapers and magazines: HE 09.5.1.1 books HE 09.5.2.1 newspapers and periodicals HE 09.5.3.1 miscellaneous printed matter
C15 EDUCATION	education, training, courses, tuition fees (private and public ed.).	Education: HE 10.1.1.1 pre-primary and primary education HE 10.1.2.1 secondary education HE 10.1.3.1 tertiary education HE 10.1.4.1 education not definable by level

BUDGET SHARE	DESCRIPTION	COICOP-HBS
C16 RESTAURANTS ETC.	Meals out, restaurant, cafe, hotel, holidays	Restaurants, holidays, hotels, etc. HE 09.6.1.1 package holidays HE 11.1.1.1 restaurants HE 11.1.1.2 cafés, bars and the like HE 11.2.1.1 accommodation services
C17 OTHER GOODS AND SERVICES	Cosmetics, personal hygiene, toilet paper, soap, leather goods, jewellery, watches, hairdressing, beauty treatment, professional fees, money given to children and other contributions (charity, subscription to trade unions and other associations, etc.), bags and wallets, life and other insurance (except car and private health ins.), funeral expenses, bets and lottery all other expenses.	Other goods and services: HE 12.1.1.1 hairdressing salons and personal grooming establishments HE 12.1.2.1 electrical appliances for personal care HE 12.1.2.2 other articles and products for personal care HE 12.1.3.1 personal care services n.e.c. HE 12.2.1.1 jewellery, clocks and watches HE 12.2.2.1 travel goods and other carriers HE 12.2.2.2 other personal effects HE 12.3.1.1 social protection services HE 12.3.1.2 crèches, nurseries HE 12.4.2.1 insurance connected with dwelling HE 12.4.5.1 other insurance HE 12.4.1.1 financial services n.e.c. HE 12.6.1.1 other services n.e.c. HE 09.4.3.1 games of chance
C3A Beer	Beer	
C3B Wine	Wine	
C3C Spirits	Spirits	

Note: Linkage between the 17 categories and the Eurostat COICOP-HBS (Coicop = Classification of Individual Consumption by Purpose) classification (See Eurostat 1997, page. 92)

**Table A.2 VAT rates by disaggregated consumption sector (Headings in bold indicate the aggregation used in this paper)**

	Belgium	Finland	France	Greece	Ireland	Italy	Lux.	Neth.	Port.	Spain	UK
<b>FOOD (C1)</b>											
Bread	6	17	5.5	8	0	4	3	6	5	4	0
Pasta	6	17	5.5	8	0	4	3	6	5	7	0
Beef	6	17	5.5	8	0	16	3	6	5	7	0
Pork	6	17	5.5	8	0	16	3	6	5	7	0
Poultry	6	17	5.5	8	0	10	3	6	5	7	0
Other meat	6	17	5.5	8	0	10	3	6	5	7	0
Fish	6	17	5.5/20.6	8	0	10	3	6	5	7	0
Oil	6	17	5.5	8	0	4	3	6	5	7	0
Milk	6	17	5.5	8	0	4	3	6	5	7	0
Cheese	6	17	5.5	8	0	4	3	6	12	7	0
Eggs	6	17	5.5	8	0	10	3	6	5	7	0
Fruit	6	17	5.5	8	0	4	3	6	5	7	0
Vegetables	6	17	5.5	8	0	4	3	6	5	7	0
Salt	6	17	5.5	8	0	19	3	6		7	0
Sugar	6	17	5.5	8	0	19	3	6	17	7	0
Confectionery	6	17	20.6	8	0	19	3	6	17	7	17.5
<b>NON-ALCOHOLIC BEVERAGES (C2)</b>											
Coffee	6	17	5.5	8	0	19	3	6	12	7	0
Tea	6	17	5.5	8	0	19	3	6	17	7	0
Mineral water	21	17	5.5	8	0	19	3	6	12	7	17.5
<b>ALCOHOLIC BEVERAGES (C3)</b>											
Wine	21	22	20.6	18	21	16	12	17.5	5	16	17.5
Beer	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Spirits	21	22	20.6	18	21	19	15	17.5	17	16	17.5
<b>TOBACCO (C4)</b>											
Tobacco	21	22	20.6	18	21	19	15	17.5	17	16	17.5
<b>CLOTHING AND FOOTWEAR (C5)</b>											
Clothes	21	22	20.6	18	21/0*	16	15/3*	17.5	17	16	17.5/0*
Shoes	21	22	20.6	18	21/0*	16	15/3*	17.5	17	16	17.5/0*
Repair services	21	22	20.6	18		19	15	17.5	17	16	17.5
Leather goods	21	22	20.6	18	21	19	15	17.5	17	16	17.5
<b>DOMESTIC FUEL (C6)</b>											
Kerosene	21	22	20.6	18	12.5	19	12	17.5		16	8
Heating gas	21	22	20.6	18	12.5	10	6	17.5	5	16	8
Heavy fuel oil	21	22	20.6	18	12.5	10	6	17.5	5	16	8
Petroleum gas	21	22	20.6	18	12.5	10	6	17.5	5	16	8
Coal	21	22	20.6	18	12.5	10	6	17.5	5	16	8
<b>ELECTRICITY (C7)</b>											
Electricity	21	22	20.6	18	12.5	10	6	17.5	5	16	8
<b>HOUSEHOLD GOODS AND SERVICES (C8)</b>											
Maintenance and repair services	21	22	20.6	18		19	15	17.5	17	7	17.5

Wooden furniture	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Bedding	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Pots and pans, crockery, cutlery, etc.	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Soaps and detergents	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Domestic services	21	22	20.6	18		0	15	17.5	17	16	17.5
Dry-cleaning	21	22	20.6	18		19	15	17.5	17	16	17.5
Cookers, heaters, etc.	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Refrigerators	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Dishwashers	21	22	20.6	18	21	19	15	17.5	17	16	17.5
<b>MEDICAL CARE (C9)</b>											
Medical fees	0	0	0	0		0	0	0	0	0	0
Drugs	6	122.1/5.5/18.6		8		4	3	17.5	5	4	0
<b>MOTOR FUELS (C10)</b>											
Petrol (Leaded)	21	22	20.6	18	21	19	15/12*	17.5	17	0	17.5
Petrol (UnLeaded)	21	22	20.6	18	21	19	15/12*	17.5	17	0	17.5
Diesel	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Fuel Gas	21	22	20.6	18	21	19	15	17.5	17	16	17.5
<b>TRANSPORT (C11)</b>											
New cars	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Second-hand cars	21	0	0/20.6	18	21	0	15	17.5	17	16	17.5
Motorcycles	21	22	20.6	18	21	19	15	17.5	17	7	17.5
Bicycles	21	22	20.6	18	21	19	15	17.5	17	7	17.5
Bus-tram fares	6	6	5.5	18	21	0	3	6	5	16	0
Train fares	6	6	5.5	18		19	3	6	5	7	0
Air transport	0	6	5.5	18		0/19	0	6	5	7	0
Taxis	6	6	5.5/20.6	18		0	3	6	5	16	17.5
Vehicle insurance	21	0	0	0	21	0	0	0	0	7	0
<b>COMMUNICATION (C12)</b>											
Telephone	21	22	20.6	18		19	15	17.5	12	16	17.5
<b>LEISURE (C13)</b>											
Radio, TV, Hi-fi, video recorders, etc.	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Cameras and camcorders	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Computers	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Sports and camping articles	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Plants and flowers	21	22	5.5	18	21	19	6	6	17	7	17.5
Toys	21	22	20.6	18	21	19	15	17.5	17	16	17.5
TV and radio license	21	6	20.6	0		19	15	0	0	7	17.5
Cinemas				4							
Theatres				4							
Charter inclusive tours											
Gambling/lotteries											
<b>BOOKS/NEWSPAPERS (C14)</b>											
Daily newspapers	6	0/22	2.1	4	12.5	4	3	6	5	4	0
Magazines	6	0/22	2.1	4	21	4	3	6	5	4	0
Books	6	12	5.5	4	0	4	3	6	5	4	0

<b>EDUCATION (C15)</b>											
Education	0	0	0	0	0	0	0	0	0	0	0
<b>RESTAURANTS (C16)</b>											
Restaurants	21	22	20.6	8	12.5	10	3	17.5	12	7	17.5
Hotels	21	6	20.6	8	12.5	19	3	6	5	7	17.5
<b>OTHER GOODS AND SERVICES (C17)</b>											
Professionals fees	21	22	20.6	18	21	19	15	17.5	17	0	17.5
Personal hygiene, soaps	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Cosmetics and perfumery	21	22	20.6	18	21	19	15	17.6	17	16	17.5
Watches	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Barbers, hairdressers	21	22	20.6	18	12.5	19	15	17.5	17	16	17.5
Jewellery	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Stationery	21	22	20.6	18	21	19	15	17.5	17	16	17.5
Insurance	0	0	0		0	0	0	0	0	0	0
Finance	0	0	0		0	0	0	0	0	0	0
Burial, Cremation					0	0			0		0
Real estate sales and rent	0		0			0	0	0	0	0	0
Postal services			0			0	0		0	0	0
Betting Lotteries					0	0	0		0	0	0
Others	0				0	0	0		0	0	0

Source: Baldini, Bosi and Mantovani (1997)

## Appendix B Regression Coefficients

**Table B.1 Household Budget Surveys used for Expenditure Imputation**

	Name of the survey	Author of the estimates and affiliation	Year of reference	Number of households	Currency	Period
Belgium	Enquete sur les budgets des ménages	Bertrand Scholtus, DULBEA, Université Libre de Bruxelles	1995-96	2724	Belgian Franc	Year
Finland	Kulutustukimus	Esko Mustonen, Vatt (Government Institute for Economic Research), Helsinki	1994-96	6743	Finnish Marc	Year
France	Enquete budgets des familles	Lavinia Mitton, Microsimulation Unit, Univ. of Cambridge	1994	9633	French franc	Year
Greece	Family budget survey	Panos Tsakloglou, Athens University of Economics and Business	1994	6702	Drachma	Month
Ireland	Household budget survey	Cathal O'Donoghue, National University of Ireland Galway	1994	7877	Irish Pound	Month
Italy	Indagine sui consumi delle famiglie italiane	Massimo Baldini, University of Modena and Reggio Emilia	1995	34403	Lira	Month
Luxembourg	Enquete budgets familiaux	Frederic Berger, Monique Borsenberger, Ceps/Instead	1994	3011	Luxembourg Franc	Month
Netherlands	Budgetonderzoek	Klaas de Vos, CentER Applied Research, University of Tilburg	1995	2069	Guilder	Year
Portugal	Inquerito aos orcamentos familiares	Carlos Farinha Rodrigues, Instituto superior de economia e gestao, Lisboa	1994	10554	Escudo	Month
Spain	Enquesta basica de presupuestos familiares	Magda Mercader Prats, Horacio Levy, Universitat Autònoma de Barcelona	1990	20934	Peseta	Year
Sweden	Swedish family expenditure survey (Utgiftsbarometern)	Matias Eklöf, Uppsala University	1996	1102	Swedish Kronor	Month
United Kingdom	Family expenditure survey	Lavinia Mitton, Microsimulation Unit, Univ. of Cambridge	1995	6797	UK Pound	Month

**Table B.2 Explanatory Variables Used in Expenditure Model**

Variable Name	Consumption <sup>1</sup>	Budget Share <sup>2</sup>	Car Ownership
<i>Marital Status</i>			
Single	1	1	1
Widowed	1	1	1
Divorced/Separated	1	1	1
Female	1	1	1
<i>Occupation</i>			
Elementary occupations	1	1	1
Senior officials and managers	1	1	1
Technicians and associate professionals	1	1	1
Professionals	1	1	1
<i>Employment Status</i>			
Employer or self-employed	1	1	1
Unemployed	1	1	1
Pensioner	1	1	1
Student	1	1	1
Inactive	1	1	1
Sick or Disabled	1	1	1
Other	1	1	1
AGE1 ((age in years of the reference person - 40) /10 <sup>2</sup> )	1	1	1
AGE2 (AGE1*AGE1)	1	1	1
AGE3 (AGE1*AGE1*AGE1)	1	1	1
Region	1	1	1
<i>Education</i>			
No Schooling	1	1	1
Primary	1	1	1
Lower Secondary	1	1	1
University	1	1	1
<i>Tenure</i>			
Social Rented	1	1	1
Other Rented	1	1	1
Number of Children aged 0-5	1	1	1
Number of Children aged 6-10	1	1	1
Number of Children aged 11-17	1	1	1
Number of Persons aged 66+	1	1	1
Number of Adults aged 16-65	1	1	1
Number of Earners	1	1	1
Constant	1	1	1

Notes:

1. The total consumption model also includes disposable income as an explanatory variable. The expenditure model also includes total consumption and total consumption<sup>2</sup> as explanatory variables.

