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## **The Redistributive Power of the Central Government Budget**

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## THE REDISTRIBUTIVE POWER OF THE CENTRAL GOVERNMENT BUDGET<sup>a</sup>

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**ABSTRACT:** We analyse the redistributive power of the Spanish central government budget to diminish regional disparities in per capita income in the 1991-1996 period. It firstly makes a brief overview of the most relevant empirical studies carried out on this subject, analysing their methodologies and results. Secondly, it estimates the redistributive power of the budgetary policies of the Spanish central government. Its principal interest lies in the fact that the data base used allows the redistributive effect of the main items of revenue and expenditure to be analysed, whereas the majority of studies carried out limit the categories of expenditure to the case of transfers. The results obtained are in line with those from other studies. The redistributive power of the central budget is around 40%, expenditure being much more redistributive than revenue, with the exception of individual income tax.

**RESUM:** Aquest treball analitza el poder redistributiu del pressupost del govern central espanyol per disminuir les disparitats regionals de renda per càpita en el període 1991-1996. Primerament, fa un breu resum dels treballs empírics més rellevants realitzats sobre aquesta temàtica, analitzant la seva metodologia i resultats. Segonament, estima el poder redistributiu de les polítiques pressupostàries del govern central espanyol. El seu principal interès està en el fet de que la base de dades utilitzada permet analitzar l'efecte redistributiu de les principals categories d'ingressos i despeses, a diferència del que fan la majoria d'estudis realitzats que limiten les categories de despesa al cas de les transferències. Els resultats obtinguts estan en la línia dels d'altres estudis. El poder redistributiu del govern central se situa entorn al 40%, essent les despeses molt més redistributives que els ingressos, a excepció de l'impost sobre la renda de les persones físiques.

*Key words:* fiscal flows, regional redistribution

*JEL classification:* E62, H11, H23

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<sup>a</sup> Comments are welcome. The opinions expressed in the paper do not necessarily reflect the IEB's opinions.

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## **1. Introduction**

The purpose of this work is to analyse the redistributive effects that fiscal flows derived from the Spanish central government budget cause at a regional level. As Eichengreen (1993) points out and Bajo and Vegara later take up, starting with the budgetary policies of the public sector, we can distinguish three effects: a) The equalisation or redistributive effect, that takes place because of the fact that in the majority of countries the tax rates are proportional or progressive whereas, at the same time, transfers and other government expenditure are made uniformly. It is, therefore, supposed that regions with lower income levels systematically receive net transfers from the rest of the regions. b) The stabilising effect, that consists in the fact that the tax revenues of the central government decrease and expenditure and transfers increase when all the regions of the State experience a recession simultaneously. c) The insurance effect, that consists in the fact that net transfers from the central government increase when a region experiences a recession that does not affect the rest of the regions.

This study is restricted, therefore, to the equalisation or redistributive effect. The redistributive power of the Spanish central government budget in reducing regional disparities in per capita income is examined. The paper is made up of four sections, this introduction being the first. The second is a brief overview of the empirical work carried out on the subject of this study. In the third section an estimation of the redistributive effects of the budget of the central government of Spain is made, and in the fourth and last section the main conclusions are gathered together.

## **2. Regional redistribution of income through the central government budget. Studies carried out**

The persistence of significant regional disparities in income, as much within the areas of federal as well as those of single-state countries, justifies the need for action by central governments to try to correct or palliate these disparities through their budget. If there have been several works that have approached this subject from a theoretical perspective, there have also been several that

have empirically evaluated the level of regional redistribution carried out by the central governments of various countries (see Table 1).

The pioneer study that approaches this subject is the MacDougall Report (1977), that analyses the ability of the central governments of France, Italy, the United Kingdom, the Federal Republic of Germany, Australia, Canada, Switzerland and the United States, to reduce regional disparities in terms of income. This report used two indicators of redistribution: 'power of redistribution' and the percentage variation in the Gini coefficient of concentration.

The 'power of redistribution' indicates the measure to which regional deviations in initial income are reduced, deviation in income being understood as the difference between the per capita regional index and the national average, which is taken as 100. Initial income is understood as that existing before action by the public sector, and final income the result after that action. The calculation of the 'power of redistribution' is carried out in two phases. In the first phase, the elasticity-income of the regional public revenues or expenditure is determined. These coefficients of elasticity are obtained through a regression where the taxes and expenditure related to the various regions are the dependent variables and the initial income is the independent variable<sup>1</sup>. All the variables are expressed as an index in relation to the average. So the equations to be estimated are of the type:

$$\left(\frac{I_i}{I}\right) = a_i + b_i \left(\frac{Y_i}{Y}\right) + e_i \quad (1)$$

$$\left(\frac{G_i}{G}\right) = a_i + b_i \left(\frac{Y_i}{Y}\right) + e_i \quad (2)$$

where,

$I_i$  are the central government taxes levied on the citizens of the region in per capita terms.

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<sup>1</sup> This definition of elasticity does not correspond fully with the more classical definition, that requires a log-lineal regression to be made between the two variables. Nevertheless, the results obtained in the two cases only differ minimally. The coefficients of elasticity estimated by the MacDougall Report are obtained under the constraint that the regression line passes through the point (100, 100), that is, the national average.

I is the average of central government taxes.

$G_1$  is the expenditure of the central government in the region in per capita terms.

G is the average of central government expenditure.

$Y_1$  is the initial income of the region in per capita terms.

Y is the national average initial income.

The elasticity thus obtained corresponds to the slope of the line of the regression. If this slope is equal to 1, the tax or expenditure is neutral, which means that it varies from one region to another in the same proportion as initial income. A tax in which the elasticity is above one is progressive, while on the other hand, expenditure for which the elasticity is above one is regressive.

The second phase of the calculation of the 'power of redistribution' consists in multiplying the deviation of the elasticity coefficient with respect to the neutral value (that is, one) by the expression of the taxes or expenditure in percentages of initial income, as follows:

In the case of income:

$$(\text{Elasticity-income of } I_h - 1) \quad \% \quad \frac{I_h}{\text{InitialIncome}}$$

In the case of expenditure:

$$(1 - \text{Elasticity-income of } G_h) \quad \% \quad \frac{G_h}{\text{InitialIncome}}$$

where,

$I_h$  is the category of income h.

$G_h$  is the category of expenditure h.

The second indicator that the MacDougall Report uses is the variation of the Gini coefficient. With this coefficient the degree of regional inequality in personal income is obtained, before all redistribution. Afterwards the modified income is calculated, which is nothing more than initial

income, less taxes and plus the expenditure made in each region. Finally, the variation in percentage terms of the Gini index is calculated before and after the public activity considered.

The Report draws three significant conclusions. The first is the affirmation that regional differences in income diminish strongly after the budgetary activity of the central government. In fact, the Report estimates that, on average, public sector activity reduces regional differences by some 40%, the single-state country budgets showing greater redistributive power than those of federal states (46% in relation to 35%)<sup>2</sup>. The second great conclusion is that the redistributive effect of public expenditure is, in general, much greater than that of public revenue. The results obtained state that, on average, the redistribution associated with public revenue is 5%, while that connected with public expenditure reaches 35%. Thirdly, the Report shows the existence of an inverse relation between the sign and the volume of the regional fiscal and trade balances.

