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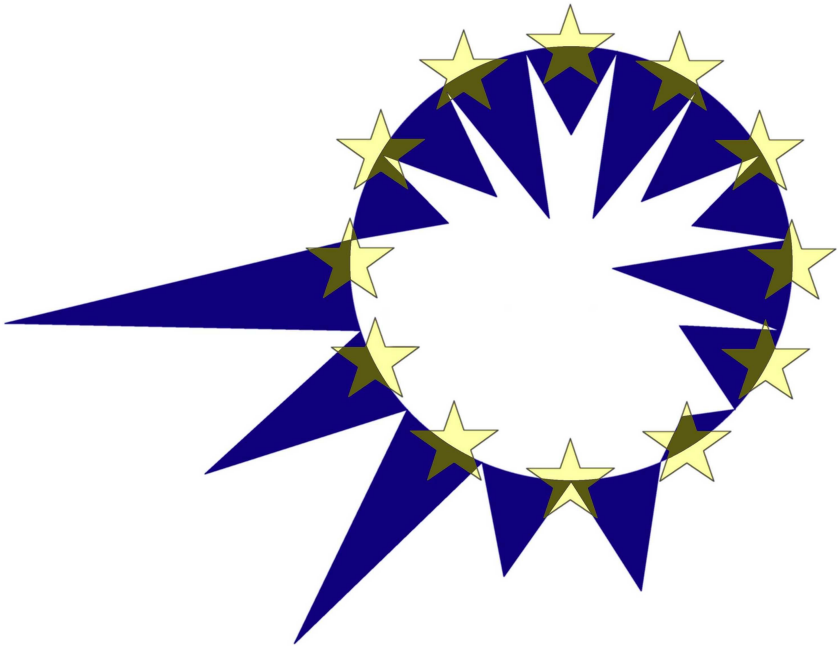

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FINAL REPORT
EUROMOD: AN INTEGRATED EUROPEAN BENEFIT-TAX MODEL

edited by
Holly Sutherland

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FINAL REPORT

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EUROMOD: an integrated European Benefit-tax model

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Final Report

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Abstract

The aim of the project was to build EUROMOD, a tax-benefit microsimulation model covering all 15 Member States of the European Union. This has been achieved, and baseline results are available for 14 countries. (Validated results for Sweden will appear shortly.) EUROMOD has been used for a number of policy-related exercises ranging from studies of the relationship of public spending on social benefits to poverty and the implications of a common European minimum pension, to the impact of welfare benefits on work incentives and the consequences of non-indexation of taxes and contributions. In addition, the model is ready to be used for a wide range of new applications. Not only can it be used to explore the impact of prospective (and hypothetical) changes in social and fiscal policy on poverty and inequality; it can also estimate the cost of reforms, provide options for financing mechanisms, and establish the effect of the reforms in other dimensions such as the work incentives of household members and any implied redistribution within the household. In many ways, EUROMOD is ahead it its time. When the project first started in 1998 (and when the idea was first conceived in 1996) the priorities set at the Lisbon European Council could not have been fully anticipated. It is now clear that the project was timely. EUROMOD is ready to play a role in analysing changes in social and fiscal policies proposed by Member States with reference to agreed benchmarks for the reduction of poverty and social exclusion.

The project final report describes in some detail the process of model construction. It was a very complex project that was more demanding for all concerned than could have been anticipated. In some respects it was more akin to an engineering enterprise than a social science research project. In building EUROMOD, particular emphasis has been placed on

- transparency of methods: it is therefore open to critiques of the approach as a whole, as well as criticism and suggestion on matters of detail;
- designing a model that is flexible and adaptable: to make the range of uses as wide as possible and to maximise the length of its useful life;
- consistency and comparability across countries: developing harmonisation of methods, assumptions and input and output concepts is a major part of building an integrated European model.

Concretely, it involved:

- identifying common structural characteristics in national policies
- identifying common data requirements
- parameterising and generalising as many aspects of the model as possible, including the definitions of the income base and unit of assessment or entitlement for each tax and benefit, the effective equivalence scales inherent in social benefit payments, and the output income measure.

This approach not only allows each system to be modelled in a manner that is comparable to existing national practice, it also provides the model user with a much greater range of choice and greater flexibility than – we believe – is available in any other existing tax benefit model.

Before the project began, the degree of experience and expertise with tax-benefit modelling in Member States varied greatly. As is well known, the tax and transfer systems also vary widely in underlying philosophy, as well as in current structure and size. The national sources of micro-data with which to build the model were not equally suited to the task. One of the project's most significant achievements is its success in bringing tax-benefit modelling capacity in all Member States up to the level of best practice in the EU.

1 Executive Summary

1.1 Objectives

1. The project was financed by the *Targeted Socio-Economic Research (TSER)* programme of the European Commission (CT97-3060). Its aim was to build EUROMOD, a tax-benefit microsimulation model covering all 15 Member States of the European Union. This involved developing an existing methodology, already in use in many individual countries, making use of national experience and expertise. The project was innovative in extending the method to cover 15 countries together in a consistent and integrated manner.

2. Tax-benefit models are based on household micro-data from representative sources. They calculate disposable income for each household in the dataset. This calculation is made up of elements of income taken from the survey data (e.g. employee earnings) combined with components that are simulated by the model (taxes and benefits). The calculations are performed once for the current system, and again for each policy change. The first round effect of the change is the arithmetic difference in the "before" and "after" calculations. Such models offer distinct "levers to pull" and "buttons to push" so that simulated changes translate directly into changes to actual policy rules that governments or other agencies can make

3. The basic output from EUROMOD is the micro-level change in household income as a result of policy changes. This provides a basis for the calculation of

- estimates of aggregate effects on government revenue
- distribution of gains and losses
- the first-round impact on measures of poverty and inequality
- differential effects on groups classified by individual or household characteristics
- effective marginal tax rates and calculated replacement rates, and changes to them
- between-country differences in the costs and benefits of reforms.

4. Either the national or the European level can be used for (a) the specification of policy changes, (b) the application of revenue constraints and (c) the evaluation of results. Thus EUROMOD is of value both in assessing the consequences of consolidated social and fiscal policies and in understanding how different policies in different countries may contribute to common objectives. It is of as much significance in evaluating national policies within a European perspective, as in evaluating policies at the level of the European Union.

1.2 The construction of EUROMOD

5. Building EUROMOD involved three main tasks:

i. establishing a micro-database for each country, containing the input variables necessary for tax-benefit calculations, together with variables to be used in analysis of model output;
ii. collection, coding and parameterisation of policy rules for 15 tax-benefit systems;
iii. testing and validation of simulated outputs from the model.

At a practical level, two further tasks were essential:

iv. design of the model framework;
v. documentation: Country Reports document the work done, by country.

Tasks (i) to (iv) are considered below.

1.2.1 Database construction

6. EUROMOD relies on micro-data at the individual level, providing information on gross incomes by source and personal and household characteristics. The main source of micro-data for each country was selected on the basis that it was (at the start of the project in 1998) the most suitable for tax-benefit modelling and was available to the project.

7. Different types of data source have distinct advantages and limitations for tax-benefit modelling. Some of the national data sources have been used for many years as the basis for national tax-benefit models and may indeed have been developed with that purpose in mind. Others, such as the European Community Household Panel (ECHP) are new in this context and significant work had to be undertaken to make it suitable for the purpose. Five countries use waves of the ECHP (Austria, Denmark, Greece, Portugal and Spain). Five additional countries use waves from national panel studies (Belgium, Germany, Ireland, Luxembourg and the Netherlands). Italy uses a special income survey and France and UK use income data from household budget surveys (based on random samples). Sweden and Finland use register data based on administrative records, combined with some survey data.

8. The main issues relating to quality and comparability of the chosen datasets are:
- definition of the "household"
- exclusions from the samples
- response rates, non-response biases and re-weighting
- unit missings and item non-response
- under-reported income and aggregate comparisons.

These are discussed in some detail in the main report. Two general guidelines were distilled from the project team's investigations into comparisons of data quality and considerations of principles to follow and methods to use in any adjustments that might be made:
- The EUROMOD project should not consider itself responsible for the quality of the data that it makes use of. Thus adjustments should be confined to those that are tried-and-tested and which are accepted by national statistical institutes.
- Adjustments to "improve" data quality should not be the choice of the model user.

9. As far as possible, common variables were defined for each country and a minimum possible number of country-specific variables were added to the database. Updating factors were applied to monetary variables to adjust them from the year in which the data were collected to a common year for policy simulation (1998).

10. As well as inputs into direct tax and benefit simulation, two other types of information were added to the "core" database. These are imputed ***household expenditure*** variables, to allow the simulation of indirect taxes and ***indicators of risk of social exclusion***, to allow these to be used as classifying variables in the analysis of output. Methods of imputation of these two types of variable are summarised briefly below.

11. Expenditure imputation and indirect taxes[1]

Except in the case of the UK and France, expenditure information is not included in the national datasets chosen to be the EUROMOD core database. A regression method was used to produce estimated parameters predicting expenditure shares for a set of 17 common categories of goods corresponding to the standard system of classification of goods and services used by Eurostat, using household budget survey (HBS) data. Estimation made use of variables common to both HBS data and the EUROMOD database (including household income, demographic variables and car ownership). The estimated parameters were then used to impute expenditures into the EUROMOD database.

12. The main national indirect taxes (VAT, Excise duties and Ad-Valorem taxes) can be simulated. In some cases a given category of expenditure will include goods with differing tax treatments. An average tax rate for each category in each country has been calculated, making use of national information on the proportions within each group that are taxed in each way.

13. Indicators of risk of social exclusion[2]

EUROMOD is best suited to the calculation of indicators based on current income concepts, particularly in relation to changes in these indicators. However, there is also an interest in being able to assess policy changes in terms of their relative impact on people who are at risk of social exclusion. The circumstances of people most at risk are identified using the European Community Household Panel (ECHP), making use of explanatory variables that are common to ECHP and the EUROMOD database. The indicators estimated cover the risks of exclusion in the fields of Living Conditions, Necessities of Life and Labour Market. Indicators can then be imputed into the EUROMOD database, using the estimated parameters.

1.2.2 Simulation of policy rules

14. The main output from EUROMOD is a measure of Household Disposable Income (HDI). The precise definition of this concept can be chosen by the model user, but contains the following broad components: wage and salary income *plus* self-employment income *plus* property income *plus* other cash market income and occupational pension income *plus c*ash benefit payments *minus* direct taxes and social insurance contributions.

15. There is a separate but related issue of the sub-set of income components that can be modelled - and hence the policy issues that may be addressed. It is helpful to think of three "levels":

i. elements that are *covered* by the model - components that may be added, subtracted or ignored in the output income measure (e.g. income from property).
ii. elements that may be *modified* in the model - "part simulated" - (e.g. a social insurance unemployment benefit).
iii. elements that are fully *simulated* by the model - (e.g. income tax.).

[1] For more information, see Baldini M, D Mantovani, C O'Donoghue, 2001, "Expenditure imputation and indirect tax simulation in EUROMOD", EUROMOD working paper EM7/01

[2] For more information, see Papadopoulos F and P Tsakloglou, 2001 "Indicators of Social Exclusion in EUROMOD", EUROMOD working paper EM8/01.

16. The only reason for placing an income element in Level (i) rather than (ii), or in Level (ii) rather than (iii) is on pragmatic grounds. There are two distinct pragmatic issues: (a) whether sufficient data are available and (b) whether the element is of sufficient significance ***at the European as well as national level*** to be worth the effort. In building an EU model with comparability as one of its main objectives, some difficult questions of both principle and practice arise. Generally, the elements of the system that are possible to simulate with available data have been simulated; those that are difficult (and are also components of HDI) have been taken directly from the data. This does mean that the scope of the model differs across countries. Furthermore, in some countries, EUROMOD does not attempt to simulate all the details that are the focus of national models. EUROMOD may be more comprehensive than a national model, or it may be less so. Generally speaking, the following instruments are simulated in all countries:

- Income taxes (national and local)
- Social insurance contributions (paid by employees, employers and the self-employed)
- Family benefits
- Housing benefits
- Social assistance benefits and other income-related benefits.

The following instruments are ***generally*** not simulated (for exceptions, see Country Reports):

- Capital and property taxes
- Real estate taxes
- Pensions and survivor benefits
- Contributory benefits
- Disability benefits.

1.2.3 Model design and implementation

17. The model design strategy concentrated on finding common features across countries throughout the model construction process. In practice this involved:

- identifying common structural characteristics in national policies
- identifying common data requirements
- parameterising and generalising as many aspects of the model as possible. These include:
    i. the income base for each tax and benefit,
    ii. the unit of assessment or entitlement for each tax and benefit,
    iii. the effective equivalence scales inherent in social benefit payments,
    iv. the output income measure.

18. This approach not only allows us to model each national system in a manner that is comparable to existing national practice, it also provides the model user with a much greater range of choice and greater flexibility than is customarily available in national models or – we believe – in any other existing tax benefit model.

19. For the simulation framework to be valid across many countries features of tax-benefit systems had to be conceptualised and then operationalised. A hierarchical structure was devised in which each tax-benefit **"system"** is made up of individual "**policies"** - the

elementary collections of tax-benefit instruments such as income taxes, social insurance contributions and social assistance benefits. The "**policy spine"** is a list of policies indicating the sequence by which they are applied in the tax-benefit system. At the lowest level is the tax-benefit "**module"**, which performs the calculation of a certain part of the tax or benefit (e.g., a deduction, or applying a rate schedule to a tax base) on each fiscal unit. The modules represent the elementary building blocks of the tax-benefit system: Only the modules contain actual tax-benefit rules. All other levels are only necessary to structure these rules and apply them in the correct sequence.

20. The programming language used is C/C++. Both the input micro-data and the model's micro-level simulation results are stored in Microsoft Access. Input and output data are stored in two separate databases so that the input micro-data can remain "read-only". All parameter lists are stored as spreadsheet tables (using Microsoft Excel).

21. At the output stage EUROMOD produces micro-level variables according to the requirements specified by the user. Typically, for each policy regime the model will produce a measure of household disposable income plus other variables needed for the particular analysis. Due to EUROMOD's flexible structure, any variable from the input database and any variable calculated by the model and output by the **"policies"** can be included in the output database. The output need not be at the household level - the unit of analysis can be any identifiable group of individuals within the household. This type of disaggregated output allows the user to calculate a wide range of statistics, according to the purpose and their own preferences. However, there are two problems.

22. First, data access restrictions do not allow access to some micro-datasets, except in the co-ordinator's institution in Cambridge UK. This means that to analyse output for those countries, the hands-on user must travel to Cambridge and carry out all the analysis there. Under the terms of the micro-data access contracts, they could take away aggregated output statistics, but not the micro-output itself. This is not always convenient or appropriate.

23. Secondly, analysis of micro-data is a complex and time-consuming task. Many applications of EUROMOD will require a common core set of output statistics that are often used in tax-benefit simulation studies. Construction of a "standard" output module not only saves time for most users, they can also rely on it to have been tested and to produce correct calculations that are robust and consistent across different applications.

24. Although a standard output routine cannot anticipate all potential user needs - and therefore does not entirely solve the data access problem - it does reduce the significance of the constraints imposed. The current version of the standard output routine can produce a range of commonly-used summary statistics according to quite a flexible, parameterised set of choices. As it stands, it forms the basis of a more comprehensive output module that can be developed and extended as needs and resources permit. Currently the output program supports the computation of quantile groups, inequality indicators, poverty indicators and summary statistics and tabulations for any variable in the output database.

1.2.4 Testing and validation

25. Three types of checks were made. The first was designed to ensure that policy rules were coded correctly. An initial step consisted of simple plausibility checks on the amounts of taxes and benefits relative to original income and household size. Then, in some cases comparisons were made on a case-by-case basis with comparable calculations from a national model. Where this was not possible, calculations for hypothetical households were checked "by hand". Complex hypothetical households were designed specifically to test the implementation of the details of the national system.

26. The second stage of validation is to run the data through the model and compare aggregate output statistics with corresponding independent statistics for 1998. An example might be to compare the number of fiscal units paying income tax with corresponding information from tax administration statistics. In principle, discrepancies can be attributed to one or more of the following:

i. the policy code is incorrect in some way
ii. the underlying data do not support accurate simulation of the policy instrument
iii. changes between the data year and the policy year have not be adequately captured
iv. the EUROMOD statistic and the external statistic are not comparable.

27. National expertise and experience were called on to attribute explanations to discrepancies and to devise solutions, if any were feasible, while maintaining comparability across countries. These are documented in the Country Reports.

28. A further part of the baseline validation exercise was to compare income distribution and poverty statistics from EUROMOD with other sources for 1998. These "other sources" are unlikely to be strictly comparable. Although some features (such as equivalence scale and unit of analysis) can be aligned, many others cannot. In particular in most cases the independent statistics were based on recorded data rather than using updated and simulated components of income. Thus one would not expect identical results. The aim was to show that EUROMOD baseline results were broadly in line with other sources and hence that EUROMOD could be reliably used as the basis for simulation experiments with policy changes. In particular the *ranking* of countries in terms of poverty and inequality statistics - known as "cross-country validation" - is an important component of the baseline validation of EUROMOD. Table 1.1 shows the Gini co-efficient and the poverty rate for 14 out of 15 countries. (Validated results are not yet available for Sweden.) Corresponding estimates from the ECHP are provided for comparison.

29. The third stage of the model validation process is to compare the results of simulated policy *changes* with estimates obtained independently. This relies on having access to national models or published national model output, together with information about exactly how the estimates were obtained. However, even without this information, any use of EUROMOD which involves simulating changes to policy contributes to the testing and validation process. Implausible or unexpected results indicate that errors or problems with the underlying data may persist. Exercises in policy analysis that have been carried out using early versions of EUROMOD are summarised in the next section.

Table 1.1 EUROMOD income inequality indicators and poverty rates

	EUROMOD 1998		ECHP 1996	
	Gini	Poverty Rate %	Gini	Poverty Rate %
Austria	0.25	11.3	0.26	13
Belgium	0.24	14.8	0.28	17
Denmark	0.24	11.1	0.23	12
Finland*	0.23	9.4		
France	0.28	11.8	0.29	16
Germany	0.28	13.5	0.28	16
Greece	0.33	20.3	0.34	21
Ireland	0.33	18.0	0.33	18
Italy	0.34	19.9	0.33	19
Luxembourg	0.26	11.8	0.28	12
Netherlands	0.25	9.9	0.30	12
Portugal	0.36	21.9	0.37	22
Spain	0.32	18.5	0.33	18
Sweden*				
UK	0.31	20.0	0.34	19

Source: EUROMOD and Eurostat (2000).
Notes: -The poverty rate is percentage of persons in households below the poverty line which is defined as 60% of national median equivalised household disposable income. The equivalence scale is the "modified OECD". No adjustments are made for differences in purchasing power between or within countries.

* EUROMOD results for Sweden are not yet available. ECHP estimates do not include Finland or Sweden.

1.3 Using EUROMOD

30. EUROMOD is better-suited to analysing some types of policy and policy change than others. Since it is a static model, designed to calculate the immediate, “morning after” effect of policy changes, it neither incorporates the effects of behavioural changes (i.e. behaviour does not change) nor the long-term effect of change. Thus it is not the appropriate tool for examining policy that is *only* designed to change behaviour, nor for policy that can only have its impact in the long term (e.g. some forms of pensions policy). It is best-suited to the analysis of policies that have an immediate effect and which depend only on current income and circumstance. This is not because we believe that these are the only policies of interest. This first attempt at a multi-country microsimulation model deliberately excludes the possibility of incorporating estimated behavioural responses, simply on feasibility and practicality grounds. A static model is useful without estimated behavioural responses; a model incorporating behavioural change also requires the existence of a static tax-benefit calculation framework. (At the same time it should be noted that EUROMOD does have the capacity to calculate marginal effective tax rates and replacement rates. Thus it is possible to produce indicators of changes to work incentives following a policy change, if not to estimate whether any behavioural change in fact takes place.)

31. EUROMOD is limited to simulating policies which depend on variables that are present in the underlying database. This does not (generally) include information on social insurance

contribution histories. Thus it is not possible to fully simulate social benefits that are contributory. For some social benefits (mainly short-term benefits such as for unemployment) it is possible to simulate the size of the benefit, given eligibility based on the data showing benefit receipt. For other instruments depending on contributions - notably pensions - this "partial simulation" is not possible. Too many dimensions of most pension calculations depend on information not available in the data. It should be made quite clear that the fact that social assistance benefits for pensioners may be fully simulated, but not the main contributory pension, does not indicate that we think the social assistance element is more important, or a more interesting topic of study, than the contributory component.

32. The issue of what is possible to simulate becomes more significant when simulations for more than one country are required. The proportion of national systems that can be simulated (and hence addressed) by EUROMOD varies considerably across countries. This is simply a limitation of the data on which we depend, combined with the nature of existing tax-benefit systems, not a choice we have made. That the model's focus on currently-determined taxes and benefits is due to technical considerations rather than chosen on grounds of policy or politics should be made clear to the end-users of EUROMOD policy analysis.

33. The capacity of EUROMOD to simulate the effects of *common* policies in EU Member States, and indeed some aspects of harmonisation of policy, raises a number of issues. First, the simulation of harmonised policy does not necessarily mean that the analyst is proposing such harmonisation. The exercise may just as easily be used to highlight the extent and nature of differences between current systems, or to demonstrate the disadvantages, as to make claims for the benefits of harmonisation. Most usefully, it may be used to illuminate the issues - particularly relating to within- and between- country distributional aspects - that need to be addressed when considering the convergence of some types of policy or the best way of achieving common objectives in differing national situations. The purpose of a microsimulation study is not only to answer questions but also to raise them.

1.3.1 Applications of EUROMOD

This section summarises some of the uses of EUROMOD to date. These provide a flavour of the types of analysis that are feasible, but by no means show the full range of possibilities.

34. Child poverty and child benefits in the European Union[3]

The extent to which differences in child benefits explain the very different levels of child poverty in the Netherlands and the UK is examined, and the effect of "swapping" child benefit systems between the two countries is explored. Some scope for improvements is found through looking beyond national borders. We conclude that the poverty-reduction properties of universal child benefits may be improved without resorting to means-testing or compromising the other functions of these benefits.

[3] Immervoll H, H Sutherland and K de Vos, 2000, "Reducing child poverty in the European Union: the role of child benefits", in Vleminckx K, and T M Smeeding, (eds.), *Child Poverty, Child Well-being and Child Policy in Modern Nations: What Do We Know?*, The Policy Press, Bristol.

35. A European Social Agenda: Poverty Benchmarking and Social Transfers [4]

The European countries which perform best in terms of reducing poverty tend to have higher social spending. Such statistical performance indicators need to be accompanied by evaluation of the relationship between policy instruments and poverty reduction, showing the trade-off between poverty reduction and social spending at the level of individual policies. Illustrative estimates using EUROMOD suggest that employing universal social transfers to reduce a country's poverty rate from the EU-average of 18% to the best-performing average of 12% would necessitate an increase in social transfers of some 2% of GDP. More targeted schemes may allow sizeable expenditure savings but at the cost of increased disincentives; the design of Europe's social agenda has to confront well-known issues of economic trade-offs; economic and social policy cannot be divorced.

36. Reducing Child Poverty in Europe: what can static microsimulation models tell us?[5]

The relationships between child poverty and the scale of cash benefits and tax concessions targeted on children are explored for four countries of the European Union: Denmark, France, Spain and the UK. It is found that child poverty can be highly sensitive to the scale of the existing tax-benefit system for children. Expansion of this system has a particularly strong effect in reducing child poverty for the UK, which starts with very high rates of child poverty and also has a system that relies to a large extent (but not exclusively) on means-tested assistance. The French system overall is less targeted on poor children (due to generous family tax concessions), but is able to reduce child poverty by a third with an expansion of the child components in the system of 28%. Child poverty is less responsive to the Danish and Spanish systems. In Spain, the 1998 system simply makes little difference to the incomes of poor households with children. In the case of Denmark, the child poverty rate is already low and below the general rate. Increasing the generosity of the system for children does reduce child poverty, but appears to leave a small minority of children unprotected.

37. Microsimulation of Social Policy in the European Union: Case Study of a European Minimum Pension[6]

The implications for poor pensioners of setting a European Minimum Pension (EMP) are explored for 6 countries. The analysis shows that the composition of the bottom of the combined income distribution is sensitive to assumptions about the comparability of purchasing power across countries and about the treatment of households of different types. We conclude that the formulation of policy for the protection of Europe's poorest people requires an appreciation, not only of the composition and location of this group, but also of the assumptions that have been used to identify it. Aspects of the EMP proposal are identified which need further specification, such as the nature of the interaction of the EMP with existing national pension systems, and with national redistributive systems in general, and the choice between different treatments of the unit of assessment of pension income.

[4] Atkinson A B, 2000, "A European Social Agenda: Poverty Benchmarking and Social Transfers", EUROMOD Working Paper EM3/00.

[5] Sutherland H, 2001, "Reducing Child Poverty in Europe: what can static microsimulation models tell us?", EUROMOD Working Paper EM5/01

[6] Atkinson A B, F Bourguignon, C O'Donoghue, H Sutherland and F Utili, forthcoming, `Microsimulation of Social Policy in the European Union: Case Study of a European Minimum Pension', in *Economica.*

38. The Impact of Tax-Benefit Systems on Low Income Households in the Benelux Countries. A Simulation Approach Using Synthetic Datasets[7]

Abstracting from the complexities of actual populations, the mechanics of social and fiscal policy instruments in the Benelux countries are analysed by applying them to a large set of 'synthetic' households. The particular focus is on low income households in order to evaluate the potential impact of the three countries' tax-benefit systems on poor households of different types. Two main conclusions are drawn. First, the analysis of poverty implications of policy reforms may be very sensitive to the exact definition of the poverty line. Hence, sensitivity analyses are essential. Second, minimum income schemes often appear to ensure incomes that are above or very close to the poverty line. The fact that in reality, substantial parts of the population live in poverty despite the existence of minimum income schemes indicates that there may be important determinants of poverty that analyses of the formal incidence of transfer incomes cannot address perfectly. These include issues of non-take-up of benefits as well as authorities' discretion with respect to benefit eligibility and/or amount.

39. Fiscal Drag[8]

Inflation can alter the structure of tax systems and lead to higher real tax burdens. The 'automatic stabiliser' argument assumes that increasing tax burdens reduce consumption and thereby aggregate demand, acting as an automatic stabiliser which helps to 'cool down' the economy in times of inflation. This argument, however, only looks at the demand side, ignoring any effects that higher tax burdens may have on the cost of production. If employees bear less than the full burden of higher taxes then real labour costs will go up as well, generating a cost-push upwards pressure on prices and opening up the possibility of a wage-price spiral. EUROMOD is used to derive distributions of inflation-induced changes in effective tax rates in four European countries. For illustrative purposes, the simulated changes in the marginal and average tax burdens of employees are then combined with estimates from the literature on the sensitivity of wages with respect to these variables. The results suggest that inflation combined with an un-indexed tax-benefit system can produce a moderate upward pressure on wages.

40. Welfare Benefits and Work Incentives: An Analysis of the Distribution of Net Replacement Rates[9]

Replacement rates are calculated for Denmark, France, Spain and the UK by simulating, for each relevant individual in each household in turn, the household disposable income for their original state (in-work, inactive or unemployed) and then changing their status to the counterfactual state (unemployed, in-work and in-work respectively), and then recalculating household disposable income. For those currently in work, France was found to have the highest incidence of 'high' replacement rates, followed by Spain, Denmark and the UK. For those who are unemployed, a very different distribution of replacement rates was found,

[7] Berger F, M Borsenberger, H Immervoll, J Lumen, B Scholtus and K De Vos, 2001, "The Impact of Tax-Benefit Systems on Low Income Households in the Benelux Countries. A Simulation Approach Using Synthetic Datasets" EUROMOD Working Paper EM3/99

[8] Immervoll H, 2000, "Fiscal Drag - An Automatic Stabiliser? A Multi-Country Study Using Microsimulation", DAE Working Paper 0025, University of Cambridge; Immervoll H, 2000, "The Impact of Inflation on Income Tax and Social Insurance Contributions in Europe", EUROMOD Working Paper EM2/00

[9] Immervoll H and C O'Donoghue, 2001, "Welfare and work incentives: the distribution of net replacement rates in Europe", EUROMOD Working Paper EM4/01

which was much more similar across countries. For those currently in work, women and young people are likely to have higher replacement rates in all four countries, because they are likely to have lower earnings. The existence of other household members' earnings is an important explanation of high replacement rates. For those with high replacement rates, spouses' incomes are often a more important component of income than benefits. Thus the replacement rate is not necessarily a good indicator of the effect of the tax-benefit system on work incentives. Another measure - the tax-benefits-to-earnings ratio (TBER) - is defined as the change in taxes and benefits when made unemployed compared to the loss in earnings. In Denmark, France and Spain, unemployment benefits are the most important determinant of the TBER, while in the UK, where unemployment benefits are flat rate and of short duration, social assistance benefits are more important and housing benefits play a role as well.

41. The Impact of Means Tested Assistance in Southern Europe[10]

Despite structural difficulties, a renewed emphasis on selectivity and targeting has in recent years led to major policy innovations in southern Europe in the field of social assistance. This is typified by the spread of minimum income programmes, in Spanish autonomous communities, in Portugal and as a pilot in Italy. The analysis focuses on Greece, Italy, Portugal and Spain. France is also included for comparative purposes and because many of the systems used in these countries as well as planned reforms are modelled on the French system. The performance of means-tested social minima is examined under a number of headings: (a) the existing level of poverty in the countries and the impact of social assistance in reducing poverty, (b) the distribution of expenditure on social assistance across the income distribution, and (c) the efficiency of social assistance as a poverty alleviation measure.