**Table B.3 Expenditure coefficients (Car Owner)**

	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
Disposable Income	0.74	0.09	0.31	0.43	0.11	0.34	0.46	0.21	0.04	0.29	0.55	0.29
Married	0.00	0.23	-0.21	-0.09	-0.15	-0.08	-0.01	-0.22	-0.08	-0.07	-0.06	-0.10
Female	0.00	-0.05	0.06	0.02	0.02	0.01	0.01	0.07	-0.04	0.04	0.0004	0.04
Occupation												
Elementary occupations	0.00	-0.02	-0.03	-0.03	-0.06	-0.03	-0.08	0.00	-0.19	-0.03	-0.013	0.02
Senior officials and managers	0.00	0.06	0.14	0.01	0.06	0.10	0.00	-0.17	0.15	0.16	0.002	0.18
Technicians and associate professionals	-0.05	0.06	0.14	0.01	0.06	0.10	0.00	0.00	0.15	0.16		0.18
Professionals	0.00	-0.02	0.06	0.17	0.06	0.05	0.02	0.00	0.04	0.15		0.23
Employment Status												
Employer or self-employed	-0.17	0.00	0.00	0.04	-0.01	0.01	0.01	0.05	-0.01	-0.03	0.114	0.02
Unemployed	-0.07	0.04	-0.15	-0.06	-0.33	-0.29	0.13	-0.24	-0.19	-0.08	-0.107	0.00
Pensioner	-0.04	-0.04	0.08	-0.04	-0.23	0.01	-0.07	-0.10	-0.05	-0.03	0.089	0.05
Student	-0.04	-0.04	0.08	-0.04	-0.23	0.01	-0.07	-0.10	-0.05	-0.03	0.089	0.05
Inactive	-0.04	-0.04	0.08	-0.04	-0.23	0.01	-0.07	-0.10	-0.05	-0.03	0.089	0.05
Sick or Disabled	-0.04	-0.04	0.08	-0.04	-0.23	0.01	-0.07	-0.10	-0.05	-0.03	0.089	0.05
Other	-0.04	-0.04	0.08	-0.04	-0.23	0.01	-0.07	-0.10	-0.05	-0.03	0.089	0.05
AGE1 ((age in years of the reference person - 40) /10 <sup>2</sup> )	0.00	0.01	0.06	-0.01	0.02	0.01	0.00	0.05	0.06	0.00	-0.701	-0.02
AGE2 (AGE1*AGE1)	0.00	-0.02	-0.06	0.00	0.01	-0.01	-0.01	-0.02	-0.02	-0.01	0.002	0.00
AGE3 (AGE1*AGE1*AGE1)	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.00001	0.00
Region1	0.00	-0.01	0.00	-0.09	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.00
Region2	0.00	0.05	-0.05	0.00	-0.11	0.00	0.00	0.00	0.28	0.00	0.00	-0.03
Region3	-0.03	0.00	-0.02	-0.05	-0.13	0.00	0.00	0.00	0.29	0.10	0.00	0.03
Region4	0.00	0.00	-0.08	-0.06	0.00	-0.02	0.00	0.00	0.13	-0.10	0.00	0.03
Region5	0.00	0.00	-0.13	0.00	0.00	-0.02	0.00	0.00	0.30	0.01	0.00	0.00
Region6	0.00	0.00	-0.12	0.00	0.00	-0.02	0.00	0.00	0.06	-0.07	0.00	-0.04
Region7	0.00	0.00	-0.22	0.00	0.00	0.00	0.00	0.00	0.00	-0.13	0.00	0.07
Region8	0.00	0.00	-0.09	0.00	0.00	-0.02	0.00	0.00	0.00	0.00	0.00	0.04
Region9	0.00	0.00	-0.04	0.00	0.00	-0.09	0.00	0.00	0.00	0.00	0.00	-0.05
Region10	0.00	0.00	-0.02	0.00	0.00	-0.09	0.00	0.00	0.00	0.00	0.00	-0.04
Region11	0.00	0.00	-0.04	0.00	0.00	-0.09	0.00	0.00	0.00	0.00	0.00	0.08
Region12	0.00	0.00	-0.16	0.00	0.00	-0.09	0.00	0.00	0.00	0.00	0.00	0.06
Region13	0.00	0.00	-0.13	0.00	0.00	-0.27	0.00	0.00	0.00	0.00	0.00	0.00
Region14	0.00	0.00	-0.20	0.00	0.00	-0.27	0.00	0.00	0.00	0.00	0.00	0.00

Region15	0.00	0.00	-0.09	0.00	0.00	-0.27	0.00	0.00	0.00	0.00	0.00	0.00
Region16	0.00	0.00	-0.09	0.00	0.00	-0.27	0.00	0.00	0.00	0.00	0.00	0.00
Region17	0.00	0.00	-0.13	0.00	0.00	-0.27	0.00	0.00	0.00	0.00	0.00	0.00
Region18	0.00	0.00	-0.11	0.00	0.00	-0.27	0.00	0.00	0.00	0.00	0.00	0.00
Region19	0.00	0.00	-0.12	0.00	0.00	-0.27	0.00	0.00	0.00	0.00	0.00	0.00
Region20	0.00	0.00	-0.12	0.00	0.00	-0.27	0.00	0.00	0.00	0.00	0.00	0.00
Region21	0.00	0.00	-0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region22	0.00	0.00	-0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Education												
No Schooling	0.00	-0.15	-0.10	-0.09	-0.03	-0.20	0.00	0.00	-0.60	-0.23	-0.071	-0.12
Primary	0.00	-0.12	-0.21	-0.09	-0.19	-0.12	-0.09	-0.23	-0.41	-0.14	-0.057	-0.16
Lower Secondary	0.00	-0.04	-0.08	0.00	-0.13	-0.08	-0.03	-0.08	-0.20	-0.05	0.000	-0.08
Upper Secondary	0.00	0.06	0.08	0.06	0.14	0.01	0.07	0.14	0.22	0.10	0.003	0.03
Tenure												
Social Rented	0.19	-0.14	-0.05	0.00	0.15	0.02	-0.01	-0.15	-0.04	0.01	-0.139	-0.13
Other Rented	0.19	-0.14	-0.05	0.00	0.15	0.02	-0.01	-0.15	-0.04	0.01	-0.139	-0.13
Number of Children aged 0-5	0.00	0.06	0.00	0.02	0.05	0.04	0.00	0.02	0.02	0.03	0.077	0.01
Number of Children aged 6-10	0.00	0.08	0.00	-0.01	0.04	0.06	0.06	0.03	0.03	0.05	0.031	0.06
Number of Children aged 11-17	0.00	0.11	0.00	0.07	0.11	0.09	0.05	0.07	0.04	0.08	0.070	0.08
Number of Persons aged 66+	0.00	-0.02	0.00	0.00	0.15	0.02	0.07	0.02	0.01	0.03	0.001	0.06
Number of Adults aged 16-65	0.04	0.14	0.00	0.05	0.21	0.10	0.12	0.09	0.14	0.14	0.039	0.21
Number of Earners	0.00	0.09	0.00	0.01	0.10	0.01	-0.05	0.08	0.05	0.01	0.071	0.05
Constant	2.63	9.92	8.54	7.24	6.01	5.06	6.10	8.18	11.16	10.12	2.272	4.70

**Table B.4 Expenditure Coefficients (Not Car Owner)**

	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
Disposable Income	0.64	0.09	0.26	0.45	0.60	0.34	0.33	0.34	0.06	0.38	0.32	0.20
Married	0.00	0.15	-0.34	-0.12	-0.09	-0.14	-0.05	-0.19	-0.20	-0.21	-0.21	-0.14
Female	0.00	-0.01	-0.05	-0.08	0.05	-0.01	0.04	0.05	0.06	0.10	0.01	0.13
Occupation												
Elementary occupations	0.00	-0.14	-0.02	-0.01	0.01	-0.07	-0.19	0.00	-0.21	-0.08	-0.15	0.10
Senior officials and managers	0.00	0.07	0.24	-0.09	0.05	0.11	0.00	-0.08	0.69	-0.02	-0.04	0.27
Technicians and associate professionals	0.05	0.29	0.24	-0.09	0.05	0.11	0.00	0.00	0.69	-0.02	0.00	0.27
Professionals	0.00	-0.01	0.06	0.25	0.27	0.07	-0.34	0.00	-0.25	-0.07	0.00	0.65
Employment Status												
Employer or self-employed	0.00	0.00	0.00	0.05	0.00	-0.03	-0.01	-0.01	-0.28	-0.19	-0.15	0.15
Unemployed	0.03	0.00	-0.30	0.00	-0.05	-0.33	-0.29	-0.08	-0.19	-0.16	-0.04	-0.12
Pensioner	0.04	-0.16	0.12	0.05	0.04	-0.12	-0.17	-0.10	-0.25	-0.06	-0.22	-0.06
Student	0.04	-0.16	0.12	0.05	0.04	-0.12	-0.17	-0.10	-0.25	-0.06	-0.22	-0.06
Inactive	0.04	-0.16	0.12	0.05	0.04	-0.12	-0.17	-0.10	-0.25	-0.06	-0.22	-0.06
Sick or Disabled	0.04	-0.16	0.12	0.05	0.04	-0.12	-0.17	-0.10	-0.25	-0.06	-0.22	-0.06
Other	0.04	-0.16	0.12	0.05	0.04	-0.12	-0.17	-0.10	-0.25	-0.06	-0.22	-0.06
AGE1 ((age in years of the reference person - 40) /10 <sup>2</sup> )	0.00	0.00	0.03	-0.03	0.04	0.00	0.06	0.03	0.04	-0.02	-0.13	-0.05
AGE2 (AGE1*AGE1)	0.00	0.02	-0.04	0.00	0.02	-0.01	-0.03	0.00	-0.06	0.00	0.0002	-0.03
AGE3 (AGE1*AGE1*AGE1)	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.000001	0.00
Region1	-0.12	-0.09	0.00	-0.03	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00
Region2	0.00	0.00	-0.17	0.00	0.01	0.00	0.00	0.00	0.18	0.00	0.00	-0.05
Region3	-0.03	0.00	0.05	0.07	-0.03	0.00	0.00	0.00	0.29	0.06	0.00	0.02
Region4	0.00	0.00	-0.09	-0.02	0.00	0.03	0.00	0.00	0.14	-0.09	0.00	0.02
Region5	0.00	0.00	-0.12	0.00	0.00	0.03	0.00	0.00	0.27	-0.01	0.00	0.02
Region6	0.00	0.00	-0.20	0.00	0.00	0.03	0.00	0.00	0.10	-0.02	0.00	0.03
Region7	0.00	0.00	-0.28	0.00	0.00	0.00	0.00	0.00	0.00	-0.10	0.00	0.11
Region8	0.00	0.00	-0.17	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03
Region9	0.00	0.00	-0.11	0.00	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	-0.05
Region10	0.00	0.00	-0.14	0.00	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	-0.04
Region11	0.00	0.00	-0.22	0.00	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	-0.02
Region12	0.00	0.00	-0.27	0.00	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	0.14