These conclusions are contrasted with the case of Spain by Castells et al. (1981). This study estimates that the redistributive power of central government revenue is situated at around 30%, the redistributive power of public expenditure being around 22%, well above that of revenues, estimated at 7%. The period of the study was limited to the year 1975.

After a long interval, various empirical studies appeared with great force in the nineties that, because of the debate generated over whether the European Economic and Monetary Union does or does not fulfil the requirements of an optimum monetary area<sup>3</sup>, took up the analysis of the redistributive and stabilising power of the budgets of central governments. Although it was the

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<sup>2</sup> In fact, the redistributive power of central governments is estimated in the case of Germany to be 29%, Australia 53%, Canada 32%, the United States 28%, and Switzerland 22% (in this case social security is not included). With regard to the single-state countries, the results obtained were in the case of France 54%, Italy 47%, and the United Kingdom 36%.

<sup>3</sup> According to the theory of optimum monetary areas, introduced by Mundell (1961), in order for monetary union to function adequately no significant asymmetric regional disturbances should exist and there should be high mobility of the factors of production. In the event that one of these conditions is not fulfilled, it is necessary that a federal budget exists with sufficient stabilising capacity to confront possible recessions at national as well as regional level.

stabilising and insurance effects on which attention was centred<sup>4</sup>, the equalisation or redistributive effect was present in the majority of the empirical studies due, in part, to the difficulty of clearly separating these three types of effects.

The starting point of the empirical studies carried out in the nineties<sup>5</sup> is the work carried out by Sala-i-Martin and Sachs (1992). These authors grouped the states of the USA into 9 regions of similar size to the countries of Europe and estimated the tax-income and transfers-income elasticity for each of the regions and the period 1970-1988, by a regression similar to that used in the MacDougall Report, although the analysis was made with time series and taking the variables as logarithms. Therefore the regression to be estimated is of the type:

$$\ln \left( \frac{X_i}{X_{US}} \right) = a_i + b_i \ln \left( \frac{Y_i}{Y_{US}} \right) + c M + e_i \quad (3)$$

where,

*i* refers to the regions.

US is the whole of the United States.

X are the taxes<sup>6</sup> (or transfers<sup>7</sup>) of the federation.

Y is the income.

M is a variable of time trends.

All the figures are taken in per capita real terms.

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<sup>4</sup> Authors such as Castells (1988) and Kauffmann and Laval (1999) consider that the insurance function is part of the stabilising function.

<sup>5</sup> A complete collection of these studies can be found in Bajo and Vegara (1999).

<sup>6</sup> Federal taxes include personal income tax, contributions to social security, omitting corporate tax, indirect taxes and taxes on foreign trade.

<sup>7</sup> Only transfers to individuals and grants to states and local governments are considered as public expenditure.

Continuing from this the insurance effect of the federal budget in correcting regional asymmetric disturbances is calculated as follows:

$$\text{Tax insurance effect} = \hat{b}_t \frac{X_t}{Y}$$

$$\text{Transfer insurance effect} = \hat{b}_g \frac{X_g}{Y}$$

where,

$\hat{b}_t$  is the income-elasticity of the taxes.

$\hat{b}_g$  is the income-elasticity of the transfers.

$X_t$  are the taxes collected.

$X_g$  are the transfers.

The previous estimation allows it to be concluded that, in average terms, when a region experiences an asymmetrical disturbance, its payments with regard to federal taxes are reduced by between 33 and 37 cents per dollar, while transfers increase by between 1 and 8 cents per dollar.

Von Hagen (1992) criticised the methodology used by Sala-i-Martin and Sachs (1992), based on estimations in levels, and argued that this methodology did not differentiate the insurance and redistributive effects. Von Hagen (1992) carried out an estimation of the income elasticity of taxes and transfers for the period 1981-1986 of the American federal government for the states of the union through a model in 'changes', carrying out a regression for each year. According to this author, the estimations in levels permit an idea to be obtained of how the American federal system treats differences in real levels of income, but not of their variations in time. For this reason the estimation of Sala-i-Martin and Sachs refers to the redistributive effect and not the insurance effect.

To overcome this restriction, Von Hagen put forward a regression of the type:

$$\Delta \ln (X_i) = a_{it} + b_i \Delta \ln (Y_i) + u_i \quad (4)$$

where,

$X_i$  are the taxes (or transfers) of the federal body in each region, in per capita terms.

$Y_i$  is the regional per capita income.

$a_{it}$  is the constant term variable each year.

$u_i$  is the random disturbance.

The results obtained by Von Hagen are much more limiting. In fact, the author estimates that the capacity of the federal budget to absorb asymmetrical disturbances is located at some 10 cents per dollar<sup>8</sup>. A possible explanation of such a low result could be the fact that Von Hagen only analysed personal income tax when dealing with federal taxes.

Goodhart and Smith (1993) have repeated the focus of these two studies for the United States, Canada and Great Britain, without obtaining significant differences between their estimations in levels and in 'changes'. The results obtained in levels in the case of the United States are closer to those obtained by Von Hagen. The authors find that an increase of one dollar in the GDP of a region means an increase of 13 cents in the federal income taxes collected and very few variations in the level of federal expenditure. As far as the insurance capacity of the tax is concerned, it is around 13%<sup>9</sup>. In the case of Canada, the insurance capacity of federal taxes as a whole is 15%, while transfers to families or the total transfers do not show any considerable insurance effects. As for the United Kingdom, this study only analyses income tax, obtaining an insurance capacity of 21%.

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<sup>8</sup> Nevertheless, the fact that the variables are not relative to the national total could suggest that the elasticity calculated gather both the insurance and the stabilising effect together.

<sup>9</sup> Goodhart and Smith (1993) recognise that the differences between the results of their study and those of Sala-i-Martin and Sachs could be due, in part, to the fact that the latter use a much broader variable when considering taxes, whilst they only use personal income tax.

Another type of estimation is that realised by departing from a macroeconomic model at a regional level in which the effects of a disturbance are simulated. This procedure has been followed to analyse the cases of the United States, Germany and France. The redistributive power of the central government budget is estimated at some 17% in the case of the United States, 37.4% in France and between 33.5% and 42% in Germany (Pisani-Ferry, Italianer and Lescure (1993)).

Of more relevance for our study is the work carried out by Bayoumi and Masson (1995) on the United States<sup>10</sup> and Canada<sup>11</sup>, in which it was attempted to clearly separate the redistributive and the stabilising effects. The contrasting of the redistributive effect was done through the use of a cross-section regression in which the relation between personal income before and after the effects of the fiscal flows of the federal government was estimated, through Ordinary Least Squares, taking the variables in terms of averages for the period 1969-1998 in the case of the United States and for the period 1965-1988 in that of Canada. More precisely, the authors estimated a regression of the following type:

$$(Y - TAX + TRAN)_i / (Y - TAX + TRAN)_s = a + b Y_i / Y_s + e_i \quad (5)$$

where,

$i$  refers to regional values (states in the case of the United States and provinces in that of Canada).  
 $s$  refers to the national average.

