Tax-Benefit Reform in Spain in a European Context:

A non-behavioural and integrated microsimulation analysis

PhD Thesis written by

Horacio Levy

Supervised by

Magda Mercader-Prats

Departament d'Economia Aplicada

Universitat Autònoma de Barcelona

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To my family

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The views expressed in this paper, as well as any errors, are the responsibilities of the author. In particular, this applies to the interpretation of model results and any errors in its use. EUROMOD is continually being improved and updated and the results presented here represent work in progress. This work uses EUROMOD data that rely on micro-data from 4 different sources. European Community Household Panel (ECHP) User Data Base made available by Eurostat; Enquête sur les Budgets Familiaux (EBF) made available by INSEE; German Socio Economic Panel Study (GSOEP) made available by German Institute for Economic Research (DIW), Berlin; and the Family Expenditure Survey (FES), made available by the UK Office for National Statistics (ONS) through the Data Archive. Material from the FES is Crown Copyright and is used by permission. Neither the ONS nor the Data Archive bear any responsibility for the analysis or interpretation of the data reported here. An equivalent disclaimer applies for all other data sources and their respective providers cited in this acknowledgement.

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Introduction and objectives

1 CONTEXT OF ANALYSIS

In the last decades, Spain has experienced one of the most successful transitions from an authoritarian regime with an underdeveloped state to a consolidated democracy and a modern welfare state. Nevertheless, this transition is not complete. Remainders from the past and new socioeconomic changes maintain Spain behind the EU average in many dimensions.

Social protection is one of these dimensions where there are still important gaps to fill. Public expenditure on social protection has increased dramatically in the last decades. Despite that, the expenditure level as percentage of GDP is still considerably below the EU average. Moreover, social protection in Spain is mainly focussed on the most traditional 'social protection functions' such as old age, widowhood and unemployment. Spanish social protection system is virtually inexistent in emerging and pressing areas such as family and housing protection.

Labour market instability, new household forms, decline of fertility rates and increasing female labour participation are changing the types of social needs and the groups at risk of falling into poverty and social exclusion. Following Esping-Andersen and Sarassa (2002), these changes have shifted the risk structure down the life cycle, deteriorating the well-being of families with young children. Besides Scandinavia, the welfare states of most OECD countries have not been able to cope with these new circumstances, remaining mainly biased towards the protection of the elderly. This is reflected in the distribution of poverty risk across age groups in most industrialised nations. According to Bradbury and Jantii (1999), in almost all EU and OECD countries child poverty is higher than the average. In contrast, elderly poverty is below the average in most of these countries. This situation is especially significant in Spain. Recent studies have shown that child poverty in Spain is considerably higher than the EU average (Mejer and Siermann, 2000) and, contrary to the rest of the Spanish population, poverty among households with children has considerably increased in later years (Cantó et al, 2002)

Therefore, family protection is one of the areas that need substantial improvements in the Spanish welfare state. The Spanish government recognised this need in the European social agenda agreed at the Lisbon and Nice European Councils in 2000. In June 2001, Spain submitted its first National Action Plan on Social Inclusion that included a 'Plan for Family Support' (*Plan Integral de Apoyo a la Familia 2001-2004*) as one of its cornerstones. The objectives of this Plan are to reconcile work and family life, to improve the families' life standards and to allow the principle of demographic continuity through generational replacement. In practical terms, the plan consisted in a substantial increase on child tax reliefs, the creation of a refundable tax credit for working mothers with young children, and in a modest raise of the income-tested child benefit.

On the other hand, good part of the development of the Spanish welfare state was possible through the reorganization of the tax system. In 1978, Spain created the personal income tax; this was followed by the implementation of the VAT in 1986. Nowadays, these taxes represent more than 40 percent of total government revenue. Despite its importance in the modernization and promotion of equity, the Spanish income tax has been increasingly questioned. One of the problems most widely cited is the high complexity of the system. This is excessively long (full of details and exceptions), it has a problematical dual taxation scheme (individual and joint schemes), and uses a complicated and vague vocabulary, which is not understood by the majority of taxpayers. Some 80 per cent of Spanish taxpayers admit the need for assistance to fill in their income tax return (Area de Sociología Tributaria, 2001). This complexity is reducing the income tax's social approval. The general perception is that the rich, who are able to get good professional advice, are the ones who gain the most from complexity. As a result, the general public does not see the income tax as a fair and progressive tax. According to Alvira Martín and García López (1998), half the Spanish taxpaying population prefers VAT (a tax widely known to be regressive in Spain) to the income tax. Therefore, diminishing complexity was one of the main objectives of the Spanish income tax reform carried out at the end of 1998. The government considered that main source of complexity was the high number of tax returns filed to the Inland

Revenue. Therefore, the reform tried to reduce this number by raising the exemption limit to file a tax return and by reforming the system of tax withholdings.

The issues cited above have been central in the economic analysis since Adam Smith's "canons of taxation". Following Atkinson (1995), in the last decades Public Economics has developed very useful tools to analyse and evaluate the effects of tax-benefit reforms. On the one hand, the theoretical analysis has advanced greatly with contributions such as Mirrlees (1971) model of optimum taxation and Harberger (1962) general equilibrium model. The optimum taxation model constitutes a key framework to identify the elements that determine the effects of direct taxes and cash benefits on equity and efficiency. The general equilibrium models analyse how tax-benefit reforms affect the demand and supply of goods and factors across markets and forecasts their situation when the economy reaches a new equilibrium. On the other hand, empirical analysis has also experienced substantial progress in the last decades. Two of the most significant developments are the tax-benefit microsimulation models and the labour-supply models. Microsimulation models are powerful tools for 'fine-tuning' analysis, allowing one to measure the effects of very specific tax-benefit reforms at the household and/or individual level (Atkinson and Sutherland, 1988; Atkinson and Bourguignon, 1991; and Redmond et al, 1998). Labour-supply models estimate the impact of taxes and benefits on individual work decisions (Hausman, 1981; Heckman, 1993 and Blundell and MaCurdy, 1999).

These developments in Public Economics were complemented with the advances in the theory of income inequality and poverty measurement. Seminal works such as Atkinson (1970), Sen (1976) and Jakobsson (1976) have been crucial to learn about the properties of the instruments usually used to measure poverty and inequality and to develop new and more robust indicators. The integration of Public Economics with the literature of inequality and poverty measurement allows one to have a clearer and better assessment of the effects of tax-benefit reform on equity.

The implementation of these instruments has been slow in Spain. Until recently, most analyses on tax-benefit reforms were still based on very limited evidence such as

macro-aggregates, policy rules and on effects over 'representative households'. Lately, a growing number of studies are building and using new techniques. Although some microsimulation exercises had been already carried out in the mid-1990s (Castañer and Santos, 1992; Manresa et al, 1996; García et al, 1997; Mercader, 1997), the 1998 income tax reform triggered off the interest of many Spanish researches in the development and use of microsimulation models. Mercader and Levy (1998), Levy (1999), and Castañer et al (2001) evaluate the distributive effects of the 1998 income tax reform. Onrubia (2001) simulates different schemes of family taxation. Durán (2001 and 2002) and Picos (2003) simulate the effects of replacing the present income tax system by a dual income tax. Oliver and Spadaro (2001) reveal the social aversion to inequality underlying before and after the 1998 Spanish income tax systems. Castañer and Sanz (2002) simulate the impact of replacing the 2001 Spanish income tax system by an equivalent flat income tax with equal revenue and redistributive effect. Some of these embryonic exercises stimulated the construction of microsimulation models for Spain. Arcarons and Calonge (2003) develop a microsimulation model for the property tax in Catalonia. Sanz et al (2003) build a behavioural microsimulation model of indirect taxation for Spain.

Nevertheless, none of these studies has used microsimulation to integrate the revenue and the expenditure side of government budget. The advantage of integrated models is that they can simulate more than one policy, and also take into account the interactions between taxes and benefits and assess the whole effect of the fiscal system. Specific models, such as those so far used in Spain, are suitable to assess the separate effect of a policy, holding fixed the interactions with the rest of the system. However, the extrapolation of results to measure the impact on individual disposable income should be taken with caution since overlooking the interactions with the rest of the fiscal system may bias the assessment of the final effect of a reform.

The processes of economic globalization and of European integration are emphasizing the interest on tax-benefit analysis from a comparative perspective. However, one of the limitations of standard comparative studies is that the populations used to compare the tax-benefit systems are different. Therefore, it is difficult to know if the differences in

outcomes are due to the system or to the population. Atkinson et al (1988) show that microsimulation can overcome this problem. Given their capacity to simulate any kind of reform, microsimulation models can be used to simulate a tax or benefit from one country into another. Hence, comparisons between two policies can be carried out using the same population, so that outcome differences are strictly due to policy differences.

2 OBJECTIVES

This thesis has three central objectives. First, it seeks to assess the effects of the recent reforms in Spain in terms of equity, simplicity and, to some extent, efficiency. Second, drawing on these results, it aims to search alternative reform scenarios that could improve the outcomes achieved by the current tax-benefit system. Third, it wishes to expand the current methods of empirical fiscal analysis used in Spain by developing a Spanish integrated microsimulation model.

The analysis is centred in two particular reforms: the *Plan for Family Protection 2001-2004* and the *1998 personal income tax reform*. The plan for family protection is mainly assessed in terms of aggregate expenditure, poverty reduction, and redistributive effect. These results are contrasted with the outcomes of other EU countries. This comparison allows one to learn more about alternative ways of reforming the Spanish tax-benefit system, as well as to examine what could be the effect of an eventual 'harmonisation' of child-related policies in the European Union.

The evaluation of the 1998 personal income tax reform weighs up the simplicity effect in terms of the number of taxpayers that need to fill in a tax return and of the gap between the withholding tax that should be paid by the taxpayer and the one effectively collected by the government.

In sum, this thesis addresses the following questions:

- Have recent tax-benefit reforms been effective and efficient tackling child poverty and income inequality? How does the new Spanish tax-benefit compare to that practiced in other EU countries in terms of child poverty alleviation and income redistribution? Given an expenditure-neutral constraint, can one design a reform that could reduce the current levels of poverty and inequality and raise social welfare in Spain?

- How effective has been the recent income tax reforms to reduce tax complexity in Spain? How many taxpayers no longer need to file a tax return after the reform? Given a revenue-neutral constraint, can one design a reform that could reduce the number of tax returns in Spain?

Given the novelty of the development and use of an integrated microsimulation model in Spain, this thesis is also compelled to answer some questions about the suitability and quality of the instruments used.

- How suitable and reliable are the microsimulation models to perform the analyses pursued? What are the analytical and technical limitations of this instrument? What are the cautions that one must have when interpreting the results?

The advances achieved with the construction of a tax-benefit microsimulation model for Spain go beyond the scope of this work. Microsimulation models are powerful tools that can be used for countless studies on tax-benefit reform, not only by academics but also by government departments, NGO's, unions, etc. (Atkinson, 1995). For this reason, the Spanish microsimulation model was constructed having in mind that it should be used in further studies and handled by other users besides its developers. Therefore, the development of a model framework which is accessible and that can be operative and useful for a long time are also objectives of this work. Moreover, the construction of the model also required the development and application of different imputation and estimation techniques to correct and adapt the survey data used to the needs of the

model. These contributions derived from the construction of the model are additional objectives of this thesis.

3 STRUCTURE OF THE THESIS

The work is structured in four chapters.

Chapter I presents the different theoretical and empirical instruments that Public Economics and the Theory of Income Inequality and Poverty Measurement have developed to assess the effects of tax-benefit reforms. The objective of the chapter is twofold. First, to contrast the analytical advantages and limitations of non-behavioural microsimulation models against other modelling techniques such as optimal taxation, general equilibrium and labour supply models. This comparison is very useful to understand the limits of non-behavioural microsimulation models and to bear in mind what are the cautions that one must have when interpreting their results. Second, to discuss the properties and the axioms that lie behind the inequality and poverty indicators used in the analysis. Therefore, the chapter makes explicit the limitations and underlying assumptions of the results produced by the microsimulation model and summarized by the poverty and inequality indexes.

Chapter II presents the Spanish and European tax-benefit microsimulation models used in the empirical analysis. One drawback of microsimulation models is that they rely on databases that were not designed for this purpose. As a result, some information that is necessary to simulate tax-benefit systems is deficient or missing. To overcome these limitations modellers must revise the quality of the database and estimate or impute the unsuitable or missing data. The chapter examines the quality of the data used by the models to simulate the Spanish tax-benefit system. It also tests the reliability of the results produced by the models by comparing them to official statistics.

Chapter III analyses how reforming cash child-related benefits would affect public expenditure, income redistribution and child poverty in Spain. The analysis is divided

in two parts. The first part compares the Spanish child-related benefits to those used in four EU countries (Denmark, France, Germany and UK). Then it examines the reforms of child-related benefits implemented in Spain in recent years, and studies what would happen if, instead of these reforms, Spain had adopted the benefits that are used in the other countries analysed here. The analysis is carried out making use of the European tax-benefit model EUROMOD

Chapter IV analyses the simplification of the Spanish personal income tax proposed by the 1998 reform. The analysis is divided in three parts. First, it assesses the effects of the reform on the number of taxpayers that need to fill in a tax return and on the gap between withholding tax to the income tax liability. Second, it analyses the effects of the reform on compliance costs and equity. Finally, it studies alternative reform proposals that would achieve the twin objectives of reducing the number of tax returns and minimising the gap between the payment of withholding tax and the tax liability under a revenue-neutral constraint. To carry out this analysis, the income tax reform is simulated using the Spanish tax–benefit micro-simulation model, ESPASIM. This model enables one to calculate withholdings and income tax liabilities, before and after the reform, from a sample of individuals and families that is representative of the population in Spain.

Chapter I

The Economics of Income Taxation and Social Benefits

1 INTRODUCTION

This chapter presents the main theoretical and methodological instruments that the economic literature has developed to analyse income taxation and social benefits. The objective is not to present an exhaustive survey of the literature. Instead, it provides an overall view of the different dimensions, questions and instruments that are relevant in the economic analysis of taxes and benefits. It will show that the literature has not been able to construct a unique framework capable of dealing with all dimensions of the economic effects of fiscal reform. Alternatively, it has developed many different branches of analysis that deal with each dimension separately. Some of these branches, the questions that they address, the tools they use and the answers that they are able to provide are discussed here.

The main objective is to highlight the advantages and limitations of microsimulation models, which is the technique used in the following chapters, in comparison to other instruments of analysis. This description will show that microsimulation models are a powerful tool for microeconomic fiscal analysis and the most suitable instrument to perform studies about the effect of tax-benefit reforms on inequality and poverty.

Finally, the chapter presents and examines some of the tools that the theoretical literature has developed to measure the redistributive and poverty effects of taxes and benefits.

This chapter is divided in four sections. After this introduction, section 2 discusses theoretical and empirical models developed by the economic literature to analyse the effects of taxes and benefits. Section 3 reviews theoretical and empirical aspects of the measurement of inequality and poverty. Section 4 briefly concludes.

2 TAX-BENEFIT MODELLING

The public debate about tax-benefit reform is always centred about the aggregated cost (to the government or to the taxpayers), the redistributive effect, who are the gainers and losers and what will be their effects on employment and economic growth. The contribution of the economic literature is to provide a framework of analysis where those issues can be assessed in a systematic way so that policy makers can choose a reform given their own value judgements and the public can have a clear picture of the implications of that reform and of other alternative policies. This information enriches the public knowledge about the effects of a tax-benefit reform and counter-weights the rhetoric and political propaganda, helping the decision-making process to be taken under higher degrees of rationality and transparency.

Given the complexities and interactions of all the economic phenomena, of the tax-benefit system and of household and individual circumstances, the construction of a full and complete model of all the effects of a tax-benefit reform is unfeasible. Hence, economists are forced to simplify many elements of reality to work in a framework that is analytically and/or computationally tractable. One of the key requirements and virtues of tax modelling is that such limitations must be made explicit so that the limitations of the analysis are clear.

Therefore, there is not a unique or best strategy for tax-benefit modelling. On the contrary, there can be as many types of models as dimensions in tax-benefit analysis. Each type of model is able to add some knowledge about a precise issue while leaving unanswered many other questions that must be dealt by another type of model.

In general, tax-benefit models can be divided in two groups. The *Analytical Models* address the central issues of the theory of taxation, such as the optimum taxation models, the applied general equilibrium models, and the life-cycle models. They are crucial to understand broad economic effects, interdependencies and unanticipated consequences. Hence, they provide the type of information that is essential for a first

and general analysis of the effects of a reform. On the other hand, they rely on much stylised representations of the population ('representative' agents or a simulated distribution) and of the complexity of the tax-benefit system. Thus, these models are less suitable for detailed or specific analysis.

This type of issues are better analysed by tax-benefit *Microsimulation Models*. These models use large data from household surveys, reproduce the effects at the household or individual level, and simulate the system in detail. Therefore, they are the most appropriate tool to study the effects taxes and benefits on income inequality, on poverty, and on narrow defined groups (for example age or gender groups). In addition, they are a valuable instrument to examine the design of certain policy element and its interaction with other elements or policies of the system.

2.1 Analytical Models

The main objective of the Theory of Taxation is, given the need of financing the public expenditure (which is assumed to be exogenous and neutral), to find a tax system that maximises social welfare. In order to achieve this objective, Public Economics proposes that the design of the tax system should follow three basic principles: economic efficiency, equity and simplicity.

Efficiency is related to the disincentive effects that a tax system may produce on economic decisions. These effects cause a reallocation of resources that is less efficient than the allocation that would result in a scenario with no taxes or with lump-sum taxation. Hence, on the efficiency side, taxes are expected to be negative to social welfare. The principle of equity is related to social aversion to inequality. In Welfare Economics, this aversion to inequality is represented as the property of quasi-concavity of the social welfare function; *ceteris paribus*, a tax system that reduces inequality increases social welfare. Finally, the collection of a tax is not exempted of costs. While the government needs to spend part of revenue to administer and ensure tax collection, taxpayers and companies also bear costs collecting information and filling tax returns.

The principle of simplicity deals with the administrative and compliance costs of tax collection. Tax complexity produces greater costs and reduces social welfare.

The Theory of Optimal Taxation deals with the trade-off between two of these principles (equity and efficiency) in a formal and systematic way. This helps one to learn about the determinants of the welfare effects of taxation. Section 2.1.1 briefly describes the basic framework of the optimum taxation model and some of its most important findings.

Simplicity was originally not included in the optimal taxation model. However, recently, some economists started to research about simplicity from a theoretical and an empirical perspective. Section 2.1.2 summarises part of the developments on the economic analysis of tax simplicity.

The Theory of Taxation also enquires about the effective allocation of taxes and their distribution. Section 2.1.3 presents some methods and results from the tax incidence literature.

2.1.1 Optimum Income Taxation Model

The equity-efficiency trade-off is one of the main subjects of economic analysis and has been explored from many classic authors such as Sidgwick, Lindahl or Ramsey. However, the contribution of Mirrlees (1971) has represented a decisive step in the study of the interaction between equity and efficiency in the theory of taxation. According to Mirrlees's basic model, the optimum taxation problem consists in maximizing social welfare given that

i. the government needs to raise a certain revenue to finance the public expenditure *G* (which is assumed exogenous and with no redistributive effect[1]);

ii. that individuals have the same preferences but they differ in productivity *w* (which is taken as fixed); and

iii. that the government knows the overall distribution of productivities, *f(w)*, but cannot observe the productivity at the individual level.

The third restriction prevents the use of *first best* taxes. If the government knew the productivity of each individual, then it could achieve equity without efficiency loss using a progressive tax on productivity. Since they cannot change their productivity (assumption *ii*) the individuals with higher productivity would not find any incentive to change their behaviour as a response to taxation. Under condition *iii* the government is constrained to tax what it can observe, i.e., income[2]. The problem with income taxation is that income depends on the number of hours worked *H,* so that $y = wH$. Hence, assuming leisure as a normal good, tax progressivity would induce individuals with high productivity to reduce their hours of work, these would allow them to pay fewer taxes and consume higher leisure, maintaining their pre-tax utility. This labour supply response reduces the tax base and lowers the government revenue. The government is then forced to impose an extra taxation in order to balance the revenue shortfall. This excess burden of taxation represents an efficiency loss that diminishes the rise in social welfare obtained through the fall in inequality.

Mirrlees's model weights the two sides of the efficiency-equity trade-off to determine the optimal income tax, *T(wH)*. Basically, these weights will depend on three elements:

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[1] For an extension of Mirrlees's model including the distributive effect of public expenditure see Boadway and Marchand (1995).

[2] Of course, the government could alternatively tax consumption. However, indirect taxation is not subject of this study. For comprehensive analysis of optimum indirect taxation and the optimum tax mix see Atkinson and Stiglitz (1980).

i) the labour supply responses of the individuals, derived from the utility function *U(C,L)*, where *C* is consumption and *L* is leisure), ii) on the distribution of productivities, *f(w)*, and iii) the social welfare function:

$$\Omega = \int_{w_0}^{\infty} \Gamma\{V[w, T(wH)]\} f(w) dw \tag{1.1}$$

where *V[]* is the indirect utility function and $\Gamma\{\}$ is a non-decreasing and quasi-concave transformation. The concavity of $\Gamma\{\}$ represents the social (or policy-maker) aversion to inequality.

Given those elements, the optimal income tax is such that the marginal tax rate is[3]:

$$\frac{t(wH)}{1-t(wH)} = \left(1 + L\frac{U''_H}{U'_H}\right)\frac{1-F(w)}{wf(w)}\left[1 - \frac{S(w)}{S(w_0)}\right] \tag{1.2}$$

where w_0 is the minimum level of productivity, *F(w)* is the cumulative distribution function of *w*, *S(w)* is the average social marginal valuation of income for those with productivity above *w*

$$S(w) = \frac{\int_{w_0}^{\infty} \Gamma\{V[w, T(wH)]\} f(w) dw}{1 - F(w)} \tag{1.3}$$

and $S(w_0)$ is the average social marginal valuation of income for the whole population.

Two terms represent efficiency part of the trade-off in the equation (1.2). The term $[L \cdot U''_L / U'_L]$ assesses the intensity of the labour supply response to taxation. In the special case where the utility function is quasi-lineal with consumption and iso-elastic

[3] The derivation of this equation is available at Atkinson and Stiglitz (1980) and Atkinson (1995).

in labour supply, this term can be replaced by $\left[1+1/\varepsilon(w)\right]$, where $\varepsilon(w)$ is the substitution elasticity of labour supply with respect to the net wage. This demonstrates that higher labour supply elasticity entails lower optimum tax rates. The second 'efficiency-term' is related to the frequency of individuals at a wage level w, $\left[wf(w)\right]^{-1}$. Hence, productivity levels with high number of workers should have lower marginal tax rates.

On the equity side, marginal tax rates increase with the proportion of the population above w, $\left[1-F(w)\right]$. Hence, if the distribution is bounded from above then the marginal tax rate to the highest productivity level, w_{max}, should be zero (Seade, 1977)[4]. Finally, the marginal tax rate depends on the social marginal valuation of income. If the government is indifferent to inequality, the marginal valuation of income is the same for all income levels, $S(w) = S(w_0)$, the last term in (1.2) is zero, and the marginal tax rate is zero. If $S(w)$ falls with w, then the last term in (1.2) is positive.

Mirrlees (1971) computed some numerical estimates of his model assuming a Cobb-Douglas individual utility function (this implicitly assumes a labour supply elasticity of 1.0), a utilitarian social welfare function and a specific distribution of abilities. The results suggest that the tax structure should be approximately linear (with a refundable tax credit), with lower marginal tax rates for higher incomes levels. The optimum tax rate would be around 20 percent. Many authors have calculated optimum income tax rates using different specifications for the social welfare function, the labour supply elasticity or the shape of productivity distribution. According to the results from Atkinson (1973) – who used a Rawlsian social welfare function – and Stern (1976) – who replaced the Cobb-Douglas utility function by a CES function with elasticity 0.4 – the tax structure may be non-lineal and the marginal tax rates could be considerably higher.

[4] Tuomala (1990) used numerical simulations to demonstrate that this result is very local. It is not even applicable to 0.1 top percent of the population.

These studies have proved that the level and the structure of the optimum income tax are very sensitive to the value of the parameters and the inclusion of other issues in the specifications of the model. Therefore, the policy lessons that can be extracted from purely analytical models of optimum income taxation are very limited. For that reason, after rising great interest of the theoretical literature in 1970's and early 1980's, optimal taxation models lost appeal because their results seemed to add little to applied tax analysis.

Recently, some economists have started to apply the optimal taxation framework to empirical analysis, relying in micro data sets instead of on statistical distributions, as in the theoretical models (Spadaro, 2002). Some examples of this new branch of optimal taxation literature are the works of Diamond (1998) and Saez (2001) that enquire about under which conditions the U-shaped marginal tax rate curve would be optimal in the US. Bourguignon and Spadaro (2002) invert the typical optimal taxation problem. Instead of deriving the optimal taxation structure given a well-behaved social welfare function, they derive the social preferences assuming that the current tax structure is optimal. Their results suggest that the governments of the analysed countries (France, Spain and UK) either under-estimate the labour supply response to taxation, or have non-Paretian social preferences (i.e., marginal social welfare is negative for individuals with high productivity), or do not optimise the tax-benefit system.

2.1.2 Tax Complexity

As argued in the beginning of this chapter simplicity is one of the principles of taxation. The costs associated to the lack of tax simplicity can be divided in two types. Compliance costs are 'associated with complying with the requirements of a tax system, over and above the actual payment of tax and over and above any distortion costs inherent in the tax' (Collard et al, 1998). These costs are borne by the taxpayer and employers. The administrative costs are those related to the cost of collecting taxes and are borne by the government.

Until recently, tax complexity was overlooked by the literature. For instance, the standard optimum taxation framework does not consider simplicity. However, recent empirical studies have demonstrated that paying and collecting taxes is quite expensive. According to Slemrod (1996), the cost associated to the complexity of the US (corporate and individual) income tax system represents about 10 percent of its total revenue. Other studies find similar levels of complexity costs for other taxes and in other countries[5].

Alm (1996) concludes that, since the levels of complexity costs are similar to those from standard efficiency costs, there is no reason to exclude them from the analysis. Moreover, complexity costs are not only relevant per se. They also affect the other objectives of taxation. Complexity has clear negative effect on government budget, since administrative costs reduce the amount of resources available for public expenditure. It also reduces efficiency increasing the 'direct tax burden' (higher taxes to pay for the administrative costs) and the 'indirect tax burden' (compliance costs). Given that compliance costs are not evenly distributed across taxpayers, complexity also produces important vertical and horizontal equity effects.

For all these reason, an increasing number of studies are including elements of tax complexity in taxation analysis. Stern (1982) was the first to include administrative costs in an optimal taxation model. Alm (1988) introduced compliance costs in the analysis of individual behavioural response to taxation. Wilson (1989) investigates which is the optimum number of commodities to be taxed when there are administrative costs. Slemrod (1994) and Slemrod and Yitzhaki (2001) include some aspects of tax evasion and compliance costs in an optimum taxation model.

Tax avoidance and/or tax evasion are also important factors related to the design and the administration of taxes. Individuals may develop legal and illegal strategies to reduce

[5] See Sandford (1995) and Hudson and Godwin (2000) for the UK; Vaillancourt (1989) for Canada; and Delgado et al (2001) for Spain.

the tax burden. Tax avoidance and tax evasion are not only important for their impact on government revenue. They also distort the allocation of resources and agent's behaviour leading to efficiency losses. Moreover, since the possibility and ability to avoid or evade taxes is not evenly distributed across taxpayers, they also produce considerable equity effects. Finally, government combats tax avoidance and evasion spending part of its resources in audits and other enforcement costs that reduce the extent of the public services that can be provided or, alternatively, require additional taxation.

Giving all these considerations, Alm (1996) proposes that simplicity issues should be included in the assessment of the other policy goals. Hence, government revenue analysis should consider not only gross tax collection but also the administrative and the enforcement costs. Equity analysis should examine how the tax burden and the compliance costs are distributed. Finally, efficiency analysis should study how individuals respond to the incentives, design and enforcement of taxes.

2.1.3 Tax Incidence Models

Another key element in Public Economics is the study of *tax incidence*. The basic optimum taxation model, presented in section 2.1.1, implicitly assumes that the demand curve for labour is infinitely elastic, so that the introduction of a tax does not affect pre-tax wage rates, *w*. The consequence of this assumption is that taxes are fully incident on those who are legally liable to pay them, i.e., that there is no 'shifting forward'. The economics of tax incidence studies *if*, *how* and to *what extent* economic agents shift the tax burden from one to another[6].

In a partial equilibrium framework, tax incidence depends on the supply and demand elasticities of the taxed good. Although this partial equilibrium is fairly transparent and easy to understand, it ignores the effects that the tax has on other markets. Harberger

[6] For a survey on the theory of tax incidence see, among others, Kotlikoff and Summers (1987) and Atkinson (1994).

(1962) seminal article goes beyond this restricted framework, proposing a general equilibrium model to take into account the interactions between taxed and non-taxed markets. The main lesson from Harberger's analysis is that, besides supply and demand elasticities, tax incidence also depends on the ease with which factors of production can be substituted for each other in different sectors. However, Harberger's model rests on a number of simplifying assumptions about the structure of the economy and of taxes that are detached from the real world. Subsequent works have dealt with some of these assumptions. Shoven and Whalley (1972) developed an applied general equilibrium model to analyse tax reforms. This model characterises the economy with more detail, replacing Harberger's two-goods, two-sectors and a single representative consumer economy by a multi-goods, multi-sectors and multi-households framework that provides more information about the effects of a tax reform.

Another issue that has received considerable attention in the tax incidence literature is the time dimension. The analysis of the incidence of a tax in one period (say, one year) may be misleading. The incidence of a tax (or a tax reform) is rarely even across the different stages in the life cycle. Furthermore, economic agents may not be able to react promptly to a tax change, so behaviour responses may continue over time. Ballard et al (1985) build a model that generates a sequence of single period competitive equilibriums. This sequence characterises the transitional effects of a tax reform. Once these effects are absorbed, the economy reaches the 'steady state'. Poterba (1989) and Fullerton and Rogers (1993) developed lifetime models of tax incidence. Auerbach and Kotlifoff (1987) go beyond and assess the tax burden of different generations.

Giving their analytical complexity, theoretical and applied general equilibrium models rely on strong assumptions about household preferences, production functions, labour supply and labour demand elasticities. Furthermore, they tend to restrain the tax instruments to a few parameters and to use aggregated units of analysis (representative agents in theoretical models and aggregated groups in empirical models). Therefore, despite the evident and valuable contribution, this type of analysis says little about the design of taxes and the distributive incidence of the tax system.

2.2 Empirical Models

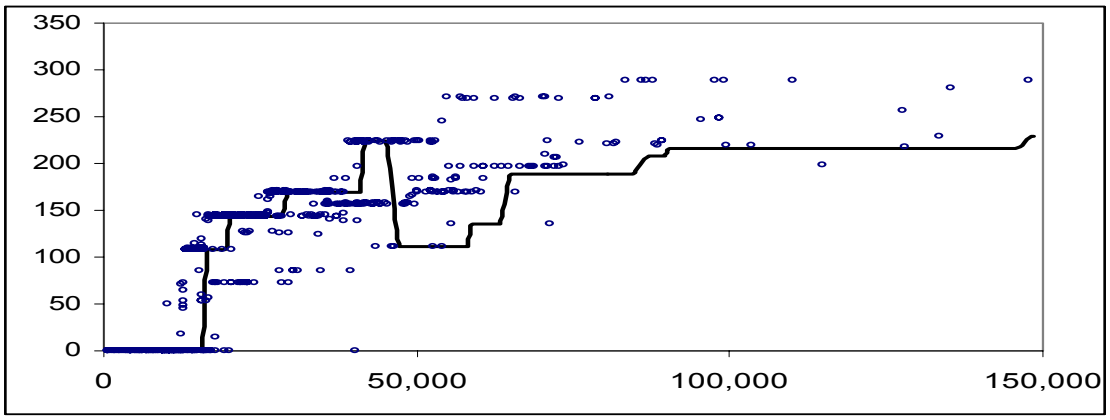
2.2.1 Microsimulation Models

Microsimulation models are computer software that estimate the effect of taxes and benefits on the disposable income of households, or individuals, in a dataset, providing information at the micro level. The data, usually derived from household surveys, is statistically representative of the analysed population. Therefore, the output can be used to calculate aggregates such as the effect of a reform on government's budget, to produce indicators of income inequality and poverty, to estimate the number of winners and losers, and to compute those results by population sub-groups such as age and gender groups or by geographical regions.

An important advantage of using large micro-data is that it ensures that the analysis takes into account the diversity of individual and household circumstances. Figure 1.1 illustrates the importance of taking into account household diversity. The figure plots how much couples with two children would gain if child tax allowances were raised for the second child in Spain. The solid line charts the gain of an 'average-representative family'[7] with different income levels, while each small circle represents the gain of a household simulated with micro data[8]. The dispersion between the 'average' and 'real' data makes it evident that 'representative cases' do not characterize a considerable part of the population. Therefore, these results cannot be extrapolated and used to assess or evaluate the overall performance of the tax-benefit system or its reform.

[7] The age of household members and the distribution of household income among individuals are equal to the average for households formed by couples with two children.
[8] The simulations were carried out with the microsimulation model ESPASIM. This model is presented in detail in Chapter II.

Figure 1.1 Diversity of circumstances



Source: ESPASIM

In addition, microsimulation models take into consideration the *frequency* in which these circumstances occur in the population. This is essential to estimate the 'real' effects on the population or to calculate aggregates. King (1988) and Atkinson and Sutherland (1988) demonstrate that 'representative cases' often used in government reports, and some academic studies, represent small proportions of the population. For example, the widely used case of couple with two children represents only 16.4 percent of the Spanish population. Therefore, the use of data that considers diversity of circumstances and the frequency with which they occur allows the microsimulation models to obtain results that are *representative* for the population studied.

On the other hand, the detailed representation of the policies allows one to consider the effects of specific policy elements and to understand the system 'from inside it', capturing interactions between policies that would not be visible or predictable otherwise. Figure 1.1 also gives a good example about this. The solid line shows an important fall in the gain of households with income around 45,000 euros. This kink results from a particularity of the Spanish income tax system, where couples can choose between individual or joint taxation. Analyses that ignore this particularity would fail to represent the real budget constraint of many households.

There are many difficulties in the construction of a microsimulation model[9]. The surveys used are not originally designed for this purpose, so relevant data may be missing, presented or measured in an inappropriate way, forcing model developers to estimate and impute part of the data. The taxes and benefits are extremely complex and are often administrated by different government departments. Hence, the information available to simulate the policies is fragmented, sometimes contradictory and often incomplete. Thus, the collection of policy rules requires detailed and persistent work in order to build a consistent policy simulation. Moreover, the continuous changes in policies, demographic and labour circumstances require frequent updating of algorithms and datasets. Therefore, the construction and maintenance of such models require substantial resources, teamwork and skills in different areas such as micro-data management and computer programming[10].

Microsimulation models are restricted to a partial equilibrium framework. These models ignore the interdependence of markets and the results obtained are unlikely to present the overall and final effects of tax-benefit reforms on the economy. Hence, microsimulation models are not suitable to estimate the macroeconomic or the long-term effects of reforms. These effects are better analysed by applied general equilibrium models such as the ones commented in section 2.1.3.

i) Types of models

Survey studies about microsimulation (Citro and Hanushek, 1991; Harding, 1996; Gupta and Kapur, 2000) reveal that a broad range of users from varied backgrounds and diverse objectives use this technique. As a result, the construction of microsimulation models is conditioned on the type of users and the objectives pursued. Although there are many types of microsimulation models, they can be classified according to five different criteria listed in Table 1.1.

[9] See Chapter II for details.
[10] For more on the construction of microsimulation models see Sutherland (1991; 1995).

Table 1.1 Type of microsimulation models

Criterion	*Type of model*
Coverage	Specific or integrated
Temporal horizon	Static or dynamic
Behaviour	Behavioural or non-behavioural
Space	Spatial non-spatial
Usage	Flexible or user-friendly

- Integrated and specific models

Microsimulation models can also be divided in terms of the scope of policies that they analyse. *Integrated* models simulate the revenue and expenditure side of government budget. *Specific* models simulate only one policy. Integrated models not only simulate reforms that affect more than one policy, they also take into account the interactions between taxes and benefits and assess the whole effect of the fiscal system. Specific models are suitable to assess the separate effect of a policy, holding fixed the interactions with the rest of the system. However, the extrapolation of results to measure the impact on individual disposable income should be taken with caution since overlooking the interactions with the rest of the fiscal system may bias the assessment of the final effect of a reform.

- Static and dynamic models

Static models ignore how policy changes affect individuals overtime. The simulations predict the 'morning after' impact of reforms of a population that is held constant. These models have a relatively simple structure, which is based on purely arithmetical calculations. Dynamic models simulate the effect of policies take into account the effects overtime. Therefore, the simulations forecast the how a policy (or its reform) would affect individuals in the future. The inclusion of time complicates the structure of the model since it involves the use of large transition matrices or econometric techniques to determine the transition of major life events – such as education, labour participation, family formation, retirement, death, etc. (Brown and Harding, 2002). Despite the obvious interest and attractiveness of dynamic microsimulation, it should be remembered that such models are considerably more complex and expensive to build and that their results are subject of higher uncertainty than static models. Therefore,

"dynamic" microsimulation models are not necessarily better than "static" ones. Static models are suitable and widely used to estimate the immediate distributional impact of fiscal reforms, while dynamic models are used to assess the effect of policies in the long-run, or the distribution of income along the lifecycle.

- Behavioural and non-behavioural models

Non-behavioural models do not capture or predict any change on individual behaviour as response to policy changes. The underlying assumption is that regardless the type or the intensity of a fiscal reform the individuals do not change their behaviour. Of course, this hypothesis is not realistic to analyse long-run effects or to study 'radical' reforms that impose extreme changes in individual budget constraints. Nevertheless, this assumption is valid to analyse the short-run (first-degree) impact of 'non-radical' reforms. Non-behavioural microsimulation models give emphasis on an accurate representation of the system and on retaining all the heterogeneity provided by the data. Their main advantages are that they do not require the estimation of behavioural functions, that they are relatively fast to run and use, and that their results are clear, robust and easy to interpret (Atkinson and Sutherland, 1988). Consequently, they can be accessible to a wide range of users and produce information that can be used to calculate aggregate as well as partial indicators of government budget, inequality, poverty, etc. Moreover, these models can assess the potential effect of policies to promote higher labour market participation (through the calculation of replacement rates) or increase labour supply (through effective marginal tax rates).

On the other hand, many tax-benefit reforms have as objective (or consequence) to alter behaviour to some extent (for instance, encouraging labour participation or fertility). Behavioural microsimulation models try to capture such changes by estimating individual responses to tax-benefit reform. Most behavioural models of direct taxes and social benefits have focused on the estimation of labour supply effects. The main advantages of behavioural models are that they allow one to estimate the 'actual' effect

on government budget after taking into account behaviour, and that welfare gains (or losses) can be measured using compensating or equivalent variations (Creedy, 2000).

Nevertheless, behavioural models also face a number of limitations. First, most models are restricted to one dimension of individual behaviour – mainly labour supply. Other important dimensions such as household formation, marriage, births or retirement decisions are ignored. Second, labour supply is analysed as a 'one job' and static phenomenon, the wage rate is taken as fixed. Search for additional or better-paid jobs or investment on human capital are not considered by these models. Third, labour supply models focus on a certain demographic group, usually selected by gender and/or marital status. Therefore, the results are only representative to the analysed group; good part of the heterogeneity assessed by non-behavioural models is forgone. Finally, behavioural models are also restricted to a partial equilibrium framework. Hence, they are not able to predict the effect of the reform on employment, unless an infinitely elastic labour demand curve and no market interdependence is assumed.

