

A microsimulation analysis of the distributive and incentive effects of the Spanish 1999 tax reform: a special focus on children benefits*

Juan A. Sanchis Llopis

Amparo Sanchis Llopis

Universitat de Valencia

Abstract.

Any tax system should aim at being dynamic and flexible, evolving and adjusting according to changes in social and economic conditions. Fiscal policy is crucial in providing incentives both in the labour market and in the product market (on working hours/spare time allocation, on the purchase of some goods, on boosting housing market, etc). Given the potential effects of fiscal reform, assessing its impact is crucial and this is why simulation techniques are an important tool of fiscal policy. They allow to examine household behavioral responses to policy changes. This issue is important specially in the case of tax reforms designed to change the behaviour of individuals. The aim of this paper is to evaluate the effects of the 1999 Spanish income tax reform on a sample of households (drawn from the Spanish Family Expenditure Survey (EPF) for 1990/91) using simulation techniques. By using a sample that is representative of the population this model allows us to make inferences about the aggregate revenue implications of specific changes, the extent of family oriented reforms and to analyze the distributive effects of the reform on different quartiles of the population. Over this constant population of households, we simulate and compare the 1998 income tax system and the 1999 reform.

JEL Classification: C33, C67, H31.

* We would like to thank José M. Labeaga for his helpful comments on this paper. We are responsible for all errors and interpretations.

1. Introduction

Any tax-benefit system should aim at being dynamic and flexible, evolving and adjusting according to changes in social and economic conditions. The structure of the population changes across time. For instance, during the last decades there has been an increase in the number of divorces, single parents, couples where both spouses work, etc. There has also been a remarkable reduction in the birth rate, together with an increase in the participation of women in the labour market. Fiscal policy should take into account all these changes and tax reform should move according to the new social parameters. Fiscal reform is also an instrument of political economy. Beyond the basic purpose of raising revenue, fiscal policy is crucial in providing incentives both in the labour market and in the product market (on working hours/spare time allocation, on the purchase of some goods, on boosting housing market, on the number of children households have, etc.). Also, there is a specific interest in raising family allowances related to children with a clear aim to increase the number of children that a household has or plans to have.

Given the potential effects of fiscal reform, assessing its impact is crucial and this is why simulation techniques are an important tool of fiscal policy. They allow to examine household behavioural responses to policy changes. This issue is important specially for tax reforms designed to change the individuals' behaviour (e.g. providing incentives to work, to increase the fertility rate, to increase private saving or to discourage the consumption of harmful goods).¹ Simulation techniques enable to calculate the impact of fiscal reform, not just on a number of examples or typical (representative) families, but on thousands of households. In addition, when the data source used is representative of the population, it is possible to infer the revenue implications and distributive effects of the tax reform, on different groups of the population.²

¹ In a household survey conducted by a Spanish social research center (CIS) carried out in 1999 in Spain, 47% of the people surveyed recognized that the number of children they have is less than they would like to have, and the reason they give is that there are not enough children benefits or children related tax exemptions to help families with more than 2 children. In their opinion this explains why the Spanish fertility rate dropped from 3.4 in 1941 to the current figure (1.2). It has been recognized by the government its commitment in relation to increase children related benefits.

² There has been a big controversy in the media about what is going to happen to specific groups of households (case studies or typical families) after the reform, although there is not any analysis that takes into account the structure of the Spanish households. With real data one can approach much better the real impact of the tax reform.

And this is important not only at individual (household) but at national level since the tax reform affects government revenue and can also be used to modify the welfare state.

Based on the 1978 act, the current Spanish income tax system has often been reformed ever since. The reforms have mainly affected the tax deductions and tax credits system, together with the level of exempted income. The Spanish income tax system after the 1978 act was based on the family as the tax unit. The tax rate was applied to taxable income (gross income net of social security contributions plus estimated income from own occupied houses). Deducting tax credits gives the tax liability, being the main tax credits a fixed deduction per elderly relatives, per elderly people in the family unit and per children, and a deduction (without limit) for mortgage interest payments to all houses owned by the family.

In 1989 the tax system changed to a more complex system based on individual taxation, although the joint scheme was still available (there are some differences in terms of tax types and general exemptions between both schemes). The main changes of this reform were a reduction in the number of tax rates (from 28 to 18), the introduction of a specific labour income deduction of 5% of gross income and some restrictions (upper limit) in the mortgage tax deductions. There are no significant changes in the family tax credit system and the main tax credit is the earner's tax credit, that is a fixed amount for those who are employees.

A second reform took place in 1996, and the most important was the transfer from the state to the Autonomous Communities some of the taxes. In this reform there was also a reduction in the number of tax rates (from 18 to 8) and some other minor changes.

In 1999 a new reform of the income tax system was implemented place (which will have its effects on 2000). The aims of the 1999 income tax reform, according to the government, are to simplify the administration and cost of the income tax, to fight fraud and tax evasion, to reduce the tax burden and at the same time to increase the progressiveness of the tax. The reform aims also at getting a tax system more in line with other European countries within the European Union (the "European tax-benefit system"). The income tax reform implies a move towards the actual British income tax system (and therefore away from the so called "Latin tax system").³ However, the reform does not develop the income benefit system (housing, health,

³ A discussion about the evolution of the Spanish income tax system across time can be found in Albi and García, 1998.

unemployment).

