FISCAL FLOWS IN EUROPE: THE REDISTRIBUTIVE EFFECTS OF THE EU BUDGET

*Rafael Domenech**
*Antonio Maudes***
*Juan Varela****

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* University of Valencia and Ministry of Economy and Finance.
** Ministry of Economy and Finance.
*** Ministry of Economy and Finance and Boston College.

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Address for comments: R. Doménech, Dpto. Análisis Económico, Universidad de Valencia, 46011-Valencia (SPAIN).
e-mail: rafael.domenech@uv.es

Abstract

In this paper we analyze the redistributive effects among European countries of the EU budget, exploring the relationship between income and fiscal flows, both in per capita terms. As redistribution policies imply transferring income among members to alleviate persistent differences in per capita income levels, they can increase the speed of convergence of beneficiary countries to similar steady states. Using a new data set on EU budget data from 1986 to 1996, we find that the EU budget has a redistributive character, though only on its expenditure side. Of all expenditure categories we do consider, the most redistributive one is the regional fund, followed by the social fund and by the guarantee section of the EAGGF. All of them become increasingly redistributive in time. As far as total budgetary revenues are concerned, they show proportionality with income. When we consider the net financial balance, our analysis allows us to identify three groups of countries, given the treatment they get from the EU budget that cannot be explained by their per capital income levels.

1. Introduction

With the current process of monetary unification among European countries, the analysis of fiscal policy has attracted considerable attention in the last few years. The standard approach in this literature (Sachs and Sala-i-Martin (1992), von Hagen (1992) or Bayoumi and Masson (1995)) has consisted in the analysis of the experience in the United States or Canada to infer some empirical lessons for monetary union in Europe. Among the problems involved in this research line, two main issues have emerged. The first one relates to the need of a Community-wide fiscal arrangement to deal with asymmetric shocks affecting the members of the new monetary federation, in a similar way to the federal system in the United States or to the national fiscal systems in European countries, which allow to partially offset asymmetric cyclical fluctuations at the regional level (see Fatás (1998)). The second issue refers to the ability of federal or national systems to implement redistributional transfers between their members, and it has received a special attention by the European Commission since, in the end, nominal convergence imposed by the Maastricht Treaty is aimed to promote and to enhance real convergence among member states in the long run.

Although in some occasions no distinction is made between stabilization or redistribution policies, some authors, as von Hagen (1992) or Bayoumi and Masson (1995), have pointed out the convenience of analyzing them separately. Stabilization policies are often justified by the existence of transitory or cyclical deviations from trend output, that may be mitigated by the redistribution of income from regions or countries having a temporary expansion to those experiencing a transitory recession. Redistribution policies imply transferring income among members to alleviate persistent differences in per capita income levels and implementing policies that stimulate long-run growth in poorer countries or regions to reduce economic inequalities.

Redistribution policies are nowadays of greater importance in the EU budget. Over time, economic and social cohesion has become one of the pillars of the European Union, giving rise to policies aimed at the reduction of regional disparities, at the support of regions affected by economic change and at the development of human resources throughout the Union. These are current priorities of the European Commission, as stated by Mr. Santer

(President of the EU Commission) in his speech to the European Parliament on July 16, 1997. These objectives have not only implied a firm political will by the Commission, but they have also been reflected in the treaties signed by country members. Thus, Article 2 of the Treaty of the European Union states that "the Community shall have as its tasks, by establishing a common market and an economic and monetary union and by implementing common policies,... to promote throughout the Community a harmonious, balanced and sustainable development of economic activities, a high level of employment and of social protection, ... convergence of economic performance, ... and social cohesion and solidarity among Member States".

Over and above, when the Maastricht Treaty laid down the basis for establishing an Economic and Monetary Union by 1999, it was also decided to reduce some of the existing economic disparities among future members that could endanger this ambitious project, and also to address the risk that EMU could deepen regional disparities. Additionally, the Treaty's requirement (extended in the Stability and Growth Pact signed in Dublin in 1996) that limits budget deficits by a maximum of 3 percent of gross domestic product (GDP), also constrains the possibilities of poorer states of increasing their investments to catch up with their richer partners. In response to these questions, the Maastricht Treaty established a new Cohesion Fund to channel financial assistance to the four poorest states, which had a per capita GDP below the 90 percent of the Union's average in PPP terms. More recently, the European Commission has kept its willingness to maintain and even further increase in the future the weight that structural policies have in the European project.[1]

This paper contributes in several respects to the existing literature on the analysis of fiscal policy in the EU. First, we focus on the redistributive effect of the EU budget from 1986 to 1996. This allows us to analyze changes on the finance and the expenditure sides of the EU budget, and to undertake a preliminary evaluation of the effects of the enlargement of the EU to Austria, Finland and Sweden. Second, and probably more important, we use EU budget data. As far as we know, this is the first attempt to evaluate

[1] For example, the Commission's *Agenda 2000* proposes to devote ECU 275 billion (at 1997 prices) to the Structural and Cohesion Funds from 2000 to 2006, whereas for the period 1993-1999 the amount allocated was ECU 200 billions.

the redistributive effect of fiscal policy in Europe with this kind of data, which makes possible to distinguish between different classes of revenues and expenditures. Third, in contrast with the US experience where federal taxes play an important role in redistributing income across states (see, for example, Bayoumi and Masson (1995)), we find that member contributions to the EU budget are proportional to per capita incomes and that redistribution across European countries is mainly achieved through the different types of expenditures.

The structure of the paper is as follows. In section 2, we sketch a simple growth model in which we can analyze the impact of redistribution policies through a federal budget upon the convergence rate to the steady state. In section 3 we explain the source and characteristics of the data used in our empirical exercises and present preliminary evidence on fiscal flows among European countries through the EU budget. In section 4 we further explore the relationships between per capita income and countries' transfers from and contributions to the EU budget. Finally, section 5 concludes with the main results.

2. Some theoretical issues

European countries have many reasons to justify the existence of redistribution policies. In particular, as stated in different treaties, the European Community shall aim at reducing disparities between the levels of development of member states and the backwardness of the least favoured regions. However, it can be argued that these policies do not aim to support a continuous and constant transfer from richer to poorer countries, but to establish appropriate conditions in which a backward economy can catch up with the leading ones more quickly than in the absence of such policies. In the long run, the financial assistance to a given country or region vanishes as disparities with the rest of the Union disappear. In other words, we can say that redistribution policies aspire to speed up the convergence process of poorer countries or regions to the average Community level.

The neoclassical growth model can be extended conveniently to analyze this kind of policies. The way in which we cope with this question is allowing for the existence of net foreign transfers when a country has a per capita income below the Union average, which accelerates the convergence process among union members. Our approach is somewhere similar to the one

proposed by Barro, Mankiw and Sala-i-Martin (1995), in the context of open economies with partial capital mobility. In their model, borrowing on world markets can only partially finance the accumulation of capital, allowing for a slightly faster convergence rate than in closed economies.

For simplicity, we focus on a country or region in which per capita income is below the average Union level, and we let aside questions related with the federal budget balance.[2] According to the main priorities of fiscal policy in the EU, we assume that this country will receive transfers from the federal budget only during the transition to a steady state, that is similar to all Union countries.[3]

The available technology for this economy is given by the following production function:

$$Y = AK_p^{\alpha} K_g^{\beta} (Le^{gt})^{1-\alpha-\beta}, \tag{1}$$

where Y is aggregate output, K_p is the private capital stock in a broad sense (that is, it may include, not only physical capital, but also human or R&D capital, in line with Mankiw, Romer and Weil (1992) or Nonneman and Vanhoudt (1996)), K_g is the public capital stock, L is labour supply, and g is the exogenous rate of growth, A is a technology scale parameter, $\alpha > 0$, $\beta > 0$ and $\alpha + \beta < 1$.

Equation (1) can be rewritten in units of effective labour as:

$$y = Ak_p^{\alpha} k_g^{\beta}, \tag{2}$$

where $y = \frac{Y}{Le^{gt}}$, $k_p = \frac{K_p}{Le^{gt}}$, $k_g = \frac{K_g}{Le^{gt}}$.