Region13	0.00	0.00	-0.20	0.00	0.00	-0.26	0.00	0.00	0.00	0.00	0.00	0.00
Region14	0.00	0.00	-0.19	0.00	0.00	-0.26	0.00	0.00	0.00	0.00	0.00	0.00
Region15	0.00	0.00	-0.13	0.00	0.00	-0.26	0.00	0.00	0.00	0.00	0.00	0.00
Region16	0.00	0.00	-0.27	0.00	0.00	-0.26	0.00	0.00	0.00	0.00	0.00	0.00
Region17	0.00	0.00	-0.11	0.00	0.00	-0.26	0.00	0.00	0.00	0.00	0.00	0.00
Region18	0.00	0.00	-0.16	0.00	0.00	-0.26	0.00	0.00	0.00	0.00	0.00	0.00
Region19	0.00	0.00	0.02	0.00	0.00	-0.26	0.00	0.00	0.00	0.00	0.00	0.00
Region20	0.00	0.00	-0.20	0.00	0.00	-0.26	0.00	0.00	0.00	0.00	0.00	0.00
Region21	0.00	0.00	-0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region22	0.00	0.00	-0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Education												
No Schooling	0.00	-0.32	-0.05	-0.16	0.18	-0.31	0.00	0.00	0.17	-0.35	0.01	-0.36
Primary	0.00	-0.32	-0.17	-0.16	-0.08	-0.22	-0.21	-0.24	0.17	-0.18	-0.13	-0.29
Lower Secondary	0.00	-0.19	0.06	0.00	0.02	-0.13	0.01	-0.13	0.44	0.03	0.00	-0.23
Upper Secondary	0.00	0.03	0.21	0.03	0.06	0.04	0.09	0.09	1.08	0.06	0.15	-0.04
Tenure												
Social Rented	0.24	-0.08	-0.14	-0.02	0.04	0.00	0.01	-0.09	0.09	-0.04	-0.12	-0.20
Other Rented	0.24	-0.08	-0.14	-0.02	0.05	0.00	0.01	-0.09	0.09	-0.04	-0.12	-0.20
Number of Children aged 0-5	0.00	0.14	0.00	0.04	0.12	0.07	-0.01	-0.01	0.03	0.04	-0.01	0.02
Number of Children aged 6-10	0.00	0.17	0.00	0.05	-0.04	0.07	0.28	-0.05	0.05	0.02	0.21	0.03
Number of Children aged 11-17	0.00	0.31	0.00	0.09	0.09	0.10	0.00	0.08	0.06	0.09	0.13	0.13
Number of Persons aged 66+	0.00	-0.01	0.00	0.05	0.09	0.07	0.08	-0.02	0.13	0.11	0.31	0.30
Number of Adults aged 16-65	0.09	0.29	0.00	0.08	2.29	0.14	0.09	0.13	0.18	0.16	0.15	0.29
Number of Earners	0.01	0.08	0.00	0.03	0.10	0.03	0.03	0.08	0.06	0.01	0.05	0.02
Constant	3.31	9.56	8.95	6.54	6.01	5.00	7.21	6.53	9.99	8.70	5.67	5.06

**Table B.5 Logit Model of Car Ownership**

	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
Married	0.00	0.60	-0.78	-1.04	-0.77	-0.23	-0.39	-1.05	-0.97	-0.78	-0.489	-0.83
Female	0.00	-1.02	0.70	-0.77	-0.42	-0.75	-0.84	-0.29	-0.59	-0.41	-0.623	-0.16
Occupation												
Elementary occupations	0.00	0.35	0.36	-0.37	-0.20	0.02	-0.48	0.00	-0.38	0.23	0.528	0.10
Senior officials and managers	0.00	-0.39	0.02	0.46	1.24	-0.07	0.00	-0.08	1.74	0.61	0.141	-0.56
Technicians and associate professionals	-0.25	-0.39	0.02	0.46	1.24	-0.07	0.00	0.00	1.74	0.61	0.000	-0.56
Professionals	0.00	0.07	-0.26	0.33	-0.19	-0.08	-0.53	0.00	0.70	-0.38	0.000	1.52
Employment Status												
Employer or self-employed	0.10	0.00	0.00	-0.47	0.72	0.24	-1.40	0.71	0.18	0.21	0.238	0.66
Unemployed	-1.23	-0.20	-0.69	-0.25	-0.46	-0.59	-1.62	-0.13	-0.60	-0.78	0.475	-0.56
Pensioner	-0.63	-0.05	-0.03	0.05	-0.53	-0.22	-1.09	0.00	-0.35	-0.50	-1.070	-0.61
Student	-0.63	-0.05	-0.03	0.05	-0.53	-0.22	-1.09	0.00	-0.35	-0.50	-1.070	-0.61
Inactive	-0.63	-0.05	-0.03	0.05	-0.53	-0.22	-1.09	0.00	-0.35	-0.50	-1.070	-0.61
Sick or Disabled	-0.63	-0.05	-0.03	0.05	-0.53	-0.22	-1.09	0.00	-0.35	-0.50	-1.070	-0.61
Other												
AGE1 ((age in years of the reference person - 40) /10 <sup>2</sup> )	0.00	-0.02	-0.02	0.07	0.36	-0.06	-0.15	0.36	0.11	-0.06	2.251	0.11
AGE2 (AGE1*AGE1)	0.00	0.05	-0.16	-0.28	-0.13	-0.07	-0.11	-0.26	-0.14	-0.17	-0.005	-0.08
AGE3 (AGE1*AGE1*AGE1)	0.00	-0.04	0.01	0.03	0.00	-0.01	0.01	0.02	0.01	0.02	0.000	0.00
Region1	0.60	-0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00
Region2	0.00	-0.52	0.98	0.00	0.31	0.00	0.00	0.00	0.79	0.00	0.00	0.00
Region3	0.67	0.00	1.17	0.74	1.34	0.00	0.00	0.00	0.70	0.10	0.00	0.13
Region4	0.00	0.00	1.04	0.20	0.00	0.08	0.00	0.00	0.68	-0.06	0.00	0.42
Region5	0.00	0.00	0.93	0.00	0.00	0.08	0.00	0.00	0.80	-0.07	0.00	0.49
Region6	0.00	0.00	1.26	0.00	0.00	0.08	0.00	0.00	0.19	0.38	0.00	0.53
Region7	0.00	0.00	0.82	0.00	0.00	0.00	0.00	0.00	0.00	-0.18	0.00	-0.17
Region8	0.00	0.00	0.63	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.73
Region9	0.00	0.00	0.96	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.65
Region10	0.00	0.00	0.80	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.30
Region11	0.00	0.00	0.91	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.12
Region12	0.00	0.00	1.11	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.42

Region13	0.00	0.00	0.72	0.00	0.00	-0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region14	0.00	0.00	1.27	0.00	0.00	-0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region15	0.00	0.00	1.56	0.00	0.00	-0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region16	0.00	0.00	1.28	0.00	0.00	-0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region17	0.00	0.00	1.29	0.00	0.00	-0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region18	0.00	0.00	0.93	0.00	0.00	-0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region19	0.00	0.00	0.91	0.00	0.00	-0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region20	0.00	0.00	1.24	0.00	0.00	-0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region21	0.00	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Region22	0.00	0.00	-0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Education													
No Schooling	0.00	-0.81	-0.49	-1.09	-2.59	-1.41	0.00	0.00	-3.32	0.07	1.168	-3.30	
Primary	0.00	-0.40	-0.66	-1.09	-1.53	-0.62	-0.87	-0.75	-1.61	-1.48	-0.194	-0.77	
Lower Secondary	0.00	-0.68	-0.22	0.00	-0.79	-0.23	-0.26	-0.49	-0.69	-0.69	0.773	-0.57	
Upper Secondary	0.00	-0.39	-0.04	0.50	0.87	0.20	0.53	-0.15	0.48	0.09	0.384	-0.07	
Tenure													
Social Rented	-0.85	-0.89	-0.29	-0.67	-1.38	-0.33	-1.17	-1.03	-0.64	0.60	-1.315	-1.38	
Other Rented	-0.85	-0.89	-0.29	-0.67	-1.38	-0.33	-1.17	-1.03	-0.64	-0.68	-1.315	-1.38	
Number of Children aged 0-5	0.00	0.44	0.00	-0.09	0.06	0.05	0.45	0.10	-0.05	0.13	-0.391	0.06	
Number of Children aged 6-10	0.00	0.24	0.00	0.00	0.10	0.07	0.03	0.02	0.00	0.03	0.005	0.03	
Number of Children aged 11-17	0.00	0.18	0.00	0.05	-0.03	0.09	0.04	-0.08	-0.14	-0.06	-0.014	0.04	
Number of Persons aged 66+	0.00	0.06	0.00	-0.08	0.21	0.25	0.34	0.19	0.03	0.13	-0.080	0.34	
Number of Adults aged 16-65	0.46	0.83	0.00	0.31	0.32	0.44	0.34	0.12	0.33	0.34	0.040	0.34	
Number of Earners	0.49	0.18	0.00	0.10	0.45	0.20	0.39	0.45	0.07	0.17	0.741	0.39	
Constant	0.59	0.86	1.22	0.84	0.96	1.19	1.32	2.01	1.32	1.26	5.523	1.32	

**Table B.6 Coefficients of log consumption ( $\beta$ ) and of the square of log consumption ( $\gamma$ ) for each category.<sup>10</sup>**

		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C3a	C3b	C3c
Belgium	$\beta$	0.555	0.024	0.067	0.016	0.174	-0.031	-0.193	-0.004	0.269	0.030	0.054	-0.070	0.005	-0.062	0.001	-0.013	-0.007	0.410	1.311	0.461
	$\gamma$	-0.028	-0.001	-0.003	-0.001	-0.008	0.001	0.007	-0.011	-0.012	-0.002	0.007	0.003	0.006	0.003	0.000	-0.015	0.008	0.104	0.638	-1.415
Finland	$\beta$	0.345	0.010	0.142	0.078	0.142	0.043	-0.096	0.195	0.267	0.249	-1.519	-0.084	-0.054	-0.061	0.000	0.326	0.015	-0.086	0.033	0.015
	$\gamma$	-0.021	-0.001	-0.006	-0.004	-0.005	-0.003	0.003	-0.009	-0.012	-0.011	0.075	0.003	0.003	0.002	0.000	-0.014	0.000	-0.010	-0.057	0.015
France	$\beta$	0.322	0.013	0.010	-0.014	0.083	-0.029	-0.172	-0.255	0.016	-0.218	0.052	-0.034	0.072	0.009	-0.011	0.113	0.043	-0.013	-0.050	0.063
	$\gamma$	-0.017	-0.001	-0.001	0.000	-0.003	0.001	0.006	0.012	-0.001	0.008	0.001	0.001	-0.002	0.000	0.001	-0.004	-0.001	0.020	-0.016	-0.003
Greece	$\beta$	-0.169	0.013	0.050	0.109	0.567	-0.097	-0.162	-0.235	0.015	0.051	-0.725	-0.065	-0.002	0.052	0.103	0.286	0.161	-0.117	-0.066	0.183
	$\gamma$	0.002	-0.001	-0.002	-0.005	-0.021	0.003	0.006	0.010	0.000	-0.003	0.031	0.002	0.002	-0.002	-0.004	-0.011	-0.005	-0.050	-0.016	0.066
Ireland	$\beta$	-0.009	-0.002	-0.009	-0.005	0.003	0.004	0.002	0.010	-0.006	0.001	0.017	-0.001	-0.003	0.000	0.003	-0.002	-0.002	0.184	-0.597	0.412
	$\gamma$	-0.022	-0.001	0.017	-0.001	0.005	-0.001	-0.003	-0.007	-0.005	-0.002	0.020	-0.003	0.001	0.002	-0.004	0.009	-0.004	0.184	-0.597	0.412
Italy	$\beta$	-0.097	0.003	0.028	0.028	0.285	-0.113	0.020	-0.270	0.034	0.070	-0.531	-0.063	0.178	0.042	0.012	0.151	0.223	-0.092	0.008	0.084
	$\gamma$	-0.002	-0.001	-0.002	-0.002	-0.017	0.006	-0.002	0.020	-0.002	-0.006	0.040	0.003	-0.010	-0.003	-0.001	-0.008	-0.013	-0.017	0.045	-0.028
Luxembourg	$\beta$	0.002	0.002	0.005	0.003	-0.018	0.000	0.003	0.013	0.002	0.000	0.029	0.000	-0.005	-0.004	-0.006	-0.034	0.006	-0.010	0.015	0.000
	$\gamma$	0.002	0.002	0.005	0.003	-0.018	0.000	0.003	0.013	0.002	0.000	0.029	0.000	-0.005	-0.004	-0.006	-0.034	0.006	-0.010	0.015	0.000
Netherlands	$\beta$	0.269	0.071	0.046	0.045	0.056	-0.304	-0.136	-0.277	0.179	0.079	0.028	-0.177	-0.015	0.015	-0.058	0.130	0.050	-0.007	-0.015	0.022
	$\gamma$	-0.016	-0.004	-0.002	-0.002	-0.003	0.013	0.006	0.014	-0.008	-0.004	0.003	0.008	0.001	-0.001	0.003	-0.005	-0.002	0.048	0.010	-0.058
Portugal	$\beta$	0.202	0.031	0.028	0.077	0.283	0.038	-0.465	-0.199	0.209	0.155	-0.827	-0.119	0.022	0.024	0.034	0.457	0.048	-0.039	-0.060	0.099
	$\gamma$	-0.014	-0.001	-0.001	-0.003	-0.012	-0.002	0.018	0.010	-0.008	-0.007	0.041	0.004	-0.001	-0.001	-0.001	-0.019	-0.002	-0.003	0.025	-0.022
Spain	$\beta$	-0.085	0.014	0.000	0.010	0.349	-0.027	-0.164	-0.386	0.086	0.086	-0.123	-0.024	0.024	0.040	-0.016	0.225	-0.007	0.007	-0.033	0.027
	$\gamma$	-0.001	-0.001	0.000	-0.001	-0.011	0.001	0.005	0.015	-0.003	-0.003	0.007	0.001	-0.001	-0.001	0.001	-0.007	0.000	-0.016	0.014	0.002
Sweden	$\beta$	0.258	-0.055	0.033	0.302	0.623	0.025	-0.244	-0.250	-0.330	0.005	-0.196	0.231	-0.541	0.184	-0.014	0.122	0.308	0.033	-0.086	0.091
	$\gamma$	-0.022	0.003	-0.002	-0.018	-0.034	-0.002	0.012	0.016	0.018	0.000	0.013	-0.012	0.032	-0.010	0.001	-0.004	-0.016	-0.057	-0.010	0.067
UK	$\beta$	-0.038	0.007	0.126	-0.002	0.204	-0.073	-0.110	0.066	0.042	-0.021	-0.218	0.006	-0.023	0.000	-0.013	0.215	-0.167	-0.019	-0.016	0.034
	$\gamma$	-0.004	-0.001	-0.009	-0.001	-0.013	0.004	0.006	-0.001	-0.003	0.000	0.016	0.000	0.002	0.000	0.001	-0.013	0.015	0.035	-0.031	-0.005

<sup>10</sup> In this table we report only the coefficients of the consumption variables. All coefficients for each variable for each model are available upon request from the authors.