The aim of this paper is to evaluate the effects of the 1999 Spanish income tax reform on a sample of households drawn from the Spanish Family Expenditure Survey (EPF) for 1990/91 using simulation techniques. By using a sample that is representative of the population this model allows us to predict the cost of the reform on total revenues, to make inferences about the aggregate revenue implications of specific changes and to analyse the distributive effects of the reform on different groups of households. Over this constant population of households, we simulate and compare the current income tax system and the changes that the 1999 reform will bring. Specifically, we carry out two several simulations exercises. First we programme both the income tax system in 1998 and the system after the 1999 reform. To apply these systems we have previously calculated the gross income (as the data we have only provide net income). When we estimate tax duties for al the individuals in our sample, both under the 1998 and the 1999 system we can assess for each individual (household) if the reform implies a reduction in taxes. We can evaluate this figure both individually (by household) and at national level as we have grossing-up factors in our data. The evaluation of the effects of the reform will allow us to assess if the new income tax system is more progressive or more regressive than the old one. The simulation of the reform also permits us to calculate its cost in terms of revenue. Sooner or later, the individuals will pay for this reduction in taxes. There are several ways to recover this reduction in taxes, but we choose to simulate an increase in the VAT types that completely offsets the reduction in revenue.⁴

A change in the structure of relative prices that a household faces would affect her welfare. Therefore, with both the effects of the income tax reform and with the effects of the changes in the VAT types we can give some evidence of who are the losers and the gainers of the reform, assuming that the government is going to implement an increase in indirect taxes to finance it.

In relation to the simulation of the 1998 and 1999 income tax systems, we also address two important questions. One, we evaluate of the new children related benefits, introduced in the 1999 reform, make an improvement with respect to the old system. The results of our

⁴ We account for the possible individual's reactions in terms of expenditure to the increase in the VAT types.

simulation suggest that these benefits are pretty much the same under both systems, and thus, the announced incentives to increase the fertility rate are not so. The second question that we address is related to the above. For married women who work part time there are in the new system an incentive to leave the labour market as there is a minimum exemption (under the joint scheme) that is higher than half the guaranteed minimum wage.

The rest of the paper is organised as follows. In section 2 we outline the Spanish income tax system and the 1999 reform. In section 3 we discuss the data, the methodology and the simulations carried out. The results are presented in section 4. Finally, section 5 concludes.

2. The Spanish income tax system and the 1999 reform.

In this section we outline the structure of the Spanish income tax system. The current tax system has its origins in the tax reform that began in 1978 and has been the subject of a number of changes ever since. In the 1978 system, based on the family as the tax unit,⁵ gross income above the general exemption level is subject to income tax. The tax rate was applied to taxable income (gross income net of social security contributions plus estimated income from own occupied residences). The total income tax due is calculated as the tax liability after tax credits have been deducted. Taxes are collected at source through the Pay as You Earn (PAYE) system. In addition to income tax, individuals also pay employee social security contributions, which are fully deductible from gross income.

In 1989 some important changes took place. The tax unit is now the individual, although a joint scheme for family units is also available. Income tax is paid by individuals only on earnings above a general exemption level. The differences between the joint and individual schemes can be summarised as follows. There is a 20% higher specific general exemption for the joint scheme, specific tax rates with lower tax cutbacks, in general, for the joint scheme than the resulting by an income splitting system, and a higher tax-credit for low-income tax units contributing under the individual scheme for multiple earners families.

The general exemption level is increased in 1989 in real terms. The number of tax rates is

⁵ Family unit is defined as a married couple, with or without dependent children, or a single parent with dependent children. Dependent children are children aged under 18 living in the household.

reduced from 28 to 18, and the average tax rate is decreased for individuals with low-income, while increased for individuals with middle and high income (the maximum tax rate being 56%). There is a specific labour income deduction of 5% of gross income (with an upper limit). Tax deductible mortgage interest payments on house purchases are restricted to the main residence and apply to an upper limit, whereas the previous system applied to all houses owned by the household with no upper limit. There were no major changes in the family tax credit system, which maintained its negligible importance.⁶ Finally, the main tax credit is the earner's tax credit (a fixed amount for those who are employees).

In 1996 a second reform took place. Although the recognition of the Autonomous Communities as participants in the income tax system started early in the 80s, it is now when the most important transfer of some taxes from the state to them takes place. The summary of the main characteristics of the system in 1996 are described as follows. The deduction of 5% of gross labour income (with an upper limit) relating to work expenses and the fixed deduction returns of capital income (29,000 pesetas) are maintained. Included as earnings there is an imputed income from owners occupied houses (2% of registered council property value). As before, mortgage interest payments on house purchase are deductible from gross income (when the house is the earner's main residence and with an upper limit of 800,000 pesetas under the individual scheme, and of 1 million pesetas under the joint scheme). There are four sets of tax rates: two for the Estate taxes and two for the Autonomous Communities taxes. The first two apply to individual income and the second two correspond to the joint scheme (which is the sum of earnings of all family members). In each of these sets, there are eight different tax rates, which are applied to 8 different levels of income (the maximum tax rate is 56%=47.60%+8.40%, that correspond to the Estate and to the Autonomous Community rates, respectively).

The main tax credits are the following. First, there is the earner's tax credit, deductible for those whose income is labour related, including social security pensions and benefits. Second there is a family tax credit, which consists of a fixed amount per dependent child (which increases with the number of children), per dependent ancestor with rents below a given level, per elderly relative aged 65 or above, and per disabled, invalid or blind member of the family

⁶ Family tax credits were an independent of income fixed amount per child, per elderly living in the household and per old aged person.

unit.⁷ Third, there is a tax credit for expenses related to sickness, house renting (when the house is main residence, and childcare (for dependent children aged under 3). Finally, there is a tax credit per private investment, which includes life insurance contracts, purchase of main residence, purchase of special properties (declared to be of cultural interest), per donations to certain Funds, per incentives to professional or business investment, among others. Accordingly, there are also some specific Autonomous Communities exemptions that apply to individuals or household who live in the corresponding Community.