1.4 Technical issues

42. A number of technical problems arose during the course of the project, relating to comparability across countries of inputs to and outputs from the model. These are:

- the reference time period
- imputation of gross incomes
- tax evasion and non-takeup of benefits.
- updating the database
- point in time of simulations
- benefit imputations

43. These are problems which do not have single, short-term solutions for all countries. Interim, second-best solutions have been adopted. These are summarised below for the first three issues, which are judged to be the most important. In the longer term, better methods may be found, but in some cases these will depend on changes in the practice of collecting and disseminating household/personal micro-data.

[10] Albuquerque J, M Balidini, O Bargain, P Bosi, H Levy, D Mantovani, M Matsaganis, M Mercader Prats, C O'Donoghue, C Farinha Rodrigues, A Spadaro, S Toso, I Terraz, P Tsakloglou, 2001, "The impact of means tested assistance in Southern Europe", EUROMOD Working Paper EM6/01.

1.4.1 The reference time period

44. The original data used for deriving the EUROMOD database refer to different time periods in different countries. Income is most commonly available on an annual basis, but in some countries the reference period for some sources of income is as short as a week. At the same time, elements of tax-benefit systems depend on income assessment over a range of periods; typically a year for income tax; month or week for social assistance and social contributions.

45. Ideally EUROMOD would use both annual information and information for 12 separate months for each country so that (a) there could be a choice of time period for the income output and (b) the most appropriate time periods could be used for each instrument. But this is not the case for any country and a tractable compromise has been reached based on a balance between three considerations: (i) data availability, (ii) the time period requirements of each policy instrument and (iii) comparability across countries.

46. Annual income (for convenience, divided by 12) was chosen as the common reference period. This fits best with the requirements of income tax simulation in all countries and least well for social assistance and social contributions where these depend on income over a shorter period. However, annual income is not available in two countries (Ireland and the UK) and the use of income from a shorter period for these not only implies some inaccuracy in income tax simulation, it also introduces some inconsistency across countries in the simulated components of income and in the income concept as a whole.

47. In the longer term there is scope for a dedicated project on this issue. It is likely that such a project would recommend changes in income micro-data collection practice.

1.4.2 Imputation of gross incomes

48. One of the most important inputs into EUROMOD is individual level information on gross incomes by source. However, many of the sources of input micro data used by EUROMOD only contain income net of income taxes and/or social insurance contributions and do not also include variables on taxes and contributions. Gross incomes were imputed in nine countries.

49. An iterative approach was used. For each household in the data where net incomes are recorded, this approach 'tries' different levels of gross incomes. For each 'provisional' gross income which is being 'tried', in a next step all relevant tax and contribution rules are applied and simulated taxes and contributions are subtracted from gross income to arrive at a simulated net income. It is then possible to compare whether the resulting simulated net income is a good approximation of net income as recorded in the original data. If it is, then an approximation of gross income has been found.

50. For three countries (Austria, Greece and Luxembourg) EUROMOD itself was used to implement the approach. Among the features of the EUROMOD algorithm is the ability to

distinguish between different individuals in the same household. In addition, it is possible in certain cases to produce different net-to-gross ratios for different income components.

1.4.3 Tax evasion and the non-takeup of benefits

51. Application of tax and benefit rules does not necessarily result in an accurate representation of the taxes paid and benefits received. Rules may not be adhered to. In the case of tax, income may not be fully declared to the authorities. In the case of benefits, lack of information or a sense of shame may inhibit entitled people from claiming. It is likely that both these issues apply to some extent in all countries. However, they may be more important in some countries than in others, due to the nature of the system and its administration on the one hand, and prevailing social norms about rights and responsibilities regarding benefit entitlement and tax payment on the other. In some countries a significant problem is recognised (for example in relation to tax evasion in Italy and Greece, and in relation to non-takeup of certain benefits in Ireland and the UK).

52. Model results can either reflect what is intended by the system, or what actually occurs. If we are interested in the first option then the problems are fewer. For pragmatic reasons, this is largely the approach that has been taken in the first version of EUROMOD.

53. In practice, the simulation of some benefits in some countries, applying non-discretionary rules, gives rise to an over-estimate of benefit recipients and the aggregate cost of the benefit. In some cases the over-estimate is very large. There is a distinction to be made between non-receipt that is intended by the system (for example, where individual discretion is an integral part of the decision-making process in benefit administration) and non-receipt that can be seen as a failure of the system. The Country Reports for Ireland and the UK explain that some benefits in these countries do appear to fail to reach some people for whom they are intended. In most other countries, the shortfall in actual receipt compared with modelled receipt is believed to be mainly due to it not being possible to reproduce part of the claim or entitlement procedure using deterministic rules. In these cases, in order not to over-estimate these benefits, entitlement is modelled by making it conditional on recorded receipt in the data.

54. The issues of take-up and evasion are important both from a policy point of view and in relation to the accuracy of EUROMOD results compared with other statistics. They will be pursued in later work.

1.5 Conclusions: project achievements and the future of EUROMOD

55. Before the project began, the degree of experience and expertise with tax-benefit modelling in Member States varied greatly. As is well known, the tax and transfer systems also vary widely in underlying philosophy, as well as in current structure and size. The national sources of micro-data with which to build the model were not equally suited to the task. Just as the starting points were not the same, neither the current state of play nor the route by which it was achieved is the same across countries.

56. The project was not like a typical research network. The timing of delivery of components was much more critical than is usually the case in the cross-national activities that EUROMOD participants are accustomed to. Thus in some respects the project was more akin to an engineering enterprise than a social science research project. However, it is also the case that the specification of the components needed discussion, clarification and revision at each stage. It was a very complex project that was more demanding for all concerned than could have been anticipated.

57. The project's most significant achievement is its success in bringing tax-benefit modelling capacity in all Member States up to the level of best practice in the EU. As well as the production of an EU-wide model, a by-product has been improvements in national models and modellers' skills due to the intensive and extensive interactions within the project team.

58. At the same time, we have identified some key areas for improvement:

- Incomplete ***take-up of benefits*** is a key issue that, at a technical level, needs further attention in EUROMOD. It is also an important policy issue. People who fail to receive benefit payments to which they are entitled, because of insufficient information or fear of stigma must be among the most likely to be at risk of social exclusion.
- Lack of comparability across national results due to differing ***reference time periods*** is a technical issue that cannot be fully resolved with existing data.
- Some of the most important components of the EUROMOD database rely on imputation. Until ***gross incomes, fully disaggregated by source*** are available for all countries EUROMOD results are subject to the errors introduced by imputation.

59. In many ways, EUROMOD is ahead it its time. When the project first started in 1998 the priorities set at the Lisbon European Council could not have been fully anticipated. It is now clear that the project was timely. EUROMOD is ready to play a role in analysing changes in social and fiscal policies proposed by Member States with reference to agreed benchmarks for the reduction of poverty and social exclusion.

60. The EUROMOD construction project represented investment in research infrastructure. The model has only just started to be useful at the end of the project. Most of its potential lies in uses in 2001 and beyond. The explicit aim of the project was to build a core model that will be able to be used as a framework for many other projects. This core model not only has the capacity and scope to support numerous applications; it has the potential to form an essential component of more elaborate models. The model was designed as the basis for a wide range of research projects over many years. Types of possible analysis include:

- simulating the impact of actual (or proposed) policy changes in order to (i) predict the effect of actual reforms in advance of contemporary micro-data becoming available or (ii) isolate the effect of tax-benefit policy changes from other influences
- designing policy to meet specific targets, and for setting feasible targets
- using equivalent simulations in different countries to explore and compare the distributional and other characteristics of national tax-benefit systems or components of them.

Longer term developments could include:

- Development of new databases (e.g. using the new Eurostat instrument, EU-SILC)

- Incorporation of greater sophistication in the representation of economic relationships, via the modelling of individual behavioural responses (e.g. in relation to labour supply) and/or macro-economic adjustments.

61. Of course, EUROMOD will need maintenance on a continuous basis if the policy rules are to be kept up-to-date and the underlying database refreshed with recent micro-data. The EUROMOD team intends to ensure that the model is maintained and that the necessary skills to carry out these tasks are encouraged and supported.

62. In considering future use of the model, it is helpful to remember that there are three types of "use": (i) hands-on use of the model itself, (ii) using results of simulations done by others, and (iii) using or re-using information contained in papers that include EUROMOD results. These distinctions are critical in relation to permission to access the underlying micro-data. As things stand, the EUROMOD team have secured 11 separate contracts to access the micro-data, each of which specifies a different set of conditions. In this context, the most restricting are those that specify a particular physical location for the data (in Cambridge) and those that limit access to a particular set of people (those named as members of the EUROMOD team). This means that hands-on users of EUROMOD must be members of the team. For the use of some datasets (those of Belgium, Finland, Ireland, the Netherlands and Sweden) they must visit Cambridge to carry out simulations for the corresponding countries. Alternatively, they must negotiate their own individual data access contract.

63. To summarise, the plan is:

- To continue developing EUROMOD and using it: the model could be useful for decades.
- To re-new the database with later waves of survey data as is deemed appropriate and as resources permit.
- To use the model as a research tool for scientific purposes and to aid decision-making.
- To facilitate access to the model by all members of the EUROMOD team.
- To continue to develop good working relationships with the providers of the original datasets and to keep them fully informed of all relevant activities; to attempt to negotiate more appropriate data access conditions.

2 Background and objectives of the project

The aim of the project was to build a tax-benefit microsimulation model - called EUROMOD - covering all 15 Member States of the European Union. This involved developing an existing methodology, already in use in many individual countries, making use of national experience and expertise. The project was innovative in extending the method to cover 15 countries together in a consistent and integrated manner.

Tax-benefit models are based on household micro-data from nationally-representative sources. They calculate household disposable income for each household in the dataset. This calculation is made up of elements of gross income taken from the survey data (employee and self-employment earnings, investment and other capital income, occupational and public pensions, unemployment benefits and other non-means-tested benefits) combined with elements of income – taxes and benefits - that are simulated by the model. The calculations are performed twice (or more), once for the current (or some other default) system, and again for each policy change, specified by the user. The first round effect of the change is the arithmetic difference in the “before” and “after” calculations.

The areas of policy for which changes can be simulated in this manner include family benefits, social assistance benefits and other income-tested benefits, income taxes, social contributions, some forms of property taxes and indirect taxes. These are the components of the tax-benefit system which are most commonly covered in national models. Certain changes to other elements, such as social protection benefits that depend on contributions, are also be possible to model.

Tax-benefit models are able to:

(i) capture the full range of variation of family circumstance without needing to define what is "typical" or "representative",

(ii) estimate aggregate effects on the basis of many observations from survey data that in combination are representative of the national population,

(iii) identify the effect of detailed policy measures on disposable incomes - the models offer distinct "levers to pull" and "buttons to push" so that simulated changes translate directly into changes to actual policy rules that governments or other agencies can make,

(iv) provide a distributional analysis and focus on particular socially defined groups of interest.

For more information about building and using tax-benefit models see Gupta and Kapur (2000), Mitton et al. (2000), Redmond et al. (1998) and Sutherland (1991).

The basic output from EUROMOD is the micro-level change in household income as a result of policy changes. This provides a basis for the calculation of

- estimates of aggregate effects on government revenue

- distribution of gains and losses
- the first-round impact on measures of poverty and inequality
- differential effects on groups classified by individual or household characteristic (such as gender, labour market status, region, household type etc)
- effective marginal tax rates and calculated replacement rates, and changes to them
- between-country differences in the costs and benefits of reforms.

The model focuses particularly on social and integration policies and their implications for the economic resources of people who are at risk of social exclusion. It provides estimates of the distributional impact of changes to personal tax and transfer policy, with (a) the specification of policy changes, (b) the application of revenue constraints and (c) the evaluation of results each taking place at either the national or the European level. Thus EUROMOD is of value both in assessing the consequences of consolidated social policies and in understanding how different policies in different countries may contribute to common objectives. It is of as much significance in evaluating national policies within a European perspective, as in evaluating policies at the level of the European Union.

EUROMOD is a *static* microsimulation model that generally does not attempt to capture individual behavioural responses to changes in policy. The model is based on theoretical considerations but is independent of any single theoretical perspective. This is to ensure that it will be of use for the evaluation of a wide range of policy proposals in many contexts over a long period of time. However, the model also has the potential to be used as a *platform* for particular analyses of behavioural change. Users of EUROMOD are not constrained to accept particular behavioural relationships, "hard-wired" into the model: in principle they are able to implement their own chosen approaches. (However, it should be clear that implementing *comparable* behavioural adjustments across 15 countries is not a trivial task.)

In building EUROMOD, particular emphasis has been placed on

- transparency of methods: it is therefore open to critiques of the approach as a whole, as well as criticism and suggestion on matters of detail;

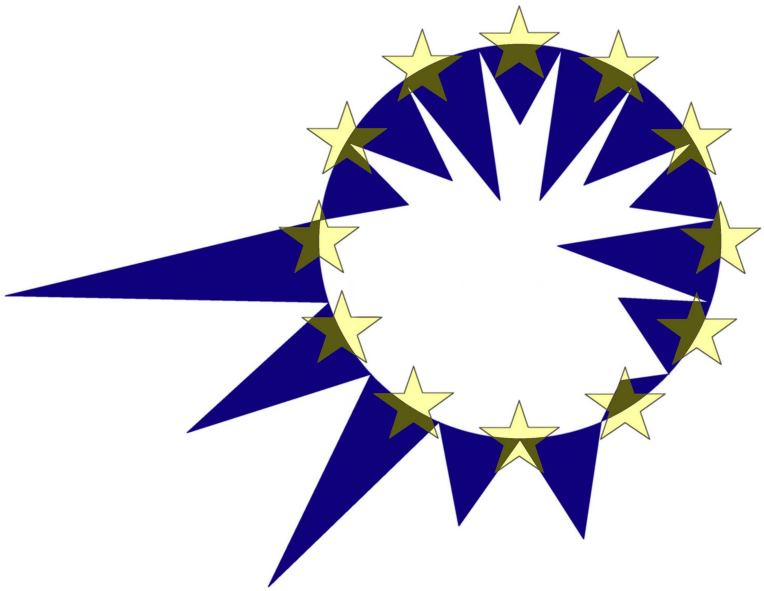
- designing a model that is flexible and adaptable: to make the range of uses as wide as possible and to maximise the length of its useful life;

- consistency and comparability across countries: developing harmonisation of methods, assumptions and input and output concepts is a major part of building an integrated European model.

2.1 The EUROMOD logo

The EUROMOD project has adopted as its "logo" an asymmetric 15-point star. This design is intended to suggest some disparity between the countries of the European Union, and is in contrast to the symmetric 12-star circle that forms the symbol of the European Union itself.[11]

In fact, our asymmetric star is based on an observed disparity that is part of the reason for building EUROMOD. This is the difference in the incidence of poverty in each Member State, in particular if poverty is defined at the European level.[12] The main motivations behind the EUROMOD project are first of all, the desire to understand the role of public policy in the patterns of poverty in Europe, and secondly to assist in developing new policies with the aim of reducing the incidence of poverty and the risk of social exclusion.



[11] The twelve golden stars represent the union of the peoples of Europe. The number of stars is not related to the number of Member States. Twelve is a symbol of "perfection and entirety".
See http://europa.eu.int/en/eu/emblem.html.

[12] The distances between the points of the star and its centre show the relative proportions of national populations falling below a EU15 poverty line, where this is defined as 50% of the European mean household disposable income. We use household micro-data from the second wave of the European Community Household Panel for all countries except Sweden and Finland for whom such data are not available. Our choice of the mean as the central measure of income (rather than the median, which is favoured by Eurostat) is designed to minimise the effort involved in integrating information for Finland and Sweden. Household incomes were measured after taxes and benefits, on an annual basis for 1994 and were converted to the common currency using 1994 PPP-adjusted exchange rates. They were equivalised using the modified OECD scale. In calculating the means and performing the headcount calculations, each household was weighted by the number of people in it. The EU15 mean was calculated by weighting the national means by the national population and dividing by the EU15 population. See Immervoll et al. (1999) for more information.

3 Scientific description of the project results and methodology

3.1 Introduction and outline

There are eight main tasks involved in model construction, listed in the box. There is a high degree of interaction between the tasks, requiring constant dialogue between members of the team and a number of iterations for most tasks. Many issues relating to comparability had to be re-visited more than once and some issues remain unresolved or a matter of continuing debate and experiment. Construction of EUROMOD should be viewed as a dynamic process which will continue for as long as the model is maintained, updated and used. Thus the version of the model that exists at the end of the project provides the basis for further development work at the same time as constituting a powerful and high quality research tool that is ready to use.

Building EUROMOD: the main tasks

For each country:

1. Creation of the input database from existing household micro-data
2. Assembly, coding, parameterisation and organisation of algorithms describing current tax and benefit rules so that, when applied to the input database, simulated values for household disposable income (and its components) may be calculated.
3. Validation of the simulation of the effect of current policy and the distribution of household disposable income against national model output or other statistics; similar validation of the estimates of the effects of policy changes.

For the model as a whole:

4. Design of software to provide an *environment* in which to build the model.
5. Definition of input, policy and output concepts that may be measured adequately using the data available and the output of policy simulations, and which provide relevant and comparable tools for use across all 15 countries.
6. An interface to the model allowing the user to access these tools, together with methods of producing a range of statistical outputs.

As essential background:

7. Technical projects assessing the representativeness of the database and exploring practical solutions to lack of comparability arising from limitations in the data.
8. Documentation: the model construction process is documented in a series of 15 Country Reports, with cross-cutting technical issues covered by other reports.

The Co-ordinator's team was responsible for Tasks 4 to 6. National teams contributed national components for Tasks 1 to 3 and 7 and 8. (See Annex II for a list of team members and institutions.) The Co-ordinator's team was also central to these Tasks, initiating discussion of strategic issues, specifying what was needed, keeping comparability in perspective, liasing with national team members and working closely with them for periods of time.

Task 1 (creation of the database) is described in section 3.2. Section 3.3 reviews the work done on data quality and comparability across countries and on the approach taken by the project to adjustments to the data (Task 7). Some technical tasks related to imputation of necessary variables are described in sections 3.8.4 and 3.8.5.

Task 2 (coding of policy rules) is described in section 3.4. The common date for policy simulation is June 1998. The method used to update the database to this point in time is described in section 3.8.1. The way in which the policy rules are organised and parameterised is explained in section 3.5.

Task 3 (testing and validation) was accomplished in a variety of ways which are described in section 3.6. One of the most stringent ways to test the model is to use it in a substantive policy application. The exercises that have been carried out to date are summarised in section 4.2 which also outlines their main policy-related findings. A comparison of baseline results across countries also provides an opportunity to assess the quality of the model. This is documented in section 3.9.

These tasks were carried out for each country. Documentation of each national tax-benefit system and EUROMOD's treatment of it is provided in 15 Country Reports (Task 8). These are listed in Annex I and are referred to throughout this report.

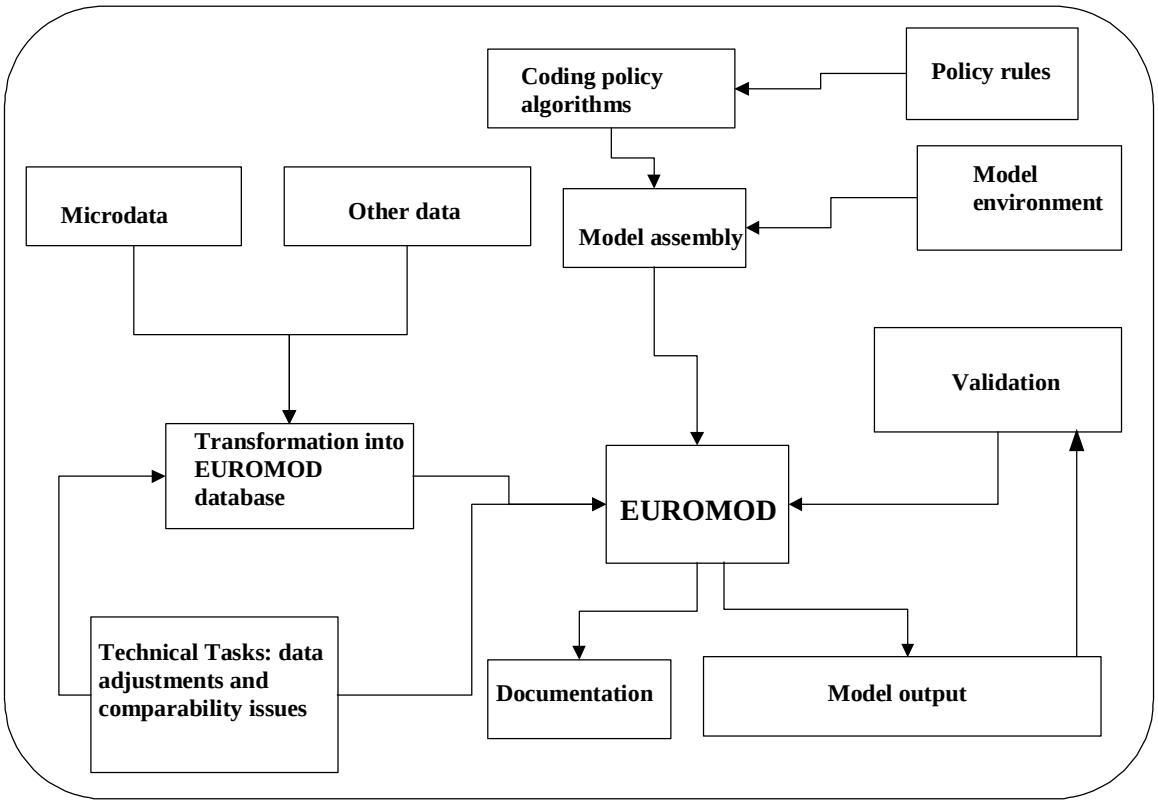
Task 4 (the model framework) is described in section 3.5 This highlights the trade-off between ease of use of the model and its flexibility. The latter quality is essential if EUROMOD is to be fully exploited and if comparable and relevant output variables are to be defined for a range of purposes. These issues (Task 5) are considered in section 3.7. The role of model flexibility in maximising comparability has meant that the development of the user interface to the model has concentrated on clarity, generality and transparency rather than special-purpose programming of graphically presented menus. Task 6 is discussed in sections 3.5 and 3.7.1.

As well as the assessment of the quality of the underlying data, Task 7 covers a range of other technical issues, most of which emerged during the course of the project and were not fully anticipated beforehand. These are covered in section 3.8.

Two further modules were built that were not so closely integrated with the rest of the tasks: (a) imputation of expenditure variables and the simulation of indirect taxes, which is described in section 3.10 and (b) construction of indicators of risk of social exclusion for use as a classifying variable, which is described in section 3.11.

Figure 3.1 summarises the relationships between the model construction tasks.

Figure 3.1 Constructing EUROMOD



3.2 Database construction

EUROMOD relies on micro-data at the individual level, providing information on gross incomes by source and personal and household characteristics and circumstance. The main source of micro-data for each country was selected on the basis that it was (at the start of the project in 1998) currently the most suitable for tax-benefit modelling and was also available to the project. The chosen sources of data are listed in Table 3.1 and more information about them is provided in Table 3.2.

It is expected that most applications of EUROMOD will use household data from these representative sources. At the same time it is recognised that individual household calculations can be a useful tool in the understanding of how tax-benefit systems work. EUROMOD also offers the option of carrying out tax-benefit calculations for a set of synthetic households, or for hypothetical households of the user's own specification. (See Berger et al. (2001) for an example of the use of this option.)

Table 3.1 Sources of micro-data for EUROMOD, by type

Country	Base Dataset	Type
Austria	European Community Household Panel	ECHP
Belgium	Panel Survey on Belgian Households (PSBH)	National Panel
Denmark	European Community Household Panel	ECHP
Finland	Income distribution survey (IDS)	Register + survey
France	Budget de Famille (BdF)	Household Budget Survey
Germany	German Socio-Economic Panel (GSOEP)	National Panel
Greece	European Community Household Panel	ECHP
Ireland	Living in Ireland Survey (LII)	National Panel
Italy	Survey of Households Income and Wealth (SHIW95)	Income survey
Luxembourg	PSELL-2	National Panel
Netherlands	Sociaal-economisch panelonderzoek (SEP)	National Panel
Portugal	European Community Household Panel	ECHP
Spain	European Community Household Panel	ECHP
Sweden	Income distribution survey (IDS)	Register + survey
UK	Family Expenditure Survey (FES)	Household Budget Survey

Permission to access to suitable household micro-data in a way that was appropriate for this project took some time and effort to negotiate successfully for all 15 countries. The nature of the project made the negotiations complex, bureaucratic and time-consuming. This is not uniformly so, and the arrangements for access to the German Socio-Economic Panel are an example of particularly good practice which appreciates the perspective of academic researchers. It is also the case that the situation regarding access is always changing. This was most noticeably so in the case of the European Community Household Panel (ECHP) data during the course of this project. Eurostat's decision to release a version of these data for scientific use has been particularly welcome.[13] More discussion of the issue of data access in relation to dissemination is provided in section 5.4 of this report. However, some of the strategic choices about model design and mode of development were strongly affected by the constraints imposed by data access conditions. As background to sections 3 and 4 of this report it is worth noting the following:

- It took some time to secure permission to access some of the micro-datasets. For example, the contract to access the ECHP was not signed until April 1999 and the contract for the French data was signed in September of the same year. Thus the project was not able to start work on the central data aspects of the model for some countries until relatively late in the project timetable.
- There are 12 separate data contracts with distinct conditions and requirements, involving a significant amount of administrative work in making sure that all of them are understood and complied with.

[13] The version made available for scientific use is known as the User Database (UDB).

- In the case of micro-data for five countries - Belgium, Finland, Ireland, the Netherlands and Sweden - the contracts specify that the datasets may only be used in the co-ordinator's institution in Cambridge.

Different types of data source have distinct advantages and limitations for tax-benefit modelling. Some of the national data sources have been used for many years as the basis for national tax-benefit models and may have been adapted or developed with that purpose in mind. Others, such as ECHP are new to any application and significant work had to be undertaken to make the suitable for the purpose. Five countries use waves of the ECHP (Austria W2,[14] Denmark W2, Greece W2, Portugal W3 and Spain W3); Five additional countries use waves from national panel studies (in most cases the national panel was or has become associated with the ECHP). These are Belgium, Germany, Ireland, Luxembourg and the Netherlands. One country uses a special income survey (Italy) and two use income data from household budget surveys which are based on random samples (France and UK). Sweden and Finland use register data based on administrative records combined with some survey data.

As far as possible, common variables were defined for each country and a minimum possible number of country-specific variables were added to the database where these were necessary for the simulation of the national tax-benefit system but were not available or needed for many other countries. The variables are defined in the Data Requirements Document (DRD). National variable descriptions are available in national versions of the DRD and more information is available in the Country Reports.

As shown in Table 3.2, the date of collection of the national datasets varies considerably. In some cases the income data refer to 1998, the chosen date for policy simulations (Finland, Luxembourg). At the other extreme the oldest data were collected in 1994/5 or 1995 (Denmark, France) and the income data refer to the previous year. A common data year was not imposed because micro-data are not available for every year for all countries and in some countries there is a long delay between data collection and release for scientific use. A common date would have meant using old data for all countries instead of a few. This means that the national databases are not - even at the outset - comparable across countries.

Indeed, it is possible that the database describes the population during a recession in some countries and a boom in others. (It might also do so even if a common date were used.) The strategy chosen to update the data to the common simulation year is described in section 3.8.1.

The combined weighted samples represent 367 million people across the European Union. The database itself is very large - nearly 100,000 households containing records of more than a quarter of a million people. The size of the database raises technical issues and has made model design and efficiency of key importance to the project. See section 3.5.

[14] Austria uses the second wave of the Austrian version of the ECHP, rather than Eurostat's User Data Base (UDB). Austria joined the ECHP one year after most other countries. The second wave therefore corresponds to wave 3 in the other countries.

Table 3.2 The EUROMOD database: basic statistics by country

Country	Base Dataset (Wave for panels)	Date of collection	Reference date for (most) incomes	Size of sample used in EUROMOD		Response rate (%)[a]	Household weights				Grossed-up sample (million)	
				Hholds	Persons		Mean	SD	Min	Max	Hholds	Persons
Austria	ECHP (W2)[b]	1996	1995	3,287	9,233	68, 87	920	571	24	2,931	3.02	7.92
Belgium	PSBH (W6)	1997	1996	2,834	7,057	?, 86	1,422	672	216	9,179	4.03	9.71
Denmark	ECHP (W2)	1995	1994	3,215	7,044	63, 84	787	315	77	2,074	2.53	5.70
Finland	IDS	1997	1997	10,010	26,902	~100 (79)	232	189	9	1241	2.33	5.08
France	BdF	1994/5	1993/4	11,291	29,160	~ 65	2,050	557	1,446	9,223	23.15	56.94
Germany	GSOEP (W15)	1998	1997	7,494[e]	18,255[e]	~52, 96	5,090	6,863	101	208,800	38.14	78.96
Greece	ECHP (W2)	1995	1994	5,214	15,183	90, 89	720	338	51	1944	3.75	10.63
Ireland	LII (W1)	1994	1994	4,048	14,585	52	279	198	9	2271	1.13	3.64
Italy	SHIW95	1996	1995	8,135	23,924	~ 57	2,436	2,285	305	26,021	19.82	57.21
Luxembourg	PSELL-2 (W5)	1999	1998	2,539	6,566	52, ?	62.8	29.2	4.6	207.1	0.16	0.40
Netherlands	SEP (W3)	1996	1995	4,568	11,035	30, 95	1,468	863	55	11,688	6.70	15.12
Portugal	ECHP (W3)	1996	1995	4,806	14,468	89, 90	668	727	5	6,863	3.21	9.92
Spain	ECHP (W3)	1996[c]	1995	6,119	18,991	67, ~86	2,018	1,182	83	5,827	12.35	38.90
Sweden	IDS	1997	1997	19,634	38,756	~100 (77)					5.03	8.99
UK	FES	1995/6	1995/6[d]	6,797	16,586	66	3,603	823	2,734	12,505	24.49	57.44
TOTAL	-	-	-	99,991	257,745	-	-	-	-	-	149.84	366.56

a For panel data two numbers are shown (X, Y). X is the response rate for the first wave and Y is an estimate of the percentage sample retention for each of the following waves. For Sweden and Finland (A (B)) refers to the response rate for the register data (A) and the survey data (B) respectively. (Since missing records in the survey component are imputed, for most purposes the response rate can be considered to be A.)
b Austria: wave 2 of the Austrian version. **c** Spain: information from W2 (1995) is also used. **d** UK: most income variables refer to one month within the year.
e Germany: excluding households with zero weights (183)

3.3 Data quality issues

National assessments of micro-data quality are an important component of the study of income distribution statistics. See Atkinson and Micklewright (1983) for the UK, Brandolini (1998) for Italy and Rodrigues (1999) for Portugal. In a comparative context, quality is not simply an absolute standard, but also an issue that needs to be considered in a relative sense. Atkinson et al. (1995) consider the quality of LIS income datasets for the countries of the OECD. The relative quality of micro-data is particularly important if we aim to "mix" or merge the micro-data from different countries, for example to construct a Europe-wide income distribution.[15]

In addition EUROMOD has a particular requirement of its data that is not necessarily relevant to income distribution studies. EUROMOD requires that the income data on which it relies be representative and of high quality *by source* of income, since different sources of income may be treated differently by tax-benefit systems. Other characteristics on which tax-benefit calculations depend - such as marital status or hours of work - also need to be captured in a representative manner. The datasets chosen for the EUROMOD database were selected with their suitability for tax-benefit modelling in mind, rather than with comparability as the main criterion. Thus an assessment of the extent to which they do provide a comparable basis for modelling is important when designing uses for EUROMOD and in interpreting results. For this reason, a "Database Robustness Assessment Exercise (DRAE)" was carried out. This drew on parallel work by the Canberra Group and on work done by Statistics Netherlands for Eurostat. A questionnaire about the datasets to be used in EUROMOD was devised and the responses were compared and consolidated.[16] The main issues relating to quality and comparability that were highlighted are:

- definition of the "household"
- exclusions from the samples
- response rates, non-response biases and re-weighting
- unit missings and item non-response
- under-reported income and aggregate comparisons.

