Fiscal Flows in Europe: the Redistributive Effects of the EU Budget

By

Rafael Doménech, Antonio Maudes and Juan Varela

Contents: I. Introduction. - II. Some Theoretical Issues. - III. Data and Preliminary Evidence. - IV. Econometric Results. - V. Conclusions

I. 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 questions 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 was 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),

---

Remark: This paper has benefited from the valuable suggestions by José E. Boscá, Alberto Cerdán, Teresa Dabán, Ana de la Fuente, Angel de la Fuente and an anonymous referee, and the comments of the participants at FEDEA, UAB, UCB, UCM, II EEA and MEH seminars. R. Doménech acknowledges the financial support of CICYT SEC99-0820 and Instituto de Economía Internacional (UV-EG). Address for comments: R. Doménech, Dpto. Análisis Económico, Universidad de Valencia, 46022-Valencia (SPAIN). e-mail: rafael.domenech@uv.es.

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 objectives have not only implied a firm political will by the Commission, but they have also been reflected in the treaties signed by member countries. 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.

This paper contributes in several respects to the existing literature on the analysis of fiscal policy in the EU. First, we present an exogenous growth model which allows us to simulate some of the effects of these policies upon the convergence process. Second, and probably more important, we use EU budget data. As far as we know, this is the first attempt to evaluate the redistributive effect of fiscal policy in Europe, through the usual econometric setup implemented to analyze the evidence in the United States and Canada, with this kind of data which make it possible to distinguish between different classes of revenues and expenditures.[1] Third, we provide a systematic examination of the correlations between EU budget aggregates for each country and relative income from 1986 to 1998. 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 upon redistribution policies. Fourth, 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.

[1] There are in the literature other papers that use this kind of data, although with different purposes or approaches. For example, Martín (2000) uses data from the *Annual Report* of the Court of Auditors to compute Gini coefficients in 1986 and 1996, showing that redistribution is mainly achieved through the regional fund.

II. 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 favored 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.

Since European redistribution policies aim to accelerate the transition of backward economies to richer countries, the neoclassical growth model with exogenous growth can be extended conveniently to analyze this kind of policies.[2] The way in which we cope with this question is by 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 somewhat similar to the one proposed by Barro et al. (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.[3] 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 for all Union countries.[4]

---

[2] As Temple (1999) has pointed out, it is difficult, at the empirical level, to distinguish between endogenous growth and long transitional dynamics in a model of exogenous growth. In our case, it is important to notice that this redistribution policies do not aim to have permanent effects upon growth rates.

[3] 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.

[4] 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

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

$$Y = AK_p^a K_g^b \left(Le^{gt}\right)^{1-a-b} \qquad (1)$$

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 et al., 1992 or Nonneman and Vanhoudt, 1996), K_g is the public capital stock, L is labor supply, and g is the exogenous rate of growth, A is a technology scale parameter, $a>0$, $b>0$ and $a+b<1$.

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

$$y = Ak_p^a k_g^b \qquad (2)$$

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

Now, we assume that, in units of effective labor, all transfers from and contributions to the federal budget tr^{UE} can be synthesized by three different kinds of flows.[5] 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 labor 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: [6]

---

simplicity can be relaxed to allow for the existence of small differences in the per capita incomes of the Union countries.

[5] 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 $xm=- tr^{UE}$.

[6] 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.

$$tr^{EU} = tr_{k_g}^{EU} + tr_{k_p}^{EU} + tr_y^{EU} = \left(f_{k_g} + f_{k_p} + f_y \right)\left(y^{EU} - y \right) \qquad (3)$$

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

$$\dot{k}_g = t\left[y + f_y \left(y^{EU} - y \right) \right] - (n + g + d)k_g + f_{k_g}\left(y^{EU} - y \right) \qquad (4)$$

where t is the income tax rate, n is the growth rate of labor and d is the depreciation rate. As we can see, if $f_y>0$ and $f_{kg}>0$ 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:

$$\dot{k}_p = s(1-t)\left[y + f_y \left(y^{EU} - y \right) \right] - (n + g + d)k_p + f_{k_p}\left(y^{EU} - y \right) \qquad (5)$$

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 et al. (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 t have only level effects on income measured in units of effective labor. In the steady state the growth rate of the variables in efficiency units is zero, $y^{EU}=y^*$ and income in efficiency units is given by:

$$y^* = A^{\frac{1}{1-a-b}} \left(\frac{t}{d+g+n} \right)^{\frac{b}{1-a-b}} \left(\frac{s(1-t)}{d+g+n} \right)^{\frac{a}{1-a-b}} \qquad (6)$$

Finally, using the production function, by Taylor approximation of (4) and (5) we can obtain the convergence equation of per capita income ($\tilde{y}_t$) to its steady state:

$$\frac{\dot{\tilde{y}}}{\tilde{y}_t} = g - l\left[\ln \tilde{y}_{t-1} - \ln A - gt - a \ln k_p^* - b \ln k_g^*\right] \qquad (7)$$

where

$$l = (1-a-b)\tilde{d} + a\left[s(1-t)f_y + f_{k_p}\right]\frac{\tilde{d}}{s(1-t)} + b\left(t f_y + f_{k_g}\right)\frac{\tilde{d}}{t} \qquad (8)$$

and $\tilde{d} = d + g + n$.