Table 1 presents the main changes to the income tax system (as it was in 1998) that the 1999 reform will bring, which we summarise in what follows. The minimum exemption for labour related income rises from 1,200,000 to 3,500,000 pesetas. The deduction of 5% of gross labour income (with an upper limit of 250,000 pesetas) is eliminated. Instead, new deductions from labour income are introduced, depending on the level of labour income.⁸ The deduction on gross income concerning mortgage interest payments on house purchase (earner's main residence) is also eliminated and instead a new tax credit is introduced. Regarding capital income, the reform eliminates the imputed rent from owner occupied dwelling (2% of the registered council value of the property) and taxable capital income related to life insurance contracts is reduced in 30% when the income has been generated in more than two years. As for deductions from the returns to capital income, the "minimum income exemption" of 29,000 pesetas is eliminated.

One of the main novelties of the tax reform is the introduction of two "minimum income exemptions", the first personal and the second familiar, which reduce the taxable income as follows. The minimum personal exemption is 550,000 pesetas (1,100,000 pesetas in case of joint scheme). This personal minimum exempted will be 650,000 pesetas when the earner is aged above 65 and 850,000 or 1 million pesetas in case of a disabled person. The minimum familiar exemption involves the following: (i) 100,000 pesetas per dependent ancestor with rents below a given level, aged above 65. (ii) Per dependent children aged under 25, with rents below a given

⁷ The definition of child when calculating the tax credit differs from that used to define the family unit. Single dependent children living in the household aged under 30 with gross income below a certain level are allowed to tax credit. Again we should stress that the 1996 reform did not change significantly the importance of the family tax credits.

⁸ Labour income will be reduced by the following amounts: for those earners whose labour income is up to 1,350,000 pesetas: 500,000 pesetas; for those earners whose labour income is between 1,350,000 and 2 million pesetas: 500,000 pesetas minus the result of multiplying by 0,1923 the difference between labour income and 1,350,000 pesetas; finally, for those earners whose labour income is above 2 million pesetas (or with non-labour

level, as follows: 200,000 pesetas per child for the first two children, and 300,000 pesetas per child after the third child. These quantities will increase in (i') 25,000 pesetas per child aged between 3 and 16, for school equipment related expenses, (ii") 50,000 pesetas per child under 3. Finally, per disabled dependent person included in (i) or (ii), either descendant or ancestor, independently of their age and with rents below a given level, 350,000 or 450,000 pesetas. These quantities are deductions that apply to gross income and therefore they are eliminated as tax credits relating to the same issues.

Regarding tax rates, the joint tax rates scheme is eliminated (which applies to family units) and the number of tax rates is reduced from 8 to 6, the minimum rate decreases from 20% to 18% (from the first peseta), and the maximum rate decreases from 56% to 48%.

As regards to tax credits, most of them are eliminated and some of them transformed into income deductions (this is the case of family tax credits or earner's tax credits, as explained above). Tax credits per house renting, childcare and sickness expenses are also eliminated. Instead of the deduction from gross income per mortgage interest payments on main residence purchase (which is eliminated), a new tax credit is introduced. This is a tax credit per investment on main residence, either purchase or restoration.⁹

To complete the picture of the current Spanish tax-benefit system we should describe the benefit system. Table 2 presents the three main benefits (labour or social related) that any individual can perceive. The system works as follows. When an individual becomes unemployed she perceives the 70% of her previous salary as unemployment benefits for a maximum of two years (depending on how long she was employed). After two years she can perceive either the social salary (state administrated) or the guaranteed minimum income (administrated by the Autonomous Communities). The amount of the social salary depends on the age and the number of dependants in the household.

Finally, in table 3 we present the VAT types for the non-durable goods that we

income above 1 million pesetas): 375,000 pesetas.

⁹ This tax credit only applies when the dwelling purchased or restored is the main residence of the earner. In this case, one of the following tax credit may be applied: (i) 15 per cent of the invested amount, including interest and capital payments and related expenses, to be applied over a maximum investment of 1,500,000 pesetas. (ii) When the investment is financed through a mortgage, the percentages of tax credit defined in (i) are as follows: during the first two years after the purchase, 25% of the first 750,000 pesetas and 15% of the remaining investment up to 1,500,000 pesetas; from the third year onwards, the above percentages will be 20% and 15%, respectively. (iii) 15 per cent of the amount deposited in special housing bank accounts, with a limit of 1,500,000 pesetas.

explicitly model in the demand system. In column one in the table we present the VAT types before 1996 and the second column we report the current VAT types. When more than two types are introduced in the cell means that different goods composing the category bear different VAT types.

[Table 1, 2 and 3 around here]

3. The data and some methodological issues.

3.1 The data.

We use two data sets, both conducted by the Spanish Statistical Office. First, we use the Spanish Expenditure Survey (“Encuesta de Presupuestos Familiares, EPF”) recorded during 1990-1991 to estimate the 1998 and 1999 tax-benefit systems we. Second, we use the Spanish Panel Expenditure Survey (“Encuesta Continua de Presupuestos Familiares, ECPF”) for 1985-1995, to simulate some of the reforms and to calculate the reaction of households to the.

The EPF is a survey carried out every 10 years approximately aiming at constructing the Spanish RPI. In this survey 21,155 households are interviewed (72,123 individuals accounting for all members in the household). This sample of households is randomly extracted from all Spanish Autonomous Communities from a stratification process that makes it representative of the Spanish economic, demographic and social structure. For each individual in the sample there is a grossing-up factor, that, theoretically, indicates the number of households this individual represents at a national level. There is comprehensive information about socio-demographic characteristics, income from 21 different sources,¹⁰ bank debts and other liabilities, mortgage payments in which the household is involved,

¹⁰ These sources are mainly: labour income, self-employed income, pensions, social salary, unemployment benefits, scholarships, earning per shares, prizes, interest from bank accounts, earnings from other investment, etc.

information about the house in which the household lives and other houses owned by the household (physical state and characteristics, and economic value of the premises) and, finally, there is detailed information about household expenditure (covering 919 expenditure categories). This information makes the survey unique to calculate the complex 1998 Spanish tax-benefit system and the extent of the 1999 reform. Furthermore, the representativeness of the sample of households and the grossing-up factors provided allow to calculate the effects of the reform at a national level, giving precise monetary costs in terms of revenue, and to calculate the effects by demographic breakdown of the Spanish households (education, income levels, number of children, etc.).