## Appendix C. Evaluation of Expenditure Model: the Case of Italy and the UK

In order to test the validity of this modelling mechanism we carry out evaluation tests for two countries (Italy and the UK). We compare indirect taxes simulated in a model based on actual expenditure data with indirect taxes simulated on imputed expenditure data.

In the Italian comparison, we simulate indirect taxes for our aggregated expenditure groups for the Household Budget Survey (34403 households in 1995) and the Bank of Italy Survey of Household Budgets (8135 households in 1995, the same as the base dataset of EUROMOD). Total consumption and income are defined according to the definitions suggested above (in particular, they are net of actual and imputed rents), but in the case of income the scarcity of information available in the HBS has forced us to great approximations.

The most relevant problem one has to face is the fact that the value of income in the HBS is 16% lower on average than income in the Bank of Italy Survey; the application of the method described above would thus lead to an overestimation of imputed consumption. A possible correction consists in simply inflating, before the estimation, all income values in the HBS by 16%, so that on average income has the same value in both surveys. This is equivalent, in a log-linear regression, to a change in the constant, leaving all the coefficients unchanged: in this case the constant falls by  $\beta \ln(1.16)$ . This solution neglects that the ratio between the average incomes in the two surveys is very likely to be variable in different socio-demographic groups, and not constant over the whole population. An improvement over the previous solution, thus, could be the computation of a set of ratios, after the subdivision of the population into a set of cells. This solution is more appealing than the previous one, but has the disadvantage of requiring a much more demanding comparison between the two surveys. The first correction could be carried out by the model assembler, simply by reducing the value of the constant by  $\beta \ln(\text{mean income in the ECHP} / \text{mean income in the HBS})$ , and the country respondent will run the regression without caring about this problem, and will just send the information about the mean value of income in the HBS. The second correction, on the other hand, must be performed by those who run the regression, because it changes the values of the parameters.

The Gini values for consumption in the Bank of Italy data and the HBS data (using the cell based correction ) are both 0.40. With the imputed budget shares, we have computed the distributive impact of VAT in Italy in 1998 both in the original HBS data and in the Bank of Italy Survey. Table C.3 shows the incidence of Vat as a proportion of total net expenditure for the various deciles of equivalent (original or imputed) total expenditure. The equivalence scale used is simply the square root of the number of household members; the incidence of Vat computed using the imputed total expenditure obtained with the 80 correction coefficients is very similar to that of the second column, and so are omitted. The dispersion of Vat rates is much lower among the imputed values, and this is of course a consequence of not having used, in the second imputation stage, the residuals from the Lorenz curves regressions.

The UK comparison is slightly different. Here we compare indirect taxes (both VAT and excise duties) between EUROMOD (imputed expenditure for aggregated expenditure groups

on the 1995 Family Expenditure Survey<sup>11</sup>) and POLIMOD (an UK tax-benefit model that simulates indirect taxes using actual disaggregated expenditure data also using the 1995 Family Expenditure Survey<sup>12</sup>). Because both models use the same data, what we are capturing here is the effect of imputation rather than using actual data and the effect of aggregating categories. Table C.3 describes the indirect tax rate as a percentage of expenditure for each equivalised disposable income (note not consumption as in the case of Italy) decile. We see that both models produce very similar distributions of expenditure, with EUROMOD having slightly lower average tax rates at the bottom and slightly higher at the top than POLIMOD.

**Table C.3 Validation of Indirect Tax Estimates Model in Italy and UK**

Decile	Italy		UK	
	Imputed -Bank of Italy Survey	Original -HBS	Imputed - EUROMOD	Original - POLIMOD
1	11.5	11.4	5.1	8.4
2	11.9	11.9	5.5	5.8
3	12.1	12.3	6.2	6.1
4	12.3	12.4	7.6	7.1
5	12.5	12.5	8.1	8.7
6	12.7	12.6	9.9	10.1
7	12.8	12.7	11.1	10.7
8	12.9	12.9	12.4	13.0
9	13.1	12.9	14.7	13.6
10	13.4	13.5	19.6	16.5

Source: EUROMOD, POLIMOD.

Note Italian results categorised by Equivalised Disposable Consumption Decile, UK results categorised by Equivalised Disposable Income Decile.

<sup>11</sup> Although the Family Expenditure Survey contains information on

<sup>12</sup> See Redmond et al. (1998) for a description.

## Appendix D Progressivity of Size of Indirect Taxes

**Table D.1. Progressivity of Indirect Taxes (Kakwani Index)**

	Be	Fi	Fr	Gr	Ir	It	Lu	Nl	Pt	Sp	Sw	UK
VAT	-2.0	-19.4	-15.4	-13.0	-13.7	-16.1	-9.4	-9.8	-23.1	-14.5	-9.0	-12.0
Excise Duty	-8.6	-21.9	-31.5	-23.9	-17.5	-21.8	-18.6	-13.0	-25.2	-18.4	-21.5	-24.6
<i>VAT Groups</i>												
Beer	0.8	-28.8	-36.0	-21.6	-21.4	-29.2	-21.2	-14.6	-26.5	-21.1	-15.8	-17.0
Book	-2.5	-25.1	-16.9	-13.2	-24.5	-15.0	-6.9	-13.6	-24.4	-12.7	-6.7	
Clothing/ Footwear	3.2	-21.5	-19.5	-14.2	-14.7	-18.1	-10.9	-10.6	-26.1	-15.8	-4.7	-12.7
Communications	-14.3	-27.0	-25.1	-27.2	-23.2	-24.7	-17.3	-24.8	-35.7	-22.2	-19.6	-13.4
Domestic Fuel	-16.9	-17.2	-29.2	-37.9	-36.7	-36.7		-26.8	-46.7	-20.5	-13.2	-34.4
Education				-23.1		-14.2		-13.1			-9.8	
Electricity	-17.7	-19.0	-29.8	-33.2	-33.4	-21.2	-29.5	-26.2	-40.0	-29.7	-20.3	-36.1
Food	-10.6	-25.8	-27.1	-36.1	-35.0	-32.8	-25.2	-20.7	-30.8	-32.5	-17.3	
Health	-6.7	-33.0			-9.8	-20.4	-19.8	-6.5	-39.0	-15.7	-18.7	-14.9
Household Goods	2.7	-26.5	-17.1	-13.5	-12.5	-13.9	-6.7	-10.1	-25.3	-11.1	-7.9	-12.9
Leisure	-1.4	-25.8	-15.6	-10.4	-17.3	-15.1	-14.4	-11.0	-26.2	-10.6	-11.3	-16.0
Non-Alcoholic Bev.	-13.7	-23.1	-26.8	-25.8	-29.2	-30.8	-29.5	-25.0	-31.4	-26.8	-10.5	
Other Goods/Services	-4.8	-15.8	-16.2	-8.5	-9.8	-18.5	-12.3	-10.7	-32.1	-18.2	-7.4	-12.9
Motor Fuels	-6.8	-19.6	-26.3	-13.3	-18.6	-22.6	-14.4	-10.5	-22.3	-19.3	-25.2	-23.9
Restaurants	3.3	-22.0	-17.3	-11.5	-6.9	-9.3	-6.5	-5.9	-23.1	-11.3	-6.7	-7.7
Spirits	-1.1	-46.1	-37.1	-5.9	-20.6	-20.8	-17.1	-7.5	-37.0	-15.0	-0.8	-17.8
Tobacco	-16.2	-37.9	-49.8	-29.2	-41.1	-27.2	-37.1	-25.0	-33.8	-25.4	-27.5	-39.5
Transport	9.0	-17.3	-13.2	-0.5	-11.8	-5.9	-6.5	-7.0	-21.6	-6.0	-4.1	-12.7
Wine	-14.4	-18.0	-33.7	-27.2	-8.5	-27.4	-14.6	-5.1	-46.3	-24.1	-2.8	-8.7

Source: EUROMOD.

Notes:

1. Base Income: Disposable Income plus Income Taxes, plus Employee and Self-Employed Social Insurance Contributions plus Employer Social Insurance Contributions.
2. Income has been equalised using the equivalence scale 1/0.5/0.3, where children are aged 17 or under.

**Table D.2. Equivalised Indirect Taxes as a % of Equivalised Disposable Income**

	Bel.	Fin.	Fra.	Gre.	Ire.	Ita.	Lux.	Neth.	Port.	Spa.	Swe.	UK
VAT	-9.4	-11.9	-16.6	-13.1	-12.5	-11.8	-8.5	-9.4	-10.8	-9.7	-12.0	-11.6
Excise Duty	-3.6	-5.1	-4.2	-6.3	-10.3	-5.3	-2.1	-2.5	-3.0	-2.1	-3.6	-6.2
VAT Groups												
Beer	-0.06	-0.45	-0.02	-0.04	-1.10	-0.05	-0.04	-0.10	-0.04	-0.05	-0.38	-0.62
Book	-0.36	-0.37	-0.21	-0.09	-0.25	-0.09	-0.04	-0.09	-0.06	-0.08	-0.26	0.00
Clothing/ Footwear	-0.91	-1.15	-3.98	-2.19	-1.64	-1.17	-1.36	-0.86	-1.28	-1.85	-1.03	-1.01
Communications	-0.32	-0.47	-0.61	-0.34	-0.53	-0.39	-0.17	-0.28	-0.35	-0.29	-0.44	-0.10
Domestic Fuel	-0.27	-0.32	-0.55	-0.47	-0.50	-0.26	0.00	-0.37	-0.05	-0.21	-0.44	-0.12
Education	0.00	0.00	0.00	-0.17	0.00	-0.03	0.00	-0.18	0.00	0.00	-0.27	0.00
Electricity	-0.68	-0.46	-0.31	-0.32	-0.28	-0.42	-0.09	-0.22	-0.14	-0.30	-0.34	-0.13
Food	-0.78	-2.42	-1.09	-1.57	-0.14	-1.79	-0.35	-0.66	-2.81	-0.91	-1.51	0.00
Health	-0.03	-0.22	0.00	0.00	-0.23	-0.16	-0.05	-0.12	-0.13	-0.17	-0.60	-0.24
Household Goods	-1.10	-1.54	-3.96	-2.44	-1.94	-2.05	-2.14	-1.68	-1.54	-2.03	-1.23	-2.95
Leisure	-0.86	-1.20	-0.42	-0.55	-1.07	-0.90	-0.77	-1.22	-0.43	-0.36	-1.12	-0.92
Non-Alcoholic Bev.	-0.27	-0.05	-0.05	-0.05	-0.30	-0.25	-0.03	-0.08	-0.09	-0.04	-0.08	0.00
Other Goods/Services	-0.76	-0.14	-2.68	-2.22	-1.24	-1.49	-0.76	-0.42	-0.81	-1.56	-1.74	-2.65
Motor Fuels	-0.62	-0.99	-0.69	-0.56	-0.97	-1.10	-0.29	-0.42	-0.55	-0.56	-0.74	-0.70
Restaurants	-1.49	-1.50	-1.70	-1.71	-1.04	-0.77	-0.35	-1.56	-1.58	-1.05	-1.75	-1.36
Spirits	-0.26	-0.04	-0.03	-0.02	-0.20	-0.03	-0.13	-0.04	-0.04	-0.01	-0.03	-0.14
Tobacco	-0.30	-0.21	-0.12	-0.45	-0.67	-0.38	-0.08	-0.17	-0.25	-0.17	-0.21	-0.44
Transport	-1.07	-1.68	-2.90	-1.61	-1.90	-1.63	-2.27	-1.66	-1.74	-0.80	-1.21	-1.31
Wine	-0.11	-0.08	-0.10	-0.03	-0.15	-0.16	-0.05	-0.11	-0.06	-0.10	-0.05	-0.20

Source: EUROMOD.