Now, we assume that, in units of effective labour, all transfers from and contributions to the federal budget (tr^{UE}) can be synthesized by three

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[2] These two assumptions could be relaxed in a two country model that accounts explicitly for a balanced federal budget. Given the purpose of this paper, these extensions to the model presented here do not change the main implications that we want to address.

[3] It is obvious that European countries present similar, although not identical, determinants of their long run per capita income levels. Nonetheless, the assumption of similar steady states that we make for simplicity can be relaxed to allow for the existence of small differences in the per capita incomes of the Union countries.

different kinds of flows.[4] The first one comprises all transfers this economy receives to accumulate public capital. The second type of flows are related to the accumulation of private capital, such as agricultural machinery, R&D funds or labour training funds. The third one comprises the net balance between contributions to the federal budget and the rest of transfers such as, for example, non structural agricultural funds. If we assume that, for simplicity, these types of flows are only explained by the difference between the average per capita income level of the Union and that of this country, we have:[5]

$$tr^{EU} = tr_{k_g}^{EU} + tr_{k_p}^{EU} + tr_y^{EU} = (\phi_{k_g} + \phi_{k_p} + \phi_y)(y^{EU} - y). \qquad (3)$$

In this economy there are two production factors which can be accumulated. The first one is public capital. We assume that

$$\dot{k}_g = \tau \left[y + \phi_y(y^{EU} - y)\right] - (n + g + \delta)k_g + \phi_{k_g}(y^{EU} - y), \qquad (4)$$

where τ is the income tax rate, n is the growth rate of labour and δ is the depreciation rate. As we can see, if $\phi_y > 0$ and $\phi_{k_g} > 0$ this economy accumulates more public capital than in the closed economy case. It is also important to notice that, since there is public capital accumulation, this factor is used in the production of goods as a conventional stock and not like the services from public goods, as in Barro's (1991) model.

Private capital accumulation is given by the following law of motion:

$$\dot{k}_p = s(1 - \tau) \left[y + \phi_y(y^{EU} - y)\right] - (n + g + \delta)k_p + \phi_{k_p}(y^{EU} - y), \qquad (5)$$

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[4] Because of the presence of these transfers, the budget restriction for this economy in efficiency units is given by:

$$y = c + i + xm,$$

where c and i include private and public expenditures in consumption and investment respectively, and $xm = -tr^{UE}$.

[5] Accepting that all countries have access to the same technology (that is, a common A and g), differences in per capita income are proportional to differences in income in efficiency units. For simplicity, the relations between fiscal flows and income in this equation are linear. In section 4 we consider a more convenient log-linear relationship.

where s is the saving rate. As we focus on fiscal transfers and we want to compare our results with the standard growth model for a closed economy, we do not consider the possibility of borrowing on world markets as Barro, Mankiw and Sala-i-Martin (1995), although this extension, as well as the analysis of its implications upon the convergence rate, is straightforward.

Given the parameter values in the production function (1) the model exhibits exogenous growth. Therefore, changes in s or τ have only level effects on income measured in units of effective labour. In the steady state the growth rate of the variables in efficiency units is zero, that is:

$$\frac{\dot{k_g}}{k_g} = 0, \frac{\dot{k_p}}{k_p} = 0, y^{EU} = y^*,$$

therefore:

$$\ln k_g^* = \frac{1-\alpha}{1-\alpha-\beta} \ln \frac{\tau^{1-\alpha} [s(1-\tau)]^{\alpha} A}{\delta + g + n} \tag{6}$$

and

$$\ln k_p^* = \frac{\beta}{1-\alpha-\beta} \ln \frac{\tau^{\beta} [s(1-\tau)]^{1-\beta} A}{\delta + g + n}. \tag{7}$$

Given these values we can easily obtain the steady state income in efficiency units:

$$y^* = A^{\frac{1}{1-\alpha-\beta}} \left(\frac{\tau}{\delta+g+n}\right)^{\frac{\beta}{1-\alpha-\beta}} \left(\frac{s(1-\tau)}{\delta+g+n}\right)^{\frac{\alpha}{1-\alpha-\beta}},$$

as well as the output capital ratios:

$$\frac{y}{k_g} = \frac{\delta+g+n}{\tau},$$

$$\frac{y}{k_p} = \frac{\delta+g+n}{s(1-\tau)}.$$

By Taylor approximation of equations (4) and (5) we obtain:

$$\frac{\dot{k}_p}{k_p} = \widetilde{\delta}\left[-(1-\alpha) - \left[s(1-\tau)\phi_y + \phi_{k_p}\right]\frac{\alpha}{s(1-\tau)}\right](\ln k_p - \ln k_p^*) + \beta\widetilde{\delta}\left[1 - \left[s(1-\tau)\phi_y + \phi_{k_p}\right]\frac{1}{s(1-\tau)}\right](\ln k_g - \ln k_g^*),$$

and

$$\frac{\dot{k}_g}{k_g} = \alpha\widetilde{\delta}\left[1 - (\tau\phi_y + \phi_{k_g})\frac{1}{\tau}\right](\ln k_p - \ln k_p^*) + \widetilde{\delta}\left[-(1-\beta) - (\tau\phi_y + \phi_{k_g})\frac{\beta}{\tau}\right](\ln k_g - \ln k_g^*).$$

where $\widetilde{\delta} = (\delta + g + n)$.

Finally, using the production function, the convergence equation of per capita income ($\widetilde{y}$) to its steady state is given by:

$$\frac{\dot{\widetilde{y}}}{\widetilde{y}_t} = g - \lambda[\ln \widetilde{y}_{t-1} - \ln A - gt - \alpha \ln k_p^* - \beta \ln k_g^*] \tag{8}$$

where

$$\lambda = (1-\alpha-\beta)\widetilde{\delta} + \alpha\left[s(1-\tau)\phi_y + \phi_{k_p}\right]\frac{1}{s(1-\tau)} + \beta(\tau\phi_y + \phi_{k_g})\frac{1}{\tau}. \tag{9}$$

As we can see, if fiscal flows are not related with income ($\phi_y = \phi_{k_p} = \phi_{k_g} = 0$), then equation (9) simplifies to the usual convergence rate in an extended Solow model (see Barro and Sala-i-Martin (1996)):

$$\lambda = (1-\alpha-\beta)(\delta + g + n).$$

Now, it is possible to calibrate this model to evaluate the implications of these fiscal flows upon the convergence rate. In order to compare the performance of this model with the existing results in the literature, we have chosen conventional parameter values. In particular, as we want a convergence rate of 2 percent for the closed economy, we impose $\alpha + \beta = 2/3$ and $\delta = 0.03$, $g = 0.02$ and $n = 0.01$, the same values used by Mankiw,

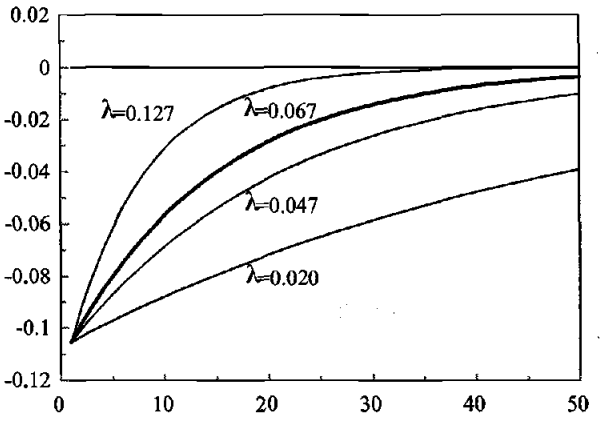

Figure 1: *Convergence paths to the steady state under different redistribution policies.*

Romer and Weil (1992). The choice of β is more problematic given the range in the estimates of public investment returns (see Gramlich (1994) and Sturm, Kaper and de Hann (1997)). In accordance with the estimations of Otto and Voss (1998) and De la Fuente (1997), we set β at 0.08. On the other hand, if we assume an optimal tax finance then τ should be equal to $\beta/(\alpha+\beta)$.[6] The saving rate has been set at 0.25, taking into account not only physical investment but also education and R&D expenditures. Finally, as we show in the next section, net transfers from the EU budget range from 2 to 6 percent of GDP for poorer countries in the EU. Therefore, we analyze different values of ϕ_{k_g}, ϕ_{k_p} and ϕ_y such that $\phi_{k_g}+\phi_{k_p}+\phi_y = 0.04$ and $y_0/y^{EU} = 0.90$.[7]

In Figure 1 we present the transitional dynamics of a country that is 10 percent below its steady state in four different environments. The first one is the closed economy environment in which $\lambda = 0.02$, that we use as a benchmark case. In the second one, we set $\phi_{k_g} = 0.01$, $\phi_{k_p} = 0.01$ and

[6] Since in this model τ has level but not growth effects, the optimal tax level is easily obtained by maximization of income in units of effective labour.

