Are Spanish Governments Really Averse to Inequality? An Empirically-Based Normative Analysis of the 1998 and 1999 Spanish Tax-Benefit Systems

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Abstract
In this paper, we will use methodology proposed by Bourguignon and Spadaro (2000b) in order to analyze if and how social preferences on inequality have changed since the introduction of the 1999 reforms to the Spanish redistribution system. Our starting point is the observed distribution of a population's gross and disposable incomes and the observed marginal tax rates as computed in standard tax-benefit models. We show that, using a set of simplifyng assumptions, it is possible to identify the social welfare function that would make the observed marginal tax rate schedule optimal, given certain assumptions on consumption-leisure preferences. We apply this methodology to the 1998 and 1999 Spanish tax benefit systems, using the Eurostat (ECHP) dataset on the income and socio-demographic characteristics of Spanish households. In order to explore other scenarios, we will also analyze the social preferences implicit in a basic income-flat tax (BI-FT) system, in line with recent proposals made by various politicians and Spanish economists.

Key Words: Micro-Simulation; Optimal Income Taxation; Fiscal Policies; Labor Supply; Spanish Income Tax

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1. Introduction

During the last 20 years, the Spanish redistribution system has undergone wide-scale changes. Since 1979, the year of the creation of income tax in Spain, there have been two main reforms to the redistribution system. In 1989, the large-scale reform made it possible for married wage earners to make a separate tax declaration. (Until then, married wage earners had been forced to declare jointly). In the 1996 elections, the Socialist Party lost power after 14 years in government and the new government, which had won by a majority, (the Popular Party) decided to carry out reforms to the redistribution system, first of all by changing the personal income tax system (PIT). The new tax law was introduced in 1999 and the political and academic debate on its effects on equity and efficiency is still open. Recently, the Socialist party proposed a possible amendment, consisting of replacing the current PIT system with a partial basic income – flat tax scheme.

As we have just mentioned, since the government proposal in 1998 for reforms to the PIT system, various authors have analyzed the effects of the change. Most of these works have been based on micro-simulation techniques. Castañer *et al.* (1999) use the panel data of the Spanish Institute of Fiscal Studies to look at the implications of the reform in terms of redistribution and welfare, showing that the new scheme reduces the total redistribution, mainly as a result of the reduction of tax receipts. Moreno *et al.* (1999) use Tax Office statistics and completed tax returns to measure progressivity, with similar results. Mercader and Levi (2001) focus on an analysis of the withholding mechanism and the effects on the efficiency of the new income tax system. Using another database, Sanchis and Sanchis (2000) simulate the new PIT system, taking into account the effects on household consumption of a VAT increase introduced to compensate for the fall in income tax revenue that the reforms involved.

The main limitation of these studies is that the analysis is constrained to the reforms' first order effects. They do not take into account any strategic reaction in the economic behavior of agents. This lack of a behavior reaction prevents the construction of a normative framework which would allow for the analysis of real redistribution systems. As stressed by various authors (see Mirrlees 1986), it is possible to compare alternative real redistribution schemes by using micro-simulation models that include behavior reactions.

In various papers, normative analyses based on the use of a social welfare function have recently been carried out in order to analyze real tax-benefit systems. The studies analyze the possibility of justifying the most salient features of existing systems by the use of optimal tax arguments. Some papers explore the conditions under which it would be optimal for the marginal tax rate curve to be U-shaped - see Diamond (1998) and Saez (2001) for the US and Salanié (1998) for

France. In the same line, other authors look at the optimality of a 100 per cent marginal tax rate at the bottom of the distribution, by means of some kind of guaranteed income program - see Bourguignon and Spadaro (2000a) in the case of France and other European countries.

In a recent paper, Bourguignon and Spadaro (2000b) used the standard model of optimal income taxation in order to reveal social preferences on inequality. They start from the observed distribution of a population's gross and disposable incomes and from the observed marginal tax rates, as computed in standard tax-benefit models. They show that, under a set of simplifyng assumptions, it is possible to identify the social welfare function that would make the observed marginal tax rate schedule optimal.

In this paper, we will use the methodology proposed by Bourguignon and Spadaro (2000b) in order to analyze whether the 1999 changes to the Spanish redistribution system reveal a change in social preferences on inequality. We will compare the results of its application on the 1998 and 1999 PIT systems, using the Eurostat (ECHP) dataset on the income and socio-demographic characteristics of Spanish households. In order to explore other scenarios, we will also analyze the social preferences implicit in a basic income-flat tax (BI-FT) scheme, in line with recent proposals by various politicians and Spanish economists.

The structure of the paper is the following. Section 2 deals with the theoretical model and its empirical implementation. In the first part of Section 3, we describe the dataset and micro-simulation model used and, in the second part, we outline the main features of the three systems modeled (1998 PIT, 1999 PIT and the simulated BI-FT). In Section 4, we comment on the results of the simulation and, finally, in section 5, we outline our conclusions.

2. The model

This section is largely based on Bourguignon and Spadaro (2000b). Let us start by checking the optimal taxation framework proposed by Mirrlees (1971). This involves certain assumptions. We assume that agents choose the consumption (y) / labor (L) combination that maximizes their preferences, U( ), given the budget constraint imposed by the government. This can be expressed as follows:

$$\underset{y,L}{Max} U(y, L) \quad [1.1]$$

s.t. $y = wL - T(wL)$ [1.2]

where w is the productivity of the agent, U( ) is the agent's utility function, T( ) is the tax-benefit system, which is an unrestricted function of the earned income. If f(w) is the density distribution of the agents' productivity, the government's optimal taxation problem goes like this:

$$\underset{T()}{Max} \int_{w_0}^{A} G\{V[w,T()]\} f(w)dw \quad [2.1]$$

s.t. $V[w,T()] = U(y^*,L^*)$ [2.2]

$(y^*,L^*) = \arg max[U(y,L); y = wL - T()]$ [2.3]

$\int_{w_0}^{A} T(wL^*) f(w)dw \geq B$ [2.4]

where the interval [w_0, A] defines the domain of f(w), L must be non negative, G{ } is the social welfare function that transforms individual indirect utility V( ) into social welfare and B is the government's budget constraint. We can see that expression 2.3 is another way of writing the agent maximization problem expressed in equations 1.1 and 1.2.