$Y$  is the per capita income before public sector activity.

$TAX$  are taxes paid per capita.

$TRANS$  are transfers (expenditure) of the federal government in per capita terms.

The difference between the coefficient 'b' and one represents the amount of redistribution caused by fiscal flows.

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<sup>10</sup> Where a sample made up of 48 states was analysed.

<sup>11</sup> With a sample of 10 provinces.

More precisely, the authors analyse the redistributive effects of various categories of fiscal flows in an accumulative way making four different regressions for initial income (Y), for which they estimate the following four equations:

$$(Y - TAX)_i / (Y - TAX)_s = a + b Y_i / Y_s + e_i \quad (6)$$

$$(Y - TAX + TRAN_1)_i / (Y - TAX + TRAN_1)_s = a + b Y_i / Y_s + e_i \quad (7)$$

$$(Y - TAX + TRAN_2)_i / (Y - TAX + TRAN_2)_s = a + b Y_i / Y_s + e_i \quad (8)$$

$$(Y - TAX + TRAN_3)_i / (Y - TAX + TRAN_3)_s = a + b Y_i / Y_s + e_i \quad (9)$$

where,

TRAN<sub>1</sub> are transfers proceeding from social security.

TRAN<sub>2</sub> are transfers proceeding from social security and those of a personal nature.

TRAN<sub>3</sub> are transfers proceeding from social security, those of a personal nature, and grants to sub-central governments.

The results obtained through the equation (9) show the Canadian federal budget has a redistributive capacity of 39%, which means that it is almost double that of the United States, which is estimated at 22%. This significant difference is fundamentally due to federal transfers to provincial and local governments, as while in Canada the redistributive power of this category of expenditure is 22%, in the United States it is only 4%. Obviously, these estimations explain the redistributive component that permeates the sub-central system of finance in Canada through equalisation grants. As for the rest of the sections outlined, the difference in redistributive power of federal taxes in one and the other country should be pointed out. Whilst in Canada they only redistribute 2%, in the United States this percentage is around 7%.

To analyse the stabilisation effect, Bayoumi and Masson estimated the same equation, but through an estimation in 'changes' for a series of years.

This same study has been reproduced for the cases of the United States, Canada, the United Kingdom and France by Mélitz and Zumer (1998) applying, as well as the cross-section

regression, an econometric estimation by panel to estimate the equation (8) proposed by Bayoumi and Masson. The estimations obtained through the panel econometric technique show that redistribution is substantially more significant in France and in the United Kingdom than in the United States and Canada. In France, net transfers (revenue less public expenditure) proceeding from the central government reduce 38% of the regional disparities in income, 26% in the United Kingdom and around 18% and 16% in Canada and the United States respectively<sup>12</sup>.

Duboz and Nicot (1998) also apply the methodology proposed by Bayoumi and Masson to the case of Germany with the purpose of analysing the measure to which the federal budget has changed its degree of regional redistribution after unification. For this purpose the authors estimate the relation existing between the regional income before central government activity and the resulting income after its activity year after year for the period 1984-1995. The results obtained show that the power of redistribution of the federal budget is around 40%, and that this percentage has remained practically unchanged after the unification process in 1991.

Another alternative way to quantify the regional redistributive capacity of the public sector is that carried out by Castells (1998). The author analysed the relation existing between the regional fiscal balance and the relative situation of a region in terms of GDP in the cases of Spain, France, Italy, Portugal, the Federal Republic of Germany, the United Kingdom, Sweden, these countries as a whole, and the European Union. In they latter case the redistributive power of the European Union budget between the various countries of which it is composed was analysed.

More precisely, Castells estimated the following equation by Ordinary Least Squares on a cross-section sample.

$$SF_i = a + b Y_i + e_i \quad (10)$$

where,

$SF_i$  is the regional fiscal balance with the central public sector (public expenditure - public revenue) expressed as  $(1 + SF_i / Y_i)$  to avoid negative values.

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<sup>12</sup> The cross-section estimations produce almost identical results.

$Y_i$  is the regional GDP per capita expressed as an index of the average for the corresponding geographical area.

The results obtained through lineal and logarithmic regressions reveal the existence of a negative relation between the fiscal balance and the per capita GDP of the various regions. This relation is highly significant in all cases and the correlation coefficients obtained are high. The regression coefficients obtained for the countries where all the central public sector budget<sup>13</sup> was considered are similar. In the logarithmic regression, where this coefficient represents elasticity, its value was located between -0.42 and -0.48. This means that an increase in per capita regional GDP (expressed as an index in relation to the average for the country) of 10% would be accompanied by a worsening of the fiscal balance over GDP of around 4.5%.

Castells also related, through lineal and logarithmic regressions, the final per capita income of each region, understood as initial income plus the regional fiscal balance with the central public administration, with the initial per capita income. Both variables are expressed as an index in relation to the average. The estimations thus obtained corroborate the results previously obtained. The initial income-final income elasticity estimated is situated between 0.52 and 0.58 in the countries where the social security is included and, on average, the redistributive power of the central governments analysed is in the order of 45%.

Domenech, Maudes and Varela (1999) carried out an analysis similar to that made by Sala-i-Martin and Sachs and Von Hagen to estimate the redistributive effects of the European Union budget between member countries during the 1986-1997 period. More exactly, these authors estimated the elasticity of different categories of community expenditure and revenue in relation to the income of the member countries through a logarithmic regression. The estimation was carried out on a pool of data where temporal dummy variables were included with the purpose of simultaneously analysing how changes affect each region each year.

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<sup>13</sup> That is all the countries of the sample except for France and Germany, where social security was not included.

The results obtained showed that the redistributive impact of the fiscal flows between the member countries generated by the European Union budget was considerable, particularly given the small size of this budget, and that this redistributive effect has tended to increase over time, due basically to the effects of the structural and cohesion funds. The elasticity of per capita community expenditure estimated in ecus in relation to per capita income is -0.23, which means a certain degree of progressiveness, whereas revenues behave proportionally as the value of the coefficient is very close to one.

### **3. Regional redistribution of income by the central government budget. Application to the case of Spain**

#### **3.1. Methodology**

The methodology employed in analysing the redistributive effects of the budget of the central public administration is based on that used in the studies of Bayoumi and Masson (1995), Mélitz and Zumer (1998) and Duboz and Nicot (1998). It consists in estimating the following equation through cross-section regressions:

$$\frac{YF_i}{YF_m} = a + b \frac{Y_i}{Y_m} + e_i \quad (11)$$

where:

i is each of the different regions.

m is the average for the regions as a whole.

Y is the initial income, equivalent to income existing before the activity of the public sector. As initial income, the Gross Added Value (GAV) at factor cost has been used, it being the most primary magnitude of income there is.

YF is the final income, equal to the initial income (Y) modified by the activity of the public sector. To obtain the final income, revenue obtained by the public sector is subtracted from the initial income and public expenditure is added.

