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The redistributive, stabiliser and insurance effects at territorial level of "federal" government budgets

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THE REDISTRIBUTIVE, STABILISER AND INSURANCE EFFECTS AT TERRITORIAL LEVEL OF "FEDERAL" GOVERNMENT BUDGETS[a,b]

Núria Bosch, Marta Espasa and Pilar Sorribas[c]

ABSTRACT: The aim of this study is to estimate the redistributive, stabiliser and insurance effects at territorial level of the federal budget of Australia, Spain, the USA and of the European Union. This analysis is carried out for the budget as a whole through regional fiscal balances and, separately for the revenues and expenditures. The methodology used is a panel data econometric model. The main conclusion is that in all the cases considered the expenditures have higher effects, both redistributive and stabiliser/insurance, than the revenues and that the size of the European budget should increase in order to be able to develope redistributive policies.

Key words: Fiscal flows, redistribution and stabilisation.
JEL Classification: E62, H11, H23

RESUMEN: El objetivo de este estudio es estimar los efectos redistributivo, estabilizador y asegurador a nivel regional de los presupuestos federales de Australia, España, EE.UU. y la UE. Este análisis se lleva a cabo para el conjunto del presupuesto a través de los saldos fiscales regionales y, separademente, para el conjunto de ingresos y gastos. La metodología utilizada es un modelo econométrico de datos de panel. Las principales conclusiones son que, en todos los casos considerados, el mayor efecto es el redistributivo, que los gastos tienen mayores efectos que los ingresos y que si la UE debería aumentar el tamaño de su presupuesto si tiene que llevar a cabo políticas redistributivas.

Palabras clave: Flujos fiscales, redistribución y estabilización
Clasificación JEL: E62, H11, H23

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1. Introduction

As Eichengreen (1993) points out, starting with the budgetary policies of the public sector, we can distinguish three effects at territorial level: 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, and vice versa. b) The stabilising effect, that consists of 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, and vice versa. c) The insurance effect, that consists of 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.

The economic literature in this field of study is quite new. Although the pioneer study that approaches this subject is the MacDougall Report (1977), it is not until the nineties, due to the debate of whether the European Economic and Monetary Union had or not had the requirements to be an optimal monetary area, when a great number of studies analyse the redistributive and stabiliser power of central government budgets[1] (specially of Canada and the USA, but also of some European countries such as France, the United Kingdom and Germany), establishing the basis of a new research area.

Hence, the aim of this study is to analyse the territorial redistributive, stabiliser and insurance effects of the central budget of three countries, Australia, Spain and the USA, and of the European Union. It seems reasonable to expect that the more centralised the political power in a country is, the higher the redistributive, stabiliser and insurance effect will be. In regard to this statement, the MacDougall Report estimates that the budgets of the unitary countries have higher redistributive power than the federal ones. Australia and USA are highly decentralised countries and, Spain where a strong decentralisation process was carried out during the last two decades, has generated a

[1] See Sala-i-Martín and Sachs, 1992; Von Hagen, 1992; Pisani-Ferry, Italianer and Lescure, 1993; Goodhart and Smith, 1993; Bayoumi and Masson, 1995; Mélitz and Zummer, 1998; Duboz and Nicot, 1998; Castells, 1998; Domenech, Maudes and Varela, 2000; and Von Hagen and Hepp, 2001.

degree of decentralisation similar to the one of the federal countries. Nevertheless, the weight of the central public sector is still higher in Spain than in Australia and the USA (see Table 1), and from a constitutional point of view it is not a federation. On the one hand, we also analyse the case of the European Union, understood as a pre-federal political union, and we compare its effects with the estimated effects of the central budget of these three countries, that can be considered "mature federations".

[INSERT TABLE 1]

The methodology used is based in the Bayoumi and Mason (1995) study, which allows the redistributive and stabiliser/insurance effects to be distinguished clearly. On the one hand, the redistributive capacity is estimated through a regression of territorial income after the intervention of the public sector over territorial income before. In order to complete the measurement of the redistributive effect, we also calculate the degree of progressivity of the fiscal balances, the revenues and the expenditures. Moreover, we analytically relate the two concepts considered to measure the redistributive effects. On the other hand, the stabiliser and insurance effects are jointly estimated through a regression of territorial income after the intervention of the public sector over territorial income before, but in this case the variables are expressed in differences. In addtition, in our study we also estimate this relationship including time-effects which control for any aggregate time-series variation. Thus, in this case, only the response to an idyosincratic shock is estimated, i.e. the insurance capacity[2]. The econometric technique used in the estimations is panel data.

The study is organised in five sections, including this introduction. In the second section the methodology used in the estimation is specified. In the third section we present the main characteristics of the data base used. In the fourth we present the results of the estimation of the redistributive, stabiliser and insurance effects and the comparative analysis is carried out. Finally in the fifth and last section we present the main conclusions.

[2] See Sorensen et al (2000).

2. Methodology

In relation to the econometric technique, we have used panel data which allows the modelling of differences in behaviour across territories, i.e. it allows for heterogeneity among them. Moreover, as this technique combines cross section and time series data sets, panel data sets are typically large, and hence they will often provide more efficient estimators than other sources.

2.1. Methodology used to estimate the redistributive effects

The methodology used to analyse the redistributive effects of the central government budget combines the elasticities method introduced by MacDougall (1977) and the disposable income method developed by Bayoumi and Masson (1995). Thus, the analysis is carried out in two phases.

First, we estimate the elasticity-income of the central budget revenue, expenditure and fiscal balance so as to examine the progression of each instrument considered.

