Family tax credits *versus* family allowances: a country-specific empirical matter. Evidence for Spain*

José Félix Sanz-Sanz(1)
Universidad Complutense de Madrid
Desiderio Romero-Jordán
Universidad Rey Juan Carlos
Santiago Álvarez-García
Universidad de Oviedo

Summary:

This article evaluates the effects of replacing tax allowances with tax credits on the tax treatment of households, in the context of the Spanish personal income tax. The analysis is performed using microsimulation techniques. Simulations include labour behavioural reactions.

Keywords: family, distribution, welfare, labour supply, microsimulation.

J.E.L. Codes: H24, H31

---

* This article is part of a wider study for the *Fundación BBVA*. José Félix Sanz would like to thank Ministerio de Ciencia y Tecnología for the financial assistance though the CICYT #BEC2003-01831 project.

[1] *Corresponding author*: José Félix Sanz, Departamento de Economia Aplicada VI, Universidad Complutense de Madrid, Campus de Somosaguas, 28223-Madrid (Spain).
Phone: 0034-913942430
e-mail: jfelizs@ccee.ucm.es

1. Introduction

The tax treatment of dependants is a fundamental aspect of personal income taxation (PIT). It is normally incorporated into the tax structure in two ways: either through a system of *family tax allowances* (TA) or by means of *family tax credits* (TC). With a progressive tax, the choice between these alternatives is not neutral in a distributive sense. In this regard, the literature has proclaimed the distributive superiority of TC over TA[2]. The reason for this is that while TC generates tax savings which are homogeneous and independent of the income of taxpayers, the tax savings generated by TA increase in accordance with the marginal tax rates and, therefore, with household income. To resolve this apparent attack on distributive principles, it is usual to propose reintroducing TC as a means of addressing tax treatment of dependants.

However, from a distributive point of view, the ranking of these two methods of tax treatment of the family is, at the very least, open to question. Our view is that the superiority of one or other system is basically an empirical matter (*country specific*), and depends on several factors. These factors include the initial design of the tax, the population distribution and the correlation between family size and composition and income distribution. Moreover, the tax treatment of dependants may generate other economic effects which are quite significant and are worthwhile to consider. In fact, moving from a TA system to a TC system, even under the assumption of revenue neutrality, would be likely to produce significant substitution effects by causing a general increase in marginal tax rates. This increase in marginal tax rates could distort the behaviour of taxpayers and, as a result, it could affect their income and therefore the distributive effect of the reform itself. Therefore, a distributive analysis which skirts around

[2] There are some exceptions, for example, Lambert and Yizthaki (1995, 1997).

the impact of the reform on taxpayer behaviour is risky and may hide its real distributive impact. In addition, given that marginal tax rates represent the "price" taxpayers pay during periods of inflation, it is likely that TC would also be more vulnerable to price increases than a TA system (McHugh, R., 1979). Doubtless to say, a balanced evaluation of the tax treatment of dependants must take all these factors into account.

Recently, the Spanish government has proposed replacing the current TA system, based on *vital minimums*, with a set of tax credits (TC). This article analyses the expected global impact of this reform.

2. Design of the simulation

The simulation will compare two alternative tax scenarios. The pre-reform scenario depicts the treatment of dependants in 2005 characterised by a system of personal and family minimum allowances (TA system) – see Table 1. The post-reform scenario replaces these allowances with a set of family tax credits (TC system) under the assumption of tax revenue neutrality. This assumption requires *equivalent family tax credits* to be calculated. These tax credits have been computed using [1].

$$c_x = \frac{\sum_{i}^{h_x} m_x}{h_x} \cdot t_{h_x} \qquad (1)$$

where m_x is the personal or family minimum allowance x, c_x is the equivalent tax credit, h is the number of households which benefit from m_x and t_{h_x} is the relevant average marginal tax rate of beneficiary households. The resulting values of tax credits are shown

in Table 1. In other words, applying the existing allowances in 2005, shown in the second column, would cost in revenue terms exactly the same amount as the application of the equivalent tax credits reported in column three. This is so, taking into account the Spanish income distribution and the distribution of the Spanish households by size and composition.

[INSERT TABLE 1]

To highlight the potential distorting effects of the reform, simulations are performed with and without labour supply behaviour. To quantify induced tax-reform labour-supply changes, it is necessary to estimate the labour response of taxpayers beforehand. For doing so, the following labour supply function is used:

$$h = \alpha + \beta\,\omega + \gamma\, m + \lambda\,\omega^2 + \mu Z + \varepsilon \qquad (2)$$

where ω is the marginal net wage of the individual, m is her virtual income and Z is a vector of employees' socioeconomic variables. The micro-data used in the simulation are drawn from of the European Union Household Panel (EUHP) for the year 2000. The sample size is 15,614 households, equivalent in population terms to 39 million individuals grouped in 12.9 million households. To determine taxpayers' labour-supply reactions, equation [2] was estimated using the pool of EUHP data for years 1994-1998. In doing so, we used Heckman's two-step process (1979) using lagged wages and lagged virtual incomes as instruments to avoid problems of endogeneity. Table 2 summarises the average labour supply elasticities obtained.