This is the general model, but some assumptions are needed to make the model tractable[1]. Firstly, it is standard practice to focus on a special case where the function U(y, L) is quasi-linear with respect to y and iso-elastic with respect to L:

$$U(y,L) = y - (1+\frac{1}{e})^{-1} L^{1+\frac{1}{e}} \quad [3]$$

where ε is the elasticity of the labor supply.

By solving the model supplied in equations 1.1 and 1.2, we get the labor supply function:

$$L^* = w^e [1 - T'(wL^*)]^e \quad [4]$$

In equation 4, ε represents the elasticity of the labor supply with respect to the marginal return to employment of the agent, the latter representing his/her productivity corrected by the marginal rate of taxation.

Under these conditions, as Atkinson (1995) or Diamond (1998) have shown, we are able to characterize the optimal tax schedule by means of the following equation:

$$\frac{t(w)}{1-t(w)} = \left(1+\frac{1}{\varepsilon}\right)\frac{1-F(w)}{wf(w)}\left[1-\frac{S(w)}{S(w_0)}\right] \qquad [5]$$

where F(w) is the cumulative distribution function, t(w) is the marginal tax for by an agent with productivity w and, therefore, with earnings wL*, and S(w) stands for the average marginal social utility of all agents with a productivity above w.

$$S(w) = \frac{1}{1-F(w)}\int_w^A G'[V(w,T(\,))]f(w)dw \qquad [6]$$

Once the optimal tax schedule has been characterized, let us invert the usual problem and define $\Phi(\,)$ as:

$$\Phi(w) = [1-F(w)]\frac{S(w)}{S(w_0)} \qquad [7]$$

Then, we can rewrite equation [5] as follows:

$$\Phi(w) = [1-F(w)] - \frac{t(w)}{1-t(w)}\cdot\frac{wf(w)\varepsilon}{1+\varepsilon} \qquad [8]$$

And, by normalizing the welfare function G( ) in such a way that the mean marginal social welfare is equal to 1, $S(w_0) = 1$, it is easy to show (after some straightforward calculations) that:

$$G'[V(w,T(\,))] = -\frac{\Phi'(w)}{f(w)} \qquad [9]$$

This formula gives us the marginal social welfare weight of an agent characterized by productivity *w* under a certain redistribution system T( ), a given distribution of productivities *f(w)* and some hypotheses regarding ε.

[1] See Tuomala 1990.

3. The Data, the Micro-simulation Model and the Main Features of Redistribution Systems

The input we use is the 1995 Spanish database from the European Community Household Panel (ECHP), published by EUROSTAT, since it includes socio-demographic characteristics, income characteristics and labor status. Our dataset contains information at both individual and household levels.

After filtering the sample for records without information on the head of the household, we obtained a sub-sample of 6,420 households out of 6,522. The original dataset was then updated, using a correction factor including inflation and the growth rate from 1995 to 1998 and 1999. No changes in the socio-demographic structure were taken into account.

The micro-simulation model, called GLADHISPANIA, replicates three possible scenarios[2]: the income tax legislation in force in the years 1998 and 1999, and a basic income-flat tax reform. The three scenarios are described below.

The 1998 and 1999 Spanish Redistribution Systems

In this sub-section, we will describe the main aspects of the Spanish tax-benefit system before and after the reforms (as modeled in the micro-simulation model). We will focus on the personal income tax (PIT) system for three reasons. Firstly, because it is the most important instrument in the Spanish tax-benefit system. Secondly, we can model reliably with the information from our database. And thirdly, because the main aim of the paper is to analyze the PIT reforms that were actually introduced, together with alternative possibilities, like the basic income-flat tax system which has recently been under discussion. In the micro-simulation model, we have put a great deal of effort into modeling social contributions and these are described briefly in the next paragraph. Family benefits and social welfare are taken into account but, sometimes, our database's lack of information will force us to make simplifyng assumptions, as we will see further below.

[2] For further details of the micro-simulation model (GLADHISPANIA) and the dataset used, see Oliver and Spadaro (2001).

Social contributions

Social security contributions can be divided into the social security contributions paid by the employee and the social security contributions paid by the employer. Social security contributions depend on a lot of factors: a person's gross earned income, type of employment contract (temporary or permanent), employment hours (part-time or full time), work status (graduate workers, engineers, unqualified assistants, white-collar workers etc) and employment sector, the kind of worker in question (self-employed, dependent worker, government employee etc) and his/her previous status before being employed in his/her current job. There are various categories of "social affiliation status" (SAS), each with its own system of regulation (see Table 5 for details)[3].

Two elements must be considered if we wish to compute social security contributions. There is a base-rate for contributions, closely related to the worker's earned income, with an upper and lower limit and there is also a contribution rate that is split into two: the employer's contribution rate and the employee's contribution rate. Table 5 details the contribution rates of the general SAS system. Meanwhile, in Table 6, the maximum and minimum contribution base-rates are shown under the 1998 and 1999 Spanish system of regulation. Both years are based on the same law[4]. For this reason, only minor changes have been made, most of them to take into account an increase in prices. In Table 5, we can see that the social security contributions paid by the employer amount to about 35% of the total, whilst the social security contributions paid by the employee only represent 6.4%. This is not usual in other European countries, where the social security contributions paid by the employer are quite low. Although the employer's social security rates are high and are clearly specified, a lot of contracts involve reductions in rates, depending on the employee's conditions prior to starting to work or his or her current conditions. For example, there are reductions in rates if the worker was previously unemployed, if the worker is over 45 years of age, or if the worker is disabled. Previous conditions are impossible to model, due to the lack of information available.

[3] In some cases (maritime workers and certain types of government employees) the information needed to compute the SAS was not available. The details of what was done in such cases can be found in Oliver and Spadaro 2001.