- Spatial and non-spatial models

Originally, most microsimulation models focused on the population and policies at the national level. Recently, there has been a growing interest on taking into account the impact of policies at different geographical levels. In that sense, two different approaches have being developed recently: regional and multi-country models. Regional models simulate and investigate the impact of policies at smaller geographical areas such as regions or municipalities. The main objective of this type of model is to analyse how national policies affect the people at different parts of the country. The Australian National Centre for Social and Economic Modelling (NATSEM) has been innovating in this area by developing a regional model based on synthetic small area data (Harding et

al, 2003)[11]. Multi-country models are capable of simulating the policies of more than one country and exchange such policies across their populations. These models are particularly interesting to analyze tax-benefit systems from a comparative perspective, to study the effect of eventual fiscal harmonisation processes over different countries, or to examine the impact of fiscal reform at a supranational level. The most noticeable example of a multi-country model is EUROMOD, a static microsimulation model involving a consortium of national experts from 15 EU countries (Sutherland, 2001a).

- Flexible and user-friendly models

Given the complexity of the tax benefit system, of personal circumstances and of the effects produced by policy reforms, "microsimulators" face a clear trade-off between flexibility and user-friendliness. The interpretation of these terms is not precise, however, user-friendliness can be associated to the skills and effort that the model requires from a new user in order to run it and interpret its results correctly. Flexibility would be the linked with the ability of simulating policy changes and producing results without re-programming the code of the model (Sutherland, 1995a). The choice between a higher level of flexibility or user-friendliness tends to be related to the type of user the model is targeted to. Therefore, in general, models oriented to a wide public sacrifice flexibility in order to be easier to user, while research-oriented models tend to be more flexible and less easy to handle.

ii) Reliability

A number of reasons prevent microsimulation models to reproduce all 'real-world' effects. First, most models suffer from data limitations, such as underreporting, missing observations, measurement error or lack of data. Second, most policies (for example, means-tested benefits) leave some degree of arbitrariness and discretion at the hand of

[11] Regional microsimulation models have also been developed in the US (Caldwell et al, 1998); Sweden (Comaren, 1999) and the UK (Voas and Williamson, 2000, Ballas and Clarke, 1999).

civil servants, so that some 'effective' recipients are not legally or theoretically eligible. Third, ambiguous police rules may lead to different interpretations between the modeller and the way it is implemented in reality. Fourth, the adaptation of the original dataset to the needs of the model (recodification of variables, updating procedures, etc.) may fail to characterise some elements of the real population. Finally, the modeller may not predict 'apparently irrational' or illegal behaviour, such as non-benefit-take-up, tax avoidance, fraud or evasion.

Pudney and Sutherland (1994) argue that the results produced by microsimulation models should be seen as 'statistical estimates of population characteristics, and accompanied by standard errors or confidence intervals which give some theoretical indication of the likely extent of sampling error'. Their investigation shows that some widely cited statistics (such as gainers and losers, poverty and inequality indices) produced by their microsimulation model have large standard errors, rising some doubts about the reliability of results especially when analysing the effects of policy change.

iii) Applications

The first works on microsimulation started in the United States in the late 1950s (Orcutt, 1957 y Orcutt et al., 1961). However, the effective development of these models started in the late 1970s and early 1980s with the greater availability of micro-data and the development of faster and cheaper computers. In Europe, the first models emerge in Germany and the UK, but nowadays most OECD and some developing countries have their own microsimulation models.

Table 1.2 Some microsimulation studies by countries

Country	*Study*
United States	Zedlewski and Meyer (1989); Chernick and Reschovsky (1990); Dickert et al (1994); Greenberg (1995); Slesnick (1996); Houser and Dickert-Conlin (1998);
United Kingdom	Atkinson, and Sutherland, (1998); de Vos and Zaidi (1996); Duncan and Weeks (1997); Evans, Piachaud and Sutherland (1994); Keenay (1995); Sutherland (1998); Eason (1996);
Other EU countries	Kaiser, van Essen and Spahn (1992); Winkelhakeand (1999); Wagenhals, (2000); Decoster, Schokkaert and Van Camp (1997); Baekgaard (1996); Nelissen (1994); Callan and Nolan (1999); Gastaldi and Liberati (1998); Baldini et al. (2001); Palme (1996);
Other OECD countries	Bradbury (1992); Chapman and Harding (1993); Schofield and Polette (1999); Aasness (1995);
Developing countries	Siqueira et al (2000); Bourguignon et al (2002);

Most studies use microsimulation to assess the effects of tax-benefit reforms or some policy elements on inequality, poverty, labour supply, or government revenue. However, others use microsimulation to update statistics (de Vos, K y Zaidi, M., 1996), to study the effect of using of different units of analysis (Sutherland, 1996), to measure marginal and replacement rates (Immervoll, 2002), or to estimate the impact of macroeconomic changes on indicators of social inclusion (Feres et al, 2002).

Following Atkinson et al. (1988) pioneering work, which simulates the welfare effect of introducing the British tax-benefit system in France, a growing number of works have used microsimulation to produce international tax-benefit comparisons. Callan and Sutherland (1997) compare the distributive impact of a basic income programme in Ireland and the UK. De Lathouver (1996) compares the Belgian and Dutch unemployment benefits; O'Donoghue and Sutherland (1998) compare the schemes of taxation of couples in the EU.

iv) Microsimulation in Spain

The first studies using microsimulation techniques in Spain started in the late 1990s. Manresa et al. (1996) assess the progressivity and the redistributive impact of the income tax, the VAT and social contributions. García et al (1997) study the effects of the VAT and social contributions and income tax reform on labour supply. Mercader (1997) compares the Spanish income taxes from 1980 and 1994, and concludes that the

later is more progressive than former. Badenes et al (1997) assess the welfare effect of alternative income tax reforms. Mercader and Levy (1998), Levy (1999), Sanchis and Sanchis (2001) and Castañer et al (2001) evaluate the distributive effects of the 1998 income tax reform. Onrubia (2001) simulates different schemes of family taxation. Durán (2001 and 2002) and Picos (2003) simulate the effects of replacing the present income tax system by a dual income tax. Oliver and Spadaro (2001) reveal the social aversion to inequality underlying before and after the 1998 Spanish income tax reform. According to their results, the social welfare function after the reform is less inequality averse then before. Oliver and Spadaro (2002) compare the redistributive effect of two alternative proposals: the Basic-Income/Flat-Tax and the Vital-Minimum/Flat-Tax[12]. Castañer and Sanz (2002) simulate the impact of replacing the 2001 Spanish income tax system by an equivalent flat income tax with equal revenue and redistributive effect.

Some of these embryonic exercises stimulated the construction of microsimulation models for Spain. Although never published, the first effort to develop a microsimulation model in Spain was carried out by Castañer and Santos (1992) in the Spanish Institute for Fiscal Studies (IEF). Currently, there are three microsimulation models in Spain: *ESPASIM* (Levy et al, 2001), *SIMCAT-P* (Arcarons and Calonge, 2003) and *SINDIEF* (Sanz et al, 2003).

SIMCAT-P is a property tax microsimulation model for Catalonia. Using administrative data from the regional government of Catalonia this model simulates the progressivity and redistributive effects of property tax reforms in this region. *SINDIEF*, developed by the Microsimulation Unit of the Spanish Institute for Fiscal Studies, uses data from the Spanish Continuous Household Budget Survey and is a behavioural microsimulation model for indirect taxation in Spain. *ESPASIM* uses data from European Community

[12] Using the Spanish income tax's terminology, the *vital-minimum* is a non-refundable personal tax allowance.

Household Panel (ECHP) and is a Spanish microsimulation model that simulates taxes and benefits in an integrated framework[13].

2.2.2 Labour supply models

The effects of taxes and benefits on work decisions (labour supply) is one of the most discussed and active fields of research in economics in the last decades. Most theoretical and empirical studies assess labour supply as the number of hours an individual is willing to work. In some cases, this number may be zero, so that the individual decides not to participate in the labour market. Hours of work and participation are not the only way that the individuals may choose to change their labour supply. Instead, individuals may choose to change their effort, their investments in human capital, the time of retirement, or the place of work and residence through immigration.

- The basic labour supply model

Following Blundell and MaCurdy (1999), the basic model of labour supply assumes that each individual maximizes a quasi-concave utility function *U(.)* subject to a budget constraint

$$Max\ U(C,L) \quad \text{s.t.}\ C + wL = \underbrace{Y + wT}_{M} \tag{1.4}$$

where C is consumption, L is leisure, w is the wage rate, Y is no-earning income and T is the total time available. The right-hand side of the budget constraint represents the 'full-income', M, that the individual could have if she/he worked all the time.

The Lagrangian of the maximization problem is

$$l = U(C,L) - \lambda\left[C + wL - (Y + wT)\right] \tag{1.5}$$

[13] ESPASIM is presented in detail in Chapter II.

so that the first order conditions related to the problem are

$$\begin{aligned}
&\frac{\partial l}{\partial C} = U_C'(C,L) - \lambda = 0 \rightarrow U_C'(C,L) = \lambda \\
&\frac{\partial l}{\partial L} = U_L'(C,L) - w\lambda \rightarrow U_L'(C,L) = w\lambda \\
&\frac{\partial l}{\partial \lambda} = C + wL - (Y + wT) \leq 0 \rightarrow C + wL \leq (Y + wT)
\end{aligned} \tag{1.6}$$

where λ is the marginal utility of income.

The marginal rate of substitution between leisure and consumption is

$$\frac{U_L'(C,L)}{U_C'(C,L)} = w \tag{1.7}$$

Hence, the Marshallian demand functions of consumption and leisure are

$$C = C(w, M) \text{ and } L = L(w, M) \tag{1.8}$$

Thus, the labour supply function can be written as

$$H = T - L = H(w, Y) \tag{1.9}$$

and the Marshallian (uncompensated) wage elasticity as

$$\varepsilon_u = \frac{\partial \ln(H)}{\partial \ln(w)} \tag{1.10}$$

The Marshallian and the Hicksian (compensated) wage elasticities are linked by the Slutsky equation

$$\varepsilon_u = \varepsilon_c + \frac{wH}{Y} \frac{\partial \ln(H)}{\partial \ln(Y)} \tag{1.11}$$

Assuming that leisure is a normal good, ε_c is positive and the second element of the right-hand side of equation (1.11) is negative. These elements represent, respectively, the opposed substitution and income effects. If the substitution effect dominates the income effect, ε_u is positive and a marginal increase (decrease) in the wage rate would rise (reduce) the labour supply. Otherwise, the results would be reversed.

As pointed out by Blundell (1996), a labour supply increase does not always entail a welfare gain, since the increase in income is offset by the reduction in leisure time. The welfare gain is measured by the pure substitution effects that compensate the wage responses for the loss in leisure time. Thus, the measurement of welfare gains or losses due to a reform requires the estimation of both the wage (uncompensated) elasticity and the income elasticity.

- Some extensions

Burtless and Hausman (1978) and Hausman (1981) built on this basic structure to develop a 'second-generation' of labour supply models that deal with the non-linearities produced by the income tax. Later, MaCurdy, et al (1990) and Heckman (1993) found that these models were sensitive to specification and measurement error. Although theoretically consistent, this approach imposed tight restrictions, some of which contradict empirical evidence[14]. MaCurdy et al (1990) and Blundell et al (1992; 1995) proposed alternative robust specifications.

Other relevant extensions of the basic labour supply model include the assessment of the effects of fixed costs and labour participation. Some studies have found that in some groups (for example, lone mothers) participation is more important than intensity of work (Cogan, 1981; Blundell et al, 1987; Mroz; 1987). According to Gruber and Saez

[14] For example, the model imposes that the labour supply function is forward-sloping while widespread empirical evidence suggests that the labour supply curve is backward bending. See MaCurdy et al (1990) and Blundell (1996) for details.

(2000), elasticities of participation are particularly important at the low end of the income distribution and are essential in the analysis of welfare programmes.

- Sources of empirical evidence

Cross-section household surveys are the sources of evidence most used in applied microeconomic labour supply analysis. The main advantage of these surveys is that the data allows one to include individual characteristics and circumstances in the analysis. On the other hand, they do not provide an exogenous change in the tax-benefit system to assess individual behavioural responses. Hence, the analysis is carried out comparing similar individuals with different wage rates. However, when the tax-benefit system is complex, the budget constraint can be non-linear. In such cases, different labour supply responses of two individuals with the same wage rate can be due to differences in individual preferences or from differences in their marginal tax rates.

A second source of evidence comes from the 'controlled experiments'[15]. This analysis tracks the evolution of two similar randomly selected groups during a certain period. The 'experimental group' faces an exogenous policy change, while in the 'control group' the system is maintained. Despite their clear attractiveness, these experiments also present a number of inconveniences. First, they are expensive and for this reason are not carried out frequently. Second, given their limited duration (usually not more than a few years) they may not be able to capture long-term effects. Third, the method is restricted to a certain group and a specific policy change. Hence, the results cannot be extrapolated to other groups or other types of reforms. Finally, the experiment requires that the controlled group is not affected by the experimental group. Hence, this method is not able to capture spillover and general equilibrium effects.

[15] Robbins (1985) and Card and Robbins (1998) present results with 'controlled experiments' on negative income taxes were performed in the United States and in Canada, respectively.

An alternative method is the 'natural experiment' approach. Contrary to the previous method, this approach assesses a real tax-benefit reform that is faced by the entire population. The problem is that there is not a 'control group'. As a result, a 'spurious' control group is set with individuals who are similar to the 'experimental group' but who are not affected by the reform. The labour supply response is then measured as the difference between the labour supply changes of the experimental and of the controlled group[16].

- Empirical Evidence

There is a substantial disagreement about the size of labour supply effects of taxes and benefits. During the 1970s, there was some consensus that male labour supply elasticities were very small and negative. However, those results were disputed by the 'second generation' approach. Burtless and Hausman (1978) and Hausman (1981) estimated relatively high compensated-elasticities, suggesting that taxation could produce important welfare losses. Later work has challenged Hausman's results[17]. Recent studies suggest that the values of men's labour supply elasticities are closer to the ones estimated by 'first generation' models[18].

Despite a considerable dispersion among estimates, there is more agreement about the labour supply responses of married women. In general, results suggest that the wage effect is positive and the income effect is negative. Thus, the compensated wage elasticities are significantly large and the welfare losses due to the tax-benefit system are considerable. However, as pointed above, the labour supply of married women may

[16] Hence, this approach relies on two strong assumptions: 'time effects must be common across experimentals and controls […] and the composition of both experimentals and controls must remain stable before and after the policy change' (Blundell and MaCurdy, 1999). Examples of works using this approach can be found in Eissa (1995) to assess the labour supply effect of the US 1986 Tax Reform Act on married women, in Graversen (1996) to study the Danish 1987 tax reform, and Blundell et al (1998) to evaluate the labour supply responses of married women in the UK over the 1980s and 1990s.
[17] See MaCurdy et al (1990), Blundell (1996) and Heckman (1993) for a detailed discussion.
[18] For extensive surveys on empirical evidence, see Killingsworth (1983), Blundell (1996) and Blundell and MaCurdy (1999).

be sensitive to other determinants such as fixed costs and household income[19]. Moreover, for many women (especially in the low end of the income distribution) labour supply responses are related to participation rather than to the number of hours or to work effort. Finally, the labour supply curve can be non-linear, so that the wage response ranges noticeably across different numbers of hours of work (Arrufat and Zabalza, 1986 and Blundell et al, 1995).

2.2.3 Take-up of social benefits

In theory, income-tested social benefits are the most efficient welfare programmes since they reach the double objective of targeting the expenditure on those with greater need and, at the same time, maintain the public budget controlled. In practice, not all people claim the benefits they are entitled to. There is widespread evidence that non-participation is an important feature of welfare programmes in many OECD countries. Riphahn (2001) estimates that 63 percent of German families entitled to social assistance benefits do not claim them. Blundell *et. al.* (1988) report a 60 percent take-up rate for the UK housing benefit among employees and pensioners. Duclos (1997) estimates supplementary benefit participation rate in 80 percent. Fry and Stark (1993) compute take-up rates of 50 percent for housing benefits and 45 percent for family credit. The British Department of Work and Pensions (DWP) publishes official take-up estimates by caseload and expenditure for income related benefits. According to DWP (2000), take-up rates by caseload range between 66 percent (for Family Credit) and 97 percent (for Housing Benefit).

The literature has demonstrated that in most cases non-take-up does result from an irrational individual choice or a simple lack of information, but from the existence of costs of claim that reduce the net gain produced by the benefit (Blundell et al, 1988; Duclos, 1995; Pudney et al, 2002). Many economists and sociologist agree that one of

[19] Cogan (1981) shows that wage elasticities fall from 2 to 0.5 if fixed cost are considered.

the most common causes of non-take-up is stigma (Goffman, 1963; Moffit, 1983; Besley and Coate, 1992). This would be related to the embarrassment produced by the need of being interviewed by a social assistant, by the feeling of failure or rejection from the community; or the negative 'signal effect' that receiving the benefit would have on current or potential employers (Creedy, 2002). Other often-mentioned reasons are the costs of information and hassle, the uncertainty about the result of the claiming process (Halpern and Hausman, 1986), and the possibility of being rejected due to administrative errors (Besley and Kanbur, 1993).

All these costs reduce the effective gain generated by claiming and receiving the benefit. In some cases, the costs can be equal or greater than the nominal amount of the transfer, explaining why some individuals decide not to claim it. Some studies have estimated the claim costs of social benefits. According to Duclos (1995), the cost of claim of the *Supplementary Benefit* in the United Kingdom is approximately 3-4 pounds per week for single pensioners. Terracol (2002) estimate that the average claiming cost of the French Minimum Income Guarantee (RMI) is almost 200 euros per month for couples without children.

Take-up rates can be calculated by microsimulation models. Using micro-data from a survey with detailed information about income, benefits and other personal and household characteristics, these models can calculate the eligibility and potential benefit for each individual. Thus, non-take-up would be measured as the difference between the number of individuals eligible according to the simulations and the number of individuals that effectively report receiving the benefit in the dataset. This method is used, for example, by the Department of Work and Pensions to estimate the take-up rates of income related benefits in the UK (DWP, 2002).

Duclos (1995) argues that measurement error may bias the results produced by this method. He suggests the estimation of an econometric model of take-up that formally considers the possibility that assessments of entitlement made by programme administrators and analysts are both subject to measurement error. The estimation of take-up models also allows one to compute the claim cost of benefits. If all potential

beneficiaries had the same characteristics, the claim cost could be easily calculated as the break-even amount that divides those that take-up the benefit from those that do not claim it. In practice, the individuals and their circumstances are very different, so costs of claimants and non- claimants are unlikely to be the same. According to Pudney et al (2002), benefit take-up is subject to self-selection and the average claim costs to claimants tend to be lower than to non-claimants. Finally, Keane and Moffit (1998) and Creedy (2002) maintain that labour supply and benefit take-up are related, and that both decisions should be modelled jointly.

3 MEASURING THE EFFECTS OF TAXES AND BENEFITS ON INEQUALITY AND POVERTY

This section briefly describes the theoretical tools that will be used in the following chapters to measure the effects of taxes and benefits on inequality and poverty[20]. The literature on inequality and poverty measurement has as main objective to evaluate and propose measures that are appropriate and consistent with economic analysis. As any other field in economics, the emphasis on a specific dimension requires the use of simplifying assumptions on others. Hence, pre-tax income is taken as given and fixed so that changes in taxes and benefits do not affect behaviour, are fully borne by the taxpayer, and taxes and benefits do not generate complexity costs.

3.1 Measuring Inequality and Redistribution

3.1.1 Lorenz Curve and Gini Coefficient

The Lorenz curve is one of the most used graphical representations of the income distribution and is a powerful tool for inequality comparisons. As shown in Figure 1.2,

[20] For exhaustive surveys on inequality and poverty measurement, see among others Atkinson (1998), Silber (1999), Atkinson and Bourguignon (2000) and Lambert (2001).

it draws the cumulative income share for the normalised population ranked by income. The level of inequality is represented by the area between the Lorenz curve and the 45º line, which corresponds to absolute equality.

Using a continuous formulation, the Lorenz curve can be can be mathematically expressed as

$$L(p) = \int_0^y \frac{x.f(x)dx}{\mu} \quad \forall \ 0<p<1,\ L(0)=0,\ L(1)=1 \tag{1.12}$$

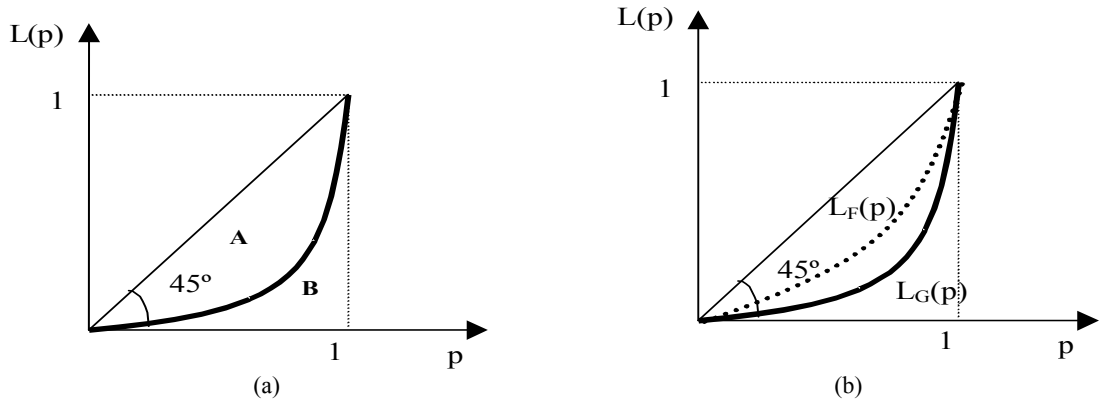
where *f(x)* is the frequency density function that is positive for all income levels between x_1 and x_N, μ is the average income, and p is the population share that ranges from 0 to 1 and for each value there is a unique income level y, so that $p=F(y)$

The Lorenz curve is very useful to compare income distributions. If the Lorenz curve of distribution *F* is always above the Lorenz curve of distribution *G* (as in Figure 1.2(b)), then distribution *F* is definitely less unequal than distribution *G*. The literature refers to this lower inequality as 'Lorenz Dominance'. Formally, Lorenz Dominance is stated as:

$$L_F(p) \geq L_G(p) \quad \text{for all } p\in[0,1] \text{ and } L_F(p) \neq L_G(p) \tag{1.13}$$

where $L_F(p)$ and $L_G(p)$ are the Lorenz curves of distributions *F(x)* and *G(x)*, respectively.

Figure 1.2 Lorenz Curve



The Gini coefficient is the most popular inequality index and can be directly derived from the Lorenz curve. Graphically, the Gini coefficient can be assessed as the area between the Lorenz curve and the 45º line (A, in Figure 1.2(a)) divided by the triangle below the 45º line (A+B, in Figure 1.2(a)). Alternatively, given that the area under the 45º line equals ½, it can be measured as 2A or as 1-2B. Hence, using equation (1.13), the Gini coefficient can be mathematically expressed as

$$G = 2\int_0^1 [p - L(p)]dp \tag{1.14}$$

or

$$G = 1 - 2\int_0^1 L(p)dp \tag{1.15}$$

This is index has some very convenient properties. First, its results ranges from 0 (absolute equality) to 1 (absolute inequality). Second, it allows inequality comparisons independently of the average income level. Third, it respects the Pigou-Dalton Transfer Principle, according to which rich to poor transferences should reduce inequality.

On the other hand, the Gini index gives the same weight to all 'share deficits', *p-L(p)*, along the income distribution (see equation (1.14)). Given the convexity of the Lorenz curve, the share deficits will be greater at the middle of the income distribution (as in Figure 1.2). As a result, the Gini coefficient is more sensitive to transfers within the middle and less sensitive to transfers in low and high ends of the income distribution. This type of problem is shared by all positive inequality indices. Despite the purpose of being objective and neutral, all inequality measures need to weight the different income

levels across the income distribution, carrying an implicit judgement value. Atkinson (1970) argues that these values should be presented clearly and explicitly[21].

3.1.2 Social Welfare and Inequality Comparisons

i) Social Welfare and the Lorenz Curve

Atkinson (1970) was the first author to provide a normative interpretation to the Lorenz curve. According to his findings, if a distribution *F* Lorenz dominates another distribution *G* of equal average income, then *F* provides more social welfare than *G* for all individualistic, symmetric, additively separable and strictly concave social welfare functions[22].

Theorem I Atkinson (1970)[23]

Let F(x) and G(x) be two income distributions with equal means, $\mu_F=\mu_G$. *Then:* $\int U(x)f(x)dx \geq \int U(x)g(x)dx$ *if and only if* $L_F(p) \geq L_G(p)$ *for all* $p[0,1]$ *and all U(x),* $U'(x)>0$ *y* $U''(x)<0$.

Shorrocks (1983) extends the analysis to distributions with different mean incomes. His objective is to include a 'preference for efficiency' criterion, i.e., other things equal; a distribution with higher mean income should be socially preferred. Thus, Shorrocks (1983) proposes the 'generalised Lorenz curve', *GL*(*p*), that results from multiplying the Lorenz curve by the mean income of the distribution.

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[21] Atkinson (1970) proposes a family of inequality indices with an explicit parameter of social aversion to inequality. This class of indices – known as the Atkinson Indices – are not presented here. Extensive literature about the Atkinson indices can be found at Atkinson (1970) and Lambert (2001).

[22] Sen (1973) claims that demands for an additive separable, individualistic and strictly concave social welfare function are very restrictive. Dasgupta, Sen y Starrett (1973) show that Atkinson's theorem is also valid under the more flexible assumption of symmetric and quasi-concave social welfare functions.

[23] For the proof of this theorem, see Atkinson (1970) or Lambert (2001).

$$GL(p) = \int_0^y x.f(x)dx \tag{1.16}$$

Similarly to Lorenz dominance, if the generalised Lorenz curve of a distribution F, $GL_F(p)$, lies above the generalised Lorenz curve of another distribution G, $GL_G(p)$, than the distribution F dominates G in generalised Lorenz sense. For this to hold, the mean income in F must be at least equal to the mean income in G, ($\mu_F \geq \mu_G$).

Assuming a social welfare function $W(.)$ that is non-decreasing in income, $dW/dx \geq 0$, the following theorem is derived

Theorem II Shorrocks (1983) [24]

Let F(x) and G(x) be two income distributions for a given population, so that $p \in [0,1]$*, and W(.) a concave, symmetric and non-decreasing in income social welfare function, then* $W_F(x) \geq W_G(x)$ *if and only if* $GL_F(p) \geq GL_G(p)$ *for all* $p \in [0,1]$.

ii) Social Welfare and the Gini Coefficient

Following the normative interpretation of the Lorenz curve, there has been an attempt to identify the social welfare function underlying the Gini coefficient. Newbery (1970) and Lambert (1985) proved that there is no differentiable individualistic, strictly concave utility function, U(x), and differentiable additive separable social welfare function, W, that could be increasing in μ and decreasing in the Gini index, G.

However, Sen (1973) demonstrated that a 'Gini-compatible' additively separable social welfare function could be found using a non-individualistic utility function, U(x, F). According to this function, individual preferences depend not only on the individual's own income, x, but also on the income distribution, F, in which the individual is in.

[24] For the proof of this theorem, see Shorrocks (1983) or Lambert (2001).

Lambert (2001) mentions two interpretations for this utility function. The first uses the theory of relative deprivation. This suggests that individual utility depends on the individual's situation and on the difference between this situation and the desired one. (Runciman, 1966). Individual utility then could be defined as

$$U(x,F) = ax - bD_F(x) \quad \text{a,b} > 0 \tag{1.17}$$

where $D_F(x)$ is the overall deprivation of an individual with income x under a income distribution F.

The second interpretation suggests an altruist individual whose utility also depends on the proportion of people who are less well off than herself. In that case, the utility function would depend on the individual income, x, and on rank, $F(x)$:

$$U(x,F) = x\left[a - bF(x)\right] \quad \text{a,b} > 0 \tag{1.18}$$

Under both specifications of the utility function, there is an additively separable social welfare function

$$W_F = U(x,F)f(x)dx \tag{1.19}$$

that can be summarised as

$$V(\mu,G) = \mu(1-kG) \qquad 0 < \text{k} \leq 1 \tag{1.20}$$

3.1.3 Progressivity and Redistribution

A tax is defined as progressive if the average tax rate increases with gross income

$$\frac{d\left[t(x)/x\right]}{dx} \geq 0 \qquad \text{for all x} \tag{1.21}$$

Moreover, Jakobsson (1976) and Fellman (1976) have proved that under a progressive income tax, the concentration curve of post-tax income dominates the pre-tax income

Lorenz curve and the pre-tax income Lorenz curve dominates the income tax concentration curve:

Theorem III Jakobsson (1976) and Fellman (1976)[25]

$d\left[t(x)/x\right]/dx \geq 0$ *for all* $x \Leftrightarrow L_{X-T} \geq L_X \geq L_T$ *for every pre-tax income distribution F(x)*

Two important conclusions can be derived from Theorem III. First, given theorems of Atkinson and Shorrocks, social welfare under a progressive income tax is higher than under an equal-yield proportional income tax[26]. Second, progressivity can be assessed as the departure from proportionality ($L_X \geq L_T$), or as the redistributive effect ($L_{X-T} \geq L_X$) of the income tax.

i) Departure from Proportionality

The departure from proportionality approach defines progressivity as the difference between the distribution of taxes and/or benefits, and the distribution of gross incomes. The most popular measure of the degree of progression of the income tax associated to this definition is the Liability Progression, $LP(x)$, which measures the elasticity of taxes, $t(x)$, with respect to gross income, x:

$$LP(x) = \frac{dt(x)}{dx}\frac{x}{t(x)} = \frac{t'(x)}{\left(t(x)/x\right)} \tag{1.22}$$

where $t(x)/x$ is the average tax rate and $t'(x)$ is the marginal tax rate.

Hence, $LP(x)$ measures the ratio between marginal and average tax rates and is greater than 1 for all income levels if the tax is strictly progressive.

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[25] The proof of this theorem can be found at Jakobsson (1976), Fellman (1976), Kakwani (1977a) and Lambert (2001).

[26] See Theorem 8.2 in Lambert (2001, pp. 191).

Jakobsson (1976) and Kakwani (1977a) establish a formal link between changes Liability Progression and the distribution of the tax burden, when the pre-tax income distribution is fixed. According to it, a tax A is more progressive, in $LP(x)$ terms, than another tax B if and only if the concentration curve of the tax burden of B dominates the concentration curve of the tax burden of A, for all levels of gross income, x.[27]

In the light of this finding, Kakwani (1977b) proposes a progressivity index that measures the distance between the Lorenz curve of the pre-tax income and the concentration curve of the tax burden, using the Gini coefficient:

$$\Pi^K = 2\int_0^1 [L_X(p) - C_T(p)]dp = \hat{G}_T - G_X \tag{1.23}$$

where $\hat{G}_T$ is the Gini coefficient of the concentration curve of the tax burden T, and G_X is the Gini coefficient of the Lorenz curve of the pre-tax income x.

ii) Redistributive Effect

The redistributive effect approach measures progressivity by comparing the distribution of income before and after taxes. Thus, Residual Progression, $RP(x)$, measures the elasticity of net income with respect to gross income:

$$RP(x) = \frac{d(x - t(x))}{dx}\frac{x}{x - t(x)} = \frac{1 - t'(x)}{1 - \left(t(x)/x\right)} \tag{1.24}$$

According to this measure, a tax is progressive if $RP(x)$ is smaller than 1 for all income levels x.

[27] For details see Jakobsson (1976), Kakwani (1977a) or Theorem 8.4 in Lambert (2001, pp. 199).

Jakobsson (1976) and Kakwani (1977a) establish a formal link between changes in Residual Progression and the distribution of post-tax incomes, when the pre-tax income distribution is fixed. According to it, a tax A is more progressive, in $RP(x)$ terms, than another tax B if and only if the concentration curve of the post-tax income of A dominates the concentration curve of the post-tax income of B, for all levels of gross income, x.[28]

In the same way as the Kakwani index of departure from proportionality, Reynolds and Smolensky (1977) propose an index of redistributive effect based on the distance between the concentration curve of the post-tax income and the Lorenz curve of the pre-tax income, using the Gini coefficient:

$$\Pi^{RS} = 2\int_0^1 \left[L_{X-T}(p) - L_X(p)\right]dp = G_X - \hat{G}_{X-T} \tag{1.25}$$

where G_X is the Gini coefficient of the Lorenz curve of the pre-tax income x, and $\hat{G}_{X-T}$ is the Gini coefficient of the concentration curve of the post-tax income x-t.

3.2 Measuring Poverty and Poverty Reduction Efficiency

3.2.1 Measuring Poverty

i) Poverty line

The first issue one must deal with in the choice of the poverty line is its definition as an absolute or relative benchmark. The absolute approach tends to interpret poverty as deprivation of a certain living standard that is needed for physical subsistence and that is fixed (in real terms) over time and across regions (countries). The most common type

[28] For details see Jakobsson (1976), Kakwani (1977a) or Theorem 8.6 in Lambert (2001, pp. 206).

of absolute poverty lines used in empirical work is based on the cost of a certain basket of goods and services. Another popular absolute poverty line is the one (or two) dollar per day poverty line used by the World Bank. The relative approach links the poverty line to the level of development of a giving society. According to this approach, the poverty line should vary across countries and rise as the economy grows. Relative poverty lines are usually set as proportion of the mean or median of living standards.

There is no unanimity about which approach is the most appropriate to measure poverty. Sen (1983) tries to reconcile them using his *capabilities* approach: 'At the risk of oversimplification, I would like to say that poverty is an absolute notion in the space of capabilities but very often it will take a relative form in the space of commodities or characteristics' (Sen, 1983, pp. 1983). Sen finds support to this argument in Adam Smith's often cited statement: 'By necessities, I understand not only the commodities which are indispensable necessary for the support of life but whatever the custom of the country renders it indecent for creditable people, even of the lowest order, to be without' (Smith, 1776). Therefore, capabilities such as taking part in the life of the community, to live without shame or to have self-respect are extremely sensitive to the affluence of a society. It would be more costly to buy the commodities needed to achieve such capabilities in a rich than in a poor society.

In line with those arguments, Atkinson (1998) concludes that 'in comparisons over time, a fixed bundle of goods is unlikely to prove an acceptable basis for a long-run poverty measure in Europe'. He also highlights that relative poverty lines are simple and transparent, being, in principle, readily explainable and offering greater confidence since they can be easily verified. In contrast, absolute thresholds are subject to some

level of complexity and arbitrariness in the choice of the components of the basket of goods and services as well as in the need of periodically revising its composition[29].

At present, most studies on poverty in Europe use relative poverty lines. However, there are also some controversies within this approach. Which statistic should be used to compute the poverty line: mean or median? Which proportion of the chosen statistic should be used: 40, 50, 60, percent etc.? Which indicator of living standard should be used: expenditure or income? Which unit of analysis shall be used: household, family, etc.? How should one deal with differences in the size and composition of the unit of analysis? These issues are essential to determine the poverty line and will be discussed in the following sections.

ii) Poverty Indices

This section does not intend to provide a comprehensive survey of the theoretical literature on poverty indices[30]. Instead, it presents some of the most relevant issues related to applied poverty measurement and draws attention to the limitations and the cautions that one should take in the choice and use these indices and in the interpretation of results.

A feature that usually characterizes the poverty indices is that they are *exclusive* measures of well-being, i.e., they are insensitive to those who are non-poor (Ravallion, 1994b). This property is generally known as the *focus axiom*. A second property widely accepted is the *monotonicity axiom*. This states that poverty indices shall respond to falls in the income of the poor by increasing the level of poverty. A third characteristic

[29] Atkinson (1998) emphasizes three issues that justify the need of revising the composition of the basket of goods and services: (i) disappearance of some goods from the market, (ii) appearance of new goods and services, (iii) changes in the demand of goods due to changes social roles.
[30] For a survey of the literature, see Zheng (1997), Foster and Sen (1997), and Lambert (2001, chapter 6).

requested by many authors is the *transfer axiom*, according to which equalizing (richer to poorer) transfers should at least not increase poverty[31].

The most widely popular poverty index is the *headcount ratio*. This index measures the proportion of the population who is below the poverty line:

$$P^H = \int_0^z f(x)dx \tag{1.26}$$

where *f(x)* is the density function, assuming that incomes are continuously distributed, and *z* is the poverty line.

Despite its popularity, many authors question the use of the headcount index. The main objection is that this index is only sensitive to income changes that lead to moves across the poverty line. Therefore, the headcount does not respect the monotonicity and the transfer axioms. Regarding the analysis of a tax-benefit reform, the headcount does not indicate a raise in poverty if a reform shifts income from a poor to a non-poor. Moreover, it does not point out a fall in poverty if a transfer from rich to poor is not enough to bring the later out of poverty. Finally, the headcount indicates a fall in poverty when a reform transfers income from a 'poorer' to 'richer' poor if the reform helps the later to cross the poverty line.

All these questionable properties result from the fact that the headcount only deals with one dimension of poverty: its *incidence*. For this reason, the theoretical literature has developed alternative measures to deal with the other dimensions of poverty. A basic measure of poverty *intensity* is the *poverty gap* (the income a poor needs to escape poverty). A poverty index that is derived from the poverty gap is the *normalised poverty deficit*:

[31] See Zheng (1997) form more on the poverty axioms.

$$P^{NPD} = \int_0^z (1 - x/z) f(x) dx \quad \text{having } x < z \tag{1.27}$$

The normalised poverty deficit respects the focus, the monotonicity and the transfer axioms. However, it is insensitive to transfers among the poor (richer-to-poorer and poorer-to-richer transfers among the poor do not change poverty according to the normalised poverty deficit).

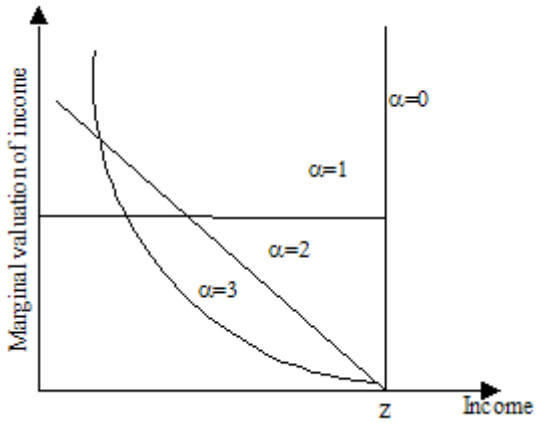
Many sophisticated poverty measures with more desirable properties have been suggested[32]. A particularly attractive family of poverty indices was proposed by Foster, Greer and Thorbecke (1984) (FGT, henceforth), and takes the following form

$$P_\alpha^{FGT} = \int_0^z (1 - x/z)^\alpha f(x) dx \quad \text{having } x < z \quad \text{and } \alpha \geq 0 \tag{1.28}$$

The parameter α is a power of the poverty gap that can be interpreted as a measure of poverty aversion (see Zheng, 2000). One interesting feature of the FGT family is that it includes the most popular poverty indices. If α = 0, the FGT index is the headcount ratio (see equation (1.26)), and if α = 1 it is the normalised poverty deficit (see equation (1.27)). For α>1 the index is averse to transfers from a poor to a less poor person. As α increases the index assigns higher weight to the poorer, when α→∞ only the poverty gap of the poorest person matters. Figure 1.3 shows Atkinson's (1998) graphical description of these weights using the marginal valuation of income implied by different values of α. As derived from the discussion about the headcount ratio, if α = 0 the index is only sensitive to marginal transfers in the poverty line. If α = 1, the index (normalised poverty deficit) gives the same weight to all transfers below the poverty line. If α = 2 the marginal valuation of income is linearly declining. If α > 2 the marginal valuation is non-linear and declines with income.

[32] See, among others, Sen (1976), Kakwani (1980), Clark, Hemming and Ulph (1981) and Chakravarty (1983).

Figure 1.3 Marginal valuation of income in the FGT poverty indices with α = 0 to 3



Source: Atkinson (1998).

A particular advantage of the FGT family is that all indices are additively decomposable, i.e. the overall poverty can be expressed as the weighted sum of poverty in the population sub-groups:

$$P_{\alpha}^{FGT} = \sum_{1 \le k \le K} p_k \int_0^z \left(1 - x_k / z\right)^{\alpha} f(x_k) dx_k \quad \text{having } x_k < z,\ \alpha \ge 0 \text{ and } k = 1,2\ldots,K \qquad (1.29)$$

where p_k is the proportion of the overall population belonging to group k.

Even if there were consensus about the use of the FGT family to measure poverty, it would be difficult to reach an agreement about the value of α to be used. One possibility is to perform a sensitivity analysis testing the robustness of results to more than one FGT index using different values of α.