The second data set used in this paper is a balanced panel of households drawn from the ECPF from the first quarter of 1985 to the fourth quarter of 1995. This is a quarterly rotating panel carried out over 3,200 households with a 12.5 per cent rotating rate to avoid attrition problems. This implies that the maximum number of collaborating periods for each household is eight. In our empirical application we have selected those households collaborating eight periods. We end up with a sample size of $N = 7,718$ and $T = 8$ (the number of observations is 61,744). This data set provides information about 258 commodities, 14 categories of household income for different members of the household as well as other household members labour and socio-demographic characteristics as age, number of children by age and sex, occupation and labour status of both spouses in the family, education of the head of the household, size of the town of residence, etc.

*3.2. Methodological issues.*¹¹

In this paper we first simulate the 1998 tax-benefit system in order to assess some of the effects that the 1999 reforms on the tax-benefit system. Although some behavioural responses are calculated after the reform takes place, we assume no behavioural responses of the individuals to the reform (static analysis).¹² In table 1 we broadly present the main

¹¹ For a more detailed discussion on some methodological issues related to microsimulation of tax systems see Sutherland (1991) and Giles and McCrae (1995).

¹² The static analysis will be inadequate for some policy reforms if these are specially designed to change the behaviour of the individuals.

changes in the new tax-benefit system. We calculate which would have been the individual (household) tax liability under both tax systems assuming that every individual in the household fulfils her tax duties. As highlighted in Mercader (1994) there are several reasons to expect that individuals do not contribute as there is tax evasion or avoidance (specially related to low income households).

As our data corresponds to previous years and we simulate the 1998 and 1999 tax systems we upgrade our data by using the Spanish Retail Price Index. This seems to be the most appropriate method of updating our data since these data is collected in order to construct the RPI.

In the data, both labour and investment income are recorded net of pay as you earn (PAYE) taxes and net of employee's social security contribution of the individual. Therefore, to compute the taxes we need to calculate the gross value of each figure. In order to do so, previously to the calculation of the individual's tax liability, we design a programme that calculates the PAYE per individual¹³ and account for the social security contributions for each job category.

Although both the 1998 and in the 1999 tax systems allow to apply a deduction per mortgage interest payments, this information is not completely available in our data sets and therefore it is not possible to calculate the deduction from gross income per mortgage interest payments.

The results obtained can be evaluated as national figures by using the grossing-up factors provided by each data set.

For each individual in the household we calculate her taxes both under the joint scheme and under the individual scheme, and select the cheapest one, assuming households would choose to pay less.

4. The tax simulations.

4.1. A theoretical framework.

¹³ To calculate the PAYE under the 1998 tax regime one only needs to account for family demographic structure (number of children) and the expected income for the year. Calculations for the 1999 tax regime are more

The 1999 income tax reform is an important reform that has been the subject of big controversy in the Spanish media. The main concern in this paper is to simulate this reform and to evaluate its impact on some specific household groups and on some specific issues (revenue reduction at national level, minimum family exemption, children related exemptions, etc.). The new income tax system in itself is much simpler than the old one but it is quite complex in its application as it tries to adjust, as much as possible, the PAYE to the individual's final tax liability (duty). Should the household or individual's situation change across the year (for example becoming unemployed or having a child) there is a mechanism to adjust to these changes. Also, there are some complexities to determine who is in the zero tax liability category. Once all these questions are solved, the tax procedure is quite straightforward.

To make some assessments about the effects of the reform on total revenue or on other important variables or groups of households we also simulate, for the same sample of households (individuals), the previous tax system. On the grounds of these two sets of estimates we give some evidence on the progressiveness of the new tax system, the estimated revenue cost of the reform, who loses and who gains with the new income tax system, the extent of the new children related exemptions, etc. We calculate the cost of the reform in terms of revenue at national level as we have the grossing-up factors that make our sample representative of the Spanish economy. This figure should then be a good estimator of the real one. We also calculate by household group, by demographic breakdown and by deciles who gains and who loses with the reform. With the two sets of results we compare children related benefits to assess if the improvement in these benefits could incentive an increase in the number of children that the Spanish households have. Finally, we analyse the incentives for married women to leave the labour market by means of the minimum personal exemption under the joint scheme of the tax system.

To simulate the tax systems we implement the methodology described above (in section 3.2.) by means of several programmes that first calculate the gross income. With these

complex but have also been calculated.

gross figures at hand we apply both the 1998 and the 1999 tax procedures to calculate everybody's tax duties.¹⁴

After calculating the changes on individual's tax liability due to the income tax reform and using the grossing-up factors, we can predict which is the cost of the reform expressed in 1999 pesetas. The results of the 1999 tax reform simulation suggest that there would be an important reduction on the state tax revenue. Presumably, this change in revenue will eventually be transferred to consumers by, for example, a reduction on the supply of public goods or an increase in other taxes. We assume that the state uses an increase on indirect taxes to finance the reduction in the individual taxes. This increase on the VAT types consists in a change in the structure of the relative prices for all commodities. On these grounds, we could model this double reform (the change in the tax-benefit system and the change in the VAT structure) as a revenue neutral one. Once we know the revenues cost of the reform, and using the information about the individuals allocations of expenditures (on non-durable goods) we can estimate the increase in VAT types (for all goods) necessary to compensate the revenue cost of the reform. Up to this point we assume that household expenditure shares (on the non-durable goods that we model) remain unchanged (static analysis).¹⁵