These are discussed in turn.

3.3.1 Definition of the household

In all but one of the national datasets the definition of the "household" (and hence the widest unit available to EUROMOD) is some variant of "living under one roof and sharing some expenses". Differences across countries in operationalising this definition are likely to be small, with the possible exception of the treatment of lodgers (for example, in Greece they appear to be included but not in Portugal).

The main difference is in the definition used in the Swedish data where the nuclear family forms the widest identifiable unit (single or couple with any children aged under 18). Children aged 18 or more and living with their parents, or any other adults in the wider household are treated as

[15] For an example using EUROMOD see section 3.9.4.
[16] Consolidated responses to the DRAE questionnaire are available in mimeo form from the project co-ordinator.

separate units. Until household-level data become available,[17] it is important to be aware that EUROMOD results for Sweden use a non-comparable unit of aggregation of income, in relation to the usual output for the other 14 countries. At the same time, EUROMOD's flexibility allows the Swedish unit to be used for the other 14 countries, making comparisons with other countries possible (see sections 3.5 and 3.7.1.)

3.3.2 Exclusions from the sample

Exclusions may occur by design, or because of the way the sample is drawn. Generally, there are few exclusions of either type that occur in some countries but not in others. Groups generally not covered include:

- populations in outlying or inaccessible regions (for example, in Spain - those in Ceuta and Melilla; in the UK - in Northern Scotland and the Scottish Islands; and in non-metropolitan France),
- citizens living abroad but paying/receiving national taxes/benefits,
- the homeless,
- illegal immigrants (language considerations may effectively exclude some legal immigrants),
- the institutional population (in hospital, care homes, children's homes, prisons etc).

The last group - people living in institutions - is generally the most important in terms of size and relevance to the calculation of taxes and benefits. It may also vary in significance across countries. For example, students in institutions may be more common in the UK - where the custom is to leave home to go to college where residences are provided - than in Spain or Italy where it is more usual for students to remain in the parental home. Italian estimates suggest that 0.81 per cent of the population is excluded by virtue of living in an institution. The German estimate for the same group is "less than 1.5 per cent". Figures for the Netherlands indicate that about 1.6 per cent of the whole population are in institutions. The figure is similar for the UK.[18] These exclusions are potentially a problem for EUROMOD for two reasons. First, they will mean that parts of the income distribution are not properly represented. Some of the excluded people are likely to have low or zero cash incomes. However, it is clear that this effect will be small and that the size of it will not vary appreciably across countries.

The second problem occurs if the excluded population receives or pays a significant part of any of the tax-benefit instruments that we model. This is likely to be a particular issue for pensions. In the Netherlands 8 per cent of those aged 65+ are in institutions and the proportion is similar for the UK. Estimates of the revenue cost and distributional effects of changes affecting the elderly (and particularly the older elderly) will not take account of the impact of these changes on the elderly in institutions.[19]

[17] Statistics Sweden are producing household-level data from 1999.
[18] See Evans (1995) for an illuminating analysis for the UK.
[19] It is worth noting that the institutionalised population has been simulated for Australia. See Lim and Percival (1999).

3.3.3 Response rates, non-response biases and re-weighting

Table 3.2 shows the response rates for the national data sources. They vary from less than 30% to over 75%. However, the response rate calculations are not comparable across different types of data source. Firstly, calculations for panel data depend on both non-response to the initial wave and attrition rates thereafter. The adverse effects of low response to panel surveys (particularly as time goes by) can be set against the positive effects of having several observations for the same people. Longitudinal data cleaning may result in individual data items containing fewer errors than in cross-sectional surveys where the information is collected only once.

Secondly, register data (as used in Finland and Sweden) do not have significant non-response problems, although the surveys used to collect information not available in the registers (a small minority of EUROMOD variables) do have some degree of non-response. Generally, these are treated as missing values and imputed, meaning that the response rate and bias of the sample itself is not affected.

Thirdly, the criteria for the households to belong to the achieved sample vary across datasets. In some cases, households with "unit missings" (missing information for individuals within a responding household) and persons with missing values on key variables are treated as non-respondents (as in the UK FES). In others, they are included as responding households (as in the ECHP and many of the national panel surveys). In the case of EUROMOD, full information on all individuals is needed. Generally households with large amounts of missing information are dropped from the sample included in the database. Thus the effective response rate is lower than shown in Table 3.2 for these cases.

Known non-response bias is usually "corrected" using re-weighting. But methods - and the relationship with the original sampling method - differ. It is important to remember that corrections in one dimension (such as household composition) may distort the sample in a dimension that is not controlled-for (such as income). Generally, EUROMOD uses non-response weights supplied with the data (calculated by the data providers). More details about specific countries can be found in the Country Reports. However, the dimensions that are used in calculating weights vary across country: national practice may differ because of specific national problems. It is also worth noting that some countries use geographic region as one of the control totals while others do not. Table 3.3 summarises the dimensions that are used.

As well as correcting for different dimensions, Table 3.2 shows that the values of the weights used with the national datasets also differ greatly in their range, and the extent to which they have an impact on final results. In some countries, the extent to the intended correction is modest and the distribution of weights is relatively narrow. For example, in the UK data the standard deviation (SD) of the weights is 23% of the mean value. In others the range is much larger and the impact on the results is correspondingly greater. For example, the SD of the weights in the German data is 135% of the mean weight.

Table 3.3 Dimensions used in re-weighting

Country	Dimensions
Austria	Household type and size, tenure (owned/other) number of economically active people, region
Belgium	Geographic location of the household (Flandre, Wallonie or Bruxelles), household size and composition, and distribution of the population by age and sex
Denmark	Household type and size, tenure (owned/other) number of economically active people, region
Finland	Number of persons by sex and age in five-year bands; Regional distribution of dwelling units (13 classes), size distribution of dwelling units (8 classes);
France	Size of household, number of economically active people, size of municipality, age of head of household, socio-economic group.
Germany	Age, sex, nationality, household size and type, region.
Greece	Geographic location of the household, household size and composition, and distribution of the population by age and sex
Ireland	Size of farm households; numbers of adults, number of persons in work, socio-economic group, age composition, location/region; distribution of persons within households.
Italy	Municipality; population's characteristics known from census
Luxembourg	Age, sex, activity status
Netherlands	Size of municipality; age, sex, marital status.
Portugal	Household type and size, tenure (owned/other) number of economically active people, region
Spain	Household type and size, tenure (owned/other) number of economically active people, region
Sweden	Age, sex, pensioners, unemployment, employment
UK	Age, sex and family type

3.3.4 Unit missings and item non-response

Some of the datasets, particularly the panel datasets, contain households who are respondents but for whom information on one or more individual is missing. In the case of the ECHP, the contribution of these missing people to total household disposable income is imputed. However, since EUROMOD needs gross incomes by source and by individual for its database, this "final level" imputation is not sufficient. There is a choice between excluding these households from the sample or imputation of all the necessary information for the unit missings. (A third possibility - ignoring the individual entirely and retaining the rest of the household - is not considered acceptable.) Generally, the former option has been chosen, since the latter is a complex task. On comparability grounds, exclusion is the better choice since it makes the datasets with less stringent criteria for "response" more similar to those with more stringent criteria (the reverse is not possible).

Using this solution, ideally the weights should be re-calculated to take account of the excluded households. Generally, this has not been done, and more details of the effect of this are to be found in the Country Reports.

A “unit missing” is an extreme form of item non-response (non-response to a single variable). Thus the problems introduced by non-response on key EUROMOD variables, and their possible solutions, are similar to those for unit missings.

3.3.5 Under-reported income and aggregate comparisons

As part of the DRAE, aggregates and distributions of key variables from the EUROMOD database were compared with independent sources. These sources included National Accounts (NA) aggregates, and administrative statistics. These comparisons are notoriously difficult to carry out conclusively. In particular, conceptual differences between NA variables and those available in household data are difficult to define and to reconcile. NA variables may themselves be uncertain estimates or may have originally been based on the micro-data that is under scrutiny. In some countries a detailed methodology has been developed, but it is not clear that these methodologies are themselves comparable. For these reasons, results of the DRAE are not reported in detail here. The general findings (from NA and other comparisons) included:

- Income sources that are most under-represented in most countries are self-employment income and income from financial capital. However, the extent of under-representation varies across countries. For example, in Spain, aggregate self-employment incomes perfectly match those from income tax statistics, while investment income and income from rent are under-reported by 80% and 70% respectively, according to the same comparison. At another extreme a comparison for Italy showed only 32-36% of NA self-employment income to be represented by the survey (estimates vary according to the survey weights used). About 20% of NA investment income is covered, while income from property (including imputed income from owner occupation) is over-estimated by about 10%.

- Some benefit recipients are under-represented and/or there may be under-reporting of some benefit incomes.

- Comparisons of employment patterns with Labour Force Survey (LFS) data show broadly similar pictures in the EUROMOD datasets. (In some cases this is ensured by the use of LFS-based estimates in re-weighting regimes.) Differences can often be explained by definitional or conceptual differences. On the whole large differences between the EUROMOD database and LFS concern small groups (such as those with more than one job), or the self-employed.

The following four criteria can be used to assess the EUROMOD database and any adjustments to it:

1. the EUROMOD database should be comparable across countries
2. EUROMOD output should be consistent with national aggregate information (e.g. National Accounts)
3. the EUROMOD database should be consistent with national income distribution statistics
4. adjustments to the EUROMOD database and/or to EUROMOD output need to be relatively straightforward and easy and quick to implement.

Since it is probably impossible to meet all of these criteria simultaneously, some general guidelines were developed to help find the right balance between them. These were distilled from the project team's investigations into comparisons of data quality and considerations of principles to follow and methods to use in any adjustments that might be made:

- The EUROMOD project should not consider itself responsible for the quality of the data that it makes use of. Thus adjustments should be confined to those that are tried-and-tested and which are accepted by national statistical institutes. National acceptability over-rides comparability issues in this context.

- Adjustments to "improve" data quality should not be the choice of the model user.

- Derivation of under-reporting adjustments (for capital and self-employment incomes) remains problematic and controversial. In the first version of the model no adjustments should be built in.

- A separate issue is the adjustment of output incomes so that they appear plausible in aggregate compared with other sources. The ranking of countries by income, and hence the country composition of the European distribution is the issue at stake. Since these factors are applied to final output (at the micro- or meso- level) decisions about the most appropriate factors are not critical to the model-building process. They remain an option for the model user at the output analysis stage.

- Additional re-weighting should be used with caution. Introducing new categories or dimensions inevitably either increases the range of weights or introduces distortion in other dimensions (or probably both). Finding genuinely comparable external data without its own non-response problems is extremely difficult and the use of near-substitute information is particularly likely to introduce distortions.

In practice the adjustment strategy was developed at the national level by country respondents, but was, where possible, co-ordinated so that it followed the above guidelines. Country Reports describe the main points and the main adjustments that have been made for each country. It should be noted that in some instances national teams have departed from agreed guidelines for nationally specific reasons. Table 3.4 summarises the main adjustments that have been made to income variables to adjust for under-reporting.

Table 3.4 Adjustment factors applied to input income variables (to adjust for under-reporting)

Country	Variable and nature of adjustment
Austria	None
Belgium	None
Denmark	None
Finland	Some capital income has been increased (proportionately) to match both the aggregate and household level. Compared to total capital income aggregates the change is not significant.
France	Capital income is reduced differentially for different levels of disposable income in the model. This is done after all tax-benefit simulations.
Germany	None
Greece	None
Ireland	None
Italy	Self-employment income and incomes from financial capital are adjusted using methods developed by Istat and the Bank of Italy respectively.
Luxembourg	None
Netherlands	None
Portugal	None
Spain	None
Sweden	None
UK	None

3.4 Policy scope, policy rules and policy simulation

The main output from EUROMOD is a measure of Household Disposable Income (HDI). The precise definition of this concept can be chosen by the model user. As defined by Atkinson et al. (1995) it is made up of the following broad components:

1. Wage and salary income (excluding employer social insurance contributions (SICs); including sick pay paid by government)
plus
2. Self-employment income
plus
3. Property income (rent, dividends, interest, *not* imputed rent from owner-occupation)
plus
4. Other cash market income and occupational pension income (regular private transfers, alimony and child maintenance, *not* one-off lump sum incomes)
plus
5. Cash benefit payments (social insurance, disability, universal and social assistance benefits, including state pension payments and near-cash benefits)
minus

6. Direct taxes and social insurance contributions (*not* employer contributions).

Excluded from this core definition of HDI are:

1. Imputed rent from owner occupation
2. Value of home production
3. Other non-cash incomes with the exception of near-cash benefits that can be "clearly measured in currency terms"[20]
4. Unrealised or irregular capital gains or losses
5. Value of credit or loans (such as student loans); repayment of loans and payment of interest are not deducted
6. Irregular lump sum incomes (such as redundancy pay or lottery winnings). Regular bonuses (such as 13th salaries) are included.

Forms of "committed expenditure" such as housing costs, loan repayments and child maintenance/alimony payments are not deducted.[21]

There are some "grey areas" such as the treatment of contributions to employer, occupational or private pensions, the treatment of near-cash payments from employers (e.g. company cars, share options) and child care subsidies. Where information on these is available in the database (or possible to simulate), the user can define HDI to treat these items, as well as others, as they wish. One example of an item that is not normally included in HDI, is employer social insurance contributions. These are, however, simulated by EUROMOD, since they may be of interest separately from measures of income.

Having defined the main output income concept, there is then the separate but related issue of the sub-set of income components that can be changed by the model - and hence the policy issues that may be addressed by the model.

It is helpful to think of three "levels":

1. income elements that are *covered* by the model - components that may be added, subtracted or ignored in the output income measure - an example is income from property.
2. income elements that may be *modified* in the model ("part simulated") - an example is a social insurance unemployment benefit.
3. income elements that are fully *simulated* by the model - an example is income tax.

The only reason for placing an income element in Level 1 rather than 2, or in Level 2 rather than 3 is on pragmatic grounds. There are two distinct pragmatic issues: (i) whether sufficient data are available and (ii) whether the element is of sufficient importance/significance ***at the European as well as national level*** to be worth the effort.

[20] See Atkinson, Rainwater and Smeeding (1995) page 15 for discussion
[21] See Smeeding and Weinberg (1998) for a stimulating discussion of defining a comprehensive household income measure.

The policy scope of national models is determined by a combination of data availability considerations and the ***national*** level of interest and concern with particular policy measures. It is documented in Country Reports. For example, in Finland social assistance is difficult to simulate because it depends on short-term income assessment whereas income is measured annually in the data (see section 3.8.3). Thus, until recently, social assistance was not simulated in the national model. On the other hand, all of the main data requirements for UK social assistance are present in the national data and all the UK national tax-benefit models have always included the simulation of income-related benefits as one of their key functions.

In building an EU model with comparability as one of its main objectives, some difficult questions of both principle and practice arise. Steps have been taken towards improving comparability. For example, EUROMOD does simulate Finnish social assistance schemes, making some broad-brush assumptions the timing of income receipt. Generally however, the elements of the system that are possible to simulate with available data have been simulated; those that are difficult (and are also components of HDI) have been taken directly from the data. This does mean that the scope of the model differs across countries. Furthermore, in some countries, EUROMOD does not attempt to simulate all the details that are the focus of national models. EUROMOD may be more comprehensive than a national model, or it may be less so. In section 3.9.3 we show the proportion of the national benefit systems (within HDI) that is simulated by EUROMOD. Here, we summarise the national tax-benefit instruments that can be simulated, partly simulated (Level 2 above) or simply included from the data.

Generally speaking, the following instruments are simulated in all countries

- Income taxes (national and local)
- Social insurance contributions (paid directly by employees, employers, the self-employed and benefit recipients)
- Family benefits
- Housing benefits
- Social assistance benefits and other income-related benefits

and the following instruments are generally not simulated, although there are exceptions (see tables 3.14a to 3.14n in section 3.9 and the Country Reports):

- Capital and property taxes
- Real estate taxes
- Pensions and survivor benefits
- Contributory benefits
- Disability benefits

Table 3.5 summarises differences in scope between national models (where these currently exist) and EUROMOD.[22] The Country Reports provide details of the parts of each national tax-benefit system that are simulated. A device we have named the "*policy spine*" shows the instruments that are simulated (or part-simulated) in the order in which they are calculated. The *policy spine* has been devised as a key foundation of the model itself and so is in practice

[22] Differences in policy scope are not the only differences between EUROMOD and national models. Questions of comparability may have lead to differing data adjustments and assumptions being made.

strongly influenced by the needs of the model framework and program. This means that in one country an instrument may be dealt with by one point in the spine (e.g. "employee social insurance contributions"), in another the corresponding instrument may require several points, perhaps due to there being differently-structured schemes for different types of employee, perhaps due to a complex structure that is best modularised for transparency reasons. At the same time, the national policy spines do provide a useful summary of the policy scope of each national part of EUROMOD.

Table 3.5 EUROMOD and national models: differences in policy scope

Country	Elements simulated in National Model, not in EUROMOD	Elements simulated in EUROMOD, not in National Model	Name of National Model
Austria	N/A	N/A	N/A
Belgium	Unemployment benefit	Social assistance benefits (minimex and RGPA)	
Denmark	None	None	LOVMODEL
Finland	Sickness and Maternity Benefit, Student Benefit and Housing Benefit for Students, Unemployment Benefit, Pensioner's Housing Benefit	None	TUJA
France	None	None	SYSIFF
Germany	None	Social Assistance, Housing Benefit, Parts of income tax	DIW
Greece	N/A	N/A	N/A
Ireland	Back to Work Allowance, Back to School Allowance, Benefit and Privilege aspects of eligibility for unemployment assistance, Part-time Job Incentive scheme	Housing Benefits, Employer SICs	SWITCH
Italy	None	Level of detail for instruments where unit is the family. EUROMOD is able to determine the correct units of assessment whereas national model always takes entire household as unit.	ITALMOD
Luxembourg	N/A	N/A	N/A
Netherlands	N/A	N/A	N/A
Portugal	N/A	N/A	N/A
Spain	None	Regional income tax credits for children, dependent parents and the elderly.	ESPASIM
Sweden	Unemployment and Sickness benefits, Child Care benefits, Capital gains tax	None	
UK	Council tax	Contributory Job Seekers Allowance	POLIMOD

Notes: N/A - no national model available to the EUROMOD team.

To use EUROMOD effectively, one needs to appreciate differences in the model's policy scope across countries in the context of the entire policy that operates in that country. To aid this understanding a "Policy Digest" was produced (Lumen, 2001). This had two functions: first, to provide a detailed description of the 15 tax-benefit systems; and secondly to compare them using a range of alternative typologies and classifications of Welfare States.

3.5 Model design and implementation

There are two alternative approaches to building a multi-country tax-benefit model. The first is to build a set of parallel models, one for each country, shaping each to the requirements and characteristics of the national tax-benefit systems and data availability. This was essentially the approach taken in the construction of a prototype model during the EUROMOD Preparatory project (Bourguignon et al., 1997). The integration of the model calculations was solely accomplished at the output stage. However, a more challenging and ultimately more powerful approach is to build a model that concentrates on finding common features across countries throughout the model construction process. This is the approach that was taken with EUROMOD. In practice it involved:

- identifying common structural characteristics in national policies
- identifying common data requirements
- parameterising and generalising as many aspects of the model as possible.

We generalise such important aspects as the definitions of
- the income base for each tax and benefit,
- the unit of assessment or entitlement for each tax and benefit,
- the effective equivalence scales inherent in social benefit payments,
- the output income measure.

This approach not only allows us to model each national system in a manner that is comparable to existing national practice, it also provides the model user with a much greater range of choice and greater flexibility than is customarily available in national models or – we believe – in any other existing tax benefit model.

Model flexibility has many advantages in terms of the comparability of results, the range of uses of the model and its durability. However, it does have some cost in terms of the ease of use of the model. To run EUROMOD at all, many thousand parameters have to be specified. To make the model useable, defaults for these parameters can be provided, specifying existing national tax-benefit policies and a series of "standard" choices regarding model and output assumptions.

Greater detail about the building of EUROMOD as a flexible modelling framework is provided in Immervoll and O'Donoghue (2001a). The following two sections summarise the model's design and describe the software that is used.

3.5.1 Model design

For the simulation framework to be valid across many countries features of tax-benefit systems had to be conceptualised and then operationalised. A hierarchical structure was devised in which each tax-benefit "s**ystem"** is made up of individual "**policies"**, the elementary collections of tax-benefit instruments such as income taxes, social insurance contributions and social assistance benefits. The "**policy spine"** is a list of policies indicating the sequence in which they apply in the tax-benefit system. At the lowest level is the tax-benefit "**module"**, which performs the calculation of a certain part of the tax or benefit (e.g., a deduction, or applying a rate schedule to a tax base) on each fiscal unit. The modules represent the elementary building blocks of the tax-benefit system: Only the modules contain actual tax-benefit rules. All other levels are only necessary to structure these rules and apply them in the correct sequence.

Elements of the model, which are parameterised, include:

1. **Modules**, the primary building blocks of the model. Components that are parameterised include the operational parameters such as rates, bands thresholds, type of income concepts and fiscal units. The use of stand-alone modules is equivalent to building up a large library of nationally-specific tax-benefit instruments. The existence of this library of modules may mean that is possible to incorporate a new tax or benefit instrument, without reprogramming. In addition, the framework provides a large number of frequently used standard functions so that accessing micro-data directly can be avoided, ensuring a consistent interpretation of variable values across all modules and simplifying the maintenance of the model. The framework also provides a large number of "general" modules, which were designed without any single country or use in mind. An example is the set of routines for simulating social benefits that is applicable to virtually all the benefits that are simulated in EUROMOD. Apart from the considerable amount of time and effort that can be saved by re-using already existing building blocks, there is the added advantage that these general modules have already been thoroughly tested. One can therefore be confident that the risk of programming errors is minimal.

2. **Policies and Policy Spine**, the structuring mechanism within the framework. Policies are the means of clustering the basic building blocks, the modules, while the policy spine is the way of organising policies. The use of this structure improves robustness, without worrying about unexpected *knock-on* effects later in the model, allowing for the library of modules to be reused for different purposes in different policies. A significant feature of this microsimulation framework is that the order in which both policies within the spine and modules within policies are simulated can be altered by the user, without re-coding the model. This design permits re-arranging the order of modules in any sequence without having to alter the tax-benefit program code. The sequence can be changed by simply moving around the parameter blocks in the parameter sheet.

3. The definition of the **fiscal units** relevant for an instrument (e.g., who belongs to a "family" receiving the instrument). In this framework, fiscal unit types have been parameterised. In the simplest case, the fiscal unit type is either the largest common unit

provided in the micro-data (the "household") or the smallest unit provided (the individual). If it is neither then which members of the household are to belong to the same unit as the "head" can be defined. Possible choices are Cohabiting Partner, Married Partner, Child and Dependent Parent. For the latter two, a powerful set of conditions is available for defining what type of person constitutes a "child" or a "dependent parent" (e.g. age limits, income limits, work status).

4. The definition of **sharing rules** within the unit (i.e., which unit member receives or pays the instrument). By default the outcome of all tax-benefit instruments are assigned to the head of fiscal unit. However frequently it is desirable to be able to use other incidence assumptions. In order to do this, it is necessary to provide information about assumed sharing arrangements. The framework supports a number of different assumptions allowing one to share amongst: Adults/Children, Economically/Non-Economically Active Persons, Part-time/Full-time Workers or Male/Female Head of Unit. It is also possible to decide how sharing occurs. The instrument to be shared can be divided equally amongst all those to whom the instrument is to be shared or divided in proportion to the level of a particular income amount held by each individual. (e.g. in the case of joint taxation, it is possible to share the joint tax burden according to the shares of taxable incomes held by the individuals). Allowing such explicit definitions of intra-unit assignments of taxes/benefits, it becomes possible to analyse simulation results at any level of aggregation (e.g. at the individual level for gender specific analyses).

5. The definition of **aggregate income variables** to be used either in calculation of an instrument (e.g., "taxable income" such as market incomes plus benefits minus deductions and allowances) or as an output of the model (e.g., "disposable income"). Each income concept is defined in terms of a vector of numbers between –1 and +1, which is applied to a list of all monetary variables in the model. These numbers indicate what fraction of each monetary variable is included in (or deducted from) the income aggregate.

6. Some parameters relate to the **input micro-data**. One of the desirable features of a microsimulation modelling framework is that it should be possible to add new variables with ease. All variables used in the model are specified in a list containing the variable names and additional information about the nature of the variable (whether it applies to a person or relates to the household as a whole; whether or not it is a monetary variable). Once this is done, the model then automatically carries out all the procedures necessary to make the variable useable by the model.

7. **Updating factors** (see section 3.8.1) can be specified for each monetary variable. Different incomes may be uprated at different rates, and these rates may themselves differ for different groups (for example employment income may have risen over time at different rates for males/females, civil servants/private sector employees etc.)

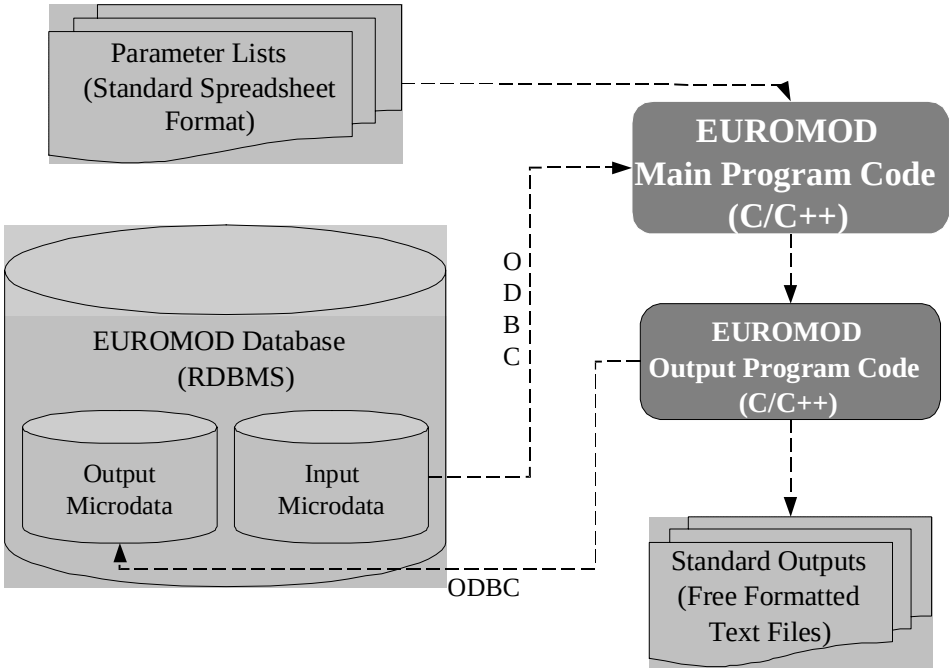
8. **Output functions**, including the variables to be output from the model, as well as the types of summary statistics required as output. The framework generates a micro output file that can output any variable or income concept for any unit of analysis in the model. A special feature of the output routine is that it can be integrated into the "spine" of the tax-

benefit system just like any other "policy". This means that it is possible to produce output at any point on the "policy spine" (e.g. before and after a certain tax-benefit instrument).

3.5.2 The EUROMOD computing environment

In choosing the environment and programming language for the model framework, an effort has been made to ensure its longevity by not irrevocably attaching it to one specific computing environment. (See figure 3.2.) In addition, the aim has been to use software of a type that is familiar to potential users as well as easily available. However, care has been taken to avoid a rigidity, which would prevent future adaptations to other platforms such as UNIX.

Figure 3.2: The EUROMOD system environment



The programming language used is C/C++. This facilitates efficiency in programming. However, the ability of C/C++ to write very streamlined and "direct" algorithms sometimes reduces the readability and transparency for less experienced users. As a rule, where trade-offs existed between transparency and speed, we accepted decreases in the model's speed in return for improved readability and usability.