[7] Since A is only a scale parameter, we choose its value to satisfy $y^{UE} = 1.0$.

$\phi_y = 0.02$, obtaining a convergence rate equal to $\lambda = 0.0667$, that is, a value three times as high as the convergence rate in the closed economy case. In the third one, net transfers are only used in private capital accumulation, so $\phi_{k_p} = 0.04$ and $\phi_{k_g} = \phi_y = 0.0$. In this case, convergence rate is higher ($\lambda = 0.1267$) than in the previous environment. Finally, we assume that $\phi_{k_g} = 0.04$ and $\phi_{k_p} = \phi_y = 0.0$, that is, net transfers from the Union budget are only used in public capital accumulation, obtaining a convergence rate equal to 0.0467. Since the coefficients of ϕ_{k_g} and ϕ_y are equal in equation (9) when τ is set at its optimal level $\beta/(\alpha+\beta)$, the convergence rate is not affected by changes in ϕ_{k_g} holding $\phi_{k_g} + \phi_y$ constant. These convergence rates can also be increased if it is possible to finance the accumulation of private capital by borrowing from world markets, in the presence of some credit constraints as in Barro, Mankiw and Sala-i-Martin (1995) model, to avoid an infinite speed of convergence. It is worth noting that convergence rates larger than the traditional 2 per cent have been recently estimated in the empirical growth literature, as for example, in the contributions of Islam (1995), Caselli, Esquivel and Lefort (1996), and Lee, Pesaran and Smith (1997).

As a summary, the main properties of the model that we have presented are the following. First, because of the assumptions we have made, steady state income levels are not affected by redistribution policies. Second, as in any exogenous growth model, changes in the saving rate or in the income tax rate have only level effects upon long run per capita income levels, although they affect the rate of growth during the transition. Third, and more important, the convergence rate to the steady states is higher when ϕ_y, ϕ_{k_p} or ϕ_{k_g} are positive, even though for reasonable parameter values it is preferable to finance private capital accumulation. Given the importance of the values of these parameters upon convergence rates, in the rest of the paper we focus precisely on the analysis of the relationships between per capita income levels and country transfers from and contributions to the EU budget.

3. Data and preliminary evidence

In order to analyze the redistribution effects emanating from EU's budget policy, we need complete information about the geographic distribution of European revenues and the allocation of operating expenditure among EU member states. We duly note that a direct evaluation of these fiscal flows does not account for all the economic benefits the countries derive from the Union, since there are some important indirect gains that we do not explore, such as spillover effects stemming from, for example, the development of European transport networks.

With respect to the time dimension of the information used, this paper draws its conclusions from the budgetary information of the 1986 to 1996 period, in which the EU budget has exhibited important changes. It must be remembered that the political and institutional equilibrium of the Community's financial regime was being eroded from 1975 to 1987. This euroskeptic period was characterized by a stalled budget procedure and a rapidly growing gap between resources and expenditures in the EC. To solve this institutional crisis, an interinstitutional accord was approved in 1988, in which the European Parliament, the Council of Ministers and the Commission reached an agreement dealing with the budgetary procedures of the EU that made possible to define the main budgetary priorities for a multi-year period. The first agreement was reached in Brussels in February 1988 and it concerned the Financial Perspectives for the 1988 to 1992 period, the so-called Delors's package, which was closely related to the Single European Act. Taking into account that this programming tool was one of the most successful reforms, the European institutions reached a new institutional agreement in the European Council of Edinburgh in December 1992, the Delors II proposal.

As far as the raw data are concerned, there is a wide variety of sources providing accounting information about the European Union. Nevertheless, the most reliable information unanimously uses the Commission accounting system (SINCOM) as the source for data on resources and allocations. This is the system used by the *Annual Report* of the Court of Auditors and by the *Allocation of Operating Expenditure by Member State* of the European Commission, which constitute the most complete EU budget data sets.

In the Appendix we describe the technical details about the data finally used in this paper, that come from different issues of the *Annual Report* of the Court of Auditors. On the revenue side, given the relative magnitudes of the contributions of each member state to the EU budget, we classify the available information in four different groups: net traditional own resources, VAT and GNP revenues and total resources. The latter comprises aggregate resources coming from each member state, which also include the budget adjustments from the previous financial year and miscellaneous revenue. Similarly, on the expenditure side, in order to simplify our analysis, we only distinguish four different groups: the guarantee section of the European Agricultural Guarantee and Guidance Fund (EAGGF), Social Funds, Regional Funds and total expenditures. It should be noted that Regional Funds include structural actions but not the Cohesion Fund.

All the Courts of Auditors information is provided in current ECUs. As we discuss in the next section, given the econometric specifications that we use (variables are in logarithms and regressions include time dummies), working with current variables in ECUs is not a drawback. Nonetheless, from an economic point of view it is also relevant to conduct some of the analysis with variables expressed in PPPs, since they provide complementary information to gauge the economic gains that a given country gets from EU fiscal flows.

In Table 1 we present EU countries' fiscal flows from and contributions to the European budget, expressed as a percentage of their GDPs in 1996, the last year in our sample. As we can see, agricultural funds (x^{g}) represent less than 1 per cent of GDP at average level, but in the case of Greece and Ireland this percentage is around 3 percent. Greece is again the exception, jointly with Portugal, in the case of regional funds (x^{r}), that averages 0.34 percent. Social funds expenditures (x^{s}) only represent 0.15 percent, with Spain, Ireland and Portugal well above this average. The preceding magnitudes do not include the Cohesion Fund. When we compare total EU expenditures among member states (x^{G}), we can evaluate the importance of this fund relative to the GDP of the four poorest countries: Spain, Portugal, Greece and Ireland receive at least more than twice as much as any other EU country. When we focus on the contribution side, we get a very different picture. As far as the VAT contribution (x^{VAT}) is concerned, there are no clear outliers from the

EU average, with the exception of the United Kingdom, that is well below due to the British check or compensation introduced in the 1984 Fontainebleau summit.[8] As expected, the GNP contribution (x^{GNP}) of each member state in GDP percentage points is approximately the same, being the EU average 0.32 percent. With respect to own traditional contributions (x^{own}), there is more variability among member states, notably because the performance of Belgium and the Netherlands, that are well above the EU average, due to the importance of international trade with non-EU members. When we aggregate these revenues, total contributions as percentage of the GDP (x^{T}) range from 0.91 of the United Kingdom and 1.44 in the case of the Netherlands. Finally, the net financial balance in terms of the GDP (x^{G-T}) shows that Ireland, Greece, Portugal and, to a lesser extent, Spain are the main beneficiaries of the EU budget, while the Netherlands, Germany and Luxembourg present the largest transfers as a share of their domestic production.

In Figure 2, 3 and 4 we present some preliminary evidence of the relationship between per capita income and the different categories of revenues and expenditures of the EU budget, as well as the final balance for each country in per capita terms in the final year of our sample expressed in ECUs (in thousands).[9] Per capita magnitudes make comparisons easier because they remove scale effects.