Notes:

1. Base Income: Disposable Income plus Income Taxes, plus Employee and Self-Employed Social Insurance Contributions plus Employer Social Insurance Contributions.
2. Income has been equivalised using the equivalence scale 1/0.5/0.3, where children are aged 17 or under.

## Appendix E Budget Shares Across the Income Distribution of Consumption Groups

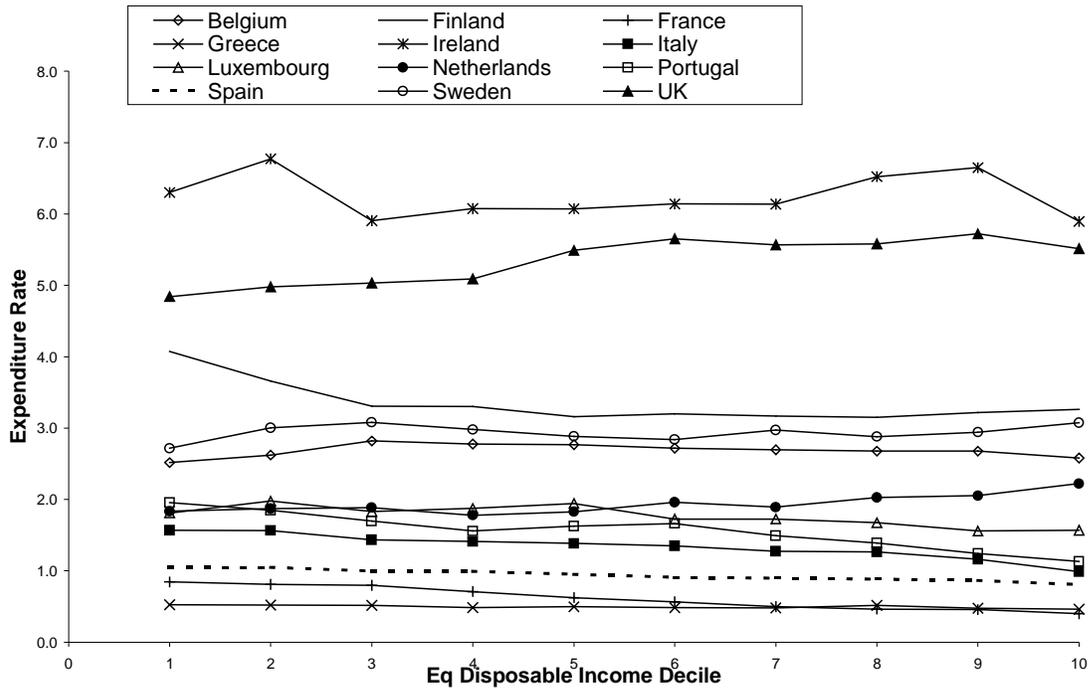


Figure E.1 Alcoholic Beverages

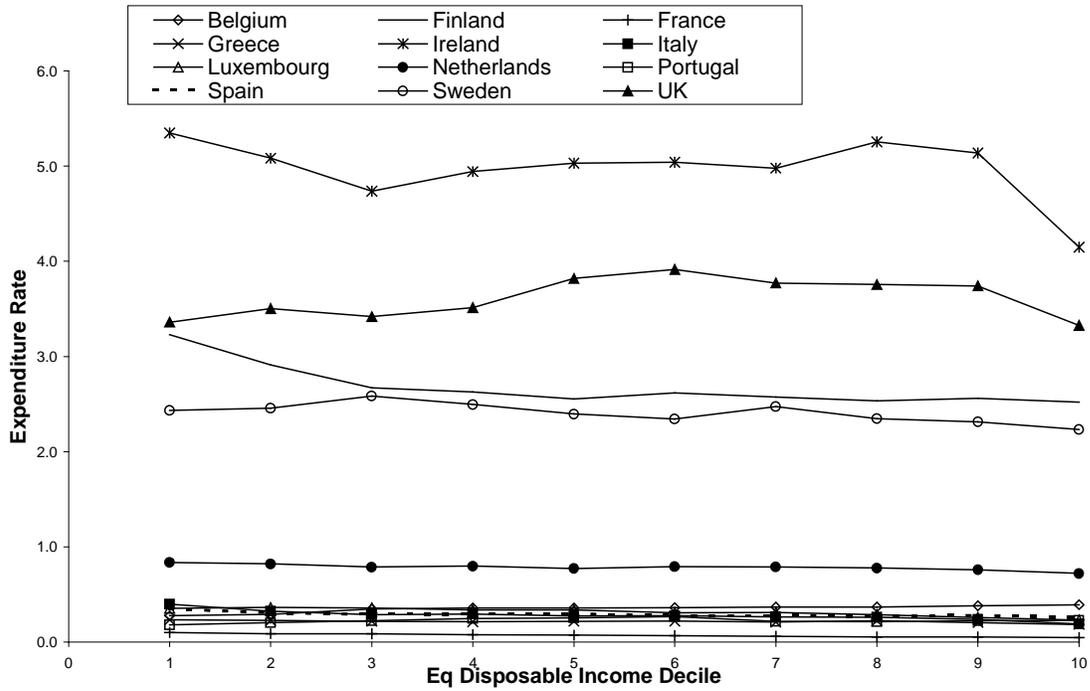
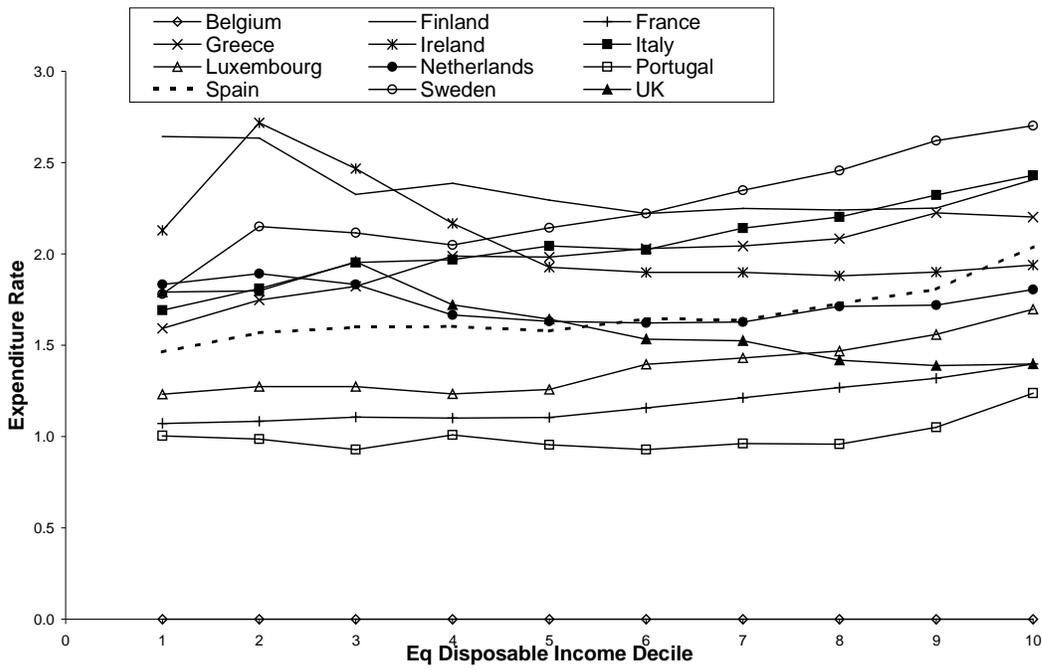
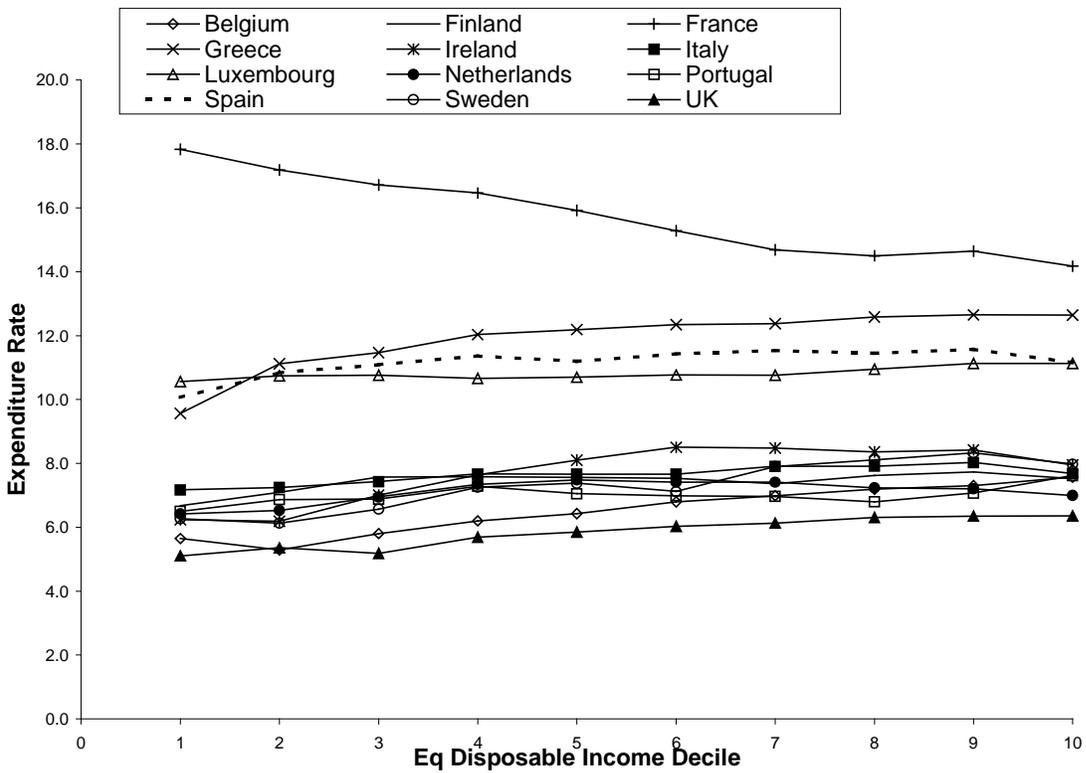