[4] Ley general de la Seguridad Social, Real Decreto Legislativo 1/1994, de 20 de junio. The law regulating the national budget includes the changes in base-rates and other rates.

Personal income tax (PIT)

The Spanish personal income tax system (PIT) is a yearly income tax system. During the year, income tax is paid – and withheld at source – when people receive their wages, capital income or other sources of income. At the end of the tax year, however, they must fill in an income tax return and calculate whether they have to pay additional sums of money or whether they are entitled to get money back from the Treasury Department. A very small number of people, those with the lowest incomes, are not required to fill one in, although they can do so if it is in their interests.

The Spanish PIT system has undergone a dramatic change since the last reforms in 1999[5]. We have moved from a structure in which people's specific conditions are taken into account mainly by means of tax deductions to another one where they are taken into account by means of tax allowances. Let us take the case of a dependent child as an example. Before the 1999 reforms took place, there was a tax reduction of 25,000 ptas. for the first child, 35,000 ptas. for the second one and 50,000 for the third and any subsequent ones. Now, there is a reduction of 200,000 ptas. for each of the first two children and 300,000 ptas. for the third child and any following ones, but this amount reduces the taxable income.

The 1999 reforms followed the German philosophy of a *subsistence-level minimum income*: the income that is taxable must only represent the surplus income, once basic needs have been covered. These reforms also conform to the government's announcement that it would lower the tax rate schedule and reduce the number of tax brackets from 8 to 6, as can be seen in Table 1. We can see that there is only one schedule for single person and family income tax returns and we can also observe that the maximum and minimum marginal taxes have fallen. The maximum amount of tax has gone down from 56% to 48%, whilst minimum tax payments have been reduced from 20% to 18%.

The main characteristics of the PIT system before and after the reforms are described in Tables 2, 3 and 4. The income which is subject to PIT includes: earned income (gross wages and self-employed income), capital income, income from property and changes in wealth. These last three are all classed as capital income in our model, due to a lack of information and the complexity of the taxation of these sources of income.

The 5% deduction on gross earned income, with an upper limit of 250,000 ptas., is eliminated with the reforms. Instead, new deductions on earned income are introduced, depending on the

[5] The 1999 reforms were introduced by virtue of "Ley 40/1998 de 9 de diciembre, del impuesto sobre la renta de las personas físicas y otras normas tributarias", whereas the 1998 PIT system was established under "Ley 18/1991, de junio, del impuesto sobre la renta de las personas físicas".

level of earned income in question. Earned income can be reduced by between 375,000 and 500,000 ptas., depending on the amount earned (i.e. by 375,000 ptas. if a person's earned income is greater than 1,350,000 ptas.). The deduction on gross income for mortgage interest payments on the purchase of a house (the earner's main residence) is also eliminated and, instead, a new tax credit is introduced. As for capital income, the reform eliminates the supposed income from owner-occupied dwellings (2% of the registered council value of the property). In addition, the tax deduction on returns on capital income (the "minimum income exemption" of 29,000 ptas.) is also eliminated.

Before the reforms, there was no minimum personal exemption or minimum family exemption, but there were personal and family tax deductions. Under the current system, once the taxable income has been calculated (before the subsistence-level minimum income), we have to apply the personal and family minimums, which then give us the taxable income before allowances. The minimum personal exemption is 550,000 ptas., or 1,100,000 ptas. in the case of a couple who fill in a joint family income tax return. This personal minimum exemption amounts to 650,000 ptas. when the earner is over the age of 65 and 850,000 or 1,000,000 ptas. in the case of a disabled person. The minimum family exemption involves two tax deductions. The first is a deduction of 100,000 ptas. for each dependent relative over 65 years of age with an income below the minimum wage. The second is a deduction per dependent child: 200,000 for each of the first two and 300,000 ptas. per child after the second child. In each of the aforementioned cases, these quantities are increased by 25,000 ptas. per child for children aged between 3 and 16 and by 50,000 if the children are under 3 years of age.

Tax allowances change relatively little with the reforms. Mortgage interests are grouped together with mortgage repayments and become a tax credit under the new tax system (see Table 4). Pension plans remain unchanged, except for a modification to the upper limit for deductions, which changes for people over 53 years of age – the maximum deduction rises from 1,100,000 to 2,200,000 ptas.

When tax allowances are subtracted, we get the taxable income and we are ready to compute the tax before tax deductions. Then, tax deductions must be taken into account (see Table 3). In 1998, there were a lot of tax deductions but, in 1999, some of them were included in the subsistence-level minimum income (i.e. personal and family tax deductions). Others became tax deductions on different kinds of expenditure (i.e. tax deductions on employees wages) and some of them were eliminated (i.e. expenditure due to and house rentals). With the new PIT system, earnings allowances and increases in personal or family minimums replace deductions for personal disabilities.

After the application of tax deductions, we obtain the amount of tax that must be paid (the "*cuota íntegra*"), but, as mentioned before, tax is withheld at source every month. So, at the end of the tax year, people must calculate whether they have to pay additional tax (a "*cuota líquida*"). or whether they are entitled to get money back. In the micro-simulation model, we do not take into account monthly withholdings. Instead, we make a direct calculation of the net tax due at the end of the year.

The Basic Income –Flat Tax Scenario

As we mentioned before, debate continues regarding the appropriateness of the reforms to the Spanish redistribution system. A number of politicians from the Socialist party, with the support of certain economists, recently proposed the introduction of a scheme similar to that of a basic income –flat tax mechanism[6]. The proposal was not well-defined, but the underlying idea of simplifying the tax structure and introducing a sort of "citizenship income" gave rise to a great deal of debate on the eventual effects in terms of equity and efficiency. In order to explore the implications on social welfare of the introduction of a BI-FT scheme, we have simulated the following reform. For the sake of simplicity, as a possible scenario, we have defined "basic income" as the amount of money that the government allows each household, independent of income and status. We take a figure of 50,000 ptas. (300 euros) per month for each equivalent adult[7]. In order to respect the government's budget constraint for our year of reference (1999), we levied a flat rate tax of 38.3% on all income, except for the BI. It is important to stress that, given this scenario, the exercise must be analyzed as a kind of instantaneous change to the social preferences of the authority responsible for redistribution, because no changes in earned income distribution are taken into account.