The next step is to allow household to react (increasing or reducing their expenditure) to the increase in VAT types. As we know both income and price elasticities we can calculate these figures for every household. This reaction would basically mean substitution changes among goods and this would imply that the extra VAT collection due to the simulated increase in VAT will not offset the total amount needed to compensate the 1999 income tax reform. Again, with the differences we could re-calculate how much the VAT types should increase to finance the cost of the reform. To this new increase we will have new household's reactions in terms of substitution between goods. We will go on with this process until

¹⁴ The programming of the tax system (using Stata 5.0) has been done in the same spirit than similar packages developed in Spain (see García, Labeaga and López, 1997) and in other countries (i.e., Bourignon and Chiapori, 1998, for France, Keane and Moffit, 1991, for the US and Giles and McCrae, 1995, for the UK). Some other issues have been programmed using GAUS 2.0. All these programs are available from the author upon request.

¹⁵ We estimate a 9 non-durable demand system in Labeaga, Preston and Sanchis (1999) using the ECPF from 1985 to 1994 by means of the QAIDS model put forward in Banks, Blundell and Lewbel, 1997. The demand system is estimated using a panel data estimator and controlling both for selectivity problems and for infrequency of purchase on the consumption of some goods. The results of this demand system are used to calculate price and income elasticity for all individuals in our sample. The ECPF and the EPF data sets are fully

convergence, i.e., the extra VAT collection completely offsets the cost of the income tax reform.

In the analysis of the effects of the VAT increase we follow Symons and Walker in the treatment of expenditures left out of the behavioural demand system that we estimate. Since this group is composed basically of durable commodities we assume that households keep on consuming the same quantities of these goods than before the tax reform takes place.¹⁶ Therefore, given that new indirect taxes will cause more expenditure devoted to these rationed commodities, we let changes in their prices induce lump sum subtractions to expenditure devoted to modelled system commodities. Formally, this assumption implies the following mapping of the household's budget constraint.

$$\{s^0, e^0, p_s^0, p_e^0\} \quad \{s^1, e^1, p_s^1, p_e^1\}$$

$$s^0 + e^0 = s^1 + e^1$$

where s are non-durable (system) expenditures, e are durable (excluded) commodities, and p_s and p_e are their respective prices. The 0,1 subscripts refer to pre- and post-reform situations.

To calculate the effect on prices of the income tax reform we assume that loss in total revenue is distributed among all prices (equally or weighted) accounting for the total population and how much each of them spends on each commodity. The above would imply an increase on each commodity VAT type. To construct the new prices for the demand system one has to bear in mind that each good composing the 9 categories has a different tax rate, and thus we weight each of them by their contribution to the composite category. Furthermore, if $p_i^0 = (1 + t_i^0)(\bar{p}_i + c_i^0)$ is the pre-reform price for the i_{th} commodity where t_i^0 and c_i^0 are the initial VAT and excise rates and \bar{p}_i is the net of taxes producer price, then the post reform increased price is given by $p_i^1 = (1 + t_i^1)(c_i^1 - c_i^0 + p_i^0 / (1 + t_i^0))$.¹⁷

Assuming that household total expenditure remains unchanged we can calculate (using our estimates for the non-durable goods demand system) the new shares after a change in the

compatible and therefore combining both data sets does not pose any problem to the analysis.

¹⁶ This does not seem to be a restrictive assumption when looking at the short run effects.

¹⁷ It is not possible to evaluate an exact figure for some of the goods of our demand system due to the different taxes that apply to different varieties in the same category (i.e., alcohol or tobacco) and thus an approximation has been used to calculate the new price.

VAT types. In order to do so, we first calculate (following Baker, Mackay and Symons, 1990) the share prediction error, that is the component of the household share not explained by prices and total expenditure.

$$\hat{e}_{ih} = w_{ih}^0 - w_{ih}(p^0, x_h, \hat{\beta}_i, \hat{\gamma}_{ij}) \quad y=1, \dots, 9; j=1, \dots, 9 \text{ and } h=1, \dots, N.$$

Thus, the post-reform shares are defined as

$$w_{ih}^1 = \hat{w}_{ih}(p^1, x_h, \hat{\beta}_i, \hat{\gamma}_{ij}) + \hat{e}_{ih}$$

With the new shares at hand we can then evaluate the extra VAT revenue due to the changes in the VAT types, and assess households' reaction to changes in relative prices.

Finally, to measure welfare changes we consider a money measure impact on households of the price changes, i.e., the equivalent gain (loss), to calculate the effect on welfare caused by price changes. This concept is defined as the amount of income that needs to be given (subtracted) to (from) household income in order to attain the post-reform level of utility while keeping the initial price vector. Since we estimate a cost function this measure of welfare can be calculated straightforward.¹⁸ First we calculate the equivalent income, which is implicitly defined as

$$v(p^r, y^e) = v(p, y)$$

where $v(\cdot)$ is the indirect utility function and p^r is a reference price vector.¹⁹ Inverting the above expression we get

$$y^e = c(v, p^r) = c(p^r, p, y)$$

that is the amount of income which at the reference price level (initial values in the case at hand) is equivalent in terms of utility to the actual household income at final prices.²⁰ Thus, the equivalent gain (loss) for any household is obtained as $EG_h = y_h^0 - y_h^1$ where y_h^0 is the

¹⁸ We follow King (1983).

¹⁹ Note that the use of a linear budget constraint makes that the equivalent income is independent of preferences.

²⁰ An alternative definition can be found in Deaton and Muellbauer, 1981.

initial level of household income.