By using a method for database access (ODBC) which is available for all major relational database management systems, database systems other than the one used as a default can be used for data storage and management. Both the input micro-data and the model's micro-output (simulation results) can be stored in one of the widely used relational database systems (Oracle, Microsoft SQL, etc.) Microsoft Access is used as the default. Input and output data are stored in two separate databases. In this way, the input micro-data can remain "read-only". However, the relational data structure makes it possible to combine the physically separate

input and output data into one logical table to analyse the impact of a tax-benefit system in relation to all sorts of characteristics (age, household size, etc.).[23]

All parameter lists are stored as spreadsheet tables. They can be read and manipulated with any spreadsheet software (e.g. Microsoft Excel).

3.6 Testing and validation

Once the policy rules were coded three types of checks were made. The first was designed to ensure that policy rules were coded correctly: that there were neither mistakes nor misunderstandings in the way that the tax-benefit system had been implemented. The most appropriate tests depended on the type of information used as the basis of the policy code. An initial step consisted of plausibility checks on the amounts of taxes and benefits relative to original income and household size. Then, in some cases comparisons were made on a case-by-case basis with comparable calculations from a national model.[24] Where this was not possible, calculations for hypothetical households were checked "by hand". The hypothetical households were not the (typically) simple households that are used in OECD average production worker calculations. Instead complex households were designed specifically to test the details of the national system. (See Berger et al. (2001) for an illustration of this technique.)

Having decided that the policy rules are coded correctly, the second stage of validation is to run the data through the model and compare aggregate output statistics with corresponding independent statistics for 1998. An example might be to compare the number of fiscal units paying income tax, and the total amount of income tax collected with information from tax administration statistics for 1998. Discrepancies can be attributed to one or more of the following four causes:

1. the policy code is incorrect in some way
2. the underlying data do not support accurate simulation of the policy instrument in question
3. the changes between the data year and the policy year have not be adequately captured by the updating and imputation processes
4. the EUROMOD statistic and the external statistic are not comparable.

If results from an established national tax-benefit model confirmed the EUROMOD results (i.e. they were the same, or could be reconciled if known differences were taken into account) then the problem lay with causes 2 to 4. National expertise and experience were called on to attribute explanations to discrepancies and to devise solutions if any were feasible while maintaining comparability across countries. These are documented in the Country Reports.

[23] It should be noted that features for combining output and input data are available in principle but may be disabled in practice to ensure compliance with data access restrictions.

[24] The amount of work involved in this was considerable both for the EUROMOD builder (co-ordinator's team) and the national teams - not least because there are many dimensions in which to compare.

A further part of the baseline validation exercise was to compare income distribution and poverty statistics from EUROMOD with other sources for 1998. These "other sources" might depend on a different original data source, or might be for the same data source but using a later underlying year of data (1998). Either way, they were unlikely to be strictly comparable. Although some features of the distributional statistics (such as equivalence scale and unit of analysis) could usually be aligned by exploiting EUROMOD's flexibility, many others could not. In particular in most cases the independent statistics were based on recorded data rather than using updated and simulated components of income. Thus one would not expect the comparisons to show identical results. The aim was to show that EUROMOD results were broadly in line with other sources. Thus the EUROMOD baseline could be reliably used as the basis for simulation experiments with policy changes. In particular the *ranking* of countries in terms of poverty and inequality statistics - known as "cross-country validation" - is an important component of the baseline validation of EUROMOD which is reported in section 3.9.

The third stage of the model validation process is to compare the results of simulated policy *changes* (or changes of other types) with estimates obtained independently. Finding these independent estimates is not easy and relies on having access to national models or published national model output, together with information about exactly how the estimates were obtained. (Note that it is not sufficient to have household income information from two points in real time, before and after a policy change. Other changes - in the macro economy or the structure of the population - will tend to confuse the picture. Some kind of simulation capacity is needed to produce policy-change statistics comparable to those generated by EUROMOD.)

3.7 Using EUROMOD

This section discusses three distinct issues which affect practical uses of EUROMOD. The first is the ***form of the output*** from the model, and the way in which effective "hands on" use can be made of EUROMOD, given the conditions attached to micro-data access.

The second issue is the need to make clear the ***strengths and weaknesses of the model*** so that uses are confined to those areas that are strong, but at the same time making clear that these divisions do not necessarily correspond to policies that are "good" and "bad".

The third set of issues arises from using a multi-country model for the first time. Comparability and ***equivalence of results across countries*** are important issues to understand if EUROMOD is to be used to the full.

These three topics are explored in turn.

3.7.1 Model outputs

EUROMOD outputs micro-level variables according to the requirements specified by the user. Typically, for each policy regime the model will produce - for each household in the micro-database - a measure of disposable income plus other variables needed for the

particular analysis. Due to EUROMOD's flexible structure, any variable from the input database and any variable calculated by the model and output by the "policies" (see section 3.5) can be included in the output database. The output need not be at the household level - the unit of analysis can be any unit: the individual or any identifiable group of individuals within the household. This type of disaggregated output allows the user to calculate a wide range of output statistics, according to the application to hand and their own preferences over the analysis software to be used and the specific measures to be employed. However, there are two problems.

First, data access restrictions do not allow access to some micro-datasets, except in the co-ordinator's institution in Cambridge UK. This means that to analyse output for those countries, the user must travel to Cambridge and carry out all the analysis there. Under the terms of the data contracts, they could take away aggregated output statistics, but not the micro-output itself. This is not always appropriate or convenient.

Secondly, analysis of micro-data is a complex and time-consuming task. Many applications of EUROMOD will require a common core set of output statistics that are often used in tax-benefit simulation studies. Construction of a "standard" output module not only saves time for most users, they can also rely on it to have been tested and to produce correct calculations that are robust and consistent across different applications.

Although a standard output routine cannot anticipate all potential user needs - and therefore does not entirely solve the data access problem - it does reduce the significance of the constraints imposed. The current version of the standard output routine can produce a limited range of commonly used summary statistics according to quite a flexible, parameterised set of choices. It is built separately from the main EUROMOD simulation model and can be run independently. It makes use of Excel parameter sheets that are designed in a similar way to the sheets which specify policies. As it stands, it forms the basis of a more comprehensive output module that can be developed and extended as needs and resources permit. Currently the output program supports the computation of

- quantile groups;
- inequality indicators;
- poverty indicators;
- summary statistics and tabulations for any variable in the output database.

The output module is designed to:

- provide statistics and summary indicators that are accepted standards among researchers and policy analysts and that can be used in a consistent way across different countries and uses of the model;
- permit users to analyse the sensitivity of the various indicators by allowing them to vary underlying concepts and definitions such as exchange rates, poverty lines, equivalence scales, etc.;
- reflect the flexibility of the tax-benefit simulation parts of EUROMOD by not imposing any *a priori* definition of concepts such as disposable income, a "child", etc.;
- be able to handle the very large amounts of data resulting from the simulation of policy instruments for all households contained in micro-datasets of several or all EU countries.

(Most general-purpose software programs have size limits that prevent their use for the purpose of analysing EUROMOD output);
- provide a user interface that is similar to that in other parts of EUROMOD;
- attach a comprehensive description to the numerical output which clearly shows the kinds of choices made by the user of the output program. Given the multitude of possible definitions and concepts such "labelling" is essential to ensure that the numbers produced by the output program are interpreted in an appropriate way;
- be computationally reliable.

Equivalence scale
Currently, there is a choice between "OECD"-type equivalence scales and "single parameter" equivalence scales which only take household size as an argument. The weights for adults and children used for the "OECD"-type equivalence scales can be freely chosen. Moreover, any definition of a "child" can be used. The "single parameter"-type equivalence scale is of the form $E = hh\_size^{par}$, where *par* can be freely chosen. (Other forms of equivalence scale will be included as options in future versions of the output program.)

Quantile groups
This module can be used to compute quantile groups in order to be able to group output accordingly (e.g., means, frequencies, for each quantile group). The relevant parameters are
- the unit of analysis (i.e., quantile groups of individuals or households);
- the number of groups (deciles, quintiles, percentiles, etc.);
- the ranking variable (e.g., disposable income, expenditure, taxes.).
- whether, in the case of comparing two policy scenarios (one "baseline" and one "reform" scenario), the cut-off points between quantile groups from the "baseline" scenario are to be retained for the "reform" scenario or whether different quantile points are to be computed for each scenario.

Inequality indicators
Currently, the output program only computes Gini inequality indicators. Relevant parameters are the unit of analysis, the measurement variable, the ranking variable (in the case of measuring income inequality, both measurement and ranking variable will usually be the same, i.e., the income variable of interest), and whether to equivalise or not. (Other inequality indicators, such as the Atkinson inequality indicator, will be included in future versions of the output program.)

Poverty indicators
This module computes poverty headcounts, poverty deficits and various measures of poverty intensity (poverty gap, Foster-Greer-Thorebecke (FGT) measures). All poverty indicators can be computed in relation to a fixed (specified) poverty line or a relative poverty line which is computed endogenously as a function of the distribution of the variable which is used for identifying poverty. Relevant parameters are
- the poverty line (i.e. an absolute amount) or the concept of relative poverty line which is to be used (i.e. a percentage of mean/median);
- the name of the variable relevant for determining poverty (e.g. disposable income);

- whether, in the case of comparing two policy scenarios (one "baseline" and one "reform" scenario), the baseline poverty line is to be retained for computing poverty indicators for the "reform" scenario or whether a different poverty line is to be computed for each scenario;
- a grouping variable. It is possible to compute different poverty indicators for various groups in the population (e.g., children, old persons, etc.).

Summary statistics
This module computes, for any variable in the EUROMOD output micro-database, the sum, mean, standard deviation, median, minimum and maximum, frequencies, and number of negative/zero/positive values. These statistics can be computed for the population as a whole and for specified sub-groups. Relevant parameters are

- the unit of analysis;
- the variable(s) to be analysed. It is possible to either specify a list of variables for which statistics should be computed or to simply compute them for all variables which are outputs from the tax-benefit simulations;
- a grouping variable (to compute statistics for population sub-groups);
- re-grouping parameters. This allows more than one value of the grouping variable to be "re-grouped" into the same group (for example, to rank by age groups 0-16, 17-35, etc.). If no re-grouping is used then each value of the grouping value is considered a separate group. Re-grouping is also necessary to prevent those users of EUROMOD, who are not entitled to access the underlying micro-data, from generating statistics for groups with cell-sizes that are "too small".
- filter parameters. To permit the generation of two-dimensional grouping (e.g., by age and gender) it is possible to specify that, in computing the group statistics, only cases where certain conditions are met should be taken into account (e.g., gender = female).
- switches indicating whether the variable of analysis and the grouping variable should be equivalised prior to computing statistics.

3.7.2 Uses and interpretation

EUROMOD is better suited to analysing some types of policy and policy change than others. Since it is a static model, designed to calculate the immediate, "morning after" effect of policy changes, it neither incorporates the effects of behavioural changes (i.e. behaviour does not change) nor the long-term effect of change (such as the impact later in life or on the next generation). Thus it is not the appropriate tool for examining policy that is *only* designed to change behaviour, nor for policy that can only have its impact in the long term (e.g. some forms of pensions policy). It is best suited to the analysis of policies that have an immediate effect and which depend only on current income and circumstance. This is not because we believe that these are the only policies of interest. This first attempt at a multi-country microsimulation model deliberately excludes the possibility of incorporating estimated behavioural responses, simply on feasibility and practicality grounds. A static model is useful without estimated behavioural responses; a model incorporating behavioural change also requires the existence of a static tax-benefit calculation framework. (At the same time it should be noted that EUROMOD does have the capacity to calculate marginal effective tax rates and replacement rates according to a wide range of specifications. Thus it is possible to

produce indicators of changes to work incentives following a policy change, if not to estimate whether any behavioural change in fact takes place.)

EUROMOD is limited to simulating policies which depend on variables that are present in the underlying database. This does not (generally) include information on social insurance contribution histories. Thus it is not possible to fully simulate social benefits that are contributory. For some social benefits (mainly short-term benefits such as for unemployment) it is possible to simulate the size of the benefit, given eligibility based on the data showing benefit receipt. For other instruments depending on contributions - notably pensions - this "partial simulation" is not possible. Too many dimensions of most pension calculations depend on information not available in the data. It should be made quite clear that the fact that social assistance benefits for pensioners may be fully simulated, but not the main contributory pension, does not indicate that we think the social assistance element is more important, or a more interesting topic of study, than the contributory component.

The issue of what is possible to simulate becomes more significant when a comparative perspective is required: when simulations for more than one country are used. Section 3.9.3 shows that the proportion of national systems that can be simulated (and hence addressed) by EUROMOD varies considerably across countries. This is simply a limitation of the data on which we depend, combined with the nature of existing tax-benefit systems, not a choice we have made. At the same time, EUROMOD users have a responsibility to motivate and to put in context their particular use of the model. That the model's focus on currently determined taxes and benefits is due to technical considerations rather than chosen on grounds of policy or politics should be made clear to the end-users of EUROMOD policy analysis.

In general, tax-benefit models are well suited to the simulation of radical and simplifying reforms (e.g. the Basic Income - Flat Tax reform analysed in Bourguignon et al. (1997)). Again this should not be taken to imply that the EUROMOD project necessarily endorses this type of reform. Particular exercises may do so, of course, but such "blue skies" simulations can also be illuminating about the effects of the existing systems which they replace (e.g. see Callan and Sutherland, 1997) and thus may act as an analytical device rather than the basis of a practical policy proposal. On the other hand, it is clear that EUROMOD exercises that analyse more incremental or gradual changes may indeed directly inform the process of practical policy development.

Finally, the capacity of EUROMOD to simulate the effects of *common* policies in EU Member States, and indeed some aspects of harmonisation of policy, raises a number of issues. First, as with other radical reforms, the simulation of harmonised policy does not necessarily mean that the analyst is proposing such harmonisation. The exercise may just as easily be used to highlight the extent and nature of differences between current systems, or to demonstrate the disadvantages, as to make claims for the benefits of harmonisation. Most usefully, it may be used to illuminate the issues - particularly relating to within- and between-country distributional aspects - that need to be addressed when considering the convergence of some types of policy and the best way of achieving common objectives in differing national situations. The purpose of a microsimulation study is not only to answer questions but also to raise them.

3.7.3 Cross-country equivalence

There are also technical issues to consider when using EUROMOD as a "European" model rather than 15 comparable national models. One may focus on the European aspect either through examining combined European output - for example, by analysing an integrated EU15 income distribution. Or one may wish to specify a common policy instrument (or a common minimum standard against which existing policy can be compared).

Both these aspects are the subject of an analysis of the effect of a (stylised) European Minimum Pension (EMP) on pensioner poverty when poverty is measured using the European income distribution (Atkinson et al., 2000). Many ways of setting the level of the minimum pension could be chosen. The method used is to pick a nationally relevant level (for the UK) and to apply it in the other five countries analysed using PPP-adjusted exchange rates. Results are analysed using alternative definitions of the bottom quintile of incomes for the combined six countries. As well as the exchange rate, the equivalence scale (to adjust incomes so that incomes of households of different sizes and compositions may be compared) is varied. It is found that the relative effectiveness of the policy in each country in terms of reducing the numbers of pensioners in the bottom quintile depends on these income equivalence assumptions and the study concludes that

> "… the imposition of this "standard" anti-poverty policy has a highly uneven effect across countries. …. It is not the case that the use of a common instrument necessarily leads to the uniform achievement of a common objective. Moreover we have shown that it is not only differences in average income that affect the relative national impacts of the reform. Existing pension policies, as well as redistributive systems in general, have deficiencies of various kinds when compared with the particular standard set by the EMP."

The sensitivity of multi-country results is also examined by O'Donoghue et al. (2000) who explored the effect on baseline distributions not only of the equivalence scale and exchange rate but also adjustments to account for differences in data quality across countries. Other possible sensitivities - to the date and time period and to the definition of income - are also discussed.

Clearly the choice of exchange rate is an important issue that not only has significant impact on model results but also is of key importance from a policy point of view. EUROMOD is ideally suited to exploring the sensitivity of cross-country comparisons to assumptions about the appropriate exchange rate.

3.8 Technical issues

A number of technical problems arose during the course of the project, relating to comparability across countries of inputs to and outputs from the model. There are:

- updating the database
- point in time of simulations

- the reference time period
- imputation of gross incomes
- benefit imputations
- tax evasion and non-takeup of benefits.

By and large, these are problems which do not have single, short-term solutions for all countries. Interim, second-best solutions have been adopted and these are summarised below. In the longer term, better methods may be found, but in some cases these will depend on changes in the practice of collecting and disseminating household/personal micro-data.

3.8.1 Updating

The strategy for adjusting data to a later simulation year usually, in national models, relies on a combination of two types of adjustment. The first type - re-weighting - attempts to correct the sample for changes over the period in structural characteristics - such as labour force status and household composition. The second type is an adjustment to monetary variables to take account of changes in prices and incomes over the period.[25]

In EUROMOD the aim is to maximise comparability across countries by our updating procedures. It was agreed - in this first version of the model - not to attempt to devise a re-weighting strategy that could be used for all countries and to confine adjustments to scaling monetary variables according to available information about changes in prices and incomes between the data year (which varies across countries) and 1998, the policy simulation year. It is clear, therefore, that the resulting dataset is in some sense a hybrid of 1998 and the data year.

The nature of this hybrid depends on the way in which the updating factors are derived. There are two choices: the first is to construct them on a "macro" basis using the growth of aggregates, often taken from the National Accounts. The second is to use a "micro" basis, using indexes of average incomes or expenditures, broken down by source and category.

An aggregate-based adjustment attempts to make the adjusted data "look like" real data for the target year (1998 in this case). However, no adjustments are made for the changes in the numbers of people in different circumstances (say, in unemployment or owning their dwelling) between the data year and 1998. So the macro approach risks distorting the micro-level updated data and hence the impact of policy. (For example, if unemployment has fallen then a macro-based index of aggregate unemployment benefit will fall. But for the people who are unemployed in 1998, incomes from benefit may have risen, not fallen.)

An interpretation of the micro approach is that the population from the data year is "parachuted" into 1998. Effectively, the question that is asked is: what incomes would these people receive if they lived in the 1998 regime? The problem with this is that aggregated micro results will not necessarily correspond to 1998 macro levels of income and other variables.

[25] A third type of adjustment - to account for changes in policy rules - is carried out where possible by simulating the reformed instruments.

Since neither approach is obviously preferable, the choice was based on a preference for simplicity and transparency: the micro approach. At the same time, for reasons of lack of suitable data most existing updating regimes use a mixture of approaches in practice. The actual updating factors are reported and the derivations described in the Country Reports. To provide a flavour of the updating process, Table 3.6 shows a typical set of updating parameters. Each monetary variable in the input dataset is assigned one of these factors, according to the type of income represented. In some countries some of these indexes take the same value as each other (typically farm and non-farm self-employment is updated using the same index i.e. $E\_ind_1 = E\_ind_2$). On the other hand, in some countries other dimensions are important to distinguish separately because of differential price changes or growth in the relevant period. For example, several countries use separate indexes for the employment income of civil servants and other employees.

In the case of taxes and benefits that are not simulated but are drawn directly from the data, actual uprating factors are derived where possible (in many countries benefits are uprated by a price index but this is by no means universal practice). Thus there may be many values of B_ind_i and T_ind_i.

Table 3.6 Typical updating factors

Income source/index type	name
Price index	*P_ind*
Earned income:	
Self employed: non-farm	E_ind_1
Self employed: farm	E_ind_2
Employed: manual	
male	E_ind_3
female	E_ind_4
Employed: non-manual	
male	E_ind_5
female	E_ind_6
Investment income	*I_ind*
Rent	*R_ind*
Mortgage interest	*M_ind*
Benefits	B_ind_i
Taxes	T_ind_i

3.8.2 Point in time

The common date for policy simulation for the first version of EUROMOD is 30th June 1998. A precise point in time is necessary (rather than a fiscal year) because Member States change their tax and benefit systems at different points in the annual calendar. Use of a specific day avoids confusion. In principle however, it may result in some degree of non-comparability of results. If country A uprates on June 30th and country B on July 1st, the simulation date for country B will be nearly one year (364 days) behind that of country A.

The model database is adjusted to the common date (see section 3.8.1) and the policy prevailing on that date forms the default policy scenario in the model.

Income tax depends on annual income. For some countries, the income tax paid currently depends on income tax rules that are in current force and income from the ***previous*** tax year (i). In others it is income tax rules in current force applied to income in the ***current*** year (with cumulative adjustments throughout the year) - see (ii). In most, it is effectively a combination of both with some tax withheld on current income and some tax due on last year's income. In some countries, the rules applying are not known until after the income is earned.

Income-related social security benefits may either depend on current income, on income over a preceding period (e.g. year) or income in the last completed tax year.

(i) Current net income = $Y_t - T(Y_{t-1})$
(ii) Current net income = $Y_t - T(Y_t)$

Given the need for simplicity and transparency, it was decided that EUROMOD should ***simulate liabilities on an accruals basis*** using (ii). This is different to the practice in some national tax-benefit models and does not correspond to the timing assumptions inherent in National Accounts, which use ***payments*** on a ***realisations*** basis.

For example, income data collected in 1995 for 1994 is updated from 1994 to 1998 and the income tax, social insurance contribution and benefit rules applying in 1998 are applied to that income.

3.8.3 The reference time period

There are three distinct issues regarding the choice of reference period for incomes - the choice between income measured over a month (or week) or income measured over a year:

- whether monthly or annual income should be used for welfare measurement and comparison;
- comparability of the income measures if the original data used for deriving the EUROMOD database refer to different time periods in different countries;
- different elements of the tax-benefit system depend on different periods of income assessment; typically annual for income tax; monthly for social assistance and social contributions.

The first issue is regarded as secondary in the face of the fact that (a) different measurement periods are used in the underlying data for different countries and (b) the appropriate measurement period is not always available for income assessment of each instrument.

The latter issue is particularly complex and there is no satisfactory solution using existing data. Ideally EUROMOD would use both annual information and information for 12 separate months for each country so that (a) there could be a choice of time period for the income

output and (b) the most appropriate time periods could be used for each instrument. But this is not the case for any country and a tractable compromise has been reached based on a balance between three considerations: (i) data availability and what is reasonable to impute, (ii) the time period requirements of each policy instrument and (iii) comparability across countries.

The solution is to use annual incomes divided by 12, or monthly incomes where this is not possible. In the longer term there is scope for a dedicated project on this issue. It is likely that such a project would recommend changes in income micro-data collection practice.

Table 3.7 shows a summary of policy instrument types by country according to whether annual, monthly or weekly income information is needed in their calculation. The table also shows the recording time periods that apply to incomes in the underlying data.

Table 3.7 Time periods that apply to national tax-benefit income assessments and are used for recording income data in national EUROMOD datasets

Country	IT	SICs	SA benefits	Other	Micro-data
Austria	Y	M			Y
Belgium	Y	M	M		Y[2]
Denmark	Y	Y	Y		Y[2]
Finland	Y	Y	M	Y/M	Y[2]
France	Y	M	Y		Y
Germany	Y	M/Y	M		Y[2]
Greece	Y	M	Y[1]		Y[2]
Ireland	Y	W	W		W/Y[3]
Italy	Y	Y	Y	Y	Y
Luxembourg	Y/M	M	M		M
Netherlands	Y	Y/O	M		Y[2]
Portugal	Y	Y	Y		Y
Spain	Y	M	Y		Y[2]
Sweden	Y	Y	M	Y	Y
UK	Y	W/Y	W/M		W/Y[3]

W - WEEKLY; **M** - MONTHLY; **Y** - YEARLY; **O** - OTHER
IT - INCOME TAX; **SICs** - SOCIAL CONTRIBUTIONS; **SA BENEFITS** - SOCIAL ASSISTANCE (AND OTHER INCOME-RELATED) BENEFITS
1. Income from the previous year is used. 2. Some incomes may be assigned to particular months.
3. Some incomes are available weekly or monthly (earnings, benefits, pensions); others yearly (self-employment income; income from capital).

Income is most commonly available in micro-data on an annual basis (12 countries). Annual income is required for income tax assessment in all countries (with-holding taxes may require monthly income information);[26] in some countries social contributions require annual income information, in other the time period is shorter (a week for employees in the UK). The relevant period also varies for social assistance and other income-related benefits.

[26] Although the usual aim is to simulate final taxes, with-holding taxes may be calculated in the imputation of gross income from net - see section 3.8.4.

The choice of annual income (for convenience, divided by 12) fits best with the requirements of income tax simulation in all countries and least well for social assistance and social contributions where these depend on income over a shorter period. However, annual income is not available in two countries and the use of a mixture of weekly and monthly income for Ireland and the UK not only implies some inaccuracy in income tax simulation, it also introduces some inconsistency across countries in the simulated components of income and in the income concept as a whole.

A related issue is the reference point in time for status and categorical variables linked to income receipt. Most surveys contain status variables - such as employment status and occupation - that relate to the time of interview or the immediately preceding period. Thus they may not be consistent with the annual income information which is usually collected for the previous year. In some cases a discrepancy will not be obvious (earnings will refer to a previous job) but in others it will be apparent (the person may have become unemployed or retired). Status information is not used by EUROMOD in many of the tax-benefit calculations: the issue of much less critical than the reference period for incomes. However, status variables are used for some eligibility calculations and in the calculation of replacement rates.

In the case of obvious discrepancies the status variables are re-defined to be as close as possible to the dominant status in the year corresponding to the income data. In Ireland and UK the status and income variables already (mainly) correspond to the previous week or month. In Finland, Italy and Sweden the status variables are already defined to be the dominant status during the income year. In the remaining countries new variables were defined for individuals who appeared to have inconsistent income source and status information. This is documented in Country Reports.

3.8.4 Imputation of gross incomes

One of the most important inputs into EUROMOD is individual level data on gross incomes by source. However, many of the sources of input micro data used by EUROMOD only contain income net of income taxes and/or social insurance contributions and do not also include variables on taxes and contributions. Methods are needed to impute gross income.

The countries for which input datasets do contain gross incomes are Finland, Ireland and Sweden. The German and UK data contain all the components of gross income, which may be added together. Employment income in the Netherlands requires adjustment to add back some social contributions and to deduct some employer contributions. In the case of the other nine countries a more elaborate procedure was required.

Reflecting the structure of existing tax and contribution rules, the conversion of net incomes to gross amounts is a complex problem. For some purposes, it may be sufficient to reduce the complexity by not taking into account all tax- and contribution- relevant characteristics of the individuals represented in the data. Eurostat use a “statistical” method to derive a ‘net/gross ratio’ which is supplied in the European Community Household Panel User Database (ECHP

UDB) along with the income variables (which are all 'net').[27] Based on information on both net *and* gross income (which are *both* available for a subset of individuals), a statistical model is estimated. Fitting this model to the data then yields estimates a net/gross ratio for those cases (the majority) where survey respondents have not provided information on both net and gross incomes. The 'statistical' approach raises several issues. First, the variation which can be reproduced by such a model is necessarily rather limited. This is because the number of observations on which the model is estimated is much too small to support the incorporation of all the complex determinants of income tax and contribution payments.

A second important problem with the 'statistical' approach is the non-differential treatment of different recipients and different types of income *within* the household. Clearly, one single household-wide conversion factor for all persons and income components within the household ignores the potentially very large differences in tax- and contribution burdens which different individuals and income types in one given household can be subject to. In many cases, for instance, individuals who are entirely exempt from taxation will live together with high-income earners. Since, in the majority of cases, taxes and contributions depend on the incomes of units smaller than the household, these variations of net-to-gross ratios are highly relevant. Contributions typically depend on earned income whereas the base for income tax is usually wider, and includes income from other sources.

While an exact computation of a net-to-gross factor is conceptually preferable to the 'statistical' approach, the implementation of such an alternative in practice is very resource intensive. The most direct solution to the problem would be an analytic inversion of all relevant tax and contribution rules prevailing in the year to which the net income data refer. While there are some computational problems, this method has successfully been implemented.[28] The main disadvantage is the significant effort that is required to build such a model, given that it is only useful for imputation purposes.

Rather than analytically inverting the system, an alternative is to adopt an iterative approach. This is the method that has been used in most of the nine countries where it is necessary. For each household in the data where net incomes are recorded, this approach 'tries' different levels of gross incomes. For each 'provisional' gross income which is being 'tried', in a next step all relevant tax and contribution rules are applied and simulated taxes and contributions are subtracted from gross income to arrive at a simulated net income. It is then possible to compare whether the resulting simulated net income is a good approximation of net income as recorded in the original data. If it is, then an approximation of gross income has been found.

In some countries the method has been implemented using national tax-benefit models (where these already exist with the policy rules applying in the data year, this was the most convenient approach). See Table 3.8 for details. For example, the problem is less serious in the French data as the incomes in the data are only net of social contributions and not taxes.

[27] See Eurostat (1996).

[28] Since taxes and contributions are not necessarily monotonously increasing functions of gross income (i.e., parts of the 'budget line' may be flat or downward sloping), expressing gross income as a function of net income may not result in a unique solution. Depending on the tax and contribution rules one has to resort to more or less restrictive assumptions to make the inverted system solvable. Berliri et al. (1999) demonstrate how this can be done in the case of Italy.