4. Results

We now apply the methodology discussed in Section 2 to the data. To retain the logic of the optimal taxation model, all households for which unearned income (including pension and unemployment benefits) represented more than 10 per cent of their total income were eliminated from the sample. Unearned income is ignored by the analysis. The results are summarized in the

[6] For more details of the general properties of a basic income - flat tax scheme, see Atkinson 1995.
[7] The equivalence scale used is the square root of the number of household members.

form of curves, showing the marginal social welfare of the various different household population quantiles, ranked according to their level of productivity.

All the functions used in the model for Section 2 are supposed to be continuous and differentiable at all points. In order to guarantee this, we estimated the density of the productivities f(w) and the observed effective marginal tax rate t(w) by adaptive kernel techniques[8].

As regards f(w), it is important to describe the process used for its computation. Basically, the idea was to invert the individual utility maximization problem (equation 1.1 and 1.2) and to recover the implicit productivity of each household by observing the gross earned income *wl* and the effective marginal tax rate *t(w)* and by making certain hypotheses as to the elasticity of the labor supply (equation 4) (in our case $\varepsilon = 0.5$)[9]. After these computations, we apply adaptive kernel density estimation techniques in order to calculate f(w)[10].

There are three panels in Figure 1. Figure 1a shows the effective net marginal tax rates that correspond to the various different population quantiles, computed by means of the official 1998 and 1999 rules modeled in GLADHISPANIA. Figure 1b shows the distribution of productivity consistent with the gross earned income distribution, under the assumption of a moderately elastic labor supply ($\varepsilon = 0.5$). The mean productivity is normalized to one. Finally, Figure 1c shows the marginal social welfare, consistent with the previous curves, for various different population quantiles, ranked according to productivity. Here again, the mean marginal social welfare is normalized to one.

Several comments should be made about this first figure. The marginal tax rate curves increase consistently, except at the very beginning. This is due to the progressivity of income tax, (which basically represents the only source of direct redistribution under both systems). As expected, the 1999 marginal tax curve is systematically lower than the 1998 curve. It is important to highlight that the reduction of the marginal tax rate increases as incomes get higher. From the 10 million-peseta gross-income mark, we can observe a big difference between the two curves.

Figure 1b shows the density functions associated with the gross income distribution and marginal tax rates from the preceding panel. The distribution can be seen to be asymmetric: the mode is left of average (normalized to 1).

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[8] See Hardle 1990.

[9] We have run simulations for a range of elasticities, from 0.1 to 0.5, and described only one scenario for reasons of space. The results are basically the same for all scenarios. What is different is the intensity of the changes in the social valuation of inequality. This coincides with what we might expect, because, for a given distribution of gross incomes and marginal tax rates, there is less inequality in productivities when the labor supply is more elastic. This implies more preference for redistribution than in the other cases.

[10] For details of this inversion process, see Bourguignon and Spadaro (2000a).

Figure 1c shows the marginal social welfare for various different population quantiles. The curves call for a technical observation on the kernel approximation. The curves are all relatively smooth for almost the whole of the productivity range, but they become somewhat agitated when entering the last 4-5 centiles of the population. Using an adaptive kernel, we eliminated the problem of choosing the optimal window for the kernel. In all cases, we tried to obtain the maximum smoothness for highly productive households, while retaining the main features of the rest of the curve. For ease of presentation, we also approximate the resulting curves in the remainder of this paper, using a 6th order polynomial. This approximation turns out to have the advantage of fitting the kernel estimate well in the first part of the curve and smoothing the upper part even more, the details of which we simply ignore.

Overall, the marginal social welfare observed declines with the level of household productivity. This is very reassuring indeed, since it suggests that the redistribution systems analyzed in this paper exhibit some minimum optimality features, in the sense that they maximize a standard concave social welfare function of individual utility levels. This is an interesting result, because it is certainly not guaranteed by the inversion methodology used in this paper.

We will start by analyzing the differences obtained from a comparison of the three systems, when the entire population is taken into consideration. In this case, we assume that the government considers all households to be units that only differ in productivity. Any other type of heterogeneity (such as size) is ignored.

If we compare the 1998 and 1999 systems, we can observe that with the 1999 system, there is a big decrease in the social welfare weighting for the poor and a strong increase for the rich. Looking at the bottom of the distribution, we can observe that, for the first 3 population deciles, the weighting is higher with the 1998 system. From decile 4 onwards, the 1999 system seems to be more generous. It is important to emphasize that, from deciles 4 to 7, there is a small, yet constant increase in the marginal social welfare weighting with respect to 1998 values, while for the last three deciles (8, 9 and 10) the difference is more acute.

Another feature of Figure 1c is that the marginal social welfare function of the 1999 system remains flat over a long interval, extending from the first decile to almost the 4th decile, while the 1998 curve decreases in a more regular way. Under the present set of assumptions, it would thus seem that the shift from the 1998 to the 1999 income tax system implies that the Spanish government was setting the 4 bottom deciles a part from the rest of the population. Although this requires a little more theoretical analysis, a shape such as this could be justified by some kind of median-voter-type argument or, more generally, by some kind of economic policy decision within the tax system itself.

The basic income-flat tax scheme (as expected) gives a strong weighting to less productive sectors of society. Up to decile 4, the marginal social welfare function is higher than in the 1998 and 1999 systems. It is interesting to observe that if we look at the very top of the distribution (decile 9), we can observe that the marginal weight for this part of the population under the BI-FT scheme is higher than it is under the 1999 system. This reflects the fact that the marginal tax rate under the BI-FT scheme is higher than the average tax rate paid by this household group

We now turn to the example in which the size and composition of households is taken into account, by the application of the previous methodology to separate household groups with a homogeneous demographic composition. As mentioned before, this is equivalent to considering the redistribution that takes place across these groups as being exogenous, independent of productivity and income. Thus, Figure 2 shows the results of the inversion of the marginal rate curve into the marginal social welfare curve for single people, couples, couples with one child and couples with two children.

