Does EMU Need a Fiscal Federation?[1]

Antonio Fatás

INSEAD and CEPR

Summary

The stabilization provided by the US federal budget has been used as an example of the adjustment mechanisms that are lacking in Europe and which are needed to make a currency area viable. This paper presents four sets of findings that suggest that the benefits of a European fiscal federation would be modest. First, we show that some of the previous estimates of the benefits of the US federal budget overestimate the amount of interstate insurance by a factor of 3. Second, Europe already has national tax systems which, according to our estimates, can insure more than 50% of a European fiscal federation. Third, we find evidence that the potential insurance benefits of a European fiscal federation have decreased over time. Fourth, there are large cross-country differences in the benefits provided by the federation. We conclude that the potential to provide interregional insurance by creating a European fiscal federation is too small to compensate the many problems associated to its design and implementation.

1. INTRODUCTION

The future adoption of a single currency among some of the members of the European Union has raised many concerns regarding its ability to deal with shocks that are asymmetric (i.e. shocks that are idiosyncratic to either regions or countries). The main concern arises from the lack of tools that countries will possess to mitigate the effects of asymmetric shocks once they join EMU. As prices and wages are not flexible enough to compensate for the loss of exchange rates and the degree of labor mobility in Europe is very limited, there is a fear that asymmetric shocks could lead to deep regional recessions and large increases in unemployment which could create a social burden that is politically unacceptable to many governments. [2]

In a currency union, absent monetary policy, the burden of adjustment lies on fiscal policy. Governments are able to use countercyclical budgets to stabilize economic fluctuations (within the limits on deficits and debt-to-GDP ratios of the Stability Pact). This is not, however, the only possible stabilizing mechanism associated to fiscal policy. For the regions that form part of a country, the fiscal system provides automatic transfers from fast growing regions to depressed regions which contribute to interregional risk sharing.

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[2] See Eichengreen (1990), Feldstein (1992), Krugman (1993), Blanchard and Katz (1992), Decressin and Fatás (1995), Sachs and Sala-i-Martin (1992) or von Hagen and Neumann (1994) for a general discussion of some of these issues.

The case of the US, where automatic interregional transfers take place through the federal budget, has been presented as an example of a tax system which helps alleviating the costs associated to a single currency.[3] These transfers play an insurance role which compensates for the lack of internal exchange rates. In the case of EMU, as there is no equivalent system of insurance, countries will have to suffer the full consequences of asymmetric shocks. The estimates of the benefits of interregional transfers in the US are large. Sachs and Sala-i-Martin (1992) estimate that a fall in state income causes transfers (or reduction in taxes) that amount to between 30 and 40% of the original fall in income and Bayoumi and Masson (1996a) estimate a net effect of around 30%.

In this paper we argue that these estimates can only be interpreted as a measure of the stabilizing effect of interstate transfers and that they overestimate the amount of interstate risk sharing by a factor of 3. The logic is simple. The methodology used in these studies is to estimate the response of taxes and transfers to income fluctuations ignoring the impact that these transfers have on the overall federal budget balance. If a state's income falls, total tax revenues will decrease unless other regions' tax revenues exactly offset the initial fall (which would only occur if there was no aggregate risk). The fall in tax revenues will create a deficit that will have to be paid through future taxes by all states, including the depressed state. Therefore, the amount of insurance that the depressed state receives is less than what the change in this period's state disposable income indicates. This effect, ignored in the work of Sachs and Sala-i-Martin (1992) or Bayoumi and Masson (1996a), is significant given the high correlation of income across US states.[4] We replicate our analysis for the countries of the European Union and find estimates for the insurance potential of a hypothetical European fiscal federation similar to the ones of the US.

The distinction between intertemporal transfers and interregional insurance is critical because while intertemporal transfers can be provided by countercyclical budgets at the national level (an option which will be available to EMU participants), interregional insurance can only be provided through a common federal budget.