4.2. The results.

In table 4 we summarize the main results from simulation of the 1999 income tax reform. The mean taxable income decreases in real terms between 1998 and 1999 (by 16%). This result is due to the introduction of the deduction from gross labour income (see table 1 for details).²¹ To the reduction in the average tax margin we should add the substantial increase in the number of households falling in the zero tax duty category. The changes introduced in the personal exemptions and in the tax credits make complicate to compare the two regimes, and therefore we just compare the mean tax due by household. There has been an important reduction on the average tax due (20%) between the 1998 and the 1999 systems. At national level, the reduction in tax income revenue is estimated to be 1,114 billions of 1999 pesetas. The main conclusion that can be drawn for the results in table 4 is that income taxes have indeed been reduced. Now we should investigate the extent of this reduction in taxes to different sub-groups of households.

Behind these averaged figures we further investigate the effects of the reform on specific households groups. Table 5 shows the increase (reduction) in 1999 pesetas of tax duties for all households, by deciles of taxable income and by demographic breakdown. The column headed "tax savings" reports the savings in taxes after the reform and the column headed "income" reports households' taxable income. On average, all households have to pay less (36,748 pesetas, i.e. 3% less than in 1998 in terms of taxable income), but this figure hides a non-equal change in the distribution of the savings. For the first five deciles of the distribution (by taxable income) there has been an increase of the tax duties after the reform, and for the rest of the individuals in the sample there is a positive saving in terms of income taxes. Also, the higher the individual income the bigger the savings. Thus, this confirms, contrary to the government announcements, that the new income tax system is less progressive than the previous one. In 1999 in the Spanish media was discussed the impact of

²¹ For a deeper discussion on the reliability of the micro-simulation procedures and results see Pudney and Sutherland, 1994.

the reform by using “typical” families. Also with these examples different people tried to show either the progressiveness or the regressiveness of the new system. As stressed in Giles and McCrae (1995) the use of such methods carries with the temptation to choose the (“appropriate”) household to highlight the point, rather than as a representative of the actual Spanish population. In all cases the information given was misleading as there was no reference to the real family structure of the Spanish economy. Assuming that the Spanish structure is the same than in 1990-91 our simulation enlightens the results of the reform.

A further step in our simulation exercise is to calculate how much would cost in terms of revenue the implementation of the reform. By means of the grossing-up factors it is possible to calculate the figure. Table 5 reports the total amount of the reform in 1999 pesetas. Several have been the figures predicted (speculated) by different institutions and economic authorities. None of these studies have used a representative sample of the Spanish economy. We claim, and the real figure in 2000 will confirm this, that the figure predicted in this analysis is the most precise calculated so far about the income tax reform.

As explained in the previous section we carried out an exercise that predicts the increase in the VAT types (by commodity group) that completely offsets the predicted cost that the reform will bring to the state revenue. It is expectable that sooner or later the individuals have to pay back any reduction in their income taxes, either via a reduction in the public goods they enjoy or via an increase in other taxes (for example indirect taxes). In this paper we calculate the increase in the VAT types that would offset the cost of the reform in terms of revenue. When the indirect tax rates change, household will react, according to their price and income elasticities, substituting from the relatively more expensive goods to the relatively cheaper ones. Their reaction would change the VAT revenue and therefore the former increase in the VAT types to offset the cost of the income tax reform would not be enough to cover this cost. It would be necessary to re-calculate the VAT types to collect. Again, there would be consumer’s reactions to the changes in VAT, etc. We follow this process until convergence is achieved (actually, to completely offset the income tax reform via increase in the VAT types we have carried out this process three times). Table 6 presents the effects, in terms of equivalent loss (gain), that the increase in the VAT types imply to

households (by demographic breakdown and by decile). The column headed “VAT tax” reports the increase in indirect taxes paid by households and the column headed “Equivalent loss” reports the money metric measure of utility change. Finally, the column headed “Total expenditure” presents household’s expenditure in the nine non-durable goods.

In table 7 we compare if there has been an improvement in the children related benefits. Under the 1998 system there was a specific tax credit per dependent children (by number of them), whereas under the current system children related benefits are in the form of deduction from gross income. It has been announced that the government was concerned about giving incentives (through the income tax system) to increase the natality rate. Also, there was a specific interest in increasing children benefits for households with more than two children. In our simulations we calculate which are the tax duties for all our sample under the 1998 tax system using first the 1998 tax credit related to children and second the deduction from gross income related to children. The results show that difference between the two schemes are quite small. Only when a household has three or more children the saving in taxes is higher than 5%.

Finally, in table 8 we present information about the minimum personal and household exemption descriptive. For married women working part time, the minimum exemption scheme can have negative incentives to participate in the labour market. The minimum guaranteed wage in Spain for 1999 is 969,780 pesetas, and the minimum personal exemption for the spouses if the households chooses the joint scheme is 550,000 and 650,000 pesetas (depending on the woman’s age). It seems from these figures that women working part time would decide to stay at home as her market salary would be less than the benefit they can get if her husband is working. This may be complementary to the interest in increasing the fertility rate as women with a taxable income below the minimum personal exemption would be better off dropping from the labour market. In table 8 can be checked that 2,332 working women younger than 65 years and 768 working women older than 65 years will have positive incentives to drop from the labour market.

5. Conclusions.

Given the distributive effects of any fiscal reform, assessing its potential impact, both in terms of total revenues and on different groups of individuals, is of great interest. This makes simulation techniques an important tool of fiscal policy. This paper evaluates the effects of the 1999 Spanish income tax reform on a sample of households drawn from the Spanish Family Expenditure Survey (EPF) for 1990/91 using simulation techniques. Given that the sample analysed is representative of the population, it is possible to predict the cost of the reform in terms of total revenues, to make inferences about the aggregate revenue implications of specific changes and to analyse its impact on different groups of households.