The variables Y and YF are expressed in per capita terms and their values are the average for the period considered, 1991-1996. The calculation of the averages was made in constant 1996 pesetas in order to correct the effect of inflation.

The estimated value for the coefficient 'b' indicates the relation between the final income (YF) and the initial income (Y) and it is interpreted in redistributive terms. So, for example, if its value is 0.70, this indicates that 70% of the interregional differences in the level of initial per capita income remain after public sector activity, and that this reduces 30% of every peseta of difference between the regions. Therefore (1-b) represents the amount of income redistribution caused by fiscal flows.

The estimation of equation (11) was carried out departing from various calculations of the final income. They were the following:

- $YF = Y + \text{Regional Fiscal Balance with the Central Public Administration}$ . In this case, the value of (1-b) indicates the total redistributive power of the Central Public Administration.
- $YF = Y - \text{Public Revenue}$  (distinguishing between the various typologies of revenues). The value (1-b) shows the redistributive power of public revenue as a whole and its different categories.
- $YF = Y + \text{Public Expenditure}$  (also distinguishing the larger categories of public expenditure). The value (1-b) indicates the redistribution derived from total public expenditure and from its main categories.

A methodological limitation of this analysis is that the magnitude of the initial income that is used (GAV) includes the remuneration of the personnel of the public administration. Therefore it is not possible to state that this indicator represents income before all action by the public sector.

Nevertheless, to obtain an indicator of income more initial than this would be extremely problematic.

Finally, it should be pointed out that the contribution of this analysis in relation to the studies reviewed in the previous section consists in estimating the redistributive power of all the larger categories of public expenditure, as it has territorially differentiated information available for all of them. In contrast, the empirical studies mentioned are limited to expenditure on transfers, either to individuals or sub-central governments.

### **3.2 Characteristics of the data base**

The data relating to public revenue and expenditure, as well as fiscal balances, used in this study have been taken from a previous study, carried out by the authors, in which fiscal flows derived from the activity of the Central Public Administration in the various Autonomous Communities or regions in the 1991-1996 period were quantified<sup>14</sup>.

In the study mentioned, the territorial data for income and expenditure are a result of an estimation of the territorial incidence of resources and expenditure of the Central Public Administration. Specifically, the State, the Central Administration Organisations<sup>15</sup> and the Administration of the Social Security form part of the Central Public Administration.

The revenue are assigned territorially using relatively accepted existing methodology consisting in adopting the hypotheses of tax incidence most suitable for each of the types of revenue and then distributing the total between the various territories in accordance with the most appropriate

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<sup>14</sup> Castells, A., Barberán, R., Bosch, N., Espasa, M., Rodrigo, F. and Ruiz-Huerta, J. (2000): Las balanzas fiscales de las Comunidades Autónomas. Análisis de los flujos fiscales de las Comunidades Autónomas con la Administración Central (1991-1996), (The fiscal balances of the Autonomous Communities. Analysis of the fiscal flows between the Autonomous Communities and the Central Administration (1991-1996)), Ariel Economía & Fundació Carles Pi i Sunyer d'Estudis Autònomic i Locals, Barcelona.

<sup>15</sup> The Organisations of the Central Administration are made up of all the autonomous and assimilated organisations that carry out administrative functions and depend upon the State. More exactly, all the Autonomous Administrative Organisations, those Autonomous Commercial Organisations that are,

statistical indicators for those hypotheses of incidence. This procedure is necessary due to the possibility of ‘shifting’ the tax burden between individuals, which means that the collection of taxes in a certain area does not necessarily correspond to the taxes paid by its residents.

The hypotheses of incidence of the tax burden established to assign the revenue of the Central Public Administration territorially are those commonly used in the majority of theoretical and empirical studies. So it is supposed that indirect taxes on consumption are passed through prices to the final consumer, and therefore it will be them that support the tax burden. In personal taxes it is supposed that transmission of the tax burden does not exist, for which reason these taxes fall, basically, on the legally liable taxpayers. As far as business taxation is concerned, the uncertainty of their final incidence leads to the formulation of alternative hypotheses, it being considered that these can be passed to the factors of production, in the form of lower factor payments, and also towards consumers in the form of higher prices.

The territorial assignation of the expenditure showed itself to be much more complex as all public expenditure, in as far as it is directed towards the production of services for their public provision, produces two types of different effects. On the one hand, public expenditure finances services that are provided to consumers without compensation and, on the other hand, it makes payments to acquire the resources necessary (labour, supplies, equipment, installations, etc.) to produce these public services. The first is a unilateral effect, without compensation, typical of the public sector. The second is a bilateral effect, with compensation, as the recipients of the payments always deliver something in exchange.

Consequently, studies of territorial aspects of expenditure can be focused upon taking the geographical location of the expenditure as a reference or the place of residence of the individuals that benefit from the service provided. The first one is the so called flow approach, and the second one is the determining benefit approach.

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because of their budgetary structure and their activity, much closer to the public sector than the private, some public bodies, and Universities with state-wide responsibilities.

The usual practice in the territorial assignation of expenditure according to the flow approach consists in attributing the public expenditure to the region in which the expenditure materialises, that is where the personnel, the use of current goods and services, the receipt of the transfers and the investments are located. This was the criteria adopted, which means that we gave the flow approach a sense of 'reality' as against the alternative of giving it a sense of 'cash flows', which would lead us to attribute the public expenditure to the region in which the Administration makes payment. In the case of remuneration of personnel the two versions of the flow approach practically coincide. But the results could be very different in the other sections of the budget. Consequently the purchase of current goods and services are ascribed to the region in which they are used and not in the region where they are acquired, investments in the region where they materialise, and transfers in the region where their final recipients reside.

The territorial assignation of public expenditure following the previous approach can be relatively easy or direct in as far as there is a system of accounting that allows all categories of expenditure to be regionalised. If not, it is necessary to establish hypotheses about the territory where this expenditure is made.

According to the benefit approach, the assignation of the expenditure is made to the community where the beneficiary resides, independently of where the public service is produced or the investment is made. In this case, it is also necessary to establish hypotheses about the situation of the beneficiaries and about the quantification of the benefits that the goods and services provide to the beneficiaries.

The territorial assignation of expenditure can differ considerably according to one or another approach, especially in those pure public goods or services of a national scope, that is those that have an indivisible character and produce external effects that reach the population as a whole, such as defence, justice, foreign affairs, public order, public health, basic research and general administration. In this case, the most used statistical indicator in carrying out territorial assignation according to the benefit approach is the population of each region, given that the provision of these goods benefits all citizens. On the other hand, according to the flow approach,

this expenditure is attributed to the region in which it materialises. Madrid is the area that gathers the greater part of this type of expenditure because it is the capital.