Following Sala-i-Martín and Sachs (1992) and the MacDougall report (1977), the coefficients of elasticity are obtained by regression, where regional taxes and expenditure are the dependent variables and the initial income is the independent variable. Initial income is defined as the income existing before the activity of the public sector. The difference between our method and that used by MacDougall is that we take the variables as logarithms and that we include time effects as Sala-i-Martin and Sachs (1992) do. Consequently, the coefficients of the slopes are the estimated elasticities.

The estimated equations are:

$$ln\frac{T_i}{T_m} = \theta + \mu_T \, ln\frac{Y_i}{Y_m} + \gamma_T t + e_i \qquad [1]$$

$$ln\frac{E_i}{E_m} = \theta + \mu_E \, ln\frac{Y_i}{Y_m} + \gamma_E t + e_i \qquad [2]$$

where,

T is the taxes in each territory in per capita terms.
E is the expenditures in each territory in per capita terms.
Y is the initial income of the territories in per capita terms[3].
t is the time-effects
i refers to the territories.
m refers to average values for the total of territories considered.

The elasticities obtained (μ_i) indicate the change in central revenues and expenditures accrued in a territory when the territorial income changes. If the slope is equal to one, the tax or expenditure is neutral, which means that it varies from one territory to another in the same proportion as the initial income. Consequently, these fiscal instruments do not modify the initial differences in relative regional income. Taxes with elasticities above one are progressive, while expenditures with elasticities above one are regressive.

In the case of fiscal balances, the elasticity-income is estimated using the equation developed by Castells (1998a), where the dependent variable is the ratio between fiscal balance and regional income. We add one to this ratio to avoid negative values. Thus, we estimate the following equation:

$$\ln\left(1+\frac{FB_i}{Y_i}\right)=\theta+\mu\ln\frac{Y_i}{Y_m}+e_i \qquad [3]$$

where *FB* is the regional fiscal balance with the budget of the central government, which is defined as the difference between the central expenditures and central revenues accrued in a territory. The rest of the variables have been defined previously.

In this case, if the income-elasticity (μ) is negative it indicates that the central budget as a whole is progressive, which means that as the income proportionally increases, the fiscal balance decreases. And it is regressive when the income-elasticity is positive.

[3] To measure the initial income we use GDP. We cannot assert that this is the proper measure of income before any intervention by the public sector, but the possibility of obtaining a better measure is really problematic.

Once the degree of progressivity of revenues, expenditures and fiscal balance is analysed, the second phase of the study consists of the analysis of their redistributive capacity, measuring the impact of each of these instruments on income. For the analysis of this second aspect we use the method developed by Bayoumi and Masson (1995), which estimates the redistributive capacity through the relationship between regional income after revenue and expenditure, i.e. disposable income, and initial regional income. Nevertheless, we estimate those equations in logarithms in order to relate analytically the two measures that we have used to quantify the redistributive effect of the central budgets: the redistributive capacity (1- β) and the income-elasticity (μ). Hence, the equation to estimate is the following:

$$\ln\left(\frac{DY_i}{DY_m}\right) = \alpha + \beta \ln\left(\frac{Y_i}{Y_m}\right) + e_i \qquad [4]$$

where *DY* is the final or disposable regional income, which is equal to the initial income (*Y*) modified by the activity of the central government. To obtain the disposable income, revenue obtained by the public sector is subtracted from the initial income and public expenditure is added. The rest of the variables have been previously described.

The estimation of the equation [4] is carried out starting from the following calculations of the final income:

- *DY = Y + Regional Fiscal Balance with central government of territory i (Expenditures-Revenues)*
- *DY = Y – Revenues obtained from the central government from territory i*
- *DY = Y + Expenditures from the central government accrued in territory i*

The estimated value for the coefficient β indicates the relationship between the disposable income (*DY*) and the initial income (*Y*) and is understood in redistributive terms. For example, a coefficient of 0.70 would indicate that 70 percent of the initial differences in relative per capita incomes remain after public sector activity, and this would reduce each monetary unit of difference between the regions or the countries by

30%. Therefore, (1-β) represents the amount of income redistribution caused by fiscal flows derived from the central government budget.

Specifically, the relationship between the redistributive capacity of the fiscal balance and its income-elasticity is[4]:

$$\beta = \mu + 1 \qquad [5]$$

In the case of the revenues and expenditures, the previous relationship is the following:

$$\text{Revenues}^{5}\text{: } 1-\beta_T = (\mu_T - 1)\frac{T}{Y-T} \qquad [6]$$

$$\text{Expenditures}^{6}\text{: } 1-\beta_E = (1-\mu_E)\frac{E}{Y+E} \qquad [7]$$

Looking at the previous relationships, we observe that the redistributive capacity of the revenues and expenditures depends not only upon their degree of progressivity, but also upon their relative importance to the disposable regional income. It may be that a revenue or expenditure item is very progressive but that its importance in regional income is very small. In this case, the redistributive capacity of this instrument is very low. Likewise, a revenue or expenditure item may not be very progressive but its importance in regional income is great; in this case the redistributive capacity may be greater. Therefore, it is necessary to consider the progressivity of the instruments and their involvement in reducing territorial income disparities.