We also apply our analysis to data on European regions (subunits of countries). Our estimates show that the amount of interregional insurance provided by the current national systems is more than half of a hypothetical European fiscal federation. This number is estimated under the unrealistic assumption that the European system is a replica of the national systems (which has implications about its size and progressivity of taxes). Under more realistic assumptions about the European fiscal federation, the additional benefits of adding a fiscal federation to the current layer of national systems would be even smaller. We also find some evidence that these benefits have been decreasing over time. Within our sample, we find that in the second part (1979-1995) the benefits of a European federation relative to national systems are lower. If this reflects a trend caused by the process of European integration and coordination of economic policies, the

[3] See Sachs and Sala-i-Martin (1992).

[4] Indeed, von Hagen (1992), who controls for the effect that a fall in a state's income has on the federal budget, obtains estimates of the benefits of the US federal budget around 10%, close to our estimates of interstate insurance.

creation of EMU might further decrease these benefits. Overall, the results of the analysis at the regional level provide a picture on interregional transfers in Europe very different from the one of Sachs and Sala-i-Martin (1992) where it is argued that the current amount of European interregional insurance is practically zero.

Finally, we find large cross-country differences regarding the potential insurance benefits of a European fiscal federation. While countries like France or Austria would benefit very little from the system, the benefits for the UK or Ireland would be substantial. This asymmetry would make the implementation of a European-wide fiscal system very complicated as some countries might not be interested in joining. A possible solution to this asymmetry could be to set different risk premium for different countries. The political viability of this option remains, however, doubtful.

Before concluding, we review some of the problems associated with the design and implementation of a European-wide insurance system. More specifically, we show that any fiscal system designed to provide cross-country insurance is very likely to generate permanent transfers across countries that will be viewed as redistributive transfers. These problems lead us to conclude that the costs of implementing the system more than surpass the modest insurance that a European fiscal federation could potentially provide.

Section 2 presents the main theoretical arguments in the debate on the role of fiscal policy in a monetary union. Section 3 reviews previous empirical estimates in the literature and presents a simple theoretical framework that leads to our estimates. Section 4 estimates the interstate insurance provided by the US federal budget. Section 5 applies the same methodology to European countries. Section 6 estimates the insurance benefits provided by the current national systems. Section 7 presents empirical evidence about the difficulties involved in designing an insurance system which avoids redistribution. Section 8 concludes.

2. FISCAL POLICY IN A CURRENCY AREA

In this section we discuss the role that fiscal policy can play in a currency area. Our unit of analysis is a group of regions that form part of a fiscal federation. We are interested in analyzing how regional governments and the federal government can stabilize asymmetric cyclical fluctuations using fiscal policy. This analysis can be applied to regions that form part of a country or to future country members of a European fiscal federation.

There are two levels at which fiscal policy can be active. First, governments can use countercyclical budgets to smooth disposable income. This stabilization takes place through *intertemporal transfers*. Second, by sharing tax receipts among several regions, the federal budget can help alleviating the effects of regional fluctuations through automatic *interregional transfers* which help sharing interregional risk.[5]

[5] See Bayoumi and Masson (1996b) for a similar analysis of some of the issues analyzed here and estimates of the relative impact of each of these transfers.

Intertemporal Transfers

When income fluctuates, consumers can isolate themselves from transitory fluctuations using savings as a buffer. In the absence of market imperfections, there is no role for the government to stabilize consumers' income. If consumers are unable to use financial markets to borrow against their future income, the government could help consumers to smooth consumption by running countercyclical budgets.

On the revenue side, progressive taxation and procyclical transfers makes disposable income less volatile than pre-tax income. This allows credit-constrained individuals to smooth their consumption. These policies are, in many cases, the result of automatic stabilizers and not the result of active discretionary policies.[6]

What is the reaction of consumers to automatic stabilizers through tax and transfer schemes? In a Ricardian world, such policies have no effects on output or welfare as consumers foresee the implications in terms of future tax payments. [7] There is no effect on consumer's wealth and saving offsets the changes in disposable income. The welfare effects (assuming no distortionary taxes) are zero. In the case where Ricardian equivalence fails, the previous statement does not hold. In the presence of liquidity constraints, consumption depends on disposable income and the welfare effects depend on the ability of fiscal policy to smooth consumption to an extent that consumers are willing to but unable to. If Ricardian equivalence fails because consumers do not internalize the future tax implications of current deficits ("future generations will pay for them"), then intertemporal transfers can be considered a form of insurance across generations.