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[8] The British check is the United Kingdom's abatement to its EU budget contribution calculated as two-thirds of the difference between its VAT share and its EU allocated expenditure share.

[9] Per capita income is defined as the ratio of GDP to population. Data for these variables, as well as for PPPs, come from OECD's *National Accounts* and *Purchasing Power Parities and Real Expenditures, Volume I 1993.*

Table 1

Principal EU budget magnitudes as a percentage of the GDP for each member

Country	Code	Expenditures				Resources				
		x^{ag}	x^{r}	x^{s}	x^{G}	x^{VAT}	x^{GNP}	x^{own}	x^{T}	x^{G-T}
Austria	A	0.67	0.01	0.05	0.88	0.58	0.31	0.16	1.03	-0.15
Belgium	B	0.56	0.03	0.06	0.96	0.52	0.33	0.53	1.32	-0.36
Germany	D	0.38	0.09	0.05	0.62	0.72	0.36	0.24	1.30	-0.68
Denmark	DK	0.97	0.00	0.04	1.10	0.49	0.28	0.21	0.97	0.14
Spain	E	0.89	0.46	0.39	2.30	0.56	0.29	0.15	0.99	1.31
Finland	SF	0.66	0.03	0.04	1.01	0.51	0.32	0.17	0.98	0.03
France	F	0.79	0.05	0.05	0.99	0.59	0.31	0.14	1.03	-0.04
United Kingdom	GB	0.38	0.09	0.10	0.65	0.28	0.33	0.33	0.91	-0.25
Greece	GR	2.98	1.43	0.13	5.37	0.65	0.37	0.18	1.18	4.19
Ireland	IRL	3.21	0.69	0.58	5.61	0.65	0.31	0.43	1.34	4.27
Italy	I	0.44	0.22	0.03	0.79	0.52	0.30	0.12	0.93	-0.15
Luxembourg	L	0.15	0.00	0.03	0.65	0.75	0.36	0.16	1.26	-0.61
Netherlands	NL	0.50	0.01	0.06	0.64	0.59	0.32	0.58	1.44	-0.79
Portugal	P	0.77	1.90	0.64	4.38	0.61	0.31	0.18	1.08	3.30
Sweden	S	0.32	0.01	0.01	0.61	0.51	0.29	0.22	1.00	-0.38
Average EU		0.91	0.34	0.15	1.77	0.57	0.32	0.25	1.2	

As we can see in Figure 2, there is a negative relationship between total expenditure and income, but with appreciable differences between the expenditure categories considered. Thus, agricultural funds have no clear pattern when we exclude Ireland and Greece from the sample. Among richer countries, Denmark could also be considered an outlier since, in per capita terms, it is receiving above twice as much funds as other countries with similar income. Likewise, in the case of social funds, Ireland, Portugal and Spain are the main beneficiaries of these policies. In principle, although all countries benefit from transfers in form of regional funds, only five countries (Portugal, Greece, Ireland, Spain and Italy) receive funds by more than 0.1 per cent of their GDP. Redistribution is intensified when we consider the Cohesion Fund that benefits Ireland, Portugal, Greece and Spain.

The results we obtain when we analyze the revenue side are completely

different. As we can see in Figure 3, per capita contributions to the EU budget increase almost monotonically with per capita income. However, it is worth emphasizing some outstanding facts. Firstly, the value added tax contribution of the United Kingdom is well below the estimated relationship, because of the British check. Secondly, current GNP contributions are not completely explained by current per capita incomes.[10] Thirdly, traditional contributions are less related to income than other types of revenues. This is due to the performance of the Netherlands and Belgium and, to a lesser extent, to that of Ireland and the United Kingdom. The former case is explained by the so called "Rotterdam effect" which states that in small open economies the EU's traditional own resources contribution is large, in per capita terms, due to the fact that they are foreign trade oriented and non EU goods pay duties in the place where they are introduced in the Community's territory and not necessarily in the country where they are consumed.

Finally, in Figure 4 we can see there is a clear negative relationship between income and the net financial balance of each country. Given that total contributions are mainly proportional to income, this picture is not too different from the one relating income to total expenditures. The four poorest countries receive substantial transfers from the EU budget, while richer countries, with the exception of Denmark, are net contributors.

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[10] In principle, GNP contributions must be strictly proportional to the GNP levels, that in most European countries are fairly similar to their GDPs. However, on a cash basis, this may not happen for a given year t since these contributions are subject to ex-post adjustments due to several factors such as revisions in GNP estimates or differences between the exchange rates in February $t-1$, used in the EU budget for year t passed by the EU Parliament, and the exchange rates in December $t-1$, which is the one finally used to make the payments in year t. It is worth noting that in Figure 3, GNP contributions for year t are calculated using GNP forecasts made at $t-1$ while GDPs per capita refer to final levels in t.

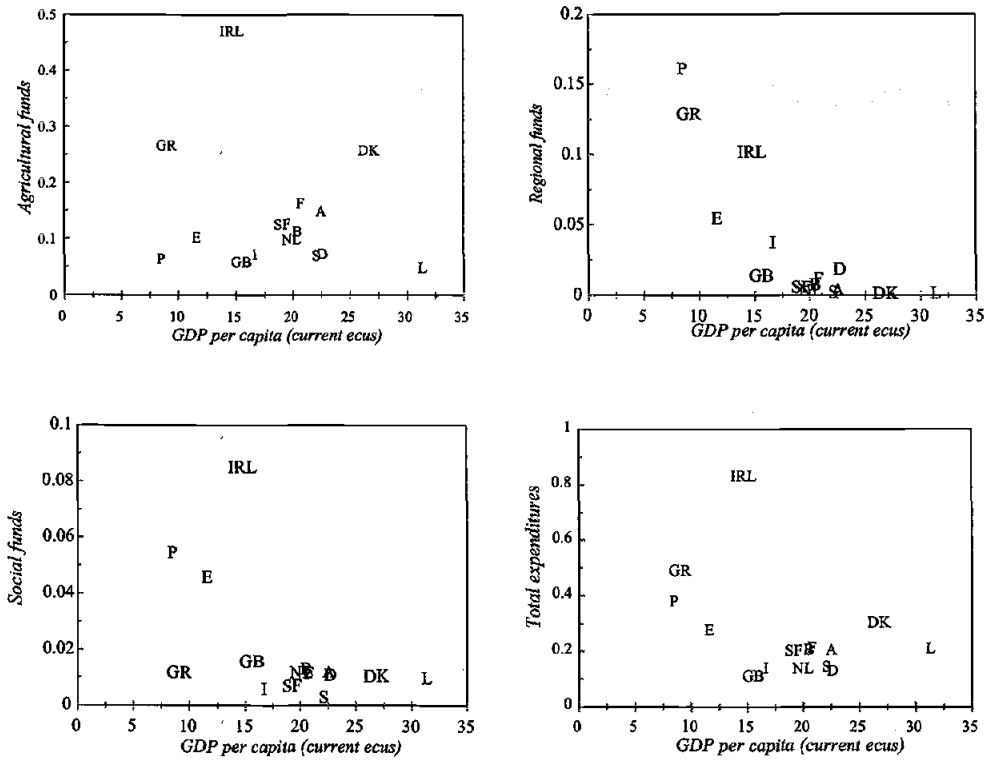

Figure 2: *EU budget flows accruing to member states in 1996 by main expenditure types in per capita terms (thousands of ECUs).*