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[4] Where $\beta = \dfrac{\partial\left(\dfrac{(Y+FB)_i}{(Y+FB)_m}\right)}{\partial\left(\dfrac{Y_i}{Y_m}\right)}\dfrac{\left(\dfrac{Y_i}{Y_m}\right)}{\left(\dfrac{(Y+FB)_i}{(Y+FB)_m}\right)}$ and $\mu = \dfrac{\partial\left(1+\dfrac{FB_i}{Y_i}\right)}{\partial\left(\dfrac{Y_i}{Y_m}\right)}\dfrac{\dfrac{Y_i}{Y_m}}{\left(1+\dfrac{FB_i}{Y_i}\right)}$

[5] Where $\beta_T = \dfrac{\partial(Y-T)}{\partial Y}\dfrac{Y}{(Y-T)}$, $\mu_T = \dfrac{\partial T}{\partial Y}\dfrac{Y}{T}$, $T = \dfrac{T_i}{T_m}$ and $Y = \dfrac{Y_i}{Y_m}$

[6] Where $\beta_E = \dfrac{\partial(Y+E)}{\partial Y}\dfrac{Y}{(Y+E)}$, $\mu_E = \dfrac{\partial E}{\partial Y}\dfrac{Y}{E}$, $E = \dfrac{E_i}{E_m}$ and $Y = \dfrac{Y_i}{Y_m}$

The previous relationships are very similar to the ones used in the MacDougall Report (1977) in order to estimate the redistributive effect, which consists of 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 regional income, instead of disposable income as in our equations.

These relationships can be expressed as follows:

$$\text{Revenues: } 1-\beta_T = (\mu_T - 1)\frac{t}{1-t} \qquad [8]$$

$$\text{Expenditures: } 1-\beta_E = (1-\mu_E)\frac{e}{1+e} \qquad [9]$$

where, $t = \frac{T}{Y}$ and $e = \frac{E}{Y}$

In this way, equation [8] expresses the same relationship that Lambert (1993) obtained, with the difference that in his equation the measures of the degree of progressivity and the redistributive capacity are expressed in indices and they refer to personal instead of territorial redistribution.

2.2. Methodology used to estimate the stabiliser and insurance capacity

The methodology used to jointly estimate the stabiliser and insurance capacity of the central government budgets is also the one developed by Bayoumi and Masson (1995).

To estimate the stabiliser and insurance effects, they examine the relationship between the increments of regional disposable and initial income. The estimation in differences allows them to focus on short-run deviations of income from its underlying growth path, that is what the stabiliser and insurance functions try to mitigate. On the other hand, the estimation of this relationship with the variables expressed in levels focuses on the long-run that is relevant when we want to measure redistributive capacity. Hence, we estimate the following equation:

$$\Delta\left(\frac{DY_i}{DY_m}\right)_t = \gamma + \delta\Delta\left(\frac{Y_i}{Y_m}\right)_t + e_i \qquad [10]$$

where *t* refers to time and the rest of the variables have been previously defined.

The estimated value for the coefficient δ indicates the relationship between the variation of disposable income (*DY*) and the variation of initial income (*Y*) and it is understood in stabiliser/insurance terms. For example, a coefficient of 0.80 indicates that 20 percent of the variations of the regional income level are absorbed by the public sector. Therefore, (1-δ) represents the amount of income stabilisation/insurance caused by fiscal flows derived from central government budget.

Following Sorensen et al. (2000), we have also estimated this equation including time-effects. These fixed time-effects control for any aggregate time-series variation, that is what the stabiliser function tries to mitigate. Thus, the coefficient estimated is only interpreted in insurance terms, as it measures the response to an idiosyncratic change in the income, i.e. what the insurance function tries to mitigate. Hence, the equation estimated is the following:

$$\Delta\left(\frac{DY_i}{DY_m}\right)_t = \gamma + \delta_I \Delta\left(\frac{Y_i}{Y_m}\right)_t + \lambda t + e_i \qquad [11]$$

where t is the fixed time-effects and the rest of the variables have been previously defined.

3. Data

The data used in this study relating to public revenue and expenditure, as well as to fiscal balances, have been deflated and provided from different sources[7]:

- In the case of Spain, the data come from a previous study 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[8]. The sample used only includes the Communities under the common

[7] In appendix 1 the revenues and expenditures considered are described.

[8] Castells et al., 2000.

system, not taking the Basque Country and Navarre or the Autonomous Cities of Ceuta and Melilla into account because they are territories that have a different financial system and a different expenditure structure.

- The data relative to the Australian Federation have been obtained from the Discussion Paper *Fiscal Subsidies within the Australian Federation* (1999). The period of time analysed consists of the fiscal years from 1985/6 to 1998/99 for the 6 States and the 2 Territories that constitute the Federation.

- The data for the USA come from the Working Papers *The Federal Budget and the States* (1997 and 1998). The period studied is 1981-1998 for the 51 States of the Federation.

- Finally, the data relative to the European Union come from the Annual Reports of the Court of Auditors. The period analysed is 1986-99, the data panel used being unbalanced due to the enlargement of the European Union in 1995.

The revenues from the different sources considered, except in the case of the European Union, 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 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 revenue from the European Union has been assigned to each country according to their contribution towards the different concepts of the European budget.

The territorial assignation of the expenditure showed itself to be much more complex. Public expenditure, in as far as it is directed towards the production of services for their public provision, produces two types of 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.

From our point of view, it seems reasonable to carry out the redistributive analysis of the public expenditure through the expenditure data generated by the benefit approach, because this approach attempts to calculate how the expenditure policies affect the welfare of the citizens measured in terms of income level. On the other hand, in order to analyse the stabiliser/insurance effect of the public policies it seems more appropriate to use the territorialized data obtained under the flow approach, due to the fact that this approach attempts to measure the economic impact generated by the activity of the public sector in a territory.

Nevertheless, in this study we have been restricted to only using the expenditure data calculated through the flow approach, due to the fact that the statistical sources used only provide data by this method.

The usual practice in the territorial assignation of expenditure according to the flow approach consists of 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.

4. Estimation and results

We have estimated both a fixed and a random effects version of the model, and we have performed the Hausman test to verify which model fits the data best. In the case of the estimation of the degree of progressivity of the central budget, the Hausman test is passed, rejecting the utilisation of a random coefficients model, the fixed effects model

being the one that fits the data best. In all the cases we have only reported the results for the model that fits the data best. On the other hand, when we estimate the redistributive, stabiliser and insurance capacity, in the case of Australia and Spain the best model is the random coefficients one, whereas in the case of the USA and the European Union, it is the fixed effects model.