In general, the shape of the marginal social welfare curve is comparable, in these cases, to the one corresponding to the population as a whole. It decreases for the whole household population of a given size, once it is ranked according to productivity levels. However, the general shape of the curve for the 1999 system is slightly different from those observed in the preceding figures, above all because the flat part, at the beginning of the curve, is considerably lower (with the exception of single people). The slope of the curve is now negative from the second decile onwards, whereas it was practically zero until the fourth decile for the curves for the entire household population. This suggests that part of the flatness of the 1999 marginal social welfare curve could be explained by the heterogeneity of the way in which the tax-benefit system deals with households of differing sizes and compositions.

In the case of single people (Figure 2a), the shift from the 1998 to 1999 system reveals that the government seems to lend greater relative importance to productive members of society, as also happens in the general case. Until the fourth decile, the curve for the 1999 system can be seen to be flatter than that of 1998. In contrast, we can observe a big increase in the weight of deciles 7 to 10. As in the previous case, the BI-FT system gives a more redistributive weighting to the poor and also gives more weight to the last two deciles in comparison with the 1999 system.

If we analyze the results of the sub-sample for couples, an interesting feature can be observed that was not present in the previous cases. The 1998 system gives greater weight to the first decile than the BI-FT system (which is a little bit surprising) and the 1999 system (as occurred before). This is highly original because, for the rest of the population (90% of households), the marginal social weight is higher. One possible explanation could be the way in which the

subsistence-level minimum income takes into account the number of children in a household. The increase in the minimum threshold per child is independent of the household's income. For the concavity of the individual utility function and of the social welfare function, this implies a greater redistributive effect.

When children are involved (Figures 2c and 2d), we still have (regularly) decreasing curves in all cases. The BI-FT curve is higher than the 1998 and 1999 curves for low productivities (until the second decile). From the third to the sixth deciles, the three curves are more or less super-imposable and, from decile 7 onwards, we can observe that the 1999 system gives more weight to the richest households than the BI-FT and 1998 systems. When we consider households with 2 children, the differences become less pronounced.

5. Conclusions

In this paper, using an original form of application developed by Bourguignon and Spadaro (2000b), based on the Mirrlees optimal income tax model, we have revealed the social aversion to inequality that allows the simulated BI-FT system and the 1998 and 1999 Spanish tax benefit systems to be optimal in the Mirrlees framework. We have observed that, in general, the social welfare function is increasing and and concave. It seems that there is some type of optimal tax theory behind the design of all of the three systems analyzed.

As regards the degree of aversion to inequality of the social planner, the results show that the shift from the 1998 system to the 1999 system involves a clear decrease in importance of less productive households, with a strong increase in the weight of more productive sectors of society. This is coherent with the declared objectives of the reform: to reduce the disincentive effects of redistribution (improving the efficiency of the economy). The BI-FT proposal seems to give strong weight to lower-ability sectors of the population, but the results of this system have to be treated with care, because it was based on the strong hypothesis of no changes to the labor supply.

As pointed out, in Bourguignon and Spadaro (2000b), the optimal income tax model represents an extremely promising framework for the analysis of real tax-benefit models and their performance in terms of equity and efficiency. Nevertheless, to conclude, we must stress that this approach has several limitations, which give rise to debate on the validity of this approach, although it also paves the way for future research. The first problem is the representation of the economy as a whole and the functioning of the labor market: if households were not on the labor

supply curve (due to constraints on the demand side), then the entire story would be different. Another restriction is the one-dimensional nature of the heterogeneity of households: it is well known that redistribution not only affects income, but also other characteristics that are not considered in our analysis. Finally, we must also highlight that this is a static model, meaning the inter-temporal and uncertainty aspects of household decisions are ignored.

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Table 1: Tax rates schedule

1998				1999	
Single Person's income tax return		**Family income tax return**		**Single person's and family income tax return**	
Bracket	Tax rate	Bracket	Tax rate	Bracket	Tax rate
0-467000	0	0-901000	0	0-600000	0.18
467000-1161000	0.2	901000-2245000	0.2	600000-2100000	0.24
1161000-2295000	0.23	2245000-3166000	0.246	2100000-4100000	0.283
2295000-3495000	0.28	3166000-4391000	0.29	4100000-6600000	0.372
3495000-5095000	0.32	4391000-5866000	0.33	6600000-11000000	0.45
5095000-6795000	0.39	5866000-7901000	0.39	> 11000000	0.48
6795000-8625000	0.45	7901000-9936000	0.45		
8625000-10500000	0.52	9936000-12136000	0.53		
> 10500000	0.56	> 12136000	0.56		

Table 2: Main Characteristics of The Spanish 1998 and 1999 PIT Systems

1998 PIT system	1999 PIT system
+ Gross wages (includes: wages, retirement pension, unemployment benefits…) Social security contributions can be deducted, together with 5% of gross earned income. There is an upper limit of 250,000 ptas.	**+ Gross wages** (includes: wages, retirement pension, unemployment benefits…) Social security contributions can be deducted and there is an earnings allowance, based on income, of between 375,000 and 500,000 ptas. (500,000 ptas for those earners whose earned income is below 1,350,000 ptas; 500,000 ptas minus the result of multiplying the difference between the person's earned income and 1,350,000 ptas by 0.1923, for those earners whose earned income is between 1,350,000 and 2,000,000 ptas; and, finally, 375,000 ptas for those earners whose earned income is above 2,000,000 ptas. or with an unearned income of over 1,000,000 ptas.)
+ The income of self-employed people There are some changes in the method of income estimation, but it cannot be modeled, due to a lack of information	**+ The income of self-employed people**
+ Property income It is assumed that an owner-occupied dwelling is a source of income (2% of the registered council value of the property)	**+ Property income** The owner-occupied dwelling is not a source of income
+ Capital income There is a general deduction of 29,000 ptas.	**+ Capital income**
	= Taxable income before subsistence-level minimum income
	- Tax allowances **Personal minimum**: 550,000 ptas. (+100,000 for people over 65) **Family minimum** **Relatives:** 100,000 each if their incomes are lower than the minimum wage **Dependent children:** 200,000 ptas for each of the first two, and 300,000 for the rest. These amounts increase by 50,000 ptas. for each child under 3 and by 25,000 for each child between 3 and 16. (Dependent children are children under 25 and those with incomes under 1 million ptas)
= Taxable income before tax allowances	**= Taxable income before tax allowances**