When dealing with public goods of local scope, that is expenditure that produces benefits that extend to the local or regional environment in which they are provided (e.g. cultural and sporting facilities, urban and transport infrastructures), the territorial assignation of public expenditure according to the benefit approach attributes, to a large extent, in relation to the pattern resulting from their distribution according to the flow approach, as it is considered that the citizens resident in the region where the facilities or infrastructures are located are those that have greater access to them and, therefore, greater possibility of enjoying them. Nevertheless, in all these types of expenditure, the possible spillover effects generated by the rest of the regions are considered.

As far as that public expenditure with rival and excludability characteristics, the assignation of the expenditure according to one or another approach greatly coincides. Within this category of expenditure can be found the payments of the Social Security to individuals and grants to sub-central governments.

Finally, the regional distribution of public expenditure that finances the provision of semi-private goods, such as education, health, and applied research, is distributed according to the benefit approach partly following the pattern resulting from the flow approach and partly in relation to the external effects that the provision of these goods generates.

It was considered to be advantageous in this study to carry out the redistributive analysis of public expenditure differentiating these two approaches of its territorial assignation with the purpose of bringing into contrast the redistributive implications that the use of one or another can contain. In spite of this we are aware that from the perspective of the redistributive effect of fiscal flows the most suitable focus is that of the benefit approach, whilst the flow approach is better adapted to the insurance effect.

### 3.3. Estimation and results

#### 3.3.1. Global redistributive power of the Central Public Administration

Equation (11) was estimated calculating the final income as that resulting from of the global activity of the public sector, that is:

$$YF = Y + \text{Regional Fiscal Balance}$$

The regional fiscal balance was obtained from the difference between the expenditure made (entry of resources) and the income obtained (exit of resources) by the Central Public Administration in each of the regions. Therefore, the fiscal balance gathers the territorial effects of the global activity of the public sector.

Table 2a shows the results of the estimation using the two approaches of territorial assignation of public expenditure and from all the regions covered by the Spanish State (the 17 Autonomous Communities together with the autonomous cities of Ceuta and Melilla, both being dealt with together). The coefficient 'b' almost presents the same value in both cases: 0.6432 when we calculate the fiscal balance according to the flow approach and 0.6461 when we calculate according to the benefit approach. As a consequence, the fiscal flows derived from the activity of the Spanish Central Public Administration reduce the interregional differences existing in the level of initial income per inhabitant by 35%-36%

With regard to the estimated value of the coefficient 'b' from the two approaches of territorial assignation of expenditure, because of the characteristics of each this should be smaller in the case of the benefit approach. Nevertheless, the estimated value is almost the same in both cases. This is due to the effect of Ceuta and Melilla that present a fiscal balance that is much higher from the flow approach (410,482 pesetas/inhabitant on average in the 1991-1996 period) than

from the benefit approach (197,428 pesetas/inhabitant)<sup>16</sup>. If these territories are excluded from the estimation, the coefficient 'b' adopts more differentiated values when dealing with one or the other approach of territorial assignation of expenditure: 0.6845 from the flow approach and 0.6542 from the benefit approach (Table 2b). It can therefore be seen that the redistributive power of the public sector is higher when we assign the expenditure territorially according to the benefit approach.

Finally, the global redistributive power of the public sector has also been estimated excluding the 'foral' Autonomous Communities or regions, as well as the autonomous cities of Ceuta and Melilla, because of their particular system of finance<sup>17</sup>. Taking only the 15 Autonomous Communities under the common system into account the redistributive power of the Central Public Administration increases, as well as the difference in the value of the coefficient 'b' obtained according to one or another approach of territorial assignation of public expenditure. The value for 'b' is now 0.6756 according to the flow approach and 0.6187 according to that of benefit approach, which means a redistributive capacity of the Central Public Administration that oscillates between 32.44% and 38.13% (Table 2c).

### **3.3.2. The redistributive power of public revenue**

The estimations in Table 3 calculate the redistributive effect of public revenue as a whole, and the various typologies of tax individually. Therefore, the final income is determined as follows:

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<sup>16</sup> Significant military expenditure is made in these territories. From the flow approach all this expenditure is assigned to them. Alternatively, in the case of the benefit approach, expenditure on defence is territorially assigned according to population. This means that the fiscal balance is greater in the case of the flow approach focus than in that of benefit approach.

<sup>17</sup>The 'foral' system is applicable to the regions (Basque Country and Navarra) which have historical charters on fiscal and economic matters ('fueros' or privileges). The 'foral' system is based on the transfer of revenue and the management of State taxes to these regions, as well as certain regulatory powers with regard to these State taxes. An annual quota is paid by these regions to the central government for the financing of general obligations of the State. In principle, the 'foral' system of finance should not influence the size of the regional fiscal balance, in as far as the contribution of these territories to the central government through their quota compensates for the reduced taxation powers of the State in these territories. Nevertheless, if this contribution is undervalued the magnitude and sign of the balance could be affected.

$$YF = Y - \text{Public Revenue}$$

Nevertheless, it has not been possible to do the estimations including all the regions of the State of Spain, due to the particular fiscal agreements that some of them have: the Basque Country and Navarre, due to their 'foral' nature, and the Canary Islands, Ceuta and Melilla because of their especial indirect taxation system. In fact we decided to exclude the Basque Country, Navarre, Ceuta and Melilla from all the estimations, and the Canary Islands when we estimate the redistributive effect of indirect taxes and total revenue.

The redistributive effect of total revenue<sup>18</sup> is very small, the value of 'b' is 0.9739 and, therefore, its redistributive power is 2.61%. Distinguishing between types of taxes, it can be said that direct taxes<sup>19</sup> have the greatest redistributive power (6%) (b=0.9400), mainly personal income tax (13.56%). On the other hand, the indirect taxes<sup>20</sup> as a whole do not reduce interregional differences in income, but rather their effect is in the opposite direction as they present a value above one for the coefficient 'b' (1.0275). Nevertheless, in the case of VAT, the coefficient 'b' has a value of 0.9271, and therefore the tax presents a redistributive power of 7.29%. Social contributions<sup>21</sup> to the Social Security, the same as with indirect taxes as a whole, present a value above one for the coefficient 'b' (1.0166), and as a consequence are without a redistributive effect favourable to the reduction of inter-territorial differences in income. Therefore, although direct taxes have redistributive capacity, the weight of indirect taxes and social contributions mean that when the redistributive power of the totality of public revenue is analysed, it is small.

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<sup>18</sup> The revenue considered is the whole of direct, indirect taxes, social security contributions, some fees and current as well as capital transfers that proceed from the rest of the public administrations or the private sector. Excluded therefore are financial revenue, property income and transfers made between various agents for reasons of consolidation.

<sup>19</sup> As well as personal income tax, the direct taxes include corporate tax, property tax and inheritance and gift tax. The latter two are of a very residual nature.

<sup>20</sup> The indirect taxes considered are VAT, excise taxes, taxes on foreign trade, taxes on wealth transfers and stamp duties, and rates imposed on sugar and isoglucose.

<sup>21</sup> This includes the Social Security contributions of employers, salaried workers, of the self-employed, the unemployed and the State.