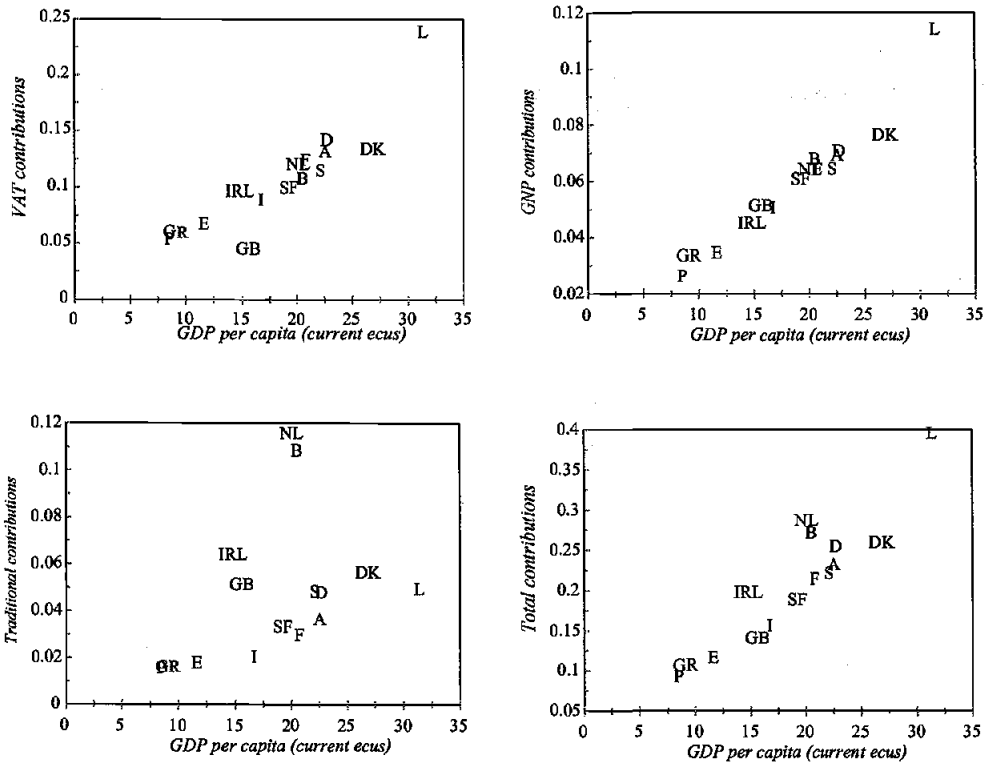

Figure 3: *EU budget receipts comming from member states in 1996 by main revenue types in per capita terms (thousands of ECUs).*

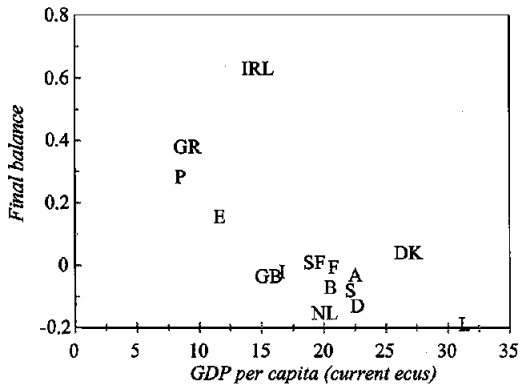

Figure 4: *Final balance against income in 1996, both in per capita terms (thousands of ECUs).*

4. Econometric results

In this section we further explore the relationships between per capita income levels and country transfers from and contributions to the EU budget that, as we have seen in the second section are crucial to quantify the effects upon convergence rates to countries' steady states. We do not perform a formal test of our model. Instead, to evaluate the redistributive effects of the fiscal flows we estimate the following regressions:

$$\ln \widetilde{x}_{it}^{j} = \gamma_{0t}^{j} + \gamma_{1t}^{j} \ln \widetilde{y}_{it} + \varepsilon_{it}, \tag{10}$$

where $\widetilde{y}_{it}$ is per capita income of country i in year t, $\widetilde{x}_{it}^{j}$ are the different categories of transfers and revenues considered in per capita terms, and $t = 1985, ..., 1996$. In these equations the coefficients of $\ln \widetilde{y}$ are elasticities with the traditional interpretation: if $\gamma_{1t}^{j} = 1$ and per capita income in a given country increases by 10 per cent, then its per capita transfer or contribution j increases also by 10 per cent. By estimating cross-sectional regressions in different years, we can analyze the stability of the coefficients of $\ln \widetilde{y}$. If these coefficients remain constant across periods we can impose the restriction $\gamma_{1t}^{j} = \gamma_{1}^{j}$, allowing the estimation of an equation with different intercepts using pooled data. Another possibility is that γ_{1t}^{j} may show a trend pattern. In this case we can estimate the following equation using again pooled data:

$$\ln \widetilde{x}_{it}^{j} = \gamma_{0t}^{j} + \gamma_{1}^{j} \ln \widetilde{y}_{it} + \gamma_{2}^{j} \ln \widetilde{y}_{it}\, t + \gamma_{3t} d_t + \varepsilon_{it}, \tag{11}$$

where d_t are time dummies. If γ_{2}^{j} is positive (negative) the elasticity of $\widetilde{x}^{j}$ with respect to $\widetilde{y}$ increases (decreases) when moving from 1986 to 1996.

The acceptance of these hypotheses opens the possibility of testing other kind of restrictions once we have sufficient degrees of freedom. For example, pooled regressions allow to analyze the sensitivity of our results to the exclusion of some countries. These exercises are interesting because we can analyze the importance of redistributing EU budget flows when we exclude from the sample clear outliers, if they exist, or countries that benefit exceptionally from Community transfers, as well as countries that have recently become EU members. In the latter case, we can test whether the enlargement of the European Community to Austria, Finland and Sweden in 1995 has implied any change upon the redistributive effects of fiscal flows

between prior members, from which we may infer some lessons to future enlargements.

Besides the differences in the data used (fiscal flows between EU countries instead of regional or state data for the United States or Canada), our approach differs somewhat from other related researches in the literature. Bayoumi and Masson (1995) implement a strategy consisting in running different regressions with pooled data from 1969 to 1986, both in growth rates and in levels to analyze fiscal stabilization and long term redistribution respectively. In their article the regressor is per capita personal income, before federal taxes and transfers, and dependent variables are different combinations of personal income after taxes and before or after social insurance, transfers or grants. They also test for the stability of their results for three subperiods, with no evidence of statistically significant changes in the estimated coefficients. Although the approach of von Hagen (1992) is more similar to ours because the main regressor is real gross state products and dependent variables are real federal income taxes and expenditures, he mainly focuses on regressions in growth rates using data for the period from 1981 to 1986 and estimates a system of seemingly unrelated regressions with one equation for each year. Finally, Sala-i-Martin and Sachs (1992) estimate one equation for each region relating relative (to the US) real income to relative taxes and transfers for the sample period 1978-88, in per capita terms, rejecting the hypothesis of regional equality in transfers responses to income but not in taxes responses to income. Instead of holding constant the elasticities across countries (as von Hagen (1992)) or across periods (as Sala-i-Martin and Sachs (1992)), we analyze the sensitivity of our results to changes in the sample in both directions.

In Figure 5 we show the OLS estimated values of γ_{1t}^{j} in equation (10) and their confidence intervals for the expenditure side using variables in ECUs.[11] The estimated coefficients for agricultural funds (γ_{1t}^{ag}) show a slight downward trend from 1986 to 1992 and subsequently they stabilize around a value of -0.60, although we cannot reject the hypothesis that γ_{1t}^{ag} are all equal to zero. In the case of regional funds (γ_{1t}^{r}), these coefficients are negative

[11] Confidence intervals do not change very much when we use White's heterokedasticity correction.

and statistically significant and there is a clear downward trend from 1986 to 1996. These findings indicate not only that regional funds are negatively related with per capita income but also that this redistributive effect has increased over time. Social funds' coefficients (γ_{1t}^{s}) are also negative and statistically significant for most of the years, although their redistributive effects remain practically constant around a smaller value in absolute terms (-1.42) than that for regional funds. Finally, total expenditures show a negative relationship with per capita income. The estimated coefficients (γ_{1t}^{G}) are not statistically different from zero but, with the exception of 1986 and 1994, they are statistically different from 1.0. The average value of γ_{1t}^{G} is equal to -0.37, implying that on average a 1 percent increase in a country's per capita income decreases the per capita funds it receives from the EU budget by 0.37 percent.