For three countries (Austria, Greece and Luxembourg) EUROMOD was used to implement the approach.[29] The basic algorithm consists of the following steps:

a. As a first estimate for imputed gross income ($grossY_0$), the algorithm simply takes the net income supplied in the data (the original net income, *ori_netY*), i.e., in iteration $x = 0$ the estimate of the net-to-gross factor k_0 is simply 1:

$$k_x = 1 \qquad x = 0 \qquad (1)$$

$$grossY_x = k_x * ori\_netY \qquad (2)$$

b. Applying the tax-benefit rules, as implemented in EUROMOD, to these gross incomes, we produce a new value for net income (the simulated net income, $netY_0$), which will, as long as taxes and contributions are positive, be smaller than *ori_netY*.

$$netY_x = (1-t_x) * grossY_x \qquad (3)$$

where t_x is the effective average tax rate.

c. Test if the exit condition (4) is met. Given discontinuities in the effective tax- and contribution schedules, it is theoretically possible that this algorithm does not converge. For cases where no solution is found after a certain number of iterations (which can be specified by the user), the algorithm automatically starts over with a (randomly) different starting value $grossY_0$.

$$\left|(ori\_netY - netY_x) / ori\_netY\right| < \left|\delta\right| \qquad \text{exit condition} \qquad (4)$$

If the value of $netY_0$ is not sufficiently 'close' to *ori_netY* (the acceptable error δ can be freely chosen by the user), a new estimate of gross income, $grossY_1$, is produced. $grossY_1$ is generated (equation 2) using a revised estimate of the net-to-gross factor, k_1, as follows

$$k_{x+1} = k_x (ori\_netY / netY_x) \qquad (5)$$

$grossY_1$ is again subjected to taxes and contributions (equation 3) producing a new value $netY_1$. This process is repeated until the value of $netY_x$ converges to the net income as recorded in the data (*ori_netY*).

Among the features of the algorithm is the ability to distinguish between different individuals in the same household. Even if individuals' incomes are taxed jointly, the algorithm is able to approximate separate net-to-gross factors for individuals in the same fiscal unit. This is possible since EUROMOD can accurately assign people to appropriate fiscal units. In addition, it is in certain cases possible to produce different net-to-gross ratios for different income components. Immervoll and O'Donoghue (2001) undertake a case study for Luxembourg to illustrate the importance of deriving separate net-to-gross factors for different individuals within a household/fiscal unit and for different income sources of the same individual.

[29] See Immervoll and O'Donoghue (2001)

Table 3.8 Summary of methods used to derive gross income data

Country	Method
Austria	(1) employment income, pensions: Official tax and contribution tables used for computing withholding taxes (2) private pensions: "Iterative" Method using EUROMOD (but with 1998 rules instead of data-year rules). See Immervoll and O'Donoghue (2001) for details on this approach.
Belgium	Net-to-gross algorithm implemented by the Belgian team: Taking into account various information about the individual and his household, tax income amounts are computed as well as social contributions. These amounts are then added to the net amount.
Denmark	Imputed using information from the Danish ECHP
Finland	None
France	Net-to-gross iterative algorithm implemented by the National team in their national model.
Germany	None
Greece	"Iterative" Method using existing rules and specially implemented withholding tax rules in EUROMOD. See Immervoll and O'Donoghue (2001) for details on this approach.
Ireland	None (gross income variables in survey)
Italy	Istat imputes gross incomes from net using a method based on recursive iteration.
Luxembourg	"Iterative" Method using specially implemented withholding tax rules in EUROMOD (data year is 1998). See Immervoll and O'Donoghue (2001) for details on this approach.
Netherlands	Employment incomes in the original data are net of employee unemployment, disability and pension insurance contributions but include employer health insurance contributions. The latter are subtracted and the former three are added to arrive at gross employment incomes. This has been done using simplified rules of the respective instruments (see country report).
Portugal	Net-to-gross algorithm implemented by the National team using a similar methodology as described in Immervoll and O'Donoghue (2001).
Spain	Net-to-gross iterative algorithm implemented by the National team as documented in Levy and Mercader Prats (1999)
Sweden	None
UK	Gross income = net income + tax + other deductions (variables are in base data)

3.8.5 Benefit imputations

In many of the input datasets, information on the amount of benefits received is not available for each individual national benefit. Benefits performing similar functions, aimed at common client groups or covering similar risks may be aggregated. This is a particular feature of the ECHP UDB, but is also common practice in the recording of pension incomes. For EUROMOD purposes this is far from ideal. As explained in section 3.4, EUROMOD aims to simulate as many benefit instruments as possible but is not able to simulate all of them. Amounts for those it does not simulate are taken directly from the data (updated appropriately). Thus in the case of an aggregate variable that includes two benefits, one that can be simulated and one than cannot, the aggregate must be split, or the benefit that cannot be simulated must be imputed in some other way. Table 3.9 summarises the main cases where this has been done. The methods are *ad hoc*, depending on the information available. Sometimes the imputation can be carried out with some confidence because there is not only a lot of relevant information, but because the system is simple. (A flat rate benefit is relatively easy to impute if eligibility is known.) In other cases, the imputation consists of little more than guesswork informed by national knowledge about how the benefits operate.

This is one area where there is clear scope for improvement in the underlying data. While aggregation of benefit variables is carried out for good reasons (such as known respondent confusion between benefits) it must be the case that data collection methods can be improved.

Table 3.9 Imputation of input benefit variables

Country	Input benefit variables that have been imputed
Austria	None
Belgium	unknown
Denmark	None
Finland	Unemployment benefits are taken from the register of the institute paying the benefit. It is checked that this is not more than the taxed benefit. The differences are in few cases and very small.
France	None
Germany	None
Greece	Old Age Agricultural Means Tested pensions split from other old age pensions.
Ireland	None
Italy	In original data supplementary pensions are not available separately from contributory pensions. Every pensioner who receives a pension equal or below the minimum is assumed to receive an amount equal to the average supplementary pension
Luxembourg	None
Netherlands	State pension has been imputed (by the data provider) for people who only provide information on total pension.
Portugal	Means Tested benefits split from Contributory pensions
Spain	(a) ECHP unemployment benefits variable split into Unemployment insurance and Unemployment assistance (b) ECHP pension variable split into four separate pension variables (c) ECHP survivor's pension variable split into two widows pension variables (insurance and assistance) and an orphan's benefit variable (d) ECHP child benefit variable split into child benefit and other family benefits. Splitting is done using a combination of personal characteristics, legal values of some benefits and eligibility requirements. See the country report for more details.
Sweden	None
UK	State Earnings Related Pension (SERPS) split from total state pension using assumptions about basic state pension receipt (see the Country Report)

3.8.6 Tax evasion and the non-takeup of benefits

Application of tax and benefit rules does not necessarily result in an accurate representation of the taxes paid and benefits received. Rules may not be adhered to. In the case of tax, income may not be fully declared to the authorities. In the case of benefits, lack of information or a sense of shame may inhibit entitled people from claiming. It is likely that both these issues apply to some extent in all countries. However, they may be more important in some countries than in others, due to the nature of the system and its administration on the one hand, and prevailing social norms about rights and responsibilities regarding benefit entitlement and tax payment on the other. Typically, evasion occurs when it is possible to hide income or withhold information about it, and non-takeup occurs when benefits must be claimed and are not contributory. In some countries a significant problem is recognised (for

example in relation to tax evasion in Italy and Greece, and in relation to non-takeup of certain benefits in Ireland and the UK). However, dealing with these issues in the context of policy simulation is not straightforward for a number of reasons.

First, we must ask the question whether model results should reflect what is intended by the system, or what actually occurs. If we are interested in the first question then the problems are fewer. For pragmatic reasons, this is largely the approach that has been taken in the first version of EUROMOD. However, the issue is important both from a policy point of view and in relation to the accuracy of EUROMOD results compared with other statistics. It will be pursued in later work.

Secondly, in the case of tax evasion, the matter is not confined to devising a method of reducing simulated tax payments to account for evasion. Typically we do not observe either actual taxable incomes (gross) or the gross incomes that are declared to the tax authorities (see section 3.8.4). Ideally, imputation of gross incomes needs to take account of tax evasion.

Thirdly, to model tax evasion or benefit non-takeup we need to know about its extent and its pattern by the characteristics of taxpayers or claimants and by the amount they are liable for, or entitled to. Typically we know little or nothing about these factors. As far as benefit non-takeup is concerned, measuring its extent and incidence is complicated, and is further confused by the fact that there is "measurement error" both in survey micro-data sources of information about benefit receipt, and in administrative procedures faced in practice by benefit claimants.[30]

The fact that a person appears not to receive a benefit to which they appear to be entitled according to the information that we do have can be attributed to a number of possible causes (or combinations of them):

1. they did not claim the benefit because they did not know about it or they did not think they would be entitled
2. they did not claim the benefit because they were ashamed to admit that they needed it, or to be seen to claim it
3. they did not claim because the amount they thought they would receive was less than the cost (hassle) of the claim procedure
4. they did claim, but some conditions for receipt were not met (and are not captured in the data) - examples might include local discretion over award of benefits or local cash limits being exceeded
5. they did claim but entitlement was refused due to administrative error
6. they did claim but were not entitled (error in survey data)
7. they did claim and did receive (error in survey data).

Simulation of some benefits in some countries, applying non-discretionary rules, gives rise to an over-estimate of the number of benefit recipients and the aggregate cost of the benefit. In some cases the over-estimate is very large (in spite of data-related problems which would tend to have the opposite effect: see section 3.8.3). Aside from questions about the

[30] See, for the UK, Department of Social Security (2000).

representativeness of the data and the effect of updating, the reason for non-receipt where receipt is simulated must be some combination of the seven explanations listed above.

From a policy point of view one might be most concerned about causes 1 and 2, and to a lesser extent, 3. (Cause 5 is also important but would - arguably - be matched by an equal number of errors in favour of claimants.)

There is a distinction to be made between non-receipt that is intended by the system (for example, where individual discretion is an integral part of the decision-making process in benefit administration) and non-receipt that can be seen as a failure of the system. The Country Reports for Ireland and the UK explain that some benefits in these countries do appear to fail to reach some people for whom they are intended. Non-takeup is modelled for these benefits in the national models for these countries. In most other countries, the shortfall in actual receipt compared with modelled receipt is believed to be mainly due to some form of explanation 3: that part of the claim or entitlement procedure is not possible to reproduce using deterministic rules based on characteristics observed in the data. In these cases, in order not to over-estimate these benefits, entitlement is modelled by making it conditional on recorded receipt in the data. So, for example, the rules governing the 1998 French means-tested benefit for sickness are applied to the people receiving this benefit in the data year.[31]

The same type of condition is applied to social assistance receipt in Germany. This is found to have quite an important effect on the baseline results for this country (considered in more detail in the following section). If German social assistance depends only on application of the non-discretionary formal rules we find that the Gini co-efficient becomes 0.25, compared with 0.28 if benefit entitlement is "tied" to receipt in the data. Although the 60% median poverty line hardly changes, the poverty rate falls from 13.5% to 10.0% if full "take-up" of social assistance is assumed.

Current EUROMOD treatment of tax evasion and benefit non-takeup is summarised in Table 3.10. Clearly there is some variation in treatment across countries and to this extent results are not strictly comparable.

It is worth noting that the practice of "tying" entitlement to receipt recorded in the data may be effective for capturing the effect of a tax-benefit system the same or similar to that operating in the data year. It is less satisfactory for modelling changes in the benefit system, particularly if these make more generous the eligibility conditions for the "tied" benefit or if in some other way they tend to influence the chances of entitlement to the "tied" benefit.

[31] Since the process of updating from the data year combines indexation (of some benefits) and simulation (of others), this may produce anomalous results if policy changes have occurred between these points in time.

Table 3.10 Tax evasion and the non-takeup of benefits

Country	Treatment of take-up or evasion issues
Austria	None
Belgium	None
Denmark	No evasion or take-up modelling. But for Social Assistance and Unemployment Benefits, eligibility depends on receipt of benefit in the data.
Finland	None
France	Receipt is used to indicate eligibility for means tested sickness benefits.
Germany	For Social assistance, two versions have been simulated: (1) 'formal' entitlement rules (disregarding any take-up issues). (2) Eligibility depends on receipt of benefit in the data.
Greece	None
Ireland	Receipt is used for eligibility for contributory benefits; 100% take-up for FIS assumed (although non-take-up is modelled in the national model)
Italy	Tax Evasion variable in the data, calculated by ISTAT. This is deducted from the income tax base and from the income base of other instruments using the tax base for assessment.
Luxembourg	None
Netherlands	None
Portugal	None
Spain	None
Sweden	Take-up of social assistance can be modelled. This can be switched off to make comparable with other countries. Receipt of housing benefits is partially used to indicate eligibility.
UK	Unemployment benefit (contributory JSA) eligibility is tied to recorded benefit receipt in the input data; 100% take-up for means-tested benefits assumed (although non-take-up modelled in national model)

3.9 Baseline results

"Baseline results" are summary statistics calculated using micro-output from EUROMOD for 1998 using a particular set of established assumptions and definitions. Their value lies in their use for validation purposes and to demonstrate the differences between results using incomes taken directly from survey data and those using simulated components of income. In most countries similar statistics could be obtained much more straightforwardly, directly from national sources of income micro-data for 1998. So while on their own they provide little value-added, the statistics that we discuss in this section provide a basis for interpreting and evaluating results from EUROMOD ***that depart from this baseline***. Typically, these are results that cannot be directly validated because they describe a hypothetical policy scenario, not a situation that has actually happened and for which descriptive statistics may exist.

Country Reports validate the baseline aggregate statistics and poverty and distribution measures for individual countries. Here, we compare some of these statistics across countries

in relation to some other international studies. Fairly well-established standard assumptions have been used, to aid comparisons with this other work, but as explained in sections 3.5 and 3.7.1 a wide range of alternative assumptions - and additional measures - are possible to produce. In all the tables that follow in this section, indicators are derived using the same definition of household disposable income (see section 3.4). Except where otherwise specified the modified OECD equivalence scale is used to adjust household income for differences in size and composition and households are weighted by their size.[32] The poverty line is defined as 60% of national median equivalised household disposable income. No adjustments are made for differences in purchasing power between or within countries.

3.9.1 Indicators of income inequality and poverty compared across countries

Table 3.11 shows the Gini co-efficient, the poverty rate and two versions of the Foster-Greer-Thorebecke (FGT) index of poverty intensity for 14 out of 15 countries. (Validated results are not yet available for Sweden.)

Table 3.11 EUROMOD income inequality and poverty indicators, 1998

	Gini	Poverty Rate %	FGT(1)	FGT(2)
Austria	0.25	11.3	0.016	0.005
Belgium	0.24	14.8	0.029	0.014
Denmark	0.24	11.1	0.022	0.010
Finland	0.23	9.4	0.013	0.003
France	0.28	11.8	0.020	0.005
Germany	0.28	13.5	0.053	0.034
Greece	0.33	20.3	0.082	0.048
Ireland	0.33	18.0	0.030	0.008
Italy	0.34	19.9	0.061	0.030
Luxembourg	0.26	11.8	0.019	0.005
Netherlands	0.25	9.9	0.022	0.015
Portugal	0.36	21.9	0.057	0.021
Spain	0.32	18.5	0.056	0.028
Sweden*				
UK	0.31	20.0	0.037	0.011

Source: EUROMOD
Notes: The poverty rate is percentage of persons in households below the poverty line which is defined as 60% of national median equivalised household disposable income. The equivalence scale is the "modified OECD".
FGT(1) is the Foster-Greer-Thorebecke index with a poverty aversion parameter of 1 (sum of normalised Eq.Pov.Gap (normalised vis-a-vis the poverty line) over poor people averaged across ENTIRE population).
FGT(2) is the Foster-Greer-Thorebecke index with a poverty aversion parameter of 2 (average squared normalised poverty gap)
* Validated results for Sweden are not yet available.

A full comparison of these results with other similar statistics is beyond the scope of this report and is the subject of further research. However, to provide some indication of the comparability of these results with other international comparisons, Table 3.12a shows a

[32] Modified OECD scale: first adult =1.0; children aged under 14 = 0.3; other people = 0.5.

comparison of the EUROMOD Gini coefficients with those calculated by Brandolini and D'Alessio (2001) using data from the Luxembourg Income Study. The studies have 11 countries in common (Austria, Portugal and Greece are not included in the Brandolini and D'Alessio (2001) study). Methods differ (Brandolini and D'Alessio use the square root equivalence scale) and in only three cases are the underlying micro-datasets the same (France, Italy, UK). Others date from different years or use different types of data (Denmark, Spain).

Table 3.12 EUROMOD output: comparisons of Gini Coefficients with external sources
(a) Luxembourg Income Study (LIS)

	Rank of EUROMOD Gini	EUROMOD Gini	LIS Gini	Rank of LIS Gini
Finland	1	0.23	0.206	1
Denmark	2	0.24	0.216	2
Belgium	3	0.24	0.247	4
Netherlands	4	0.25	0.248	5
Luxembourg	5	0.26	0.222	3
Germany	6	0.28	0.259	6
France	7	0.28	0.265	7
UK	8	0.31	0.315	10
Spain	9	0.32	0.284	8
Ireland	10	0.33	0.300	9
Italy	11	0.34	0.316	11

Sources: Table 3.11 and Brandolini and D'Alessio (2001), Table 5.

Table 3.12b shows a similar comparison with ECHP data for 1996 (1995 incomes) for 13 countries (excluding Finland and Sweden) taken from Eurostat (2000). The methods are the same but the base data source is the same in only five countries (and uses a different year in two of these five).

Table 3.12 EUROMOD output: comparisons of Gini Coefficients with external sources
(b) European Community Household Panel (ECHP) 1996

	Rank of EUROMOD Gini	EUROMOD Gini	ECHP Gini	Rank of ECHP Gini
Denmark	1	0.24	0.23	1
Belgium	2	0.24	0.28	3 (=)
Netherlands	3	0.25	0.3	7
Austria	4	0.25	0.26	2
Luxembourg	5	0.26	0.28	3 (=)
France	6	0.28	0.29	6
Germany	7	0.28	0.28	3 (=)
UK	8	0.31	0.34	11 (=)
Spain	9	0.32	0.33	8 (=)
Ireland	10	0.33	0.33	8 (=)
Greece	11	0.33	0.34	11 (=)
Italy	12	0.34	0.33	8 (=)
Portugal	13	0.36	0.37	13

Sources: Table 3.11 and Eurostat (2000), Table A.2.1.6.

Of course, the fact that EUROMOD simulates some income components and updates to a common year also has an effect. Given all these differences, the size of the Gini coefficients and their ranking by country seem very similar in the case of the LIS comparison and only slightly less so in the case of the ECHP. The differences between the two independent sources seem as large as the differences between EUROMOD and either of them.

A second comparison - of poverty rates - is shown in Table 3.13. The external source that is used here is Mejer and Siermann (2000) using data from the third wave (1995 incomes) of the ECHP for 13 countries (Sweden and Finland are excluded). The general method is the same (using a poverty line defined using the same guidelines) but differences in the underlying data, the reference year and the fact that many EUROMOD income components are simulated will all have an effect.

Table 3.13 EUROMOD output: comparisons of poverty rates with an external source

	Rank of EUROMOD poverty rate	EUROMOD poverty rate %	ECHP poverty rate %	Rank of ECHP poverty rate
Netherlands	1	9.9	12	1 (=)
Denmark	2	11.1	12	1 (=)
Austria	3	11.3	13	4
France	4	11.8	16	5 (=)
Luxembourg	5	11.8	12	1 (=)
Germany	6	13.5	16	5 (=)
Belgium	7	14.8	17	7
Ireland	8	18.0	18	8 (=)
Spain	9	18.5	18	8 (=)
Italy	10	19.9	19	10 (=)
UK	11	20.0	19	10 (=)
Greece	12	20.3	21	12
Portugal	13	21.9	22	13

Sources: Table 3.11 and Mejer and Siermann (2000), Table 3.

The country ranking of poverty rates using EUROMOD output is quite similar to that using the ECHP. As far as the actual rates are concerned, EUROMOD produces rates that are quite a lot lower than the ECHP rates in the Netherlands, France, Germany and Belgium.

3.9.2 National income distributions and the redistributive impacts of taxes and benefits

Tables 3.14a to 3.14n show national distributions of household income and the tax-benefit components of these incomes by decile group for each country. These tables use national currencies in monthly terms. The notes to the tables explain the national composition of the broad headings that are used in each table ("Taxes", "EESICs" - employee contributions, "ERSICs" - employer contributions, and "Benefits", which also includes public pensions). (This categorisation of instruments is an area where EUROMOD offers a flexibility which is needed if results are to conform to different conventions and are to be used for a range of purposes. The categories chosen for these tables are simply for illustrative purposes.)

The lower half of each national table indicates the redistributive nature of the tax and social security systems by showing the share of total income and each of the components that is found in each decile group.

Table 3.14a EUROMOD baseline output, 1998: AUSTRIA

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	9703	12805	-114	1128	1324	3152	7881
2	11733	18380	555	2155	2786	2123	9324
3	13416	21678	1296	2944	3456	1839	9816
4	14944	26657	2057	3815	4423	1982	10822
5	16546	27162	2766	4333	5034	1565	9586
6	18260	30932	3955	5322	6027	1579	8674
7	20590	33971	4659	5766	6418	1005	11307
8	23224	37830	6305	6465	7629	911	13292
9	28179	44346	9411	8002	8257	930	14611
10	-	65802	24794	9233	9728	716	35412
Mean:		32266	5810	4946	5532	1583	13351
		%	**%**	**%**	**%**	**%**	**%**
1		4.5	-0.2	2.6	2.7	22.5	6.7
2		5.6	0.9	4.3	4.9	13.1	6.8
3		6.5	2.2	5.8	6.0	11.2	7.1
4		7.2	3.1	6.8	7.0	11.0	7.1
5		8.3	4.7	8.7	9.0	9.8	7.1
6		9.0	6.4	10.1	10.2	9.4	6.1
7		10.3	7.9	11.4	11.4	6.2	8.3
8		11.9	11.0	13.3	14.0	5.8	10.1
9		13.9	16.4	16.3	15.1	5.9	11.0
10		22.8	47.7	20.9	19.7	5.1	29.6
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax**

EESICs: **Employee SICs** + **Self-employed SICs + Benefit Recipient SICs**

ERSICs: **Employer SICs** + '**Employer' SICs paid by benefit paying institutions**

Simulated Benefits: **Child Benefits + Maternity Allowance Supplement + Small Children Benefit + Newborn Health Check Bonus + Provincial Family Bonus + Minimum Pension (non-Civil Servants) + Minimum Pension (Civil Servants) + Extra Child Benefit for Pensioner Parents (non-Civil Servants) + Extra Child Benefit for Pensioner Parents (Civil Servants) + Social Assistance**

Total Benefits: Simulated Benefits + Public Pensions (all types) + Short Term Pregnancy Benefit + Maternity Benefit + Student Grants Unemployment Benefit + Unemployment Assistance + Federal Disability Benefit + Provincial Disability Benefit + Housing Benefit + Rent Subsidy

Instruments in **bold** are simulated

Table 3.14b EUROMOD baseline output, 1998: BELGIUM

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	22895	27376	3497	610	1866	9663	21896
2	27752	36746	2093	1204	4059	5753	27511
3	32513	44716	4564	2771	8235	4360	27341
4	36754	52478	6534	3606	10964	3569	30257
5	41265	64074	10647	5880	18027	4416	28110
6	45847	76868	16214	8212	24429	6020	30351
7	51201	83608	20226	9688	29545	4884	29812
8	56717	95341	28461	12389	38070	5212	27488
9	67144	104224	34661	14573	44809	4188	21924
10	-	148381	64291	21477	63003	2394	26474
Mean:		71033	18121	7610	22996	5070	27076
		%	**%**	**%**	**%**	**%**	**%**
1		4.2	2.1	0.9	0.9	20.6	8.7
2		6.1	1.4	1.9	2.1	13.3	11.9
3		7.1	2.8	4.1	4.0	9.7	11.4
4		8.2	4.0	5.2	5.3	7.8	12.3
5		8.8	5.7	7.5	7.6	8.5	10.1
6		9.4	7.8	9.4	9.2	10.3	9.7
7		10.5	9.9	11.3	11.4	8.6	9.8
8		11.7	13.7	14.2	14.4	9.0	8.9
9		13.6	17.8	17.8	18.1	7.7	7.5
10		20.5	34.8	27.7	26.9	4.6	9.6
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax + Property Tax**

EESICs: **Employee SICs** + **Self-employed SICs + Benefit Recipient SICs**

ERSICs: **Employer SICs**

Simulated Benefits: **Child Birth Benefits + Ordinary Child Benefits** + **Child Benefits for the Self-employed** + **Disabled Workers' Child Benefit** + **Social Supplement Child Benefit** + **Guaranteed Child Benefit** + **Social Assistance ("MINIMEX")** + **Social Assistance for the Elderly**

Total Benefits: Simulated Benefits + Public Pensions (all types) + Unemployment Benefits (all types) + Disability/Care/Accident/Sickness Benefits + Maternity Payments + "Special Funds" Allocations

Instruments in **bold** are simulated.

Table 3.14c EUROMOD baseline output, 1998: DENMARK

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	6243	6435	1781	340	96	4601	5385
2	7479	9157	2874	405	117	8240	8591
3	8536	11584	4094	859	246	8569	9014
4	9613	14126	5404	1531	403	6713	7141
5	10664	17344	7587	2355	596	5210	5761
6	11765	18872	8800	2726	667	4567	4994
7	12940	21283	10628	3310	812	3709	4002
8	14470	22656	11728	3635	852	2873	3061
9	17097	25509	14643	4194	971	2511	2780
10	-	38947	30480	6478	1306	1500	1783
Mean:		17594	9133	2372	558	5043	5460
		%	**%**	**%**	**%**	**%**	**%**
1		4.9	2.6	1.9	2.3	12.3	13.3
2		6.7	4.1	2.2	2.7	21.1	20.3
3		7.2	4.9	4.0	4.8	18.7	18.2
4		7.7	5.6	6.2	6.9	12.7	12.5
5		8.3	7.0	8.3	8.9	8.7	8.8
6		9.3	8.4	10.0	10.4	7.9	7.9
7		10.2	9.8	11.7	12.2	6.2	6.2
8		11.4	11.4	13.6	13.6	5.1	5.0
9		13.5	15.0	16.5	16.3	4.7	4.8
10		20.7	31.2	25.6	21.9	2.8	3.1
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Bottom Income Tax** + **Middle Income Tax** + **Top Income Tax** + **Local Income Tax**

EESICs: **Employee SICs** + **Self-employed SICs** + **Benefit Recipients' SICs**

ERSICs: **Employer SICs** + '**Employer' SICs paid by benefit paying institutions**

Simulated Benefits: **Public Old Age Pension + Disability Pension + Unemployment Benefit** + **Family Allowance** + **Ordinary Child Benefit** + **Extra Child Benefit** + **Special Child Benefit** + **Multi Children Child Benefit** + **Social Assistance** + **Housing Benefits** + **Housing Allowance**

Total Benefits: Simulated Benefits + Other Public Pensions (Supplementary (ATP); Survivor) + Early Retirement Benefit ("Efterlon") + Sickness Benefits + Maternity Payments

Instruments in **bold** are simulated.

Table 3.14d EUROMOD baseline output, 1998: FINLAND

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	4111	4215	434	131	43	550	3421
2	4847	5977	936	262	64	611	4812
3	5473	7640	1561	434	91	794	5494
4	6111	8895	2231	636	119	664	5169
5	6758	9999	2758	758	102	648	5097
6	7488	11400	3525	1002	159	656	4543
7	8299	12984	4397	1225	144	655	3935
8	9316	14458	5247	1419	162	621	3681
9	11100	16411	6655	1723	191	481	3456
10	-	23842	12127	2421	340	432	4147
Mean:		10939	3670	921	133	609	4351
		%	**%**	**%**	**%**	**%**	**%**
1		5.8	1.8	2.2	4.9	13.7	11.9
2		6.6	3.1	3.4	5.8	12.1	13.3
3		6.9	4.2	4.7	6.8	12.9	12.5
4		7.7	5.8	6.6	8.5	10.4	11.3
5		8.4	6.9	7.5	7.0	9.7	10.7
6		9.2	8.5	9.7	10.6	9.6	9.3
7		10.1	10.2	11.3	9.2	9.2	7.7
8		11.3	12.3	13.2	10.4	8.8	7.3
9		13.3	16.1	16.6	12.8	7.0	7.1
10		20.6	31.2	24.8	24.1	6.7	9.0
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Capital Income Tax + Income Tax + Local Income Tax + Church Income Tax +** property tax

EESICs: **Employee Social Insurance Contributions + Self-employed Social Insurance Contributions + Employee Sickness Social Insurance Contributions**

ERSICs: **Employer Social Insurance contributions**

Simulated Benefits:
Child Day Care Subsidy + Child Home Care Subsidy + Child Benefits + Lone Parent Benefit + General Housing Benefits

Total Benefits:
Simulated Benefits + Maternity payments + Pension from abroad + Basic Unemployment Benefit + Closure Pension + Other Social Benefits (earned Income) + National Occupational Earnings Related Pension + Earnings Related Unemployment Benefit + Child home care additional means-tested payment + Child home care non-means benefit + Work Injury Pension + Labour Market Support (an unemployment benefit) + Military Injury Compensation + Pension from medical treatment injury + National (basic) pension + Other pension + 2ndOther Pension + Pensioners housing benefit + Sickness Benefit + Survivor's Pension + Training Subsidy for Unemployed + Ex-Child home care subsidy + student housing benefits

Instruments in **bold** are simulated.

Table 3.14e EUROMOD baseline output, 1998: FRANCE

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	4468	6097	206	598	1137	2264	3733
2	5269	8017	249	942	1680	2143	4386
3	6048	8998	352	1258	2089	1360	4586
4	6835	10470	543	1704	2754	1207	4580
5	7699	11944	726	2066	3238	1091	4730
6	8710	13717	953	2503	3803	948	4838
7	9897	15484	1316	3074	4610	899	4557
8	11554	17881	1816	3695	5376	588	4851
9	14457	21120	2594	4325	6120	473	5923
10	-	32618	6989	6966	10278	384	6918
Mean:		14775	1620	2745	4156	1130	4929
		%	**%**	**%**	**%**	**%**	**%**
1		4.1	1.3	2.2	2.7	19.9	7.5
2		5.3	1.5	3.3	3.9	18.5	8.7
3		6.4	2.3	4.8	5.2	12.6	9.7
4		7.1	3.4	6.2	6.6	10.7	9.3
5		8.0	4.4	7.4	7.7	9.5	9.5
6		9.0	5.7	8.8	8.9	8.1	9.5
7		10.2	7.9	10.9	10.8	7.8	9.0
8		11.7	10.9	13.1	12.5	5.0	9.5
9		14.4	16.1	15.8	14.8	4.2	12.1
10		23.9	46.6	27.4	26.7	3.7	15.2
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax + Capital Income Tax** + property tax

EESICs: **Employee SICs + All CSG/CRDS Contributions**
ERSICs: **Employer SICs**

Simulated Benefits: **Allocation Familial (family benefits) + Allocation pour Jeune Enfants + Complement Familial (benefits for young children and large families) + Minimum old age pension + Allocation Parent Isole + RMI: social means tested benefit + Means Tested Invalidity Benefit (Allocation Aux Adultes Handicapes) + Alloc. de rentrèe scolaire + Aide à la Scol. + Allocation Logement**

Total Benefits: Simulated Benefits + Maternity payments + Social Benefits for dependent elderly adults (Aide aux Personnes Agees Dependantes, special education (Allocation d'education speciale…destinee aux enfants handicapes), parental education (Allocation Parentale d'Education), Lone Parents with certain characteristics (Allocation de Soutien Familial) + Invalidity pension + Invalidity Benefit + Aide sociale + War pension + Help for child guard (aide a la garde d'enfant) + Pension Benefits + Survivor Pension + Pre-Retirement Pension

Instruments in **bold** are simulated.