- Tax allowances **Pension plan:** with a maximum of 1,100,000 ptas. or 20% of earned income **Mortgage interests**	**- Tax allowances** **Pension plan:** with a maximum of 1,100,000 ptas. or 20% of earned income
= Taxable income **Þ Tax before tax deductions** **- Tax deductions** (see Table 3)	**= Taxable income** **Þ Tax before tax deductions** **- Tax deductions** (see Table 3)
= PIT	**=PIT**

Table 3: Tax deductions

1998 Tax deductions	1999 Tax deductions
Cultural items of investment: 15% **Donations:** 10-25% **Housing investments** (see Table 4) **Paid dividends:** 40% in general **Deduction for disability:** 56,000 ptas. **Personal tax deduction:** 20,000 if he/she is over 65 **Family tax deductions** Older relatives: 16,500 or 32,900 for each one, depending on whether he/she is under 75 or not **Dependent children:** 1st 25,000; 2nd 35,000; 3rd and following 50,000 **House rentals:** 15% with a maximum of 100,000 ptas. **Expenditure due to illness:** 15% of total amount **Wage-earning employee:** 72,000-27,000 depending on the amount of net wages and taxable income (net of wages) **Others:** child custody, life insurance, property savings account/mortgage account	**Cultural items of investment:** 15% **Donations:** 10-25% **Housing investments** (see Table 4) **Paid dividends:** 40% in general ~~**Deduction for disability**~~ ~~**Family tax deductions**~~ ~~**House rentals**~~ ~~**Expenditure due to illness**~~ **Wage-earning ~~employee~~**

NOTE: Tax deductions that disappear with the new reform are crossed out.

Table 4: Housing investments

1998		**1999**
There is a tax deduction of **15%** on the **amount invested in special mortgage accounts/property savings accounts** with a limit of up to 1,500,000 ptas. per year, for a maximum of 5 years		There is a tax deduction of **15%** on the **amount invested in special mortgage accounts** with a limit of up to 1,500,000 ptas. per year, for a maximum of 4 years
Mortgage payments = Mortgage interests + Mortgage repayments		
Mortgage interests	**Mortgage repayments**	**Mortgage payments**
Mortgage interests can be **subtracted from property income** (property income can be negative)	Mortgage repayments have a tax deduction of **15%**	Without loans: Mortgage payments have a tax deduction of 15%
Upper limit: 800,000 and 1,000,000 ptas. for individual and family income tax returns respectively	Upper limit: 30% taxable income	With loans: First two years: **25%** on the first 750,000 ptas. and **15%** on sums up to 1,500,000 ptas.
	Other housing investment expenditure is liable for the same deductions but we do not have sufficient data	Third year and following years: **20%** on the first 750,000 ptas. and **15%** on sums up to 1,500,000 ptas

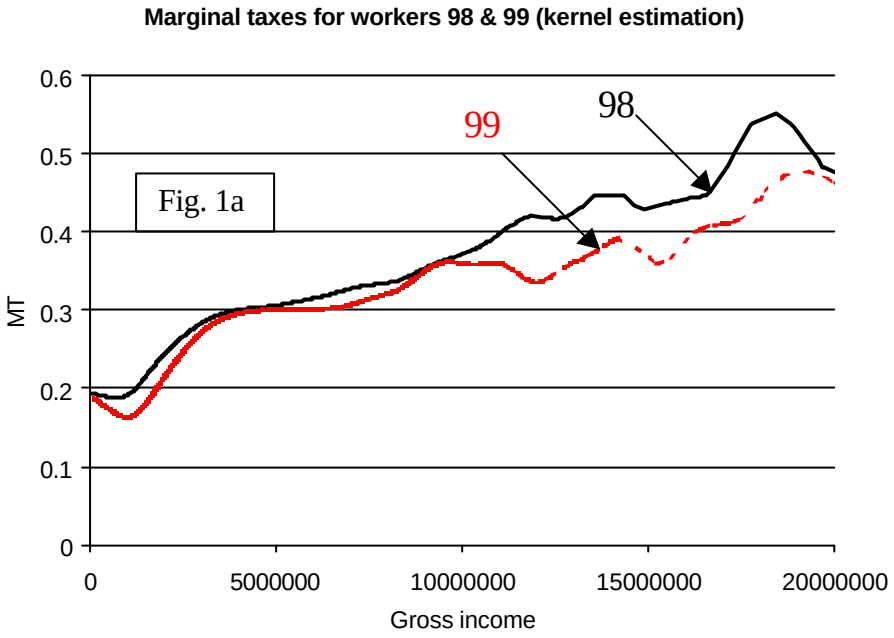
Table 5: Social Security contribution rates of the general SAS system