In Figure 6 we present a similar exercise for the revenue side of the EU budget. The estimated coefficients of VAT contributions (γ_{1t}^{vat}) are, in general, not statistically different from one.[12] GNP contributions started in 1990, although in that year this resource had a negligible importance because it only represented on average 0.62 percent of countries' total contributions. This explains that our regressions initiate in 1991. In this year, and also in 1992, the coefficients of GNP contributions (γ_{1t}^{GNP}) are statistically significant and larger than one, implying that in those years this resource was not proportional to income. Nonetheless, in successive years we can safely accept the hypothesis of proportionality. The coefficients of own traditional resources (γ_{1t}^{own}) are in general less than 1.0 (the average value is 0.92), although they are not statistically different from this value. Finally, the elasticity of total contributions to income in per capita terms (γ_{1t}^{T}) is on average equal to 1.04, and we can accept again that this elasticity is time invariant and equal to 1.0, that is, if a country's per capita income increases by 1 percent its total per capita contribution to the EU budget increases by the same amount.

In summary, we have found that per capita contributions increase proportionally to per capita income as a country becomes richer, but the Community funds received remain constant or even decrease. This result

[12] The exception is 1987, although in this case we can accept the hypothesis $\gamma_i^{vat} = 1.0$ at a 10 percent significant level.

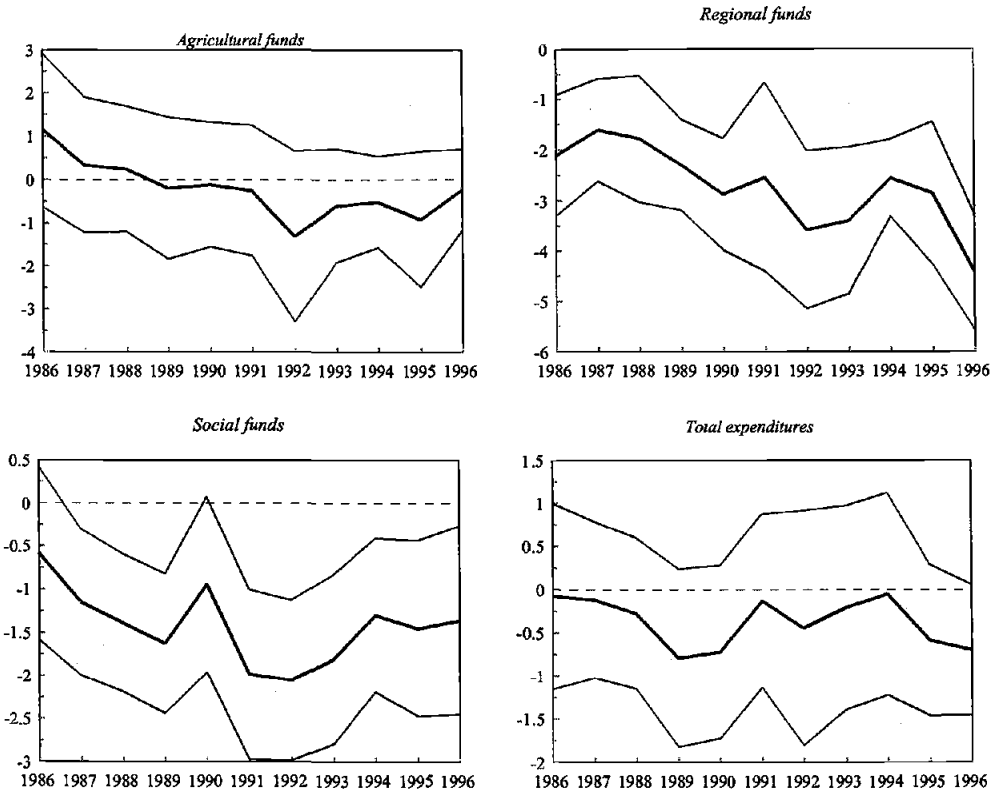

Figure 5: *Estimated values of γ_{it} and their confidence intervals at 95 percent for different expenditure categories.*

implies that the EU budget has a clear redistributive effect on the income of its members in per capita terms, and that this effect is driven by expenditure criteria but not by revenue ones. Figure 7 summarizes these findings and shows the estimated coefficient ϕ_1 in the following regression:

$$\ln \widetilde{y}_{it} = \phi_0 + \phi_1 \ln(\widetilde{y}_{it} - \widetilde{x}_{it}^{G} + \widetilde{x}_{it}^{T}) + \upsilon_{it} \tag{12}$$

where ϕ_1 is the elasticity of the observed per capita GDP to income before transfers from and taxes to the European Union. The interpretation of this coefficient is straightforward. If $\phi_1 = 1$ fiscal flows among EU members have no redistributive effects, while if $\phi_1 < 1$ the EU budget reduces per capita income in rich countries and increases that of poor ones.

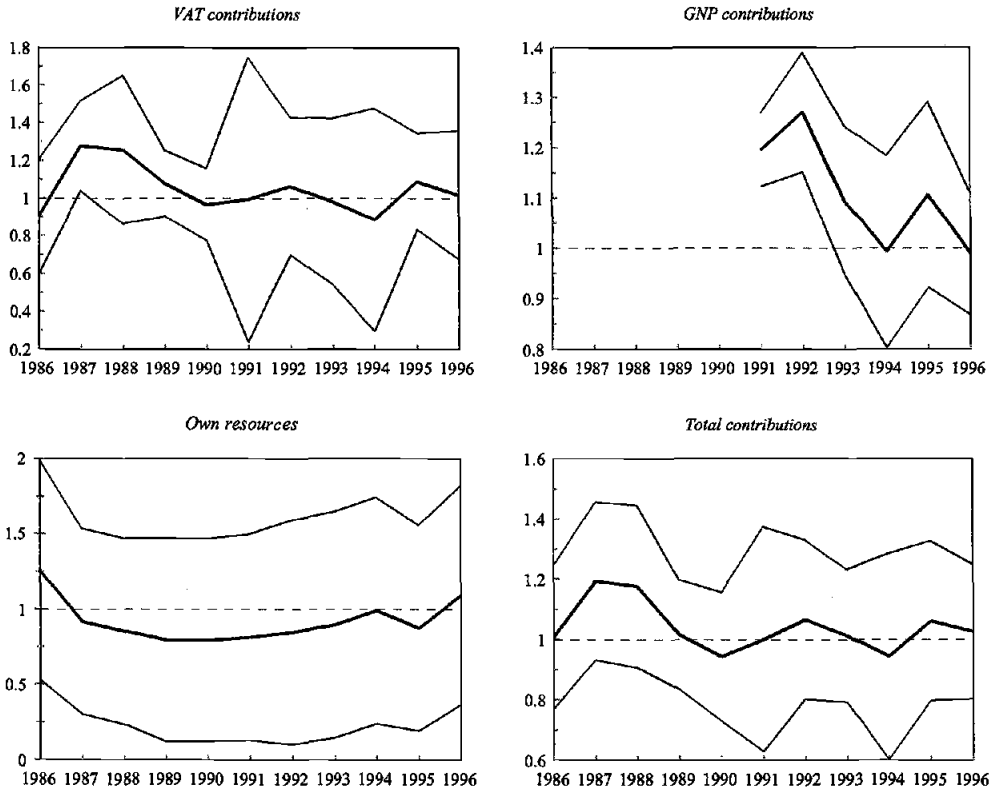

Figure 6: *Estimated values of γ_{it} and their confidence intervals for different countries' contributions to the EU budget.*

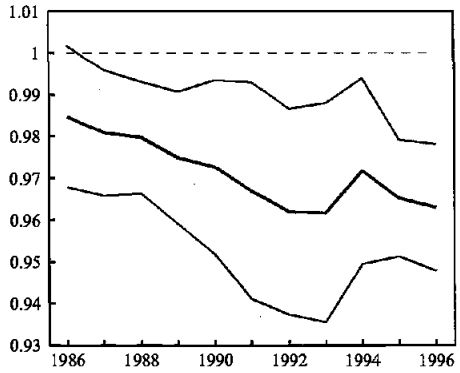

Figure 7: *Estimated values of coefficient ϕ_1 in equation (12).*

In Table 2 we present the estimated values of γ_1^j and γ_2^j in equation (11) for the four categories of expenditures and revenues, expressed in ECUs and in per capita terms.[13] The first three columns of results refer to the current fifteen EU members. At the beginning of our sample, agricultural funds were positively correlated with income although the negative value of γ_2^{ag} implies that these funds became negatively correlated with income after 1988. This result was also pointed out by Figure 5. As we can see, γ_2^j is also significant for regional and social funds, having in both cases a negative sign. The trend in the coefficients of these variables is no longer present when we consider total expenditures, confirming again the results displayed in Figure 5. It is also meaningful to note that the coefficient of γ_1^G is negative although not different from zero.