Table 3.14f EUROMOD baseline output, 1998: GERMANY

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	1194	877	2	61	61	153	539
2	1558	2038	56	253	253	245	1238
3	1797	2506	142	390	390	242	1107
4	2036	2921	255	514	514	152	1400
5	2257	3374	422	634	634	129	1296
6	2531	3560	553	715	715	99	1276
7	2871	4010	728	833	833	91	1230
8	3340	4755	1147	1054	1054	85	1042
9	4087	5491	1524	1111	1111	56	1045
10	-	7650	2890	1064	1064	31	1182
Mean:		3700	782	654	654	128	1120
		%	**%**	**%**	**%**	**%**	**%**
1		2.9	0.0	1.1	1.1	14.5	5.8
2		5.5	0.7	3.9	3.9	19.1	11.0
3		6.5	1.8	5.7	5.7	18.2	9.5
4		7.4	3.1	7.3	7.3	11.1	11.7
5		8.2	4.8	8.7	8.7	9.0	10.4
6		9.5	7.0	10.7	10.7	7.6	11.2
7		10.7	9.2	12.6	12.6	7.0	10.8
8		12.3	14.0	15.4	15.4	6.3	8.9
9		14.8	19.5	17.0	17.0	4.4	9.3
10		22.3	39.9	17.6	17.6	2.6	11.4
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax** + **Solidarity Surplus Tax**

EESICs: **Employee Social Insurance Contributions**

ERSICs: **Employer SICs**

Simulated Benefits: **Child Benefits** + **Housing Benefits ("Wohngeld")** + **Social Assistance East/West ("Sozialhilfe: Hilfe zum Lebensunterhalt")**

Total Benefits: Simulated Benefits + Public Pensions (all types) + Unemployment Benefits (all types) + Bad Weather Payments + Disability/Care/Accident/Sickness Benefits + Maternity Payments + Federal Education Allowances ("Bundeserziehungsgeld") + Provincial Education Allowances ("Landeserziehungsgeld")

Instruments in **bold** are simulated.

Table 3.14g EUROMOD baseline output, 1998: GREECE

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	72636	65084	3937	6019	1762	24292	36357
2	113622	167854	5402	15809	10705	17728	75934
3	140132	229271	6456	26154	20487	15152	100700
4	164229	292573	10729	40214	32656	14979	92541
5	190492	327198	13793	47379	39959	10937	102854
6	215316	394998	25900	63418	53422	9580	96868
7	254474	450301	36370	73275	61574	10076	123671
8	300132	531637	63412	98760	81868	8569	102540
9	377649	618409	95593	114380	95623	7219	109096
10	-	950554	298308	128791	94379	5685	126047
Mean:		393524	55696	59574	47570	12800	94907
		%	**%**	**%**	**%**	**%**	**%**
1		2.1	0.9	1.3	0.5	23.8	4.8
2		4.5	1.0	2.8	2.3	14.5	8.3
3		6.0	1.2	4.5	4.4	12.1	10.9
4		6.9	1.8	6.3	6.4	10.8	9.1
5		8.2	2.4	7.8	8.3	8.4	10.1
6		9.1	4.2	9.7	10.2	6.8	9.9
7		10.7	6.1	11.5	12.1	7.3	12.0
8		12.4	10.4	15.2	15.8	6.1	9.9
9		15.3	16.7	18.7	19.6	5.5	11.1
10		24.9	55.2	22.3	20.4	4.6	13.8
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax**

EESICs: **Employee SICs + Self-employed SICs + Farmer SICs + Pensioners SICs**
ERSICs: ***Employer SICs***
Simulated Benefits: **OAED Child Benefit + Child Benefit for Civil Servants + Oga pension (farmer, non contributory) + Solidarity Pension + Social Solidarity Supplement + Child Benefit with more than 4 dependent children + Many children benefit + Third child benefit + Unprotected Child Benefit (Lone Parents)**

Total Benefits: Simulated Benefits + Public Pensions (all types) + Unemployment Benefits (all types) + Disability/Care/Accident/Sickness Benefits + Maternity Payments + Housing Benefits

Instruments in **bold** are simulated.

Table 3.14h EUROMOD baseline output, 1998: IRELAND

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	324	603	1	1	0	569	571
2	393	544	1	2	1	446	446
3	451	799	8	6	5	551	552
4	536	995	39	19	16	478	479
5	641	1274	112	40	33	327	329
6	764	1607	199	62	54	267	270
7	904	1791	268	75	65	217	220
8	1079	2026	377	94	78	183	183
9	1353	2346	575	119	101	114	116
10	-	3713	1037	162	104	84	84
Mean:		1572	269	58	45	325	326
		%	**%**	**%**	**%**	**%**	**%**
1		3.3	0.0	0.1	0.0	14.9	14.9
2		5.0	0.1	0.5	0.3	19.8	19.7
3		5.4	0.3	1.2	1.3	18.1	18.1
4		6.0	1.4	3.1	3.3	14.0	13.9
5		7.0	3.6	6.0	6.3	8.7	8.7
6		8.3	6.0	8.7	9.8	6.7	6.7
7		10.0	8.8	11.5	12.7	5.9	5.9
8		12.2	13.3	15.5	16.4	5.3	5.3
9		15.4	22.0	21.1	23.1	3.6	3.7
10		27.4	44.7	32.5	26.8	3.0	3.0
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax**

EESICs: **Employee SICs** + **Self-employed SICs + Public Sector SICs**

ERSICs: **Employer SICs**

Simulated Benefits:
Blind Persons Pension + Carers Allowance + Child Benefit + Deserted Wife Allowance + Deserted Wife Benefit + Disability Benefit + Disabled Persons Maintenance All. + Family Income Supplement + Housing Benefit + Invalidity Pension + Lone Parent Allowance + Maternity Benefit + Old Age Contributory Pension + Old Age Non Contributory Pension + Orphans Benefit + Pre-Retirement Allowance + Retirement Pension + injury benefit + Supplementary Welfare Allowance + Survivors Benefit + Unemployment assistance (LT) + Unemployment assistance (ST) + Unemployment Benefit + Widows Non-Contributory Pension

Total Benefits: Simulated benefits + Back to Work Allowance + Constant Attendance Allowance + Other Welfare Allowances + Unemployability Supplement

Instruments in **bold** are simulated.

Table 3.14i EUROMOD baseline output, 1998: ITALY

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	764	1045	101	66	109	255	488
2	1014	1544	119	76	186	330	854
3	1210	2131	244	142	403	312	880
4	1441	2452	383	175	452	205	1009
5	1685	2895	521	218	561	142	1135
6	1964	3373	644	264	631	122	1239
7	2272	4013	848	336	868	96	1288
8	2678	4559	1068	402	1021	76	1318
9	3407	5594	1453	545	1235	40	1318
10	-	9657	3199	885	1257	21	1941
Mean:		3775	874	315	679	159	1158
		%	**%**	**%**	**%**	**%**	**%**
1		2.4	1.0	1.8	1.4	14.1	3.7
2		4.5	1.5	2.7	3.0	22.9	8.1
3		5.4	2.7	4.3	5.6	18.6	7.2
4		6.5	4.4	5.6	6.7	12.9	8.7
5		7.8	6.0	7.0	8.4	9.0	9.9
6		9.1	7.5	8.5	9.4	7.8	10.9
7		10.4	9.5	10.4	12.5	5.9	10.9
8		12.2	12.3	12.9	15.2	4.8	11.5
9		15.0	16.8	17.5	18.4	2.5	11.5
10		26.8	38.3	29.4	19.4	1.4	17.6
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax**

EESICs: **Employee SICs** + **Self-employed SICs**

ERSICs: **Employer SICs**

Simulated Benefits: **Family Allowances** + **Supplementary Old Age/Survivor Pension + Supplementary Disability Pension**

Total Benefits: Simulated Benefits + Public Pensions (all types) + Unemployment Benefits (all types) + Disability/Care/Accident/Sickness Benefits + Social Security (National, Provincial, Municipal, Other)

Instruments in **bold** are simulated.

Table 3.14j EUROMOD baseline output, 1998: LUXEMBOURG

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	41846	61036	255	5035	5395	15420	31465
2	49681	78619	1031	6381	6949	10654	41146
3	56893	91233	1883	8294	8774	7745	39550
4	64380	98685	3679	8653	9029	6639	46250
5	72264	112634	5971	9418	10524	6511	54513
6	81092	129609	10613	12398	12459	6492	53800
7	91573	144874	17608	15786	16077	5405	44556
8	105516	165552	25223	17606	18790	5108	46836
9	129329	192284	43427	21597	22588	4629	45302
10	-	283130	117836	31614	28830	3389	36437
Mean:		138248	24040	13977	14210	7070	44056
		%	**%**	**%**	**%**	**%**	**%**
1		4.1	0.1	3.3	3.5	20.2	6.6
2		5.4	0.4	4.3	4.6	14.3	8.8
3		6.3	0.8	5.7	5.9	10.5	8.6
4		7.4	1.6	6.4	6.6	9.7	10.9
5		8.3	2.5	6.9	7.6	9.4	12.6
6		9.2	4.4	8.8	8.6	9.1	12.0
7		10.6	7.4	11.4	11.4	7.7	10.2
8		11.9	10.4	12.5	13.1	7.2	10.6
9		14.2	18.5	15.8	16.3	6.7	10.5
10		22.6	54.0	24.9	22.3	5.3	9.1
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax**

EESICs: **Employee SICs** + **Self-employed SICs** + **Benefit Recipients' SICs**

ERSICs: **Employer SICs** + '**Employer' SICs paid by benefit paying institutions**

Simulated Benefits: **Maternity Allowance** + **Prenatal Allowance** + **Child Birth Allowance** + **Postnatal Allowance** + **Child Benefit** + **Handicapped Child Benefit** + **Education Allowance** + **Beginning of School Allowance** + **Seriously Disabled Persons' Allowance** + **Social Assistance ("RMG")** + H**ousing Benefits**

Total Benefits: Simulated Benefits + Public Pensions (all types) + Unemployment Benefits (all types) + Disability/Care/Accident/Sickness Benefits + Maternity Payments + "Other Public Benefits"

Instruments in **bold** are simulated.

Table 3.14k EUROMOD baseline output, 1998: NETHERLANDS

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	1510	1705	65	294	184	849	1300
2	1746	2283	93	451	222	1298	1620
3	1968	2729	129	585	278	1120	1524
4	2244	3437	225	838	437	723	1116
5	2509	3992	317	1030	544	634	1068
6	2804	4505	421	1221	674	448	820
7	3174	4993	601	1382	736	352	699
8	3642	5190	604	1443	769	417	641
9	4382	6155	1079	1581	808	480	781
10	-	8359	2994	1815	911	366	694
Mean:		4344	685	1056	551	683	1039
		%	**%**	**%**	**%**	**%**	**%**
1		4.3	1.0	3.0	3.6	13.5	13.6
2		6.0	1.5	4.9	4.6	21.7	17.8
3		6.7	2.0	5.9	5.4	17.4	15.6
4		7.1	3.0	7.2	7.2	9.5	9.7
5		8.0	4.0	8.5	8.6	8.1	8.9
6		8.7	5.2	9.7	10.3	5.5	6.7
7		10.0	7.6	11.4	11.7	4.5	5.9
8		12.4	9.2	14.2	14.5	6.3	6.4
9		14.6	16.3	15.5	15.1	7.3	7.8
10		22.1	50.2	19.7	19.0	6.1	7.7
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax**

EESICs: **Employee SICs** + **Self-employed SICs** + **Benefit Recipients' SICs**

ERSICs: **Employer SICs** + '**Employer' SICs paid by benefit paying institutions**

Simulated Benefits: **Earnings Transfer Allowance** + **Child Benefits** + **Public Old Age Pension ("AOW")** + **Survivor Pension ("ANW")** + **General Social Assistance ("ABW")** + **Social Assistance for Older Unemployed ("IOAW")** + **Housing Benefits**

Total Benefits: Simulated Benefits + Unemployment Benefits (all types) + Social Assistance for the Self-Employed ("UBZ") + Disability/Care/Accident/Sickness Benefits

Instruments in **bold** are simulated.

Table 3.14l EUROMOD baseline output, 1998: PORTUGAL

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	38248	51276	588	1134	2449	12097	35870
2	50118	80083	1831	3438	7423	3617	42956
3	61497	106883	2557	6578	14203	5868	46706
4	72279	143195	6914	10907	23549	3956	39758
5	86959	164370	9777	13195	28489	3135	41180
6	100222	198255	13155	18384	39693	2898	39795
7	119595	216679	20598	18385	39694	2401	42134
8	146569	265160	29905	23339	50391	2239	54848
9	200345	336055	59888	34092	73608	2665	53451
10	-	557968	168660	62639	135244	2418	88320
Mean:		210688	32117	19101	41240	4331	48703
		%	**%**	**%**	**%**	**%**	**%**
1		3.0	0.2	0.7	0.7	34.5	9.1
2		4.2	0.6	2.0	2.0	9.2	9.7
3		5.0	0.8	3.4	3.4	13.3	9.4
4		5.9	1.9	5.0	5.0	7.9	7.1
5		7.2	2.8	6.3	6.3	6.6	7.8
6		8.5	3.7	8.7	8.7	6.0	7.3
7		10.1	6.3	9.5	9.5	5.5	8.5
8		12.2	9.0	11.8	11.8	5.0	10.9
9		15.4	18.0	17.3	17.3	5.9	10.6
10		28.6	56.7	35.4	35.4	6.0	19.6
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax + Capital Income Taxes**

EESICs: **Employee SICs** + **Self-employed SICs**

ERSICs: **Employer SICs**

Simulated Benefits: **Child Benefits + Social Assistance (minimum income)**

Total Benefits: Simulated Benefits + Old-age Insurance (RGSS) + Old-age Agricultural Insurance (RESSA) and Assistance + Survivors related Benefits + Sickness/invalidity Benefits + Family Benefits + Social Assistance (various schemes)

Instruments in **bold** are simulated.

Table 3.14m EUROMOD baseline output, 1998: SPAIN

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	46887	66865	124	5780	5109	1700	36888
2	62042	107391	1739	6007	10934	405	56409
3	75935	120741	3899	6011	11976	40	62084
4	87245	161737	8469	8600	19037	23	70617
5	99760	183057	12752	9578	21411	3	76419
6	115337	221549	18517	12291	33276	0	71208
7	136572	258744	28319	14846	38670	3	71763
8	162508	312950	43445	17366	49442	0	79131
9	209449	363506	65679	19286	52199	0	74114
10	-	544054	166330	24146	66368	0	68007
Mean:		234620	35412	12351	30749	200	66788
		%	**%**	**%**	**%**	**%**	**%**
1		2.5	0.0	4.2	1.5	75.6	4.9
2		4.7	0.5	4.9	3.6	20.6	8.6
3		6.1	1.3	5.8	4.6	2.4	11.0
4		6.9	2.4	7.0	6.2	1.1	10.6
5		7.9	3.7	7.9	7.1	0.2	11.6
6		8.9	4.9	9.4	10.2	0.0	10.1
7		10.6	7.7	11.5	12.1	0.1	10.3
8		12.4	11.5	13.1	15.0	0.0	11.1
9		15.5	18.5	15.6	16.9	0.0	11.1
10		24.5	49.5	20.6	22.8	0.0	10.7
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax**

EESICs: **Employee SICs** + **Self-employed SICs + Agrarian (Employee and Self-Employed) and Civil Service SICs**

ERSICs: **Employer SICs**

Simulated Benefits: **Child Benefits**

Total Benefits: Simulated Benefits + Housing benefits + Unemployment Insurance Benefit + Unemployment Assistance Benefit + Old-age (insurance an early retirement) + Old-age (minimum pension) + Old-age (non-contributory – new system) + Old-age (assistance – old system) + Survivors (widows or orphans, insurance) + Widows (minimum pension) + Sickness and Invalidity Benefits + Social Assistance Benefits (household social assistance, but not including child benefit) + Family Benefits

Instruments in **bold** are simulated.

Table 3.14n EUROMOD baseline output, 1998: UNITED KINGDOM

Decile Group	Decile Point (upper limit)	Disposable Income	Taxes	EESICs	ERSICs	Simulated Benefits	Total Benefits
1	380	503	41	2	2	311	434
2	453	637	52	9	7	305	477
3	536	724	65	13	12	235	479
4	634	919	108	32	29	164	402
5	757	1125	155	52	52	114	351
6	873	1359	218	80	82	94	283
7	1019	1564	281	102	108	67	222
8	1219	1800	361	126	138	37	170
9	1558	2199	511	165	189	29	113
10	-	3354	1028	205	273	26	95
Mean:		1424	285	79	90	139	304
		%	**%**	**%**	**%**	**%**	**%**
1		3.4	1.4	0.3	0.2	21.7	13.9
2		4.5	1.9	1.2	0.8	22.2	15.9
3		5.7	2.5	1.9	1.6	18.8	17.5
4		6.5	3.8	4.2	3.3	11.9	13.4
5		7.6	5.3	6.4	5.6	7.9	11.2
6		8.9	7.1	9.5	8.5	6.3	8.7
7		10.5	9.4	12.4	11.5	4.6	7.0
8		12.6	12.6	15.9	15.3	2.6	5.6
9		15.3	17.7	20.7	20.9	2.0	3.7
10		25.0	38.3	27.7	32.5	2.0	3.3
		100.0	100.0	100.0	100.0	100.0	100.0

Notes: Decile groups are ranked according to equivalised household disposable income. All other income figures are household averages per decile group. They are monthly, in national currency and **not** equivalised.

Taxes: **Income Tax +** Council tax

EESICs: **Employee SICs + Self-employed SICs**

ERSICs: **Employer SICs**

Simulated Benefits: **Income Support + Family Credit + Housing Benefits + Council Tax Benefit + Child Benefits + Job Seekers Allowance**

Total Benefits: Simulated Benefits + attendance allowance + disability living allowance (Self Care) + disability working allowance + invalid care allowance + incapacity benefit + industrial injury benefit + mobility allowance (now "disability living allowance (Mobility)") + retirement pension + severe disablement allowance + state Earnings related Pension (SERPS) + statutory sick pay + training allowance + war pension + widow benefit + foster childrens allowance

Instruments in **bold** are simulated.

3.9.3 The scope of benefit simulations in comparative perspective

As outlined in section 3.4, it is possible to simulate varying proportions of national tax-benefit systems, depending on the nature of the instruments and the available data. Tables 3.14a to 3.14n demonstrate that this is certainly the case for benefits and public pensions.

Table 3.15 summarises the information provided in the national tables regarding the proportions of the benefit and public pension systems that can be simulated. It does so by decile group of the national income distributions. The countries are ranked in order of the size of the benefit and public pension system in relation to household disposable income.

Table 3.15 Proportions of national benefit and public pension systems that are simulated in EUROMOD

		% of benefit system that is simulated										
	benefits as % of household income		NATIONAL DECILE GROUPS									
		ALL	1	2	3	4	5	6	7	8	9	10
Austria	41	12	40	23	19	18	16	18	9	7	6	2
Finland	40	14	16	13	14	13	13	14	17	17	14	10
Belgium	38	19	44	21	16	12	16	20	16	19	19	9
France	33	23	61	49	30	26	23	20	20	12	8	6
Luxembourg	32	16	49	26	20	14	12	12	12	11	10	9
Denmark	31	92	85	96	95	94	90	91	93	94	90	84
Italy	31	14	52	39	35	20	13	10	7	6	3	1
Germany	30	11	28	20	22	11	10	8	7	8	5	3
Spain	28	0	5	1	0	0	0	0	0	0	0	0
Greece	24	13	67	24	15	16	11	10	8	8	7	5
Netherlands	24	66	65	80	74	65	59	55	50	65	62	53
Portugal	24	9	34	8	13	10	8	7	6	4	5	3
UK	21	46	72	64	49	41	33	33	30	22	25	28
Ireland	21	100	100	100	100	100	100	99	99	100	99	100

Source: Tables 3.14a to 3.14n.
Notes: Countries are ranked by the size of their benefit and public pension system in relation to total household disposable income.

In some countries nearly all the system can be simulated (in Denmark about 92%) and in others only a small part is feasible to simulate (in Spain about 0.3%). In addition, the extent of feasible simulation varies across the income distribution. Typically, EUROMOD has better coverage in this respect at the bottom of national distributions. For example, in France while 23% of the system is simulated overall, the figure is 61% in the bottom income decile group and 6% in the top group.

In most countries it is not possible to simulate the public pension system. In many cases this forms a large part of the total benefit and pension system and is the major explanation for the shortfall from 100%. However, in some countries such as Ireland and Denmark, a large part of the public pension system can be simulated. In addition, some countries have private

pensions systems which may be supported in some way - typically by tax concessions on pension contributions. These are not necessarily captured by income tax simulations. In these countries (Ireland, the Netherlands and the UK are examples) the proportions simulated will appear higher than if the whole pension system were included in "benefits".

3.9.4 The European income distribution

As well as analysis at the national level, EUROMOD can combine micro-outputs from national simulations to allow analysis at the European level. To illustrate this capability, the baseline measures of household disposable income for 14 countries (Sweden omitted) have been combined to form an EU14 distribution (incomes are equivalised and weighted as in the preceding sections). To do this, national currencies have been converted to a common currency using PPP adjustment factors.[33] On this basis, the "European" Gini coefficient is 0.31 and the poverty rate is 17.5%. This corresponds to 6.25 million people living below the EU14 poverty line and compares well with Eurostat's estimate using the 1996 ECHP (which excludes Finland) of 17% (Eurostat, 2000; table A2.2.3).

Table 3.16 shows the proportion of each national population in each decile group of the "European" distribution. Portugal, Greece and Spain are most over-represented in the bottom decile group. The same is true for Ireland, but to a lesser extent. Table 3.17 shows the country composition of each EU14 decile. This demonstrates that although people from Portugal and Greece are most at risk of being in the lowest income group, they do not form the largest part of that group. The most common countries within the bottom group are, after Spain, Germany and Italy, followed by the UK and then the Portugal.

Luxembourg stands out in table 3.16 as having the most over-representation in the top decile group. Italy and the UK are also over-represented. Within the top decile group (table 3.17) Italians are the largest group, followed by the British, Germans and French.

[33] We use 1997 "national currency/PPS" figures for private household consumption taken from Eurostat (1999). PPP exchange rates for 1998 are approximated by taking into account the differential changes of the Harmonised Consumer Price Index (HCPI) between 1997 and 1998 in the respective countries (using the German Mark as the 'anchor' currency). The resulting PPP exchange rates (national currency per Euro) are Austria: 13.48, Belgium: 37.06, Denmark: 8.653, Finland: 6.398, France: 6.387, Germany: 1.946, Greece: 242.1, Ireland: 0.6725, Italy: 1632, Luxembourg: 39.45, Netherlands: 1.976, Portugal: 125.9, Spain: 124.9, UK: 0.6613.

Table 3.16 Proportions of national populations in decile groups of the EUROMOD income distribution, 1998

% of national population in each EU14 decile group[1]

	EU14 decile of equivalised household income										
	1	2	3	4	5	6	7	8	9	10	Total
Austria	2	7	9	11	12	14	13	13	11	9	100
Belgium	5	12	10	11	12	13	12	12	8	5	100
Denmark	3	6	9	11	11	13	15	14	12	6	100
Finland	4	13	13	14	13	13	12	9	6	4	100
France	3	7	11	11	11	11	11	12	11	12	100
Germany	8	6	9	11	12	12	12	11	11	9	100
Greece	26	17	12	10	9	8	6	5	4	3	100
Ireland	15	18	9	9	8	8	8	9	8	8	100
Italy	11	9	9	8	9	8	9	10	12	15	100
Luxembourg	0	1	2	3	7	8	11	13	20	36	100
Netherlands	2	4	10	11	11	12	13	12	14	11	100
Portugal	37	15	11	7	7	5	4	4	4	4	100
Spain	24	17	13	9	8	8	6	6	5	4	100
UK	7	15	10	9	7	9	9	10	11	13	100
TOTAL	10	10	10	10	10	10	10	10	10	10	100

Source: EUROMOD

Notes: incomes are adjusted using PPPs (see footnote 33). Rows and columns may not add due to rounding.

[1] Results for Sweden are not included.

Table 3.17 The country composition of the EUROMOD income distribution, 1998

% of EU14 decile group by country[1]

	EU14 decile of equivalised household income										
	1	2	3	4	5	6	7	8	9	10	All
Austria	0.4	1.5	1.9	2.4	2.6	3.1	2.9	2.8	2.4	2.0	2.2
Belgium	1.3	3.3	2.6	3.1	3.2	3.6	3.4	3.4	2.1	1.3	2.7
Denmark	0.5	0.9	1.4	1.7	1.8	2.1	2.4	2.2	1.9	1.0	1.6
Finland	0.5	1.8	1.8	2.0	1.9	1.9	1.6	1.3	0.8	0.5	1.4
France	4.5	11.8	16.8	17.6	18.3	17.5	18.0	18.4	17.6	18.7	15.9
Germany	17.7	12.7	19.8	24.7	27.4	25.7	25.5	23.9	24.0	19.5	22.1
Greece	7.7	5.0	3.6	2.9	2.6	2.4	1.8	1.5	1.2	1.0	3.0
Ireland	1.5	1.8	0.9	0.9	0.8	0.8	0.8	0.9	0.8	0.8	1.0
Italy	17.2	14.1	13.7	12.8	14.2	13.3	15.1	16.7	19.1	23.8	16.0
Luxembourg	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.4	0.1
Netherlands	0.9	1.6	4.1	4.8	4.5	5.2	5.3	5.2	5.9	4.7	4.2
Portugal	10.4	4.2	3.2	2.1	2.0	1.5	1.2	1.1	1.1	1.2	2.8
Spain	26.3	18.0	14.0	9.9	8.9	8.6	6.8	6.5	5.0	4.8	10.9
UK	11.1	23.3	16.1	14.9	11.9	14.5	15.0	16.0	17.7	20.2	16.1
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: EUROMOD

Notes: incomes are adjusted using PPPs (see footnote 33)

[1] Results for Sweden are not included.

3.10 Expenditure imputation and indirect taxes

In order to simulate indirect taxes in EUROMOD, information is required about expenditures disaggregated according to their tax treatment. Except in the case of the UK and France, expenditure information is not included in the national databases used by EUROMOD. These were chosen on the basis of their suitability for direct tax and benefit modelling (see section 3.2).

There are a number of possible methods that can be used to impute expenditure from an expenditure survey to the base dataset. Statistical matching methods identify households that are similar to each other and then assign the consumption from the household(s) in the expenditure survey to the corresponding household(s) in the base dataset. The method requires direct access to the expenditure micro-data on a continuing basis. In some countries this is not possible. As a result, a regression method has been used. This produces estimated parameters that may be incorporated into EUROMOD without the need for data access permission for each use. See Baldini et al. (2001) for more information.

The technique involved three components: (a) the imputation of total consumption, (b) the imputation of budget shares and (c) the imputation of budget shares for detailed alcohol groups. A regression of total consumption was estimated using OLS on variables from an expenditure dataset that were comparable with variables in the base dataset used by EUROMOD using the following functional form: $\ln C_{HBS} = \alpha + \beta \ln Y_{HBS} + \gamma X_{HBS} + u$, where, C is total household consumption, Y is total household disposable income, and X is a vector of socio-demographic characteristics which are available both in the expenditure micro-data and the EUROMOD database. These variables included, for the reference person (head of household: age, sex, whether they were married or cohabiting, their labour force status and broad occupational category, and the highest level of education they reached. For the household as a whole, the variables included the region of residence, housing tenure, car ownership, the number of people by age category, the number of "earners" (including pensioners) and total disposable income.

The estimated coefficients were applied to the base dataset in order to obtain an imputed value for total household consumption. The problem of the lower variability of the imputed value of total consumption (compared with the actual value) was solved through the generation of an error term to reproduce the same variance of consumption in the HBS. An error term was artificially generated, normally distributed, with zero mean and a variance equal to the variance of the residual of the HBS regression.

Total consumption is defined as the monetary value of non-durable and durable goods and services purchased during the period of collection of the expenditure data. This definition does *not* include: imputed rent, nor rents paid by tenants, benefits in kind provided by the employer, the amounts paid for direct taxes or social security contributions, the value of home production, the value of debt repayment, the value of gifts received, the value of houses purchased.

Total household disposable income is defined as the sum of all incomes obtained from the market, plus public transfers minus direct taxes and contributions minus private pension contributions, rent and mortgage interest paid. It does *not* include: imputed rents home production, the value of benefits in kind, capital gains or losses or irregular lump sum incomes.

The next stage is to estimate budget shares of total consumption for the expenditure categories using the following functional form: $w_i = \alpha + \beta \ln C_{HBS} + \gamma (\ln C_{HBS})^2 + \delta X_{HBS}$, where, w_i refers to the *i*th budget share.