Alternatively, one could perform ordinal poverty comparisons checking if the distribution F leads to less poverty than G for all poverty indices of a certain class and order s of stochastic dominance up to a given limit z[33]. The stochastic dominance

[33] For a detailed description of stochastic dominance and the mathematical proof of the results presented in this section see Duclos (2002, chapter 9).

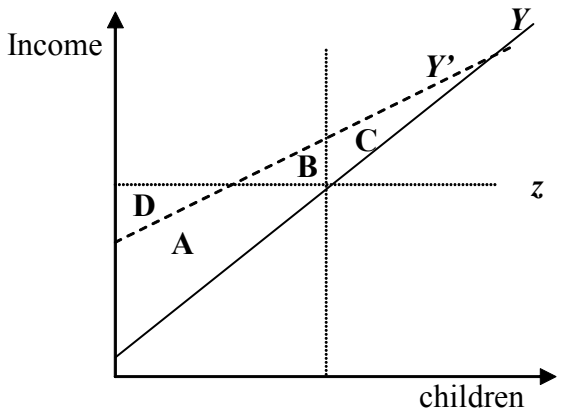
approach allows one to test the robustness of results to classes of poverty indices and to the choice of the poverty line.

The first-order dominance condition requires that the headcount ratio in *G* is larger than the headcount in *F* for all income levels between 0 and *z*. This is a very exigent condition. However, if it is fulfilled then poverty is lower in *F* than in *G* for all indices in the FGT family for all poverty lines $0 \leq \pi \leq z$. The second-order stochastic dominance excludes the headcount ratio ($\alpha = 0$) by limiting its range to all indices that obey the *transfer axiom* (recall section ii). The condition to assure that poverty in the distribution *F* is lower than in *G* for all indices in this class is that the curve of cumulated poverty gaps described by *F* lies below the one described by *G* for all income levels up to *z*. Every higher order of stochastic dominance requires a less demanding condition; on the other hand, it excludes an additional FGT poverty index associated to a consecutive value of α.

3.2.2 Poverty Reduction Efficiency

Beckerman (1979) developed a method to measure the efficiency of poverty alleviating policies. This method is graphically represented by Figure 1.4. The horizontal axis represents all population increasingly ordered by income. The vertical axis represents the disposable income, so that *y* and *y'* represent the disposable income before and after a benefit, respectively. People are poor if their income is below the poverty line *z*. The diagram represents total benefit expenditure as the area A+B+C. A+B is spent on the poor and C on non-poor. The poverty gap before and after transfers correspond to the areas A+D and D, respectively.

Figure 1.4 Poverty reduction efficiency of a benefit



Beckerman (1979) proposes the three following indices to measure the efficiency of transfer programmes:

1. Vertical Efficiency (VE) - is the proportion of total transfers received by the poor

$$VE = (A + B)/(A + B + C) \tag{1.30}$$

2. Poverty Reduction Efficiency (PRE) – is the proportion of total transfers that effectively contributes to reduce the poverty gap.

$$PRE = (A)/(A + B + C) \tag{1.31}$$

3. Spillover (S) – is the amount of transfers paid to the poor that exceeds the poverty line, normalized by the amount of total transfers paid to the poor.

$$S = (B)/(A + B) \tag{1.32}$$

Of course, *efficiency* indices say little about how much poverty has diminished after the benefit. Beckerman proposes the poverty gap reduction (PGR) as a measure of poverty reduction *effectiveness*:

$$PGR = A/(A + D) \tag{1.33}$$

There are three important weaknesses in Beckerman's approach. First, it is very dependent on the value of the poverty line. As seen in section 3.2.1, there is considerable arbitrariness in the choice of the poverty line. Second, the efficiency indices proposed by Beckerman are measures of poverty gap reduction. Therefore, these indices are implicitly assuming that the social welfare function gives the same weight to all poor individuals independently of their income (see section 3.2.1). Finally, these measures do not consider the deadweight losses that the benefit may produce through the taxes needed to fund it or the behavioural responses (for example on labour supply) that it may induce on beneficiaries.

Duclos et at (2003) develop an alternative approach to measure the poverty reduction efficiency of tax-benefit programmes. Based on the poverty stochastic dominance literature, they propose the *Programme Dominance curves* to analyse tax-benefit reforms. This approach produces results that are robust to the choice of poverty lines and poverty measures, allows one to decompose the policy's poverty reduction efficiency in terms of targeting and allocation, and can consider differences in behavioural responses across program reforms.

3.3 Measurement Issues

3.3.1 Income versus expenditure

There are practical and conceptual issues involved in the choice of the indicator of living standards used to measure inequality and poverty. In practical terms, expenditure data is usually better reported then income (especially from certain sources, such as self-employment and capital) in most household surveys[34].

[34] See Chapter II for further discussion about the quality of income data on surveys.

Conceptually, the best indicator of living standard is individual consumption. Either in a short or in a long-term perspective, the distribution of consumption across time is smoother than income. In the short-run, income is very sensitive to seasonal changes that may not reflect real changes in living standards. Conversely, consumption considers households capacity to 'dissave' or to borrow, revealing how households foresee their own nearby future. From a life-cycle perspective, the individuals try to smooth consumption along their life saving during their working-years and spending those savings when they reach retirement. However, in practice, myopia and uncertainty obstruct individuals to estimate perfectly their 'permanent income', leading to an irregular consumption pattern across their lifetime.

Moreover, there are relevant and difficult-to-assess differences between expenditure and consumption. The household own-production (including domestic services) does not pass through the market, complicating the assessment of the value of these goods and services. In addition, durable goods are not fully consumed in the moment of purchase and the service value provided by them is not easy to estimate. This problem is especially important in industrialised countries, since great part of the expenditure is on durable goods. As a result, the expenditure data from household surveys (usually assessed for short periods of time) may be less adequate than income to assess individual consumption.

3.3.2 Intra-Household Distribution

Household surveys give little information about how income or consumption is split within the household. Hence, instead of assessing 'real' individual well-being, most studies based on survey data assess household's living standard evenly split among its members. Intra-household distribution can be a very important issue in poverty analysis. If the distribution of well-being differs across household members then the overall poverty could be significantly different from the one assessed assuming equal sharing. This problem could be particularly important when analysing poverty by gender or age groups.

Regarding tax-benefit reforms, intra-household issues are decisive if the targeted group (say women or children) does not truly benefit from a transfer due to intra-household sharing. Moreover, it could be that the income source may affect the distribution of income within the household. Alderman et al (1995) show evidence of a positive correlation between the proportion of household income earned by women and the relative level of consumption of children. This suggests that child benefits paid to mothers are more effective to benefit children than if paid to fathers.

3.3.3 Equivalence Scales

Individual well-being is also affected by the size and composition of the household where the person lives in. Therefore, interpersonal comparisons are subject to differences in the needs of different household types. The literature deals with those differences constructing equivalence scales that standardise the needs of all household types to that of a reference or equivalent household (usually a single-adult household).

Following Cowell and Mercader (1999), the basic idea consists on constructing an equivalence scale, e_h, that, giving the household characteristics, k_h, would convert household nominal income, x_h, into an equivalent income, y_h, which would be comparable across all household types:

$$y_h = y(x_h, k_h) = \frac{x_h}{e_h} \tag{1.34}$$

The equivalence scale can range between two extremes. On the one hand, it could be assumed that there are no differences in needs across all household types. In this case, nominal and equivalent incomes are the same ($x_h = y_h$) and the value of the equivalence scale is equal to one to all household types ($e_h = 1$). On the other hand, it could be argued that all individual have the same level of need regardless the household size or composition. In this case, the equivalent income is assessed as the household nominal income *per capita* and the value of the equivalence scale is the number of household members.

The choice of a suitable value for the equivalence scale is subject to a high degree of arbitrariness. One way of dealing with the choice of the equivalence scale is the use of a parametric specification. Hence, given a functional form ($\hat{e}$) of the relationship between household needs and characteristics there is a vector of all parameters φ that synthesizes this relationship:

$$e_h = \hat{e}(k_h, x_h, \varphi) \text{ for all } \varphi \in \Phi \tag{1.35}$$

where Φ is the conjunct of all possible parameters φ (Cowell and Mercader (1999)).

There are many functional forms in the literature. One of the most used classes of equivalence scales is the one derived from the OECD scale:

$$e_h = 1 + (n_a - 1)s_a + (n_c * s_c) \text{ for all } \varphi \in \Phi \tag{1.36}$$

where n_a is the number of adult household members, n_c the number of children, and s_a and s_c are the parameters for adults and children, respectively[35].

Buhmann et al (1988) suggest an alternative class that roughly represents most equivalence scales used in the literature:

$$e_h = n^s \text{ for all } s \in [0,1] \tag{1.37}$$

where m is the number of household members and s is a parameter that synthesizes the elasticity of needs to household size.

[35] The values of s_a and s_c suggested by the OECD (Atkinson et al, 1995) are 0.7 and 0.5, respectively (children are defined as those under 16). The European Commission suggests using this functional form with s_a = 0.5 and s_c=0.3 and children as those under 14. This equivalence scale is widely known as the 'modified OECD scale'.

An alternative and extended specification of Buhmann et al's scales includes sensitivity to the adult/child relativity dimension and was used by Jenkins and Cowell (1994) and Bradbury and Jantii (1999) and is recommended by the US National Science Foundation Poverty Commission (National Research Council, 1995):

$$e_h = (n_a + \beta n_c)^s \quad \text{for all s and } \beta \in [0,1] \tag{1.38}$$

where β is a parameter of the relative weight of a child with respect to an adult[36].

Despite the scale specification, many studies have demonstrated that inequality and poverty indices are very sensitive to the value of the parameters. Using Buhmann et al's (equation (1.37)), Coulter et al (1992) prove that inequality and poverty indices have a non-monotonic relation with parameter *s*, leading to U, J and reverse-J results, depending on the index. Jenkins and Cowell (1994) extend this analysis to a specification such as in equation (1.38) and find similar results. The choice of the parameter *s* also affects the composition of poverty. de Vos and Zaidi (1997) find evidence that poverty incidence among single elderly and households with children are particularly sensitive to the choice of the parameters. Hence, testing the sensitivity of the results to changes in the value of the equivalence scale is crucial in the assessment of tax-benefit reforms.

4 CONCLUDING REMARKS

This chapter presented some of the most relevant theoretical and empirical issues related with the economic analysis of income taxation and social benefits. The chapter showed that fiscal policies affect many dimensions of the economy and that, although the

[36] A large list of equivalence scales transformed to this parametric class can be found in Buhmann et al (1988, table 2) and in Atkinson et al (1995, table 2.2). For a discussion about the advantage of using more parameters to capture variation by age and more characteristics see Coulter, Cowell and Jenkins (1992), Banks and Johnson (1994) and Jenkins and Cowell (1994).

literature has advanced a great deal, economic analysis is not able to provide more than some partial and incomplete answers.

This review helps one to understand the advances and the limits of non-behavioural microsimulation techniques. In that sense, non-behavioural microsimulation models are not capable of identifying the optimality of the fiscal system. However, they provide relevant information in order to distinguish some of the elements that are decisive to in the measurement of the welfare effects of taxation. This information can be expanded through the inclusion of behavioural estimations that could measure some efficiency costs of taxation. Nevertheless, the chapter has also shown that the labour supply models are still limited in their characterization of the behavioural responses and of the incentive effects of taxation. Therefore, although it is clearly a field of research that presents great potential, behavioural microsimulation needs further research before their results could be widely used in policy analysis. At the present stage, although clearly biased and incapable of predicting medium and long-term effects, non-behavioural microsimulation models produce outputs that are less exposed to arbitrary assumptions and manipulation and, therefore, are more transparent.

The chapter also stressed the importance of the inclusion of the simplicity aspects of taxation. Compliance and administration costs are quite significant in size and produce considerable efficiency, equity and revenue effects. Chapter 4 will show that microsimulation models can contribute in the assessment of tax complexity.

Microsimulation models rely on a partial equilibrium framework. As a result, these models cannot provide evidence on tax incidence or in the overall economic effects of fiscal reform. These issues are better addressed by theoretical and applied general equilibrium models. On the other hand, microsimulation models provide detailed and representative results at the household and/or individual level. Therefore, these models are suitable for distributive incidence analysis and provide the type of data needed for the measurement of the poverty and inequality.

Chapter II

Microsimulation: Models, Data and Validation

1 INTRODUCTION

This chapter presents the two microsimulation models that are used in the following chapters of this thesis: ESPASIM and EUROMOD. Sections 2 and 3 show that these models have different designs and objectives that make them complementary. ESPASIM simulates in detail the Spanish tax-benefit system, is user-friendly and accessible to all users. EUROMOD is a model designed to simulate the tax-benefit systems of the 15 countries of the European Union in a common, comparable and transferable framework. EUROMOD is extremely flexible; however it overlooks some country specificities and it is less easy to be used.

Microsimulation models use micro-level databases that are able to characterise the diversity of personal and household circumstances and that are representative of the population at the national level. The main drawback of these databases is that they are not designed for this purpose. As a result, some information that is necessary to simulate tax-benefit systems is deficient or missing. To overcome these limitations modellers must revise the quality of the database, and estimate or impute the unsuitable or missing data. Section 4 explores those issues in detail by presenting the Spanish database used by ESPASIM and EUROMOD.

Once the model is built and the data is prepared, one must check the validity of the output produced by the model. This is done by comparing the model's results with official published figures. Section 5 presents a detailed validation of the ESPASIM's outputs.

2 THE SPANISH MICROSIMULATION MODEL – ESPASIM

ESPASIM is an integrated tax-benefit microsimulation model for Spain. It was developed by a research team at the Department of Applied Economics in the Universitat Autònoma de Barcelona (Levy et al, 2001). This computer program enables one to calculate the impact of taxes and benefits on the disposable income of a representative sample of households and individuals in Spain. ESPASIM takes micro-data containing information on these individuals and calculates the taxes and the benefits that each person in the database should pay and

receive under alternative fiscal systems. This enables one to calculate, for example, the tax collection, the winners and losers, the marginal tax rates, and poverty and inequality indices.

Until recently, most studies on tax-benefit reform in Spain were based on representative cases (for example, a married couple with two children) or in aggregate statistics. However, given the enormous diversity of personal circumstances, any assessment based solely on these figures cannot be more than an approximation. ESPASIM uses micro-data from representative samples of the Spanish population, producing results that are sensitive to the diversity characterising the real world. Moreover, ESPASIM is an *integrated model*, i.e. it takes into account the combined effects, the interactions and the complexities of the policies that form the Spanish tax-benefit system.

2.1 Coverage

This section describes the taxes and benefits simulated by ESPASIM[37]. The model is based on the current Spanish tax-benefit system and the policies are structured in menus with parameters that refer to the most relevant elements of each policy. The user can simulate reforms by altering the value of these policy parameters. Reforms that are more 'fundamental' can be simulated by replacing the existing policies by 'artificial' ones. These 'artificial policies' are taxes and benefits that are not currently used in the Spanish system but that are of interest in the public or in the academic debate[38].

2.1.1 Taxes

ESPASIM simulates the most important personal taxes in Spain: personal income tax, value-added tax, excise duties, and employee and employer social security contributions. Following Table 2.1, these taxes and contributions represent 82.2 percent of all tax levied in Spain. The model neither simulates non-personal taxes, such as the corporate income tax, nor taxes the

[37] For a more exhaustive description of the model, see Levy, Mercader and Planas (2002).
[38] The flat-rate basic income proposal is an example of 'artificial policy'.

require data that is not available in the database, such as the inheritance tax, property tax, fees and public prices.

Table 2.1 Taxes simulated by ESPASIM

Taxes	*Number of taxpayers* [a]	*% of total revenue* [a]	*Treatment in ESPASIM*	*Why is not simulated?*
Direct Taxes		33.3%		
Personal Income Tax		22.6%	Simulated	Some tax reliefs and regional particularities are not considered
Corporate income tax		9.5%	Excluded	Non-personal tax
Income tax on non-residents		0.5%	Excluded	No information available about non-residents
Inheritance tax		0.0%	Excluded	No information available about bequests
Property tax		0.2%	Excluded	No information available about property
Other direct taxes		0.4%	Excluded	
Indirect Taxes		35.6%		
Value Added Tax		19.2%	Simulated	
Excise duties		9.3%	Simulated	
Other indirect taxes		1.0%	Excluded	No information available
Fees and public prices		1.4%	Excluded	No information available
Other revenues		4.7%	Excluded	No information available
Social Insurance Contributions	15,649,900	31.1%		
General Regime	11,656,800	25.4%	Simulated	Apprenticeship and part-time specific contributions are taken into account.
Coal-miner regime	16,600	0.1%	Partially Simulated	Due to lack of data this regime is taken as part of the general regime
Agrarian Regime	1,127,600	0.7%	Simulated	
Sea worker regime	78,100	0.1%	Partially Simulated	Due to lack of data this regime is taken as part of the general regime
House cleaner regime	155,900	0.1%	Partially Simulated	Due to lack of data this regime is taken as part of the general regime
Self-employees	2,614,900	3.7%	Simulated	
Unemployed workers		1.1%	Simulated	
Student regime	-	-	Excluded	No information available
Civil servants' regime	-	-	Partially Simulated	Due to lack of data this regime is taken as part of the general regime
Military forces' regime	-	-	Partially Simulated	Due to lack of data this regime is taken as part of the general regime
Judges' regime	-	-	Partially Simulated	Due to lack of data this regime is taken as part of the general regime
Total		100.0%		

[a] Figures for year 2001.

Notes: 'Included' means that the benefit is included in the micro-data but is not simulated by ESPASIM. 'Partially Simulated' means that ESPASIM simulates only some benefit rules. 'Simulated' means that most rules are simulated; however, some minor particularities may not be simulated.

Source: IGAE (2002) and MTAS (2002).

ESPASIM simulates, in detail, most of the key elements of the Spanish income tax. All relevant components of the taxable income as well as the most important tax reliefs are simulated by the model. Table 2.2 demonstrates that the incomes simulated by ESPASIM represent 94 percent of the total taxable income. The model also simulates 95 percent of the tax allowances and almost 60 percent of the tax credits. Therefore, the simulations comprise the greatest part of the Spanish income tax.

ESPASIM does not simulate some elements because of lack of data. Irregular incomes (i.e. incomes that are assessed in a period longer than a year), private pension plans, household investments by own resources (with no mortgage), and compensations are the most important elements not simulated by the model.

The Spanish income tax has some regional variations. The most relevant one concerns the regions of Basque Country and Navarre that have completely independent income tax systems. The other Spanish regions follow a common system with some small differences that result from regional specific tax reliefs. ESPASIM ignores those regional specificities and assumes that all regions apply a common 'national' income tax. Hence, ESPASIM's current version is not appropriate to study tax-benefit policies and reforms at the regional level. Nevertheless, from a national perspective, it should be noticed that altogether regional tax credits represented less than 0.5 percent of overall tax credits in 1999.

Table 2.2 Income tax elements simulated by ESPASIM [a]

Simulated		*Not simulated*	
Income tax element	*Amount (thousand euro)*	*Income tax element*	*Amount (thousand euro)*
Taxable Income	190,959,997	Taxable Income	11,463,598
Net employment income	151,438,707	Irregular incomes and others	11,463,598
Net self-employment income	25,922,995		
Capital income	7,937,653		
Property income	5,660,642		
Tax Allowances	68,129,488	Tax Allowances	3,595,983
Personal and family tax allowances	68,129,488	Other tax allowances	137.337
		Investments on Pension Plans	3,269,784
		Child support	247,069
		Negative tax bases from previous years	78,993
Tax Credits	2,736,975	Tax Credits	2,044,091
Mortgage	2,736,975	Investment on culture and donations	48,187
		House expenditure without mortgage	751,631
		Subsidies	54,414
		Incomes from Ceuta and Melilla	60,528
		Regional tax credits	20,949
		Compensations	1,108,382

[a] Figures for year 1999.

ESPASIM models in detail the income tax withholdings. This element is important to assess accurately the tax liability of some low-income households. A considerable part of Spanish taxpayers is exempt from filling a tax return and can choose the withholdings collected during the year as their final liability. Therefore, to have accurate results for taxpayers who are exempt from filling a tax return one must simulate the system of withholdings. Moreover, Chapter IV will prove that the inclusion of withholdings in the simulations allows one to measure some administrative and compliance costs of the income tax.

Following the widespread attention in the academic literature and the increasing interest in the public debate, ESPASIM also allows one to replace the current Spanish income tax by a flat-tax basic income proposal.

In Spain, the system of social insurance contributions is split into eleven regimes[39]. ESPASIM aggregates ten of these regimes into four[40]. Some special regimes (coal-miner, sea-worker, house cleaner and public servants) require information that is not available in the dataset and, for this reason; workers in these special regimes are simulated as if they were members of the general regime.

Certain particularities – such as special rules for football players and bullfighters, or different bases of contributions for specific contingencies – are not considered by the model either. Due to lack of data, contributions on overtime work are not simulated. In Spain, self-employed workers can choose their base of contribution between a top and bottom limit. ESPASIM assumes that all workers choose to contribute the minimum amount.

2.1.2 Benefits

ESPASIM includes all Spanish social benefits in its database. Nevertheless, the model is not able to simulate many of these benefits. Table 2.3 lists all Spanish social benefits, summarises their importance in terms of recipients and as percentage of overall social expenditure, and indicates if they are simulated or not.

In Spain, the eligibility and amount of the unemployment insurance benefits and insurance pensions depend on the past labour and contribution history. ESPASIM's database does not contain this information. Hence, the model includes but does not simulate these benefits[41]. This is an important drawback because these benefits represent 85 percent of total in-cash social expenditure. Other benefits, such as the unemployment assistance benefit and the supplements to pensions, rely on past contribution history and on an income test. Thus, these benefits can be partially simulated: the part dependent on the contribution history (eligibility)

[39] The eleven regimes are general regime, coal-miner regime, agrarian regime, sea worker regime, house cleaner regime, self-employees, unemployed workers, student regime, civil servants' regime, military forces' regime and judges' regime.
[40] The social insurance contribution from university students (student's regime) is not included in the simulations.
[41] This means that the benefit is included in the micro-data but is not simulated by the model.

is exogenously taken from data and the part dependent on the income test (amount) is simulated.

Although relying on available data, the old-age assistance benefit is also partially simulated. Data quality analysis has shown that the number of simulated recipients is not consistent with the one found in the database or in official statistics. On the other hand, the number of recipients in the database is similar to the one published in official statistics (see section 4.2.2). For this reason, the eligibility is taken from data and only the benefit amount is simulated.

Child benefit is the only Spanish social benefit fully simulated by ESPASIM. Data quality analysis has shown that the results of simulating child benefit are consistent with official statistics (see section 4.2.2). It should be noticed, however, that the model does not simulate child benefit for invalid children.

Finally, the minimum income guarantee and the incapacity assistance benefit are not simulated due to lack of information on region of residence and on incapacity. Nevertheless, ESPASIM allows one to replace the regional minimum income guarantee for an 'artificial' national social assistance benefit.

Table 2.3 Benefits simulated by ESPASIM

Benefits	*Number of recipients* [a]	*% of total expenditure* [a]	*Treatment in ESPASIM*	*Why is not simulated?*
Contributory benefits	**8,179,058**	**84.9%**	**Included**	**No data on contribution history**
Unemployment insurance	501,258	6.9%	Included	No data on contribution history
Incapacity pension	788,600	15.4%	Included	No data on contribution history
Old-age pension	4,545,600	49.0%	Included	No data on contribution history
Widow's pension	2,042,400	11.2%	Included	No data on contribution history
Orphan's pension	257,800	1.0%	Included	No data on contribution history
Relative's pension	43,400	0.2%	Included	No data on contribution history
Maternity benefit	0,000	1.2%	Included	No data on contribution history
Contributory, income-tested benefits	**3,634,620**	**10.9%**		
Unemployment assistance	590,567	4.0%	Partially simulated	Data available is not sufficient to simulate all eligibility conditions.
Old-age pension supplement	23,451	0.0%	Included	Data available is not sufficient to simulate all eligibility conditions.
Incapacity pension supplement	1,397,755	3.3%	Included	No information on disability
Widow's pension supplement	878,067	3.3%	Included	Data available is not sufficient to simulate all eligibility conditions.
Orphan's pension supplement	113,041	0.1%	Included	Data available is not sufficient to simulate all eligibility conditions.
Relative's pension supplement	19,045	0.0%	Included	Data available is not sufficient to simulate all eligibility conditions.
Income-tested benefits	**774,534**	**4.2%**		
Child benefit	647,845	1.1%	Simulated	Benefit is not simulated for disabled children.
Old-age assistance benefit	276,488	1.4%	Partially simulated	Eligibility is taken from data. Number of recipients is quite different from official sources when eligibility criteria are applied on data.
Old-age assistance (old-system)	17,045	0.1%	Partially simulated	Eligibility is taken from data. This is an old system and only people who were receiving it before 1990 are eligible for it
Incapacity assistance benefit	345,849	1.4%	Included	No information on disability
Regional Minimum Income Guarantees	(1) (2) 78,445	(2) 0.3%	Included	Regional information is not available.
National Minimum Income Guarantee [b]			Artificial benefit	
Total		100.0%		

[a] Figures for year 2001.
Sources: MTAS (2002) and Arriba and Moreno (2002) for the Minimum Income Guarantee figure.
(1) Number of households,
(2) Figure for year 2000.
Notes: 'Included' means that the benefit is included in the micro-data but is not simulated by ESPASIM. 'Partially Simulated' means that ESPASIM simulates only some benefit rules. 'Simulated' means that most rules are simulated; however, some minor particularities may not be simulated.

2.2 Assumptions and limitations

ESPASIM is a *static* and *non-behavioural* micro-simulation model[42]. This means that calculations are made without taking into consideration temporal elements or behavioural adjustment as response to policy change. The simulations involve purely arithmetical calculations that calculate the reform's 'morning after' impact. The model only considers one precise point of time, taking the demographic and economic structures as constant. Therefore, ESPASIM is not able to assess the effects of policy reforms on the long-run or on individual decisions such as labour supply, retirement, marriage or fertility. Nevertheless, the model enables one to obtain an inkling of the impact that a specific policy change might have on incentives, through the calculation of effective marginal tax rates. Moreover, the ESPASIM is very flexible reading and producing micro-data. Thus, the model could be easily used in conjunction with a micro-econometric model to simulate behaviour.

ESPASIM applies the legislation without considering possible differences between the system in theory and in practice. The model does not simulate tax evasion, fraud and benefit take-up. Therefore, it tends to overestimate the 'real' tax revenue. Regarding social benefits, there is not a clear-cut conclusion. On the one hand, non-take-up induces the model to overestimate of the number of recipients. On the other hand, benefit fraud pushes the results in the opposite direction.

The model takes the household as the basic unit of analysis. This has significant implications in the interpretation of results. First, the model leaves out intra-household distribution analysis. The results are calculated using (equivalent) household income as the indicator of individual well-being. Second, the model assumes that household members maximise income at the household level. Therefore, individuals would sacrifice part of their own personal income in order to get higher household income. This assumption is important in the choice of the scheme of taxation in the income tax. Although facing a greater burden, lower income

[42] See Chapter I for details about behavioural and non-behavioural microsimulation models.

household members would choose joint taxation if the liability reduction of higher income members more than compensates that loss.

2.3 User-friendliness and Accessibility

Atkinson (1995) and Creedy (2001) highlight that microsimulation models can be relevant tools in the public debate of tax-benefit reform. Model's results can provide useful information to a clearer understanding of the implications of reforms as well as to increase the public knowledge of the fiscal system. This objective could be greatly achieved if the microsimulation models were accessible to a wide range of users besides academics.

One of ESPASIM's objectives is to give access to the potential of micro-simulation techniques to a wide range of people. For this reason, accessibility and user-friendliness were two criteria that guided the model's construction. ESPASIM's interface is menu-driven and provides information at all stages. It has also a policy and an operation guide that can be accessed directly from the model. The first guide gives detailed descriptions about each policy and parameter in the model. The second guide explains how to use each model tool.

Sutherland (1995a) finds out that although some models were designed to be user-friendly most have considerable access restriction. The main causes of access restriction are related to data access permissions imposed by data providers (national statistical offices or by the government in the case of administrative data) and the modellers' desire of protecting the model from unsuitable or uncontrolled use. Other models have restricted access because of a fee is charged to contributes to finance their maintenance. ESPASIM is one of the first microsimulation models available free of charge to anyone. A compact version of the model

with encrypted code and data, and that does not allow the user to produce results at the micro-level, is available for download from the internet[43].

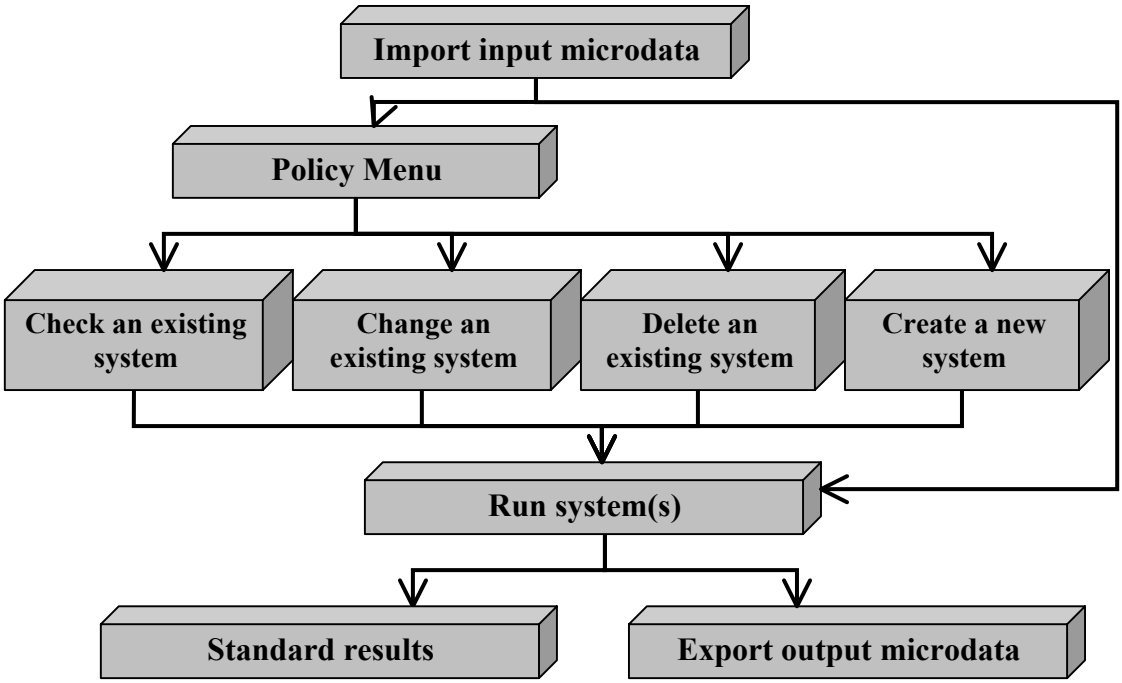
2.4 How does ESPASIM work?

The model has been constructed with Visual Basic 6.0® and works in personal computers with Windows 95® (or later versions) as user interface. Using Windows makes it possible for anyone familiar with this operative system to use ESPASIM to simulate the impact of alternative tax-benefit systems in Spain. The program works by means of a system of menus that guide the user through the different stages of micro-simulation.

ESPASIM is structured following the logical sequence illustrated in Figure 2.1. First, the program reads the micro-data upon which it is going to carry out the simulation. The software loads two files in ASCII format: individual and the household file. The former contains the relevant information at the individual level, and the latter deals with the characteristics of the households to which the individuals belong. The model allows the user to choose the database to be used in the simulations and to apply updating factors on monetary variables.

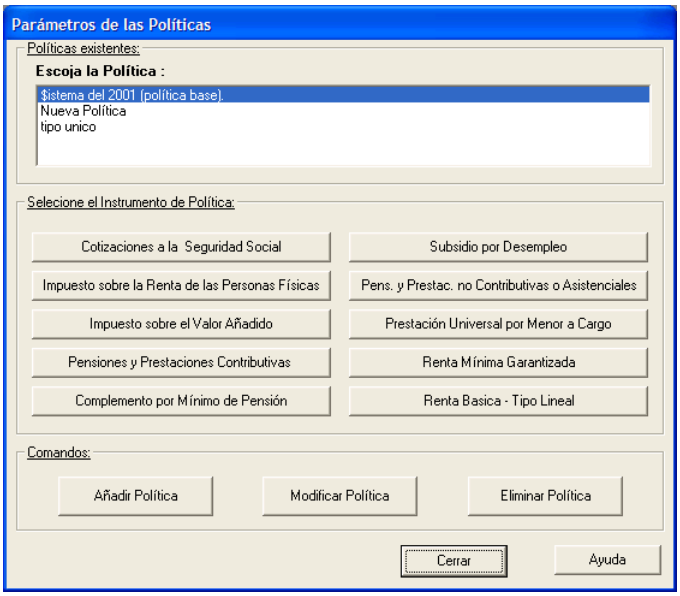
[43] In the first eight months of use, ESPASIM was downloaded almost 60 times. The most frequent users are academics, university students, analysts at ministries of social affairs and public finance, and private consultants. Although the majority of users are from Spain, the model was also downloaded from Latin America (Brazil, Argentina, Venezuela and Colombia), France, Morocco and Singapore.

Figure 2.1 Simulating with ESPASIM



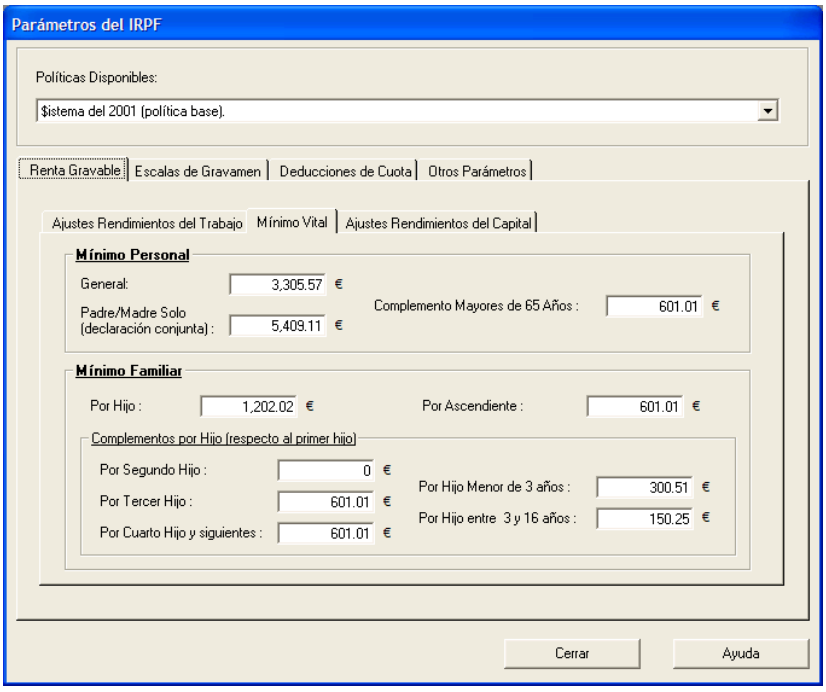
Once the data is read, the user can open the policy menu to check, change or eliminate the existing systems or to create new reforms; alternatively, the user could simply opt to run some of the systems already stored in the parameter file. If the user opens the policy menu, she/he will find a frame similar to Figure 2.2 with buttons that give access to the different policy sheets.

Figure 2.2 ESPASIM's Policy Menu



The policy sheets are also structured in menus and sub-menus that contain the parameters that can be manipulated by the user in order to create new reforms. Figure 2.3 illustrates ESPASIM's parameter sheet for family tax allowances in the Spanish income tax.

Figure 2.3 ESPASIM's Income Tax Family Allowances



Once the systems and reforms are created, the model is ready to run the simulations. ESPASIM runs up to 5 different systems (reforms) at the same time plus an extra one which is used as 'baseline' system. The model assumes the baseline as the pre-reform system so that the calculation of winners and losers of all simulated reforms are computed against it. Using a computer with a Pentium III processor and 256 Mbytes of RAM, ESPASIM executes these 5+1 reforms with a sample of approximately 20,000 individuals in less than one minute.

After the simulations are done, the user can read some standard results such as aggregate tax revenue, benefit expenditure, number of taxpayers and benefit recipients, winners and losers by decile or income brackets, Lorenz, curve, poverty and inequality indices, and distribution of effective marginal tax rates. The user can also export the output of simulations at the individual or household level to an ASCII file in order to calculate alternative or more specific results[44].

3 THE EUROPEAN MICROSIMULATION MODEL – EUROMOD

EUROMOD is a multi-country tax-benefit microsimulation model for all countries of the European Union. It was developed by a research team that involves researchers from 18 institutions in 15 EU countries, co-ordinated by the Microsimulation Unit, at the University of Cambridge[45]. This model is a powerful instrument for research on tax-benefit reform in a comparative or in a supra-national (European) perspective.

3.1 Coverage

One of the great innovations of EUROMOD is the construction of a flexible framework that is able to simulate in a consistent and integrated way the tax-benefit systems of many and very

[44] Further instructions about how to use ESPASIM are available at the model's help file, which can be downloaded at http://selene.uab.es/espasim.
[45] For details about the EUROMOD's team and project, see Immervoll et al. (1999), Sutherland (2001) and its website: http://www.econ.cam.ac.uk/dae/mu/emod.

different countries[46]. It is relatively easy to simulate one country's policy into another using EUROMOD. The model uses databases that contain variables with names and definitions that are common across countries. Thus, most relevant information (income, personal and labour characteristics, etc.) can be easily transferred from one country to another. If one wants to simulate the system of country 'A' into country 'B', all that is needed is to run the model for country 'A' using data from country 'B'[47].

Likewise, the model structures most tax-benefit policies using functions and algorithms (modules) that are shared by all countries. While in ESPASIM the algorithms were designed to calculate one specific policy (say, the child benefit), in EUROMOD a (or a group of) module(s) is able to calculate different types of policies (for example, the same module can be used to simulate a benefit or a tax credit). Hence, the code used to compute the policy of one country is shared with all other countries. As a result, if one wants to simulate just one policy from country 'A' into country 'B', all that is needed is to copy the policy modules from country 'A' and to add them into the tax-benefit system in country 'B'[48].

EUROMOD uses micro-level databases that are representative of all simulated countries. Table 2.4 demonstrates that the countries use different sources of data. Ten countries (Austria, Belgium, Denmark, Germany, Greece, Ireland, Luxembourg, Netherlands, Portugal and Spain) use data from the European Community Household Panel (ECHP) or from national panel studies that are associated with the ECHP. Italy uses data from a special income survey, France and UK use data from national household budget surveys and Sweden and Finland use databases that combine administrative and survey data[49].

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[46] For more details about EUROMOD's microsimulation framework - MMEANS - see Immervoll and O'Donoghue (2001).

[47] Some countries' systems need data that is not available in other countries' databases. In those cases, the transference is not as straightforward as presented here.

[48] Some policies require very complicated operations or unusual variables that are not available in all countries. For this reason, some policies use country specific functions that cannot be directly transferred to other countries. In those cases, the transference is not as straightforward as presented here. Chapter III.3.1 in chapter III illustrates this difficulty and presents alternatives to solve it.

[49] For more details about EUROMOD's databases, see Sutherland (2001a) or EUROMOD's website.

Table 2.4 EUROMOD data sources

Country	*Base Dataset for EUROMOD*	*Date of collection*
Austria	European Community Household Panel (W2)	1996
Belgium	Panel Survey on Belgian Households (W6)	1997
Denmark	European Community Household Panel (W2)	1995
Finland	Income distribution survey	1997
France	Budget de Famille	1994/5
Germany	German Socio-Economic Panel (W15)	1998
Greece	European Community Household Panel (W3)	1996
Ireland	Living in Ireland Survey (W1)	1994
Italy	Survey of Households Income and Wealth	1996
Luxembourg	PSELL-2 (W5)	1999
Netherlands	Sociaal-economisch panelonderzoek (W3)	1996
Portugal	European Community Household Panel (W3)	1996
Spain	European Community Household Panel (W3)	1996
Sweden	Income distribution survey	1997
Unite Kingdom	Family Expenditure Survey	1995/6

Source: Sutherland (2001a).