The main results obtained are the following. First, the cost of the reform in terms of revenue is, according to our calculations, of 1.115 billions of 1999 pesetas. We claim that this figure is a very good estimate of the real cost of the reform given that we have used a representative sample of the Spanish economy. Second, assuming that the loss in revenues due to the reductions in income taxes will have to be compensated by increases in other taxes, e.g. the VAT, we calculate the increase in the VAT types needed to finance the cost of the income tax reform.

Third, our results show that the mean taxable income decreases in real term by a 16 %, mainly due to the introduction of the deduction from gross labour income, and there is a substantial increase in the number of households income tax exempted. Moreover, we estimate a reduction in the average tax due of about 20 %. Beyond these average figures, we further investigate the effects of the reform on specific household groups and obtain a non-equal change in the distribution of the tax savings.

References.

- Albi Ibáñez, E. and J.L. García Ariznavarreta, 1998: *Sistema fiscal español*, Barcelona, Editorial Ariel Economía.
- Backer, P., S. Mackay and E. Symons, 1990: "The simulation of indirect tax reforms: the IFS Simulation Program for Indirect Taxation (SPIT)", WP90/11. London: Institute for Fiscal Studies.
- Banks, J., R. Blundell and A. Lewbel, 1997: "Quadratic Engel curves and consumer demand", *The Review of Economics and Statistics*, 4, 527-539.
- Blundell, R., A. Duncan and C. Meghir, 1992: "Taxation in empirical labour supply models: lone mothers in the UK", *The Economic Journal*, 102, 265-278.
- Bourgingon and Chiapori
- Deaton, A. and J. Muellbauer, 1980: *Economics and consumer behaviour*, New York: Cambridge University Press.
- Dickert-Conlin, S. and A. Chandra, 1999: "Taxes and the timing of births", *Journal of Political Economy*, 107, 161-177.
- García, J., J.M. Labeaga and A. López, 1997: "Análisis microeconómico de los efectos de cambios en el sistema impositivo y de prestaciones sociales", *Moneda y Crédito*, 204, 67-104.
- Giles, C. and J. McRae, 1995: "TAXBEN: the IFS microsimulation tax and benefit model", WP95/19. London: Institute for Fiscal Studies.
- INE (1991). *Encuesta de presupuestos familiares*. Madrid: Instituto Nacional de Estadística.
- INE (1985). *Encuesta continua de presupuestos familiares*. Madrid: Instituto Nacional de Estadística.
- King, M., 1983: "Welfare analysis of tax reforms using households data", *Journal of Public Economics*, 21, 183-214.
- Labeaga, J.M. and A. López, 1994: "Estimation of the welfare effects of indirect tax changes on Spanish households: an analysis if the 1992 VAT reform", *Investigaciones Economicas*. 18 2, 289-311.
- Labeaga, J.M. and A. López, 1996: "Flexible demand system estimation and the revenue and

- the revenue and welfare effects of the 1995 VAT reform on Spanish households”, *Revista Española de Economía*, 2, 181-197.
- Mercader-Prats, M., 1997: “On the distributive and incentive effects of the Spanish income tax: a comparison of 1980 and 1994”, *European Economic Review*, 41, 609-617.
- Nichele, V. and J.M. Robin, 1995: “Simulation of indirect tax reforms using pooled micro and macro French data”, *Journal of Public Economics*, 53, 53-85.
- Pudney, S. and H. Sutherland, 1994: “How reliable are microsimulations results? An analysis of the role of sampling error in a UK tax benefit model”, *Journal of Public Economics*, 53, 327-365.
- Symons, E. and J. Walker, 1989: “The revenue and welfare effects of fiscal harmonisation for the UK”, *Oxford Review of Economic Policy*, 33, 61-75.

Table 1. The 1998 tax income system and the 1999 reform.

	The 1998 Income Tax System	1999 Reform
Minimum exemption for labour related income	1,200,000 pesetas	3,500,000 pesetas
Deductions on gross income: minimum personal exemption	None	The minimum personal exemption is 550,000 pesetas per person or per spouse (650,000 pesetas when the earner is aged above 65 and 850,000 or 1 million pesetas in case of a disabled person).
Deductions on gross income: familiar minimum exemptions	None.	<ul style="list-style-type: none"> - 100,000 pesetas per dependent ancestor aged above 65. - Per dependent children as follows: 200,000 pesetas per child for the first two children, and 300,000 pesetas per child after the third child. In addition (i) 25,000 pesetas per child aged between 3 and 16, for school equipment related expenses, (ii) 50,000 pesetas per child under 3. - Per disabled dependent person 350,000 or 450,000 pesetas.
Deductions from gross labour income	5% of gross income, with an upper limit of 250,000 pesetas	<ul style="list-style-type: none"> -500,000 when labour income is up to 1,350,000 pesetas. -up to 375,000 for income between 1,350,000 and 2,000,000. - 375,000 for income above 2 million pesetas or when the individual has income from other sources (different from labour) above 1000000 pesetas.
Capital income	There is a "minimum capital exemption" of 29,000 pesetas	Taxable capital income is reduced in 30% when generated in more than 2 years.
Tax rates	There are two schemes: one individual tax rates scheme and one joint tax rates scheme. For each scheme, there are 8 tax rates, with a minimum of 20% and a maximum of 56%. In both cases, the tax rates are the result of combining the Autonomous Community and the State tax schemes	There are 6 tax rates, with a minimum of 18% and a maximum of 48%. These 6 tax rates are the result of combining the Autonomous Community and the State tax schemes. Although the new income tax system is individually based, the joint scheme is also available.
Tax credits	<ul style="list-style-type: none"> - Per earner. - Per dependent children, elderly or disabled. - Per child custody expenses. - Per sickness expenses. - Per house renting. 	Some of previous tax credits (per earner, per dependent children and per elderly) are transformed into income deductions (personal and family related). Other are eliminated (house renting, sickness and child custody expenses). The main tax credit remaining is per investment on main residence (purchase or restoration).
House deductions	<ul style="list-style-type: none"> - There is a deduction from gross income per mortgage interest payments on house purchase (only when the house is the earner's main residence and with an upper limit). - Owners' occupied houses have to impute as income the 2 % of registered council property value. - There is a tax credit of 15% per investment on main residence. 	<ul style="list-style-type: none"> -Income deduction per mortgage interest payments is eliminated. - The 2% value of the owners' occupied property is not imputed as income. - There is a tax credit of 25% of the sum of mortgage interest payments and capital invested on main residence, with a limit of 750,000 pesetas, and of 15% of further 750,000 pesetas, for the first two years. From the third year onwards the tax credits are 20% and 15%, respectively.