In the case of Australia, a dummy variable has been included in all the equations in order to consider the specific characteristics of the federal expenditure in the Northern Territory[9].

4.1. Estimation of the redistributive effects

In Table 2 the results of income-elasticity (μ) estimation of the fiscal balance of the central budgets analysed are shown. The budget of the Spanish central government is the one that presents the highest redistributive effect. The degree of progressivity of its fiscal balance is -0.3296, which means that an increase in income of 100 monetary units (m.u.) in a territory will cause a worsening of the fiscal balance of this territory due to the activity of the central public sector of 32.96 m.u. Table 3 shows the total redistributive capacity estimated for the central budget (1- β = 0.3296), which means that the fiscal flows generated by the activity of the central government decrease the existent interterritorial differences in the level of income per capita by 32.96%. We can verify that the analytical relationship (5) between the degree of progressivity and the redistributive capacity of the fiscal balance holds ($\beta = \mu + 1$).

In second place is the Australian federal government, its estimated progressivity being –0.2799, followed by the USA (-0.1806) and finally the European budget (-0.0490).

[9] The Northen Territory is a territory that receives a relatively high volume of transfers from the federal government due to the recognised high cost of its public services, and which has a fiscal capacity similar to the standard. Thus, for instance, the equation to estimate the degree of progressivity of the revenues is the following:

$$\ln \frac{T_i}{T_m} = \theta + \mu_T \ln \frac{Y_i}{Y_m} + \sigma D + \gamma_T t_t + e_i$$

where *D* is a dummy variable which takes the value 1 in the case of the Northern Territory and 0 for the other States.

We can also carry out the previous analysis graphically. Graph 1 shows the relationship between the fiscal balance of the central budget and the initial income of the different territories. This relationship is a proxy to the progressivity of the fiscal balance. In all the cases the slope is negative, which means that the relationship is progressive, Spain being the case considered that has the steeper slope, which corroborates the results obtained in the estimation.

[INSERT GRAPHIC 1]

The relationship between initial and disposable territorial income, through which we measure redistributive capacity, can also be analysed graphically. Looking at Graph 2 we can observe that in this case Spain is the country with the highest redistributive capacity and that the European Union has an insignificant redistributive effect.

[INSERT GRAPHIC 2]

When we analyse the progressivity and the redistributive capacity of the revenues and expenditures individually, we can observe that in all the cases analysed the expenditures have the highest redistributive effect. Specifically, the country in which federal expenditures show the highest income-elasticity is Australia, -0.2515, which means that an increase of 100 m.u. in a territory produces a decrease of the federal expenditure accrued in this territory of 23.87 m.u.. This is followed by the European Union (-0.2387), Spain (-0.2057) and the USA (-0.1893).

The above order changes when we consider redistributive capacity. In this case, Australia remains in the first position (24.91%), but now Spain is in the second place (22.92%) and not the European Union (3.99%), which comes last the USA (13.07%) remains in third place. The change in the order is due to the fact that the redistributive capacity depends not only on the progressivity but also on other factors such as the relative weight of the expenditure on income, as we have previously explained in the methodological section. Thus, although the European Union shows a high degree of progressivity of expenditure, its redistributive power is really small due to the low weight of the common expenditure.

[INSERT TABLE 2 & 3]

In the case of the revenues, the federal revenues of the USA is the one that shows the highest degree of progressivity (1.1484) and the highest redistribuitve capacity (13.07%). Australia is placed in the second position, with a estimated progressivity of 1.0756 and a redistributive capacity of 2.26%. Spain is placed in the third place with estimated values of 1.0569 and 2.12% and last is the European Union with estimated values of 1.0013 and 0.83%, respectively. A feasible explanation of the high progressivity of the federal revenues of the USA is that the indirect taxes in the American federation are almost insignificant. It is worth mentioning that the revenues of the European Union are proportional. The high redistributive capacity of the Australian and Spanish federal expenditures can be explained by the territorial equalisation grants scheme that these countries have.

4.2. Estimation of the stabiliser and insurance capacity

In Table 4 the results of the joint estimation of the stabiliser and insurance capacity (1-δ) of the fiscal balance of the central budgets analysed are shown. The Australian federal budget shows the highest stabiliser/insurance capacity (21.86%). That means that if the income in a territory changes in 100 m.u., the disposable income varies by 78.14 m.u., its stabiliser/insurance capacity being 21,86 m.u. Second is the American federal budget (19.74%), followed by Spain (17.93%) and the European Union (2.73%).

[INSERT TABLE 4]

When we analyse the stabiliser and insurance capacity of the revenues, the order of the different cases studied changes. In this case, the American federal revenues present the highest capacity, which is estimated at 9.10%, followed by Spain (5.35%), Australia (1.07%) and the European Union (0.17%). A feasible explanation of this change is the differences in the tax structures that exist among the cases studied. Thus, for instance, the federal revenues of the USA come mainly from direct taxes, and therefore they are more sensible to the economic cycle.

In the case of expenditure, the country with the highest stabiliser/insurance capacity is Australia (19.00%), followed by Spain (13.70%), the USA (13.45%) and the European Union (2.32%).

In Table 5 the results of the insurance capacity (1-δ_I) estimation of the fiscal balance of the central budgets analysed are shown. In this case, it is also the Australian federal budget that shows the highest insurance capacity (8.68%), followed by the USA (7.87%), Spain (6.85%) and the European Union (0.99%).