In general, the databases used by EUROMOD face the same type of restrictions faced by ESPASIM. In most countries, the European model neither simulates taxes on capital, inheritance, real estate and property; nor pensions, in-kind, contributory and disability benefits.

The personal income tax and the social insurance contributions are simulated in all countries. Property tax is simulated in Belgium and included (but not simulated) in Finland and France. Despite generally simulating the same taxes, these represent quite different revenues across countries. While in Belgium and Denmark, simulated taxes represent 40 percent of the gross income and employer social contributions, in Ireland and the UK they represent less than 25 percent (see Table 2.A.1, in the appendix, for details)[50]. Regarding the Spanish tax system, EUROMOD and ESPASIM use the same database and simulate the same policies. The only significant difference between the European and the Spanish models is that the former does not simulate the income tax withholdings, slightly overestimating the tax burden of some individuals at medium and lower part of the income distribution.

[50] For a more exhaustive discussion about EUROMOD's simulated policies see Sutherland (2001a) and the EUROMOD's County Reports, available at http://www.econ.cam.ac.uk/dae/mu/emod

There is a wide variation in the simulation of benefits across countries. EUROMOD simulates almost all cash benefits from Ireland and Denmark. On the other hand, like ESPASIM, the child benefit is the only Spanish benefit fully simulated by the European model (see Table 2.A.1, in the appendix, for details). EUROMOD is better covering income-tested benefits because the data needed is more frequently available. Hence, the model is more effective simulating benefits that deal with the lower part of the income distribution and that are mainly designed to tackle poverty.

Currently, EUROMOD simulates the tax-benefit systems of EU-15 countries for year 1998. A new version with 2001 tax-benefit systems will be ready by the end of year 2003. Further updates on data and policies, and the inclusion of new EU members are planned for the future.

3.2 Assumptions

EUROMOD and ESPASIM were constructed following the same philosophy and share most assumptions presented in section 2.2. EUROMOD is also a non-behavioural microsimulation model, i.e., it does capture the effects of policy change on decisions such labour supply, retirement, fertility, etc. However, the model also calculates effective marginal tax rates and may work in conjunction with behavioural micro-econometric models.

EUROMOD does not have an integrated method to model tax evasion and non-take-up of benefits. However, in some countries these are very relevant and are treated in a particular way. In Italy, tax evasion is imputed according to an estimate from the Italian statistical office. In order to prevent high differences between simulated eligibility and effective benefit take-up, some simulated benefits take the eligibility from the original database[51].

[51] See Sutherland (2001a, Table 3.10).

4 MICROSIMULATION DATA FOR SPAIN

The availability of micro-data with detailed information on individual demographic, social and economic characteristics, as well as on income and expenditure is essential to the development of a microsimulation model. Some of the most important features of microsimulation could not be achieved without micro-data. Most models use data from surveys and panels built by official statistical institution, such as Eurostat or the national statistical offices. The main advantages of these surveys are their representativeness at the national level and the quality of the data. The main drawback is that these surveys were not designed to be used by microsimulation models. As a result, some crucial information is not available in a suitable form or is not available at all. This section presents the some of the difficulties one must deal with in order to construct a microsimulation database out of survey data.

The data used to construct the microsimulation database come from the Spanish sample of the European Community Household Panel (ECHP), designed by Statistical Office of the European Community (Eurostat) and collected by the Spanish National Statistics Institute (INE). The data-file used is the User's Database (UDB), which is provided by Eurostat.

The information available in the database is representative of the Spanish population, with the exception of individuals living in institutions, hospitals and in the cities of Ceuta and Melilla[52]. The ECHP contains detailed data on income, housing and other demographic, social and economic characteristics of the respondents. The interviews are performed to all individuals in the household who are aged 16 or more. The information available for individuals below that age is restricted to basic demographic characteristics such as age, gender and relationship with the other household members. Most information available in each wave of the panel corresponds to the year of the interview. The main exception is

[52] According to the Spanish National Statistics Institute, 300,000 individuals lived in collective residences or institutions in Spain in 1991 (INE, 1991) and 140,000 lived in Ceuta and Melilla in 1995 (INE, 1995) ,

income, which is assessed as the annual amount received in the previous year.

Great part of the data used to construct the microsimulation dataset comes from the ECHP's third wave, which was collected in 1996. In order to reconcile the income data with labour characteristics, variables on employment and occupation were taken from the previous wave.

4.1 Adapting survey data for microsimulation

4.1.1 'Net-to-gross' conversion

One of the main problems one faces building a microsimulation database out of a survey's micro-data is that (in many cases) the income data available is net of income tax and social contributions. This data is not suitable to simulate the income tax, social contributions and many benefits because they are calculated on gross income. Therefore, converting the net income into gross amounts is essential.

Following equation (2.1), gross income (y) is the sum of net income (x), social contributions (c) and income tax withholding (t).

$$y = x + c + t \tag{2.1}$$

Hence, the conversion from net to gross depends on the functions of social contribution *c(.)* and income tax withholding *t(.)*. The simpler is the structure of these functions the easier is the solution. In Spain, these functions differ across types of income. Self-employment incomes, for example, have very simple functions. Social contributions are lump sum and withholdings are collected using a flat tax. As a result, the conversion from net to gross self-employment income rather is trivial.

$$x_{se} = y_{se} - c_{se} - y_{se} * t_{se} \longrightarrow y_{se} = \frac{x_{se} + c_{se}}{1 - t_{se}} \tag{2.2}$$

These functions are much more complex in the case of employment incomes. The base and the rate of social contributions on employment income depend on the worker's earnings and

employment characteristics '*z*' (type of activity, occupation, contract and number of months worked during the year). Income tax withholdings on employment income depend on the number of children '*k*' and income.

$$y_e = x_e + c_e(y_e, z) + y_e * t_e(y_e, k) \qquad (2.3)$$

Given the practical complexity of these functions, a numerical iterative method becomes necessary. A way of solving equation (2.3) is to iterate according to the following fixed-point algorithm:

$$y_e^{n+1} = f_x(y_e^n) = x_e + c_e(y_e, z) + y_e * t_e(y_e, k) \quad \text{with} \quad y_e^0 = x_e \qquad (2.4)$$

The existence of a fixed point is guaranteed if $f_x(y_e)$ is continuous. The solution will be unique if, in addition, $|f_x'(y_e)|<1$. Figure 2.4 represents the function f_x for a worker without children. As it can be seen, the function is not continuous and, in some intervals, the solution is not unique. Despite that, f_x could be easily approximated by a continuous and derivable function having a derivative lower than one, without any remarkable empirical implication (Levy and Mercader-Prats, 1999).

Figure 2.4 Gross and net employment income for a worker without children

4.1.2 Splitting Social Benefits

Another problem that is relatively frequent when using survey data is that some types of income (especially social benefits) are aggregated in a common variable. This aggregation prevents one from simulating and the analysing of some benefits.

The ECHP's User Database aggregate all benefits related to a specific social function (old age, unemployment, family, etc.) in a single variable. Practically, no Spanish benefit can be assessed separately in the database. To overcome this drawback some imputation methods were used to split the aggregated variables into as many benefits as possible. A detailed work based on the information provided by the survey and current legislation was carried out this division.

i) Unemployment-related benefits

There are two unemployment benefits in Spain. The *unemployment insurance benefit* is paid to those who have contributed at least 360 days in the last 6 years before getting unemployed. The duration and the amount of the benefit depend on the contributory history and the number of dependent children. The *unemployment assistance benefit* is paid to those who have not contributed enough months to get unemployment insurance or whose eligibility has expired, to emigrants who are returning to Spain, to workers who have recovered from severe invalidity and to recent liberated prisoners. The duration of the benefit depends on personal and family's circumstances. The amount is fixed at 75 percent of the minimum wage (extra pays are not included).

ECHP's User Database does not distinguish one benefit from the other. They are both included in a single variable named *unemployment-related benefits*. Although both benefits depend somehow on the worker's contribution history, some partial simulations of considerable interest (for instance, changing the amount of the benefits or replacing one or the other by a new benefit) could be done if these benefits are assessed separately.

A priori, the identification of the type of benefit should be straightforward. The minimum

amount of the unemployment insurance (u_i) is higher than the fixed amount of unemployment assistance (u_a). Therefore, if the observed unemployment benefit (U) was paid the same number of months (m) to all individuals the separation would be obvious.

$$\begin{cases} U/m \geq u_i \longrightarrow \text{unemp. insurance} \\ U/m \cong u_{ai} \longrightarrow \text{unemp. assistance} \end{cases} \tag{2.5}$$

However, the number of months that these benefits are paid in a year can vary considerable across individuals. Thus, it is necessary to compute all the possible combinations of type of unemployment benefit and number of pays. The annual amount of benefit derived from each combination is compared to the amount reported in the database. The combination that minimizes the difference between these amounts is taken as the solution. In the case there is more than one solution, the combination that estimates a number of pays that is closer but not greater than the individual's observed number of months in unemployment is taken as the final solution.

Although the annual estimated benefits are very close to the observed in the data, the amounts are not exactly the same. Case-by-case analysis shows that most discrepancies are due to 'rounding' (i.e., the individuals report an approximation of the amount effectively received). Since one may simulate changes in these amounts, it is desirable that the amounts in the database are consistent with the existing tax-benefit system. This would assure that the effects measured in the simulations are due to tax-benefit changes and not to data imprecision. For this reason, the original annual unemployment benefits are replaced by the estimated amounts, which are consistent with the tax-benefit system.

ii) Old-age related benefits

There are three different old-age related benefits in Spain. The most important is the *old-age pension,* which is paid to all retired individuals who have contributed to social security for a certain number of years. The amount of the pension depends on the number of years contributed and the magnitude of these contributions. If the number or the amount of these contributions were low, the pension paid to the individual may be below a limit that the Social

Security sets as a minimum pension. In that case, the pensioner may be eligible to an income-tested *supplement benefit* that fills the gap between the old-age pension and the minimum limit. Finally, old-age individuals who have not contributed enough to receive a pension living in low-income families receive an *old-age assistance benefit*.

Differently from unemployment benefits, the distribution of old-age benefits is quite stable along the year (pensioners are not likely to change their status). Moreover, the amounts and the eligibility criteria of the benefits are substantially different. Therefore, identifying the types of benefits according to their rules is relatively straightforward[53]. If the amount of the observed benefit is higher than the minimum pension, then the individual receives 'pure' old-age insurance pension. If the pension is similar to the minimum pension (old-age assistance benefit) and the individual fulfils the eligibility criteria then the pensioner receives insurance pension and supplement (old-age assistance).

If the individual receives 'pure' old-age pension or old-age assistance then imputation is automatic: the whole amount is classified as the identified benefit. However, in the case of pensioners who receive supplement the imputation of the benefit is more problematic. One part of the benefit is paid as insurance pension and the other as supplement. No information in the database allows one to know which part corresponds to each benefit. Hence, the amounts are imputed according to the average share of these supplements published by Ministry of Social Affairs. In 1995, 27.4 percent of total benefits received by supplement receivers were supplements.

iii) Survivor benefits

The Spanish Social Security offer pensions to three groups of survivors: widows, orphans and other dependent relatives. Most of these benefits are contributory pensions that depend on the

[53] Some relevant details are forgone in the estimations. According to the benefit rules, the income test on pension supplements is calculated on net income from the previous year while the income test on old-age assistance is calculated using gross expected annual income in the current year. The imputations are based on the final annual net/gross income from the current year, respectively.

contribution history of the late relative and some receive a supplement. Unlike the old age, there are not assistance benefits for survivors in Spain.

Before splitting the benefits into pensions and supplements, it is necessary to identify the type of survivor. Since the ECHP reports the marital status of the individuals, the identification of widows is straightforward. On the other hand, there is no information about the relationship between the beneficiary and the late person, for this reason, one is not able to isolate orphans from other relatives.

The procedure to split survivor benefits is similar to the one used to old-age related benefits. The average share of supplements on total widow insurance pension, among supplement receivers, is estimated in 47.6 percent.

iv) Family related allowances

There are two family benefits in Spain: maternity and child benefit. Maternity benefit is a contributory benefit paid to women who adopt or have a child. The child benefit is income-tested and is paid to parents with children under 18. If the child is invalid and older than 18, the benefit is not income-tested and the amount is much higher.

The number of 'family related allowances' in ECHP's original data is well below the number child benefits[54]. The impression is that since the amount of the child benefit is so low (18 euro per month) and it is paid only twice a year, many families forget to report the child benefit. On the other hand, the ECHP provides all the information necessary to simulate the rules of the child benefit. The number of simulated child benefits as well as the simulated expenditure

[54] See discussion and numbers in section Chapter II.4.2.2.

on child benefits are quite close to the amounts reported by the social security (see 0)[55]. Given the good adjustment of the simulation, these estimated child benefits are imputed into the data. If the simulated beneficiary (or her/his partner) originally reports family benefit, then the positive difference between the original family benefit and the imputed child benefit is taken as 'other family benefits'.

4.2 The Quality of Income Data

Previous studies have questioned the quality of income data in Spanish surveys (see Sanz (1995) and Andrés and Mercader (2001)). Therefore, a detailed analysis on the quality of income data is necessary before their used.

This section uses two approaches to assess the quality of the income data: internal consistency and compatibility with external sources. The internal consistency of the data is assessed crossing income data with other information available in the survey that are linked to this income (for example, the employment status). The comparison with external sources is assessed contrasting the data's output to statistics published in official reports. This approach is similar to the one used by Sanz (1995) to study the Spanish 1990 Household Budget Survey and by Andrés and Mercader-Prats (2001) to examine the first wave of the ECHP Production Database.

[55] Despite the good adjustment of simulations in comparison with Social Security's statistics, two issues may alter the quality of these estimations, at least in some households. First, while the rules require the income-test to be calculated on the annual income from the *previous* year, the simulations use income from the *current* year. Second, while the rules and the household incomes are from 1995, the demographic characteristics (for instance, number of household members and age) are taken from 1996. As a result, some individuals who are eligible (not eligible) to child benefit in the simulations may not (may) be eligible in 1995 due to differences in demographic characteristics or income.

4.2.1 Market incomes

ECHP provides four different sources of market income: employment income, self-employment income, interests and rents. The amounts are annual and net of income tax withholdings and social insurance contributions.

As already explained, the internal consistency assessment results from comparing the number of individuals who report a certain market income (for instance, employment income) to the number of individuals who report to have an employment status suitable with this type of income (to be an employee). However, this comparison must be analysed with caution. Individuals can have more than one source of income at the same time or change the employment status during the year. Therefore, the employment status reported in the ECHP may not be unique. This is especially relevant in Spain, where temporary jobs are frequent in labour-intensive sectors such as tourism. To minimise potential errors, the employment status is check in a month basis.

Regarding the external validation, there are two main sources of official statistics on market income in Spain: National Accounts (NA) and Fiscal Statistics (FS). The European system of National Accounts was reformed in 1995. For this reason, the Spanish statistical office (INE) has published two volumes with statistics for 1995. The first one uses the 1979 European system of National Accounts and takes 1986 as reference year (NA86). The second uses 1995 European system and 1995 as reference year (NA95). Although the second volume is expected to be more reliable, the first one offers figures that can be used to measure net incomes. The Fiscal Statistics are published by the Ministry of Finance and are based on income tax withholdings registers and on filed income tax returns. One of the advantages of Fiscal Sources is that statistics are provided by income brackets. The main drawback is that it does not include statistics for the Basque Country and Navarre, since these regions have independent tax systems.

Table 2.5 Internal Consistency of ECHP Data

	Number of earners (A)	*Number of individuals with related employment status (B)*	*A / B (in %)*
Employment income	11,229,055	11,237,538	99.9%
Self-employment income	2,191,996	2,733,736	80.2%

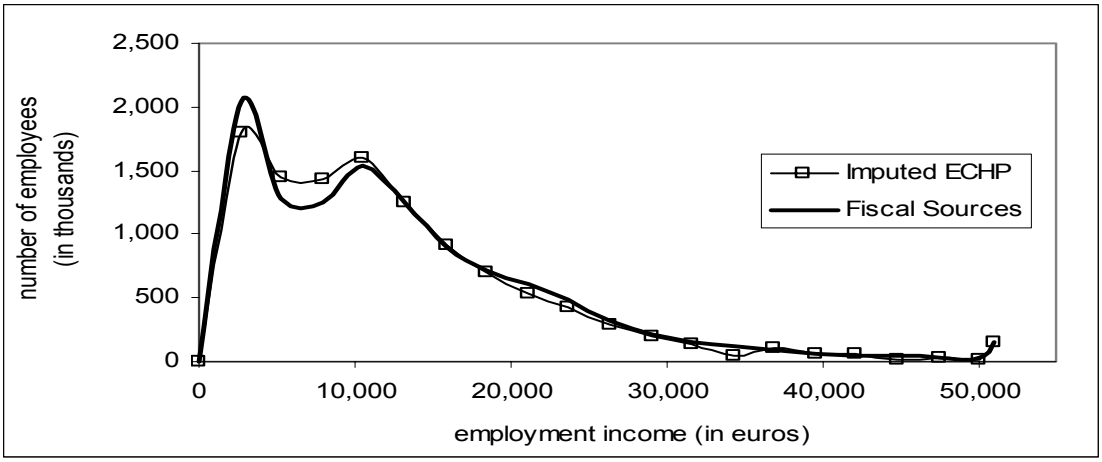
Source: ECHP 1996, own calculations

i) Employment income

Employment incomes in the ECHP are consistent with the employment status reported by the individuals. Practically all individuals who report to have been an employee at least one month in 1995 report some employment income. According to Table 2.5 only 8,500 employees (3 observations in the sample) do not report earnings.

The number of employees also seems to be correct in comparison to external sources. The amounts are especially close to the ones in the 1995 National Accounts and in the Fiscal Statistics. Figure 2.5 shows the distribution of the number of employees by income brackets. Both distributions are very similar, although the micro-data slightly underestimates the number of employees who receive less than 2,500 euros per year and overestimates of those with earnings between 2,500 and 5,000.

Figure 2.5 Number of Employees by Income Bracket (1995 figures)



Sources: ECHP 1996, own calculations and Ministerio de Hacienda (2003)

Previous studies have shown that aggregate employment incomes in household surveys are lower than National Accounts statistics[56]. Table 2.6 demonstrates that ECHP data also underestimates aggregated employment income in comparison to National Accounts. Net wages and salaries reported in the ECHP are equal to 92 percent of 1986 National Accounts' net employment income. There is a great discrepancy between aggregate employment income in 1986 and 1995 National Accounts. The aggregate gross wages imputed in the ECHP are closer to the number presented by NA86, although NA95 is expected to be more reliable.

Table 2.6 Number of Earners and Aggregate Employment Income (1995 figures)

Source	*Earners (thousands)*			*Amount (millions of euros)*		
	Data (1)	*Official* (2)	*Ratio* (1) / (2)	*Data* (4)	*Official* (5)	*Ratio* (4) / (5)
Employment income						
Net income	-	-		105,102 (i)	113,730 (a)	92%
Gross income	-	-		132,503 (ii)	149,922 (a)	88%
Gross income	11,229	11,089 (b)	101%	132,503 (ii)	172,879 (b)	77%
Average number	9,324 (iii)	8,943 (c)	104%			
Gross income	11,229 (ii)	11,344 (d)	99%	132,503 (iii)	138,692 (d)	96%

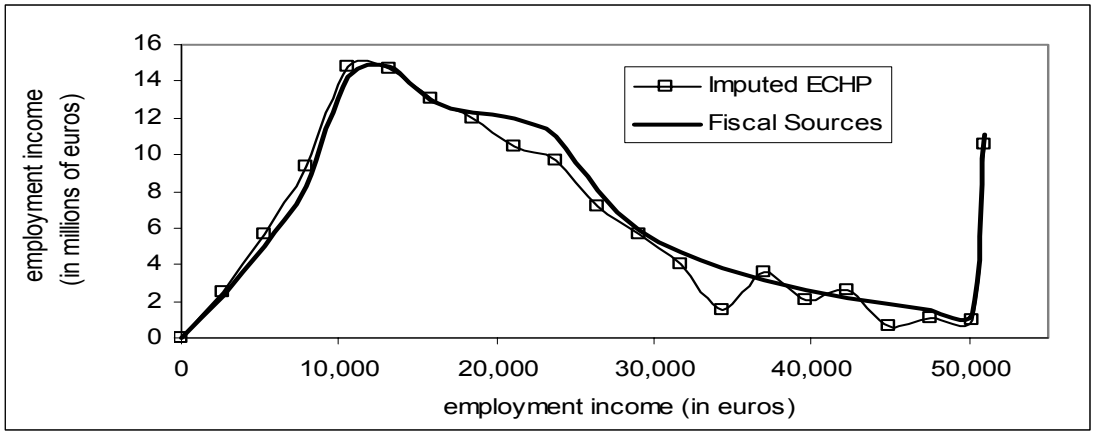
Notes: (i) Original data; (ii) Imputed data; (iii) Number estimated as the number of earners multiplied by the average number of months receiving this income divided by 12

Sources: ECHP 1996, own calculations and (a) INE (1998) National Accounts base year 1986 – Aggregate net earnings; (b) INE (2002) National Accounts base year 1995 – Number and aggregate gross earnings; (c) MTAS (1996) Active Population Survey 1995 – Average number of earners in the year, (d) Ministerio de Hacienda (2003) Fiscal Sources from withholdings – Number of workers and aggregate gross earnings, (e) Ministerio de Hacienda (1997) Income Tax Statistics 1996 – Number of tax returns and earnings net of social contributions.

In comparison to Fiscal Statistics, aggregate gross employment incomes are slightly underestimated in the data. Figure 2.6 describes the distribution of the aggregated employment income by brackets of gross employment income in fiscal sources and in the micro-data. It shows that the underestimation is concentrated in three segments of the income distribution, one in the middle (around 20,000 euros per year) and two in the upper part of the distribution. According to this figure, high incomes (above 50,000 euros per year) are well represented in the dataset.

[56] See Sanz (1995) for the Spanish household budget survey, Andrés and Mercader (2001) for the first wave of the Spanish ECHP, Atkinson and Mickleright (1983) for the UK and Brandolini (1999) for Italy.

Figure 2.6 Employment Income by Income Bracket (1995 figures)



Sources: ECHP 1996, own calculations and Ministerio de Hacienda (2003)

These comparisons allow one to draw some relevant conclusions. First, the employment income reported in the data is significantly lower than National Accounts aggregates, although it is consistent with income tax registers. Therefore, in the case the differences between national accounts, data and fiscal statistics are due to data underreport and tax evasion (instead of some methodological difference), then it can be argued that the pattern of underreporting in the ECHP is very similar to the pattern of tax evasion in the income tax. Second, the good adjustment of imputed gross employment incomes vis-à-vis fiscal statistics suggests that the net to gross algorithm functions correctly. Finally, employment incomes make up about 80 percent of the income tax gross taxable income, thus the data allow the model to produce fair results in terms of the tax aggregates and individual tax liabilities for most households and individuals.

ii) Self-employment income

Only part of the self-employed workers reports their earnings in the ECHP. According to Table 2.5, 20 percent of those who have been self-employed at least one month in 1995 do not report self-employment earnings.

Table 2.7 shows that the average number of self-employees who report income represents 66% of the number of self-employees in the Active Population Survey (this percentage raises to 82% if self-employees who do no report earnings in data are included). Comparing to

income tax statistics, the number of earners in the data are underreported by 26 percent (12 percent if those not reporting earnings are included).

Table 2.7 Number of Earners and Aggregate Sef-employment Income (1995 figures)

Source	*Earners (thousands)*			*Amount (millions of euros)*		
	Data (1)	*Official (2)*	*Ratio (1) / (2)*	*Data (4)*	*Official (5)*	*Ratio (4) / (5)*
Self-employment						
Net income	-	-	-	18,879 (i)	22,924 (e)	82%
Gross income	-	-	-	26,726 (ii)	- (a)	-
Gross income	-	-	-	26,726 (ii)	81,963 (b)	33%
Average number	2,044 (iii)	3,099 (c)	66%	-	-	-
Average number	2,536 (iii)	3,099 (c)	82%	-	-	-
Gross income	2,192 (ii)	2,951 (e)	74%	26,726 (ii)	22,924 (e)	117%

Notes: (i) Original data; (ii) Imputed data; (iii) Number estimated as the number of earners multiplied by the average number of months receiving this income divided by 12

Sources: ECHP 1996, own calculations and (a) INE (1998) National Accounts base year 1986 – Aggregate net earnings; (b) INE (2002) National Accounts base year 1995 – Number and aggregate gross earnings; (c) MTAS (1996) Active Population Survey 1995 – Average number of earners in the year, (d) Ministerio de Hacienda (2003) Fiscal Sources from withholdings – Number of workers and aggregate gross earnings, (e) Ministerio de Hacienda (1997) Income Tax Statistics 1996 – Number of tax returns and earnings net of social contributions.

Regarding income aggregates, the data's aggregate gross self-employment income represents just one third of the amount in NA95. However, the difference is much lower when comparing to Fiscal Statistics. Net self-employment incomes reported in the data are 18 percent lower than in income tax records.

In sum, ECHP self-employment incomes are not comparable with national account's figures. However, the amounts are much closer to other external sources, such as the income tax statistics. These big differences between external sources may be due to different accounting methodologies and/or to tax evasion. The comparison suggests that self-employees tend to underreport their earnings in the ECHP in somewhat the same degree they evade the income tax. Nevertheless, the adjustment could be improved if income was imputed to self-employed workers who do not report income in the ECHP.

iii) Capital and Property income

National accounts and Inland Revenue also show a great discrepancy in the measurement of capital and property incomes. Aggregate interests and dividends in national account more than double the amount reported in the income tax. This divergence is smaller when measuring income from rents. Despite these discrepancies in the external sources, Table 2.8 proves that capital incomes are highly underreported in the ECHP. Net interests represent less than one third of the amount declared to the income tax. Regarding income from rents, the aggregate amount reported in the ECHP adds up 40 percent of the figure in the income tax. ECHP data also underestimates the aggregate number of people who have capital income.

In sum, capital incomes are poorly reported in the ECHP. Therefore, the microsimulation database is not suitable for analysis on tax-benefit reform on investment income. Recently two works have tried to overcome this drawback by imputing the capital from a more reliable database (Ministry of Finance's Taxpayers Panel) by means of a statistical matching to the 1991 Spanish Household Budget Survey (Alegre et al, 2001) and to the 1995 ECHP (Gago and Picos, 2003).

Table 2.8 Number of Earners and Aggregate Capital Income (1995 figures)

Source	*Earners (thousands)*			*Amount (millions of euros)*		
	Data (1)	*Official (2)*	*Ratio (1) / (2)*	*Data (4)*	*Official (5)*	*Ratio (4) / (5)*
Interests						
Net income	6,005 (i)	-	-	3,629 (i)		-
Gross income	6,005 (ii)	-	-	4,838 (ii)	27,404 (b)	18%
Gross income	6,005 (ii)	6,724 (e)	89%	4,838 (ii)	12,031 (e)	40%
Rents						
Net income	609 (i)	-	-	1,585 (i)	-	-
Gross income	609 (ii)	-	-	1,585 (ii)	5,762 (b)	28%
Gross income	609 (ii)	1,081 (e)	56%	1,585 (ii)	4,106 (e)	39%

Notes: (i) Original data; (ii) Imputed data; (iii) Number estimated as the number of earners multiplied by the average number of months receiving this income divided by 12

Sources: ECHP 1996, own calculations and (a) INE (1998) National Accounts base year 1986 – Aggregate net earnings; (b) INE (2002) National Accounts base year 1995 – Number and aggregate gross earnings; (c) MTAS (1996) Active Population Survey 1995 – Average number of earners in the year, (d) Ministerio de Hacienda (2003) Fiscal Sources from withholdings – Number of workers and aggregate gross earnings, (e) Ministerio de Hacienda (1997) Income Tax Statistics 1996 – Number of tax returns and earnings net of social contributions.

4.2.2 Social Benefits

Section 4.1.2 has shown that some ECHP benefit variables were split and imputed in order to have more detail in the database. Here, the original and the imputed benefits are compared with external statistics. The most extensive and detailed source of statistics on social benefits in Spain is the Social Security's Annual Statistical Report (SSASR). This report provides information on all social benefits by type of benefits, regions, age and other characteristics. SSASR expresses all figures in terms of 'average number of beneficiaries per month in the year'. This can be very different from the 'total number of beneficiaries in the year' that is the data available in the ECHP. To overcome this drawback other statistics (such as Fiscal Statistics) are used to complement this information.

Table 2.9 Number of Recipients and Aggregate Social Benefits (1995 figures)

Source	*Recipients (thousands)*			*Amount (millions of euros)*		
	Data (1)	*Official (2)*	*Ratio (1) / (2)*	*Data (4)*	*Official (5)*	*Ratio (4) / (5)*
Unemployment benefits						
Original unemployment benefits	1,882	-	-	4,828	7,834 [c]	62%
Imputed unemployment benefits	1,882	2,967 [b]	63%	4,934	6,916 [t]	71%
Imputed unemployment insurance	915	622 [a]	147%	2,859	4,855 [c]	59%
Imputed unemployment assistance	967	830 [a]	117%	2,075	2,979 [c]	70%
Old-age and invalidity benefits						
Original old-age benefits	5,932	5,663 [a]	105%	36,224	34,121 [a]	106%
Original old-age benefits	4,438	4,480 [d]	99%	29,106	26,174 [d]	119%
Imputed old-age benefits	4,438	4,480 [d]	99%	33,415	26,174 [d]	119%
Imputed old-age pension	4,208	4,229 [d]	100%	29,080	23,947 [c]	121%
Imputed old-age supplement	1,109	1,365 [d]	81%	1,557	1,557 [c]	100%
Imputed old-age assistance	231	252 [d]	91%	611	670 [c]	91%
Original invalidity benefits	1,528	1,236 [d]	124%	7,119	9,087 [d]	78%
Imputed invalidity benefits	1,528	1,236 [d]	124%	7,468	9,087 [d]	82%
Survivor benefits						
Original survivor benefits	1,829	2,049 [a]	89%	7,682	7,630 [a]	101%
Imputed survivor benefits	1,829	2,049 [a]	89%	7,763	7,630 [a]	102%
Imputed widow pension	1,719	1,837 [a]	94%	5,927	7,024 [a]	84%
Imputed widow supplement	821	884 [a]	93%	1,475	1,475 [a]	100%
Imputed other benefits	111	212 [a]	52%	322	606 [a]	53%
Family benefits						
Original family benefits	385	-	-	541	908 [a]	60%
Imputed family benefits	1,138	-	-	804	908 [a]	88%
Imputed child benefit	926	853 [a]	109%	334	329 [a]	101%
Other family benefits	282	-	-	470	578 [a]	81%
'Invalid' child benefit	-	147 [a]	-	-	247 [a]	-
Maternity benefit	-	-	-	-	331 [a]	-
Social assistance benefits						
Original social assistance benefits	75	60 [e]	126%	142	165 [e]	86%

Notes: (a) MTAS (1996) Social Security Annual Statistical Report 1995– Average number of recipients and aggregate gross benefits[57]; (b) Ministerio de Hacienda (2003) Fiscal Sources from collecting withholdings – Number of recipients and aggregate annual gross benefits; (c) Estimated figures using MTAS (1996) and MTAS (1999) [58]; (d) CCOO (2001); (e) Ayala (2000).

[57] SSASR expresses the expenditure on benefits in terms of 'average monthly benefit per recipient'. Total annual amounts presented are estimated as the number of 'average recipients' multiplied by the average monthly amount and by the number of pays (many social benefits include 2 extra pays).

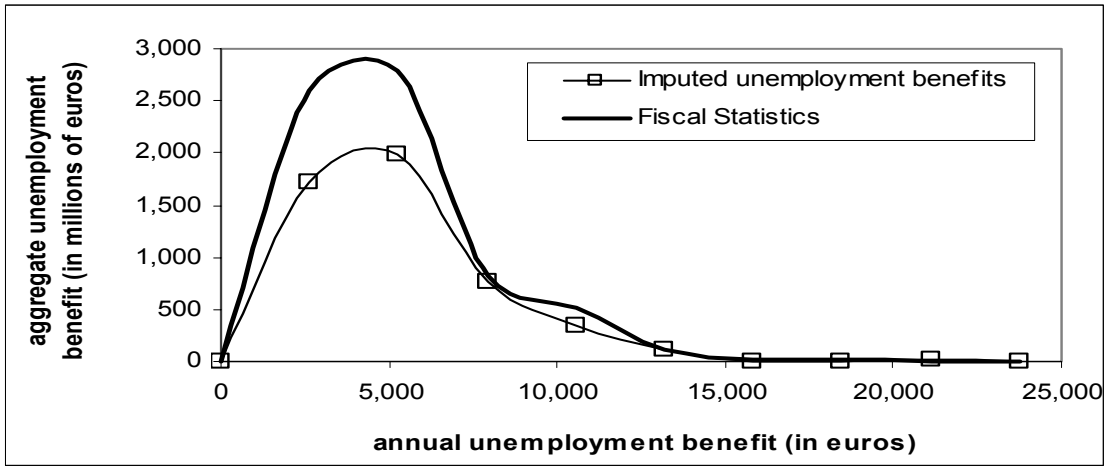
[58] In 1998, the Spanish social security changed the definition of pensions, setting all pensions paid to those over 65 as old-age pensions. After this change the distribution of old-age and invalidity benefits in SSASR's is similar very to the one in the ECHP. The 1995 figures were estimated as the sum of old-age and incapacity benefits in 1995 multiplied by the share of each of these benefits in 1998.

i) Unemployment benefits

Table 2.9 compares the number of recipients and the aggregate expenditure per type of benefit. As already commented, the numbers of recipients published by the SSASR are not comparable to the ones calculated in the data. In comparison to fiscal statistics (which are comparable), the number of recipients in the data is underestimated by 40 percent and the aggregate expenditure on unemployment benefits is underestimated by 30 percent. Figure 2.7 shows that the underreporting is concentrated among those who receive around 5,000 euros per year. According to CCOO (2001), the expenditure on unemployment benefits is higher than the one published in Fiscal Statistics. As a result, the level of underestimation on aggregate expenditure in comparison to CCOO's figure is 40 percent.

The results also show that the data is particularly deficient representing unemployment insurance benefits (it underreports by more than 40 percent). Aggregated unemployment assistance benefits are also not well reported, it is almost 30 percent lower than CCOO's figures.

Figure 2.7 Unemployment Benefits by Income Bracket (1995 figures)



Sources: ECHP 1996, own calculations and Ministerio de Hacienda (2003)

ii) Old-age, and Invalidity benefits

Until 1998, the Spanish Social Security counted great part of the pensioners above 65 as invalidity pensioners. This accounting method is not compatible with ECHP's data, where

most pensioners above 65 are computed as old-age pensioners. Table 2.9 makes clear the problem. Taking old-age and invalidity pensions together, the number of recipients and the aggregate expenditure in the data are very close to Social Security's figures. However, if these pensions were assessed separately the figures would be substantially different.

In order to have comparable statistics, SSASR's old-age and incapacity benefit numbers were estimated (see footnote 58). The results show that the imputations described in section 4.1.2 have correctly identified most beneficiaries of old-age insurance pensions, pension supplement and old-age assistance benefits. Despite that, old-age assistance and old-age supplements are slightly underreported in the microsimulation data.

On the other hand, the data overestimates the aggregate expenditure on old-age insurance pensions by 20 percent. The aggregate expenditure on old-age supplements is imputed accordingly to the Social Security's statistics, for this reason, the data results are the same.

Finally, the number of incapacity benefits in the data is higher than the number in the SSASR. This is because many beneficiaries of temporary incapacity change their status along the year. Therefore, the average number of recipients tends to be significantly lower than the total number of recipients in the year. In contrast, the data's aggregate expenditure on incapacity benefits is slightly underestimated.

iii) Survivor benefits

According to Table 2.9, the microsimulation data underestimates the number of survivor benefits. The table shows that this underestimation is especially significant among other survivor pensions (orphans and other relatives). The main reason for it is that the ECHP does not interview household members under 16 and, as a result, does not assess the pensions that these children may receive.

Most survivor benefits in Spain are below the income tax exemption limit. For this reason, the net to gross algorithm hardly changes the aggregate amount of these benefits. On the other hand, the method used to split survivor benefits identifies almost 90 percent of the widows

who receive a pension supplement. The aggregate expenditure on pension supplements is imputed accordingly to the SSASR's statistics, for this reason, ECHP's results are exactly the same.

iv) Family-related benefits

The number of recipients and the aggregate expenditure on family related benefits in the original data are notably lower than the official figures. Only 385,000 individuals report some family benefit in the data. According to MTAS (1996), 1 million families received child benefit in 1995. It is clear that child benefits are underreported in the data. This problem was overcome by simulating and imputing child benefit to all eligible parents (see section 4.1.2).

Table 2.9 compares the family benefits before and after the imputation to official statistics. The table shows that the imputations estimate correctly the number and the expenditure on child benefit for non-invalid children. On the other hand, the data underestimates the expenditure on other family benefits (child benefit for invalid children and maternity benefit) by 20 percent.

v) Social Assistance benefits

There is not a well-developed central social assistance benefit in Spain. Instead, every regional government has its own social assistance program (usually named *minimum income guarantee*). The eligibility rules, the amount of the benefit and effective coverage of these programs vary considerably from region to region. Moreover, there are not official statistics on the number of recipients and aggregate expenditure on these programs for all regions in 1995. The only statistics available for that year are provided by Ayala (2000). Table 2.9 shows that the micro-data overestimates the number of households receiving social assistance and underestimates the total expenditure on these benefits.

4.3 Updating the database to the current year

One of the main objectives of a microsimulation model is to simulate reforms on the current

tax-benefit system. Ideally, the best way to do so is to use micro-data from the present year. However, to have access to micro-data from current year is practically impossible. Even if the institution that collects the data could check, correct, impute and make it available immediately, some relevant information such as annual income could only be assessed once the year has finished. Consequently, in most cases microsimulation models rely on data from an earlier year.

In order to make the data from a previous year compatible and as representative as possible of the current year it must be updated. Sophisticated methods, such as sample re-weighting, have been developed to update micro-databases (see Atkinson et al., 1992). These methods are able to take into account changes in dimensions such as demographic or labour market characteristics.

The approach adopted here is much simpler. It consists of constructing factors based on external data to update the monetary variables.

4.3.1 Updating factors

Table 2.10 lists the statistics used to construct the updating factors for each monetary variable in the database. The factors for market incomes are constructed using 1995 National Accounts statistics. The advantage of using National Accounts is that they are made available much faster than Fiscal Statistics. Nevertheless, National Accounts statistics are only available after the year is finished. Therefore, they are of used to update market incomes up to the year before the current one. The factors to update from the previous to the current year are derived from government's macroeconomic forecasts on nominal GDP growth. National accounts are also used to calculate the updating factors for private transfers, unemployment insurance benefit, pensions and other benefits.

The factors to update income-tested social benefits (such as unemployment assistance or child benefit) are calculated accordingly to the change in the rules. Mortgage payments are updated by the variation in the average amount of mortgages published by the Spanish Central Bank (*Banco de España*). Finally, rents and medical expenses are updated by the variation of the

consumer price index on housing and medical expenses, respectively. Since these statistics are available once the year is finished, these expenditures are updated from the previous to the current year using the government's expected variation in CPI in the current year.