There is some empirical evidence in favor of the stabilizing effects of government's fiscal policies. Galí (1994) shows that the size of the government budget is inversely related to the amplitude of business cycles in a sample of OECD countries. Bayoumi and Masson (1996a) present estimates of the smoothing of disposable income achieved by this type of policies in European countries.

Interregional Transfers

The same fiscal system that allows individuals to stabilize consumption through intertemporal transfers can also provide interindividual or interregional transfers. The nature of these transfers can be very different from those generated by countercyclical budgets because they are designed to reduce not only the volatility of disposable income but also the volatility of permanent income. As a result, interindividual or interregional transfers can not only help credit-constrained consumers to smooth consumption but they also isolate permanent income

[6] One could also consider the effects of government expenditures. There could be an active policy to increase spending during periods of weak private aggregate demand. By doing so, fiscal policy could contribute to aggregate demand and could have beneficial effects on overall income. We ignore this possibility to simplify our analysis and concentrate on the debate on interregional insurance through tax and transfer mechanisms.

[7] This assumes that government expenditures are unaltered by cyclical fluctuations. We will make this assumption throughout our analysis.

from fluctuations. In other words, they provide insurance.[8] If a region goes into a recession, it receives transfers from other regions that are booming. Consumers are not concerned with higher future taxes because transfers from fast-growing regions offset their decline in income. Because these transfers provide insurance to consumers, they can be considered as a more efficient tool to stabilize consumption than intertemporal transfers. They have direct implications on consumer's wealth without relying on the failure of Ricardian equivalence. Indeed, Bayoumi and Masson (1996b) presents some favorable evidence in this direction. They estimate the impact on consumption of interregional and intertemporal transfers to conclude that the stabilizing effects of interregional transfers are larger.

Clearly, as suggested above, the distinction between stabilization and insurance is not evident if consumers do not internalize future tax payments. For example, if consumer's horizons are finite, intertemporal transfers also provide insurance. This insurance, across generations, is equivalent to the one provided by interindividual or interregional transfers. For most of our analysis we abstract from this type of insurance and consider that the main role of intertemporal transfers is stabilization while interregional transfers are intended to provide insurance. This distinction is not relevant when we consider the benefits of a European fiscal federation. What matters is that intertemporal transfers, regardless of their welfare effects and insurance properties, will still be available to national governments in EMU while automatic interregional transfers will not, unless a fiscal federation is created.

The Role of a Federal Budget: Interregional Insurance or Intertemporal Stabilization?

For the federal budget to be able to generate any amount of interregional insurance, it must be that regional incomes are not perfectly correlated. Otherwise, all the risk would be aggregate risk, which cannot be insured by interregional transfers. If a region went into a recession, there would be no booming regions from which to transfer resources. In general, any fiscal federation will have some amount of idiosyncratic risk and transfers will be a combination of interregional insurance and intertemporal stabilization.

To see the interaction between insurance and stabilization, we can think about a region that goes into a recession, and let us assume that income in other regions of the fiscal federation is not affected. Aggregate output and, consequently, federal tax revenues will decrease in response to the shock, the federal budget will go into a deficit and all regions will foresee an increase in taxes to pay for the current deficit. Note that the region in recession still benefits from the policy because it will only pay its share of the future tax payments, which is clearly lower than the amount of taxes that the region is foregoing this period. In other words, there is some insurance built into the system. But, in addition, that region also receives the benefit of the intertemporal stabilization provided by the budget deficit, as the government postpones the tax payments required to balancing the budget today. Of course, the government could avoid the budget deficit by raising taxes in all regions to compensate for the fall in revenue this period. In

[8] This insurance could also be provided by the private sector. See Atkeson and Bayoumi (1993) and Asdrubali, Sorensen and Yosha (1996) for estimates of the role that private markets play in insuring region-specific risks.