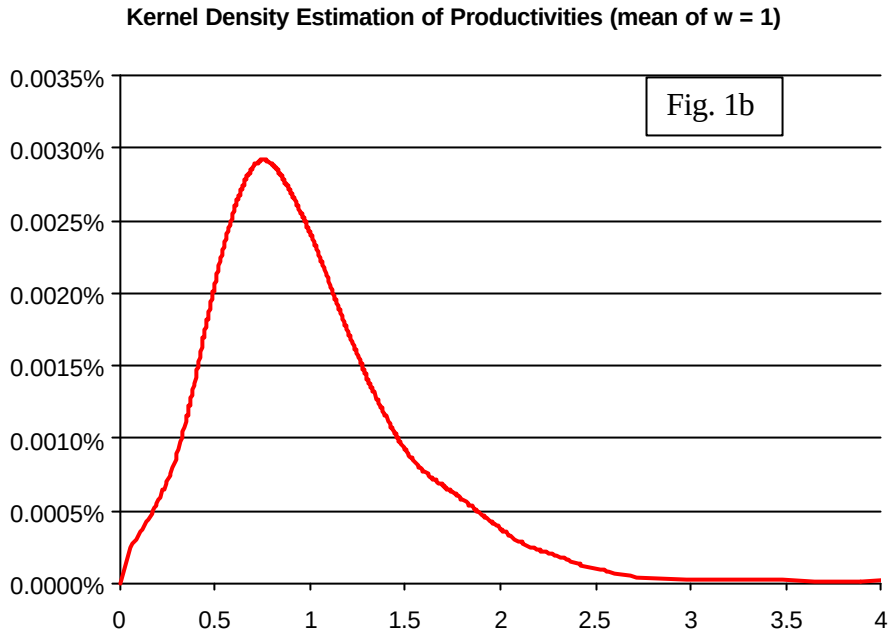
	Firm		**Worker**		**Total**	
Contribution Items	1998	1999	1998	1999	1998	1999
General contingencies	23.60%	23.60%	4.70%	4.70%	28.30%	28.30%
Mean no. of industrial accidents and professional illnesses	4.00%	4.00%	0.00%	0.00%	4.00%	4.00%
Unemployment						
Full-time worker (permanent worker)	6.20%	6.20%	1.60%	1.60%	7.80%	7.80%
Full-time worker (temporary worker)	6.20%	6.70%	1.60%	1.60%	7.80%	8.30%
Part time worker	6.20%	7.70%	1.60%	1.60%	7.80%	9.30%
Social welfare fund	0.40%	0.40%	0.00%	0.00%	0.40%	0.40%
Professional training	0.60%	0.60%	0.10%	0.10%	0.70%	0.70%

Table 6: Monthly Minimum and Maximum Base-Rates

	1998	**1999**
Min. base-rate	79380 (= minimum wage/12)	80815 (= minimum wage/12)
Min. base-rate	392700	399780

Fig. 1


Marginal taxes for workers 98 & 99 (kernel estimation)
Fig. 1a
99
98
MT
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5000000
10000000
15000000
20000000
Gross income


Kernel Density Estimation of Productivities (mean of w = 1)
Fig. 1b
0.0035%
0.0030%
0.0025%
0.0020%
0.0015%
0.0010%
0.0005%
0.0000%
0
0.5
1
1.5
2
2.5
3
3.5
4