Table 2.10 Data used to build the updating factors

Monetary variable	*Data used to build the updating factors up to the previous year*	*Data used to build the updating factors from previous to the current year*
Employment earnings	Compensation of resident employees Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Self-employment earnings	Gross operating surplus Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Investment income	Interest and distr. income of corps. Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Property income	Other property income Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Private transfers	Other current transfers Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Unempl. insurance benefit	Social benefits Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Unempl. assistance benefit	Amount of the benefit Source: Social Security	Amount of the benefit Source: Social Security
Old-age pension	Social benefits Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Old-age pens supplement	Amount of the benefit Source: Social Security	Amount of the benefit Source: Social Security
Old-age assistance benefit	Amount of the benefit Source: Social Security	Amount of the benefit Source: Social Security
Widow pension	Social benefits Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Widow pens supplement	Amount of the benefit Source: Social Security	Amount of the benefit Source: Social Security
Incapacity benefits	Social benefits Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Other survivor benefits	Social benefits Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Child Benefit	Amount of the benefit Source: Social Security	Amount of the benefit Source: Social Security
Other family benefits	Social benefits Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Other benefits	Social benefits Source: National Accounts	Forecasted nominal GDP variation Source: Ministry of Economics
Mortgage Expenses	Growth of average mortgages Source: Mortgage Statistics (SCB)	Forecasted CPI variation Source: Ministry of Economics
Medical Expenses	Medical expenses Source: Consumer's Price Index	Forecasted CPI variation Source: Ministry of Economics
Rent expenses	House rent Source: Consumer's Price Index	Forecasted CPI variation Source: Ministry of Economics

4.3.2 The quality of the updated database

How reliable is the updated data? Given the lack of comparable external information, one is not able to know to what extent the updated micro-data is representative of the current population. However, a retrospective analysis can compare the outcomes of the 1995 income data updated to 1998 against 'real' 1998 income data from the ECHP 1999. This comparison

gives one some indications about the quality of the updating factors and the main problems of using outdated data. This section compares two sets of outcomes that are crucial in tax-benefit microsimulation: income aggregates and poverty rates.

- Incomes

Between 1995 and 1998, Spain experienced a considerable growth in the GDP and in employment. As a result, it would be expected that the number of individuals receiving market incomes in the updated data would be underestimated in contrast to the 1998 situation. At the same time, the increase in income and employment would probably lead the updated data to overestimate the number of recipients of income-tested and unemployment benefits. Finally, policies whose changes are related to demographic and social transitions (such as old age, survivors and invalidity pensions) are expected to vary less noticeably in a short period of time.

Table 2.11 shows that the updated data underestimates by 6 percent the number of employees in 1998. On the other, the updated data accurately estimates the increase of aggregate income. The table also shows that the number of self-employed and earners of capital income is much higher in the ECHP for 1998 than in the updated data. However, this change is not due to a 'real' increase in the number of earners but a higher rate of income reporting in the 1999 ECHP. According to official external sources, between 1995 and 1998 the number of self-employed and capital earners has decreased by 1.6 and 9 percent, respectively[59].

Regarding unemployment benefits, Table 2.11 shows that the updated data overestimates the number and the aggregate amount by 30 and 35 percent, respectively. Family benefits are also overestimated by 20 percent. Conversely, the number of old age and survivor pensioners is just slightly underestimated. Contrary to what would be expected, invalidity benefits vary

[59] According to the Active Population Survey, the number of self-employed individuals has changed from 3.1 million workers in 1995 and to 3.05 million in 1998. At the same time, the number of individuals who reported capital incomes in the income tax has decreased from 7.8 million in 1995 to 7.08 million in 1998.

considerably from 1995 to 1998. As a result, the updated data overestimates the number of recipients by 17 percent.

Table 2.11 Number of Recipients and Aggregate Income (1998 figures)

Type of income	*Number of income recipients (in thousands)*			*Aggregate annual income (10^6 euros)*		
	Data updated to 1998	*ECHP 1999 (1998 incomes)*	*Ratio ½*	*Data updated to 1998*	*ECHP 1999 (1998 incomes)*	*Ratio 3/4*
Employment	11,229	11,948	94%	122,413	122,737	100%
Self-employment	2,192	2,601	84%	21,989	30,033	73%
Capital	6,005	18,184	33%	3,019	5,619	54%
Unemployment ben.	1,882	1,453	129%	5,623	4,162	135%
Survivors benefits	1,829	1,891	97%	8,948	8,808	102%
Old-age benefits	4,438	4,618	96%	33,900	33,292	102%
Family benefits	385	319	121%	541	446	121%
Invalidity benefits	1,528	1,306	117%	8,291	6,502	128%

Sources: ECHP 1996, own calculations and INE (2003a)

- Poverty

The overall poverty rate using the updated data is very close to the one in the ECHP 1999. Nevertheless, Table 2.12 shows that the level of adjustment is not homogenous across age and gender groups. The updated data tends to underestimate the number of children and elderly people in poverty. The overestimation of family benefits in the updated data (see Table 2.11) is the most likely cause of the lower child poverty rate. Regarding old-age poverty, many elderly people receive benefits that are very close to the poverty line[60]. Hence, the slight overestimation of aggregate old age and survivors benefits (see Table 2.11) has incorrectly moved some recipients slightly above the poverty rate. On the other hand, the updated data overestimates the poverty rate among working age adults. The fall of unemployment and the increase in employment rates are the most probable causes of this overestimation. Finally, the data captures with good precision poverty rates among the young.

[60] Table 2.A.3 shows that the FGT1, which is a measure sensitive to the poverty gap, for the old-age is much lower than in any other age group and is relatively close to zero.

Table 2.12 Poverty rates in 1998 using the updated data and the ECHP 1999

	Population			*Male*			*Female*		
Age group	*Updated data*	*ECHP 1999*	*Ratio (1)/(2)*	*Updated data*	*ECHP 1999*	*Ratio (1)/(2)*	*Updated data*	*ECHP 1999*	*Ratio (1)/(2)*
All	18.8%	18.9%	99.3%	18.6%	18.5%	100.6%	18.9%	19.3%	98.1%
≤ 15	23.3%	25.0%	93.2%	22.1%	24.5%	90.2%	24.6%	25.7%	95.7%
16-29	20.4%	20.4%	100.1%	20.6%	20.3%	101.3%	20.3%	20.5%	98.9%
30-44	17.6%	17.2%	102.5%	16.6%	15.4%	108.0%	18.6%	19.1%	97.5%
45-64	17.7%	16.5%	107.5%	17.6%	16.6%	106.1%	17.8%	16.5%	108.1%
≥ 65	14.7%	16.2%	90.7%	15.4%	16.3%	94.6%	14.2%	16.1%	87.9%

Results obtained using OECD modified equivalence scale and 60 percent of median as poverty line
Sources: INE (2003a) and own calculation using ECHP 1996 updated data

5 MODEL VALIDATION

The previous section examined the quality of the database used by the microsimulation model. This section complements this information by comparing results of simulations carried out with ESPASIM to official statistics. In contrast to the previous section, now the outcomes rely not only on the quality of the data, but also on the quality of the microsimulation model.

5.1 Instruments of validation

Currently the most up-to-date data on social benefits and social contribution are from 2001, while the most recent external detail report on the income tax corresponds to 1999. As a result, the simulations were carried out for both years and the results are presented accordingly.

The outcomes presented here come from simulations using the microsimulation model ESPASIM. Nevertheless, analogous analysis performed with the microsimulation model EUROMOD show that both models provide similar results (Levy and Mercader, 2003).

5.2 Validation of Benefits

The external data used to validate social benefits comes from the Social Security's Annual Statistical Report (MTAS, 2002). Therefore, the same qualities and drawbacks mentioned in that section about this data are also applicable here.

Table 2.13 Number of recipients and aggregate expenditure on social benefits in 2001

Benefit	*Recipients (thousand)*			*Expenditure (million euro)*		
	ESPASIM (1)	*Official (2)*	*Ratio (1) / (2)*	*ESPASIM (4)*	*Official (5)*	*Ratio (4) / (5)*
Unemployment insurance	915	501	183%	3,805	4,728	80%
Unemployment assistance	967	591	164%	2,417	2,746	88%
Old-age insurance pension	4,208	4,546	93%	38,708	35,954	108%
Old-age pension supplement	1,109	1,398	79%	1,253	2,299	55%
Old-age assistance benefit	231	276	84%	781	938	83%
Widows insurance pensions	1,719	2,147	80%	7,889	8,606	92%
Widow minimum supplement	821	917	90%	1,537	1,890	81%
Sick/incapacity pensions	1,528	1,158	132%	9,941	11,551	86%
Social Assistance benefits	75	78	97%	189	210	90%
Child Benefit	771	573	134%	370	286	130%

Sources: ESPASIM/ECHP 1996, MTAS (2002)

- *Unemployment insurance*

Following Table 2.13, ESPASIM underestimates the aggregate expenditure on unemployment insurance benefit in 2001 by 20 percent[61]. Despite the important difference, it should be noticed that this gap is substantially lower than the underestimation assessed in the original data[62]. This reduction is mainly because the average number of recipients of unemployment insurance benefit fell by 20 percent between 1995 and 2001 (MTAS, 2002).

[61] Recall that the number of unemployment benefit recipients in the SSASR is not comparable to the figure provided by EspaSim (see section Chapter II.4.2.2).

[62] The original data underestimates the expenditure on unemployment insurance benefits in 1995 by 41 percent (see Table 2.9).

- *Unemployment assistance*

Unemployment assistance benefits describe a pattern similar to the one in unemployment insurance. According to MTAS (2002), the average number of recipients fell by 29 percent and the aggregate expenditure by 8 percent. As a result, ESPASIM underestimates the expenditure on unemployment assistance benefits by 12 percent, in contrast to the 30 percent underestimation in Table 2.9.

- *Old-age insurance pension*

Between 1995 and 2001, the number of old-age pensioners increased by 7 percent. Since the updating procedure does not re-weight the pensioner population, ESPASIM underestimates the number of recipients in 2001 by 7 percent. On the other hand, the model overestimates the overall expenditure by 8 percent. As a result, ESPASIM overestimates average old-age pensions by 16 percent.

- *Old-age pension supplement*

ESPASIM underestimates the number of old-age pension supplements by 21 percent. This is mainly due to the underestimation in the original data and to the increase in the number of beneficiaries between 1995 and 2001.

At the same time, given the underestimation of the number of recipients and the overestimation of average old-age insurance pensions[63], ESPASIM underestimates the aggregate expenditure on old-age supplements by 45 percent.

[63] Old-age supplement is calculated as the difference between the minimum pension established by the government and the individual's old-age insurance pension.

- *Old-age assistance benefit*

Table 2.13 shows that ESPASIM underestimates the number and the expenditure on old-age assistance benefits by 16 percent. The causes of these differences are the underestimation in the original data (see Table 2.9) and the 10 percent increase in the number of recipients between 1995 and 2001.

- *Widows insurance pensions*

ESPASIM underestimates the number and expenditure on widow insurance pensions by 20 and 8 percent, respectively. The underestimation of the number of beneficiaries results from the underestimation in the original data (see Table 2.9) and the increase, by 17 percent, in the number of recipients between 1995 and 2001. The underestimation of the expenditure is due to the underestimation in the original data.

- *Widow pension supplement*

The model underestimates the number and expenditure on widow pension supplement by 10 and 19 percent, respectively. The underestimation of the number is due to the underestimation in the original data (see Table 2.9) and the increase in the number of recipients between 1995 and 2001. The underestimation of the expenditure is due to the underestimation of the number of recipients and the overestimation of the average widow insurance pension.

- *Sick/incapacity benefits*

ESPASIM overestimates the number and underestimates the expenditure on sickness and invalidity benefits by 32 and 14 percent, respectively. As already commented in section 4.2.2ii), the overestimation of the number is mainly due to methodological differences in the way recipients are counted in ESPASIM and in the Social Security's report. On the other hand, the underestimation of the expenditure is because the original data underestimates these benefits.

- *Social Assistance benefits*

According to Table 2.13, the model underestimates the number of households and the expenditure on social assistance benefits by 3 and 10 percent, respectively. The original data overestimates the number of recipients by 26 percent. The good adjustment in 2001 is mainly due to the 30 percent increase in the number of beneficiaries between 1995 and 2001.

- *Child Benefit*

ESPASIM overestimates the number and the expenditure on child benefit for non-invalid children by 34 and 30 percent, respectively. Three reasons are behind this. First, given that the data has not been corrected for the fall in unemployment, the model must be overestimating the number of low-income families with children. Second, according to INE (2003b), between 1995 and 2001 the population under 18 years of age decreased from 8.2 to 7.3 million. Third, in 2000 the Spanish Social Security carried out some controls to tackle fraud among benefit claimants. As a result, the number of child benefits paid to families diminished by 13 percent in 2000, while in previous years the fall was between 3 and 4 percent.

5.3 Social insurance contributions

Between 1995 and 2001, the number of workers affiliated to Social Security increased by 27 percent. Since the data was not re-weighted to take into account this structural change, the model is expected to underestimate the number of contributions. Table 2.14 shows that the simulated number of contributions is 14 percent lower than the one in official statistics. The simulations are particularly deficient for the agricultural employees and non-agricultural self-employed regimes.

Given the underestimation in the number, the simulation also underestimates the aggregate revenue. However, it should be noticed that the model overestimates the revenue in the general regime. The reason is that ESPASIM includes some public servants (judges, members of the armed forces, university professors, etc.) that have special regimes of contribution in the general regime. Since these workers earn wages well above the mean, their contributions

distort the overall revenue.

Table 2.14 Social Insurance Contributions by Regimes, 2001

Regime	*Contributors (thousand)*			*Revenue (thousand euro)*		
	ESPASIM (1)	*Official (2)*	*Ratio (1) / (2)*	*ESPASIM (4)*	*Official (5)*	*Ratio (4) / (5)*
General	10,791	11,847	91%	10,085	7,846	129%
Agricultural workers	816	1,128	72%	803	961	84%
Agricultural Employees	438	812	54%	255	-	-
Agricultural Self-Employed	378	316	120%	548	-	-
Self Employed	1,814	2,675	68%	4,069	6572.13	62%
Total	13,421	15,650	86%	14,956	15,379	97%
Unemployed	1,882	-	-	176	163	108%

Sources: ESPASIM/ECHP 1996, MTAS (2002)

5.4 Income Tax

This section compares the aggregates simulated with ESPASIM to those from the 1999 Income Tax Report (ITR), the last published by Ministry of Finance.

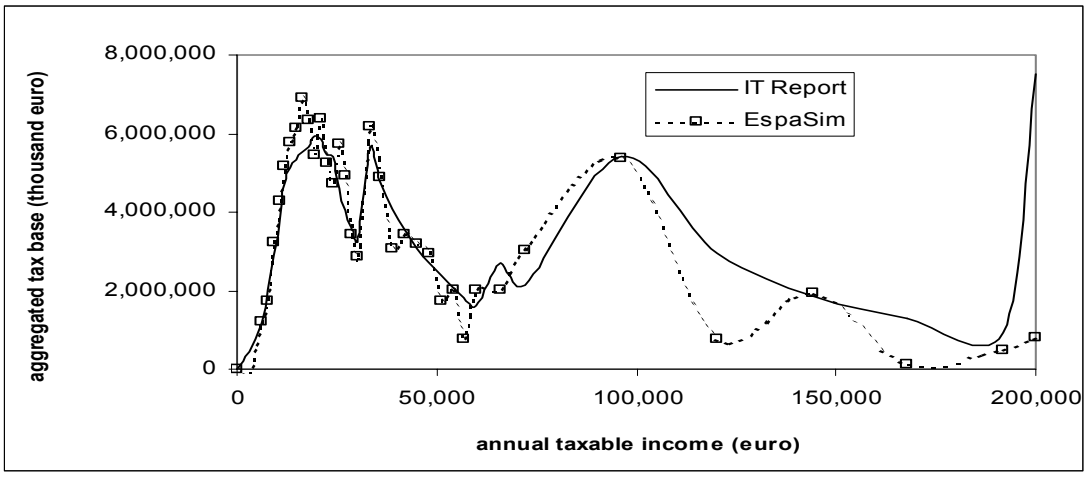
Table 2.15 demonstrates that ESPASIM is quite accurate simulating the most relevant elements of the Spanish income tax. The main drawbacks are the lack of data on irregular incomes, investments on pension plans, and the underestimation of capital and property incomes.

Net employment and self-employment incomes are slightly overestimated in ESPASIM. This is mainly because the updating procedure, described in section 4.3, tends to overrate the average income of individuals (see Table 2.11). In the end, this overestimation offsets the lack of data on pension plans and the underestimation of capital, property and irregular income. As a result, the simulated tax base is similar to the 'real' one. The simulation also estimates with good precision the personal and family tax allowances.

Figure 2.8 shows that very high incomes (above 100,000 euros) are not well captured by the

data[64], leading to a 6 percent underestimation of the 'gross' tax liability. On the other hand, ESPASIM does not simulate a considerable part of the tax credits. This more than compensates the overestimation of the gross tax liability, so that the simulated income tax revenue (net of tax credits) is 4 percent higher than the one published by the Ministry of Finance.

Figure 2.8 Aggregate Income Tax Base by Bracket of Taxable Income



Source: ESPASIM/ECHP 1996

[64] The underestimations are mainly on self-employment, capital and property incomes. High wages and salaries are reasonably estimated in the data. Figures in the appendix show the distribution of employment, self-employment, capital and property income by bracket of taxable income.

Table 2.15 Income Tax Aggregates

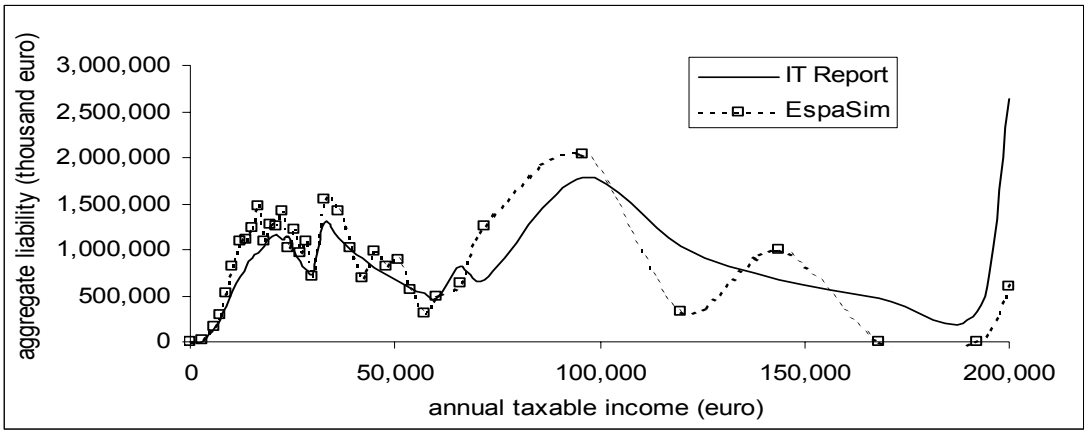
Aggregate	Income Tax Report	EspaSim	(2)/(1)
Taxable Income	**202,423,595**	**195,234,867**	**96%**
Net employment income	151,438,707	163,304,650	108%
Net self-employment income	25,922,995	26,624,558	103%
Capital income	7,937,653	3,195,618	40%
Property income	5,660,642	2,110,041	37%
Irregular incomes and others	11,463,598		0%
Tax Allowances	**71,725,471**	**67,933,208**	**95%**
Personal and family tax allowances	68,129,488	67,933,208	100%
Other tax allowances	137.337		0%
Investments on Pension Plans	3,269,784		0%
Child support	247,069		0%
Negative tax bases from previous years	78,993		0%
Tax base	**130,560,924**	**127,301,659**	**98%**
Tax Liability before Tax Credits	**34,620,106**	**32,663,519**	**94%**
Tax Credits	**4,396,358**	**1,294,201**	**29%**
Investment on culture and donations	48,187		0%
Mortgage	2,736,975	2,170,260	79%
House expenditure without mortgage	751,631		0%
Subsidies	54,414		0%
Incomes from Ceuta and Melilla	60,528		0%
Regional tax credits	20,949		0%
Compensations	1,108,382		0%
Net tax liability	**30.223.748**	**31,369,318**	**104%**

Sources: ESPASIM/ECHP 1996, IGAE (2002)

According to Figure 2.9, the simulation overestimates the aggregate tax liability of tax units[65] with income below 100,000 euro, while it underestimates the aggregated tax of very high incomes. Nevertheless, Figure 2.10 suggests that this inexactness is not expected to cause significant changes in the income distribution.

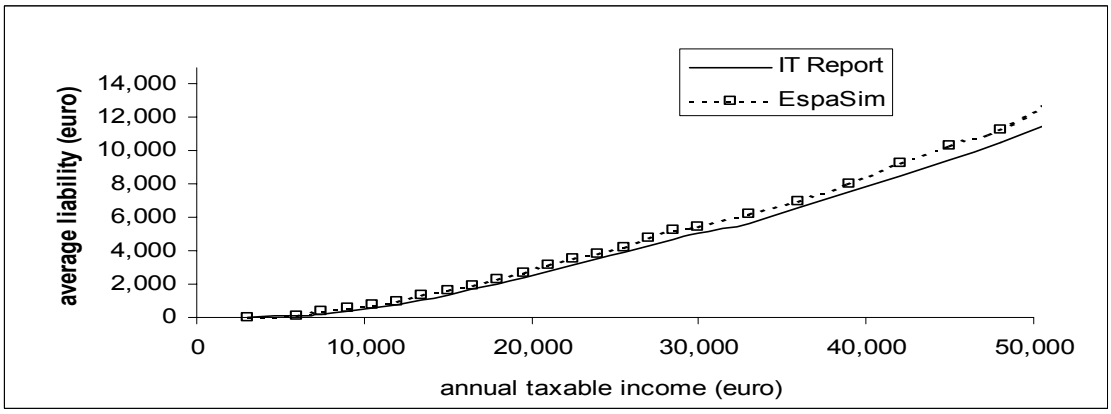
[65] The Income Tax Report does not assess the number of taxpayers but the number of tax returns and withholding communications sent to the Inland Revenue. This means that, for example, all individuals in a family that pay income tax under joint taxation are taken as one tax return. Throughout the exposition the term 'tax unit' is used to define the unit of assessment used in the ITR.

Figure 2.9 Aggregate Income Tax Liability by Bracket of Taxable Income



Source: ESPASIM/ECHP 1996

Figure 2.10 Average Income Tax Liability by Bracket of Taxable Income



Source: ESPASIM/ECHP 1996

6 CONCLUDING REMARKS

This chapter presented the Spanish and European microsimulation models used in the next chapters, analysed the quality of the data used by the models, and tested the reliability of the results produced by the models vis-à-vis official statistics.

Sections 2 and 3 showed that ESPASIM and EUROMOD are powerful instruments to analyse personal taxes and benefits and that their simulation cover a considerable part of the revenue and expenditure sides of the government's budget. Both models were designed following the same philosophy and, as a result, they share many characteristics. However, the models pursue different objectives. ESPASIM is a national model. Therefore, it is structured following the logic of the Spanish tax-benefit system and its simulation capacities are oriented

to country-specific issues. ESPASIM also aims to be accessible to a wider public, for this reason, accessibility and user-friendliness were two of the criteria guiding the construction of the model.

EUROMOD is a multi-country tax-benefit microsimulation model for all countries of the European Union and is a powerful instrument for research on tax-benefit reform in a comparative or in a supra-national perspective. One of the great innovations of EUROMOD is the construction of a flexible framework that is able to simulate in a consistent and integrated way the tax-benefit systems of many and very different countries. This allows one to simulate quite easily the system or the policy of a country in another.

Sections 4 and 5 studied to what extent micro-data from surveys are suitable for microsimulation analysis. The investigation was carried out using the Spanish data from ECHP 1996 and the microsimulation model ESPASIM.

The results showed that the ECHP 1996 is good representing employment and, to a lesser extent, self-employment income. On the other hand, capital and property income are quite deficient and incompatible with any attempt to simulate or analyse these income sources separately. Nevertheless, these incomes represent only 12 percent of Spanish household disposable income and are not expected influence results on overall income dramatically.

The data also adequately represents most social benefits. The two main exceptions are the unemployment and family benefits that are markedly underestimated.

The results also demonstrate that the adjustments done in the original data perform correctly. On the other hand, the procedure of grossing-up monetary variables using updating factors produces some distortions such as overestimation of unemployment and income-tested benefits and underestimation of the number of workers in times of economic growth. The magnitude of these distortions may be acceptable when the spell between the data year and the present time is small. Longer spells would require more sophisticated data treatment such as sample re-weighting.

Regarding the quality of the simulations, the results show that most outcomes are relatively close to official statistics. The main problems are related to lack of data (such as irregular incomes or pension plans), the underestimation of some variables in the original database (such as capital income and unemployment benefits), and the updating procedure (for instance, the overestimation of average pensions and employment income). In sum, the simulations carried out with the ECHP provide results that are satisfactory and suitable for the analysis of tax-benefit reform for most relevant policies in Spain.

7 APPENDIX

Table 2.A.1 Taxes and social contributions simulated by EUROMOD

	Simulated Taxes and Social Insurance Contributions (SICs)	*% of gross income + Employer SICs*
Austria	Income tax, SICs	33,5%
Belgium	Income tax, Property tax, SICs	40,7%
Denmark	Income taxes (national, church and local), SICs	40,7%
Finland	Income taxes (national, church and local), Capital income tax, SICs	30,2%
France	Income tax, Capital income tax, SICs, CSG/CRDS Contributions	36,6%
Germany	Income tax, Solidarity surplus tax, SICs	36,1%
Greece	Income tax, SICs	29,3%
Ireland	Income tax, SICs	19,1%
Italy	Income tax, SICs	33,1%
Luxembourg	Income tax, SICs	27,4%
Netherlands	Income tax, SICs	34,5%
Portugal	Income tax, Capital income tax, SICs	30,5%
Spain	Income tax, SICs	25,1%
UK	Income tax, SICs	24,2%

Source: Sutherland (2001a)

Table 2.A.2 Benefits simulated by EUROMOD

	Simulated Benefits	*% of disp. Income*	*% of total benefits*	*Benefits not simulated*
Austria	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	4,9%	11,9%	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
Belgium	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	7,1%	18,7%	Public Pensions (all types), Unemployment Benefits (all types) + Disability/Care/Accident/Sickness Benefits, Maternity Payments, 'Special Funds' Allocations
Denmark	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	28,7%	92,4%	Other Public Pensions (Supplementary (ATP); Survivor), Early Retirement Benefit ('Efterlon'), Sickness Benefits, Maternity Payments
Finland	Child Day Care Subsidy, Child Home Care Subsidy, Child Benefits, Lone Parent Benefit, General Housing Benefits	5,6%	14,0%	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

Continues…

	Simulated Benefits	*% of disp. Income*	*% of total benefits*	*Benefits not simulated*
Germany	Child Benefits, Housing Benefits ('Wohngeld'), Social Assistance East/West ('Sozialhilfe: Hilfe zum Lebensunterhalt')	3,5%	11,4%	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')
Greece	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)	3,3%	13,5%	Public Pensions (all types), Unemployment Benefits (all types), Disability/Care/Accident/Sickness Benefits, Maternity Payments, Housing Benefits
Ireland	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	20,7%	99,7%	Back to Work Allowance, Constant Attendance Allowance, Other Welfare Allowances, Unemployability Supplement

Continues…

	Simulated Benefits	*% of disp. Income*	*% of total benefits*	*Benefits not simulated*
Italy	Family Allowances, Supplementary Old Age/Survivor Pension, Supplementary Disability Pension	4,2%	13,7%	Public Pensions (all types), Unemployment Benefits (all types), Disability/Care/Accident/Sickness Benefits, Social Security (National, Provincial, Municipal, Other)
Luxembourg	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'), Housing Benefits	5,1%	16,0%	Public Pensions (all types), Unemployment Benefits (all types), Disability/Care/Accident/Sickness Benefits, Maternity Payments, 'Other Public Benefits'
Netherlands	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	15,7%	65,7%	Unemployment Benefits (all types), Social Assistance for the Self-Employed ('UBZ'), Disability/Care/Accident/Sickness Benefits
Portugal	Child Benefits, Social Assistance (minimum income)	2,1%	8,9%	Old-age Insurance (RGSS), Old-age Agricultural Insurance (RESSA) and Assistance, Survivors related Benefits, Sickness/invalidity Benefits, Family Benefits, Social Assistance (various schemes)
Spain	Child Benefits	0,4%	1,1%	Unemployment Insurance Benefit, Unemployment Assistance Benefit, Old-age (insurance an early retirement), Old-age (supplement), Old-age (non-contributory – new system), Old-age (assistance – old system), Survivors (widows or orphans, insurance), Widows (supplement), Sickness and Invalidity Benefits, Social Assistance Benefits (household social assistance, but not including child benefit), Family Benefits
United Kingdom	Income Support, Family Credit, Housing Benefits, Council Tax Benefit, Child Benefits, Job Seekers Allowance	9,8%	45,7%	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 children's allowance

Source: Sutherland (2001a)

Table 2.A.3 Poverty intensity by gender and age in the data updated to 1998

FGT1	population	male	female
Total Population	6.2%	6.1%	6.2%
Pop ≤ 15	8.2%	7.5%	9.0%
Pop 16-29	7.7%	8.0%	7.4%
Pop 30-44	5.9%	5.6%	6.3%
Pop 45-64	6.0%	6.1%	5.8%
Pop ≥ 65	2.5%	2.1%	2.8%

Source: ECHP updated to 1998

Chapter III

Child-targeted tax-benefit reform in Spain in a European context

1 INTRODUCTION

Higher unemployment and labour market instability, new household forms, decline of fertility rates and increasing female labour participation are changing the types of social needs and the groups at risk of falling into poverty and social exclusion. Among others, social protection for families with children is one of the most evident (Esping-Andersen and Sarassa, 2002).

This situation is particularly relevant in Spain, where social expenditure on family benefits is very modest. Two recent studies (Abramovici, 2003 and Bradshaw and Finch, 2002) show that Spain is one of the countries that spend least on family benefits in the European Union. Developing child-targeted policies in Spain, following the ones used in other EU countries, could be a valuable strategy in order to reach two important objectives: reducing child poverty and easing young couples' costs of having children.

The objective of this chapter is to analyse how reforming child-related benefits would affect public expenditure, income redistribution and child poverty in Spain. Henceforth, the term 'child-related benefits' is used to refer to cash social benefits, fiscal benefits (such as child tax allowances, tax credits or other tax alleviating elements), and other cash policy elements that are conditional on the existence of children in the household. In-kind benefits are not analysed here.

The analysis is divided in two parts. The first part compares the Spanish child-related benefits to those used in four EU countries (Denmark, France, Germany and UK). Then it examines the reforms of child-related benefits implemented in Spain in recent years, and studies what would happen if, instead of these reforms, Spain had adopted the benefits that are used in the other countries analysed here. These exercises allow one to learn more about alternative ways of reforming Spanish tax-benefit system, as well as to examine what could be the effect of an eventual 'harmonisation' of child oriented policies in the European Union.

This analysis is carried out making use of the European tax-benefit model EUROMOD[66]. The chapter is divided into six sections. After this introduction, section 2 briefly compares the situation of Spanish children vis-à-vis other EU countries. Section 3 presents some methodological issues related to the use of the microsimulation model EUROMOD, how simulations were carried out, as well as some definitions. Section 4 describes child-targeted policies for each country and compares their outcomes. Section 5 assesses the impact of recent reforms implemented in Spain, and simulates replacing these policies by the ones used in other EU countries. Conclusions are drawn up in Section 6.

2 THE SITUATION OF SPANISH CHILDREN IN A EUROPEAN CONTEXT

Spain is one of the countries with higher child poverty rates in Europe. According to a EUROSTAT study, child poverty in Spain is 3 percentage points higher than the average in the European Union (Mejer and Siermann, 2000). Moreover, Cantó et al (2002) find that in recent years (1990 to 1995) poverty rates among households with children have risen from 20 to 23 percent. The situation is very different among households without children. During the same period, poverty rate in this group fell from 12 to 10 percent.

There is some general evidence that children have a higher risk of being in poverty. Analysing 25 industrialised countries, Bradbury and Jäntii (1999) find that child poverty rates are higher than the overall poverty rate in 23 countries. Using an equivalence scale that gives less weight to children, Mejer and Siermann (2000) find that poverty among children is higher than the for the overall population in all the EU countries, except Denmark and Greece. This contrasts with the other group that has been traditionally thought to be at high poverty risk: the elderly. According to Bradbury and Jäntii (1999), in most countries, poverty rates among elderly people are lower than the overall poverty rate. This is particularly clear in Spain. Ordering thirteen[67] EU countries by overall poverty rates, Spain has the fifth highest poverty. Ordered by child poverty, Spain climbs up to the third place in the ranking (only UK and Ireland have

[66] See Chapter II for a description about the model.
[67] Sweden and Finland were not included in this analysis.

higher child poverty rates). However, among the elderly, Spain falls to the eleventh place, only the Netherlands and Luxembourg have lower elderly poverty rates.

Many issues are behind the higher poverty risk of children. The most obvious and relevant one is the labour force status of their parents. In the past, the 'male breadwinner model' assumed that working men were able to earn enough to maintain their families. Therefore, child poverty was associated to the father's unemployment. Today, higher labour insecurity, job change, unemployment spells and precarious work have removed the labour market foundations of this model (Esping-Andersen, 1999). Hence, the presence of second earner in the household has become decisive in to cover the economic needs of the family. Table 3.1 shows that children living in families with no earner face the highest poverty risk in all selected countries. However, the table also demonstrates that the poverty risk of children living in one-earner families is not lower than the overall risk. This is especially relevant in Spain, since 55 percent of the children live in one-earner families and the child poverty rate across the group is 21 percent.

Table 3.1 Children and Child Poverty Rates By Number of Household Earners

	Spain	Denmark	France	Germany	UK
Proportion of children living in households with :					
0 earner	**11.2%**	**9.0%**	**9.7%**	**13.1%**	**21.4%**
	(0.009)	(0.013)	(0.004)	(0.009)	(0.009)
1 earner	**55.5%**	**27.7%**	**40.8%**	**46.9%**	**31.3%**
	(0.005)	(0.019)	(0.008)	(0.023)	(0.007)
2+ earners	**33.3%**	**63.2%**	**49.5%**	**40.1%**	**47.3%**
	(0.011)	(0.018)	(0.008)	(0.023)	(0.012)
Child Poverty (headcount ratio)					
0 earner	**58.4%**	**17.5%**	**40.7%**	**50.0%**	**69.8%**
	(0.037)	(0.040)	(0.023)	(0.067)	(0.017)
1 earner	**21.0%**	**8.5%**	**12.4%**	**11.7%**	**25.4%**
	(0.013)	(0.014)	(0.011)	(0.011)	(0.021)
2+ earners	**9.1%**	**2.2%**	**2.7%**	**5.1%**	**9.1%**
	(0.013)	(0.009)	(0.003)	(0.008)	(0.009)
All	**21.2%**	**5.4%**	**10.4%**	**14.1%**	**27.2%**
Poverty line (equivalent household disposable income per month in 1998 euros)					
z	**359**	**818**	**666**	**665**	**624**

Notes: The poverty line is computed as 60% of median equivalent household income before family benefits (see section 3), per month . The equivalence scale used is the modified OECD. The poverty rates include family benefits, even though the poverty line is drawn without them. Euro exchange rates in december 31st 1998 were: Spain: 166.386; Denmark: 7.46; France: 6.56; Germany: 1.96; UK: 0.70. Earners are defined as all household members that receive employment or self-employment income. Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: Euromod

A second issue that is often related to child poverty is 'family change'. Lone-parenthood is the most clear and often-mentioned example of new family arrangements that face high poverty risk. Their incapacity to combine full-time work and childcare leads children in this type of family to face high poverty risk (see Table 3.2). Although child poverty rates in lone-parent households are similar to those in other European countries, in Spain (as well as in other southern European countries) the number of children living in this type of family is still small. According to Table 3.2, less than 3 percent of Spanish children live in lone-parent households. This contrasts to countries such as Germany or the UK, where the proportion is around 20 percent.

Table 3.2 Children and Child Poverty Rates By Household Type

	Spain	Denmark	France	Germany	UK
Proportion of children living in households formed by:					
Lone-parents	**2.6%**	**12.8%**	**7.8%**	**20.1%**	**19.1%**
	(0.002)	(0.008)	(0.006)	(0.021)	(0.011)
Couples with children	**68.1%**	**75.2%**	**76.5%**	**62.8%**	**69.4%**
	(0.012)	(0.010)	(0.007)	(0.018)	(0.010)
"Other adults" and children	**29.3%**	**12.0%**	**15.8%**	**17.1%**	**11.5%**
	(0.011)	(0.014)	(0.005)	(0.015)	(0.008)
Child Poverty (headcount ratio)					
Lone-parents	**44.7%**	**5.8%**	**9.0%**	**32.3%**	**49.5%**
	(0.058)	(0.021)	(0.021)	(0.053)	(0.020)
Couples with children	**17.9%**	**4.9%**	**8.9%**	**8.7%**	**22.3%**
	(0.017)	(0.011)	(0.008)	(0.009)	(0.008)
"Other adults" and children	**27.0%**	**8.0%**	**18.3%**	**12.3%**	**19.4%**
	(0.020)	(0.021)	(0.019)	(0.029)	(0.016)

Notes: Lone-parent families are one-adult only. Households that include a one-parent family and other adults is defined as "Other adults" households.
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: Euromod

At the same time, unemployment and labour market instability are especially concentrated among young adults in Spain. The unemployment rate among those aged under 30 is 2/3 higher than for the overall population. Moreover, this group faces high job instability. Almost 60 percent of individuals aged 16 to 29 works under temporary contracts (MTAS, 2000). In order to avoid falling into poverty, a large proportion of Spanish young people live with their parents. According to Fernández Cordón (1997), 72 percent of Spaniards aged 20 to 29 were living with their parents in 1994. Cantó-Sánchez and Mercader-Prats (1998) show that the employment status of young adults living in their parents' households affects the poverty risk of the household. The presence of employed young adults may protect the family from falling into poverty when the head of the household is not working. On the other hand, the presence of non-employed young adults substantially increases the child poverty risk. According to Table 3.2, while in Spain 30 percent of the children live in households with 'other adults' besides their parent(s) (in most cases elder siblings), in the other analysed countries this proportion ranges between 11 and 17 percent. At the same time, child poverty risk is significantly high in this group in Spain. This indicates that, in average, the presence of young adults in the household increases the poverty risk of children.

Delaying independence also gives the young an opportunity to save income to face the future costs of having a family. Most Spanish youngsters leave the parental home when they are ready to face these costs. Martínez and Ruiz-Castillo (2002) find that the decisions to leave home and to get married are simultaneous among Spanish youth. Furthermore, Ahn and Mira (2001) show that, besides marriage, the decision to have the first child is also conditional on leaving the parental home. Therefore, the delay in young people's independence reduces the fertility period of young couples and is one of the causes of the fall in fertility in Spain. According to EUROSTAT (2002), the fertility rate in Spain, in 2001, was 1.25 children per woman of fertile age, while the average in the EU was 1.47. Almost 50 percent of Spanish adults think that they have fewer children than they would like to. More than 80 percent of these adults point to economic reasons to explain why they do not have more children (CIS, 1998).

On the other hand, Spain is one of the countries that spend least on family and child protection in the EU. According to Abramovici (2003), only 2.7 percent of total social benefits were spent on family or children benefit in Spain in 2000. This contrast with 8.2 percent spent in average in the EU[68]. Besides the small expenditure, the design of child protection in Spain is also unsatisfactory. Sutherland (2001c) simulates the effects of increasing the amount of child benefits by a same proportion in four EU countries. Results show that a similar proportional increase in aggregate expenditure (as percentage of aggregate household disposable income) would reduce child poverty by 11 percent in Denmark and France, 13 percent in the UK and only 2 percent in Spain.

Therefore, reforming child-targeted policies in Spain could be an effective means to achieve two objectives that are of increasing importance in the Spanish political agenda. First, better child-oriented policies could reduce child poverty considerably. Second, policies that reduce the costs of having children could also provide an incentive for earlier leaving of the parental home and higher fertility.

[68] It should also be stressed that Spain has one of the lowest expenditures on social protection in EU.

3 METHODOLOGICAL ISSUES

This study makes use of the static microsimulation model EUROMOD. Previous works on child benefits have show the advantages of using EUROMOD for comparative analysis. Immervoll et al (1999) use the model to examine the extent to which differences in child benefits explain the difference in child poverty in the Netherlands and the UK. Sutherland (2001c) uses EUROMOD to measure the poverty reduction potential of the existing child benefits in four EU countries.

3.1 Simulations

The objective of the simulations is to assess the effect of 'child-targeted policies' on household disposable income. Here, child-targeted policies include not only those formally oriented to children, such as child benefits. Elements of policies that are conditional or related to the existence of children (such as day care, housing and social assistance benefits) are also included in the analysis. Identifying which part of these policies is targeted to children is not always clear-cut. It is necessary to establish a common criterion in order to assure a consistent comparison across countries. The criterion used here is that the policy must relate to 'strict childhood'. This means that only policies with eligibility or amount conditional on the existence of an individual who is defined as 'a dependent child under 18' are taken as child-targeted policies. The term strict is associated to the age limit. If, for instance, a benefit is given to all children under age 21, then the part of the benefit given to children under 18 is considered in the analysis. The benefit paid for individuals aged 18 to 21 is not considered a 'child-targeted policy'. Moreover, in the case of policies not exclusively targeted to children (such as social assistance or housing benefits), only the part conditional to the existence of children is computed[69].