this case, all the transfers occur within the same period and the system is one where there is interregional risk sharing but no intertemporal stabilization.[9]

A second way of understanding the connection between stabilization and insurance is to look at the effects of regional shocks on other regions' tax liabilities. By being in a fiscal federation, a region is also responsible for the taxes generated by cyclical fluctuations in other parts of the federation. As a result, other regions' volatility influences the insurance benefits of being a member of the federation. A negative shock to the income of a region reduces the permanent income of all the other regions because of the future taxes to cover this year's deficit. In the extreme case of a region with no income volatility, if it decides to join a fiscal federation, the region will always see its volatility increase due to income fluctuations in other members of the federation.

The difference between intertemporal transfers and interregional insurance is key to understanding the benefits of creating a fiscal federation in EMU. The reason is that intertemporal stabilization will still be available to countries that belong to EMU through their national budgets. Therefore, the relevant question is how large the potential for *interregional insurance* is in a European fiscal federation. Before addressing this issue, we review the empirical literature on the estimates of the benefits of the US federal budget to assess the extent to which these estimates are measures of intertemporal stabilization or interregional insurance.

3. PREVIOUS EMPIRICAL LITERATURE

The majority of the studies on the benefits of automatic transfers in a fiscal federation uses data on US states to understand the economic importance of those transfers on a currency area of size similar to the future EMU.[10] The general methodology is to measure the reaction of regional taxes and transfers to income fluctuations. The question addressed by all these studies is, if income in a region goes down by 1% relative to the national average, what is the change in that region's taxes and transfers?

One of the first studies was Sachs and Sala-i-Martin (1992). They used data on taxes and transfers from US states to measure the stabilizing effects associated to the federal budget. Their empirical methodology consisted on measuring the effects of changes in state income on state taxes and transfers.[11] Their conclusion was that the US federal fiscal system provides a significant stabilizing role. Quoting from their article "the fraction of the initial shock that is absorbed by the federal budget is between one third and one half" or "a one dollar reduction in state personal income reduces final disposable income by only 56 to 65 cents".

[9] Under Ricardian equivalence, and assuming that the tax payments are shared equally among all regions in both cases, both of these scenarios are equivalent. In the first case, a transitory deficit will have to be compensated by higher taxes in the future and consumers will anticipate those higher taxes today.

[10] There is also a more theoretical literature on this subject that deals with the design and political implementation of fiscal federations. See, for example, Persson and Tabellini (1996), von Hagen and Hammond (1996) or Mélitz (1994). We will refer to some of these issues in Section 7.

[11] Both of the variables are measured relative to their national counterparts.

Bayoumi and Masson (1996a) reached similar results by running regressions in growth rates. The reason for using growth rates is that the methodology of Sachs and Sala-i-Martin (1992) was capturing two very distinct effects of the federal budget: redistribution and insurance. The mechanisms associated to income taxes that create stabilizing transfers are also responsible for any redistribution built into the fiscal system. Indeed, Sachs and Sala-i-Martin, by estimating their regressions in levels, were mainly capturing interregional transfers in response to differences in income per capita (redistribution) and not in response to asymmetric business cycles (insurance). Despite the difference in methodology, the estimates of Bayoumi and Masson for the US are very close to those of Sachs and Sala-i-Martin as they conclude that the stabilization effects of the US federal system are around 30%.

To what extent are the estimates of Sachs and Sala-i-Martin (1992) or Bayoumi and Masson (1996a) a measure of interregional insurance? Despite the differences in the methodology used, both studies measure the volatility of state disposable income relative to state current income by estimating either the response of taxes and transfers to income changes or the response of disposable income to income changes. In both cases, the main finding is that the volatility of disposable income is significantly smaller than the volatility of income.[12] Following our arguments of the previous section, this estimated stabilizing effect on disposable income could only be an upper bound to the amount of interregional insurance provided by the system. Only in the extreme case where a change in state taxes did not have any impact on the overall government budget, both would be equivalent. This can only occur in the special case where there is no aggregate risk.