As we can see, if fiscal flows are not related with income (f_y=f_{kp}=f_{kg} =0), then (8) simplifies to the usual convergence rate in an extended Solow model (see Barro and Sala-i-Martin, 1996).

Now, it is possible to calibrate this model to evaluate some implications of these fiscal flows upon the convergence process. 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 without fiscal flows, we impose a=2/3 and δ=0.05, g=0.02 and n=0.01. The choice of b is more problematic given the range in the estimates of public investment returns (see Gramlich, 1994, and Sturm, Kuper and de Haan, 1997). In accordance with the estimations of Otto and Voss (1998) and De la Fuente (1997), we set b at 0.08. On the other hand, if we assume an optimal tax finance then t should be equal to $b/(a+b)$.[7] The saving rate has been set at 0.2, taking into account not only private physical investment but also education and R&D expenditures. Finally, as we estimate in section four, the aggregate value of f_y+f_{kp}+f_{kg} is close to 0.05. Therefore, we analyze different values of f_y, f_{kp} and f_{kg} maintaining constant f_y+f_{kp}+f_{kg} at 0.05.[8]

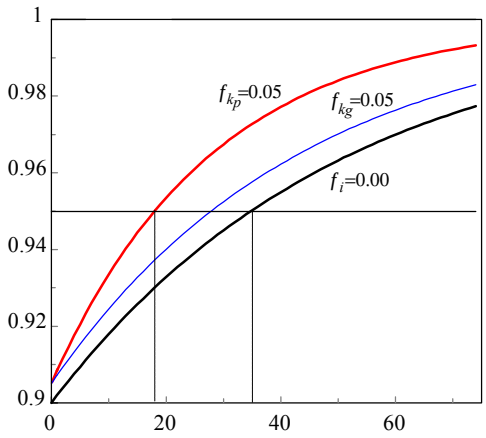
In Figure 1 we present the transitional dynamics of a country that is 10 percent below its steady state in three different environments. The first one is the closed economy environment in which l=0.02, that we use as a benchmark case, taking approximately 35 years to close half of the gap with the steady state. In the second one, net transfers are only

[7] In this model t has level but not growth effects. The optimal tax level is easily obtained maximizing income in units of effective labour.

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

used in private capital accumulation, so f_{kp}=0.05 and f_y+f_{kg}=0.0. In this case, the convergence rate is higher than in the previous environment, and it takes approximately 18 years to close half of gap with the steady state. Finally, we assume that f_{kg} =0.05 and f_y+f_{kp}=0.0, that is, net transfers from the Union budget are only used in public capital accumulation. In this case, the economy close half of the gap in 28 years. Since the coefficients of f_y and f_{kg} are equal in (8) when t is set at its optimal level $b/(a+b)$, the convergence rate is not affected by changes in f_{kg} holding f_y+f_{kp} 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).

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



The model can be easily extended to consider the possibility of bureaucratic inefficiencies, corruption of other distortions affecting the contribution of redistribution policies upon accumulation rates. We can interpret the preceding model as a particular case in which we imposed the maximum effectiveness of Union transfers. In the extreme case in

which transfers do not increase accumulation rates in (4) and (5), even with redistribution policies, the model collapses to the standard exogenous growth model with no effects upon the convergence rate. Therefore, administrative controls and meticulous evaluations of projects are as important as generous transfers in order to accelerate the convergence process.

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 f_y, f_{kp} or f_{kg} 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.

III. 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. Although the basic information for this exercise is available at national level we call the attention to some qualifications which condition our analysis. As the European Commission (1998) has pointed out that the fiscal balance of each country does not account for all the economic benefits that their derive from the Union due, at least, by three main reasons. First, there are some important indirect gains which are not taken into account when comparing fiscal balances between countries, such as spillover effects stemming from, for example, the development of European transport networks. Second, there are some difficulties in determining the nationality of the final beneficiaries of the different expenditures of the EU budget. Finally, the EU funds are heterogeneous across countries and direct comparisons between diverse categories of these expenditures are not easy.