It should be noticed that due to lack of data, EUROMOD does not simulate nor includes in-

[69] For example, the British *Income Support* is paid to low-income family units with or without children. However, the amount of the benefit increases if the individual or couple has a child. This 'complement' for having children is computed as a child-targeted policy.

kind benefits or public provided services. This is an important limitation in the analysis. Non-cash benefits have a significant effect on family and child welfare and play a major role on the policy debate in many countries. Bradbury and Jäntii (1999) suggest that comparisons of child poverty rates across countries may not change much including non-cash benefits or not[70]. Smeeding and Rainwater (2002) note that 'while non-cash benefits as a percent of GDP are far more equal across nations than are cash benefits, […] the nations that spend the most in cash incomes […] also spend the most on health and education combined'. The same tendency is found when analysing family benefits in continental Europe, Ireland and the UK. However, this trend does not hold when Scandinavian countries are included. In contrast to other EU countries, where in-kind benefits represent about one quarter of total family/child benefits, in EU Scandinavian countries the share is close to one half (Abramovici, 2002). Therefore, all results, particularly those for Denmark, should be interpreted with caution[71].

Nonetheless, cash benefits are relevant policy tools for child-oriented tax-benefit reforms. In many cases, cash benefits are able to offer similar or equivalent protection to non-cash benefits (for instance, childcare benefits could have an effect similar to public-provided or subsidised crèches). Moreover, given that they do not induce or restrict consumption to a particular pattern determined by the government, cash benefits are less paternalistic and have a clearer incidence (at least at the household level).

Table 3.3 lists the child-targeted policies that are assessed here. In order to have a better understanding of the structure implemented in each country, child-targeted policies are classified into six policy types: (1) tax reliefs, (2) income-related child benefits, (3) non-income-related child benefits, (4) childcare benefits, (5) housing benefits and (6) social assistance. Tax reliefs include all child-targeted elements of the income tax or social insurance contributions that may alter the tax liability. This category includes tax allowances and tax credits, as well as other child-related tax instruments such as the French family ratio

[70] Whiteford et al (1994) find that, despite differences in level, child poverty rates including and not including education and health benefits are strongly correlated.

[71] According to Abramovici (2002), Denmark is the country with highest proportion of family/child social protection spent on in-kind benefits (60 percent of total family/children protection).

(*quotient familial*). Income-related child benefits comprise all child benefits that are income-tested, while non-income-related child benefits are those not conditional on current income. Childcare benefits are those cash benefits paid for day-care expenditure on children. Housing and social assistance benefits are designed to protect other social needs but are more generous to families with children (extra level of generosity is assessed as a child-related policy).

Table 3.3 Child-targeted policies simulated in EUROMOD 1998

	Tax-reliefs	*Income related benefits*	*Non income related benefits*	*Housing benefits*	*Childcare*	*Social assistance*
Spain	• Income Tax - Child Tax credit	• Income-tested Child benefit				
Denmark			• Family Allowances • Ordinary Child Benefit • Extra Child Benefit • Special Child Benefit • Multi Child Benefit	• Housing benefit • Housing allowance	• Day-care subsidy	• Social Assistance
Germany	• Income Tax - Child Tax Allowance • Lone Parent Allowance	• Child Raising Allowance • Post Natal Benefit for Non-Earning Mothers	• Child Benefit	• Housing benefit		• Social Assistance
France	• Income Tax (Family Ratio) • Special Contribution on Pensions (Family Ratio) • Special Contribution on Unemployment (Family Ratio)	• Young Children Allowance • Family Complement • Education Related Family Benefit	• Family Allowance	• Housing benefit		• Minimum Income Guarantee • Lone Parents Benefit
United Kingdom	• Lone Parent Allowance	• Family Credit	• Child Benefit	• Housing benefit • Council tax benefit		• Income Support
Spain 2003	• Income Tax - Child Tax allowance	• Income-tested Child benefit	• Working mother tax credit			

Note: For detailed descriptions of each country's tax-benefit systems see the C*ountry Reports*, available at www.econ.cam.ac.uk/dae/mu/emod.htm

The expenditure on child-targeted policies is assessed as the difference in household disposable income before and after excluding these policies from the tax-benefit system. This is carried out by running two simulations: one with the whole tax-benefit system and another, defined as the 'baseline', which excludes the child-targeted policies from the system.

Section 5.2 presents simulations that include the other countries' child-targeted policies in Spain. It is relatively easy to simulate one country's policy into another using EUROMOD. The model structures most tax-benefit policies using functions that are suitable for all countries. Hence, a policy from country 'A' can be promptly transferred and simulated in country 'B'. However, some policies require very complicated operations or unusual variables that are not available in all countries. For this reason, some policies use country specific functions that cannot be directly transferred to other countries.

All policies that use common or country specific functions that require variables available in the Spanish data were simulated as they are in the original country. However, some policies use functions that need variables that are not available for Spain. In those cases, similar functions that do not require the 'unusual' variable replaced those ones[72].

Finally, all simulations assume that those entitled to a benefit or tax relief claim and correctly receive them. In other words, it is assumed full take-up in all countries and simulations. The only exception is Germany. There is a high discrepancy between the number of simulated entitlements in EUROMOD and the number of recipients of social assistance and housing benefits in the German database (GSOEP). According to Mantovani and Sutherland (2003), EUROMOD simulations assuming full take-up would underestimate the headcount ratio for children (aged under 15) by 5 percentage points, in comparison to the number published by Eurostat (based on the ECHP 1998). For this reason, the German social assistance and

[72] For instance, the UK Income Support is means-tested for capital assets. The Spanish data does not have information on capital assets. As a result, the Income Support simulated in Spain does not include this means test. Nevertheless, other income-test conditions that require data available for Spain were kept in the simulation.

housing benefits are only simulated for those people who report to receive them in the original database[73].

3.2 Definitions

The results are produced using the assumptions most frequently used in the income inequality and poverty measurement literature. Differences in household size and composition are dealt with applying the modified OECD equivalence scale suggested by EUROSTAT.[74] Throughout the analysis, individual well-being is measured through the household disposable income; hence, it is implicitly assumed that household income is equally shared among all household members. The unit of analysis is the individual.

Following UNICEF's recommendation, children are defined as all household members less than 18 years of age. Finally, the poverty line is set to 60 percent of the median of equivalent disposable income in the 'baseline scenario'[75]. The poverty line is fixed and used in all reform scenarios. Poverty incidence, intensity and severity are measured using FGT indexes α=0 to 2 (Foster et al, 1984).[76]

[73] For more details about the quality of the simulations, see Grabka (2001) and Mantovani and Sutherland (2003).
[74] The modified OCDE equivalence scale gives weight 1 for the first adult, 0.5 for remaining adults and 0.3 for children under 14 years of age.
[75] Recall that the 'baseline scenario' is each country's 1998 tax-benefit system excluding all child-targeted policies.
[76] See Lambert (2001, chapter 6) for a recent survey on poverty measurement.

4 CHILD-RELATED BENEFITS IN EU COUNTRIES IN 1998

4.1 Policy Description

This section briefly describes the child-related benefits in each country in 1998. Table 3.A.1 (in the appendix) presents each policy simulated by EUROMOD in further detail.[77] It should be noticed that the family policies in some countries have been significantly reformed in recent years. Therefore, some policies described here are quite different from the ones that are in use presently[78].

4.1.1 Denmark

The most relevant policy in Denmark is the family allowance, which is paid to all families with children under 18. This benefit is complemented with other non-income-related benefits that are paid to lone and disabled parents as well as families with twins. Lower income families may also be eligible for further benefits. Childcare expenses are subsidised for families with income below a certain limit. The amount of income-tested housing and social assistance benefits increase with the presence of children in the household.

Most child benefits in Denmark are aimed at dependent children under 18. They are paid per child and do not vary with special circumstances. The main exception is the Family Benefit, whose amount per child decreases with the age of the child. These benefits are not included in the income test of any benefit and only social assistance is taxable.

[77] National tax-benefit systems and the ways they are modelled in EUROMOD are documented in EUROMOD Country Reports: Hansen (2001) for Denmark, Bargain and Terraz (2001) for France, Grabka (2001) for Germany, Levy and Mercader-Prats (2001) for Spain and Sutherland (2001b) for the UK.

[78] Description of recent changes in the British system can be found at Sutherland and Pichaud (2001) and Brewer et al (2001). An excellent description of family benefits in all EU countries can be found at website of the European Observatory of National Family Polices Recent changes in Spain are presented in the next section.

4.1.2 France

The most important child-targeted policy in France is the Family Benefit (FB). This benefit has been always non-income related. However, in 1998 it was exceptionally conditional on income. Following a clear pro-natal objective, FB is granted only to families with two or more children and the amount increases more than proportionally with every additional child.

Other income-related benefits target small children (Young Children Allowance, YCA), families with three or more children (Family Complement, FC), and children in education (Education Related Family Benefit, ERFB). Low-income families are also protected by the Housing Benefit (HB), Minimum Income Guarantee (MIG) and Lone Parent Benefit (LPB).

The tax system benefits families with children through the Quotient Familial (QF) in the income tax and in the special contributions on pensions and unemployment benefits. This instrument divides the tax base by an amount that increases with the number of children. The same amount multiplies the computed tax (after applying the tax rate) to obtain the total tax liability.

There is not a universal definition of a child in the French system. The QF has the broadest child definition (24 year-old individuals in education and with low income are considered children). Most policies increase the amount of the benefit more than proportionally with every additional child. Finally, all child benefits (except ERFB) are included in the MIG's income test. Therefore, for low-income families, the MIG's rules prevail completely over the ones of the various child benefit instruments[79].

[79] I thank Olivier Bargain for this comment.

4.1.3 Germany

The most important child-targeted policy in Germany is the Child Benefit (CB). This universal benefit is paid to all families with children. However, some high-income individuals find more profitable to replace the CB with the Child Tax Allowance.

Other child-targeted policies are restricted to lone parents (Lone Parent Tax Allowance), and to mothers of very young children who work less than 19 hours a week (Child raising allowance, CRA), or who do not work at all (Postnatal Benefit, PB). On the other hand, the amount of the German housing and social assistance benefits also increase with the presence of children in the household.

The definition of a child is quite generous in most German benefits. Low-income, unemployed individuals are considered children until 27 years of age in the Child Tax Allowance and Child Benefit. Most policies pay the same amount per each additional child; the main exception is the CB, whose amount increases more than proportionally with every extra child. Finally, the amounts of the social assistance benefits and child raising allowances increase with the age of the child.

4.1.4 United Kingdom

In line with the countries described above, the British system is also based on a universal benefit complemented with income-related-benefits. However, the amount of the universal child benefit (CB) in the UK is around half the amount in the other countries; in PPP euros (see Table 3.A.1). Moreover, this benefit is counted in the income test of the Income Support, Housing Benefit and Council Tax Benefit. Since Income Support has a 100 percent

withdrawal rate, recipients of this benefit have their child benefit 'effectively taxed' at 100 percent tax rate[80].

Children living in low-income families with at least one working parent may also benefit from Family Credit. The amount of this income-related benefit increases with the number and age of children, and the number of hours worked by the parents. The existence of children in the household also increases the amount of the housing (HB) and council tax benefit (CTB).

At the same time, lone parents, disabled people, pensioners and unemployed who do not work more than 16 hours per week may be eligible to Income Support. The maximum amount of this income-tested benefit increases with every additional child, although that less than proportionally. IS's maximum amount also increases with child age and in lone parent households.

The UK is the only analysed country with a standard definition of dependent children. All child-targeted polices in the UK in 1998 are focused on individuals under 16 years of age or under 19 if in full-time non-advanced education. The British system also implicitly assumes a decreasing 'marginal cost of children', since all benefits pay higher individual amounts for the first child. Finally, the system also implicitly considers older children and lone parent households to have higher needs.

4.1.5 Spain

Spain is widely known for its underdeveloped system of child protection (Bradshaw and Finch, 2002). In 1998, there were only two national child-targeted policies in Spain: an income tax Child Tax Credit and an income-tested Child Benefit (*Prestación por hijo a cargo*). The Child Tax Credit was available for children less than 30 years of age, was not

[80] This view about the relation between CB and IS differs from the standard one in the UK. The practice in Britain is that the child benefit is automatically paid to all children and the Income Support amounts are set as a complement. I thank Holly Sutherland for this comment.

refundable and increased more than proportionally with the number of children in the household. The child benefit pays the same amount to all children less than 18 years of age that live in low-income families.

4.2 Policy Outcomes

4.2.1 Expenditure and coverage

Table 3.4 shows the aggregate expenditure on child-targeted policies (including tax reliefs) as a percentage of aggregate household disposable income in 1998. France is the analysed country that spent most on child-targeted policies, with an aggregate expenditure that is equivalent to 4.4 percent of the aggregate household disposable income. On the other hand, in 1998, Spain spent less than 0.7 percent of its aggregate household disposable income on child-targeted policies. Aggregate expenditure in Denmark, Germany and the UK was around 3 percent of disposable income.

Non-income-related child benefits are the greatest source of expenditure in all countries except Spain. However, the share of these benefits on the overall expenditure ranges from around 90 percent in Denmark to 40 percent in France. Denmark is the only country without income-related child benefits. In the other countries, these benefits represent between 10 and 20 percent of the overall expenditure. Tax reliefs are important in France, but especially in Spain where they represent almost 80 percent of the total expenditure. Supplements for the existence of dependent children are considerable in British and Danish social assistance benefits and in the French and Danish housing benefit.

Table 3.4 Child-related benefits: expenditure and coverage in EU countries 1998

	Overall	*Tax Reliefs*	*Income-related benefits*	*Non-income-related benefits*	*Housing benefits*	*Childcare benefits*	*Social assistance benefits*
Aggregate expenditure as percentage of household disposable income							
Spain	**0.7%**	**0.5%**	**0.1%**	0.0%	0.0%	0.0%	0.0%
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Denmark	**3.2%**	0.0%	0.0%	**2.8%**	**0.2%**	**0.1%**	**0.2%**
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
France	**4.3%**	**1.2%**	**0.8%**	**1.7%**	**0.5%**	0.0%	**0.1%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Germany	**3.1%**	**0.3%**	**0.3%**	**2.4%**	0.0%	0.0%	**0.1%**
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
UK	**2.9%**	**0.0%**	**0.4%**	**1.8%**	**0.0%**	0.0%	**0.6%**
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage of children living in households that receive some benefit							
Spain	**95.5%**	**80.0%**	**25.1%**	0.0%	0.0%	0.0%	0.0%
	(0.005)	(0.011)	(0.016)	(0.000)	(0.000)	(0.000)	(0.000)
Denmark	**100.0%**	0.0%	0.0%	**100.0%**	**17.5%**	**14.9%**	**11.5%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.013)	(0.012)	(0.010)
France	**96.5%**	**70.9%**	**60.9%**	**73.2%**	**44.6%**	0.0%	**11.0%**
	(0.002)	(0.007)	(0.006)	(0.003)	(0.005)	(0.000)	(0.005)
Germany	**100.0%**	**22.7%**	**17.0%**	**100.0%**	**8.3%**	0.0%	**10.7%**
	(0.000)	(0.020)	(0.006)	(0.009)	(0.008)	(0.000)	(0.005)
UK	**98.2%**	**15.7%**	**20.7%**	**98.2%**	**14.6%**	0.0%	**35.1%**
	(0.001)	(0.011)	(0.011)	(0.001)	(0.010)	(0.000)	(0.009)

Notes: Lone-parent families are one-adult only. Households that include a one-parent family and other adults is defined as "Other adults" households.
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: Euromod

Given the existence of universal benefits, the Danish and German child systems cover all children under 18. The UK has also a universal benefit (Child Benefit). However, since its definition of a dependent child does not include people aged 16 or 17 who are not in fulltime-non-advanced education, 2 percent of British children under 18 do not receive any benefit. In France, the non-income-related benefit (Family Benefit) is paid only to families with at least two children. Moreover, in 1998 this benefit was income tested. As a result, the 1998 French system did not cover almost 4 percent of children under 18. In Spain, almost 96 percent of the children under 18 were protected by some child-targeted policy. The great majority (80 percent) gained from the Child Tax Credit, while the income-tested Child Benefit covered only 25 percent.

4.2.2 The redistributive effect of child-related benefits

Table 3.5 shows the concentration curves of the overall expenditure on child-related benefits[81]. The expenditure share is greater to lower income deciles in all countries. This share is considerable higher in Denmark and the UK, where almost 40 percent of overall expenditure is given to the first quintile. Spain is the only country where the concentration curve crosses the 45º line. The break-even point is in the seventh decile, thus the 30 percent richest Spanish children get more than 30 percent of the overall expenditure on child-related benefits. In fact, the concentration curve of Spanish system is dominated by the concentration of all other systems. Therefore, the child-related benefits in Spain are unequivocally less redistributive than in the other countries.

[81] Deciles were calculated using equivalent household disposable income as described in section Chapter III.3.2.

Table 3.5 Concentration curves of child-related benefits in EU countries 1998 for households with children

	Spain	*Denmark*	*France*	*Germany*	*UK*
1	**12.6%**	**21.2%**	**15.9%**	**13.5%**	**20.5%**
	(0.001)	(0.002)	(0.001)	(0.000)	(0.001)
2	**23.4%**	**38.3%**	**29.8%**	**28.0%**	**38.2%**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
3	**33.2%**	**48.4%**	**41.7%**	**39.7%**	**53.5%**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
4	**42.5%**	**57.7%**	**52.3%**	**50.2%**	**65.3%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
5	**51.3%**	**66.9%**	**61.4%**	**59.1%**	**72.8%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
6	**60.3%**	**74.3%**	**69.9%**	**67.5%**	**79.1%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
7	**69.0%**	**81.3%**	**77.6%**	**76.3%**	**84.7%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
8	**79.6%**	**87.8%**	**84.8%**	**83.8%**	**89.9%**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
9	**89.8%**	**94.1%**	**91.7%**	**91.8%**	**95.0%**
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
10	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	(0.002)	(0.004)	(0.002)	(0.004)	(0.001)

Deciles were calculated using equivalent household disposable income without child-targeted benefits.
Equivalence scale used: modified OECD.
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: EUROMOD.

Table 3.6 shows that in relative terms child-benefits in all countries, except Spain, reduce income inequality among households with children in similar and significant magnitude. In all countries the Reynolds-Smolensky index after all child-benefits are included represents about 18 percent of the Gini before such benefits[82]. It is interesting to notice that those results are obtained using very different policy combinations. In all countries, non-income-related transfers are the benefits that contribute the most to reduce inequality. In Denmark and Germany most redistribution is due to those benefits. In France, income-related and housing benefits are also important, while in the UK, social assistance benefits contribute with 40

[82] In absolute terms, the redistributive effect of the Danish system is considerably lower. However, it should be noticed that the pre-benefits Gini index in Denmark is substantially smaller than any other country.

percent of total redistributive effect. Tax reliefs have a very small redistributive impact in all countries; in France and Germany these 'fiscal benefits' increase inequality among households with children.

The Spanish case is completely different from the other countries. The distributive effect of child-benefits is very small and income related benefits are the main source of income levelling.

Table 3.6 Gini and Reynolds-Smolensky indices in EU countries 1998 for households with children

	Spain	*Denmark*	*France*	*Germany*	*UK*
Gini before child-benefits	**35.3%**	**22.0%**	**32.1%**	**30.7%**	**36.3%**
	(0.017)	(0.019)	(0.011)	(0.011)	(0.015)
Reynolds-Smolensky (Overall benefits)	**0.6%**	**3.9%**	**5.9%**	**5.0%**	**6.8%**
	(0.000)	(0.003)	(0.001)	(0.003)	(0.003)
Reynolds-Smolensky (Tax Reliefs)	**0.2%**	**0.0%**	**-0.6%**	**-0.2%**	**0.0%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Reynolds-Smolensky (Income-related benefits)	**0.4%**	**0.0%**	**2.0%**	**1.1%**	**1.5%**
	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)
Reynolds-Smolensky (Non-income-related benefits)	0.0%	**2.9%**	**3.2%**	**3.9%**	**3.0%**
	(0.000)	(0.002)	(0.001)	(0.002)	(0.001)
Reynolds-Smolensky (Housing benefits)	0.0%	**0.5%**	**1.7%**	**0.0%**	**0.1%**
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Reynolds-Smolensky (Childcare benefits)	0.0%	**0.4%**	**0.0%**	0.0%	0.0%
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Reynolds-Smolensky (Social assistance benefits)	0.0%	**0.4%**	**0.2%**	**0.4%**	**2.7%**
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)

Notes: Equivalence scale used: modified OECD.
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: EUROMOD.

4.2.3 Child poverty

Child-targeted policies are effective reducing child poverty in all analysed countries, except in Spain. Table 3.7 shows that the reduction in child poverty headcount ranges from 8 percentage points in Denmark to 18 percentage points in France. In contrast, child-related

policies reduce the child poverty headcount by less than 2 percentage points in Spain. While before including child-targeted policies, child poverty incidence in Spain is about 4 percentage points lower than in Germany and France, after child-targeted policies are included, child poverty incidence in Spain is 7 and 11 percentage points higher than these countries, respectively.

Table 3.7 also shows that the British and the French systems are the most effective reducing child poverty intensity and severity, respectively. Besides starting with a significant lower poverty level, the Danish system has also a considerable effect on poverty reduction. The German system is apparently less effective reducing child poverty. However, this result must be taken with caution because. It should be remembered that German income related and social assistance benefits are simulated assuming take-up from data[83]. Therefore, German results are not strictly comparable with the ones from other countries.

It is also worth noticing that in all countries non-income-related benefits are the most effective reducing child poverty, regardless the poverty index. Childcare and social assistance also contribute to lessen poverty in Denmark. Income related benefits contribute to tackle child poverty in France, Germany and the UK. Also are important the housing benefits in France and the social assistance benefits in the UK.

In Spain, the poverty reduction effect of child-benefits is very small. Tax reliefs are the most effective Spanish policies reducing the poverty headcount. However, these tax credits do not benefit the poorest among the poor. As a result, most of the alleviation of poverty intensity and severity is due to the income related benefits.

[83] See section Chapter III.3.1.

Table 3.7 Child poverty and child poverty reduction in EU countries

	Child Poverty	*Child Poverty Reduction*						
	No child policy	*All child policies*	*Tax Reliefs*	*Income-related benefits*	*Non-income-related benefits*	*Housing benefits*	*Childcare benefits*	*Social assistance benefits*
Poverty Incidence (FGT, α = 0)								
Spain	**23.0%**	**1.7%**	**1.4%**	0.1%	0.0%	0.0%	0.0%	0.0%
	(0.008)	(0.004)	(0.003)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Denmark	**13.1%**	**7.8%**	0.0%	0.0%	**5.5%**	0.4%	**0.7%**	**0.9%**
	(0.015)	(0.010)	(0.000)	(0.000)	(0.008)	(0.002)	(0.002)	(0.004)
France	**28.0%**	**17.6%**	**0.8%**	**3.9%**	**6.8%**	**3.3%**	0.0%	**0.3%**
	(0.009)	(0.006)	(0.001)	(0.002)	(0.005)	(0.003)	(0.000)	(0.001)
Germany	**26.8%**	**12.8%**	**0.5%**	**2.0%**	**10.7%**	0.3%	0.0%	**1.1%**
	(0.020)	(0.009)	(0.001)	(0.003)	(0.008)	(0.002)	(0.000)	(0.003)
UK	**38.2%**	**11.1%**	**0.1%**	**1.8%**	**4.1%**	0.4%	0.0%	**2.4%**
	(0.009)	(0.008)	(0.001)	(0.003)	(0.007)	(0.003)	(0.000)	(0.004)
Poverty Intensity (FGT, α = 1)								
Spain	**7.9%**	**0.9%**	**0.2%**	**0.7%**	0.0%	0.0%	0.0%	0.0%
	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Denmark	**3.7%**	**2.5%**	0.0%	0.0%	**2.0%**	**0.6%**	**0.4%**	**0.2%**
	(0.006)	(0.004)	(0.000)	(0.000)	(0.002)	(0.001)	(0.001)	(0.001)
France	**8.1%**	**6.5%**	**0.1%**	**2.2%**	**3.7%**	**2.2%**	0.0%	**0.3%**
	(0.003)	(0.002)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Germany	**10.7%**	**4.9%**	**0.1%**	**1.0%**	**4.1%**	**0.0%**	0.0%	**0.4%**
	(0.010)	(0.003)	(0.000)	(0.001)	(0.003)	(0.000)	(0.000)	(0.001)
UK	**14.4%**	**9.8%**	**0.0%**	**2.0%**	**4.6%**	0.1%	0.0%	**3.8%**
	(0.005)	(0.005)	(0.000)	(0.001)	(0.002)	(0.001)	(0.000)	(0.002)
Poverty Severity (FGT, α = 2)								
Spain	**4.2%**	**0.6%**	**0.0%**	**0.6%**	0.0%	0.0%	0.0%	0.0%
	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Denmark	**1.8%**	**1.3%**	0.0%	0.0%	**1.0%**	**0.3%**	**0.3%**	**0.1%**
	(0.004)	(0.003)	(0.000)	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)
France	**3.3%**	**2.9%**	**0.0%**	**1.2%**	**1.9%**	**1.2%**	0.0%	**0.1%**
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Germany	**7.6%**	**3.8%**	**0.0%**	**0.9%**	**3.2%**	0.0%	0.0%	**0.2%**
	(0.009)	(0.004)	(0.000)	(0.002)	(0.003)	(0.000)	(0.000)	(0.000)
UK	**6.8%**	**5.6%**	**0.0%**	**1.2%**	**3.2%**	0.0%	0.0%	**2.6%**
	(0.003)	(0.004)	(0.000)	(0.001)	(0.002)	(0.001)	(0.000)	(0.002)

Notes: The poverty line is computed as 60% of median equivalent household income before family benefits per month (see section 3 and Table 3.1 for details). Equivalence scale used: modified OECD.
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level

The British system is undoubtedly the most efficient targeting child-benefits to the poor. Almost $^{2}/_{3}$ of total expenditure in the UK is concentrated on poor children. In the other countries, more than half of the expenditure ($^{3}/_{4}$ in Spain and Denmark) is dedicated to non-poor children. The Danish system is the least efficient system; only 16 percent of total

expenditure reduces the poverty gap. The Spanish is the most 'efficient' targeting the child-benefits paid to the poor, only 4 percent of those benefits increase the income of beneficiaries above the poverty line.

Table 3.8 Targeting efficiency of child-related benefits in EU countries 1998

	Spain	*Denmark*	*France*	*Germany*	*UK*
Vertical Efficiency	**26.5%**	**26.4%**	**39.3%**	**36.3%**	**63.8%**
	(0.014)	(0.028)	(0.012)	(0.021)	(0.011)
Poverty Reduction Efficiency	**25.3%**	**15.9%**	**27.2%**	**24.6%**	**56.0%**
	(0.016)	(0.020)	(0.011)	(0.017)	(0.012)
Spillover	**4.4%**	**39.6%**	**30.7%**	**32.2%**	**12.2%**
	(0.018)	(0.026)	(0.013)	(0.021)	(0.009)

Notes: The poverty line is computed as 60% of median equivalent household income before family benefits per month (see section 3 and Table 3.1 for details). Equivalence scale used: modified OECD.
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: EUROMOD.

5 REFORMING SPANISH CHILD-RELATED BENEFITS

This section simulates the child-targeted policies from the Danish, German, French, British and Spanish 2003 systems. In all simulations, the data and the policies, except those related to children, refer to 1998[84]. Therefore, the differences between the results presented here and those for the 1998 Spanish system (presented in the previous section) are only due to differences in the child policies. Other elements that could affect the outcomes, such as socio-economic-demographic changes, are held constant. It should be stressed that this *ceteris paribus* analysis does not represent the "real" effects that these policies would have today. Instead, they characterize an artificial experiment of what would have happened if these reforms had been implemented in 1998.

[84] The monetary parameters of the Spanish 2003 system were deflated to 1998 levels using the Consumer Price Index. The monetary parameters from the systems of other countries were re-scaled by common indices so that the aggregate expenditure level of each system would be equal to that produced by the 2003 Spanish system. For a similar analysis, using results not constrained to a similar expenditure level see Levy (2003).

5.1 The 2003 Spanish child-related benefits

Recently, family-oriented policies became a crucial element in the Spanish policy debate. The Spanish National Action Plan for Inclusion (NAPIncl), submitted to the EU in 2001, includes the 'Plan for Family Support' (*Plan Integral de Apoyo a la Familia 2001-2004*) as one of its cornerstones. The objectives of this Plan are to reconcile work and family life, to improve the families' life standards and to allow the principle of demographic continuity through generational replacement. Regarding in-cash child policies, the main measures proposed deal with increasing the expenditure on tax reliefs and social benefits, and the introduction of a new benefit for working mothers.

Many of the plan's proposals were implemented in the 2003 tax-benefit system. This presents three notable changes with respect to the system analysed in the previous section. First, the child tax credit was replaced by a more generous tax allowance. Second, the amount and the income-test of the child benefit were increased. Third, a refundable tax credit for working mothers with children aged under three was introduced. Although formally it is a tax relief, in practice the working mother refundable tax credit can be interpreted as a non-income-related benefit, since mothers do not have to pay taxes in order to receive it. Therefore, this new policy actually represents the introduction of the first non-income-related child benefit in Spain.

5.2 Introducing EU child-targeted policies in Spain

This section also simulates switching the 2003 Spanish child benefits by those practiced in the other countries analysed in section 4. Nevertheless, some policies such as housing and childcare benefits are not included due to lack of data in the Spanish database. This omission is especially relevant in the case of the French and Danish systems since these benefits contribute with a considerable share of the overall expenditure and are very important for low-income households. The German child tax allowance was also not simulated because of the complicated interaction it produces between the income tax and the child benefit. This tax allowance only benefits high-income taxpayers; therefore, the system simulated in Spain is

less generous to better off children than the original German system. Finally, all simulations assume full take-up. This is consistent with the assumption used in the simulations in section 4.2, except for German social assistance benefits[85]. Therefore, German social assistance benefits are likely to be overestimated in the Spanish simulations.

5.3 Policy Outcomes

5.3.1 Expenditure and coverage

Recent reforms have increased significantly the expenditure on child-related benefits in Spain. According to Table 3.9, if 2003 policies have been implemented in 1998, aggregate tax-benefit expenditure on children would represent 1.3 percent of overall household disposable income, almost twice the amount spent by the 1998 system (recall Table 3.4).

Most of the increase is due to the more generous child tax allowances, which represent almost ¾ of total expenditure. The expenditure on the new working-mother-refundable tax credit corresponds to 0.2 percent of aggregate household disposable income and is greater than the expenditure on the income-tested child benefit.

Paradoxically, the system of 2003 reduces the percentage of children who receive child-related benefits. The percentage of children covered by the system falls from 96 percent (in the 1998 system) to 93 percent[86]. The reason for this apparent contradiction is found in the tax cut and the nature of the tax allowances. The tax cut has reduced the number of taxpayers in 2003 with respect to 1998. Since the child tax allowance is not refundable, individuals who do not pay enough income tax do not benefit from it. The new working-mother tax credit is refundable; however, since it is targeted to working-mothers with infants it only benefits 15 percent of the Spanish children.

[85] Recall section Chapter III.3.1.
[86] This fall is not statistically significant at the 95 percent level, but is significant at the 90 percent.
[87] See Chapter IV.

Table 3.9 Child-related benefits: expenditure and coverage in Spain

	Overall	*Tax Reliefs*	*Income-related benefits*	*Non-income-related benefits*	*Housing benefits*	*Childcare benefits*	*Social assistance benefits*
Aggregate expenditure as percentage of household disposable income							
Spain 2003	**1.3%**	**0.9%**	**0.1%**	**0.2%**	0.0%	0.0%	0.0%
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Danish system	**1.3%**	**0.0%**	0.0%	**1.1%**	0.0%	0.0%	**0.2%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
French system	**1.3%**	**0.9%**	**0.1%**	**0.3%**	0.0%	0.0%	**0.1%**
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
German system	**1.3%**	**0.0%**	**0.0%**	**1.3%**	0.0%	0.0%	**0.1%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
British system	**1.3%**	**0.0%**	**0.3%**	**1.0%**	0.0%	0.0%	**0.1%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percentage of children living in households that receive some benefit							
Spain 2003	**93.3%**	**76.6%**	**24.7%**	**14.5%**	0.0%	0.0%	0.0%
	(0.006)	(0.009)	(0.011)	(0.010)	(0.000)	(0.000)	(0.000)
Danish system	**100.0%**	0.0%	0.0%	**100.0%**	0.0%	0.0%	**11.8%**
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.010)
French system	**82.0%**	**68.8%**	**16.4%**	**32.2%**	0.0%	0.0%	**9.8%**
	(0.013)	(0.018)	(0.010)	(0.011)	(0.000)	(0.000)	(0.010)
German system	**100.0%**	0.0%	**9.3%**	**100.0%**	0.0%	0.0%	**10.6%**
	(0.001)	0.0%	(0.008)	(0.000)	0.0%	0.0%	(0.011)
British system	**98.6%**	0.0%	**14.6%**	**98.6%**	0.0%	0.0%	**11.0%**
	(0.003)	(0.000)	(0.010)	(0.002)	(0.000)	(0.000)	(0.011)

Notes: Lone-parent families are one-adult only. Households that include a one-parent family and other adults i
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: Euromod

The simulation of the British system in Spain provides very interesting results. While in the UK, the expenditure on social assistance benefits (*Income Support*) is appreciably higher than on the income related benefits (*Family Credit*)[88], simulated in Spain results are reversed. This difference is explained by the fact that the percentage of children living in families with no working parents in the UK is twice the percentage in Spain[89]. As a result, there are more families eligible for Income Support in the UK than in Spain. In addition, the Family Credit is

[88] Recall Table 3.4.
[89] See Table 3.1. This difference is considerably higher among low-income households. In the UK, only 39% of children in the first decile live in households with at least one employed member. In Spain, 67% of children in the first decile live in this type of households.

considerably more generous to the first child and to older children. Spanish children are in average older than British children and a higher percentage of them live in one-child households. These factors explain part of the higher cost of Family Credit in Spain[90].

The French system simulated in Spain would also spend proportionally less on income-related and non-income-related benefits than in France. The main reason is that these benefits are especially generous to households with more than 2 children and the share of children living in this type of household in Spain is almost half the one in France.

The German and Danish systems assure some protection to all children under 18. Meanwhile, the British system excludes people aged 16 or 17 who are not in full-time-non-advanced education, therefore 1.5 percent of the Spanish children under 18 would be left unprotected by that system. As regards the French system, given the expenditure constraint and the fact that in 1998 all benefits in France were income tested (recall section 4.1.2), 18 percent of the Spanish children would not be protected by any benefit.

5.3.2 The redistributive effect of child-related benefits

As already observed in other studies[91], high-income households are the ones who gain most from replacing tax credits with tax allowances. Therefore, it is not surprising that child benefits under the 2003 system increase with household income. According to Table 3.10, children in the last decile get, in average, more than twice the benefit paid to children in the first decile. The expenditure is especially low among children in the second to fourth decile. This is due to a discontinuity in the new Spanish system. On the one hand, households in middle-low part of the income distribution have too much income to be eligible for the income-tested child benefit. On the other hand, their income is not large enough to tax income tax and, therefore, benefit from the child tax allowances.

[90] The family credit pays higher supplements for children aged 11 or more and is particularly generous to those aged 16 or more. According to the datasets used by EUROMOD, 28 percent of British children are aged 11-15 and 10 percent are age 16+. In Spain these proportions are 30 and 14 percent, respectively.
[91] See for example Parker and Sutherland (1991).

In contrast, the systems from the other EU countries would be much more generous to children living in low-income households. Under the British system, more than ¼ of the overall expenditure would be spent on the first decile. The systems from Denmark, France and Germany would assign almost twice the amount the 2003 Spanish system gives to children in the first 3 deciles.

Table 3.10 Concentration curves of child-related benefits in Spain for households with children

	Spain 2003 system	*Danish system*	*French system*	*German system*	*British system*
1	**7.8%**	**15.5%**	**13.5%**	**15.2%**	**25.7%**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
2	**14.1%**	**27.1%**	**23.7%**	**26.0%**	**36.1%**
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
3	**19.7%**	**36.5%**	**34.2%**	**36.0%**	**45.0%**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
4	**26.5%**	**46.3%**	**42.3%**	**45.7%**	**53.8%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
5	**35.2%**	**55.4%**	**48.7%**	**54.7%**	**61.3%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
6	**43.6%**	**63.9%**	**55.6%**	**63.4%**	**69.1%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
7	**52.5%**	**72.0%**	**63.0%**	**71.7%**	**76.1%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
8	**66.6%**	**81.5%**	**73.3%**	**81.4%**	**84.2%**
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
9	**82.2%**	**91.0%**	**83.9%**	**90.7%**	**92.2%**
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
10	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)

Deciles were calculated using equivalent household disposable income without child-targeted benefits.
Equivalence scale used: modified OECD.
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: EUROMOD.

The 2003 Spanish system is less effective reducing income inequality among households with children than before. Following Table 3.11, the Reynolds-Smolensky index under the 2003 system is 0.2 percentage points lower than under the 1998 system. Neither the tax reliefs nor the working-mother tax credit contributes to reduce income inequality under the new system.

On the contrary, the Reynolds-Smolensky would more than double if the system from any of the other EU countries was implemented in Spain. In all systems most of this redistribution is due to the non-income-related ('universal') child benefits.

Table 3.11 Gini and Reynolds-Smolensky indices in Spain for households with children

	Spain 2003 system	*Danish system*	*French system*	*German system*	*British system*
Gini before child-benefits	**35.3%**	**35.3%**	**35.3%**	**35.3%**	**35.3%**
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Reynolds-Smolensky (Overall benefits)	**0.5%**	**1.5%**	**1.2%**	**1.5%**	**2.0%**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)
Reynolds-Smolensky (Tax Reliefs)	0.0%	0.0%	**0.0%**	**0.0%**	0.0%
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Reynolds-Smolensky (Income-related benefits)	**0.5%**	0.0%	**0.2%**	**0.1%**	**0.8%**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Reynolds-Smolensky (Non-income-related benefits)	0.0%	**1.3%**	**0.9%**	**1.3%**	**1.0%**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Reynolds-Smolensky (Housing benefits)	0.0%	0.0%	0.0%	0.0%	0.0%
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Reynolds-Smolensky (Childcare benefits)	0.0%	0.0%	0.0%	0.0%	0.0%
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Reynolds-Smolensky (Social assistance benefits)	0.0%	**0.3%**	**0.2%**	**0.2%**	**0.3%**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)

Notes: Equivalence scale used: modified OECD.
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: EUROMOD.