### 3.3.3. The redistributive power of public expenditure

Tables 4 and 5 show the redistributive power of the whole of public expenditure and its main categories, using the flow approach and the benefit approach respectively. In their calculation, the estimation of equation (11) was carried out obtaining the final income as follows:

$$YF = Y + \text{Public expenditure}$$

Similarly, the estimation was made for the whole of the Autonomous Communities in the common system. The 'foral' systems were excluded, as their particular system of finance affects the level of direct expenditure that the State makes in these territories<sup>22</sup>. The autonomous cities of Ceuta and Melilla were excluded as they present a quite different structure of expenditure from the rest of the regions.

The redistributive power of the total expenditure<sup>23</sup> of the Central Public Administration is 22.34% ( $b=0.7766$ ) when it is assigned territorially according to the flow approach, and 26.63% ( $b=0.7337$ ) when this is done according to the benefit approach.

If we distinguish between the larger categories of expenditure, the values of the coefficient 'b' do not vary much between one or another approach of the territorial assignment of expenditure, with the exception of expenditure on pure public goods. This is due to the fact that for the majority of the categories of expenditure analysed, the assignation criteria do not differ between the two approaches by very much, as was shown in the previous section.

The expenditure with the greatest redistributive capacity (around 10%) is that made on Social Security (payments to individuals made by the Administrative Organisations of the Social

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<sup>22</sup> More precisely, because of the different system of financing the health service.

<sup>23</sup> The public expenditure considered is the expenditure to produce goods and services not for sale and for the redistribution of wealth or income, remaining outside the area of the study financial costs, and those deriving from interest payments, the consumption of fixed capital and consolidation transfers.

Security system<sup>24</sup> and the National Employment Services, INEM) and expenditure with regard to grants to sub-central governments. Due to the varying ceiling on responsibilities existing between the Autonomous Communities under Article 151 and those under Article 143 of the Constitution<sup>25</sup>, in order to obtain the redistributive effect of the sub-central grants we have had to group the expenditure in this area together with that on education, as the first to exercise this responsibility included the resources necessary to finance it within the grants received from the State. The redistributive power of this group of expenditure is 10%. Nevertheless, to also obtain the redistributive power of expenditure on education individually, we have made an analysis grouping only those Autonomous Communities under Article 143 (Table 6), as it is the part of the State territory where the State provides this service directly. The redistributive capacity of expenditure on education is around 4%. Similarly, grants to the sub-central governments of the Autonomous Communities under Article 143 have a redistributive power of 7% (Table 6). On the other hand, grants to sub-central governments of the Autonomous Communities under Article 151, that include resources for the financing of education decentralised to these regions, has a greater redistributive capacity, 10% (Table 7), equal to that obtained when carrying out the analysis for the whole of the Autonomous Communities under the common system grouping together expenditure on education and grants.

Of the other categories of expenditure analysed, those that stand out because of their redistributive effects are expenditure on health services and on pure public goods, that bring together the expenditure on general services of the Public Administration<sup>26</sup>, the defence services

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<sup>24</sup> Among which are expenditure on pensions, benefits for temporary disability and other economic benefits, and the administration and general services of these economic benefits.

<sup>25</sup> Regarding the responsibilities assigned to the Autonomous Communities, we should distinguish between two types of Communities, depending on the access route taken towards autonomy, which may be either the route indicated by Article 143 of the Constitution or Article 151. The fundamental difference between them, as far as the level of responsibilities and expenditure is concerned, is that route provided by Article 143 involves access to common responsibilities only, and excludes two fundamental functions, i.e. health and education, which account for a large volume of expenditure.

<sup>26</sup> Within this group of functions there are four large blocks of programmes: those corresponding to higher executive, legislative and judicial bodies, those connected with economic and budgetary policy, those related to foreign affairs and those related to the organisations of the judiciary, as well as the Central Administration, that carry out activities that could fall within these blocks of programmes.

and the public order and security services. The redistributive power of the first is 5%. In the case of the second it is necessary to distinguish between the two approaches of the territorial assignation of expenditure, as the results are clearly different. Using the flow approach, the value of the coefficient 'b' is 1.0165, therefore it does not contribute to the reduction of territorial differences in per capita income, its effect is rather more the opposite. On the other hand, the expenditure on pure public goods, if territorially assigned according to the benefit approach, has a redistributive power of 4% (0.9630).

Finally, the analysis made found no redistributive capacity for expenditure on housing or culture, as the values of the coefficient b are around one, nor for expenditure on infrastructures under the benefit approach. The latter, on the other hand, has a slight redistributive effect (2%) when its territorial assignation is made according to the flow approach.

#### **4. Conclusions**

In this study the power of the Spanish Central Public Administration to diminish territorial disparities in per capita income between the various Spanish regions through budget policy has been analysed. For this purpose the relation present between initial income, understood as that existing before the activity of the public sector, and the final income, understood as that resulting after the activity of the public sector through its revenue and expenditure policies, was determined by the use of a lineal regression.

The work of MacDougall (1977) was pioneer in this type of analysis and has been followed in a series of contributions, especially from the nineties onwards, that have been outlined in this study. The methodology used for the analysis carried out here is based, therefore, on that frequently used in the contributions mentioned.

From the estimations realised the global distributive power of the Central Public Administration is obtained. This, resulting from its activity in the whole of revenue as well as expenditure policies, is 36%. This means that 64% of the interregional differences in per capita income

remain after the activity of the public sector, and they are reduced by 36%. If this same analysis is carried out for the group of the Autonomous Communities under the common system only, excluding the 'foral' systems and the autonomous cities of Ceuta and Melilla, the redistributive power oscillates between 32% and 38%, according to whether the territorial assignation of expenditure is done under the flow approach or the benefit approach. The first approach assigns the expenditure to the region where the expenditure materialises, the second to the region where the beneficiary is located.

As regards taxes, the results show that the most redistributive are direct taxes, with a capacity of 6%, and especially personal income tax (13.56%). On the other hand, the redistributive power of social contributions and indirect taxes is null, even though when VAT is analysed separately it presents a redistributive effect of 7.29%. All in all, the redistributive power of the whole of revenues is low, at 2.61%, due to the fact that the effects of indirect taxes and the social contributions compensate for that of direct taxes.

The results show that public expenditure as a whole has much more redistributive power than revenues, with values that oscillate between 22.34% and 26.63% according to whether we adopt the flow approach or the benefit approach for the territorial assignation of expenditure. The redistributive capacity of the main categories is as follows: social security (10%), grants to sub-central governments in Autonomous Communities under Article 151 (10%), grants to sub-central governments in Autonomous Communities under Article 143 (7%), health services (5%), education (4%), pure public goods (4%), infrastructures (2%). On the other hand expenditure on housing and culture has no redistributive power.

The results obtained do not differ to any great extent from those obtained in preceding work carried out for other periods and in other countries. Two broad conclusions may be arrived at. The first is that the redistributive power of the central government budget is considerable (around 40%). The second is that the redistributive capacity of public expenditure is much greater than that of revenues, even though that of personal income tax is considerable. Redistribution through expenditure is achieved fundamentally through social security payments and transfers to sub-central governments.