With respect to the time dimension of the information used, this paper draws its conclusions from the budgetary information of the 1986 to 1998 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 it 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 at 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.[9]

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

[9] The data used in this paper and its technical details are available at http:/iei.uv.es/~rdomenec/EUbudget.html.

noted that Regional Funds include structural actions but not the Cohesion Fund, that appears as part of total expenditures.

All the Court 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 the average EU countries' fiscal flows from and contributions to the European budget, from 1995 to 1998, expressed as a percentage of their GDPs, and their relative per capita incomes in PPPs.[10] As we can see, agricultural funds (x^{ag}) represent less than 1 per cent of GDP on average, but in the case of Greece and Ireland this percentage is around 3 percent. 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 incomes. Greece and Ireland, jointly with Portugal and Spain, are again well above the EU average in the case of regional funds (x^{r}). Social funds expenditures (x^{s}) only represent 0.15 percent on average, with the same group of countries above this level. 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.[11] As expected,

---

[10] We compute these average for this period because the enlargement of the EU to Austria, Finland and Sweden in 1995. Contributions from the EU budget for these countries in 1995 show a clear different pattern to that observed in 1996 and 1998. 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.

[11] 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.

the GNP contribution (x^{GNP}) of each member state in GDP percentage points is approximately the same, being the EU average 0.31 percent.[12] With respect to the own traditional resources contributions (x^{own}), there is more variability among member states, notably because the performance of Belgium and the Netherlands, 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 country where they are introduced in the Community's territory, which is not necessarily the country where they are consumed or transformed.[13] When we aggregate these revenues, total contributions as a percentage of GDP (x^{T}) range from 0.85 of Italy and 1.47 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, Luxembourg and Sweden present the largest transfers as a share of their domestic production. The negative budget position of some of these countries has been a main concern of the European Commission (1998), and it partially explains that, according to the Agenda 2000 approved at Berlin in 1998, Austria, Germany, the Netherlands and Sweden will benefit in the future with a reduction of a 25 per cent in their contributions to finance the British check.

[12] 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*.

[13] The Berlin Council in 1998 decided an increase of the collection fees in traditional own resources from 10 to 25 per cent. This change will mitigate the Rotterdam effect in the total contributions of Belgium and the Netherlands.

Table 1 - *Principal EU budget magnitudes as a percentage of the GDP for each member. 1995-98*

Country	Code	Expenditures				Resources					
		x^{ag}	x^{r}	x^{s}	x^{G}	x^{VAT}	x^{GNP}	x^{own}	x^{T}	x^{G-T}	y_i / y_{EU}
Austria	A	0.41	0.03	0.05	0.70	0.60	0.35	0.15	1.08	-0.38	1.05
Belgium	B	0.53	0.04	0.05	0.92	0.49	0.35	0.53	1.32	-0.40	1.10
Germany	D	0.30	0.07	0.05	0.51	0.58	0.35	0.21	1.12	-0.61	1.03
Denmark	DK	0.90	0.01	0.04	1.07	0.48	0.33	0.22	1.01	0.06	1.15
Spain	E	0.96	0.57	0.29	2.33	0.53	0.32	0.16	0.99	1.34	0.76
Finland	SF	0.45	0.06	0.06	0.91	0.51	0.34	0.16	0.99	-0.08	0.94
France	F	0.73	0.05	0.05	0.93	0.56	0.34	0.14	1.03	-0.10	1.03
United Kingdom	GB	0.36	0.06	0.08	0.58	0.31	0.34	0.30	0.93	-0.35	0.98
Greece	GR	2.50	1.32	0.26	4.94	0.58	0.35	0.17	1.08	3.86	0.62
Ireland	IRL	3.00	0.74	0.57	5.31	0.62	0.33	0.43	1.33	3.97	0.96
Italy	I	0.45	0.17	0.05	0.77	0.45	0.29	0.13	0.86	-0.08	0.99
Luxembourg	L	0.12	0.02	0.03	0.72	0.66	0.37	0.15	1.17	-0.45	1.70
Netherlands	NL	0.50	0.02	0.06	0.66	0.56	0.34	0.56	1.40	-0.73	1.05
Portugal	P	0.76	1.66	0.61	4.22	0.60	0.32	0.22	1.11	3.11	0.66
Sweden	S	0.27	0.02	0.04	0.54	0.53	0.33	0.21	1.05	-0.50	0.98
Average EU (weighted)		0.54	0.15	0.09	0.95	0.51	0.34	0.22	1.05	-	1.00