[INSERT TABLE 5]

When we analyse the insurance capacity of the revenues, the order of the different cases studied changes in the same way as when we jointly analise the stabiliser and insurance capacity. In this case, the American federal revenues present the highest capacity, which is estimated at 2.68%, followed by Spain (1.16%), Australia (0.58%) and the European Union (0.02%). A feasible explanation of this order is again the tax structure.

In the case of expenditure, the country with the highest insurance capacity is Australia (8.56%), followed by the USA (5.99%) Spain (5.45%), and the European Union (0.95%).

It is worth mentioning that, as in the case of redistributive capacity, in all the cases studied expenditures have a higher stabiliser/insurance (and only insurance) power than revenues, and in all cases the joint estimation of the stabiliser and insurance capacity is more than twice the insurance capacity. Hence, we can conclude that the stabiliser capacity is higher than the insurance one.

5. Conclusions

From the analysis carried out, we present the following general conclusions:

- The results obtained indicate that the influence of the fiscal flows varies depending on the function considered (redistributive, stabiliser or insurance) and among countries.

- We do not observe any strict relationship among redistributive, stabiliser and insurance capacity and the degree of centralisation of the different countries analysed.
- In all the cases studied, except the USA, the redistributive effects of the budget are greater that the stabiliser and insurance ones.
- Likewise, as in the previous studies carried out on this subject, in all the cases studied the redistributive effects as well as the stabiliser and insurance effects of the expenditures are higher than those of the revenues.
- When we consider budgets as a whole, those of Spain and Australia are the ones that show the highest redistributive effects, 33% and 28%, respectively. The main reason for this fact is the influence of the grants to subcentral governments. In Spain, in a previous study by the authors, thier redistributive capacity is estimated to be around 9%[10]. In the case of Australia, it is known that this country has a very strong interterritorial equalisation system. On the other hand, the USA, that only has a redistributive capacity of 18%, does not have an explicit territorial equalisation system among the States and the Federation. Therefore, it seems admissible to assert that the territorial redistribution of the central governments depends on the tax system and on the existence of equalisation grant schemes, as previous studies also show[11].
- The above conclusion is reafirmed in the case of the redistributive capacity of the expenditures. Australia and Spain are the countries with the highest capacity, 25% and 23%, respectively, their progressivity being –0.2515 and –0.2057, respectively. On the other hand, the USA, shows a expenditure progressivity of –0.1893 and a redistributive power of 13%.
- It is worth to mentioning the case of the European Union, where although the common expenditure is highly progressive (-0.2387), the redistributive capacity is only 4%, due to the low relative weight with respect to income.
- The redistributive capacity of federal revenues depends on whether the indirect taxes are at national or subnational level. Thus, for instance, in the USA the indirect taxes at federal level almost do not exist and this is the country among the cases

[10] See Barberán et al., 2000.

[11] See Bayoumi and Mason, 1995; and Pisani-Ferry et al., 1993.

analysed that presents the highest redistributive capacity, 4.97%, as opposed to the 2.12% of Spain, 2.26% of Australia and 0.83% of the European Union.

- The stabiliser and insurance capacity of the central budget as a whole is similar in the three countries analysed, their value being estimated at around 20%, similar result to that obtained by Mélitz and Zummer (1998).
- In this case, the stabiliser and insurance function is also realised mainly through the expenditures, the results being 19% for Australia, 13.70% for Spain, 13.45% for the USA and only 2.32% for the European Union. It is only the USA where federal revenues have an important stabiliser and insurance role (9%), due to thier structure and composition.
- The very low stabiliser and insurance capacity of the European Union the budget can be caused by the rigidity of the European budget, which is shown through the financial perspectives, that fix for long periods of time the amount and structure of the expenditures, which decreases their capacity to adapt to the economic cycle.
- When we only estimate the insurance capacity, we observe, on the one hand, that in all the cases, it is much lower than the redistributive and stabiliser capacity, and on the other hand, that, in general, it follows the same pattern as when we estimate it jointly with the insurance capacity, except in the case of the expenditures.
- Finally, from the analysis developed we can assert that if in the future the European Union has to behave as a federation correcting disbalances in territorial income and attenuating feasible asymmetric shocks, it is necessary either to change its instruments or to increase its size.

APPENDIX

A. European Union

The data related with the European budget used in this work come from different issues of the *Annual Report* of the Court of Auditors which uses the Commission's accounting system (SICOM).

On the revenue side, data are provided on a cash basis, that is, resources which were made available to the EU budget. Community revenue could be summarised as four main resources:

- *Net traditional own resources*, less collection costs. These resources comprise customs duties, agricultural duties and sugar and isoglucose levies.
- The *resource* based on the *value-added tax* (VAT).
- *GNP resources*.
- The *surplus* from the previous financial year and miscellaneous revenues.

On the expenditure side, the data used refer to actual payments. The Court of Auditors publishes figures of expenditure allocated by Member State for the following categories:

- Price and markets *common agricultural policy* (that is, the guarantee section of the EAGGF, subsection B1).
- *Structural operations* (subsection B2), which includes:
    a. EAGGF guidance section and the financial instrument for fisheries guidance.
    b. Regional fund.
    c. Social fund.
    d. Other structural actions
- *Research and technological development* (subsection B6).
- *External policies* (subsection B7).
- *Other measures* (subsection B3, B4 and B5).

B. Australia

The main expenditure items that we have considered are: final consumption expenditure (such as salaries and defence), interest paid on behalf of other governments, subsidies,

personal benefit payments including grants to non-profit institutions, grants to state governments and gross fixed capital expenditure. In regard to the revenues, the main items considered are: personal income tax, company tax, superannuation and fringe benefits tax, withholding tax, petroleum resource rent tax, sales tax and customs and excise duty. For further details see Intergovernmental Relations Division (1999).