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**Table 1: Empirical studies on the level of regional redistribution of budgetary policies of central governments**

AUTHOR	SAMPLE	METHOD	RESULTS
MacDougall (1977)	Germany (figures for 1970 and 1973) Switzerland (1967) Australia (figures for 1971-72 and 1973-74) Canada (figures for 1969, 1973, and 1973-74) USA (Average 1969-71, 1972 and 1974) France (figures for 1969 and 1970) Italy (1973) United Kingdom (1964)	The 'redistributive power' is measured from the estimation of the coefficients of elasticity of the regional public revenues and expenditure in relation to the initial income, understood as that existing before action by the public sector. These coefficients are obtained by a regression calculus where the revenues and expenditure are the dependent variables and the initial income is the independent variable. All the figures are in per capita terms. The redistributive power is calculated by multiplying the deviation of the coefficient of elasticity with respect to one by the percentage of initial income that taxes or expenditure represent. The GINI coefficient of variation is also used.	On average, the redistributive power of the public sector is estimated as 40%, the redistributive effect of public expenditure being 35% while that associated with revenue is only 5%.
Castells et al. (1981)	Spain (1975)	As for MacDougall (1977)	The redistributive power of the central Government is around 30%, the redistributive power of expenditure being 22% and that of revenue 7%.
Sala-i-Martin and Sachs (1992)	United States (grouping the American States into 9 large regions) (1970-88 period)	The taxation-income and transfer-income elasticities are estimated for each of the regions, using logarithms. That is an regression equation is made in which the dependent variable is the percentage of regional revenue or expenditure with respect to the national total and the independent variable is the percentage of initial income in relation to the national income. All the variables are in per capita terms. The insurance effect is calculated from the income elasticity.	The insurance power of the Federal Government of the United States is around 40%. Taxes present the greatest power, being estimated at 33%-37%, whilst that of public expenditure is on average 1%-8%.
Von Hagen (1992)	United States (51 states) (1981-86 period)	The same model as that of Sala-i-Martin and Sachs is estimated, but in 'changes' and making a regression not for every region but for every year. The variables for public revenue and expenditure as well as for income are not relative to the national total. They only considered personal income tax as federal tax.	The stabilising-insurance effect of the federal fiscal system of the United States is estimated to be 10%.
Goodhar and Smith (1993)	United States (44 states) (1981-86) Canada (11 provinces) (1965-88) United Kingdom (11 regions) (1983-87)	Repeats the focus of the work of Sala-i-Martin and Sachs and that of Von Hagen, but in these three countries. The estimations are made in levels and in 'changes'. As regards public revenue, in the case of the United States and the United Kingdom only personal income tax is considered.	In the United States personal income tax has an insurance power of 13%, whilst in the United Kingdom it is 21%. In Canada, the insurance effects of federal taxes as a whole reaches 15%. The transfers analysed, in the case of the United States as well as Canada, do not present considerable insurance effects.
Pisani-Ferry, Italianer and Lescure (1993)	United States Germany France	Estimation of a regional macroeconomic model.	The insurance power of the central government budget is estimated as 17% in the case of the United States, at 37% in France and at 38% in Germany.

Cont. Table 1

AUTHOR	SAMPLE	METHOD	RESULTS
Bayoumi and Masson (1993)	United States (48 states) (1969-86) Canada (10 provinces) (1965-88)	Outline the redistributive function of central government through a cross-section regression in which the relation between personal income before (independent variable) and after public sector activity (dependent variable) is estimated. These variables are taken in average terms for the period, per capita and related to the national average.	The federal budget of Canada has a redistributive power of 39%, whilst that of the United States is 22%.
Mélitz and Zummer (1998)	United States (48 states) (1960-94) Canada (10 provinces) (1965-88) France (21 regions) (1973-89) United Kingdom (12 regions) (1971-93)	Repeats the work of Bayoumi and Masson, but as well as the cross-section analysis carry out a panel econometric analysis.	The redistributive power of the central government is substantially more significant in France (38%) and the United Kingdom (26%) than in the United States (16%) and Canada (18%).
Duboz and Nicot (1998)	Germany (1984-95) 1984-90 for the 11 länder) (1991-95 for the 11 and the 16 länder)	Apply the method proposed by Bayoumi and Masson, estimating the relation that there is between the regional income before the activity of the central government and the income resulting after its activity, year after year.	The degree of redistribution carried out by the federal government is in the order of 40%. This level of redistribution remained practically unchanged after the unification process.
Castells (1998)	Spain France Italy Portugal Germany Sweden European Union	The author estimates, on the one hand, the relation existing between the fiscal balance and the relative situation of a region in terms of GDP. On the other hand, the author estimates the relation between the final per capita income of each region (that is after the activity of the central public administration) and the initial per capita income. The estimations in every case are made through lineal and logarithmic regressions.	In the logarithmic regression, where the coefficient represents the elasticity of the fiscal balance with regard to GDP, this is in the order of 0.45 on average. This means that an increase of 100% in the GDP would be accompanied by a worsening of the fiscal balance over the GDP of 45%. In the second estimation the result obtained was that the redistributive power of the central governments is around 45%.
Domenech, Maudes and Varela (1999)	European Union (1986-97)	Carry out an econometric estimation similar to that made by Von Hagen and Sala-i-Martin and Sachs, in which is estimated the elasticity of the various categories of community revenue and expenditure in relation to the income of the member countries through a logarithmic regression on a pool of data in which dummy time variables are included.	The elasticity of community per capita expenditure estimated in ecus with regard to the per capita income is -0.23, which means a certain progressiveness. The revenues are shown to be proportional. The value of their coefficient is very close to one.

Table 2a  
**INCOME BEFORE AND AFTER THE ACTIVITY OF THE PUBLIC SECTOR (I)**  
 (Sample: all the Autonomous Communities and Ceuta y Melilla) (18 observations)

	Dependent variable: Final income (YF)	Constant	Coefficient 'b' of the explanatory variable: Initial income (Y)	R <sup>2</sup>	F	Redistributive power: 1-b
Fiscal balance Flow approach	Y- Total revenue + total expenditure	0.3734 (5.164)***	0.6432 (9.039)***	0.83625	81.710	0.3568
Fiscal balance Benefit approach	Y- Total revenue + total expenditure	0.3738 (7.954)***	0.6461 (13.968)***	0.92421	195.102	0.3539

Table 2b  
**INCOME BEFORE AND AFTER THE ACTIVITY OF THE PUBLIC SECTOR (I)**  
 (Sample: all the Autonomous Communities) (17 observations)

	Dependent variable: Final income (YF)	Constant	Coefficient 'b' of the explanatory variable: Initial income (Y)	R <sup>2</sup>	F	Redistributive power: 1-b
Fiscal balance Flow approach	Y- Total revenue + total expenditure	0.3226 (7.162)***	0.6845 (15.553)***	0.94161	241.888	0.3155
Fiscal balance Benefit approach	Y- Total revenue + total expenditure	0.3639 (7.549)***	0.6542 (13.889)***	0.9279	192.915	0.3458