IV. 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. First, given the small length of the sample period (from 1986 to 1998) it is difficult to evaluate the long run effects of these redistribution policies. Second, given the information available, it is not possible to distinguish the part of the transfers that finance private or public capital. In other words, we

cannot get estimates of f_y, f_{kp} and f_{kg} separately. Instead, we concentrate in the estimation of relationships as the one stated by (3) in the model analyzed in the second section for different categories of expenditures and contributions. Therefore, the objective of this section is to end up with an estimate of $f=f_y+f_{kp}+f_{kg}$ for the net balance, as a way of testing a necessary condition to accelerate the convergence process among European countries.[14]

Before estimating f, it is illustrative to analyze the way EU redistribution policies are implemented. We do so estimating the following regressions:

$$\ln \tilde{x}_{it}^{j} = g_{0t}^{j} + g_{1t}^{j} \ln \tilde{y}_{it} + e_{it}, \tag{9}$$

where $\tilde{y}_{it}$ is per capita income of country i in year t, $\tilde{x}_{it}^{j}$ are the different categories of transfers and revenues considered in per capita terms, and t=1986,...,1998. In general, we could think of different economic or socio-political variables, that for convenience we include in vector **z**, explaining the per capita levels of transfers and contributions for each European country, that is,

$$\ln \tilde{x}_{it}^{j} = f(\mathbf{z}_{it}^{j}) \tag{10}$$

For example, $\mathbf{z}_{it}^{j}$ could contain information about the share of agriculture in GDP, unemployment rates, population in regions that are classified as Objective 1 by the European Commission, the outside-EU trade for each country, etc. In other words, $\mathbf{z}_{it}^{j}$ summarizes the European legislation, shaped by a large number of rules which have changed over the years, concerning each transfer and contribution. However, we do not want to recover these rules used by the European Commission to calculate different aggregates. Instead, we want to uncover the intensity of redistribution through different expenditures and contributions, that is, (9) just tests one hypothesis: to what extent does all this legislation have a redistributive effect between European countries. Therefore, the empirical results we present in this section should not be evaluated in terms of the fit of the regressions but by the value and the significance of per capita income coefficients.

It is important to point out some issues related with the estimation of (9). First, this equation is estimated in levels. As it is usual in this literature (e.g., in Bayoumi and Masson,

[14] As we have shown in the second section, notice that this condition is necessary but not sufficient.

1995), with this specification we analyze redistribution, whereas estimation in growth rates evaluate fiscal stabilization. Second, by estimating cross-sectional regressions in different years, we can analyze the stability of the coefficients of $\ln \tilde{y}_{it}$. If these coefficients remain constant across periods we can impose the restriction $g_{1t}^{j} = g_{1}^{j}$, allowing the estimation of an equation with different intercepts using pooled data. Another possibility is that g_{1t}^{j} may show a trend pattern. In this case we can estimate the following equation using again pooled data:

$$\ln \tilde{x}_{it}^{j} = g_{0t}^{j} + g_{1}^{j} \ln \tilde{y}_{it} + g_{2}^{j} \ln \tilde{y}_{it}\, t + g_{3t}\, d_{t+} e_{it}, \qquad (11)$$

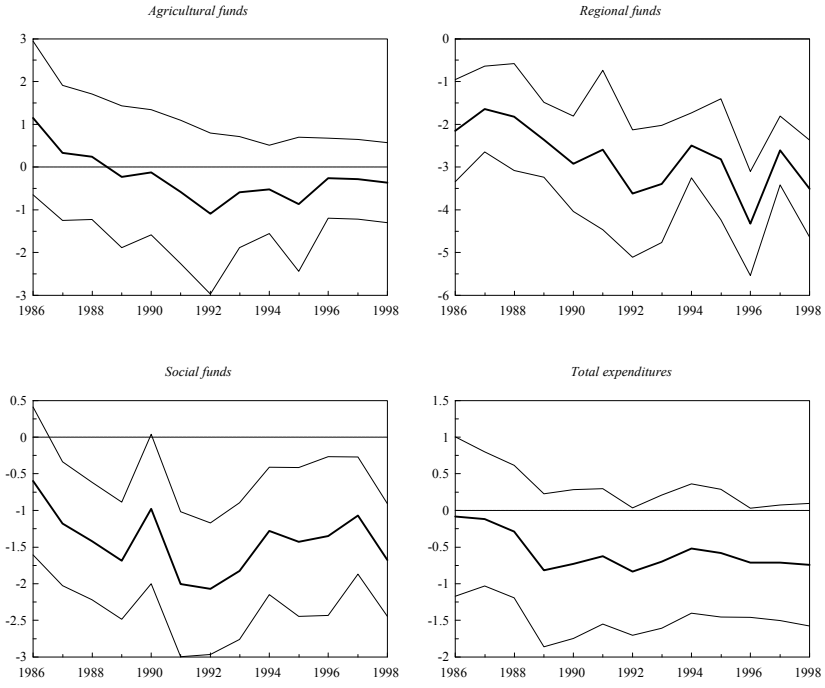
where d_t are time dummies and t is a trend. If g_{2}^{j} is positive (negative) the elasticity of $\tilde{x}_{it}^{j}$ with respect to $\tilde{y}_{it}$ increases (decreases) when moving from 1986 to 1998.