C. Spain

We have considered the non-financial revenues and expenditures generated by the intervention of the central public sector, excluding those that have a bilateral character. Specifically, in the case of the revenues, neither the inheritance tax revenues nor the expropriation of investments in real assets, and in the case of the expenditure, the payment of interest and the consumption of fixed capital. For further details see Castells et al (2000).

D. USA

We have considered a range of taxes that represent the total federal tax burden, including: individual income tax, corporate income tax, state and gift taxes, employment taxes, Social Security taxes and, excise taxes. On the other hand, the main expenditures considered are: payments from the federal treasury to state governments, federal employees, individuals (e.g. Social Security payments) and government contractors. For further details see Leonard et al (1997, 1998)

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Table 1: Distribution of the public expenditure among fiscal tiers

	Central level	Intermidiate level	Local level	Total
Australia (1998)				
% s/ total	50,2	43,8	6,0	100,00
% s/ GDP	18,1	15,8	2,2	36,1
USA (1998)				
% s/ total	52,2	23,8	24,00	100,00
% s/ GDP	19,1	7,7	8,4	35,2
Spain (1998)				
% s/ total	62,7	24,3	12,9	100,00
% s/ GDP	28,7	11,1	5,9	45,8

Source: International Monetary Fund: *Government Finance Statistics Yearbook 2000*, Washington, D.C.; and Ministerio de Economía y Hacienda: *La descentralización del gasto público en España. Período 1987-1998*, Madrid, 2000.

Table 2. Income Elasticity of the Central / Federal Fiscal Flow, Taxes and Expenditures

Dependent Variable: *Fiscal Balance* [$ln(1+FB_i/Y_i)$], *Taxes* [$ln(T_i/T_m)$], *Expenditure* [$ln(E_i/E_m)$]

	Australia			Spain			USA			EU		
Variable	1.A.	1.B.	1.C.	2.A.	2.B.	2.C.	3.A.	3.B.	3.C.	4.A.	4.B.	4.C.
θ	1.0253 (7.531)**	0.8392 (3.568)**	0.2746 (0.138)	1.0478 (4.327)**	0.9243 (3.072)**	0.2246 (2.871)**	1.3972 (2.346)**	0.7248 (1.842)*	0.2043 (0.456)	0.7943 (0.875)	0.1378 (0.457)	0.1473 (0.691)
$Ln(Y_i/Y_m)$	-0.2799 (-7.983)**	1.0756 (3.587)**	-0.2515 (-5.730)**	-0.3296 (-5.409)**	1.0569 (4.367)**	-0.2057 (-3.224)**	-0.1806 (-4.031)**	1.1484 (5.670)**	-0.1893 (-3.741)**	-0.0490 (-3.972)**	1.0013 (3.015)**	-0.2387 (-3.057)**
R^2	0.9574	0.9497	0.9543	0.9601	0.9303	0.9543	0.9187	0.9046	0.9271	0.9229	0.9130	0.9297
F	83.29	80.09	82.18	65.03	64.62	63.51	57.03	51.22	50.73	89.14	82.79	85.43
LM (OLS vs F/R)	121.18	105.18	114.57	104.72	100.78	102.76	89.72	90.46	91.52	54.09	56.40	52.66
Hausman (F vs R)	31.14	30.93	32.83	40.09	38.03	39.87	52.70	53.19	54.88	23.57	24.16	29.45

Notes: 1. * & ** = significantly different from zero at the 90% and 95% levels
2. t statistics are shown in brackets
3. High values of LM favor FEM/REM over OLS model. High (low) values of Hausman favor FEM (REM)

(A): Dependent variable: *Fiscal Balance from the central/federal government in the region i*
(B): Dependent variable: *Taxes paied to the central/federal government by the region i*
(C): Dependent variable: *Expenditures realized by the central/federal government in the region i*

Table 3. Redistributive Power of the Central / Federal Budget

Dependent Variable: *Disposable income* $ln(DY_i/DY_m)$

	Australia			Spain			USA			EU		
Variable	1.A.	1.B.	1.C.	2.A.	2.B.	2.C.	3.A.	3.B.	3.C.	4.A.	4.B.	4.C.
α	0.2948 (5.271)**	-0.0249 (-1.098)	0.2683 (7.134)**	0.1945 (3.741)**	-0.1783 (-5.890)**	0.2101 (6.827)**	-.-	-.-	-.-	-.-	-.-	-.-
$Ln\ (Y_i/Y_m)$	0.7201 (15.463)**	0.9774 (35.472)**	0.7509 (25.985)**	0.6704 (17.473)**	0.9788 (32.920)**	0.7708 (20.004)**	0.8194 (9.931)**	0.9503 (8.147)**	0.8693 (9.465)**	0.9510 (5.248)**	0.9917 (5.213)**	0.9601 (5.238)**
R^2	0.9802	0.9897	0.7950	0.9384	0.9590	0.9703	0.9602	0.9453	0.9518	0.9799	0.9639	0.9703
F	205.37	143.10	296.13	115.13	121.63	161.20	201.32	140.73	183.72	88.14	105.44	99.13
LM (OLS vs F/R)	679.22	121.47	694.32	210.35	206.39	175.03	703.92	683.14	743.77	503.81	460.03	442.61
Hausman (F vs R)	2.04	3.08	3.28	2.01	1.01	1.09	62.87	52.70	59.07	75.20	73.46	72.14
Redistributive power:1-β	0.2799	0.0226	0.2491	0.3296	0.0212	0.2292	0.1806	0.0497	0.1307	0.0490	0.0083	0.0399