Both types of equation were estimated using OLS. One drawback of this choice is that budget shares could potentially be simulated to be less than zero or greater than one. To avoid this problem, all estimated negative budget were shares to zero, rescaling to ensure that the sum of the budget shares equalled 1.

Budget shares were estimated for 17 common categories of goods corresponding to the standard system of classification of goods and services used by EUROSTAT. These are:
1. Food (except consumed in restaurants, etc.)
2. Non-alcoholic beverages
3. Alcoholic beverages
4. Tobacco
5. Clothing and footwear
6. Domestic fuel
7. Electricity
8. Household goods and services
9. Medical and health care
10. Petrol, diesel and other motor fuels
11. Transport
12. Communication (telephone, mobile phone, postal service, etc.)
13. Recreational and cultural goods and services
14. Books, newspapers and magazines
15. Education
16. Restaurants etc. (meals out in restaurants, hotel, holidays)
17. Other goods and services.

In general this allows much of the heterogeneity of indirect taxes across types of goods to be simulated. However in order to simulate the impact of detailed excise duties on alcohol, the budget shares of wine, beer and spirits (within the general heading of alcoholic beverages) were also estimated. Separate models were estimated depending on whether the household had a car or not, as these households were found to have quite different consumption patterns.

EUROMOD uses the estimated coefficients in combination with income and characteristics from the database, first to impute total consumption, then to impute each specific budget share. Multiplying the resulting imputed budget shares by total consumption results in the good-specific expenditure.

Indirect taxes that are simulated are classified into three types, VAT, Excise duties and Ad-Valorem taxes. In the case of excise duties, where taxes are expressed in terms of quantity and

not expenditure, it has been necessary to impute a quantity from the value of expenditure using information on unit prices.

In some cases a given category of expenditure will include goods with different tax treatments. An average tax rate for each category in each country has been calculated, making use of national information on the proportions within each group that are taxed in each way.

Validation of the method can make use of a number of steps:
(a) Firstly comparison of imputed expenditure with actual expenditure that is contained in the UK base data set ensures that the expenditure imputation routine operates correctly,.
(b) To check that the functional forms are appropriate for each country, the imputed total expenditure resulting from different disposable income values can be compared for a range of household types.
(c) To validate the indirect tax routines, the simulated indirect taxes in EUROMOD using actual UK data are compared with results from the UK national model, POLIMOD.
(d) Finally, aggregate indirect taxes calculated by EUROMOD can be compared with administrative data for all countries.

3.11 Indicators of risk of social exclusion

EUROMOD is best suited to the calculation of indicators based on current income concepts, particularly in relation to changes in these indicators. However, recently, there has been a shift in emphasis from "poverty" to "social exclusion" about which there is less agreement over conceptual and measurement issues. Indeed, much of the information needed for the construction of such indicators is not available in the EUROMOD database. In an exercise to explore possibilities for constructing a relevant classifying variable, Papadopoulos and Tsakloglou (2001) outline a methodology for identifying members of the population at high risk of exclusion in particular fields, combining the information of the EUROMOD database with that of the European Community Household Panel (ECHP). Since the information available in the EUROMOD database is cross-sectional, the indicators of exclusion analysed are static rather than dynamic. Moreover, due to data limitations in both the ECHP – in most cases the information of the ECHP refers to "functionings" rather than "capabilities" that would be more appropriate for the analysis of social exclusion – and the EUROMOD data base, the analysis is restricted to a limited number of indicators/areas of exclusion. The indicators examined cover the risks of exclusion in the fields of Living Conditions, Necessities of Life and Labour Market.

The methodologies outlined for the construction of indicators of high risk of exclusion in the fields of Living Conditions and Necessities of Life are very similar. In both cases, the first step is the construction of such indicators in the ECHP. For the purposes of the indicator of exclusion in the field of Living Conditions, information on 22 items covering the non-availability of a number of housing amenities, the existence housing problems and the enforced lack of consumer durables is aggregated into a single index. The weights assigned to the individual components for the construction of this index are determined endogenously and are inversely related to the proportion of the households of each country without access to the

corresponding items/attributes. Naturally, these weights differ across countries. Likewise, the indicator of risk of exclusion in the field of Necessities of Life is the weighted average of 6 items reflecting the inability of the household to afford some functioning that are considered to be necessities of life in the reference societies. In the next step, cut-off thresholds are selected, households at high risk of exclusion in these fields are identified and the share of households at risk of exclusion in each country (x%) is estimated. Then, a set of variables common in the ECHP and the EUROMOD database that can be thought of as reasonable determinants of a household's probability of falling below these cut-off thresholds are identified and logit models of a household's probability of to fall below these thresholds are estimated using ECHP data (two equations for each country). Finally, the estimated coefficients are applied to the variables of the EUROMOD database and for each household a "deprivation score" is derived. In each country, the x% of the household with the highest deprivation scores are identified as "households at high risk of exclusion" in the field of Living Conditions or the field of Necessities of Life.

For the identification of persons at high risk of exclusion from the Labour Market, the unemployed and the "precariously employed" among the labour market participants in the ECHP database are, first, identified. The latter are persons currently employed with poor employment record in the past and insecure employment conditions at present. Then, a set of variables common in the ECHP and the EUROMOD database that can be considered as possible determinants of the probability of an individual to belong to the group of "unemployed" or "precariously employed" is selected and, for each country, a logit model using these regressors is estimated on the ECHP data. In the next stage, the labour market participants in the EUROMOD database are isolated and the estimated coefficients are applied on the corresponding variables, thus deriving individual "probability scores". In each country, the x% of the labour market participants with the highest scores (where x% is the sum of the shares of the unemployed and the "precariously employed" among labour market participants in the ECHP) are identified as "persons at high risk of exclusion from the Labour Market". Moreover, using a similar methodology, the group of "constrained workers" is identified in the EUROMOD database. The latter are those among the working age inactive persons (excluding the retired and those who are still in education), who would have liked to have a job but are not seeking employment because of housework or looking after children or looking after other persons. Even though the risk of social exclusion of the "constrained workers" is likely to be lower than that of the unemployed and the precariously employed, they face a type of labour market exclusion that may increase the risk of social exclusion in the longer term.

Papadopoulos and Tsakloglou (2001) provide an example using Greek data, discuss several practical problems related to the operationalisation of the methodologies outlined above, and compare advantages and disadvantages of alternative solutions to these problems

4 Conclusions and policy implications

This section covers two separate items. The first consists of a general assessment of the project's achievements in terms of its main objective: to construct a tax-benefit model for the European Union. The second summarises the policy-related findings from some of the first exercises using EUROMOD.

4.1 Conclusions

Before the project began, the degree of experience and expertise with tax-benefit modelling in Member States varied greatly. As is well known, the tax and transfer systems also vary widely in underlying philosophy and historical development, as well as in current structure and size. The national sources of micro-data with which to build the model were not equally suited to the task. Just as the starting points were not the same, neither the current state of play nor the route by which it was achieved is the same across countries.

In some cases, EUROMOD is a replica of a corresponding national model, of which the national team had intimate knowledge. These national models have been a valuable resource in constructing EUROMOD, although typically the extent of transformation of the organisation and structure of the modelling has been large and the similarities with the national model are only apparent in comparing results. In these cases the problems to be solved have been those relating to comparability with other countries and departures from national modelling traditions. Countries that fall into this group include Finland, France, Ireland, Italy, Spain, Sweden and UK.[34]

At the other extreme some countries have no tax-benefit modelling tradition. Other sources of information about the operation of national tax-benefit systems than national model code has had to be found. Validation could not rely on comparisons with national model output. In some cases - particularly Austria - this situation is combined with a tax-benefit system that is very challenging to model because of its complexity. As well as Austria, this group of countries includes Greece, Luxembourg and Portugal.

The project was not like a typical research network. The timing of delivery of components was much more critical than is usually the case in the cross-national activities that EUROMOD participants are accustomed to. Thus in some respects the project was more akin to an engineering enterprise than a social science research project. However, it is also the case that the specification of the components needed discussion, clarification and revision at each stage. It was a very complex project that was more demanding for all concerned than could have been anticipated.

The project's most significant achievement is its success in bringing tax-benefit modelling capacity in all Member States up to the level of best practice in the EU. As well as the

[34] It should be clear that EUROMOD is seen as performing a parallel and complementary role to national models, not as trying to substitute for them.

production of an EU-wide model, a by-product has been improvements in national models and in modellers' skills due to the intensive and extensive interactions within the project team. Involvement of graduate students alongside established academics with world-wide reputations in both project meetings and the work itself has been a productive and stimulating networking experience for all concerned.

In many ways, EUROMOD is ahead it its time. When the project first started in 1998 (and when the idea was first conceived in 1996) the priorities set at the Lisbon European Council could not have been fully anticipated. It is now clear that the project was timely. EUROMOD is ready to play a role in analysing changes in social and fiscal policies proposed by Member States with reference to agreed benchmarks for the reduction of poverty and social exclusion.

Not only is EUROMOD ready to use for this and other purposes. Some early analysis has already been carried out using the model (see next section). Furthermore, it is available as a platform for developing new methods and indicators for the analysis of the impacts of social and fiscal policy. (See section 5.4.)

At the same time, we have identified some key areas for improvement. Three are highlighted here:

- Incomplete ***take-up of benefits*** is a key issue that, at a technical level, needs further attention in EUROMOD. It is also an important policy issue. People who fail to receive benefit payments to which they are entitled, because of insufficient information or fear of stigma must be among the most likely to be at risk of social exclusion. (See section 3.8.6.)

- Lack of comparability across national results due to differing ***reference time periods*** is a technical issue that cannot be fully resolved with existing data. Micro-data that allow more options in defining the reference period of incomes is an important requirement for the future. (See section 3.8.3.)

- Some of the most important components of the EUROMOD database rely on imputations, particularly of gross incomes and of amounts of specific benefits. Until ***gross incomes, fully disaggregated by source*** are available for all countries EUROMOD results are subject to the errors introduced by imputation. (See sections 3.8.4 and 3.8.5.) It is to be hoped that the new Eurostat instrument "EU-SILC" will be able to meet some of this requirement.

4.2 Some policy findings from EUROMOD

This section summarises the findings of policy-related investigations that have made use of EUROMOD as a research tool.

4.2.1 Child poverty and child benefits in the European Union

In a preliminary exercise that used evidence from the European Community Household Panel we found that family benefits vary in their importance to household incomes and in the prevention of child poverty across Europe. In one group of countries family benefits appear to have a significant effect on the protection of children from financial poverty. The UK and the Netherlands are both members of this group, and we used EUROMOD to examine the extent to which differences in child benefits explain the very different level of child poverty in the two countries. We also explore the effect of "swapping" child benefit systems between the two countries and find that there is some scope for improvements in looking beyond national borders. We conclude that the poverty reduction properties of universal child benefits may be improved without resorting to means-testing or compromising the other functions of these benefits.

See Immervoll et al. (2000) and Immervoll et al. (2000a).

4.2.2 A European Social Agenda: Poverty Benchmarking and Social Transfers

The European countries which perform best in terms of reducing poverty tend to have higher social spending. Such statistical performance indicators need however to be accompanied by evaluation of the relationship between policy instruments and poverty reduction, showing the trade-off between poverty reduction and social spending at the level of individual policies. Illustrative estimates using EUROMOD suggest that employing universal social transfers to reduce a country's poverty rate from the EU-average of 18% to the best-performing average of 12% would necessitate an increase in social transfers of some 2% of GDP. More targeted schemes may allow sizeable expenditure savings but at the cost of increased disincentives; the design of Europe's social agenda has to confront well-known issues of economic trade-offs; economic and social policy cannot be divorced.

See Atkinson (2000).

4.2.3 Reducing Child Poverty in Europe: what can static microsimulation models tell us?

This paper reviews the range of ways in which static microsimulation models such as EUROMOD can help us to understand child poverty and to develop policy to reduce it. One illustration presents some results from EUROMOD which explore the relationships between child poverty and the scale of cash benefits and tax concessions targeted on children in four countries of the European Union: Denmark, France, Spain and the UK. The purpose is to illuminate national differences in the relationships between some of the variables that are important for policy makers. Three particular questions were the focus of the study:

(1) How well-targeted on poor children are existing child-related components in tax-benefit systems?
(2) How much would it cost to reduce child poverty by one third in each country using the existing systems for children?
(3) Can inflating (deflating) the differentials for children in existing systems bring child poverty rates down (up) to the level of all-person poverty? How much of an adjustment is needed?

It is found that in some countries child poverty is highly sensitive to the scale of the existing tax-benefit system for children. Expansion of this system has a particularly strong effect in reducing child poverty for the UK, which starts with very high rates of child poverty and also has a system that relies to a large extent (but not exclusively) on means-tested assistance. However, increasing the scale of the system for children by 50% only brings child poverty down to the level that is found in France under the 1998 system and fails to quite equate the UK child poverty rate with the general UK rate of poverty.

The French system overall is less targeted on poor children (due to generous family tax concessions), but it is possible to reduce child poverty by a third and to bring the child poverty rate to the level of poverty in general with relatively modest expansions of the child components in the system (28% and 14% respectively).

Child poverty is less responsive to the Danish and Spanish systems. In Spain, the 1998 system simply makes little difference to the incomes of poor households with children. In the case of Denmark, the child poverty rate is already low and below the general rate. Expanding the scale of the system for children does reduce child poverty (in proportional terms, the reduction is large), but appears to leave a small minority of children unprotected.

Finally, by varying the definition of income used to measure poverty, we identify the importance of housing benefits in protecting people from poverty in Denmark, France and UK. They have a particular role in protecting children in France.

See Sutherland (2001).

4.2.4 Microsimulation of Social Policy in the European Union: Case Study of a European Minimum Pension

The implications of setting a European Minimum Pension (EMP) are explored using a prototype version of EUROMOD for 6 countries. The model is used to examine how far such a policy is "targeted" on the poorest pensioners. The analysis shows that the composition of the bottom of the European income distribution is sensitive to assumptions about the comparability of purchasing power across countries and about the treatment of households of different types. We conclude that the formulation of policy for the protection of Europe's poorest people requires an appreciation, not only of the composition and location of this group, but also of the assumptions that have been used to identify it. The analysis also demonstrates that the purpose of a microsimulation study is not only to answer questions but also to raise them. Aspects of the

EMP proposal are identified which need further specification, such as the nature of the interaction of the EMP with existing national pension systems, and with national redistributive systems in general, and the choice between different treatments of the unit of assessment of pension income.

See Atkinson et al. (2000) and Atkinson et al. (forthcoming).

4.2.5 The Impact of Tax-Benefit Systems on Low Income Households in the Benelux Countries. A Simulation Approach Using Synthetic Datasets.

This paper demonstrates the level of detail taken into account in modelling social and fiscal policy rules in EUROMOD. Abstracting from the complexities of actual populations, the mechanics of social and fiscal policy instruments in the Benelux countries are analysed by applying them to a large set of 'synthetic' households. By using a large set of households, it is possible to extend and improve the kind of analyses which are possible with studies of the "Average Production Worker" type. The particular focus is on low income households in order to evaluate the potential impact of the three countries' tax-benefit systems on poor households.

Tax-benefit calculations for 'typical' households provide convenient summary pictures of certain aspects of tax-benefit systems. They can, however, be seriously misleading because they reduce very complex systems to single point estimates. Using EUROMOD, we substitute the "typical" household by a synthetic *dataset*, which can be used across countries. By varying certain important household characteristics (notably income), this dataset captures a much larger range of household situations. The calculations performed on this range of households not only show the tax-benefit position of many individual households but also demonstrate which characteristics are relevant in determining taxes and benefits in each country.

'Budget constraints' are computed and compared for several model households in the Benelux countries. Based on these results, the performance of the three tax-benefit systems is discussed in terms of reducing poverty for the different household types. A main finding is that minimum income schemes often ensure incomes that are above or very close to the poverty line.

Two main conclusions are drawn. First, the analysis of poverty implications of policy reforms may be very sensitive to the exact definition of the poverty line. Hence, sensitivity analyses are essential. Second, in reality, substantial parts of the population live in poverty despite the existence of minimum income schemes. This indicates that there may be important determinants of poverty that analyses of the formal incidence of transfer incomes cannot perfectly address. In particular, these include issues of non-take-up of benefits as well as authorities' discretion with respect to benefit eligibility and/or amount.

See Berger et al. (2001).

4.2.6 Fiscal Drag

Unlike the work done by Berger et al. (2001), which analyses the mechanics of different tax-benefit system without taking into account the specific structure of the respective countries' population, this paper explores the effects of changing population characteristics. Immervoll (2000) uses EUROMOD to look at how the distribution of tax burdens and the overall revenue can be affected if people's incomes move upwards as they do when wages increase in line with prices.

Inflation can alter the structure of tax systems and lead to higher real tax burdens. The 'automatic stabiliser' argument assumes that increasing tax burdens reduce consumption and thereby aggregate demand, acting as an automatic stabiliser which helps to 'cool down' the economy in times of inflation. This argument, however, only looks at the demand side, ignoring any effects that higher tax burdens may have on the cost of production. If employees bear less than the *full* burden of higher taxes then real labour costs will go up as well, generating a cost-push upwards pressure on prices and opening up the possibility of a wage-price spiral. This paper build on analyses of the differential effect of marginal and average tax rates on the wage setting process in an imperfect labour market. In Immervoll (2000a), EUROMOD is used to derive distributions of inflation-induced changes in effective tax rates for representative samples of the population of four European countries. The approach takes into account both the complexities of tax-benefit systems and the heterogeneity of taxpayers and benefit recipients in the population. For illustrative purposes, the simulated changes in the marginal and average tax burdens of employees are then combined with estimates from the literature on the sensitivity of wages with respect to these variables. The results suggest that inflation combined with an un-indexed tax-benefit system can produce a moderate upward pressure on wages. However, it is argued that the wage equations from the literature on which such results are based are less than satisfactory since they ignore that tax rates of different individuals are generally affected to different extents.

See Immervoll (2000) and Immervoll (2000a).

4.2.7 Welfare Benefits and Work Incentives: An Analysis of the Distribution of Net Replacement Rates

Replacement rates are a measure of the degree to which the income of an individual (and their family) is maintained if they are out of work. From a social policy perspective the higher the replacement rate, the more protected they are from the impact of losing work income. At the same time, high replacement rates *may* reduce the effort made by those out of work to secure employment (or those in work to keep it). The distribution of replacement rates was examined for Denmark, France, Spain and the UK.

Simulating replacement rates using EUROMOD allows for the actual structure of the population to be incorporated. It thus overcomes some of the criticisms of using "typical family" calculations, where the "typical family" often is representative of only a small fraction of the population. In addition, the simulation method allows us to explore replacement rates of the entire workforce rather than being restricted to those individuals

whose change of employment status can be observed in the data, a criticism of "data based" methods of calculating replacement rates. We can thus produce distributions of replacement rates for all people who may be *potentially* affected. In addition, the method permits analyses of the effects of policy *reforms* on replacement rates to be assessed.

Replacement rates are calculated by simulating for each individual in turn, the household disposable income for their original state (in-work, inactive or unemployed) and then changing their status to the counterfactual state (unemployed, in-work and in-work respectively), simulating their counterfactual income (earnings or benefits) and then recalculating household disposable income. The definition of replacement rate is the ratio of the household disposable income out of work to the household disposable income in work.

The main findings were as follows. For those currently in work (in the data), France was found to have the highest incidence of 'high' replacement rates, followed by Spain, Denmark and the UK. For those who are unemployed (in the data), we found a very different distribution of replacement rates which was much more similar across countries. For this group, Denmark had the largest proportion of people with high replacement rates. Compared to those in work, fewer unemployed in France, Spain and the UK have very high replacement rates (≥ 80%) while the opposite is true in Denmark. This is because the replacement rates for those currently in work measure the replacement rate in the first year of unemployment. As the duration of entitlement to unemployment benefits (UB) may be short, those who have been unemployed for longer may cease to be eligible for these benefits. They may then become eligible for lower valued unemployment- or social assistance (France, UK) or nothing as in the case of many unemployed in Spain. On the other hand, the earnings of unemployed entering work will be lower on average than earnings of those currently in work. This will result in a lower denominator and thus higher replacement rates. The two effects run in opposite directions, with the 'earnings' effect dominating in Denmark and the institutional factors dominating in France, Spain and the UK.

In general, the incidence of very high replacement rates (≥ 80%) is greater amongst the inactive than either the unemployed or employed. This is because in many cases inactive people are in receipt of disability benefits or early retirement pensions that are often of a higher value than unemployment benefits. In addition, they are likely to have lower potential earnings than the unemployed, whose duration out of work is typically lower than for the inactive group.

For those currently in work, women's replacement rates are higher than men's in all four countries, because they are likely to have lower earnings. Younger people also have higher replacement rates, for similar reasons. In addition, we find that the existence of spouse's and other household members' (e.g. parents') earnings is an important explanation of high replacement rates. For most countries, for those with high replacement rates, spouses' incomes are often a more important component of income than benefits. This is particularly the case for individuals currently in work.

We concluded that the replacement rate is not necessarily a good indicator of the effect of the tax-benefit system on work incentives. Another measure was developed: the tax-benefits-to-

earnings ratio (TBER). This is defined as the change in taxes and benefits when made unemployed compared to the loss in earnings. In Denmark, France and Spain unemployment benefits are the most important determinant of the TBER, while in the UK, where unemployment benefits are flat rate and of short duration, social assistance benefits are more important and housing benefits play a role as well.

The TBER for inactive groups is in general much lower than the equivalent replacement rate. This is because individuals in this group will often not be entitled to benefits at all. Loss of disability benefits is the main cause of high TBERs. In France and the UK, because many inactive people are in households where a spouse is unemployed and on means tested benefits, the impact of moving into work results in a reduction of social assistance and housing benefits. Otherwise, the main effect is from increasing taxes and contributions, which in Spain are the most important factors reducing the gain from moving from inactivity into work.

See Immervoll and O'Donoghue (2001b).

4.2.8 The Impact of Means Tested Assistance in Southern Europe

Social assistance in Southern Europe faces a unique set of constraints, most relevant of which are *the role of the family* and *the "softness" of state institutions*. The family in southern Europe has historically functioned as an effective, albeit informal, social safety net. It can be argued that the role of the family as a social "shock absorber" has allowed governments to pay less attention and deploy fewer resources to some policy issues than might have been the case otherwise. This is the case across a whole range of policy areas such as child care, unemployment assistance, care for the elderly etc.. Nevertheless, as the family itself comes under stress, it may not be relied upon to play a similar role in the future. As to the "softness" of state institutions, the problem here lies in the nature of social assistance. The delivery of targeted benefits requires a degree of administrative capacity and reliability of income assessment that often is unavailable in southern Europe.

Despite these structural difficulties, a renewed emphasis on selectivity and targeting has in recent years led to major policy innovations in the field of social assistance in southern Europe. This is typified by the spread of minimum income programmes, in Spanish autonomous communities, in Portugal and as a pilot in Italy.

The analysis focuses on Greece, Italy, Portugal and Spain. France is also included for comparative purposes and because many of the systems used in these countries as well as planned reforms are modelled on the French system.

The performance of means-tested social minima was examined under a number of headings: (a) the existing level of poverty in the countries and the impact of social assistance in reducing poverty, (b) the distribution of expenditure on social assistance across the income distribution, and (c) the efficiency of social assistance as a poverty alleviation measure.

Equivalent expenditures on general social assistance in France were found to be more effective in reducing poverty than in the other countries primarily because of the high degree of targeting of these benefits. Child benefits in France are also more successful at poverty reduction than in the other countries, but this is because of higher aggregate expenditures rather than their being targeted on the poor. Making standard assumptions about intra-household sharing, the family in Southern countries was found to be much more important in the prevention of poverty than the social assistance safety net, while in France the state was relatively more important.

See Albuquerque et al. (2001)

5 Dissemination and exploitation of results

5.1 General dissemination strategy

The general approach has been to present the EUROMOD project and its outputs to as wide a range as possible of policy-related and technical/scientific audiences, rather than to use the project's resources to hold its own events. It has been thought much more effective to show the usefulness of EUROMOD within specific contexts than to attempt to present it as being of interest in its own right. At the same time, at a technical level, the model itself has been of interest to the specialised international community of microsimulation model builders.

Annex I lists the written outputs from the project under the following headings:

- EUROMOD Working Papers
- Published papers and others presented outside the EUROMOD consortium
    - A Papers that describe the model itself and potential uses
    - B Country Reports
    - C Technical issues related to model construction
    - D Policy-related papers

Annex I also lists the presentations outside the EUROMOD consortium. In addition, many papers were presented during the nine project meetings (see Annex IV) and five meetings of the EUROMOD Advisory Group (see Annex III). The agenda and papers for these meetings are available from the co-ordinator on request.

5.2 The EUROMOD Advisory Group

The project established an Advisory Group which held five formal meetings (see Annex III). In addition, individual members of the Group (see Annex III) have given specific advice and assistance at various stages. It is often difficult to ensure a steady flow of comment on the mechanics of a research project, as opposed to the final outcomes. In this case the valuable advice from the Advisory Group has contributed very considerably to the development of the project.

The Advisory Group has been very supportive of the project and its achievements. The following are extracts from Minutes of meetings and other correspondence (unattributed):

> "Good broad progress has been made on three fronts: construction, methodological development and treatment of policy issues. The flexibility of the model and the innovative structure and design are particularly impressive." (September 1999)

> "The co-ordinator's team should be congratulated and the Commission should be very pleased with how the project is going." (May 2000)

"The team was congratulated on their progress in completing the model. There was no question that that the original project was very ambitious and that this is a huge achievement." (November 2000)

"The flexibility of the model is unique. Most tax-benefit models are built round particular tax-benefit systems, but the concept of the 'policy spine' means that EUROMOD can cope with any set of taxes and benefits that interact in every conceivable manner. This flexibility gives EUROMOD the ability to analyse the possible impact of applying part of one country's tax-benefit system to another country. In addition to any direct policy value, such exercises give important insights into the causes of differences in poverty between countries." (December 2000)

5.3 Other contacts

There have been a number of points of contact with **Eurostat**:

- The co-ordinator (Sutherland) is a member of a *Task Force on Net Social Protection Expenditure*
- In discussions with the Canberra Group on methodology for income statistics (Sutherland)
- Our work on imputation of gross income from net (Immervoll and O'Donoghue) has been made use of in discussions about the content of EU-SILC (at a working group on Statistics on *Income, Poverty and Social Exclusion* doc. e2/sep/29/2001)

There have also been some contacts **outside the EU**, based on the design of the framework of EUROMOD, and the possibility for this being used as the basis for building tax-benefit models for developing and transition economies. These include a visit to the Getulio Vargas Foundation (Rio de Janeiro) Brazil by O'Donoghue, to the United Nations Social Policy Division (New York) by Immervoll and O'Donoghue and to the World Bank (Washington) by Immervoll and O'Donoghue.

5.4 Long term exploitation of EUROMOD

EUROMOD has only just started to be useful at the end of the construction project. Most of its potential lies in uses in 2001 and beyond. The explicit aim of the project was to build a core model that will be able to be used as a framework for many other projects. This core model not only has the capacity and scope to support numerous applications; it has the potential to form an essential component of more elaborate models. The model was designed as the basis for a wide range of research projects over many years. The construction project represented investment in research infrastructure.

Of course, EUROMOD will need maintenance on a continuous basis if the policy rules are to be kept up-to-date and the underlying database refreshed with recent micro-data. The EUROMOD team intends to ensure that the model is maintained and that the necessary skills to carry out these tasks are encouraged and supported.

Future applications of EUROMOD could consist of three broad types

1. Applications that do not require major changes or additions to the model: these include
   - running options already specified as "blueprint" parameter sets
   - specifying policy changes by altering existing parameters
   - introducing new code describing policy structures that are not already anticipated within the model.
2. New databases (for example, using EU-SILC)
3. Major experimental or speculative developments: these could include:
   - Incorporation of greater sophistication in the representation of economic relationships, via the modelling of individual behavioural responses (e.g. in relation to labour supply) and/or macro-economic adjustments.
   - Modules built on a consistent basis for countries currently outside the EU. These could include prospective EU member states or other OECD countries, in order that consistent comparisons can be made, and in order to extend the availability of tax-benefit modelling technique in general.
   - Linkages to other types of European model, such as macro-economic models. Those that analyse environmental aspects of policy could be of particular interest.
   - Versions incorporating some elements of projection into the future, so that assessments can be made of the broad effects of demographic ageing, macro-economic convergence or other foreseeable developments on the impact of policy instruments on incomes.

However wide the range of possibilities, it is clear that the process of using EUROMOD for any purpose will not be a trivial task. It will depend on a good understanding of the present systems of taxation and social protection in all the Member States, as well as an appreciation of the advantages and limitations of static microsimulation. Hands-on use will require specific training in the capabilities of the model.

In considering future use of the model, it is helpful to remember that there are three types of "use": (i) hands-on use of the model itself, (ii) using results of simulations done by others, and (iii) using or re-using information contained in papers that include EUROMOD results.

These distinctions are critical in relation to permission to access the underlying micro-data. As things stand, the EUROMOD team have secured 11 separate contracts to access the micro-data (5 countries use one dataset, the ECHP). Each contract specifies a different set of conditions. In this context, the most restricting are those that specify a particular physical location for the data (in Cambridge) and those that limit access to a particular set of people (those named as members of the EUROMOD team). This means that hands-on users of EUROMOD must be members of the team. For the use of some datasets (those of Belgium, Finland, Ireland, the Netherlands and Sweden) they must visit Cambridge to carry out simulations for the corresponding countries. Alternatively, they must negotiate their own individual data access contract.

Members of the EUROMOD team have signed a Consortium Agreement, the current version of which is in Annex V.