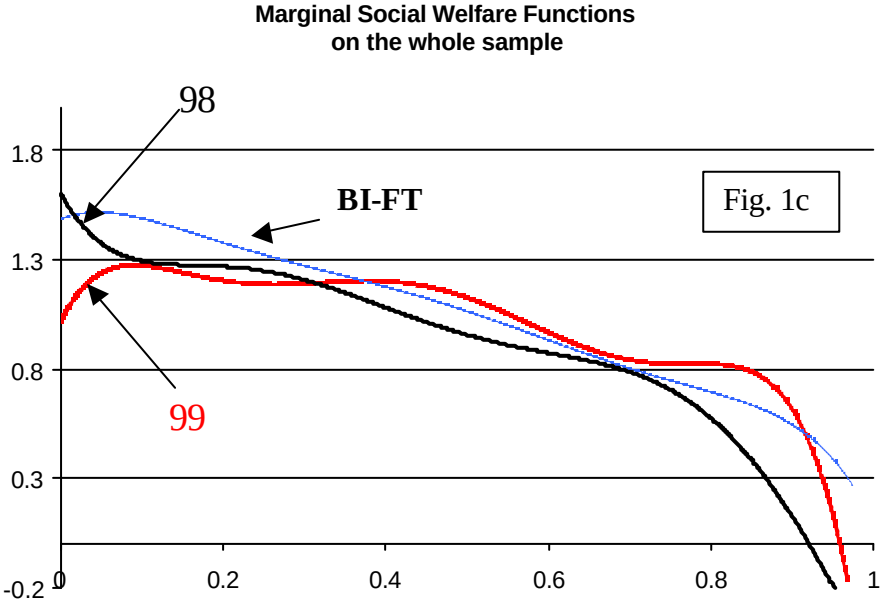
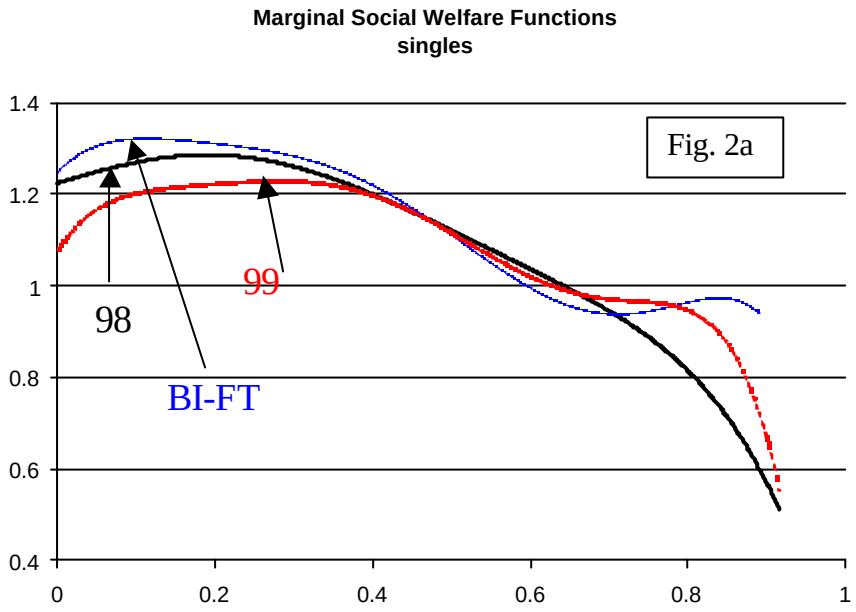
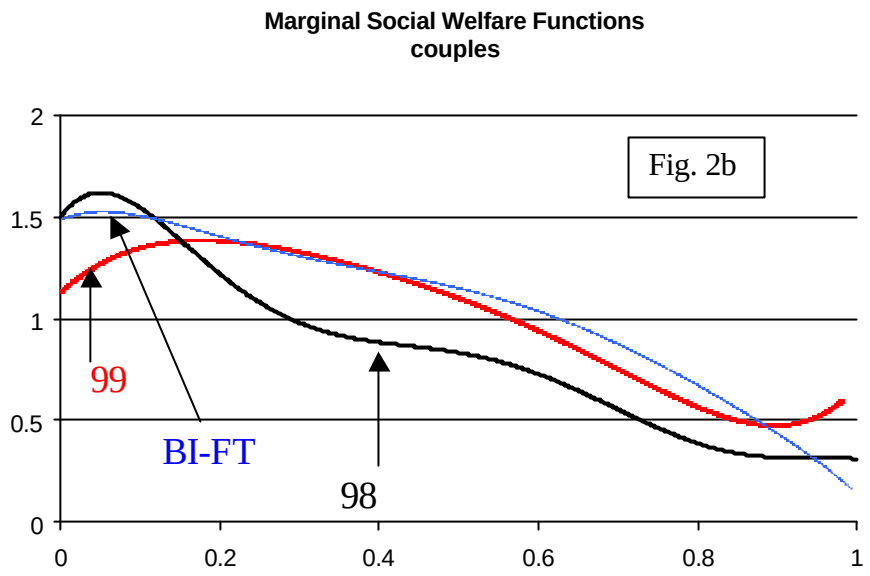
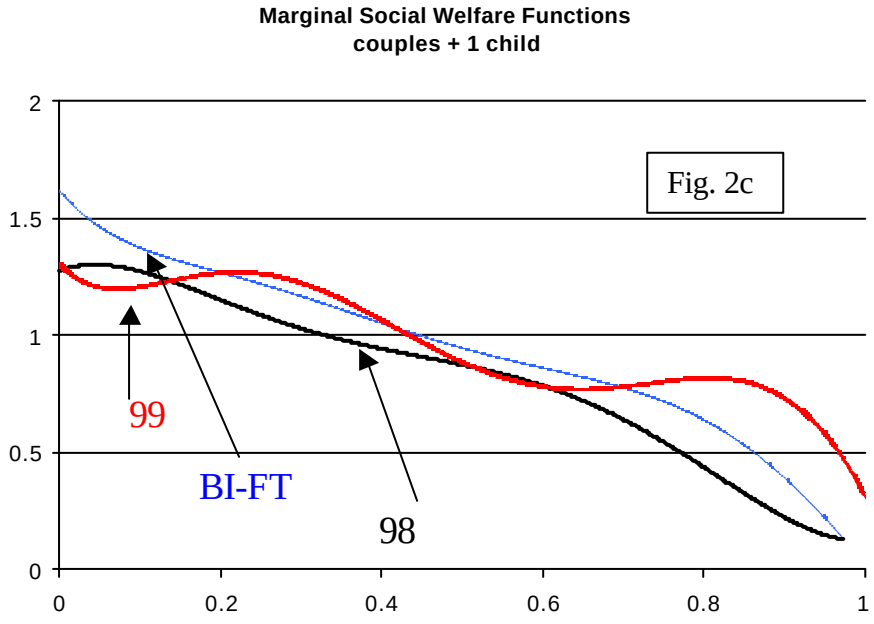
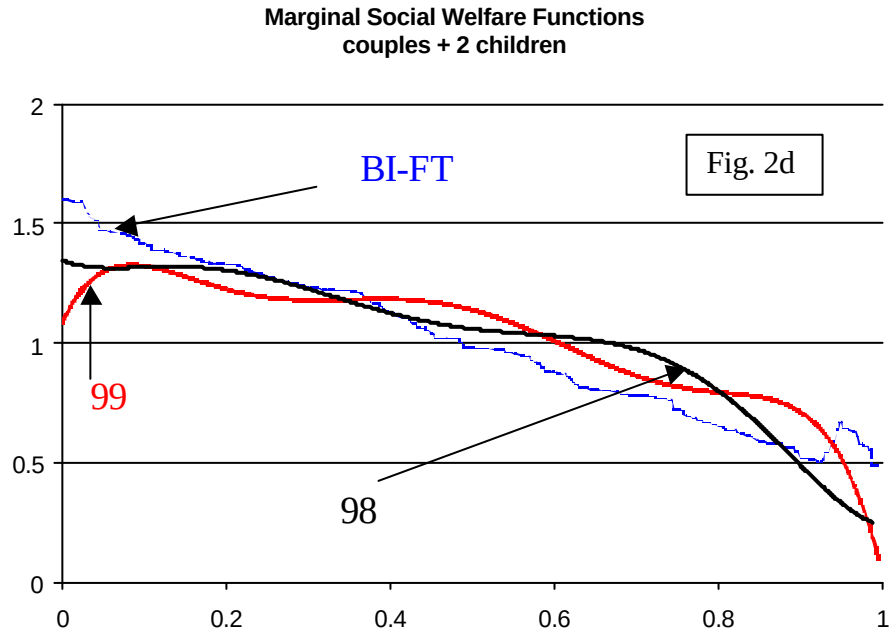

Marginal Social Welfare Functions
on the whole sample
98
BI-FT
Fig. 1c
99
1.8
1.3
0.8
0.3
-0.2
0
0.2
0.4
0.6
0.8
1

Fig. 2


Marginal Social Welfare Functions
singles
Fig. 2a
1.4
1.2
1
0.8
0.6
0.4
0
0.2
0.4
0.6
0.8
1
99
98
BI-FT


Marginal Social Welfare Functions
couples
Fig. 2b
2
1.5
1
0.5
0
0.2
0.4
0.6
0.8
1
99
BI-FT
98


Marginal Social Welfare Functions
couples + 1 child
Fig. 2c
2
1.5
1
0.5
0
0.2
0.4
0.6
0.8
1
99
BI-FT
98


Marginal Social Welfare Functions
couples + 2 children
Fig. 2d
2
1.5
1
0.5
0
0.2
0.4
0.6
0.8
1
BI-FT
99
98