[INSERT TABLE 2]

To analyze the distributive, allocative and welfare impact of the reform, we use the indices and measures traditionally used in the literature (see Appendix).

3. Distributive, allocative and welfare results

Table 3 summarises the reform's effects on taxable income and tax rates in the behavioural simulation. The invariability of average tax rates before and after the reform verifies that the assumption of tax revenue neutrality is correct. However, the reform increases taxable income by 61.08%! with a consequent increase in the marginal tax rates (22.73%). It is therefore a case of a reform with little income effects but strong substitution effects. Namely, we are before a tax change with significant allocative consequences. To be precise, the simulation suggests that, given the estimated elasticities, this increase in marginal tax rates would reduce, on average, the labour supply of individual workers by 12 minutes per week. This reduction in labour supply would be equivalent to a cut in more than 135,000 full-time equivalent jobs per year[3]. The estimated variation in the deadweight loss and the change in welfare confirm this result. Specifically, as can be seen in Table 4, the deadweight loss estimated for the total population would increase by 11,833.5 million Euros, equivalent to 976.90 Euros per household annually. Similarly, the loss of individual welfare, measured using the so-called equivalent variation, amounts to an annual average per household of 938 Euros.

[INSERT TABLES 3 AND 4]

Once we have taken this robust allocative impact into account, we are able to evaluate the reform's distributive consequences. Table 5 presents the Gini and Atkinson indices for

[3] A full-time equivalent post is equal to 1,740 hours a year.

after-tax income. The calculations include simulations with and without behavioural reactions. As can be observed, the reform improves equality in the income distribution in the absence of behavioural changes but worsens it when labour behaviour is taken into account. This result confirms our hypothesis that not including labour behaviour may hide the real distributive impact of tax reforms. Particularly in those reforms, such as the one simulated in this paper, where there are significant substitution effects.

Table 6 summarises the reform's impact on the progressivity and redistributive capacity of the tax. As can be seen, both progressivity and redistributive potential of the tax are increased with the reform. This increase is greater when the labour response of workers to the tax change is taken into account.

[INSERT TABLES 5 AND 6]

4. Sensitivity of both systems to inflation

To evaluate the sensitivity of both systems to inflation, we calculate the tax revenue-income elasticity of TA and TC for an equal increase in price levels. For an individual *i* with *pre-form* net income I_{oi} and *pre-reform* tax liability T_{oi}, the elasticity is calculated as:

$$\xi_i = \frac{\Delta T_i}{\Delta I_i} \cdot \frac{I_{0i}}{T_{0i}} \tag{3}$$

where ΔT and ΔI stands for variations in tax liabilities and net incomes between pre-reform and post-reform tax scenarios. Table 7 shows the average elasticies, by income decile, for both systems, TA and TC, when facing an increase in prices equals to 5%. The

figures show very clearly the higher sensitivity of TC compared to TA. This higher sensitivity occurs in all income deciles. Conversely, elasticities decrease with income both for TA and TC. In other words, regardless the system chosen, the higher levels of income are, on average, less sensitive to inflation.

[INSERT TABLE 7]

References

Atkinson, A. B., 1970, On the measurement of inequality, *Journal of Economic Theory*, 3, 244-263.

Kakwani, N. C., 1977, Application of Lorenz curves in economic analysis. *Econometrica*, 45, 719-727.

Heckman, J., 1979, Simple selection bias an a specification error, *Econometrica,* 47, pp. 153-161.

King, M., 1983, Welfare analysis of tax reforms using household data, *Journal of Public Economics*, 21, 183-214.

Lambert, P.J., Yitzhaki, A.S., 1995, Equity, equality and welfare. *European Economic Review*, 39, 674-682.

Lambert, P.J., Yitzhaki, A.S., 1997, Income tax credits and exemptions. *European Journal of Political Economy*, 13, 343-351.

McHugh, R., 1979, Exemptions, personal credits and the inflation sensitivity of progressive income taxes. *National Tax Journal*, XXXII-2, 215-219.

Reynolds, M. y Smolensky, E., 1977, Public Expenditures, Taxes and the Distribution of Income: The United States 1950, 1961, 1970. (Academic Press, New York).