Table 2. The Spanish benefit system.

Type of benefit	Description
Unemployment benefit	First 2 years unemployed: 70% of previous salary. After 2 years: either the social salary or the guaranteed minimum income offered by the Autonomous Communities.
Social salary	75% of guaranteed minimum wage if aged<45 100% of guaranteed minimum wage if aged>45 with two dependants. 120% of guaranteed minimum wage if aged>45 with three or more dependants.
Guaranteed minimum income offered by the Autonomous Communities.¹	For individuals who do not receive social salary or unemployment benefits: 35838 pesetas monthly for families with one child. 60925 pesetas monthly for families with two or more children.

Notes:

1. Guaranteed minimum income calculated as an average for all the Autonomous Communities.

Table 3. Indirect tax system (VAT) before and after the 1996 reform.

Commodity category	VAT type before 1996	VAT type in 1999
food³	6%, 3%	7%, 4%
alcohol⁴	excise duty (special type)	excise duty (special type)
tobacco⁵	excise duty (special type)	excise duty (special type)
clothing and footwear	15%	16%
house energy⁶	15%, 6%, 4.864%	16%, 7%, 4.864%
out	6%	7%
entertainment	6%	7%
personal care	15%	16%
health⁷	6%, 3%	7%, 4%
private and public transport⁸	6%, special	7%, special

Notes:

1. VAT system starts in Spain in 1986, although some time before the old system was adapting to the VAT system.

2. Types of VAT: general, reduced, super-reduced and special types (for alcohol, tobacco, electricity among other goods).

3. In food we should take into account that for bread, milk, eggs, fruit and vegetables the VAT type is 4%.

4. There are specific excise duties depending on the % of alcohol in the alcoholic drinks.

5 After 1996 there are 4 types (12.5%, 22.5%, 37.5% and 54.5%) and one excise duty of 500 pesetas/1000 cigarettes.

6. For water consumption the VAT type is 7% and for electricity the type is 4.864%.

7. For health services the VAT type is 7% and for medicines the type is 4%.

8. For fuel and similar there is a special VAT type.

Table 4.
Main figures under the 1998 and 1999 tax income systems.

	1998 (1999 pesetas)	1999
Mean taxable income	2515414	2108352
Mean tax liability	553912	365789
Mean deduction from gross income		
Mean tax credits	90672	10800
Mean tax due	431698	344783
National revenue¹	5789.975	4675.054

Notes:

1. National revenue in billions and in 1999 pesetas.

Table 5.
Income savings after the 1999 tax income reform (in 1999 pesetas).

Group of households	Tax savings	Income (all)	Income (relsp=1)
All households	36748	1201288	2516403
Age < 65	33863	1195709	2798299
Age ≥ 65	54195	1231727	1713620
0 children	42341	1302764	2188159
1 child	37679	1243759	2890263
2 children	33102	1122039	3017054
3 children	25561	954033	2948578
4 children	21800	825018	2813965
> 4 children	20687	716862	2554994
1st decile	-3433	325569	734501
2nd decile	-2145	1086042	1097724
3rd decile	-3289	1369295	1372994
4th decile	-5841	1654439	1657507
5th decile	-4414	1954458	1958495
6th decile	13715	2289373	2291366
7th decile	48826	2679165	2678123
8th decile	74752	3149005	3151070
9th decile	77720	3842860	3848115
10th decile	171718	6343181	6361436

Table 6.
Tax payments increase and equivalent loss after the increase in consumer prices
(1999 pesetas).

Group of households	Tax	Equivalent loss	Expenditure
All households	66461	1416	2423252
Age < 65	66080	1440	2410586
Age ≥ 65	67545	1349	2459342
0 children	66940	1440	2439824
1 child	66729	1487	2435928
2 children	65433	1354	2386278
3 children	66065	1285	2408449
4 children	61607	1167	2242136
> 4 children	60483	1031	2203113
1st decile	13242	219	479374
2nd decile	24556	437	892436
3rd decile	33961	634	1235965
4th decile	42665	823	1553486
5th decile	51649	1026	1882350
6th decile	61113	1241	2227087
7th decile	72370	1512	2639262
8th decile	86922	1871	3171747
9th decile	108633	2391	3963947
10th decile	169466	4014	6185584

Table 7.
Changes in children related benefits under the 1998 and 1999 regimes (in 1999
pesetas).

Group of households	Tax 98	Tax 98 with 1999 children related benefits	Tax 99
All households	143737	147563	110814
Household with children	136182	131374	103218
1 child	262521	255714	233609
2 children	297390	284486	229521
3 children	261417	242771	189299
4 children	269125	246357	161572
> 4 children	176170	150054	101597

Table 8.
Minimum personal exemption for women under the 1999
income tax system.

Group of women	Number of women below the minimum exemption	Taxable income
All women	-	266223
Working women	-	815819
working women aged ≤ 65	2332	198660
working women aged > 65	768	210646