The acceptance of the hypotheses $g_{1t}^{j} = g_{1}^{j}$ 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 elasticity 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.

Figure 2 - *Estimated values of g_{it} and their confidence intervals at 95 percent for different expenditure categories.*



In Figure 2 we show the OLS estimated values of g_{1t}^{j} in (9) and their confidence intervals for the expenditure side using variables in ECUs.[15] The estimated coefficients for agricultural funds (g_{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 g_{1t}^{ag} are all equal to zero. In the case of regional funds (g_{1t}^{r}), these coefficients are negative and statistically significant and there is a clear downward trend from 1986 to 1998. 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 (g_{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 (-1.40) than that for regional funds. Finally, total expenditures show a negative relationship with per capita income. The estimated coefficients (g_{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 g_{1t}^{G} is equal to –0.43, 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 0.43 percent.

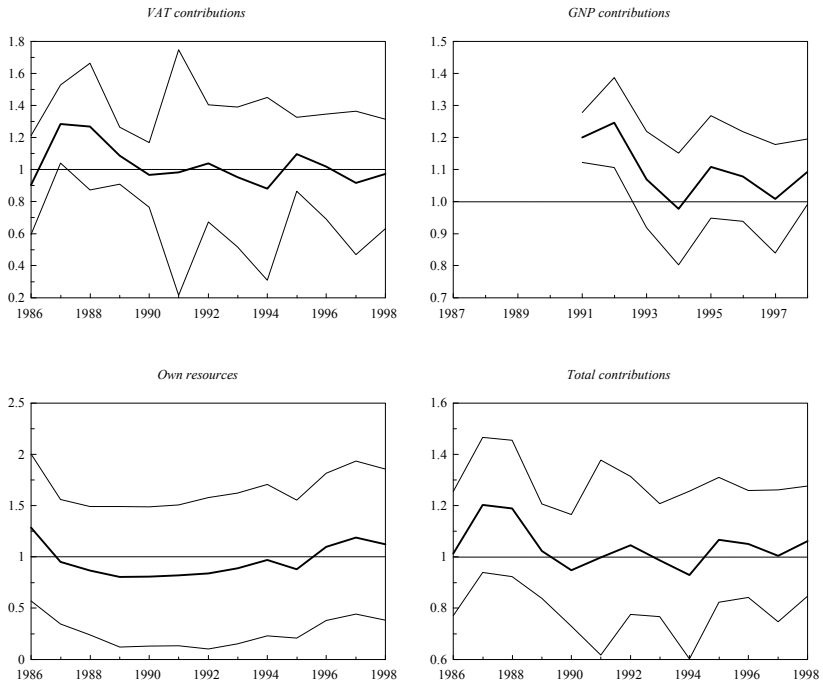
In Figure 3 we present a similar exercise for the revenue side of the EU budget. The estimated coefficients of VAT contributions (g_{1t}^{VAT}) are, in general, not statistically different from one.[16] GNP contributions started in 1990, although in that year this resource had a negligible importance 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 (g_{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 (g_{1t}^{own}) are in general less than 1.0 (the average

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

[16] The exception is 1987, although in this case we can accept the hypothesis g_{1t}^{VAT}=1.0 at a 10 percent significant level.

value is 0.94), although they are not statistically different from this value. Finally, the elasticity of total contributions to income in per capita terms (g_{1t}^{T}) is on average equal to 1.03, 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. This result is in contrast with the evidence shown by Bayoumi and Masson (1995) for the United States, where the contribution of each state to the federal budget have a redistributive character.