Appendix

In the distributive analysis of income, X, we use the traditional Gini, G_X, and Atkinson, $A_X(\varepsilon)$, indices defined as:

$$G_X = 1 - \frac{1}{N} - \frac{2\sum_{i=1}^{N}(N-i+1)w_i x_i}{N^2 \mu} \tag{1}$$

$$A_X(\varepsilon) = 1 - \frac{\hat{y}_e}{\overline{Y}_e} \tag{2}$$

where, N is the sample size, i is the range of each individual, w_i is the normalised weight of the sample unit, μ is weighted average income, ε is the aversion to inequality parameter, $\hat{y}_e$ is the equally distributed equivalent of equivalent incomes and, finally, $\overline{Y}_e$ is the average of equivalent incomes. The Reynolds-Smolensky (1977) and Kakwani (1977) indices computed to measure the progressivity and redistributive power of the simulated tax structures are defined as:

$$\prod^{RS} = G_X - G_{X-T} \tag{3}$$

$$\prod^{K} = C_T - G_X \tag{4}$$

where C_T is the concentration index of tax liabilities, G_X is the Gini index of income before taxes and G_{X-T} is the corresponding Gini index for net-of-tax income. To measure the effects on efficiency and individual welfare we use the Hicksian measurements of equivalent variation (EV) and the variation in equivalent deadweight loss (DWLV).

$$EV = e(\omega^0, v^1) - e(\omega^1, v^1) + (m^1 - m^0) = EV(\omega) + EV(m) \tag{5}$$

$$DWLV = -\sum EV(\omega) - \sum (R^1 - R^0) \tag{6}$$

where v is the level of indirect utility, ω is the net wage, m stands for virtual income and R is tax revenue. Super indices 0 and 1 refer to pre-reform and post-reform scenarios, respectively.

Tables

Table 1
Allowances versus *equivalent* family tax credits
(Annual euros)

Item	Allowances	*Equivalent family tax credits*
General	3.400	967
Additional for taxpayer > 65 years	800	120, 50
First child	1.400	242,06
Second child	1.500	259,35
Third child	2.200	380,38
Fourth child and subsequent children	2.300	397,67
Ascendant > 65 years	800	90,16
Ascendant > 75 years	1.800	293,02

Table 2
Average elasticities

		Non-compensated	Income	Compensated
Single	Men	0,3078065	-0,0004420	0,3082485
	Women	0,2240269	0,0121900	0,2118369
Married	Men	0,1257485	-0,0078626	0,1336111
	Women	0,4465245	-0,0627656	0,5092901
Total		0,2493289	-0,0129828	0,2623117

Table 3
Effects on income and tax rates

	Pre-reform	Post-reform	Variation
Taxable income*	136,074.4	219,192,3	61,08%
Average effective tax rate	9,77%	9,77%	0,00%
Average weighted marginal tax rate	22,3160%	27,3883%	22,73%

* In millions of euros.

Table 4
Individual welfare and efficiency
(Euros per household per year)

Item	Aggregate total	Population Average	Household average	Average total
Cash gain	-4,9	-0,1	-0,4	11,6
Equivalent Variation	-11.362,8	-400,5	-938,0	-74,1
Deadweight loss change	11.833,5	417,1	976,9	104,9

Table 5
Effects on the equality in distribution of income

Indices	Pre-reform Scenario	Without Behaviour		With behaviour	
		Post-reform	Variation (%)	Post-reform	Variation (%)
Gini for net income	0,33258	0,33134	-0,37313	0,33306	0,14347
Atkinson for net income (0.5)	0,09055	0,08991	-0,70511	0,09080	0,27064
Atkinson for net income (1)	0,19038	0,18941	-0,50768	0,19097	0,30859
Atkinson for net income (1.5)	0,35014	0,34925	-0,25581	0,35072	0,16568

Table 6
Effects on progressivity and redistributive capacity

Indices	Pre-reform	Without Behaviour		With behaviour	
		Post-reform	Variation (%)	Post-reform	Variation (%)
(Reynolds-Smolensky index)	0,03496	0,03620	3,54991	0,03632	3,90786
(Kakwani index)	0,32377	0,33780	4,33258	0,33871	4,61509
Re-ranking effect	7,05424E-05	0,000368045	421,73642	0,000299924	325,16791

Table 7
Revenue-income elasticities for TA and TC systems
Simulation includes labour-supply reactions

Decile	Elasticity	
	TA	TC
1	.	.
2	7.7465	19.6155
3	4.7167	6.0486
4	3.6294	4.3887
5	3.2025	3.9978
6	2.6890	3.0096
7	2.4536	2.6467
8	2.1780	2.4308
9	1.9939	2.0941
10	1.6186	1.6285