Table 2c  
**INCOME BEFORE AND AFTER THE ACTIVITY OF THE PUBLIC SECTOR (I)**  
 (Sample: all the Autonomous Communities under the common system) (15 observations)

	Dependent variable: Final income (YF)	Constant	Coefficient 'b' of the explanatory variable: Initial income (Y)	R <sup>2</sup>	F	Redistributive power: 1-b
Fiscal balance Flow approach	Y- Total revenue + total expenditure	0.3318 (6.392)***	0.6756 (13.144)***	0.93002	172.766	0.3244
Fiscal balance Benefit approach	Y- Total revenue + total expenditure	0.3986 (7.873)***	0.6187 (12.342)***	0.92137	152.334	0.3813

Table 3  
**INCOME BEFORE AND AFTER THE ACTIVITY OF THE PUBLIC SECTOR (II)**  
(Sample: Autonomous Communities under the common system) (15 observations)

	Dependent variable: Final income (YF)	Constant	Coefficient 'b' of the explanatory variable: Initial income (Y)	R <sup>2</sup>	F	Redistributive power: 1-b
Revenue	Y- Total revenue (1)	0.0365 (0.795)	0.9739 (21.421)***	0.97451	458.843	0.0261
	Y- Direct taxes	0.0674 (2.394)**	0.9400 (33.722)***	0.98870	1137.183	0.0600
	Y - Personal income tax	0.0924 (0.695)	0.8644 (6.562)***	0.76813	43.065	0.1356
	Y- Social contributions	-0.0160 (-2.292)**	1.0166 (147.475)***	0.99940	21748.865	-0.0166
	Y- Indirect taxes (1)	-0.0274 (-4.637)***	1.0275 (176.192)***	0.99961	31043.618	-0.0275
	Y VAT (1)	0.0403 (0.431)	0.9271 (10.028)***	0.89339	100.600	0.0729

(1) The Canary Islands are excluded as they have an indirect tax system different from the rest of the Autonomous Communities.

Table 4  
**INCOME BEFORE AND AFTER THE ACTIVITY OF THE PUBLIC SECTOR (III)**  
(Sample: Autonomous Communities under the common system) (15 observations)

	Dependent variable: Final income (YF)	Constant	Coefficient 'b' of the explanatory variable: Initial income (Y)	R <sup>2</sup>	F	Redistributive power: 1-b
Expenditure Flow approach	Y + Total expenditure	0.2226 (3.967)***	0.7766 (13.980)***	0.93763	195.427	0.2234
	Y + Expenditure en Social Security (1)	0.1036 (3.466)***	0.8980 (30.337)***	0.98607	920.335	0.1020
	Y + Expenditure on Health	0.0430 (6.589)***	0.9550 (147.800)***	0.99941	21844.800	0.0450
	Y + Expenditure on Housing	0.0017 (1.087)	0.9984 (632.846)***	0.99997	400493.451	0.0006
	Y + Expenditure on Culture	-0.0024 (-1.041)	1.0020 (445.258)***	0.99993	198254.719	-0.0020
	Y + Expenditure on Education + Grants to Sub-central governments	0.1029 (9.293)***	0.8975 (81.899)***	0.99807	6707.45943	0.1025
	Y + Expenditure on Pure Public Goods (2)	-0.0208 (-0.697)	1.0165 (34.463)***	0.98917	1187.690	0.0165
	Y + Expenditure on Infrastructures	0.0209 (2.160)**	0.9795 (102.387)***	0.99876	10483.136	0.0205

(1) Includes expenditure on payments to individuals.

(2) Includes the following functional groups of expenditure: general services of the Public Administration, defence services and public order and security services.

Table 5  
**INCOME BEFORE AND AFTER THE ACTIVITY OF THE PUBLIC SECTOR (IV)**  
(Sample: Autonomous Communities under the common system) (15 observations)

	Dependent variable: Final income (YF)	Constant	Coefficient 'b' of the explanatory variable: Initial income (Y)	R <sup>2</sup>	F	Redistributive power: 1-b
Expenditure Benefit approach	Y + Total expenditure	0.2729 (6,234)***	0.7337 (16,928)***	0.95660	286.567	0.2663
	Y + Expenditure en Social Security (1)	0.1042 (3.472)***	0.8975 (30.201)***	0.98595	912.118	0.1025
	Y + Expenditure on Health	0.0488 (9.023)***	0.9498 (177.386)***	0.99959	31465.634	0.0502
	Y + Expenditure on Housing	0.0020 (1.282)	0.9982 (661.117)***	0.99997	437075.185	0.0008
	Y + Expenditure on Culture	-0.0004 (-0.331)	1.0003 (824.450)***	0.99998	679718.179	-0.0003
	Y + Expenditure on Education + Grants to Sub-central governments	0.1053 (9.629)***	0.8957 (82.698)***	0.99810	6838.972	0.1043
	Y + Expenditure on Pure Public Goods (2)	0.0372 (16.520)***	0.9630 (432.041)***	0.99993	186659.186	0.0370
	Y + Expenditure on Infrastructures	0.0099 (1.103)	0.9913 (111.819)***	0.99896	12503.404	0.0087

(1) Includes expenditure on payments to individuals.

(2) Includes the following functional groups of expenditure: general services of the Public Administration, defence services and public order and security services.

Table 6  
**INCOME BEFORE AND AFTER THE ACTIVITY OF THE PUBLIC SECTOR (V)**  
(Sample: Autonomous Communities under the common system. Article 143) (10 observations)

	Dependent variable: Final income (YF)	Constant	Coefficient 'b' of the explanatory variable: Initial income (Y)	R <sup>2</sup>	F	Redistributive power: 1-b
Expenditure Flow Approach	Y + Expenditure on Education	0.0391 (6.124)***	0.9593 (146.426)***	0.99963	21440.615	0.0407
	Y + Sub-central Financing	0.0700 (5.518)***	0.9288 (71.291)***	0.99843	5082.351	0.0712
	Y + Expenditure on Education + Grants to Sub-central Governments	0.1052 (7.978)***	0.8920 (65.851)***	0.99816	4336.306	0.1080
Expenditure Benefit approach	Y + Expenditure on Education	0.0432 (10.068)***	0.9559 (216.797)***	0.99983	47001.103	0.0441
	Y + Sub-central Financing	0.0700 (5.518)***	0.9288 (71.291)***	0.99843	5082.351	0.0712
	Y + Expenditure on Education + Grants to Sub-central Governments	0.1093 (8.955)***	0.8887 (70.935)***	0.99841	5031.718	0.1113

Table 7  
**INCOME BEFORE AND AFTER THE ACTIVITY OF THE PUBLIC SECTOR (VI)**  
(Sample: Autonomous Communities under the common system. Article 151) (5 observations)

	Dependent variable: Final income (YF)	Constant	Coefficient 'b' of the explanatory variable: Initial income (Y)	R <sup>2</sup>	F	Redistributive power: 1-b
Flow approach and benefit approach	Y + Grants to Sub-central Governments	0.9973 (5.003)**	0.9009 (45.563)***	0.99856	2075.960	0.0991