5.3.3 Social Welfare

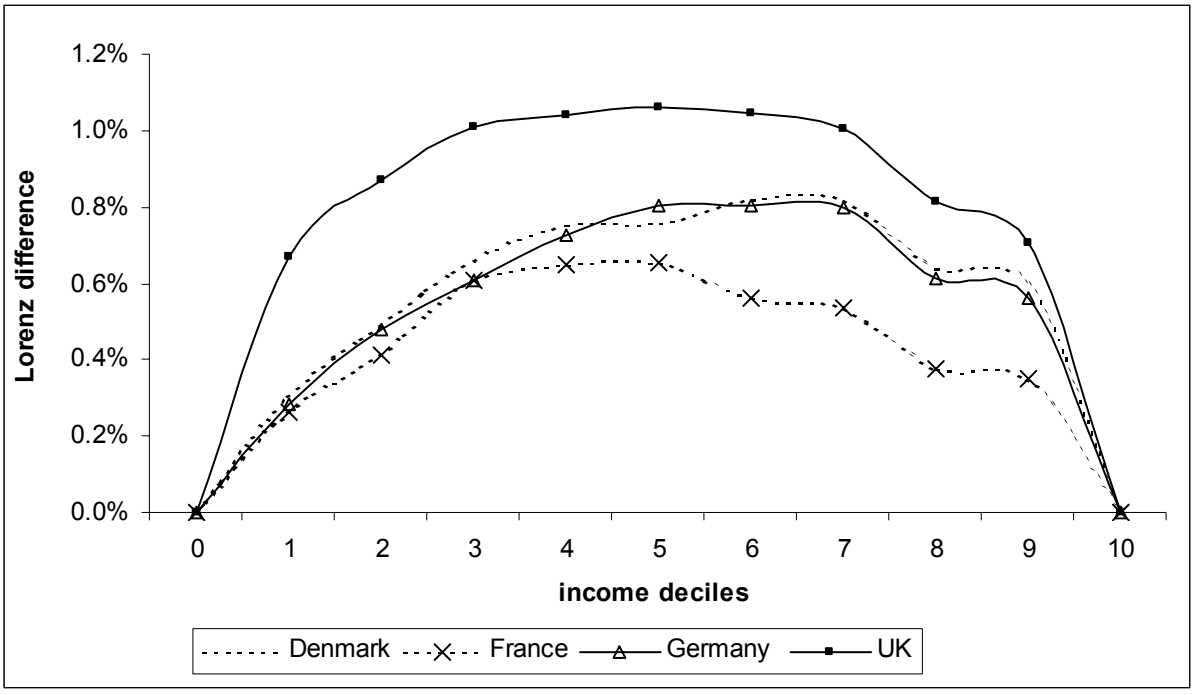
Given the expenditure-neutral constraint, the average disposable income after child benefits is the same for all analysed systems. Therefore, the Lorenz Curves produced by the different systems can be used for social welfare comparisons as proposed by Atkinson (1970) theorem (recall Chapter I).

Figure 3.1 depicts the difference between the Lorenz curves of equivalent household disposable income after the EU systems and the Lorenz curve after the 2003 Spanish system.

The graph clearly shows that the Lorenz curves of all EU systems dominate the Lorenz curve of the 2003 Spanish system (the results are statistically significant for all systems and deciles, except for the French system at the 7th and 9th deciles). Therefore, replacing the 2003 Spanish system by any of the other analysed systems would increase social welfare for any symmetric and quasi-concave social welfare function.

The comparison across the EU systems show that the Danish and the German Lorenz curves are very close to each other and would cross at the 5th and 6th decile. The French Lorenz curve would be dominated by the Danish (and would cross with the German at the 3rd decile), however the differences are not statistically significant. On the other hand, the Lorenz curve under the British system would clearly dominate the other systems, although these differences are not statistically significant after the 5th decile.

Figure 3.1 Lorenz Dominance for children in Spain



Notes: Equivalence scale used: modified OECD.
Source: EUROMOD

5.3.4 Child poverty

Given that most of the rise in the expenditure is assigned to children living in better-off households, the 2003 Spanish system has little impact on child poverty. Table 3.12 shows that the new working-mother tax credit reduces the poverty headcount by half percentage point. However, this is offset by the lower poverty reduction effect of the new tax reliefs. While the 1998 child tax credits reduced the headcount by 1.4-percentage point, the 2003 tax allowances only reduce it by 0.8. Hence, despite almost doubling the expenditure on child-related cash transfers, the 2003 system does not reduce child poverty in Spain[92]

The poverty alleviation effect would be dramatically different if the system of the other analysed countries was implemented in Spain. Following Table 3.12, the poverty headcount would fall more with the Danish system (4 percentage points) and less with the British; however, this difference is not statistically significant. In contrast, the British system would be the most effective tackling poverty intensity and severity. In all systems, the non-income-related child benefits would contribute the most in the reduction of the poverty incidence and severity. British income-related child benefit (Family Credit) would also be quite effective reducing poverty intensity and severity.

[92] In fact, the poverty headcount and poverty severity increase under the new system. However, it should be notice that these results are not statistically significant.

Table 3.12 Child poverty and child poverty reduction in Spain

	No child policy	*All child policies*	*Tax Reliefs*	*Income-related benefits*	*Non-income-related benefits*	*Housing benefits*	*Childcare benefits*	*Social assistance benefits*
Poverty Incidence (FGT, α = 0)								
Spain 2003	**23.0%**	**1.5%**	**0.8%**	0.2%	0.5%	0.0%	0.0%	0.0%
system	(0.008)	(0.004)	(0.002)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)
Danish	**23.0%**	**4.1%**	0.0%	0.0%	**3.8%**	0.0%	0.0%	**0.2%**
system	(0.008)	(0.005)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)	(0.001)
French	**23.0%**	**3.7%**	**1.7%**	**0.0%**	**2.8%**	0.0%	0.0%	**0.2%**
system	(0.008)	(0.004)	(0.003)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)
German	**23.0%**	**3.8%**	0.0%	**0.0%**	**3.6%**	0.0%	0.0%	0.0%
system	(0.008)	(0.005)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)
British	**23.0%**	**3.6%**	0.0%	**0.3%**	**3.1%**	0.0%	0.0%	**0.3%**
system	(0.008)	(0.006)	(0.000)	(0.001)	(0.004)	(0.000)	(0.000)	(0.001)
Poverty Intensity (FGT, α = 1)								
Spain 2003	**8.0%**	**0.9%**	**0.1%**	**0.7%**	**0.1%**	0.0%	0.0%	0.0%
system	(0.005)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Danish	**7.9%**	**1.9%**	0.0%	0.0%	**1.6%**	0.0%	0.0%	**0.4%**
system	(0.005)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
French	**7.9%**	**1.8%**	**0.2%**	**0.3%**	**1.1%**	0.0%	0.0%	**0.3%**
system	(0.005)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
German	**7.9%**	**1.9%**	0.0%	**0.1%**	**1.6%**	0.0%	0.0%	**0.3%**
system	(0.005)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
British	**7.9%**	**2.7%**	0.0%	**1.1%**	**1.3%**	0.0%	0.0%	**0.4%**
system	(0.005)	(0.002)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Poverty Severity (FGT, α = 2)								
Spain 2003	**4.3%**	**0.7%**	**0.0%**	**0.7%**	**0.0%**	0.0%	0.0%	0.0%
system	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Danish	**4.2%**	**1.3%**	0.0%	0.0%	**1.1%**	0.0%	0.0%	**0.3%**
system	(0.003)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
French	**4.2%**	**1.3%**	**0.0%**	**0.3%**	**0.8%**	0.0%	0.0%	**0.2%**
system	(0.003)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
German	**4.2%**	**1.4%**	0.0%	**0.1%**	**1.1%**	0.0%	0.0%	**0.3%**
system	(0.003)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
British	**4.2%**	**2.2%**	0.0%	**1.2%**	**0.9%**	0.0%	0.0%	**0.3%**
system	(0.003)	(0.002)	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)	(0.001)

Notes: The poverty line is computed as 60% of median equivalent household income before family benefits per month (see section 3 and Table 3.1 for details). Equivalence scale used: modified OECD.
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: EUROMOD.

The considerable rise of expenditure and the insignificant change of child poverty have significantly reduced the targeting efficiency of Spanish child-related benefits. Under the

2003 system, the share of benefits targeted to poor children (vertical efficiency) falls from 26 percent (see Table 3.8) to 15 percent (see Table 3.13). In all systems, especially the Spanish and the British, the spillover is considerably low.

On the contrary, the Danish, French and German systems would target about 30 percent of the total expenditure on poor children. The British system would be even more efficient, almost 40 percent of the overall expenditure would be given to poor children.

Table 3.13 Targeting efficiency of child-related benefits in Spain

	Spain 2003 system	*Danish system*	*French system*	*German system*	*British system*
Vertical Efficiency	**15.0%**	**30.0%**	**26.8%**	**29.0%**	**38.8%**
	(0.007)	(0.018)	(0.018)	(0.019)	(0.027)
Poverty Reduction Efficiency	**14.5%**	**27.3%**	**23.4%**	**26.8%**	**36.7%**
	(0.007)	(0.020)	(0.020)	(0.020)	(0.029)
Spillover	**3.8%**	**8.9%**	**12.5%**	**7.5%**	**5.6%**
	(0.008)	(0.017)	(0.022)	(0.016)	(0.018)

Notes: The poverty line is computed as 60% of median equivalent household income before family benefits per month (see section 3 and Table 3.1 for details). Equivalence scale used: modified OECD.
Standard errors are given in parentheses, numbers in bold are significant at the 5 percent level
Source: EUROMOD.

6 CONCLUDING REMARKS

This chapter has analysed the recent tax-benefit reforms of policies oriented to children in Spain, in a European context. The analysis was carried out using the microsimulation model EUROMOD.

Results obtained show that the tax-benefit expenditure on children in Spain is much lower than in the other EU countries analysed here. Furthermore, Spain is the only analysed country that uses tax reliefs as the main child-targeted policy. Since this type of policies benefit principally better-off households, the Spanish system is particularly deficient at protecting poor children. In contrast, child-related policies play an important role redistributing income and reducing child poverty in the other analysed countries.

Despite the substantial increase after the recent reform, the expenditure on child-related policies in Spain (under the 2003 system) is well below other EU countries. Moreover, this increase was mainly due to higher tax reliefs. The reform has also introduced for the first time a non-income-related benefit in Spain. However, since this new benefit is targeted on working mothers with children aged under 3, it has limited coverage and negligible redistributive impact. As a result, after the reform the Spanish child-related policies are less efficient at reducing child poverty, and redistribute income towards better-off children.

Reforms using the policies from the other analysed countries would dramatically reshape the child-related benefits in Spain. Overall, they would cost considerably more than the present system. Therefore, the cost of implementing these policies in Spain at the expenditure levels practiced in the original countries would be unfeasible for the Spanish government in the short term. However, even under an 'expenditure-neutral' constraint these policies would be very effective redistributing income towards poorer children, reducing child poverty, and rising social welfare.

In a static and narrow analysis, income-related benefits, such as the British Family Credit, are the most attractive and efficient policies to redistribute income and reduce child poverty. However, the literature shows that this type of policies is not exempt from criticism when analysed from a wider perspective. Atkinson (1993) identifies three major problems in targeting family benefits according to income. First, there is the problem of 'imperfect targeting' of income-related-benefits. Eligible families may not be awarded due to administrative errors or non-take-up. Conversely, non-eligible families could be awarded due to control failure or fraud. There is substantial evidence about non-take-up problems with income-related-benefits in the UK. According to DWP (2001), in 1999 the family credit was the British income-tested benefit with lowest take-up rate (66 percent of entitled caseloads). In fact, one of the objectives of its replacement by the Working Family Tax Credit (WFTC) was the reduction of 'stigma associated with claiming in-work support, and encourages higher take-up' (HM Treasury, 2000). The elimination or, at least, minimisation of this first difficulty causes a second problem: administrative costs. In a world of imperfect and asymmetric information, targeting derives to a 'principal-agent problem': government aims to induce all those eligible to claim and ensure that all claimants are in fact eligible. Expenditure

on advertisement and income-test verification may result in considerable deadweight costs and significant inefficiency. This would be especially important in Spain where there is little tradition in administering income-related-benefits, persistent tax evasion and a considerable informal economy (Laparra and Aguilar, 1997). This lack of know-how can put at risk a reliable assessment of income at a reasonable administrative cost. Regarding the British Family Credit, the administrative cost is especially high because it does not only require controlling the household income but also the number of each parents' working hours per week[93]. The third problem is the negative effects of such benefits on work incentives. With effective marginal tax rates close to a 100 percent, income-tested benefits maintain disposable income virtually unchanged for a wide range of gross earnings, reducing the incentive to work. In-work benefits, such as the Family Credit, try to avoid the poverty trap by conditioning the income-related-benefit to work. However, the existence of an income test is negative to work incentive in two ways. First, the reduction or elimination of the benefit beyond a given threshold provides few financial incentives to the beneficiaries to search for a better-paid job. While successfully preventing full dependency on social protection (claiming social assistance or unemployment benefit), it is less clear that in-work benefits provide incentives for beneficiaries to achieve full independence in the medium or long-term (Evans, 1996; Brewer, 2000). Second, in-work benefits tend to be jointly assessed on the couple's income[94]. As a result, the second earner (usually the woman) faces higher marginal tax rates and lower work incentives[95]. This problem is particularly relevant in Spain. In contrast to the UK, child poverty in Spain is mainly related to one-earner families. Therefore, increasing work incentives for the second-earner is crucial to reduce child poverty and long-term welfare dependence in Spain.

[93] For more on the administrative characteristics of British in-work benefits see Brewer et al (2001).
[94] This is the case in the UK Family Credit (now WFTC) and the US EITC.
[95] Immervoll (2002) shows that British working women face higher marginal effective tax rates than working men in the bottom of the household income distribution.

Non-income-related benefits (such as the Danish Family Allowance and the German and British Child Benefit) are less likely to face these problems, however these policies cost noticeably more to reach a similar reduction on child poverty.

Regarding policy recommendations, further analysis would be needed in order to draw firm conclusions about which type of child-related policies would be the most appropriate to Spain. However, the evidence presented here represents an important step in this direction. On the one hand, it shows that microsimulation is a valuable tool for future research in this area. On the other hand, it demonstrates that the recent reforms implemented in Spain reinforce a model of child protection that produces outcomes that could be much improved and that has no similarity with the systems of other EU countries that have more experience in family policy.

Table 3.A.1 Child-related benefits in 1998

	Name	Type	Target	Child definition[1]	Eligibility depends on			Amount per child[5]	Amount varies with					Taxed
					Emp[2]	Hrs[3]	Ch[4]		Ch[4]	Age [6]	LP[7]	Emp[2]	Hrs[3]	
DK	*Family allowance*	Non-income-related benefit	All children	<18	No	No	>0	1,475 €	Yes, Prop	Yes ↓	No	No	No	No
	Ordinary child benefit	Non-income-related benefit	Lone and disable parents	<18	No	No	>0	622 €	Yes, Prop	No	No	No	No	No
	Extra child benefit	Non-income-related benefit	Lone parents	<18	No	No	>0	475 €	No	No	No	No	No	No
	Special child benefit	Non-income-related benefit	Lone or disable parents without alimony pay	<18	No	No	>0	1,193 €	Yes, Prop	No	No	No	No	No
	Multi child benefit	Non-income-related benefit	Lone or disable parents with twins	<7	No	No	>1	770 €	Yes, Prop	No	No	No	No	No
	Housing benefit	House benefit	Families with rented accommodation	<23	No	No	No	- [dk2]	-	No	No	No	No	No
	Housing allowance	House benefit	Low income families	<18	No	No	No	- [dk2]	-	No	No	No	No	IT
	Day care subsidy	Childcare	Low income families	<6	No	No	>0	3,629 € [dk1]	Yes, Prop	Yes ↓	No	No	No	No
	Social assistance	Social assistance	Low income families	<18	No	No	No	310 € [dk3]	No	No	No	No	No	IT
FR	*Income tax*	Tax relief	Quotient familial	<18; <21 inc; <25 edu, inc	-	-	No	1/2 part [fr1]	Yes, MP	No	No	No	No	-
	'Csg' special contribution on unemployment benefit	Tax relief	Quotient familial	<18; <21 inc; <25 edu, inc	-	-	No	1/2 part [fr1]	Yes, MP	No	No	No	No	-
	'Csg' special contribution on pensions	Tax relief	Quotient familial	<18; <21 inc; <25 edu, inc	-	-	No	1/2 part [fr1]	Yes, MP	No	No	No	No	-
	Family benefit	Non-income-related benefit	Child benefit	<16; <19 inc; <20 edu, inc	No [c]	No	>1	1,250 € [fr2]	Yes, MP [a]	Yes ↑	Yes [b]	No [c]	No	CRDS, RMI[d]
	Young children allowance	Income-related benefit	Young child benefit	<3	No [c]	No	>0	1,791 €	No [a]	No	No [b]	No [c]	No	CRDS, RMI[d]
	Family complement	Income-related benefit	Families with 3 or more children	>2 and <16; <19 inc; <20 edu, inc	No [c]	No	>2	1,625 €	No [a]	No	No [b]	No [c]	No	CRDS, RMI[d]
	Education related family benefit	Income-related benefit	Children in education	>5 & <18 edu, in soc assist	No	No	>0	633 €	Yes, Prop [a]	No	No	No	No	CRDS, RMI[d]
	Education related family benefit	Income-related benefit	Children in education	>5 & <18 edu	No	No	>0	243 €	Yes, Prop [a]	No	No	No	No	CRDS, RMI[d]
	Housing benefit	Housing benefit	Families with rent or mortgage	<20 inc	No	No	No	- [fr3]	-	No	No	No	No	No
	Minimum income guarantee (rmi)	Social assistance	Low income families	<15; <20 edu	No	No	No	1,333 €	Yes, MP	No	Yes ↑	No	No	No
	Lone parent benefit	Social assistance	Lone parent families	<17; <19 edu	No	No	>0	7,800 €	Yes, Prop	No	-	No	No	AS, RMI, IB

continues…

	Name	Type	Target	Child definition[1]	Eligibility depends on			Amount per child[5]		Amount varies with					Taxed
					Emp[2]	Hrs[3]	Ch[4]			Ch[4]	Age[6]	LP[7]	Emp[2]	Hrs[3]	
D	*Lone parent tax allowance*	Tax relief (tax allowance)	Lone parent families	<17; <22 edu	No	No	>0	2,871 €		No	No	-	No	No	-
	Child tax allowance	Tax relief	Children of medium-high income taxpayers	<19; <22 edu, inc; <28, unemp, inc	No	No	>0	3,533 €		Yes, Prop	No	-	No	No	-
	Child benefit	Non-income-related benefit	All children	<19; <22 edu, inc; <28, unemp, inc	No	No	>0	1,350 €		Yes, MP	No	-	No	No	No
	Post natal benefit	Non-income-related benefit	Non working mothers	<1	Yes[g]	No	>0	76 €		Yes, Prop	No	No	No	No	SAB
	Child raising allowance (federal and per länder)	Income-related benefit	Young children	<3	No	Yes[e]	>0	3,067 €	ge1	Yes, Prop	Yes ↑	No	No	No	SAB
	Housing benefit	Housing benefit	Families with rent or mortgage	<24	No	No	No	-	ge2	-	No	No	No	No	No
	Social assistance (federal and per länder)	Social assistance	Low income families	<17	No	No	>0	1,920 €	ge3	Yes, Prop	Yes ↑	Yes ↑	No	No	No
UK	*Lone parent tax credit*	Tax relief (Tax credit)	Lone parents	<16; <19 edu	No	No	>0	405 €		No	No	-	No	No	-
	Child benefit	Non-income-related benefit	Children	<16; <19 edu	No	No	>0	690 €		Yes, LP	No	Yes ↑	No	No	Income support; housing and council tax benefit
	Family credit	Income-related benefit	Children in working families	<16; <19 edu	Yes	>16	>0	4,522 €		Yes, LP	Yes ↑	No	No	Yes ↑	Housing benefit; council tax benefit
	Council tax benefit	Housing benefit	Low income families	<16; <19 edu	No	No	No	-	uk1	Yes, LP[a]	Yes ↑[a]	Yes ↑[b]	No	No	No
	Housing benefit	Housing benefit	Low income families with rent	<16; <19 edu	No	No	No	-	uk2	Yes, LP[a]	Yes ↑	Yes ↑	No	No	No
	Income support	Social assistance	LP, unemp, pens & disable parents	<16; <19 edu	No	<17	No	1,280 €		Yes, LP	Yes ↑	Yes ↑	No	No	No

continues…

	Name	Type	Target	Child definition[1]	Eligibility depends on			Amount per child[5]	Amount varies with					Taxed
					Emp[2]	Hrs[3]	Ch[4]		Ch[4]	Age[6]	LP[7]	Emp[2]	Hrs[3]	
E	*Child tax credit 1998*	Tax relief (Tax credit)	Children	<30 inc	No	No	>0	150 €	Yes, MP	No	No [h]	No	No	-
	Child benefit 1998 [i]	Income-related benefit	Children in low income families	<18 inc	No	No	>0	245 €	Yes, Prop	No	No [h]	No	No	No
	Child tax allowance 2003	Tax relief (Tax allowance)	Children	<25 inc	No	No	>0	1,211 €	Yes, MP	Yes ↓	No [h]	No	No	-
	Working mother refundable tax credit 2003	Tax relief (Ref tax credit)	Working mothers w/ young children	<3	Yes	No	>0	1,400 €	Yes, MP	No	No	No	No	-
	Child benefit 2003 [i]	Income-related benefit	Children in low income families	<18 inc	No	No	>0	252 €	Yes, Prop	No	No [h]	No	No	No

[1] Age limit (*<30*), income limit (*inc*), must be in education (*edu*), must be unemployed (*unemp*). [2] Employment statuses of parents. [3] Number of hours worked by parents. [4] Number of children . [5] Annual amount for a household with one new-born child and with no income. [6] Age of children. [7] Lone parent.
[dk1] Average annual cost of a nursery in 1998 [dk2] The amount depends on rent payments [dk3] Difference between maximum social assistance benefit for an eligible person with and without children. [fr1] One part if first child of a lone parent. [fr2] For second child in the household. [fr3] The amount depends on rent or mortgage payments [ge1] Amount for the Federal child raising allowance. [ge2] The amount depends on rent or mortgage payments. [ge3] Amount for west Germany and east Berlin. [it1] Difference between family benefit for a couple with very low income and no children and the same income and 1 child. [uk1] The amount depends on council tax payments [uk2] The amount depends on rent payments
[a] Income-test disregard changes with the number or age of children. [b] Income-test disregard changes if it is a single or lone parent family. [c] Income-test disregard changes with the number of employed parents . [d] CRDS – Special social contribution on family benefits. [e] Not eligible if mother works more than 19 hours per week. [f] Income-test disregard increases with age of children. [g] Not eligible if mother has employment income. [h] Lone parents are allowed to choose the joint scheme of taxation. [i] There are two child benefits, one for social security contributors and other those who do not contribute. However, eligibility conditions and amount of the benefit is the same in both policies. EUROMOD take them as one benefit. These benefits have special rules (no age or income limit and higher amount of benefit) for disable children. Due to lack of data these special rules are not simulated in EUROMOD.
For detailed descriptions of each country's tax-benefit systems see the C*ountry Reports*, available at http://www.econ.cam.ac.uk/dae/mu/emod.htm

Chapter IV

Simplifying the Spanish Personal Income Tax System

1 INTRODUCTION [96]

The Spanish personal income tax (SPIT) is widely acknowledged as very complicated. The points that are usually stressed when describing the complexity of the income tax legislation are its excessive length (full of details and exceptions), the existence of a dual taxation scheme (individual and joint schemes) and its use of complicated and vague vocabulary, which is not understood by the majority of taxpayers. Some 80 per cent of Spanish taxpayers admit the need for assistance in filling in their income tax return (Area de Sociología Tributaria, 2001). This lack of understanding of the legislation by the average taxpayer is one of the explanations for the Spanish income tax system losing social approval. The general perception is that the rich, who are able to get good professional advice, are the ones who gain the most from complexity. The general public thus does not see the income tax as a fair and progressive tax. According to Alvira Martín and García López (1998), half the Spanish taxpaying population prefers VAT (a tax widely known to be regressive in Spain) to income tax.

Diminishing the complexity was therefore one of the main objectives of the Spanish income tax reform carried out at the end of 1998. However, Spanish policy-makers decided to reduce income tax complexity in a somewhat special way. Instead of reducing the length or simplifying the terminology of the legislation, the main strategy was to lower the number of tax returns filed to the Spanish Inland Revenue (*Agencia Estatal de Administración Tributaria*, henceforth AEAT). This did not strictly entail decreasing the number of

[96] An earlier version of this chapter was published in Fiscal Studies. Levy and Mercader (2002).

contributors. After the reform, some taxpayers settle their tax obligations through the payment of withholdings without needing to fill in a tax return.

The objective of this chapter is threefold. First, it aims to assess the extent to which the reform has fulfilled its purpose of reducing the number of tax returns and of adjusting withholding taxes to the income tax liability. Secondly, it analyses the effects of the reform on compliance costs and equity. Finally, it studies alternative reform proposals that would achieve the twin objectives of reducing the number of tax returns and minimising the gap between the payment of withholding tax and the tax liability under a revenue-neutral constraint. To carry out this analysis, the income tax reform is simulated using the Spanish tax–benefit micro-simulation model, ESPASIM. This model enables one to calculate withholdings and income tax liabilities, before and after the reform, from a sample of individuals and families that is representative of the population in Spain.

The chapter is divided into six sections. After this introduction, Section II briefly describes the Spanish income tax system and its recent reform, including a description of the system of withholding. Section III discussed some methodological issues related to use of the microsimulation model ESPASIM. Section IV describes and analyses the effects of the income tax reform on simplicity by looking at the number of tax returns sent to the AEAT and the gap between withholding and tax liability. In Section V, taking the new system as a baseline, some alternative reform proposals are studied. Conclusions are then drawn.

2 DESCRIPTION OF THE SPANISH PERSONAL INCOME TAX SYSTEM

2.1 Effective Income Tax Function

Let T_i be the income tax function of individual i. Instead of having a single tax function, the Spanish personal income tax has two. This occurs because individuals who belong to a family unit[97] can choose to pay either through the individual scheme, T_i, or through the joint scheme, which taxes the income of all members of the family unit together. Let $T^c_{f(i)}$ be the tax liability of family unit $f(i)$, where c represents the joint scheme. Supposing that members of the family unit minimise the family liability rather than the personal liability, the personal income tax function, T^*_i, can be written as (4.1)

$$T_i^* = \begin{cases} T_i^c & \forall\, i \in f(i) \text{ and } \sum_{i \in f(i)} T_i \geq T^c{}_{f(i)} \\ T_i & \text{otherwise} \end{cases} \tag{4.1}$$

where T^c_i is the individual tax liability under the joint scheme.

In most countries, the personal income tax is initially collected periodically throughout the fiscal year by a pay-as-you-earn (PAYE) procedure, which is the system of withholding. While income tax applies to the total annual income of the individual, withholdings are deducted from each source of income separately. Generally, the amount paid in income tax withholding will differ from the tax liability unless the individual has only one source of income. This is due to the progression of the income tax schedule. The periodicity of collection also affects the adjustment of withholding to income tax liability. Withholding taxes are collected every time the individual receives an income, while income tax applies

[97] The family unit consists of a married couple (common law partners excluded) and their children under 18 years of age, or of a single parent and his/her children under 18 years of age (Ley 40/1998, art. 68).

to the annual amount. If the individual's income is not evenly distributed throughout the year, the withholding will again differ from the tax liability. Mathematically this can be illustrated using Jensen's inequality. If the tax schedule, T(x), is strictly convex then

$$T(E(x)) < E(T(x)) \text{ for all } d\left[T(x)/x\right]/dx > 0 \text{ and x} \tag{4.2}$$

where E is the expectations operator over the tax base x.

In Spain, each type of income has withholding taxes deducted at a different rate. Self-employment income, capital incomes and rents have tax withheld at a fixed rate, while taxes on 'employment income' (wages and social benefits) are withheld under a progressive schedule. At the end of the year, taxpayers are requested to file a tax return. In this return, the taxpayer calculates the income tax liability, based on the total income obtained during the year. Other personal circumstances are involved in this calculation. If the withholding taxes already collected are greater than the income tax liability, the individual receives a refund. If they are smaller, the individual has to pay the difference to the AEAT.

The mechanism that deals with the interaction between the income tax function and the system of withholding taxes is the Obligation to File a Tax Return (OFTR, hereafter). Up to a certain level of income, the individual is not obliged to file a tax return. Exempted taxpayers can choose either to file one and pay the exact amount of taxes or to take withholding taxes collected as their final liability. Supposing that the individual minimises the amount of taxes paid, the effective personal income tax function, τ_i, can be written as

$$\tau_i = \begin{cases} min\left[W_i, T_i^*\right] & \text{if the individual is exempted from filing a return} \\ T_i^* & \text{if the individual is obligated to file a tax return} \end{cases} \tag{4.3}$$

where W_i is the individual withholding function.

2.2 Effective Income Tax Function for 'Employment Income' before and after the Reform

Before the 1998 income tax reform, the income tax exemption limit for 'employment income' (wages and social benefits) was below the exemption limit for withholding taxes[98]. Therefore, under Spanish law everybody who paid withholding tax was obliged to file a tax return. If an individual were exempted from filing a tax return, then he or she would not have fiscal duties. Hence, the effective income tax function for those with 'employment income' before the reform was

$$\tau_i^e = \begin{cases} T_i^{e,*} & \text{if the individual is obliged to file a return} \\ 0 & \text{otherwise} \end{cases} \qquad (4.4)$$

where *e* represents 'employment income'.

After the reform, this situation changed significantly. The income tax exemption limit for employment income was tripled[99]. The withholding exemption limit was also reformed[100] but its lowest limit was not increased. As a result, exemption from filing a return no longer ensures that the individual is not paying tax. Under the new income tax, the effective personal income tax function for those with 'employment income' is as expressed in equation (4.3).

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[98] In 1998, the lowest limit for an individual to be exempt from paying withholding was 7,500 euro per year, while the limit to exempt from filing a tax return was 7,200 euro. To be exempt from filing a tax return the individual should also have less than 1,500 euro in capital income and no self-employment or property income. According to the *Encuesta de Salarios*, in 1998 the average annual earnings in Spain were about 15,878 euro.

[99] Alter the reform the exemption limit of the obligation to file a tax return was increased from 7,200 to 21,000 euro.

[100] Before the reform, it depended on the number of children. After the reform, the limit also depends on marital status and the amount of the spouse's income (Real Decreto 2717/1998).

2.3 The New Withholding Function

In order to avoid disparity between the amount of income tax liability and withholding taxes collected, the withholding function on employment income was substantially changed. Before the reform, withholding tax was calculated through a table of average tax rates that depended on income bracket and number of children. After the reform, the calculation is similar to the individual income tax scheme[101] (not taking into account tax credits). Hence, in order to obtain the rate of withholding, one has to calculate the tax base, deduct tax allowances and apply the tax schedule (details in Table 4.1).

Furthermore, there is a change in the base period of withholding collection. Before the reform, withholding taxes were collected periodically, usually once a month. The rate of withholding was based on the expected annual income of the individual. If the expected income or the number of children changed, then the rate was recalculated and the new rate used for future periods. However, there was no rectification of the amount withheld up to that moment. At the end of the year, the difference between the amount of withholding that 'had been' and the amount that 'should have been' collected was disregarded. Those possible differences had no final effect on individuals' tax liabilities, because all taxpayers were obliged to present a tax return. This is no longer the case after the reform. In order to reach the objective of matching the amount of withholding to the final liability, $W_i = T_i^*$, the new withholding taxes are collected on a cumulative basis. Following Kay and King (1990), this means that the system 'tries to ensure that at each point in the tax year an appropriate proportion of the whole year's liability has been paid'. As before the reform, the system is based on expected annual income and personal characteristics. However, if one of these variables changes, then the new withholding not only takes into account these

[101] Section IV shows that there are marginal differences that affect some taxpayers.

new values, but also corrects the difference between what has been collected and what should have been collected so far.

This system obviously increases employers' compliance costs, especially in a country such as Spain. In 1999, 33 per cent of Spanish employees held temporary contracts and about 52 per cent of the contracts signed that year had duration of less than six months. In this context, the difficulty of predicting employees' annual wages is considerable. Hudson and Godwin (2000) draw the same conclusion for the UK withholding system. According to them, 'the aim of withholding the exact amount due in the financial year (...) makes the UK system more complex for employers to operate and thus increases their compliance costs'. However, they argue that this simplifies the task for most taxpayers. Moreover, they find economies of scale in such activities, and, therefore, claim that transferring the costs from the individuals to the companies minimises the overall compliance costs. Section IV analyses the effect of these changes on Spanish taxpayers.

Table 4.1 Main Elements of the Income Tax System in 1999 Simulated in ESPASIM

	Income tax individual scheme	*Income tax joint scheme* [a]	*Withholding tax on 'employment income'* [a]
Exemption limit	• Earnings plus capital incomes lower than € 21,000 • Capital incomes lower than € 1,500 • No rents, self-employment incomes, mortgage interest payments or private pensions contributions	• Earnings plus capital incomes lower than € 21,000 • Capital incomes lower than € 1,500 • No rents, self-employment incomes, mortgage interest payments or private pensions contributions	• **Depend on number of children, marital status and income of the spouse.** • **Values: from € 7,500 (single without children) to € 12,170 (married with dependent spouse and two or more children)**
Tax base	• Wages, salaries, pensions, other social benefits, rents, self-employment and capital income	• Wages, salaries, pensions, other social benefits, rents, self-employment and capital income	• Wages, salaries, pensions and other social benefits, ***rents, self-employment and capital income***

Tax allowance	• Social insurance contributions
	• Earnings allowance (€ 2,255 to € 3,000)
	• Personal allowance:
	• General: € 3,305
	• Supplement for elderly people: € 595
	• Family allowances:
	  • Children:
	  ○ € 1,200 (1st and 2nd),
	  ○ € 1,800 (3rd and following)
	  ○ € 150 (supplement children 4 to 16 years)
	  ○ € 300 (supplement children below 4 years)
	  • Children allowances must be divided by 2, unless the taxpayer is single-parent
	  • Dependent Parent: € 600 for each older than 65
		• Social insurance contributions
		• Earnings allowance (€ 2,255 to € 3,000)
		• Personal allowance:
		• Couple: **€ 6,610**
		• Single Parent with children: **€ 5,409**
		• Supplement for elderly people: € 595
		• Family allowances:
		  • Children:
		  ○ € 1,200 (1st and 2nd),
		  ○ € 1,800 (3rd and following)
		  ○ € 150 (supplement children 4 to 16 years)
		  ○ € 300 (supplement children below 4 years)
		  • ***Children allowances must be divided by 2, unless the taxpayer is single-parent***
		• Dependent Parent: € 600 for each older than 65
			• Social insurance contributions
			• Earnings allowance (€ 2,255 to € 3,000)
			• Supplementary allowance for pensioner (**€ 600**)
			• Supplementary allowance for unemployed (**€1,200**)
			• General: € 3,305
			• Supplement for elderly people: € 595
			• Family allowances:
			  • Children:
			  ○ € 1,200 (1st and 2nd),
			  ○ € 1,800 (3rd and following)
			  ○ € 150 (supplement children 4 to 16 years)
			  ○ € 300 (supplement children below 4 years)
			  • **Children allowances must be divided by 2, for all taxpayers (single-parent or not)**
			  • **Supplement for more than 2 children: € 1,200**
			  • ***Dependent Parent: € 600 for each older than 65***

Tax schedule	• 6 income brackets. Marginal tax rates range between 18 and 48 percent	• 6 income brackets. Marginal tax rates range between 18 and 48 percent	• 6 income brackets. Marginal tax rates range between 18 and 48 percent
Tax credits	• Donations: 10 percent of total expenses • Mortgage payments: 25 percent of first € 4,508 and 15 percent of further € 4,508	• Donations: 10 percent of total expenses • Mortgage payments: 25 percent of first € 4,508 and 15 percent of further € 4,508	• ***Donations: 10 percent of total expenses*** • ***Mortgage payments: 25 percent of first € 4,508 and 15 percent of further € 4,508***
Withholding on other incomes			• Self-employment: 20percent rate on total income • Capital: 18 percent rate on total income • Rents: 18 percent rate on total income

[a] Text in bold represent elements that differ from the individual scheme. Text in italics represents elements that are available in the individual scheme and are not available under the scheme in this column (joint or withholding scheme).

3 METHODOLOGICAL ISSUES

The empirical analysis of the reform is based on ESPASIM[102]. The model simulates income tax in detail and includes both the income tax parameters before the last government reform and the new parameters of the current income tax system, including the parameters related to the new system of withholding. Simulating using ESPASIM not only allows one to know the number of filed tax returns, the aggregate amount of withholding tax and the income tax revenue. It also tells one what would have been the income tax liability of a person who is not obliged to file a tax return, and why the withholding differs from the tax liability. Compared with simulations based on administrative data (*Panel de Declarantes del IRPF*), ESPASIM provides more extensive and complete information since it includes both people who file a tax return and people who do not file a return but who pay tax through the system of withholding.

The model is based on the assumptions that there are no differences between how the system works in theory and how it works in practice, and that, given the legislation, individuals choose to pay the lowest possible tax. An important reason to expect a departure from these assumptions is the existence of tax evasion. A second reason to expect a deviation, particularly important in this context, is that low-income households exempt from filing a return may decide not to request the refund of the amount that they have already paid under the withholding system. The omission of these differences between theory and practice means that the results produced by the model express the 'potential' rather than the 'real' effect of the income tax reform. Moreover, withholding is modelled on a 'real' year income base. Thus, withholding variations induced by variations in incomes over the year are not considered in the model. This implies that ESPASIM underestimates the costs of the new withholding system associated with variations in incomes over the year. Furthermore, ESPASIM is a *static* micro-simulation model. This means that calculations are made without taking into consideration any reaction in the behaviour of agents brought about by policy

[102] For a description about ESPASIM, see Chapter II or Levy, Mercader-Prats and Planas (2001). Information about the model is periodically updated at the webpage: http://selene.uab.es/espasim

change. Hence, the results should be interpreted as the short-term effect, before agents have time to adjust their behaviour to the policy change.

4 AN ASSESSMENT OF THE REFORM

This section analyses how much the reform of withholding has simplified the system. More particularly, it considers both the reduction in the number of tax returns sent to the AEAT and the gap between the withholding payment and income tax liability.

The results presented below proceed from the simulation of two scenarios, named SPIT98 and SPIT99. SPIT98 is the tax–benefit scenario of 1998. SPIT99 includes all the elements of the tax–benefit system of 1998 except for the income tax and withholding, which correspond to those after the new reform[103]. Thus, it should be stressed that SPIT99 does not simulate the 1999 income tax system. Instead, it simulates what would have happened if the new reform had been implemented in 1998[104].

4.1 Individuals Exempt from Filing a Tax Return

According to the results in Table 2, the reform reduces the total number of taxpayers (defined as those with a strictly positive tax liability, $t_i > 0$) by around 1.4 million people (from 12.4 million to 11.0 million). The main cause of this reduction is the decline in the tax burden, which, according to the estimates, is around 14.8 per cent lower after the reform[105]. Over 5 million taxpayers are exempted from filing a return after the reform (45 per cent of all

[103] The monetary parameters of the 1999 income tax and withholding were deflated to 1998 levels using the consumer price index.
[104] All monetary results presented refer to 1998 prices.
[105] According to ESPASIM results, SPIT98 collects 31.3 billion euro and SPIT99 26.6 billion euro. Official statistics indicate that total tax collection was not altered in nominal terms between 1998 and 1999, 34.3 billion euro and 34.8 billion euro respectively (Ministerio de Hacienda, 2000). Several studies about the effects of the reform on tax collection predicted a reduction in the tax burden induced by the reform, in real terms, of between 15 and 20 per cent (see Mercader-Prats and Levy (1998), Castañer, Onrubia and Paredes (1999) and Sanchís and Sanchís (2000)).

taxpayers). Before the reform, only 7.2 per cent of those paying income tax were exempted from filing the tax return.

Almost 2.5 million taxpayers who are exempted from filing the tax return pay withholdings that exceed the final liability, $W_i > T_i^*$. Assuming that the cost of filing the tax return is lower than the excess of withholding, these taxpayers are expected to file the return. Therefore, half of the taxpayers who are exempted do not file a tax return. Furthermore, only 1.4 million exempted taxpayers, who are expected not to file a tax return, pay through the withholding tax the same about that would pay filing the tax return, $W_i > T_i^*$. After the reform, more than 1 million exempted taxpayers pay less tax than they should because they are exempt from filing the tax return.