When we exclude Ireland from these regressions we find that γ_1^j increases for the four expenditure categories. The differences between the estimates in column (5) and (2) give an approximation to the magnitudes of the specific budgetary benefits for this country. In the case of Luxembourg we find mixed results. The exclusion of this country increases the positive elasticity between agricultural funds and income (through γ_1^{ag}, that becomes

[13] These regressions include time dummies for each year in the sample. The inclusion of these dummies has the advantage that, as variables appear in logarithms, we do not need to express them in constant terms (e.g., using a GDP deflactor for the EU).

higher than 1.0), but, with the exception of 1986, also decreases the elasticity between regional funds and income (through the increase in the absolute value of γ_2^r). In other words, the exclusion of Luxembourg increases the redistribution effects of regional funds but decreases those of agricultural funds. Finally, when comparing the results for the EU15 with those of the EU12 we do not find any remarkable difference, suggesting that the enlargement in 1995 of the EU did not have any effects upon fiscal flows between European countries and the EU budget.

On the revenue side, the comparison of the results for the four country samples considered does not yield any noteworthy difference, with the exception of the own traditional resources coefficient that increases notably (by 20 percent) when we exclude Luxembourg. Although Luxembourg is a small open economy, the Rotterdam effect does not apply because most of its imports coming from non EU countries enter the Union through foreign customs.

In Table 3 we present the same kind of estimations with variables expressed in PPPs. The overall results of the comparisons across country samples remain valid. However, there are some interesting variations in the estimated coefficients of equation (11) when we change from variables in ECUs to variables in PPPs. In general, there is a stronger negative correlation between per capita expenditure variables and income. Agricultural funds are negatively correlated with income from the beginning of the sample, and the estimated coefficients for the other two funds and for total expenditures are larger in absolute value. On the revenue side, the estimated coefficients are slightly higher but, interestingly, per capita income explains a smaller variance of per capita contributions to the EU budget. This result suggests that the financing of the Community budget takes into account differences in countries' per capita incomes using current exchange rates of national currencies to ECU, while expenditures are based upon income differentials after accounting for disparities in price levels.

Another way of analyzing the implications of using current exchange rates or PPPs is through the estimation of equation (12) twelve times (given the insufficient number of observations we exclude Austria, Finland and Sweden from this analysis), including a single country dummy each time. In Figure 8 we present the estimated values of these dummies using both

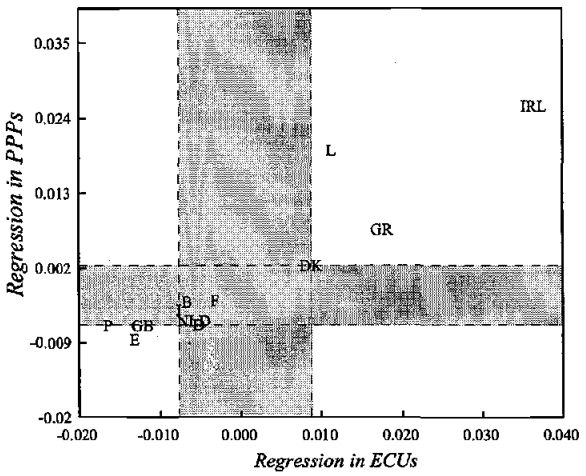

Figure 8: *Estimated values of country dummies in equation (12).*

types of conversion rates. Countries outside the grey areas have statistically significant dummies. Only in two countries is the dummy significant using one of the two variables: the dummies for Portugal and United Kingdom are statistically significant when we express variables in ECUs but not in PPPs. In other cases, there are some differences in the estimated values of country dummies. Thus, the ranking of countries that specially benefit from the EU budget in per capita terms (Ireland, Greece and Luxembourg), after accounting by per capita income differentials, changes when we use variables expressed in PPPs instead of in ECUs. Something similar happens in the ranking of countries for which the estimated dummies are negative (Portugal, Spain and United Kingdom).

Table 2

Redistribution through fiscal flows. Variables in ECUs

	EU15			EU15-IRL		EU15-LUX		EU12	
	γ_1^j	γ_2^j	R^2	γ_1^j	γ_2^j	γ_1^j	γ_2^j	γ_1^j	γ_2^j
$\ln \widetilde{x}_{it}^{ag}$	0.56	-0.16	0.10	0.76	-0.16	1.27	-0.19	0.51	-0.14
	(1.43)	(2.28)		(2.06)	(2.44)	(3.75)	(3.12)	(1.34)	(2.01)
$\ln \widetilde{x}_{it}^{r}$	-1.76	-0.19	0.64	-1.62	-0.19	-1.75	-0.25	-1.79	-0.17
	(5.33)	(3.17)		(5.19)	(3.24)	(5.85)	(4.66)	(5.36)	(2.87)
$\ln \widetilde{x}_{it}^{s}$	-0.01	-0.01	0.33	-0.01	-0.01	-0.01	0.01	-0.01	-0.01
	(1.61)	(2.60)		(2.04)	(5.26)	(1.30)	(2.85)	(1.68)	(2.49)
$\ln \widetilde{x}_{it}^{G}$	-0.23	-0.03	0.22	-0.07	-0.03	0.15	-0.13	-0.25	-0.03
	(0.86)	(0.72)		(0.30)	(0.82)	(0.62)	(3.08)	(0.91)	(0.43)
$\ln \widetilde{x}_{it}^{VAT}$	1.11	-0.01	0.76	1.12	-0.01	1.04	-0.02	1.11	-0.01
	(11.2)	(0.76)		(10.7)	(0.68)	(10.5)	(1.22)	(10.9)	(0.67)
$\ln \widetilde{x}_{it}^{GNP}$	1.44	-0.04	0.97	1.41	-0.04	1.50	-0.06	1.42	-0.04
	(10.5)	(2.61)		(10.0)	(2.39)	(10.5)	(3.24)	(9.92)	(2.29)
$\ln \widetilde{x}_{it}^{own}$	0.96	-0.01	0.43	1.01	-0.01	1.18	-0.01	0.94	0.01
	(5.42)	(0.26)		(5.71)	(0.15)	(6.67)	(0.47)	(5.23)	(0.03)
$\ln \widetilde{x}_{it}^{T}$	1.09	-0.01	0.89	1.11	-0.01	1.09	-0.02	1.09	-0.01
	(16.4)	(0.91)		(16.4)	(0.91)	(15.1)	(1.37)	(16.0)	(0.70)
Obs.[a]	138			127		127		132	

(a) Sample period 1986-96, except for $\ln \widetilde{x}_{it}^{GNP}$, 1991-96.