Notes: 1. * & ** = significantly different from zero at the 90% and 95% levels
2. t statistics are shown in brackets
3. High values of LM favor FEM/REM over OLS model. High (low) values of Hausman favor FEM (REM)

(A): $DY_i = Y_i$ + *fiscal balance from the central/federal government in the region i*
(B): $DY_i = Y_i$ - *taxes paied to the central/federal government by the region i*
(C): $DY_i = Y_i$ + *expenditures realized by the central/federal government in the region i*

Table 4. Stabiliser and Insurance Power of the Central / Federal Budget

Dependent Variable: *Increment Disposable Income* [$\Delta(DY_i/DY_m)$]

	Australia			Spain			USA			EU		
Variable	1.A.	1.B.	1.C.	2.A.	2.B.	2.C.	3.A.	3.B.	3.C.	4.A.	4.B.	4.C.
γ	$0.89*10^{-17}$ (0.000)	$0.84*10^{-11}$ (0.000)	$0.49*10^{-12}$ (0.000)	-0.0001 (-0.072)	-0.0001 (-0.266)	-0.0001 (-0.085)	-.-	-.-	-.-	-.-	-.-	-.-
$\Delta(Y_i/Y_m)$	0.7814 (27.716)**	0.9893 (26.421)**	0.8100 (29.732)**	0.8207 (8.232)**	0.9465 (26.164)**	0.8630 (8.051)**	0.8026 (15.346)**	0.9090 (14.259)**	0.8655 (15.014)**	0.9727 (4.865)**	0.9983 (9.370)**	0.9768 (4.821)**
R^2	0.8913	0.9102	0.9001	0.4963	0.9056	0.9647	0.9579	0.9669	0.9679	0.9673	0.9503	0.9589
F	92.01	89.12	100.05	164.03	203.46	103.84	371.11	195.58	136.48	98.46	59.37	76.49
LM (OLS vs F/R)	34.80	69.60	49.58	19.71	24.32	29.85	22.63	24.50	23.94	195.86	164.25	132.54
Hausman (F vs R)	0.68	0.41	0.97	0.46	0.82	1.12	82.51	71.21	79.03	66.00	63.24	60.78
Stabiliser power: 1-δ	0.2186	0.0107	0.1900	0.1793	0.0535	0.1370	0.1974	0.0910	0.1345	0.0273	0.0017	0.0232

Notes: 1. * & ** = significantly different from zero at the 90% and 95% levels
2. t statistics are shown in brackets
3. High values of LM favor FEM/REM over OLS model. High (low) values of Hausman favor FEM (REM)

(A): $DY_i = Y_i$ + *fiscal balance from the central/federal government in the region i*
(B): $DY_i = Y_i$ - *taxes paied to the central/federal government by the region i*
(C): $DY_i = Y_i$ + *expenditures realized by the central/federal government in the region i*

Table 5. Insurance Power of the Central / Federal Budget

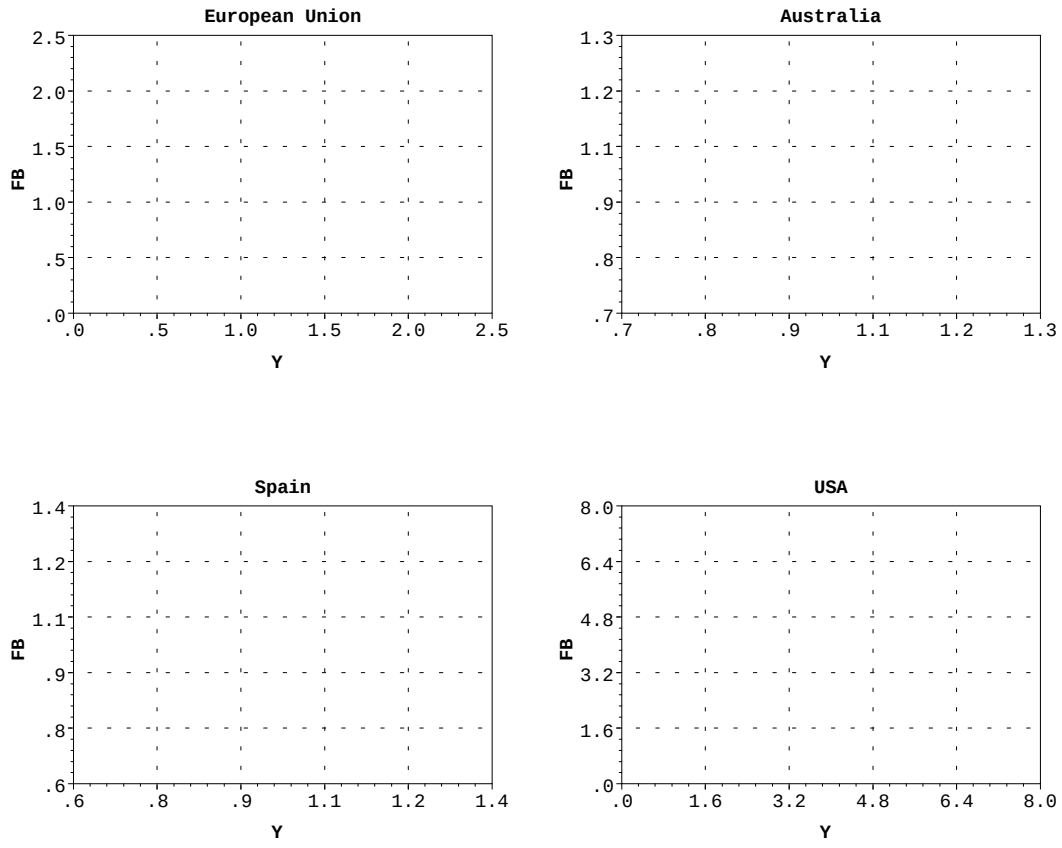
Dependent Variable: *Increment Disposable Income* [$\Delta(DY_i/DY_m)$]