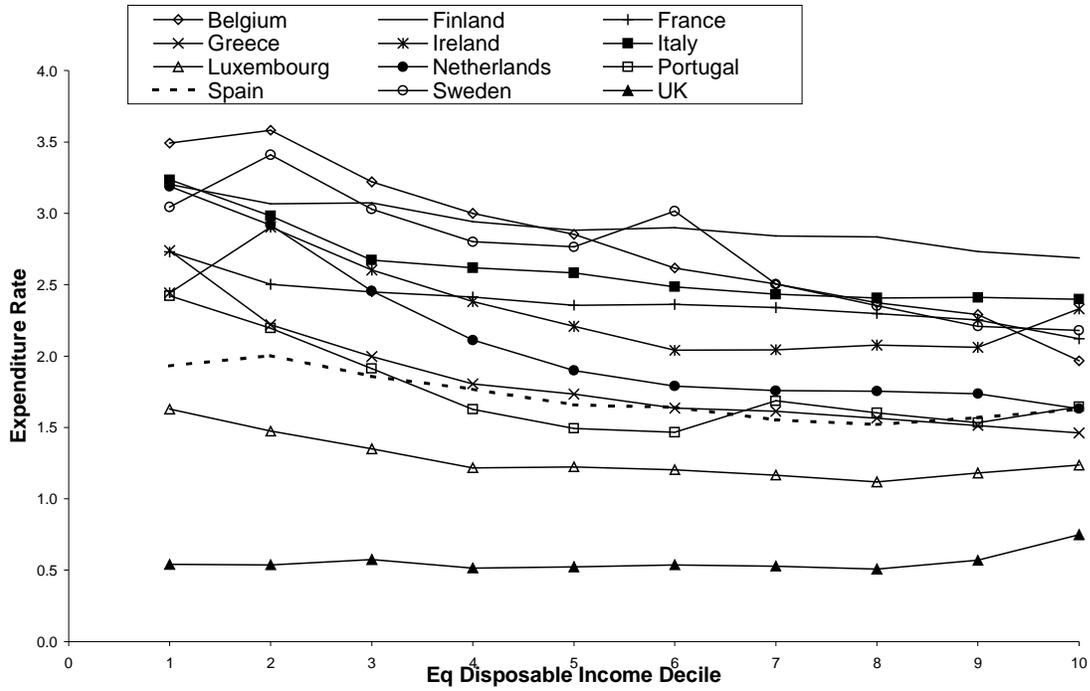
Figure E.2 Beer



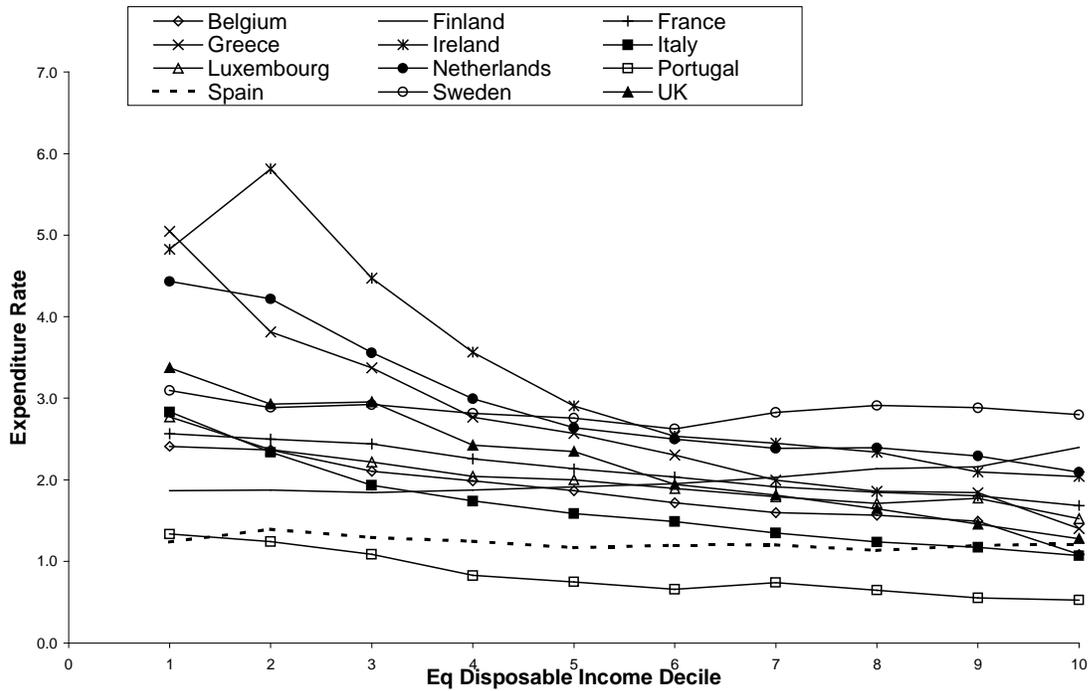
**Figure E.3 Books**



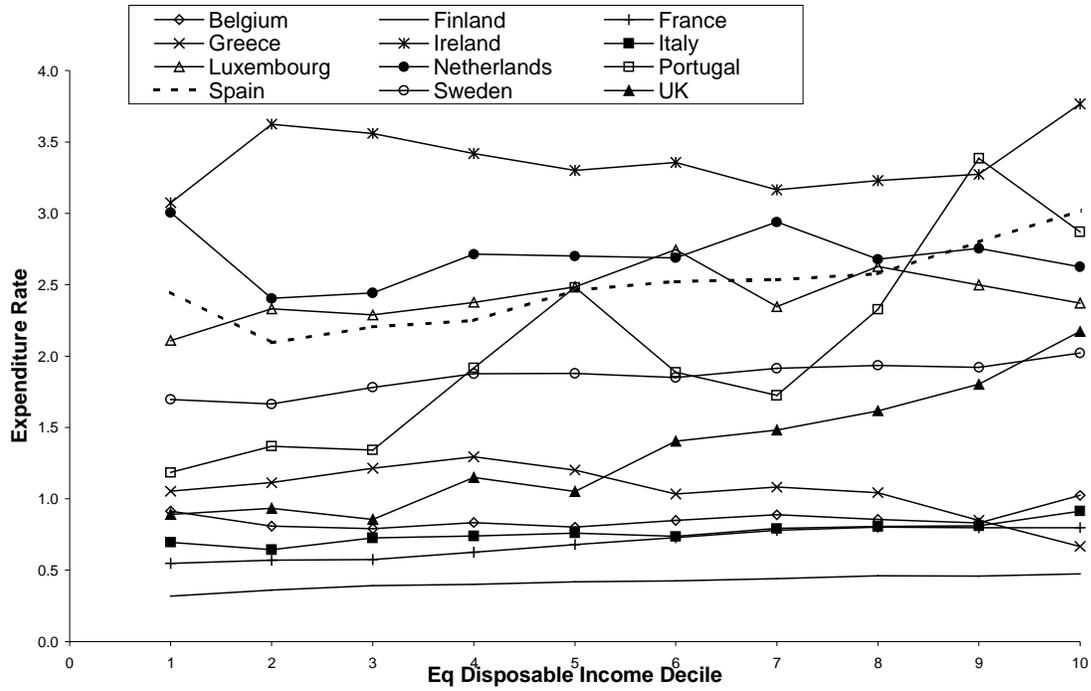
**Figure E.4 Clothing and Footwear**



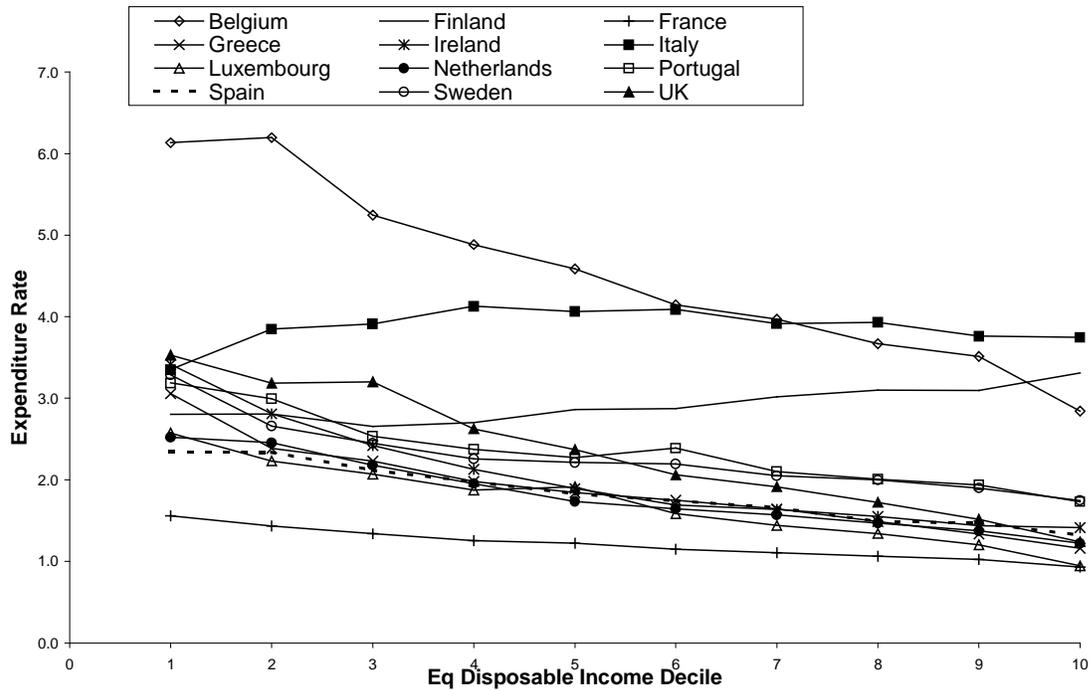
**Figure E.5 Communications**



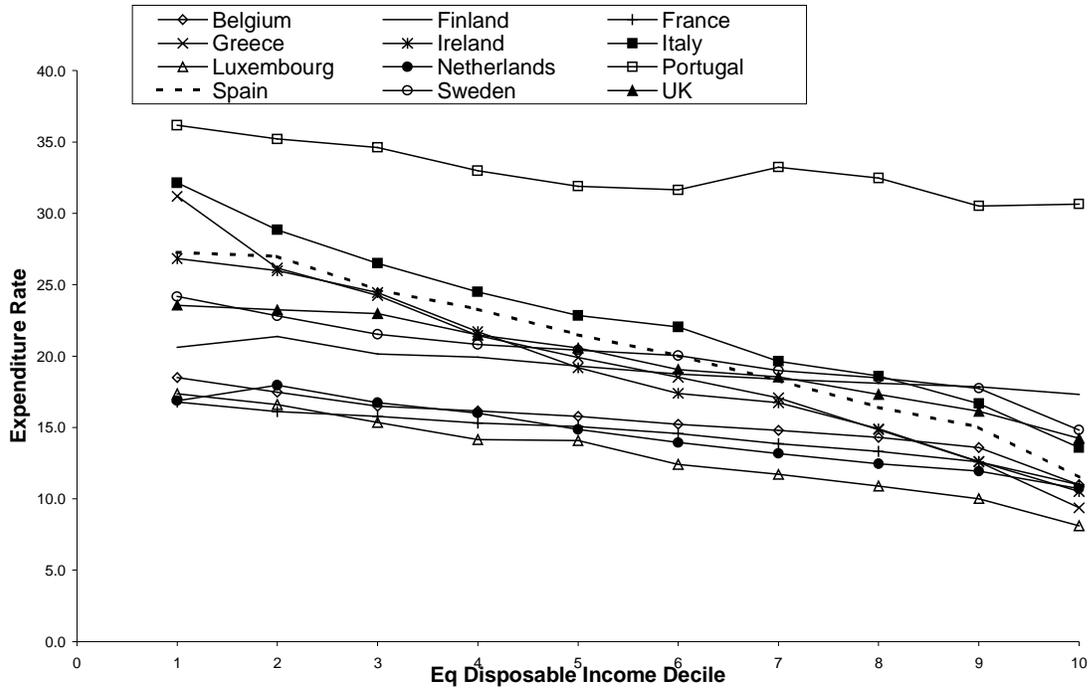
**Figure E.6 Domestic Fuel**



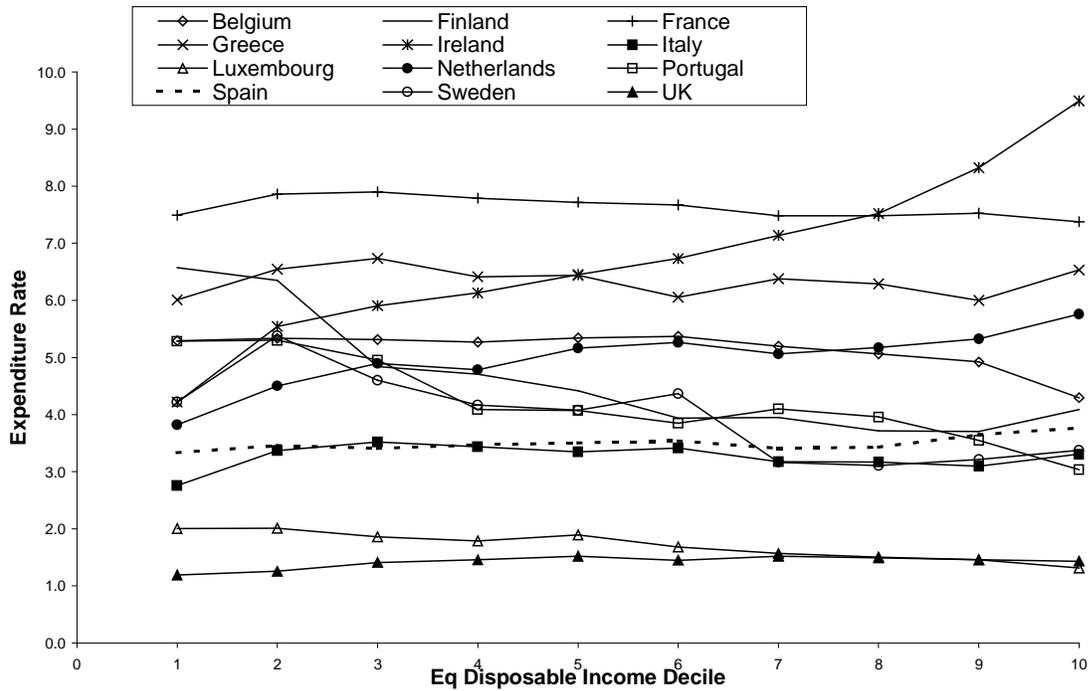