Figure 3 - *Estimated values of g_{it} and their confidence intervals at 95 percent for different countries' contributions to the EU budget.*



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 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, confirming the results of other researches that

use alternative methodologies (see, for example, Martín, 2000). Figure 4 summarizes these findings and shows the estimated coefficient f_1 in the following regression:

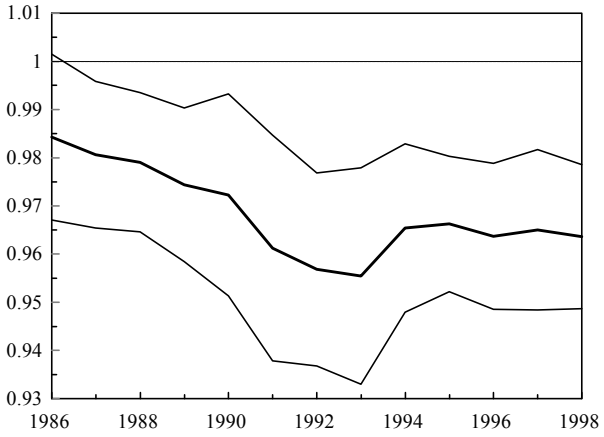
$$\ln \tilde{y}_{it} = f_0 + f_1 \ln(\tilde{y}_{it} - \tilde{x}_{it}^G + \tilde{x}_{it}^T) + v_{it} \tag{12}$$

where f_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 f_1 fiscal flows among EU members have no redistributive effects, while if f_1<1 the EU budget reduces per capita income in rich countries and increases that of poor ones. In fact, we can approximate (12) by:[17]

$$\frac{\tilde{x}_{it}^G - \tilde{x}_{it}^T}{\tilde{y}_{it}} = \frac{1 - f_1}{f_1} \frac{\tilde{y}_t^{EU} - \tilde{y}_{it}}{\tilde{y}_{it}} + v_{it} \tag{13}$$

that has the same interpretation as (3) in our model of the second section. For example, in 1993 we find that f_1=0.955 and it is statistically different from 1, so $f = \frac{1 - f_1}{f_1} = 0.047$. As the confidence interval for f is given by (0.022, 0.071) we can accept the necessary condition f>0 to accelerate the convergence process among European countries.

Figure 4 - *Estimated values of coefficient* f_1 *in (12).*



[17] We assume that when $\ln \tilde{y}_{it} = \ln \tilde{y}_{EU}$ then $\tilde{x}_{it}^G + \tilde{x}_{it}^T = 0$ so $f_0 = (1 - f_1) \ln \tilde{y}_{EU}$

In Table 2 we present the estimated values of g_1^j and g_2^j in (11) for the four categories of expenditures and revenues, expressed in ECUs and in per capita terms.[18] 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 g_2^{ag} implies that these funds became negatively correlated with income after 1988. This result was also pointed out by Figure 2. As we can see, g_1^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 2. It is also meaningful to note that the coefficient of g_1^G is negative although not different from zero.

When we exclude Ireland from these regressions we find that g_1^j increases for the four expenditure categories.[19] 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 elasticity between agricultural funds and income (through g_1^{ag}, that becomes positive), but, with the exception of 1986 and 1987, also decreases the elasticity between regional funds and income (through the increase in the absolute value of g_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

[18] 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 deflator for the EU).

[19] The exclusion of Ireland and Luxembourg in these regressions is justified by the fact that these are two small countries which, given their specificities, can bias the results for the whole sample. In fact, the results obtained when we exclude these two countries are similar to those obtained weighting the observations by population size.

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.

When we estimate the same equations as in Table 2 with the variables expressed in PPPs, the overall results of the comparisons across country samples remain valid.[20] However, there are some interesting variations in the estimated coefficients of (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 (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 5 we present the estimated values of these dummies using both types of conversion rates. Countries outside the grey areas have statistically significant dummies. 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 for 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).

[20] These results are available upon request from the authors.

Table 2 - *Redistribution through fiscal flows. Variables in ECUs*

	EU15			EU15-IRL		EU15-LUX		EU12	
	g_1^j	g_2^j	R^2	g_1^j	g_2^j	g_1^j	g_2^j	g_1^j	g_2^j
$\ln \tilde{x}_{it}^{ag}$	0.41	-0.11	0.10	0.66	-0.12	1.14	-0.14	0.40	-0.10
	(1.19)	(2.06)		(2.01)	(2.43)	(3.78)	(3.07)	(1.14)	(1.82)
$\ln \tilde{x}_{it}^{r}$	-1.93	-0.14	0.66	-1.77	-0.14	-2.00	-0.18	-1.96	-0.13
	(6.51)	(3.14)		(6.41)	(3.46)	(7.25)	(4.23)	(6.43)	(2.78)
$\ln \tilde{x}_{it}^{s}$	-0.01	-0.01	0.31	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	(2.01)	(2.43)		(2.44)	(6.17)	(1.71)	(2.54)	(1.98)	(2.19)
$\ln \tilde{x}_{it}^{G}$	-0.28	-0.05	0.28	-0.09	-0.05	0.09	-0.11	-0.30	-0.04
	(1.29)	(1.43)		(0.50)	(1.97)	(0.41)	(3.38)	(1.32)	(1.14)
$\ln \tilde{x}_{it}^{VAT}$	1.12	-0.01	0.74	1.13	-0.01	1.04	-0.02	1.12	-0.02
	(12.0)	(1.04)		(11.5)	(1.03)	(11.1)	(1.52)	(11.6)	(1.07)
$\ln \tilde{x}_{it}^{GNP}$	1.27	-0.02	0.98	1.24	-0.02	1.29	-0.03	1.26	-0.02
	(12.2)	(1.74)		(12.0)	(1.57)	(11.8)	(2.27)	(11.5)	(1.53)
$\ln \tilde{x}_{it}^{own}$	0.94	0.01	0.44	1.01	0.01	1.08	-0.01	0.92	0.01
	(5.63)	(0.18)		(6.04)	(0.15)	(6.81)	(0.05)	(5.39)	(0.49)
$\ln \tilde{x}_{it}^{T}$	1.09	-0.01	0.90	1.12	-0.01	1.08	-0.01	1.08	-0.01
	(17.6)	(0.82)		(17.9)	(0.96)	(16.2)	(1.26)	(17.0)	(0.61)
Obs.[a]	168			155		155		156	