Table 3

Redistribution through fiscal flows. Variables in PPPs

	EU15			EU15-IRL		EU15-LUX		EU12	
	γ_1^J	γ_2^J	R^2	γ_1^J	γ_2^J	γ_1^J	γ_2^J	γ_1^J	γ_2^J
$\ln \widetilde{x}_{it}^{ag}$	-1.34	-0.09	0.23	-0.76	-0.14	0.49	-0.25	-1.35	-0.09
	(2.29)	(0.96)		(1.26)	(1.35)	(0.76)	(2.18)	(2.42)	(0.95)
$\ln \widetilde{x}_{it}^{r}$	-3.59	-0.19	0.54	-3.42	-0.17	-4.60	-0.35	-3.60	-0.18
	(5.23)	(1.57)		(4.74)	(1.40)	(7.32)	(3.12)	(5.37)	(1.56)
$\ln \widetilde{x}_{it}^{s}$	-2.81	0.01	0.54	-2.33	-0.02	-3.45	-0.06	-2.81	0.01
	(6.59)	(0.05)		(5.98)	(0.34)	(7.29)	(0.66)	(6.97)	(0.04)
$\ln \widetilde{x}_{it}^{G}$	-1.87	0.10	0.31	-1.48	0.07	-1.31	-0.17	-1.88	0.09
	(4.49)	(1.21)		(3.56)	(0.97)	(3.27)	(2.38)	(4.50)	(1.26)
$\ln \widetilde{x}_{it}^{VAT}$	1.26	-0.03	0.56	1.33	-0.03	1.03	-0.05	1.27	-0.03
	(7.57)	(0.94)		(7.19)	(1.08)	(5.44)	(1.41)	(7.41)	(0.94)
$\ln \widetilde{x}_{it}^{GNP}$	1.63	-0.06	0.96	1.57	-0.06	1.92	-0.11	1.61	-0.06
	(7.34)	(2.06)		(6.78)	(1.82)	(7.15)	(3.17)	(7.05)	(1.94)
$\ln \widetilde{x}_{it}^{own}$	0.59	0.03	0.17	0.79	0.02	1.28	0.01	0.58	0.03
	(1.99)	(0.55)		(2.49)	(0.34)	(3.75)	(0.03)	(1.92)	(0.64)
$\ln \widetilde{x}_{it}^{T}$	1.13	-0.01	0.74	1.24	-0.02	1.11	-0.03	1.13	-0.01
	(9.98)	(0.54)		(10.3)	(1.08)	(8.00)	(1.07)	(9.82)	(0.49)
Obs.[a]	138			127		127		132	

(a) Sample period 1986-96, except for $\ln \widetilde{x}_{it}^{GNP}$, 1991-96.

5. Conclusions

In this paper we have analyzed the redistributive effects of the EU general budget. This issue is particularly important because redistribution policies are nowadays of greater importance in the EU budget. In fact, when the Maastricht Treaty was signed it was also decided to reduce some of the existing economic disparities that could be deepened by EMU.

Redistribution policies imply transferring income among members to alleviate persistent differences in per capital income levels and, as our growth model shows, these policies can increase the speed of convergence of beneficiary countries to common steady states. However, the small size of the EU budget limits the magnitude of these effects. In any case, it must be understood that these policies do not account for all the gains EU countries derive from the Union.

Using EU budget data on a cash basis from 1986 to 1996, we obtain as the main result that EU budget has a redistributive character, though only on its expenditure side. For instance, the elasticity of total per capita expenditure in current ECUs with respect to per capita income is less than one with a point estimate of -0.23 for the EU15, although not statistically different from zero. Of all expenditure categories we do consider, the most redistributive one is the regional fund, followed by the social fund and by the guarantee section of the EAGGF. All of them become increasingly redistributive in time. These findings do not basically change when the regressions are run in PPPs. Nonetheless, they are altered when we exclude some countries from the sample. For example, excluding Ireland greatly reduces the redistributive ower of the expenditures, since all the elasticities of the four expenditure categories increase. Likewise, if we exclude Luxembourg from the sample, the common agricultural policy becomes regressive.

As far as total budgetary revenues are concerned, they show proportionality with income. Surprisingly, the only exception seems to be the GNP resource, which apparently shows a redistributive effect in the early nineties, but at the end of the period it has a unit elasticity.

Finally, when we consider the net financial balance, we identify three groups of countries. Firstly, those that benefit by more than what would correspond with their per capita income level. Secondly, those whose per

capita financial balance is in line with their per capita income level. It is interesting to note that, surprisingly, in this group we find some of the countries that are questioning the current system of distribution policies implied by the EU budget. The third group comprises those countries which get a poorer treatment.

There are several natural extensions to the findings of this paper. First, although we have analyzed the redistributive effects of EU budget at national level, most fiscal policies in the expenditure side are determined by principles of regional cohesion and solidarity. Certainly, some revenues can not be easily redistributed at regional level and, therefore, this kind of analysis would be only partial. A second possible extension is related to the analysis of level and growth effects for the EU as a whole of these redistributive policies. Our model could be easily modified to consider some kind of spillover effects across countries which can not only affect the convergence paths but also the steady state levels of European countries. Thus, at empirical level, instead of looking for the winners and the losers of these policies, it is also relevant to study if redistribution has also positive effects upon countries that are net contributors in the EU budget.

6. Appendix: EU budget data.

As stated in section 3, the data used in this paper come from different issues of the *Annual Report* of the Court of Auditors. These reports pave the way for the discharge procedure, regulated in Article 206 of the EC Treaty and in Article 89 of the Financial Regulation of December 21, 1977, applicable to the General Budget of the European Community. The Annual Report of the European Court of Auditors has greatly changed during the last twenty years affecting, therefore, the choice of the variables to keep a homogeneous data structure during our sample period. The latest available report concerns the financial year 1996. This report consists of two volumes, the first one dealing with the financial activities developed in the General Budget, the Sixth and Seventh European Development Funds and the financial instruments and banking activities. All the data used in the rest of the paper come exclusively from the information about the General Budget available in the first volume.

On the revenue side, data are provided on a cash basis, that is, own resources which were made available to the EU budget. This information may differ from the entitlements figures to the extent to which national procedures do not ensure that, in accordance with Community legislation, members' debts are entered in the accounts at the appropriate time. There are other reasons accounting for the difference between the reported figures and the entitlements, for instance, the existence of separate accounts or B-accounts in member states, the write-off of established entitlements, or differences in the tariff classification among others. Community revenue could be summarized in four main resources:

1. *Net traditional own resources*, less collection costs, which represented 16.7 percent of total actual revenues in 1996. These resources comprise customs duties (86.6 percent of gross traditional own resources), agricultural duties (5.4 percent of total) and sugar and isoglucose levies (8 percent).
2. The own resource based on *value-added tax* (VAT) amounted to 45 percent of actual revenue in 1996.
3. *GNP resources* that amounted to 26 percent of actual revenue in 1996.
4. The *surplus* from the previous financial year and miscellaneous revenue, representing 12,5 percent of actual revenue in 1996.

On the expenditure side, the data used in this paper refer to actual pay-

ments, either the same year of EU budget appropriations or to commitments made in the preceding years. The allocation of the operating expenditure follows the Court of Auditors' system. Operating expenditure can be defined, following Article 19.1 of the Financial Regulation, as the expenditure for policies by the European Commission included in Part B, that is, one of the accounting sections of the EU General Budget. Therefore, administrative expenditure, which is contained in Part A of the budget, is excluded; as well as the expenditure relating to the remaining European Institutions. Once defined operating expenditure, we should address the problem of allocating these expenditures among member states. h ere are two alternatives. The first one is applied in the calculation of the UK correction (COM 85/36 final), in which all operating expenditure is allocated among member states, with just two exceptions: expenditures that benefit recipients outside the Union and expenditures being too difficult or impractical to allocate. The second one is used in the elaboration of the data supplied by the Court of Auditors that allocates part of external expenditures in non EU countries among member states.

The Court of Auditors publishes figures of expenditure allocated by Member State for the following categories:

1. Price and markets *common agricultural policy* (that is, the guarantee section of the European Agricultural Guarantee and Guidance Fund, EAGGF, subsection B1).
2. *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.
3. *Research and technological development* (subsection B6).
4. *External policies* (subsection B7).
5. *Other measures* (subsection B3, B4 and B5).

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