**Figure E.7. Education**



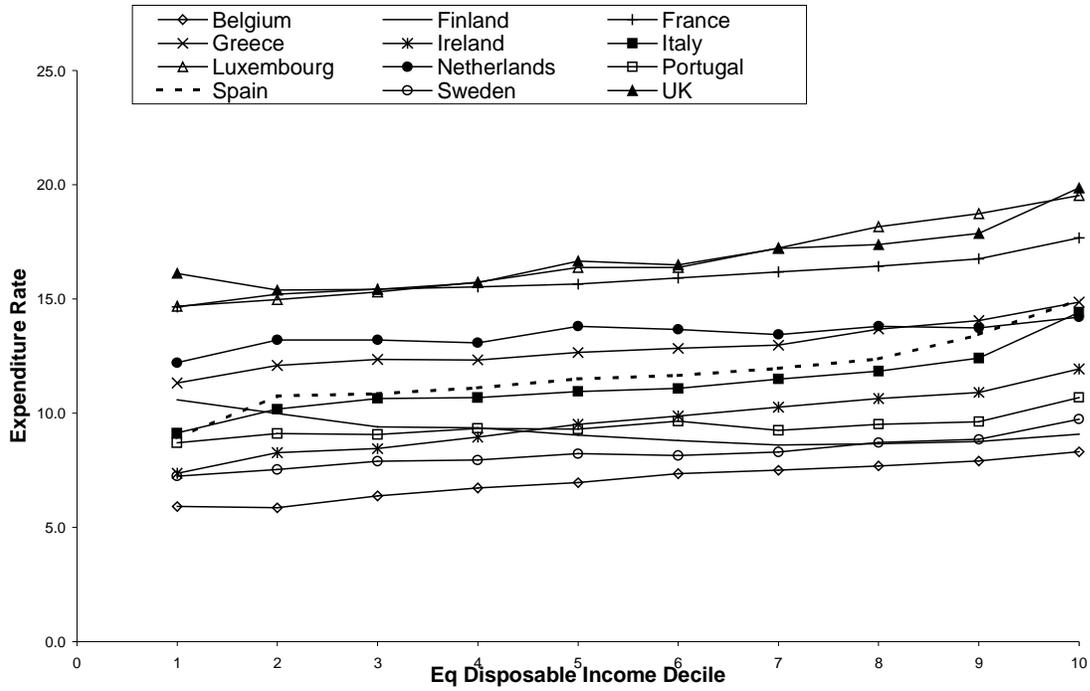
**Figure E.8 Electricity**



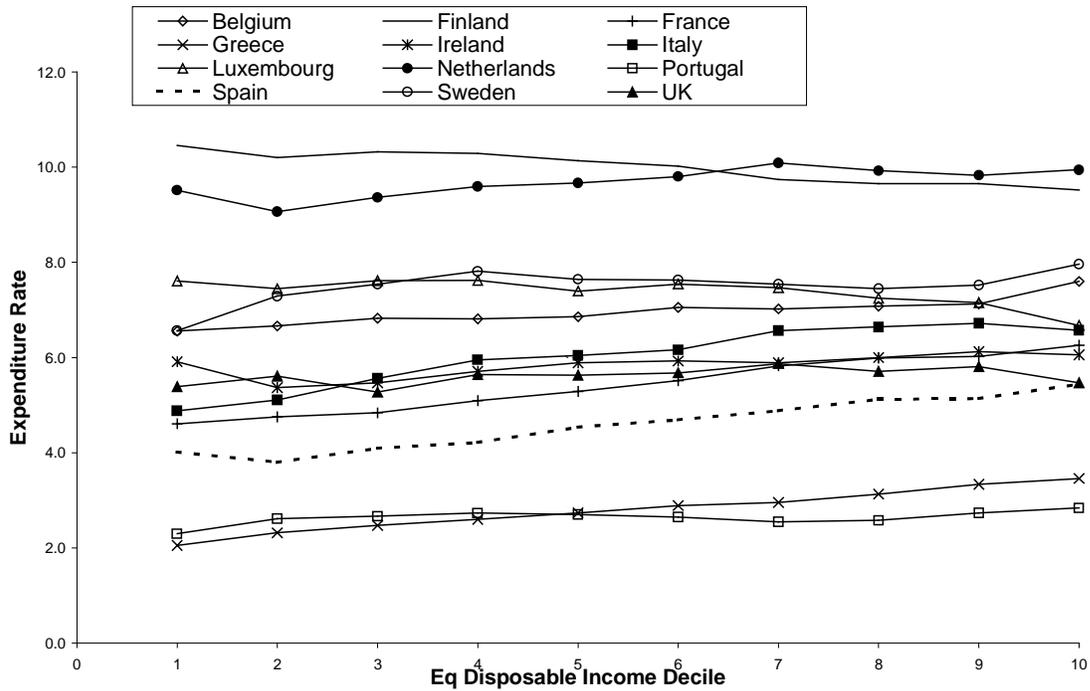
**Figure E.9 Food**



**Figure E.10 Health**



**Figure E.11 Household Goods**



**Figure E.12 Leisure**

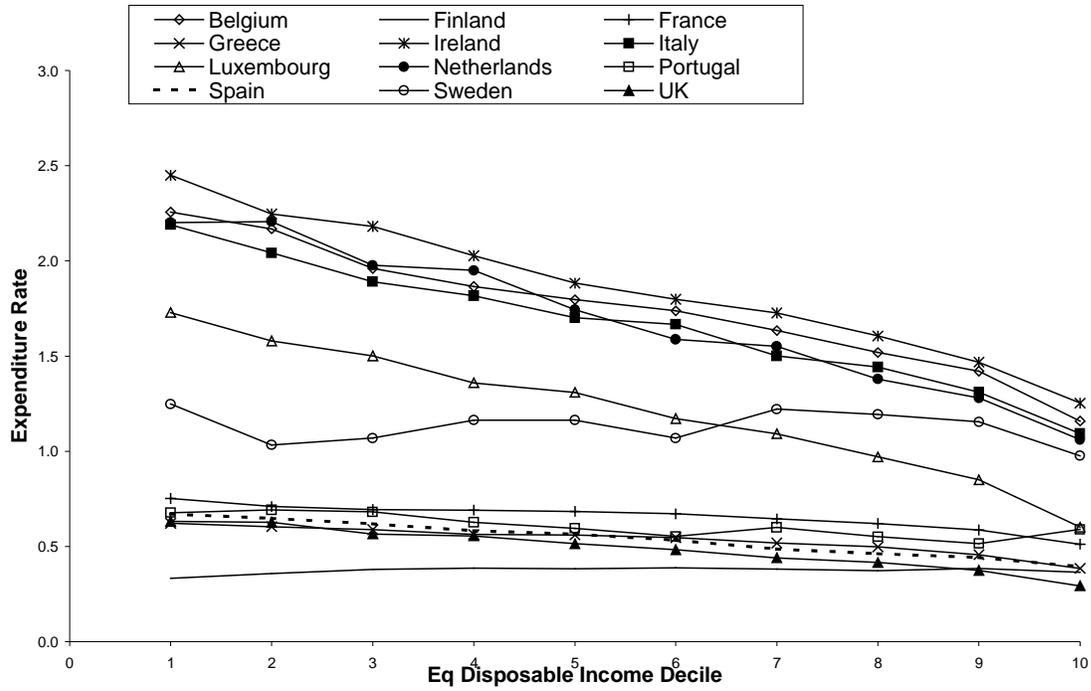


Figure E.13 Non-Alcoholic Beverages

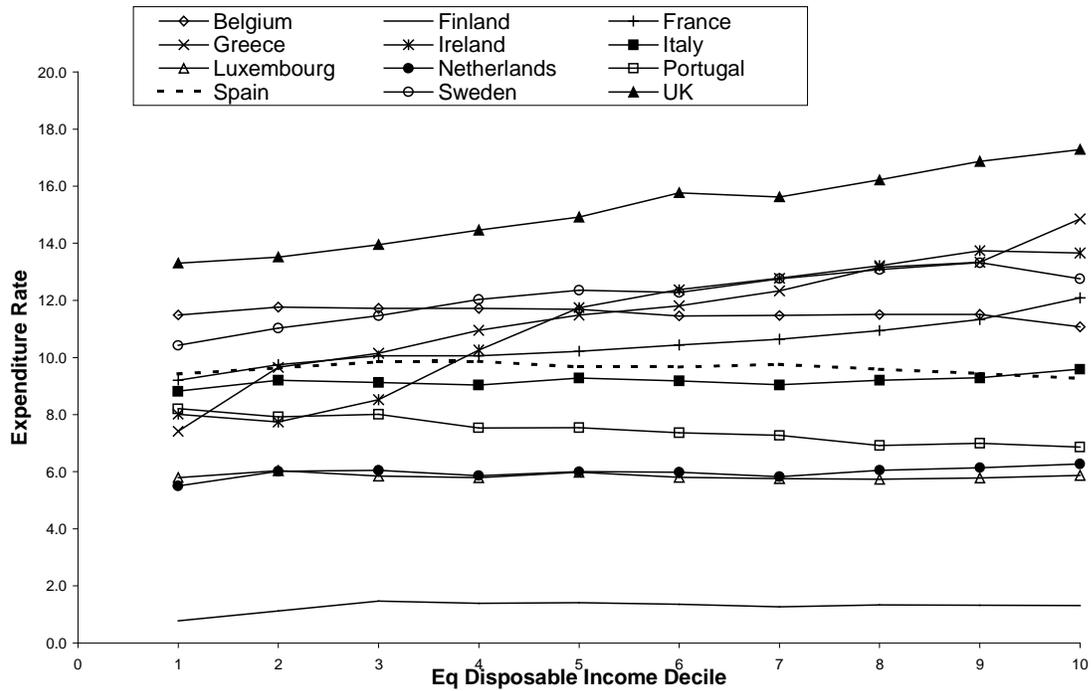
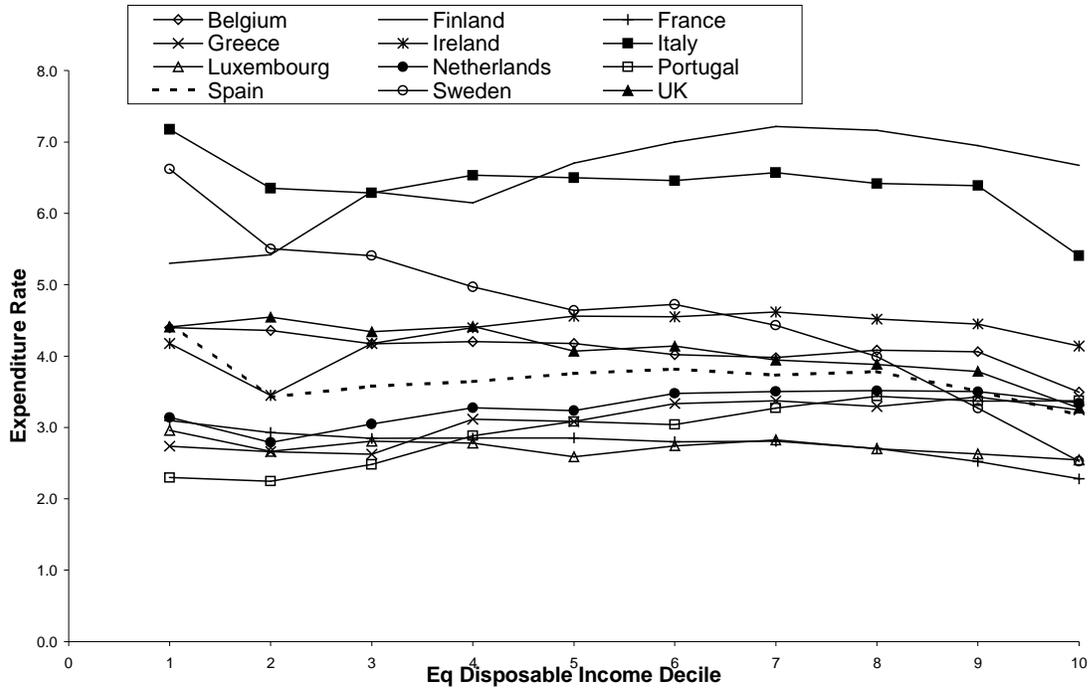
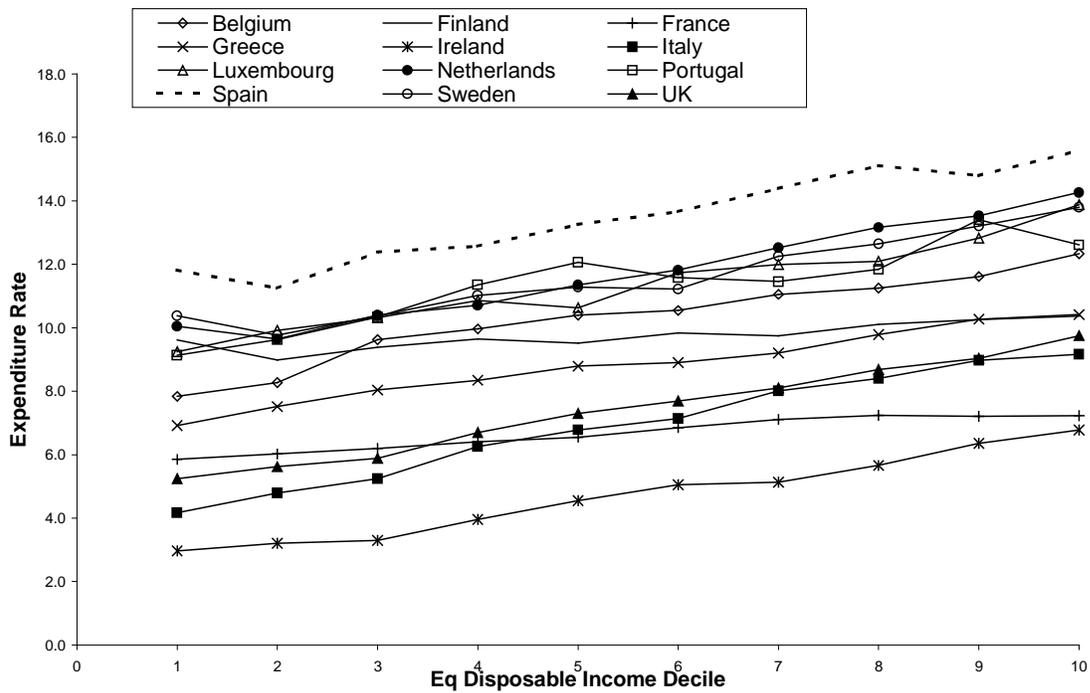