	Australia			Spain			USA			EU		
Variable	1.A.	1.B.	1.C.	2.A.	2.B.	2.C.	3.A.	3.B.	3.C.	4.A.	4.B.	4.C.
γ	$0.32*10^{-14}$ (0.000)	0.45*10-8 (0.000)	0.22*10-9 (0.000)	-0.0002 (-0.047)	-0.0002 (-0.158)	-0.0002 (-0.103)	-.-	-.-	-.-	-.-	-.-	-.-
$\Delta(Y_i/Y_m)$	0.9132 (19.432)**	0.9942 (21.451)**	0.9144 (18.244)**	0.9315 (6.441)**	0.9884 (24.330)**	0.9455 (8.199)**	0.9213 (13.299)**	0.9732 (9.124)**	0.9401 (9.987)**	0.9901 (5.855)**	0.99983 (9.041)**	0.9905 (4.005)**
R^2	0.8521	0.9015	0.8402	0.4532	0.8663	0.9417	0.9324	0.9143	0.9228	0.9377	0.9147	0.9011
F	85.32	84.23	99.41	143.24	185.01	88.43	201.24	157.32	108.54	72.63	48.01	66.93
LM (OLS vs F/R)	31.07	62.33	46.22	19.00	21.98	28.43	22.02	23.94	21.07	183.42	154.77	130.23
Hausman (F vs R)	0.62	0.40	0.74	0.63	0.89	1.02	78.07	69.14	80.15	61.57	60.00	62.43
Insurance power: 1-δ_I	0.0868	0.0058	0.0856	0.0685	0.0116	0.0545	0.0787	0.0268	0.0599	0.0099	0.0002	0.0095

Notes: 1. * & ** = significantly different from zero at the 90% and 95% levels
2. t statistics are shown in brackets
3. High values of LM favor FEM/REM over OLS model. High (low) values of Hausman favor FEM (REM)

(A): $DY_i = Y_i$ + *fiscal balance from the central/federal government in the region i*
(B): $DY_i = Y_i$ - *taxes paied to the central/federal government by the region i*
(C): $DY_i = Y_i$ + *expenditures realized by the central/federal government in the region i*

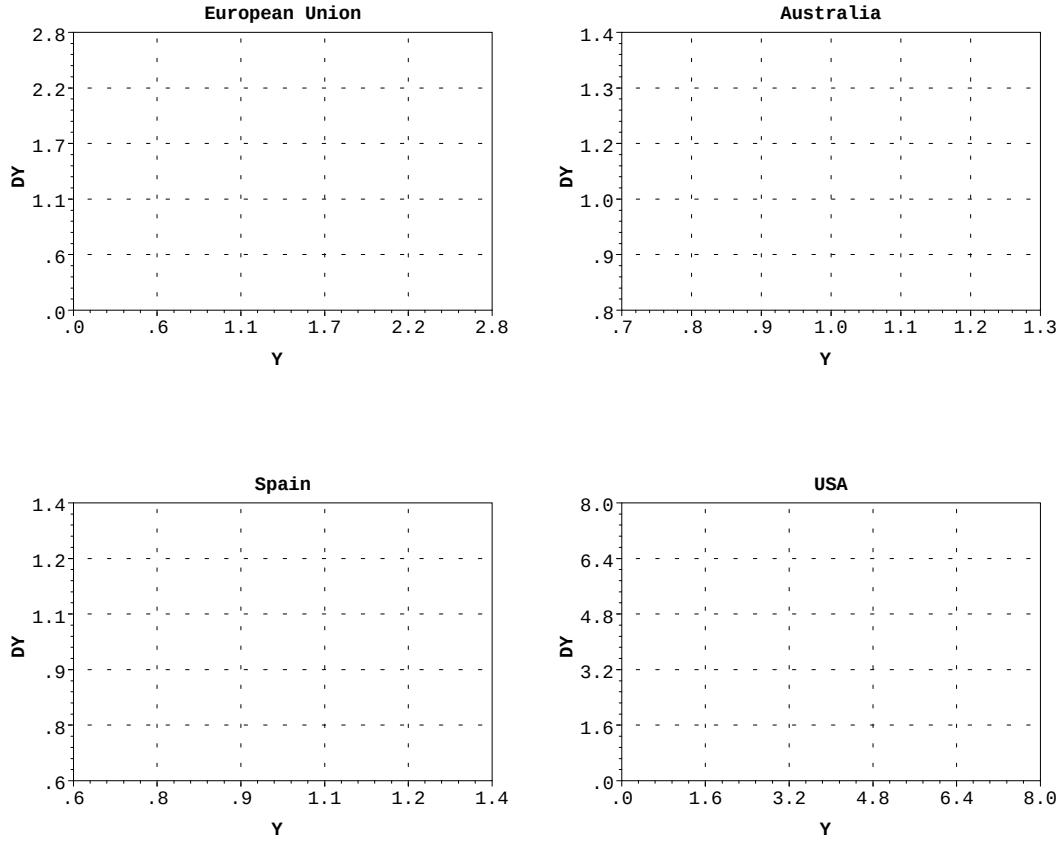
Graphic 1. Relationship between the regional fiscal balance and the regional income



$$Y = \frac{Y_i}{Y_m} : initial\ reginal\ income$$

$$FB = 1 + \frac{FB_i}{Y_i} : fiscal\ balance$$

Graphic 2. Relationship between the regional income before and after the intervention of the central /federal government



$Y = \frac{Y_i}{Y_m}$: *initial reginal income*

$YF = \frac{YF_i}{YF_m}$: *disposable regional income*

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