Table 4.2 Number of Taxpayers, Exempt or Not Exempt from Filing a Tax Return, under the SPIT98 and SPIT99 Systems

	Individuals with $(\tau_i) > 0$ [a]		*Individuals with* $(W_i \text{ or } T_i^*) > 0$ [b]	
	SPIT98	*SPIT99*	*SPIT98*	*SPIT99*
All individuals	12,399,136	11,020,519	14,925,986	15,146,287
- Obliged to file a return	11,501,537	6,015,755	12,513,520	7,956,283
	(148,916)	(117,987)	(152,434)	(131,625)
- Exempt from filing a return	897,599	5,004,764	2,412,466	7,190,004
- $(W_i - t_i^*) = 0$		1,430,944		1,447,278
		(61,425)		(61,760)
- $(W_i - t_i^*) > 0$	97,719	2,463,849	1,612,586	3,463,510
	(16,335)	(79,481)	(65,048)	(92,934)
- $(W_i - t_i^*) < 0$	799,880	1,109,921	799,880	2,279,216
	(46,309)	(54,328)	(46,309)	(76,639)

τ_i – income tax effectively paid (see equation (4.3) for formal definition)
W_i – withholding collected (see equation (4.3) for formal definition)
T_i^* – income tax liability (see equation (4.1) for formal definition)
[a] Taxpayers (individuals with final income tax greater than zero)
[b] Individuals with income tax or withholding greater than zero.
Note: Standard errors are given in parentheses.
Source: ESPASIM/ECHP.

These results offer a rather positive view of the reform since they do not take into account individuals with no tax duties but with positive withholding. The last two columns of Table

4.2 complement this picture by counting the individuals who have either a positive income tax liability or positive withholding ($T_i > 0$ or $W_i > 0$). Notice that after the reform, the number of taxpayers plus the number of people with tax duties or positive withholding increases by about 220,000. Almost 2 million individuals have to file a tax return although they do not have to pay taxes. Another 1 million individuals exempt from filing a return pay withholding taxes unnecessarily since their final liability is also zero. Finally, over 1.1 million individuals who should be paying taxes are not contributing at all, because they are exempted from filing a return and their withholding is zero. According to these numbers, the total number of tax returns sent to the AEAT would be 7.96 million (those obliged to file a tax return) plus 3.46 million (exempt but paying withholding in excess), a net reduction of only 2.7 million with respect to the old system. In fact, out of the total number exempt from filing a return and paying withholding or income tax, only 20 per cent pay the right amount of taxes.

Why there are so many individuals exempt from filing a tax return paying withholding different from the income tax liability? Analysing Table 4.1, one can identify some possible sources of divergence between withholding and the new income tax. These are presented and measured in Table 4.3.

The joint scheme of taxation is a major cause of over-withholding. Almost 65 per cent of the individuals paying excessive withholding use the joint scheme. In average, the excess of withholding tax among these individuals is around 600 euro. The reason for this gap between withholding and joint taxation can be readily seen in Figure 4.1. This shows the withholding and income tax liability, under individual and joint schemes, for an 'artificial' tax unit[106]. After the reform, the withholding function is similar to the liability under the individual scheme — hence, if the taxpayer chooses the individual scheme, withholding almost perfectly fits liabilities. However, if the taxpayer chooses the joint scheme, then withholding is greater than liabilities. Because of the progression of the income tax schedule, this gap increases with income.

[106] See note [a] to Figure 4.1.

As already commented, capital incomes are exempted from filing a tax return up to 1,500 euro and are withheld using a flat tax rate (see Table 4.1). Of course, it is unlikely that the withholding flat tax rate matches the effective average tax rate of the progressive income tax schedule. Therefore, those individuals who are exempted from filing a tax return and whose effective average tax rate is lower than the flat withholding tax rate, pay withholding in excess. According to Table 4.3, 2.2 million individuals with capital income pay more withholding than they should. However, the average excess of withholding among these individuals (240 euro) is considerably lower than the overall average (400 euro).

Other sources of excess result from the fact that the withholding tax does not include the dependent parent tax allowance and that single parents can only deducted half the amount of the children tax allowances (see Table 4.1)[107].

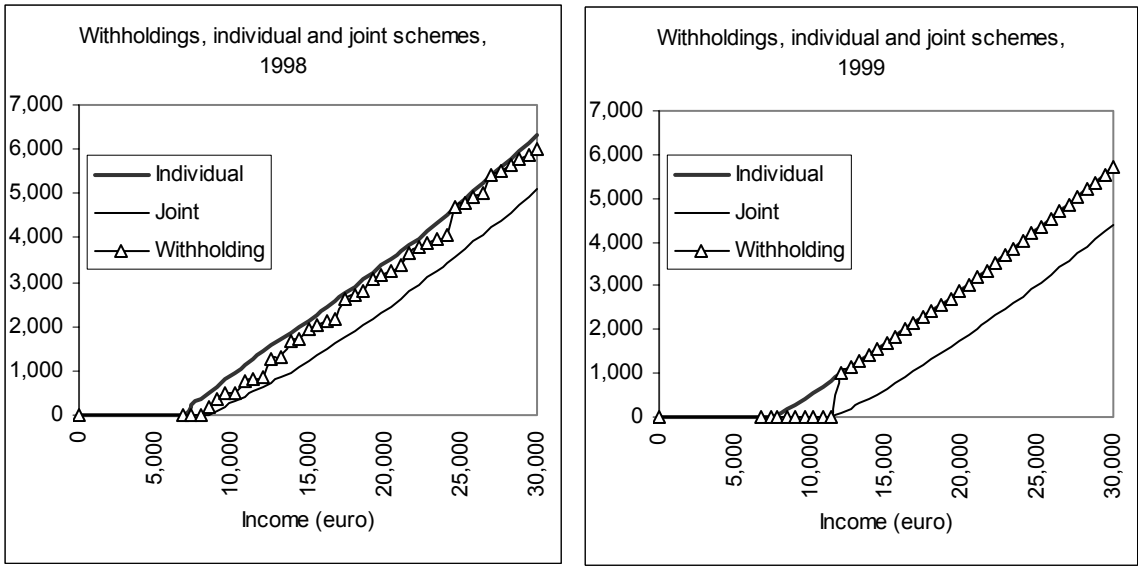
[107] These exclusions from the withholding rules were corrected by a sentence from the Spanish Supreme Court in May 2000 and included in the law in June 2000 (*Real Decreto* 1088/2000).

Table 4.3 Causes of Differences between Withholding and Income Tax Liabilities among Individuals Exempt from Filing a Tax Return, under the SPIT99 System

	All Individuals with (W_i or T_i^*) > 0 [a]		*Individuals with (W_i or T_i^*) > 0 and no 'other incomes'* [b]	
	Number	*Aggregated gap (thousand euro)*	*Number*	*Aggregated gap (thousand euro)*
Over-withhold'	3,463,510	1,397,864	1,239,276	876,429
	(92,934)	(54,658)	(57,308)	(44,486)
Taxes through Joint Scheme	2,234,298	1,323,750	1,088,607	841,762
	(75,926)	(54,282)	(53,819)	(44,033)
Cohabits with Dependent Parent	582,186	127,973	181,579	69,009
	(39,621)	(15,798)	(22,242)	(11,814)
Single Parent	51,755	9,688	23,872	7,072
	(11,895)	(2,739)	(8,081)	(2,507)
Possess 'Other Incomes'	2,224,234	520,318	0	0
	(75,765)	(32,754)	(0)	(0)
Under-withhold'	2,279,216	-344,925	1,577,674	-276,063
	(76,639)	(19,486)	(64,370)	(15,738)
Has more than 2 children	44,492	-6,394	37,311	-5,945
	(11,030)	(2,915)	(10,101)	(2,893)
Pensioner or unemployment benefit recipient	1,488,389	-230,610	1,156,712	-183,234
	(62,597)	(12,260)	(55,427)	(11,322)
Exempt from withholding	1,135,894	-204,609	1,128,034	-195,233
	(54,941)	(17,488)	(54,757)	(14,210)
Possess 'Other Incomes'	693,682	-57,644	0	0
	(43,186)	(5,452)	(0)	(0)

[a] Individuals with income tax or withholding greater than zero.
[b] Individuals with income tax or withholding greater than zero and no self-employment, capital or property income.
W_i – withholding collected (see equation [2] for formal definition)
T_i^* – income tax liability (see equation [1] for formal definition)
Notes:
Standard errors are given in parentheses.
'Over-withhold' - to pay more withholding than the amount determined by income tax liability.
'Under-withhold' - to pay less withholding than the amount determined by income tax liability.
'Other incomes' – Incomes which are not considered earnings in Spanish Income Tax (self-employment, capital and property incomes).
The groups presented in the table are not exclusive; hence some individuals are counted in two or more groups.
Source: ESPASIM/ECHP.

Figure 4.1 Withholding and Income Tax Liabilities under Individual and Joint Schemes for a Specific Taxpayer, under the SPIT98 and SPIT99 Systems [a]



[a] Calculations were made using an 'artificial' individual, who only has employment income, is a member of a family unit with a dependent spouse (the spouse has no income) and has two children under 18 years of age.
Source: ESPASIM.

Among those individuals 'under-withholding' (i.e. paying withholding taxes that are less than the income tax), the supplementary allowances for pensioners and for receivers of unemployment benefit under the withholding function (absent in the tax function), as well as the differences between the withholding and income tax exemption limits, are the major causes for this gap, especially among those with no 'other incomes'. Out of the total population under-withholding, 65.3 per cent are pensioners or unemployment benefit recipients. Also out of the total, 50 per cent are 'exempt from withholding'; this group consists of individuals with low incomes who would have to pay income tax if they had to present a tax return. Overall, the aggregate amount of under-withholding is 345 million euro. Since the under-withholding individuals do not have to file a tax return, the AEAT is forgoing these resources, which represent 1.3 per cent of overall income tax receipts. Alternatively, it could be said that the AEAT is paying 1.3 per cent of total income tax revenue to reduce the

number of tax returns by 1.1 million. Moreover, differences in the tax treatment received through withholding and through the tax function generate new horizontal inequities within the system.

To sum up, although the reform mainly increases the number of exempted taxpayers (there are 4.1 million new exempted), the number of tax returns filed to the AEAT decreases only by 2.7 million, since many of the taxpayers exempted pay withholding in excess. Moreover, the new income tax system has not fully eliminated the compliance costs for individuals exempted but with positive withholding — these total 6 million individuals after the reform. Although they are not obliged to calculate their income tax liability in a tax return, they need to calculate it to be sure that they are not paying withholding in excess. Individuals with capital incomes can hardly predict the most convenient way of paying taxes without calculating the tax liability. Pensioners, unemployment benefit recipients and single people with 'employment income' and without deductible expenses (such as mortgage payments or donations) are the most likely taxpayers to have no advantage from filing a return. Married couples with considerable income inequality between spouses are the most likely to be under the joint scheme and thus benefit from filing a tax return.

After the reform, part of the compliance cost faced by low-income taxpayers has been transferred to the AEAT. Because of the greater amount of information collected through the withholding system, the AEAT now offers a fast-track tax return for exempted taxpayers. This tax return can be filed directly by telephone with the assistance of a worker from the AEAT.[108]

[108] According to Area de Sociología Tributaria (2001), the number of taxpayers who use assistance from the AEAT has increased with the reform (from 12.4 million to 18.7 million). In addition, both the average time and the direct monetary cost spent by taxpayers in order to file the return have been reduced.

4.2 Gap between Withholding and Income Tax Liability for All Individuals

Here the analysis is extended to measure the gap between withholding taxes collected and income tax liability to all individuals, independently of whether they are exempt from filing a return or not. If a taxpayer pays withholding taxes higher than the income tax liability, he or she will not get this over-withholding back until the following year, when the tax return is filed. It should be noted that the Spanish government does not pay interest on income tax refunds. Hence, this 'over-withholding' can be considered as a compulsory loan that the government takes from the contributors free of financial costs.[109]

Table 4.4 shows that the reform increases the aggregate excess collection of withholding tax by 1.5 billion euro. On the other hand, the new system considerably reduces the number and the amount of under-withholdings. Overall, the new income tax increases the difference between the amount of withholding tax 'effectively collected' and the amount that 'should have been' collected by 3 billion euro. Under SPIT99, the system of withholding collects 31.7 per cent more than overall income tax revenue. Not surprisingly, taxpayers express negative opinions when assessing the new withholding system (see Area de Sociología Tributaria (2001)).

[109] Some taxpayers may interpret over-withholding as a way of committing themselves to forced saving. According to Area de Sociología Tributaria (2001), 36.7 per cent of taxpayers who paid withholding taxes in excess interpret it in this way. However, 52.6 per cent think that there should not be over-withholding or that the government should pay interest for it.

Table 4.4 Causes of Differences between Withholding and Income Tax Liabilities among All Individuals, under the SPIT98 and SPIT99 Systems

	All Individuals with W_i or $T_i^* > 0$ [a]			
	SPIT98		*SPIT99*	
	Number	*Aggregated gap (thousand euro)*	*Number*	*Aggregated gap (thousand euro)*
'Over-withhold'	9,484,048	5,935,393	9,674,244	7,492,672
	(140,116)	(140,674)	(141,056)	(161,061)
Taxes through Joint Scheme	5,350,262	4,581,836	5,686,616	5,625,472
	(112,390)	(133,300)	(115,286)	(147,462)
Cohabits with Dependent Parent	2,587,587	2,816,772	2,633,330	2,771,661
	(81,314)	(119,447)	(81,978)	(114,066)
Single Parent	1,134,979	491,398	1,275,534	707,254
	(54,920)	(36,521)	(58,113)	(50,717)
Possess 'Other Incomes'	149,031	122,838	130,901	69,046
	(20,159)	(22,325)	(18,897)	(15,239)
'Under-withhold'	5,441,938	-2,425,527	3,540,583	-970,632
	(113,193)	(159,057)	(93,860)	(92,367)
Has more than 2 children	155,144	-108,318	107,634	-52,794
	(20,567)	(36,769)	(17,141)	(19,978)
Pensioner or unemployment benefit recipient	2,096,342	-944,154	1,967,222	-466,656
	(73,683)	(91,431)	(71,503)	(60,185)
Exempt from withholding	1,282,717	-352,646	1,316,284	-253,385
	(58,271)	(22,798)	(59,002)	(19,122)
Possess 'Other Incomes'	2,208,793	-1,530,114	1,634,513	-622,589
	(75,518)	(149,594)	(65,469)	(90,246)

[a] Individuals with income tax or withholding greater than zero.
W_i – withholding collected (see equation [2] for formal definition)
T_i^* – income tax liability (see equation [1] for formal definition)
Notes:
Standard errors are given in parentheses.
'Over-withhold' - to pay more withholding than the amount determined by income tax liability.
'Under-withhold' - to pay less withholding than the amount determined by income tax liability.
'Other incomes' – Incomes which are not considered earnings in Spanish Income Tax (self-employment, capital and property incomes).
The groups presented in the table are not exclusive; hence some individuals are counted in two or more groups.
Source: ESPASIM/ECHP.

Once again, the joint scheme of taxation and the different treatment of self-employment, capital and property income are the major causes of excessive withholding, although mortgage tax credits and the tax allowance for dependent parents also play an important role. In relation to the old system, over-withholding has notably increased for those possessing 'other incomes' or contributing under the joint scheme. Again, the main causes of under-withholding are the different treatment of 'other incomes', the supplementary allowances for pensioners and unemployment benefit recipients, as well as the differences between the withholding and income tax exemption limits (see Table 4.1).

Table 4.5 Distribution of Average $W_i - T_i^*$ by Decile a

Decile	*Average income (euro)*	*Average (W_i - T_i^*) > 0 (euro)*		*Average (W_i - T_i^*) < 0 (euro)*	
		SPIT98	*SPIT99*	*SPIT98*	*SPIT99*
1	2,674	48	60	0	0
	(64.81)	(33.42)	(26.17)	(0.38)	(0.24)
2	4,697	103	81	-3	-1
	(63.91)	(37.94)	(40.51)	(0.80)	(0.29)
3	6,158	185	206	-15	-5
	(74.20)	(33.35)	(44.70)	(1.89)	(1.04)
4	7,501	265	354	-34	-12
	(76.86)	(36.03)	(47.61)	(3.33)	(1.41)
5	8,895	320	480	-47	-15
	(90.77)	(40.60)	(56.01)	(4.16)	(1.44)
6	10,508	362	536	-67	-21
	(113.11)	(42.50)	(56.04)	(5.58)	(2.22)
7	12,526	323	521	-88	-35
	(134.87)	(52.09)	(62.20)	(6.15)	(2.95)
8	15,319	370	519	-128	-48
	(163.01)	(57.22)	(74.57)	(8.78)	(3.96)
9	19,172	417	507	-213	-48
	(220.18)	(72.40)	(85.69)	(16.34)	(4.42)
10	32,651	514	419	-563	-267
	(676.07)	(91.48)	(93.22)	(61.05)	(35.95)

[a] Deciles were defined using gross household equivalised income. Equivalence scale used: square root of the number of individuals within the household. Each household was weighted by its size.
Note: Standard errors are given in parentheses.
W_i - withholding collected (see equation (2) for formal definition).
T_i^* - income tax liability (see equation (1) for formal definition).
Source: ESPASIM/ECHP.

Table 4.5 shows that the average amount of 'over-withholdings' and 'under-withholdings' increase with the income level. However, in relative terms (i.e., as a percentage of the household income) the excess of withholding tax is greater at the middle of the income distribution. Households in deciles 4 to 7 pay, in average, an excess of withholdings that represent more than 4 percent of their annual income. The reform reinforces this pattern. In comparison to SPIT98, the new system increases, in average, the 'over-withholdings' of households in fifth to seventh decile by more than 50 percent. On the other hand, after the reform 'under-withholdings' hardly exceed half percentage point of household disposable income. Nonetheless, 'under-withholding' are considerably higher in the top decile.

5 ALTERNATIVE REFORM SCENARIOS

Taking the new income tax system as baseline, this section explores alternative reforms that could improve the twin objectives of reducing the number of tax returns sent to the AEAT and minimising the gap between the payment of withholding and the tax liability whilst keeping a revenue-neutral constraint.

The previous section identified joint taxation as one of the main causes of the gap between withholding and the income tax liability. In theory, the main objective of joint taxation is to assure tax "neutrality" among families: all families with the same income have the same tax liability independently of how the income is split among household members. For that reason, in the past joint taxation was the norm in most countries[110]. On the other hand, under equal tax reliefs and an equal progressive tax schedule, the burden produced by joint taxation is greater than by individual taxation for any family with more than one earner. Moreover, given the progression of the tax schedule, joint taxation raises the marginal tax rates of family members, especially for the one with lowest earnings[111]. In order to tackle these problems, most joint taxation schemes have greater tax reliefs or different tax schedules (see O'Donoghue and Sutherland, 1998). However, this differentiated treatment does not benefit all families and, as a result, many EU countries have abolished the joint taxation.

Following a sentence by the Spanish Constitutional Court, the Spanish tax system is individual, but families can opt for joint taxation (recall section 2). Table 4.1 reveals that the main difference between Spanish individual and joint taxation is that, in comparison to the former, the later multiplies by two the personal and the family tax allowances for couples[112]. Therefore, given that all families can opt for individual taxation, in practice the objective of the Spanish joint taxation is to alleviate the tax burden of one-earner families.

[110] For a description of the history of the treatment of marriage in the Spanish income tax, see Onrubia (2001).
[111] See O'Donoghue and Sutherland (1998) and Ruiz-Huerta et al (2001) for a discussion about the properties of joint taxation and its practice in EU and OECD countries.
[112] In the case of single-parents the joint taxation rises the personal allowance by 2/3.

The justification for this special treatment for one-earner couples is that the ability to pay of married couples is lower than the one of a single person with the same income. Ayala et al (2003) explore this argument by calculating the implicit equivalence scales of the Spanish income tax reliefs. Their results show that, unlike most equivalence scales used in income distribution and poverty analysis (recall section Chapter I.3.3.3, in Chapter I), the Spanish joint taxation assumes no economies of scale in a couple (each spouse has the same weight as a single person). The implicit equivalence scale in joint taxation is considerable more generous than in any other Spanish tax or benefit. For example, in contrast to the 100 percent increase in the join taxation, the Spanish minimum income guarantee programmes pay, in average, only 16 percent more to a couple than to a one-adult household (Ayala et al, 2003).

Pasqual (1992) also show that the Spanish joint taxation does not benefit low-income families since the tax reliefs are not refundable. Therefore, similarly to the discussion in chapter III, tax reliefs are only accessible to medium/high-income households and are more generous than the social benefits targeted to the poor. Furthermore, Pasqual et al (1994) demonstrate that the Spanish joint taxation produces paradoxical incentives in the marital status of families. On the one hand, it encourages the marriage of one-earner couples. On the other hand, it produces financial incentives to end marriage among two-earner couples with children.

Therefore, the elimination of joint taxation is not only based on the "administrative" grounds, because it would reduce the number of tax returns. Also from efficiency, vertical and horizontal equity perspectives, joint taxation is highly questionable.

The analysis in this section is performed in two steps. In the first step, all sources of divergence between withholding and the income tax liability identified in the previous section are eliminated. The eliminations are done cumulatively through four different reform scenarios, named SIM1 to SIM4. *SIM1* includes all the elements of SPIT99 except the joint scheme of taxation, which is eliminated. *SIM2* includes all the elements of SIM1 but

'homogenises' tax allowances between withholding and income tax.[113] *SIM3* is similar to SIM2 but abolishes the exemption limit for withholding on 'employment income'. Finally, *SIM4* eliminates the mortgage tax credit. No scenario eliminates the distortion caused by self-employment, capital and property incomes in the system. One suitable way of eliminating this distortion would be a 'dual income tax' such as is practised in some Scandinavian countries. However, analysis of this type of system is beyond the scope of this study.

As it will be seen, reform *SIM4* increases government revenue and produce significant losses to many taxpayers. The second step analyse revenue neutral reforms, with respect to the baseline scenario, that minimise the number of losers.

[113] In SIM2, the withholding tax includes the tax allowance for dependent parents and the whole amount of the children tax allowance for single parents. In addition, the 'ordinary' income tax includes the tax allowances supplements for pensioners, unemployment benefit recipients and parents with more than two children. See Table 1 for details about these deductions.

Table 4.6 Effects of Alternative Reforms on Individuals Exempt from Filing a Tax Return and with No Income other than 'Employment Income'

	Over-withholding (no. of people)	*$(W_i - T_i^*) > 0$ Aggregated gap (thousand euro)*	*Under-withholding (no. of people)*	*$(W_i - T_i^*) < 0$ Aggregated gap (thousand euro)*
SPIT99	1,239,276	865,332	1,577,674	-268,351
	(57,308)	(44,152)	(64,370)	(15,611)
SIM1	201,606	30,991	1,925,669	-417,238
	(23,431)	(4,248)	(70,784)	(20,748)
SIM2	0	0	778,111	-209,498
	(0)	(0)	(45,688)	(15,977)
SIM3	0	0	0	0
	(0)	(0)	(0)	(0)
SIM4	0	0	0	0
	(0)	(0)	(0)	(0)
SIM5	0	0	0	0
	(0)	(0)	(0)	(0)
SIM6	0	0	0	0
	(0)	(0)	(0)	(0)

W_i – withholding collected (see equation [2] for formal definition)
T_i^* – income tax liability (see equation [1] for formal definition)
SIM1: SPIT99 plus abolishment of joint taxation
SIM2: SIM1 plus 'homogenised' income tax and withholding tax allowances
SIM3: SIM2 plus eliminate withholding exemption
SIM4: SIM3 plus eliminate mortgage tax credits
SIM5: SIM4 plus Personal Tax Allowance rise from € 3,222 to 4,200 and tax allowance for dependent spouse (€ 4,200)
SIM6: SIM4 plus eliminate all Family Tax Allowances and create a Children Tax Credit (€ 450 for the first two and 600 for the following), an Dependent Parent Tax Credit (€ 300) and a Dependent Spouse Tax Credit (€ 1,980).
Notes: Standard errors are given in parentheses.
Source: ESPASIM/ECHP.

Among the individuals exempt and with no income other than 'employment income', abolishing the joint scheme of taxation would reduce the number over-withholdings by about 1 million and almost eliminate the positive aggregate gap between withholding and income tax liability. On the other hand, the number of under-withholdings increases because some of the individuals who pay taxes through the joint scheme in SPIT99 are subject to withholdings that are lower than their income tax liability under the individual scheme. Compared with the 1999 system, the number of exempt individuals who do not need to file a tax return increases by 35 per cent in SIM1, while the gap between withholding and income tax decreases by 685 million euro (60 per cent lower than under the SPIT99 system).

Table 4.7 Effects of Alternative Reforms on All Individuals

	Over-withholding: aggregated gap (thousand euro)	*Under-withholding: aggregated gap (thousand euro)*	*Revenue (thousand euro)*	*Losers (no. of people)*	*Winners (no. of people)*	*Gini* [a]
SPIT99	7,492,672	-970,632	26,644,471			0.329
	(161,061)	(92,367)	(3,179,886)			(0.0044)
SIM1	3,713,639	-1,454,302	30,491,807	16,206,834	0	0.331
	(105,487)	(103,518)	(3,266,800)	(312,858)	(0)	(0.0045)
SIM2	3,721,220	-1,024,648	30,271,928	15,977,949	2,217,544	0.331
	(106,141)	(100,860)	(3,259,080)	(312,203)	(147,129)	(0.0045)
SIM3	3,753,950	-752,255	30,527,448	18,522,283	2,185,247	0.332
	(106,218)	(99,157)	(3,253,929)	(316,943)	(146,118)	(0.0046)
SIM4	2,633,021	-795,494	31,685,988	21,322,461	1,659,166	0.331
	(93,578)	(100,179)	(3,275,185)	(315,836)	(128,229)	(0.0045)
SIM5	3,451,352	-720,047	26,654,638	9,303,763	17,090,523	0.329
	(126,094)	(98,132)	(3,234,715)	(270,699)	(314,958)	(0.0044)
SIM6	3,616,506	-835,161	26,591,717	9,966,477	14,384,476	0.326
	(138,588)	(105,172)	(3,343,240)	(277,021)	(306,348)	(0.0044)

[a] Gini estimates calculated using DAD 3.1. See Duclos, Araar and Fortin (2001)
W_i – withholding collected (see equation [2] for formal definition)
T_i^* – income tax liability (see equation [1] for formal definition)
SIM1: SPIT99 plus abolishment of joint taxation
SIM2: SIM1 plus 'homogenised' income tax and withholding tax allowances
SIM3: SIM2 plus eliminate withholding exemption
SIM4: SIM3 plus eliminate mortgage tax credits
SIM5: SIM4 plus Personal Tax Allowance rise from € 3,222 to 4,200 and tax allowance for dependent spouse (€ 4,200)
SIM6: SIM4 plus eliminate all Family Tax Allowances and create a Children Tax Credit (€ 450 for the first two and 600 for the following), an Dependent Parent Tax Credit (€ 300) and a Dependent Spouse Tax Credit (€ 1,980).
Note: Standard errors are given in parentheses.
Source: ESPASIM/ECHP.

SIM2 diminishes considerably the number of cases of 'under-withholding' and eliminates the remaining over-withholding. Under SIM2, 1.1 million individuals, who were under-withholding in SIM1, have their withholding perfectly adjusted to the income tax liability. After this reform, the gap between withholding and income tax is 209 million euro. SIM3 eliminates the gap for those individuals who were not paying withholding tax because of the exemption limit for withholding on 'employment income'.

Table 7 shows that SIM3 would imply a reduction of 4 billion euro in the gap between withholding and income tax. Under SIM4, the absolute gap is further reduced, being 5 billion euro lower than under SPIT99 (a 60 per cent reduction). Table 7 also provides information on

income tax collection, numbers of losers and winners and the Gini coefficient under the different reform scenarios. As can be seen, reforms SIM1 to SIM4 raise the total tax burden by 3.5–5 billion euro. Moreover, almost 42–55 per cent of the Spanish population lose with those reforms, although relative income inequality (measured by the Gini coefficient) is not significantly altered.

Reforms SIM5 and SIM6 use the overall increase in tax burden implied by SIM4 to compensate the losers whilst retaining revenue neutrality with respect to the baseline scenario (SPIT99). These objectives can be achieved by different ways: altering rates and thresholds in the tax schedule, modifying the value of the present deductions or creating new tax allowances or tax credits. SIM5 and SIM6 are just two examples. *SIM5* increases the tax schedule's exemption limit[114] to 4,200 euro and creates a 4,200-euro tax allowance for dependent spouses.[115] *SIM6* replaces the tax allowances for children, dependent parents and dependent spouses from SIM5 with equivalent tax credits. The system of withholding is altered accordingly under both scenarios.

According to Table 4.6, SIM5 and SIM6 maintain the adjustment between withholding and income tax among individuals who only have 'employment income'. However, Table 4.7 shows that the rise of tax credits and tax allowances increases the gap among taxpayers with income from other sources. Despite that, the total absolute gaps in reforms SIM5 and SIM6 are about half the amount in the baseline scenario (SPIT99). Table 7 also shows that under these reforms, the number of losers falls from 21 million in SIM4 to 9 or 10 million. Moreover, the average loss drops to around 350 euro. About 17 million individuals (44 per cent of the population) reduce their taxes under SIM5. More than 14 million benefit from reform SIM6, with an average gain of 240 euro. Moreover, both reforms maintain the same degree of income inequality observed under the 1999 system.

[114] In the 1999 Spanish income tax legislation, this exemption limit is presented as a personal tax allowance (Mínimo Personal).
[115] A 'dependent spouse' is defined as someone married to the taxpayer and with no income.

6 CONCLUDING REMARKS

The strategy followed in Spain to simplify the income tax system was to reduce the number of income tax filings by adjusting withholding on 'employment income' to the income tax liability. This chapter has identified some important disadvantages of this practice.

Results presented reveal that, in spite of the fact that the reform exempts around 5 million people from filing a tax return, the number of tax returns is reduced only by 2.5 million. Almost 2.5 million exempted taxpayers pay withholding tax in excess and are likely to file the tax return in order to receive a refund. In fact, the new withholding system is only able to match the liability of 1.5 million taxpayers. Around 1 million taxpayers, who are exempted from filing a tax return, pay fewer withholdings than they should.

The new system establishes a duality between the system of withholding and the income tax function that ends up maintaining part of the compliance costs for most individuals who are not obliged to file an income tax return but are paying withholding. Although they are not obliged to calculate their income tax liability in a tax return, they need to calculate it to be sure that they are not paying withholding in excess. Differences in treatment between withholding and the income tax function also generate problems of horizontal inequity in the system. Moreover, the analysis suggests that compliance costs for companies have increased with the reform. The withholding function is more complex than before and must be recalculated on a monthly basis.

Adjusting withholding on 'employment income' to the income tax liability does not appear to be the best strategy for simplifying a 'complex' system. The chapter explored alternative reform scenarios based on two main principles: (i) a complete homogenisation of the differences between the withholding and tax functions and (ii) a deeper simplification of the income tax function. Reforms analysed consider the abolition of the joint scheme of taxation and the general substitution of tax allowances by tax credits. The results presented indicate that adjusting withholding to the income tax liability is a more successful strategy for

simplifying ‘simpler’ tax systems, although some of the difficulties of this strategy, in particular, those related to the treatment of self-employment and capital incomes persist.

Conclusions

Recalling the introduction of this thesis, a first objective of this study was to assess the effect of recent reforms of child-benefits in Spain. The results obtained in chapter III supported the widespread impression that Spain spends considerably less in child policies than other EU countries. Nevertheless, it showed that the gap is relatively lower when 'fiscal benefits' (tax reliefs) are added. In fact, the results show that in Spain the expenditure on child-related tax reliefs quadruplicates the expenditure on other child benefits. Non-refundable tax reliefs, such as the ones mainly used in Spain, are only effective for those taxpayers that earn enough income to pay income tax, and do not benefit low-income households. Therefore, Spain not only spends 'little' in child protection, it also spends it 'badly' from an equity point of view.

The recent reforms implemented in Spain alleviate in part the first problem but worsen the second. According to EUROMOD's simulations, the 2003 Spanish tax-benefit system spends almost twice as much on child benefits as the 1998 system. Nevertheless, the level is still considerably low (just above 1 percent of total household disposable income). On the other hand, instead of improving the redistributive effect of child benefits, the reform has raised the share of expenditure targeted to better-off children, by not only raising the expenditure on tax-reliefs but also replacing the former child tax credits by tax allowances. Therefore, the reforms have been neither effective nor efficient tackling child poverty and income inequality in Spain.

The systems of child-related benefits in Denmark, France, Germany and the UK are radically different from the Spanish. First, the expenditure level is various times higher than in Spain. Second, in all countries the system is based on generous universal (non-income related) child benefits. These benefits are complemented with some income related child-benefits or supplements on housing and social assistance benefits that are mainly targeted to children living in poor households. Child tax reliefs have a minor share of the budget in all analysed countries except France. Finally, the child poverty alleviation and redistributive effects of these policies are very significant.

Even under an expenditure-neutral constraint (i.e., maintaining the current low level of expenditure), replacing the 2003 Spanish system by any of the other analysed countries would considerably reduce child poverty and inequality and rise social welfare in Spain. The results

are particularly interesting because they highlight the positive redistributive effect that universal child benefits would have. Furthermore, this type of benefit is less likely to produce disincentive effects on labour supply (poverty trap), usually has higher take-up rates, and generates lower administrative costs. For that reason, future reforms of the Spanish child benefit system should seriously consider the replacement of the current tax reliefs by universal and non-conditional child benefits.

A second objective was to assess the effect of the 1998 income tax reform on tax complexity. It should be stressed that the complexity cost was measured following the definition used by the Spanish government when designing the reform, i.e., the number of tax returns filed to the Spanish Inland Revenue. The results obtained in chapter IV show that the reform was not fully successful achieving its objectives. On the one hand, it significantly reduced the number of taxpayers that are not obliged to file a tax return. However, almost half of those taxpayers pay withholding tax in excess and need to file a tax return in order to receive a refund for that excess. Additionally, more than one third of the taxpayers that are exempt and that would not benefit from filing a tax return pay less withholdings than they should. This deficiency in the withholding collection reduces the potential income tax revenue by more than 1 percent.

The main causes of the lack of adjustment between withholdings and the income tax are the existence of a voluntary joint taxation scheme that favours one-earner couples, and (to a lesser extent) the use of flat rate withholding taxes of non-employment incomes. The elimination of the optional joint scheme of taxation would produce two important advantages in terms of tax simplification. First, it would simplify the tax function eliminating the need of calculating two tax returns to optimise the household tax-burden. Second, a simpler tax function could be easily replicated by the withholding tax, increasing the number of taxpayers that would not need to file a tax return. Therefore, the elimination of joint taxation is a clear (and one of the few) strategy to notably simplify the Spanish income tax.

A third objective was to develop an integrated Spanish microsimulation model and to check its suitability and reliability to analyse tax-benefit reforms in Spain. The results obtained in the empirical chapters of this thesis show that microsimulation models provide very useful evidence to study relevant aspects of tax-benefit reforms, such as the distributive and poverty

alleviation effects of child benefits, and even some aspects of tax compliance and administration. The development of an integrated microsimulation model for Spain has not only expanded our knowledge about tax-benefit reform in Spain, it has made available a new instrument of analysis that is very useful for future research and that is freely accessible to anyone.

Regarding the reliability of the microsimulation models, the analysis proved that results produced by the model are adequate for most policies and for the greatest part of the Spanish population. There are some limitations in the data (for example, in the measurement of capital income and in some benefits) and in the procedures to adapt the 'raw data' to the model (for example, the updating techniques); however these imperfections do not severely affect the quality of results for most policies and population groups. Moreover, these limitations are equivalent in type and level to those experienced by microsimulation models from other EU countries (Mantovani and Sutherland, 2003). Therefore, the reliability of microsimulation models in Spain is comparable to that of models from countries with longer tradition building and using microsimulation techniques.

It is hoped that this and other recent efforts to develop user-friendly and widely accessible microsimulation models, contribute to enhance the empirical research and the public debate about tax-benefit reform in Spain.

Despite the important advances achieved, this study suggests and leaves unanswered many questions that motivate future research.

First, one would like to know *what would be the distributive and poverty impact of in-kind child benefits*. Given that the expenditure in this type of benefit is very small in Spain, their inclusion would not considerably change the conclusions about Spanish child benefits (the comparison with other EU countries would just reinforce the impression that the expenditure level in child benefits is very low in Spain). However, their inclusion would give the chance to study other reform alternatives. Nevertheless, the inclusion of these benefits in a microsimulation model would introduce a number of difficulties. In many countries (including Spain), regional or local governments administer these benefits, and public, private

or mixed institutions provide the service, each one charging different prices to the families and receiving different subsidies from the government. Therefore, the simulations of in-kind benefits would require very detailed data that is unlikely to be available in most survey databases. Furthermore, changes in the provision of childcare services would require the estimation of a childcare demand model, since their reforms are obviously expected to change the current demand patterns (Schofield et al, 1996).

The reforms of child benefits and those simulated to reduce the number of tax returns (in particular the elimination of the joint taxation) are clearly expected to affect work incentives, especially among women. Therefore, a second question that is left unanswered here is *what would be the effect of the simulated reforms on employment, especially of women*. One possibility would be to use behavioural microsimulation, estimating the labour supply response of women, as Blundell et al (2000) have done to the UK, and Alvarez and Prieto (2002) for Spain. Nevertheless, it must be remembered that female unemployment in Spain is very high (above 20 percent). Hence, ceteris paribus, an increase of female labour supply is unlikely to produce an equivalent rise in female employment. In fact, the rise of female labour participation could just cause higher female unemployment. Therefore, despite the limitations referred in chapter I, macroeconomic and general equilibrium models are still the most suitable instruments to estimate the employment effects of tax-benefit reforms, at least in countries like Spain. Recently some economists have been trying to integrate microsimulation with macroeconomic or with general equilibrium models (Bourguignon et al., 2002; Cockburn, 2001; Cogneau and Robilliard, 2000; and Davies, 2003). Although this literature is still in an 'embryonic' stage, it promises great improvements to overcome many of the restrictions that each of these methodologies have when used separately.

Evidence in other countries, especially in the UK, shows that take-up rates differ significantly across benefits. Therefore, it would be interesting to know *what would be the take-up rates of the different child benefits in Spain*. Currently, there is no empirical evidence about the take-up of these benefits in Spain. Moreover, recent government measures to combat fraud suggest that the Spanish system is more likely to suffer from fraudulent participation than from non-take-up. This problem is known in the literature as E-mistake or Type II error of targeting (Cornia and Stweart, 1995). Hence, it would be particularly interesting to study the

participation of the 'non-deserving' recipients in Spanish child benefits. Unfortunately, so far there is no data available for this type of study. A better measurement of child benefits in the Spanish household surveys or the access to administrative data from the social security would allow one to investigate in this area.

There is a vast literature, especially in the US, about how taxes affect marriage (Alm, 1997). Economic theory (Becker, 1981) and some empirical studies (Gauthier and Hatzius, 1997) suggest that greater expenditure in child benefits raise fertility rates. Therefore, one also would like to know *how tax-benefit reforms would affect demographic decisions*. One very interesting and relatively easy approach would be to follow Dickert-Colin and Houser (1998) and Dickert-Colin (1999). These studies have used microsimulation to measure the financial incentives that the US tax-benefit system produces on divorce decisions. This method could also be applied to study the financial incentive of the tax-benefit system to have another child.

Despite their interest, especially because they were the objective of the 1998 income tax reform, the number of tax returns filed to the Inland Revenue is just a proxy of part of the complexity costs of taxation. Therefore, one would like to know *what are the overall effects of the 1998 income tax reform on tax complexity; and how these effects were distributed across taxpayers, employers and the government*. According to Area de Sociología Tributaria (2001), the taxpayers' compliance costs fell 2 percent in direct costs and 37 percent in terms of time dedicated to filing tax returns after the reform. Following Agencia Tributaria (2000) the administrative costs directly related to the income tax increased 44 percent after the reform. As far as we know, there is no data or estimation about the compliance costs for employers; therefore, it is not possible to measure the overall effect of the reform on complexity.

Recently some Spanish regional governments have implemented their own child benefits. Hence, it would be interesting to know *to what extent these benefits reproduce or diverge from the system implemented by the Spanish central government; and how these regional policies affect child poverty and income inequality*. A new database that is statistically representative at the regional level and the simulation of regional policies are already being

developed for a forthcoming version of ESPASIM. Therefore, it is hoped that this question will be answered in future studies.

Finally, chapter I has shown that the poverty and inequality indicators used in the empirical analysis are quite restrictive and carry very questionable properties. Therefore, one would like to know *how robust are the results obtained to different inequality and poverty measures and to different specifications.* Complementing the measures used here with others based on the dominance approach would clearly give us more certainty about the robustness of these results, and in terms of social welfare. This line of research is also currently being developed.

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