(a) Sample period 1986-98, except for $\ln \tilde{x}_{it}^{GNP'}$, 1991-98

Finally, we have also tested if there has been any remarkable change in the estimated coefficient of these country dummies during the sample period we are analyzing. We have considered two different periods taking 1993, when the transfers associated to cohesion fund begun, as the partitioning year. As we can see in Figure 6, there is a clear positive relationship between the estimated values of these dummies in both periods, when we express the variables in ECUs. However, for some countries there are some important changes since their dummies become significant from 1993 to 1998. Thus, taking into account their per capita incomes, Portugal and Luxembourg clearly improve their final balance with the EU budget in the second part of the sample, while for the United Kingdom and Italy we observe the opposite. It is also important to notice that in the four countries these changes seem to be mainly explained by variations in the expenditure side rather than in the revenue side.

Figure 5 - *Estimated values of country dummies in (12).*

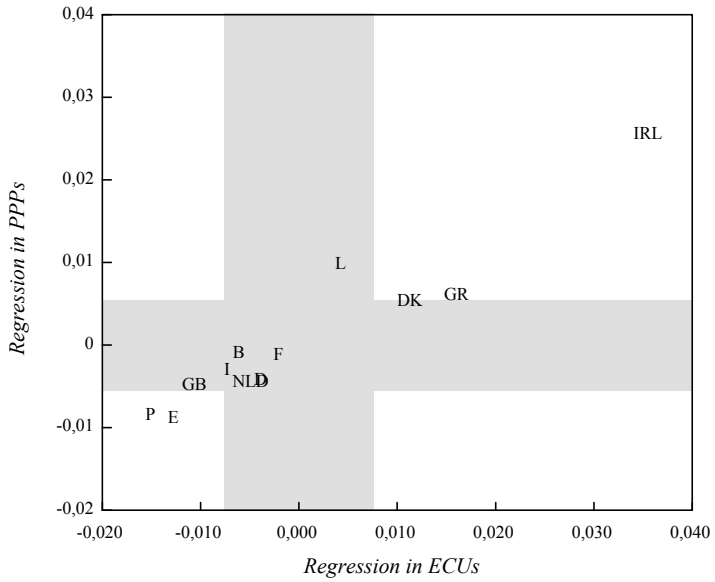
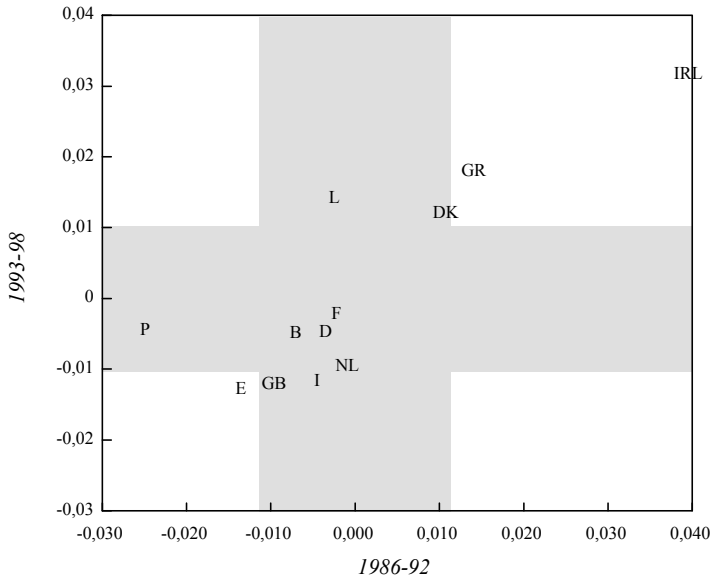


Figure 6 - *Changes in estimated values of country dummies in (12).*



V. 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 capita 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 1998, we obtain as the main result that the 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 power 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, in contrast with the results for the United States, 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 an elasticity equal to one.