To summarise, the plan is:

1. **To continue developing EUROMOD and using it: the model could be useful for decades.**
2. **To re-new the database with later waves of survey data as is deemed appropriate and as resources permit.**
3. **To use the model as a research tool for scientific purposes and to aid decision-making**
4. **To facilitate access to the model by all members of the EUROMOD team.**
5. **To continue to develop good working relationships with the providers of the original datasets and to keep them fully informed of all relevant activities; to attempt to negotiate more appropriate data access conditions.**

6 Acknowledgements and references

6.1 Data acknowledgements

The original datasets on which EUROMOD is based have been collected by, or on behalf of, a number of agencies including Eurostat, national statistical offices and non-governmental institutions. The project recognises its debt to the collectors, providers and owners of the copyright in these data (as well as to the respondents to the surveys). We are committed to applying a stringent code of conduct to the use of the original data and to the variables derived from it that are stored in the model at the micro-level.

Acknowledgement for use the data sources is given in EUROMOD publications. However, due to shortage of space in some circumstances the full form cannot always be given. The full form is shown below.

Data Acknowledgements

EUROMOD relies on micro-data sets from fifteen countries. These are

- the European Community Household Panel (ECHP) 1995 and 1996 (second wave and third waves) made available by Eurostat;
- the Living in Ireland Survey made available by the Economic and Social Research Institute;
- 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;
- for France, 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 GSOEP at the German Institute for Economic Research (DIW), Berlin;
- the Survey of Household Income and Wealth (SHIW95) made available by the Bank of Italy;
- for Luxembourg, the Socio-Economic Panel (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;
- for the UK, the Family Expenditure Survey (FES). FES data have been made available by the 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.

6.2 References

Albuquerque J, M Balidini, O Bargain, P Bosi, H Levy, D Mantovani, M Matsaganis, M Mercader Prats, C O'Donoghue, C Farinha Rodrigues, A Spadaro, S Toso, I Terraz, P Tsakloglou, 2001, "The impact of means tested assistance in Southern Europe", EUROMOD Working Paper EM6/01

Atkinson A B, 2000, "A European Social Agenda: Poverty Benchmarking and Social Transfers", EUROMOD Working Paper EM3/00.

Atkinson A B, F Bourguignon, C O'Donoghue, H Sutherland and F Utili, 2000, "Microsimulation and the Formulation of Policy: A Case Study of Targeting in the European Union", in Atkinson, A B, H Glennerster and N Stern (eds) *Putting Economics to Work: volume in honour of Michio Morishima*, STICERD Occasional Paper 22, LSE.

Atkinson A B, F Bourguignon, C O'Donoghue, H Sutherland and F Utili, forthcoming, `Microsimulation of Social Policy in the European Union: Case Study of a European Minimum Pension', in *Economica*.

Atkinson A B and J Micklewright, 1983, "On the Reliability of Income Data in the Family Expenditure Survey 1970-1977", *Journal of the Royal Statistical Society*, series A,146, 33-61.

Atkinson A B, L Rainwater and T M Smeeding, 1995, *Income Distribution in OECD Countries*. Paris: Organisation for Economic Co-operation and Development.

Baldini M, D Mantovani, C O'Donoghue, 2001, "Expenditure imputation and indirect tax simulation in EUROMOD", EUROMOD working paper EM7/01

Berger F, M Borsenberger, H Immervoll, J Lumen, B Scholtus and K De Vos, 2001, "The Impact of Tax-Benefit Systems on Low Income Households in the Benelux Countries. A Simulation Approach Using Synthetic Datasets" EUROMOD Working Paper EM2/99.

Berliri C, R De Carli and V Atella, 1999, "Moving from net to gross income in EUROMOD. An analysis of two alternative procedures", Paper presented at a EUROMOD project meeting, Copenhagen, February.

Bourguignon F, C O'Donoghue, J Sastre-Descals A Spadaro and F Utili, 1997, "Eur3: a Prototype European Tax-Benefit Model", Microsimulation Unit Discussion Paper MU9703, Department of Applied Economics, University of Cambridge.

Brandolini A, 1998, "The Personal Distribution of Incomes in post-war Italy: Sources, Description, Data Quality, and the pattern of Income Inequality"; Banca d'Italia paper.

Brandolini A and G D'Alessio, 2001, "Household Structure and Income Inequality", Luxembourg Income Study Working Paper No. 254, LIS: Luxembourg.

Callan T and H Sutherland, 1997, "The Impact of Comparable Policies in European Countries: Microsimulation Approaches", *European Economic Review*, 41: 3-5, 627-633.

Department of Social Security, 2000, *Income Related Benefits: Estimates of Take-Up in 1998-99*. London: DSS Analytical Services Division.

Eurostat, 1996, *ECHP Documentation* (Doc PAN 15.2/96), Luxembourg.

Eurostat, 1999, *Purchasing power parities and related economic indicators*, Luxembourg.

Eurostat, 2000, *European Social Statistics: income, poverty and social exclusion*, Luxembourg.

Evans M, 1995, "Out for the count: the incomes of the non-household population and the effect of their exclusion from national income profiles", Welfare State Programme discussion paper WSP/111, STICERD, London School of Economics.

Gupta A and V Kapur (eds), 2000, *Microsimulation in Government Policy and Forecasting*, Amsterdam: North Holland.

Harris G, 1998, "Income Distribution Data for the United Kingdom: Robustness Assessment Report", Papers and Final Report of the Second Meeting on Household Income Statistics, Canberra Group: Expert Group on Household Income Statistics.

Harris G, 1999, "Robustness Assessment Reports: Aims, Progress and Prospects", Papers and Final Report, Third Meeting on Household Income Statistics, Canberra Group: Expert Group on Household Income Statistics.

Immervoll H, 2000, "The Impact of Inflation on Income Tax and Social Insurance Contributions in Europe", EUROMOD Working Paper EM2/00

Immervoll H, 2000a, "Fiscal Drag - An Automatic Stabiliser? A Multi-Country Study Using Microsimulation", Department of Applied Economics Working Paper 0025, University of Cambridge.

Immervoll H and C O'Donoghue, 2001, "Imputation of Gross Amounts from Net Incomes in Household Surveys: An Application using EUROMOD", EUROMOD Working Paper EM1/01.

Immervoll H, O'Donoghue C, 2001a, "Towards a Multi-Purpose Framework for Tax-Benefit Microsimulation. A Discussion by Reference to EUROMOD, a European Tax-Benefit Model", EUROMOD Working Paper EM2/01.

Immervoll H and C O'Donoghue, 2001b, "Welfare and work incentives: the distribution of net replacement rates in Europe", EUROMOD Working Paper EM4/01

Immervoll H, C O'Donoghue and H Sutherland, 1999, "An Introduction to EUROMOD", EUROMOD Working Paper EM0/99.

Immervoll H, H Sutherland and K de Vos, 2000, "Child Poverty and Child Benefits in the European Union", EUROMOD Working Paper EM1/00.

Immervoll H, H Sutherland and K de Vos, 2000a, "Reducing child poverty in the European Union: the role of child benefits", in Vleminckx K, and T M Smeeding, (eds.), *Child Poverty, Child Well-being and Child Policy in Modern Nations: What Do We Know?*, The Policy Press, Bristol.

Levy H and M Mercader-Prats, 1999, "A Note on the Net to Gross Procedure: The case of Spain," Paper presented at a EUROMOD project meeting, Rome, September.

Lim P P and R Percival, 1999, "Simulating Australia's Institutionalised Population", Technical Paper No. 17, NATSEM, University of Canberra.

Mejer L and C Siermann, 2000, "Income poverty in the European Union: children, gender and poverty gaps", *Statistics in Focus: Population and Social Conditions*, 3-12/2000, Eurostat.

Mitton L, H Sutherland and M Weeks (eds), 2000, *Microsimulation Modelling for Policy Analysis: Challenges and Innovations*, Cambridge University Press.

O'Donoghue C, H Sutherland and F Utili, 2000, "Integrating Output in EUROMOD: An Assessment of the Sensitivity of Multi-Country Microsimulation Results" in Mitton L, H Sutherland and M Weeks (eds) *Microsimulation modelling for policy analysis*, Cambridge University Press.

Papadopoulos F and P Tsakloglou, 2001 "Indicators of Social Exclusion in EUROMOD", EUROMOD working paper EM8/01.

Redmond G, H Sutherland and M Wilson, 1998, *The arithmetic of tax and social security reform: a user's guide to microsimulation methods and analysis*, Cambridge University Press.

Rodrigues C F, 1999, "Income distribution and poverty in Portugal 1994/95 - A Comparison between the European Community Household Panel and the Household Budget Survey", CISEP, ISEG, mimeo.

Sutherland H, 1991, "Constructing a Tax-Benefit Model: What Advice Can One Give?", *Review of Income and Wealth*, 37 (2) 199-219.

Sutherland H, 2001, "Reducing Child Poverty in Europe: what can static microsimulation models tell us?", EUROMOD Working Paper EM5/01

7 Annexes

Annex I: Publications, presentations and other outputs

EUROMOD Working Papers

The project's own working paper series contains scientific papers produced using EUROMOD and technical papers reporting on crosscutting issues. A mailing list has been compiled for individuals and institutions to be informed about these papers. They are available without charge and most will also be available on the co-ordinator's and other partners' web sites.

The co-ordinator's web address is **http://www.econ.cam.ac.uk/dae/mu/emod.htm**

Papers to date are:

NUMBER	TITLE	AUTHORS	PUBLICATION DATE
EM0/99	An Introduction to EUROMOD	H Immervoll, C O'Donoghue and H Sutherland	September 1999
EM1/99	Integrating Output in EUROMOD: An Assessment of the Sensitivity of Multi-Country Microsimulation Results	C O'Donoghue, H Sutherland and F Utili	September 1999
EM2/99	Microsimulation and the Formulation of Policy: A Case Study of Targeting in the European Union	A B Atkinson, F Bourguignon, C O'Donoghue, H Sutherland and F Utili	September 1999
EM1/00	Child Poverty and Child Benefits in the European Union	H Immervoll, H Sutherland and K de Vos	February 2000
EM2/00	The Impact of Inflation on Income Tax and Social Insurance Contributions in Europe	H Immervoll	May 2000
EM3/00	A European Social Agenda: Poverty Benchmarking and Social Transfers	A B Atkinson	July 2000
EM1/01	Imputation of Gross Amounts from Net Incomes in Household Surveys: An Application using EUROMOD	H Immervoll and C O'Donoghue	June 2001
EM2/01	Towards a Multi-Purpose Framework for Tax-Benefit Microsimulation: A Discussion by Reference to EUROMOD, a European Tax-Benefit Model	H Immervoll and C O'Donoghue	Forthcoming

NUMBER	TITLE	AUTHORS	PUBLICATION DATE
EM3/01	The Impact of Tax-Benefit Systems on Low Income Households in the Benelux Countries. A Simulation Approach Using Synthetic Datasets.	F Berger, M Borsenberger, H Immervoll, J Lumen, B Scholtus and K De Vos	Forthcoming
EM4/01	Welfare benefits and work incentives: the distribution of net replacement rates in Europe using a cross-country microsimulation model, EUROMOD	H Immervoll and C O'Donoghue	Forthcoming
EM5/01	Reducing Child Poverty in Europe: what can static microsimulation models tell us?	H Sutherland	June 2001
EM6/01	The impact of means tested assistance in Southern Europe	J Albuquerque, M Balidini, O Bargain, P Bosi, H Levy, D Mantovani, M Matsaganis, M Mercader Prats, C O'Donoghue, C Farinha Rodrigues, A Spadaro, S Toso, I Terraz, P Tsakloglou	Forthcoming
EM7/01	Expenditure imputation and indirect tax simulation in EUROMOD (provisional title)	M Baldini, D Mantovani, C O'Donoghue	Forthcoming
EM8/01	Indicators of Social Exclusion in EUROMOD	F Papadopoulos and P Tsakloglou	June 2001
EM9/01	Final Report - EUROMOD: an integrated European Benefit-tax model	H Sutherland (ed.)	June 2001

Published papers and others presented outside the EUROMOD consortium

A Papers that describe the model itself and potential uses

1 Immervoll H, C O'Donoghue and H Sutherland, 1999, `An Introduction to EUROMOD', EUROMOD Working Paper EM0/99.

2 Atella V, C Berliri and V Parisi, 1999, `Il modello italiano in EUROMOD: problemi metodologici e primi risulti', mimeo.

3 Sutherland H, 2000, "EUROMOD", in Gupta A and V Kapur (eds), Microsimulation in Government Policy and Forecasting, Amsterdam: North Holland, pp 575-580.

4 Sutherland H, 2000, "EUROMOD: a tax-benefit model for the European Union",

Transfer, 6 (2) pp 312-316.

5 Sutherland H, 2000, "Use of microsimulation models to estimate net social protection expenditure: a contribution from EUROMOD (an integrated European benefit-tax model)", Eurostat paper doc. ESSPROSS-NET 2000/12.

6 Immervoll H, O'Donoghue C, 2001, "Towards a Multi-Purpose Framework for Tax-Benefit Microsimulation. A Discussion by Reference to EUROMOD, a European Tax-Benefit Model", EUROMOD Working Paper EM2/01.

B Country Reports

7	Austria	Michael F. Förster, Herwig Immervoll and Geza Tarcali
8	Belgium	Julie Lumen and Bertrand Scholtus
9	Denmark	Hans Hansen
10	Finland	Heikki Viitamäki
11	France	Olivier Bargain and Isabelle Terraz
12	Germany	(forthcoming)
13	Greece	(forthcoming)
14	Ireland	Tim Callan, Mary Keeney, Brenda Gannon and John Walsh
15	Italy	Vincenzo Atella, Manuela Coromaldi and Luca Mastrofrancesco
16	Luxembourg	Frédéric Berger and Monique Borsenberger
17	Netherlands	Klaas de Vos
18	Portugal	(forthcoming)
19	Spain	Horacio Levy and Magda Mercader Prats
20	Sweden	Åsa Karlsson, Statistics Sweden
21	United Kingdom	Holly Sutherland

C Technical issues related to model construction

22 Sutherland H, 1999, `The Sensitivity of Europe-wide Microsimulation Results', in Official Statistics in a Changing World, Proceedings of the 3rd International

Conference on Methodological Issues in Official Statistics, Statistics Sweden, Stockholm.

23 O'Donoghue C, H Sutherland and F Utili, 2000, `Integrating Output in EUROMOD: An Assessment of the Sensitivity of Multi-Country Microsimulation Results' in Mitton L, H Sutherland and M Weeks (eds) *Microsimulation modelling for policy analysis*, Cambridge University Press. Also circulated as EUROMOD working paper EM2/99.

24 Immervoll H and C O'Donoghue, 2001, `Imputation of Gross Amounts from Net Incomes in Household Surveys: An Application using EUROMOD', EUROMOD working paper EM1/01

25 Baldini M, D Mantovani, C O'Donoghue, 2001, 'Expenditure imputation and indirect tax simulation', EUROMOD working paper EM7/01

26 Papadopoulos F and P Tsakloglou, 2001 `Indicators of Social Exclusion in EUROMOD', EUROMOD working paper EM8/01.

D Policy-related papers

27 Albuquerque J, M Balidini, O Bargain, P Bosi, H Levy, D Mantovani, M Matsaganis, M Mercader Prats, C O'Donoghue, C Farinha Rodrigues, A Spadaro, S Toso, I Terraz, P Tsakloglou, 2001, "The impact of means tested assistance in Southern Europe", EUROMOD Working Paper EM6/01

28 Atkinson A B, 2000, "A European Social Agenda: Poverty Benchmarking and Social Transfers", EUROMOD Working Paper EM3/00.

29 Atkinson A B, F Bourguignon, C O'Donoghue, H Sutherland and F Utili, 2000, `Microsimulation and the Formulation of Policy: A Case Study of Targeting in the European Union', in Atkinson A B, H Glennerster and N Stern (eds) *Putting Economics to Work: volume in honour of Michio Morishima*, STICERD Occasional Paper 22, LSE. A revised version is forthcoming as `Microsimulation of Social Policy in the European Union: Case Study of a European Minimum Pension', in *Economica*. (A version is also circulated as EUROMOD Working Paper EM2/99)

30 Berger F, M Borsenberger, H Immervoll, J Lumen, B Scholtus and K De Vos, 2001, "The Impact of Tax-Benefit Systems on Poverty Rates in the Benelux Countries. A Simulation Approach Using Synthetic Datasets" EUROMOD Working Paper EM2/99,.

31 Immervoll H, 2000, "The Impact of Inflation on Income Tax and Social Insurance Contributions in Europe", EUROMOD Working Paper EM2/00

32 Immervoll H, 2000, `Fiscal Drag - An Automatic Stabiliser? A Multi-Country Study Using Microsimulation', Department of Applied Economics Working Paper 0025, University of Cambridge.

33 Immervoll H and C O'Donoghue, 2001, `Welfare and work incentives: the distribution of net replacement rates in Europe', EUROMOD Working Paper EM4/01

34 Immervoll H, H Sutherland and K de Vos, 2000, `Reducing child poverty in the European Union: the role of child benefits', in Vleminckx K, and T M Smeeding, (eds.), Child Poverty, Child Well-being and Child Policy in Modern Nations: What Do We Know?, The Policy Press, Bristol. (A longer version is circulated as 'Child Poverty and Child Benefits in the European Union', EUROMOD Working Paper EM1/00)

35 Lumen J, 2000, *Policy Digest*, mimeo

36 Sutherland H, 2001, "Reducing Child Poverty in Europe: what can static microsimulation models tell us?", EUROMOD Working Paper EM5/01

Presentations outside the EUROMOD consortium

Paper EM1/99 was presented at a Workshop on *Microsimulation in the New Millennium: Challenges and Innovations* in Cambridge, UK in August 1998.

Sutherland presented paper 22 at the **Statistics Sweden Conference on Methodological Issues** in Official Statistics, Stockholm, October 1998.

Versions of EM2/99 were presented by Bourguignon at an invited session of the **Royal Economic Society** conference (UK) in March 1999 and by Sutherland at the Welfare Policy and Analysis seminar at the **London School of Economics** (UK) in February 1999.

In July 1999, Sutherland presented the EUROMOD project under the title "EUROMOD: A benefit-tax model" to the Eurostat-sponsored **TES Summer School on Social Statistics**, in Siena, Italy.

Associated with the 6th project meeting in Rome in September 1999 a conference *EUROMOD: un modelo di microsimulazione su scala Europea* was organised by the **Consiglio Nazionale dell'Economia e del Lavoro** (CNEL) to present EUROMOD to an audience of representatives of Italian government and research organisations. An introduction to the project (based on working paper EM0/99) was presented by Sutherland. Atella presented paper 2 and Bourguignon presented paper EM2/99.

Immervoll and Sutherland presented paper EM1/00 to a conference on *Child Well-being in Rich and Transition Countries*, held in Luxembourg September- October 1999.

Sutherland presented a paper under the title "EUROMOD and the state of the art in household income statistics" at a Seminar on *Income Methodology for Statistics on Households*, **Eurostat**, Luxembourg December 1999.

Immervoll and O'Donoghue presented EM2/01 at the 6th **Nordic Seminar on Microsimulation Models**, Copenhagen in June 2000. The same paper was presented to the

UK Department of Social Security in March 2000, and in April 2001, under the title "Applications of a Multi-Purpose Microsimulation Tax-Benefit Model in the Developed and Developing World" at the **United Nations Social Policy Division** (New York,) and the **World Bank Thematic Group on Inequality** (Washington).

Sutherland presented the EUROMOD project under the title "EUROMOD: A benefit-tax model" at **Eurostat**, Luxembourg in May 2000.

Immervoll presented paper EM2/00 at the Institute of Public Finance, **University of Innsbruck**, Austria in May 2000.

Atkinson included results from EUROMOD on the relationship between social spending and poverty rates in three countries in a paper written for the **Conseil d'Analyse Economique of the French Prime Minister** as part of the preparations for the French Presidency of the Union (an English version is available as EM3/00).

Immervoll presented paper 32 at the 56th **Congress of the International Institute of Public Finance**, Seville in August 2000.

Sutherland presented paper 5 to the **Eurostat** Task Force on *Net Social Protection Expenditure* on 26th October 2000.

Immervoll and O'Donoghue of the Cambridge team presented EM4/01 to the *Workshop on Unemployment Work and Welfare* for **DG-Research** in Brussels in November 2000 and the same paper was presented to the *Welfare Policy and Analysis* seminar at the **London School of Economics** in January 2001.

In November 2000 the Spanish EUROMOD partner Magda Mercader Prats organised a workshop in Barcelona under the title *Fighting Poverty and Inequality through Tax-Benefit Reform: Empirical Approaches*. At this, Sutherland gave an invited lecture based on EM5/01, De Vos presented EM3/01 and O'Donoghue presented EM6/01.

Sutherland presented EM5/01 to the Institute for Social and Economic Research seminar at the **University of Essex** (UK) in February 2001.

Sutherland presented EM5/01 at the 2001 conference of the **European Society of Population Economics**, in Athens, June, 2001.

Planned presentations

Immervoll will present a version of paper 33 at the 57th **Congress of the International Institute of Public Finance**, Linz, August 2001.

Associated papers

Some members of the EUROMOD team have produced papers partly based on work done for the EUROMOD project. These include

Magda Mercader-Prats y Horacio Levy (1999) "ESPASIM: Un modelo de micro-simulación para España", Document de Treball 99.08, Departament d'Economia Aplicada, Universitat Autònoma de Barcelona.

Invited presentation at the XXIV Simposio d'Análisis Económico (Bellaterra 1999)"Microsimulación y reforma fiscal: Una aplicación con el modelo ESPASIM".

Matsaganis, M (forthcoming) "Social Assistance in southern Europe: the case of Greece revisited", *Journal of European Social Policy*.

Tsakloglou, P (1999) "Poverty and anti-poverty policies in Greece and comparisons with other Mediterranean EU member states", Athens University of Economics and Business, Department of International and European Economic Studies Discussion Paper No 99-01 (forthcoming in E. Mossialos (ed) Contemporary Greece and Europe, Ashgate: London). Presented at a conference at the London School of Economics on "The contribution of a changing Greece to the European Union".

Deliverables

The five deliverables that were planned at the outset of the project (and specified in the Workprogramme) are listed below, along with an indication of progress and achievement.

1. **A Country Report for each country, documenting the national database, existing policy and validation of simulated output.**

See the list under B. above and **http://www.econ.cam.ac.uk/dae/mu/emod.htm**

2. **Technical reports on the treatment of issues in common across countries.**

See the list under C. above and **http://www.econ.cam.ac.uk/dae/mu/emod.htm**

3. **A digest of policy for all EU countries, organised by policy area, making clear which policies may be simulated by EUROMOD, which are country-specific and which may be implemented for more than one country, and explaining the definitions of common policy concepts that have been developed.**

Country Reports contain much of this information. In addition, the Policy Digest (see section 3.4 of this report) is in the process of preparation as a book.

4. **A report on a number of applications of EUROMOD, specified and evaluated in conjunction with the Advisory Group.**

See the list under D. above and summaries in section 4 of this report. Also see **http://www.econ.cam.ac.uk/dae/mu/emod.htm**

5. **A version of the model, EUROMOD, for use by Commission Services.**

As noted in the Workprogramme, "the final deliverable is subject to conditions that may be imposed by the data providers." Some data providers would require that Commission Services make their own contract with the data provider for access to the data on which the national module is based.

In principle the remainder of the model could be delivered to Commission Services. However, due to the complexity of the model any practical access would require appropriate Commission Services personnel to receive training in the use of the model.

Annex II: The EUROMOD team 1998-2000

(* denotes people no longer involved by the end of the project**)**

Country	Country team leader	Other team members
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Country	Country team leader	Other team members
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	Paolo BOSI Prometeia Calcolo via G. Marconi 43 40122 Bologna Tel: 39 51 6480911 Fax: 39 51 220753 E-mail: bosi@ecoalpha.unimo.it	Massimo Baldini Daniela Mantovani Stefano Toso
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PORTUGAL	Carlos Farinha RODRIGUES CISEP, Instituto Superior de Economia e Gestao Rua Miguel Lupi 20 1200 Lisboa Tel: 351 1392 5964 Fax: 351 1396 7309 E-mail: carlosfr@iseg.utl.pt	Jose Luis Albuquerque
SPAIN	Magda MERCADER PRATS Department d'Economia Aplicada Facultat de Ciencies Economiques Universitat Autonoma de Barcelona Edifici B 08193 Bellaterra Tel: 34 93 581 2290 Fax: 34 93 581 2292 E-mail: mmercader@volcano.uab.es	Horacio Levy
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	Tony ATKINSON Nuffield College, University of Oxford Oxford OXI INF Tel: (+44) 1865 278519 Fax: (+44) 1865 278676 E-mail: tony.atkinson@nuf.ox.ac.uk	

Annex III: The EUROMOD Advisory Group

Name:	Institution (at the time of membership of the AG):	Meetings attended
Andrea Brandolini	Bank of Italy, Rome	1, 2, 3
Gabrielle Clotuche	European Commission DGV/E, Brussels	2, 5
Nicole Dewandre	European Commission DGXII/E, Brussels	1
Pieter Everaers	Eurostat, Luxembourg	3
Gordon Harris	Department of Social Security, London	1
Christopher Heady	University of Bath and OECD, Paris	1, 2, 3, 5
Reiner Hoffman	European Trade Union Institute, Brussels	
John Langmore	Economic and Social Affairs, United Nations, New York	
Eric Marlier	Eurostat, Luxembourg	1, 4, 5
John Micklewright	UNICEF-ICDC, Florence	3, 4, 5
Mark Pearson	OECD, Paris	2
Aino Salomäki	European Commission DGII/B,1, Brussels	1, 2, 5
David Silke	Combat Poverty Agency, Dublin	1, 2
Geneviève Zdrojewski	European Commission DGXII/H, Brussels	2, 3, 4, 5

Meetings

1	15th June 1998	DULBEA, ULB, Brussels
2	11th February 1999	SFI, Copenhagen
3	16th September 1999	CNEL, Rome
4	8th May 2000	DIW, Berlin
5	24th November 2000	UAB, Barcelona

Annex IV: Project meetings

	DATE	PLACE	LOCAL ORGANISER
1	9th-10th March 1998	University of Cambridge	Holly Sutherland
2	15th-16th June 1998	DULBEA, ULB, Brussels	Danièle Meulders
3	16th-17th November 1998	ESRI, Dublin	Tim Callan
4	11th-12th February 1999	SFI, Copenhagen	Hans Hansen
5	21st-22nd May 1999	University of Pau, France	Jacques Le Cacheux
6	17th September 1999	Tor Vergata, Rome	Vincenzo Atella
7	24th-25th January 2000	DELTA and OFCE, Paris	François Bourguignon and Jacques Le Cacheux
8	8th-9th May 2000	DIW, Berlin	Gert G. Wagner
9	26th-27th November 2000	UAB, Barcelona	Magda Mercader Prats

Annex V: EUROMOD project Consortium Agreement (February 1999)

1. The EUROMOD construction project is funded by EC contract CT97-3060 and is due for completion in December 2000. The project aims to build an EU-wide tax-benefit microsimulation model, as set out in the Contract Work Programme (CWP).

2. This Consortium Agreement (CA) is a statement of the rights and responsibilities of the EUROMOD team. This team consists of the co-ordinator, partners, associate partners and sub-contractors based in 18 institutions named in the CWP.

3. There is no intention to contradict the contractors' obligations to the European Commission (EC). Where this may appear to be the case, obligations to the EC take precedence.

4. This CA is signed by the leader of each of the 18 participant groups. The principle of subsidiarity applies in distributing rights and responsibilities among members of these participant groups. However, the co-ordinator should be informed of any changes to the membership of these groups.

5. An Executive Committee is established, consisting of the co-ordinator, the full partners and the Model Assembly group (see CWP page 9). The main purpose of this Committee is to (i) make decisions in the event of the whole team being unable to reach agreement, (ii) resolve any disagreement between the co-ordinator and any or all of the other members of the team and (iii) deal with any infringements of this Agreement.

6. The tasks of each group in the team are set out in the CWP. If any group is unable to complete the task, or to complete it in the necessary time period, then it is that team member's responsibility to establish a sub-contract with a third party, such that the task is completed to the satisfaction of the co-ordinator and within the terms and conditions set by the contract with the EC. This third party may be another member of the current team. In the case of the co-ordinator being unable to carry out a task, the Executive Committee will have responsibility for approving the sub-contracting of this task.

7. The construction of EUROMOD involves co-operative effort and any publications, presentations and other dissemination or publicity should acknowledge this. EUROMOD (or "the model") consists of many elements. All the tasks that are involved in constructing the model contribute to the intellectual capital embodied in it. All the individuals in the team should be considered to own a share of this intellectual property.

8. However, the micro-data on which the model relies are the copyright of the data providers, not of the EUROMOD team. In general, this also applies to the transformed data that form the model database. (Although the transformation algorithms can be considered as part of "the model".) EUROMOD team members are responsible for abiding, in the strictest terms, by all the conditions set by the providers of micro-data. It is the responsibility of individual team members to inform themselves of these conditions. This applies whether it is they, or other team members, who are signatories to contracts with data providers.

9. All uses of the model, or of parts of it, should be reported to the co-ordinator, who will maintain a database of this information that will be freely available. It is the responsibility of users of the model, or parts of it, to ensure that the EUROMOD team has had opportunity to check and approve the use of the model.

10. The EUROMOD team should not be held responsible for the quality of the use of the model, or the interpretation of results from the model, unless this has been explicitly agreed by each participant group. Annex 1 sets out a recommended form of acknowledgement and disclaimer, to be used in all publications that make use of EUROMOD, or parts of it.

11. This CA applies for the duration of the EU-funded project. It is valid until the final scheduled meeting of the project, when continuation and amendment of the terms of the CA will be discussed.

Signed..... Date……..

On behalf of the ……..……. group.

Annex 1 Acknowledgement and disclaimer

The EUROMOD project, to construct an integrated European tax-benefit model, is funded by the European Commission *Targeted Socio-Economic Research* programme (CT97-3060). The project involves 35 individuals in 18 institutions from 15 countries and thanks are due to the whole team [particularly….] The author(s) alone is/are responsible for the views expressed, for the interpretation of model results and for any errors in the use of EUROMOD. [Add relevant data acknowledgements]