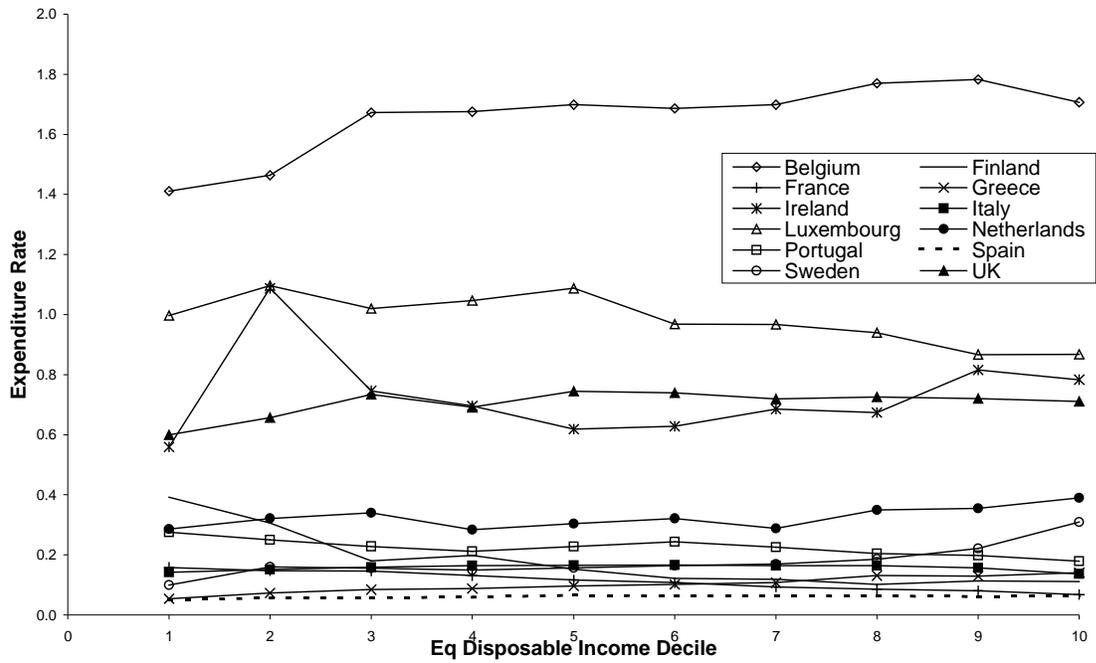
Figure E.14 Other



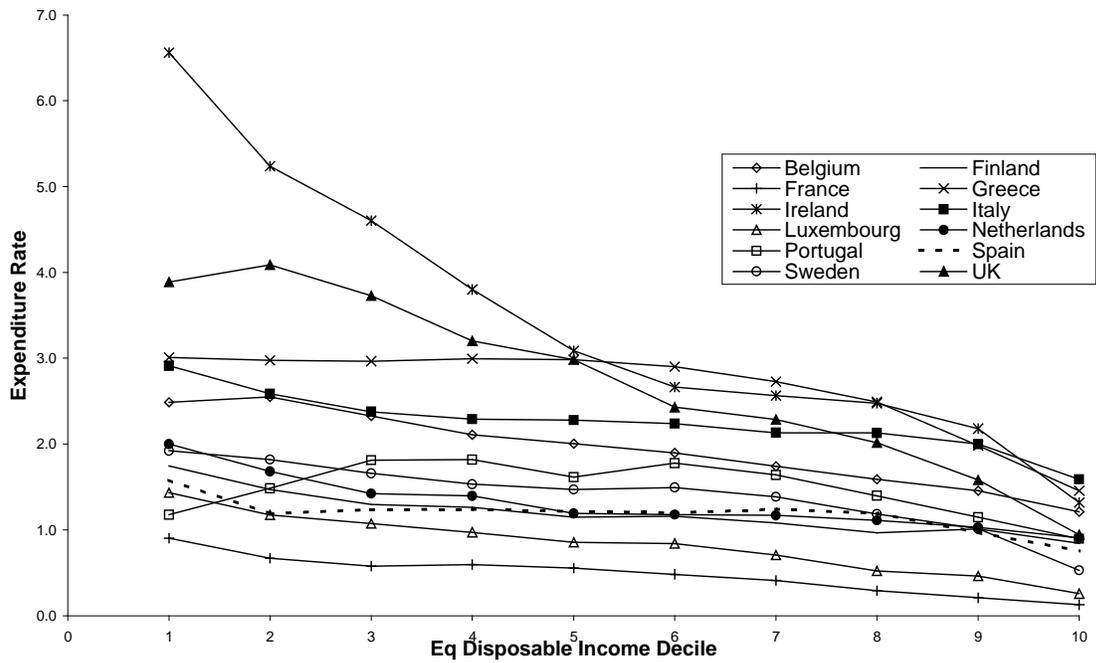
**Figure E.15 Motor Fuels**



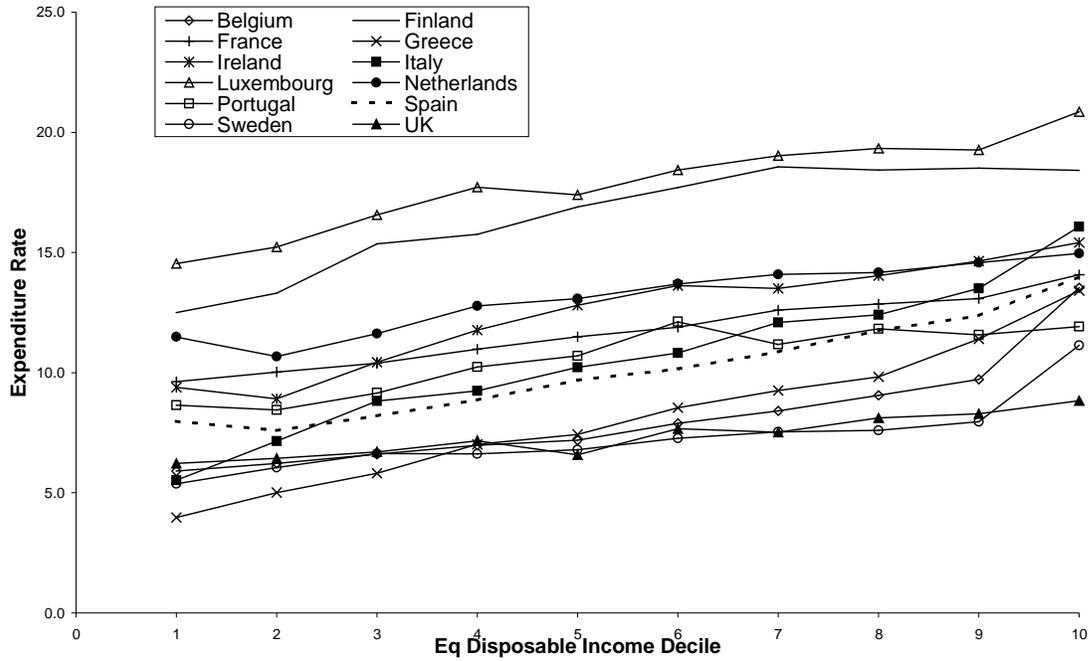
**Figure E.16 Restaurant**



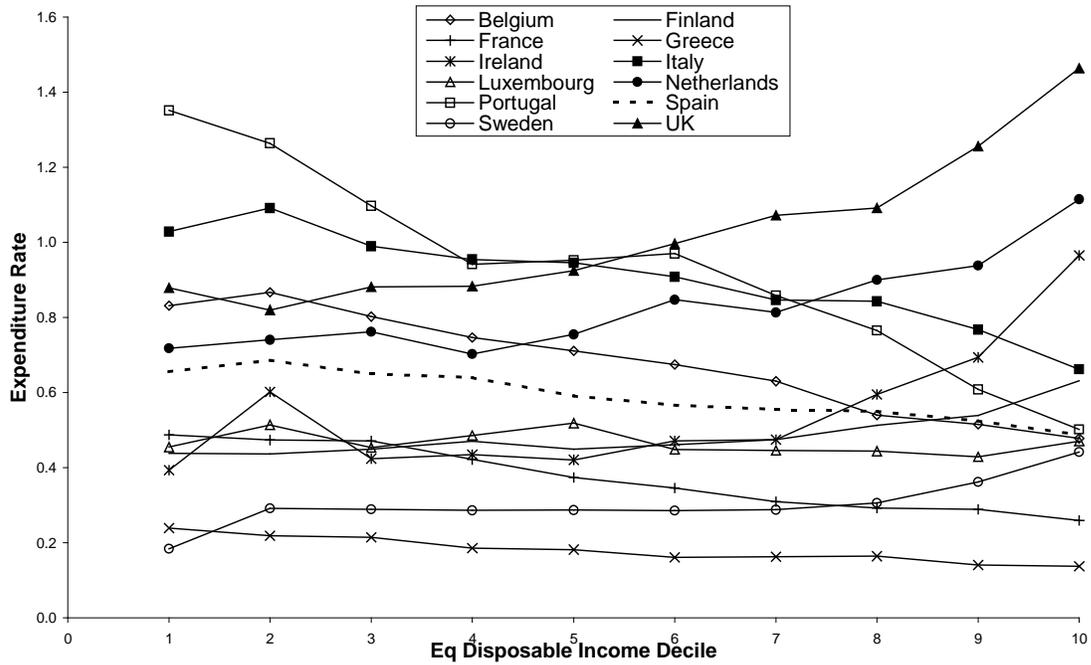
**Figure E.17 Spirits**



**Figure E.18 Tobacco**



**Figure E.19 Transport**



**Figure E.20 Wine**