Finally, when we consider the net financial balance, we find that the EU budget has a remarkably redistributive effect on the income of its members. This result is a necessary condition to speed up the convergence process among European countries. Our results show that the EU budget redistributes the 5 per cent of any difference between richer and poorer

countries. Although this number is well below the estimates for the United States (federal taxes and transfers redistribute approximately a 20 per cent), it is important to notice that this redistributive effect is achieved with budget resources that represent less that 1.27 per cent of the European GNP. However, not all EU countries are treated alike, since we identify three different groups of countries. Firstly, those that benefit by more than what would correspond to 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 have been 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 the 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 to the EU budget.

References

Artis, M. and Lee, N. (1995): *The Economics of the European Union, Policy and Analysis*. Oxford University Press.

Barro, R. J. (1990): Government Spending in a Simple Model of Endogenous Growth. *Journal of Political Economy*, 98, S103-125.

Barro, R. J., N. G. Mankiw, and X. Sala-i-Martin (1995): Capital Mobility in Neoclassical Models of Growth. *American Economic Review*, 85(1), 103-115.

Barro, R. J. and X. Sala-i-Martin (1995): *Economic Growth*. McGraw Hill.

Bayoumi, T. and P. R. Masson (1996): Fiscal Flows in the United States and Canada: Lessons for Monetary Union in Europe. *European Economic Review*, 39, 253-274.

Caselli, F., G. Esquivel and F. Lefort (1996): Reopening the Convergence Debate: A New Look at Cross-Country Growth Empirics, *Journal of Economic Growth*, 363-389.

De la Fuente, A. (1997): Fiscal Policy and Growth in the OECD. D. 97007. DGAPP. Ministerio de Economía y Hacienda. Madrid.

EC Commission (1997): *Informe Anual sobre los Fondos Estructurales 1996*, COM(97) 526 final.

EC Commission (1998): *Financig the European Union. Commission Report on the Operation of the Own Resources System.*

EC, Annual Report of The Court of Auditors, *Official Journal of the European Communities*, various issues.

Fatás, A. (1998): Does EMU Need a Fiscal Federation?, in D. Begg, J. von Hagen, C. Wyplosz and C. F. Zimmermann (eds.), *EMU: Prospects and Challenges for the Euro*. CEPR.

Gramlich, E. M. (1994): Infraestructure Investment: a Review Essay. *Journal of Economic Literature*, 32, 1176-1196.

Islam, N. (1995): Growth Empirics: A Panel Data Approach, *Quarterly Journal of Economics*, CX, 1127-1170.

Lee, K., M. H. Pesaran and R. Smith (1997): Growth and Convergence in a Multi-Country Empirical Stochastic Solow Model. *Journal of Applied Econometrics*, XII, 357-392.

Mankiw, N. G.; D. Romer and D. N. Weil (1992): A Contribution to the Empirics of Economic Growth. *Quarterly Journal of Economics*, 107(2), 407-37.

Martin, C. (2000): *The Spanish Economy in the New Europe*. Macmillan Press.

Nonneman, W. and P. Vanhoudt (1996): A Further Augmentation of the Solow Model and the Empirics of Economic Growth for OECD Countries. *Quarterly Journal of Economics*, 111, 943-953.

Otto, G. D. and G. M. Voss (1998): Is Public Capital Provision Efficient?. *Journal of Monetary Economics*, 42, 47-66.

Sachs, J. and X. Sala-i-Martin (1992): Fiscal Federalism and Optimun Currency Areas: Evidence from Europe and the United States, in M. Canzoneri, V. Grilli and P. Masson (eds.), *Establishing a Central Bank: Issues in Europe and Lessons from the US*, Cambridge University Press.

Sturm, J. E., G. H. Kuper and J. de Haan (1997): Modeling Goverment Investment and Economic Growth on a Macro Level: A Review, in D. Brakman, H. van Ees and S. K. Kuipers (eds), *Market Behaviour and Macroeconomic Modeling*. Macmillan.

Von Hagen, J. (1992): Fiscal Arrangements in a Monetary Union: Evidence from the US, in D. E. Fair and C. de Boissieu (eds.), *Fiscal Policy, Taxation and the Financial System in an Increasingly Integrated Europe*, Kluwer Academic Publishers.

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 1998, 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 capita income levels.

Keywords: convergence, redistribution, fiscal policy, European Union
JEL numbers: F36, F43, H11