A simple example can highlight the importance of this issue. Suppose there are two regions with incomes that are perfectly correlated and, moreover, the volatility of their incomes is the same. Suppose taxes are proportional to income and transfers are unresponsive to output fluctuations. If we regressed state disposable income on state income, we would find a coefficient less than one which could be misinterpreted as interregional risk sharing but which is only a measure of the stabilizing of disposable income done by countercyclical budget balances. Indeed, in this special case, there is absolutely no interregional insurance. This issue is already recognized in Sachs and Sala-i-Martin (1992) when they argue that all the variables in their analysis should be thought of as present discounted values. However, their empirical analysis ignores this and only makes use of contemporaneous values.

von Hagen (1992) presents estimates of the benefits of the US federal budget much smaller than those of Sachs and Sala-i-Martin or Bayoumi and Masson. According to his estimates, the federal budget only absorbs 10% of a change in state income. His empirical specification takes into account the effect that changes in state income have on the overall federal budget by controlling for aggregate time effects. Because of this correction, this estimate (three times smaller than the previous ones) can be considered a closer measure to the interstate insurance

[12] Bayoumi and Masson (1996a) present specific estimates of the source of this stabilization distinguishing between the effects of taxes, transfers and government expenditures. In general, government expenditures do not seem to react and most of the automatic stabilization takes place through unresponsive transfers.

provided by the US federal budget.[13] In fact, in the next section, using a different methodology, we calculate the interregional insurance benefits of the US federal budget and our estimates are almost identical to those of von Hagen (1992).

From Stabilization to Insurance

From the previous analysis, it is clear that to obtain an estimate of the interregional insurance provided by a fiscal federation one cannot simply measure the response of taxes and transfers to changes in income. One also needs to consider the impact that this has on the overall federal budget. This is indeed equivalent to looking at the amount of idiosyncratic risk relative to aggregate risk present in the federation. In this section we use a simple theoretical argument to unveil the relationship between stabilization and insurance. Our goal is to understand how the ratio of idiosyncratic to aggregate risk or, equivalently, the correlation between regional risks, affects the insurance potential of a fiscal federation.

For simplicity, we look at a federation with two regions (*i* and *j*) of equal size. In any period, income in each of the regions is a random variable with the same mean $\boldsymbol{Y}$, possibly different volatility σ_i and σ_j, and a correlation equal to ρ.

We assume that the government needs to finance a given amount of government expenditures, which is constant and does not respond to shocks.[14] The government sets initially a tax rate in order to keep a balanced budget. As the government needs to satisfy its budget constraint, the deficit or surplus in any period determines future changes in the tax rate.

The deficit or surplus of this period's government balance measures the intertemporal stabilization built into the tax system (its ability to stabilize disposable income). In this simple model where income is stationary, the simplest way of generating any type of stabilization is to assume a proportional tax. If the tax rate is τ, then it follows that the volatility of disposable income (defined as its standard deviation) is equal to

$$\sigma_{i,d} = (1- \tau)\, \sigma_i.$$

We define *intertemporal stabilization* as the decrease in volatility of disposable income relative to pre-tax income. This is equal to

$$\textbf{\textit{Intertemporal Stabilization}} = (\sigma_{i,d} / \sigma_i) - 1 = \tau \qquad (1)$$

[13] von Hagen's estimates are very close to the ones of Asdrubali, Sorensen and Yosha (1996). They measure the relative contribution of three different channels of interstate risk sharing in the US. The three channels analyzed are capital markets, federal government and credit market. Their estimates show that the federal government absorbs around 13% of the fluctuations in gross state product.

[14] This assumption seems to be supported by the evidence presented in von Hagen (1992) about state government expenditures.

One should therefore interpret the parameter τ as the overall stabilizing effect of taxes and transfers on disposable income. In this simple example it coincides with the tax rate but, in a more complicated setup, the tax rate might be unrelated to the magnitude of stabilization. [15]

As we argued before, the previous estimate of stabilization is not a good measure of interregional insurance because it does not consider future tax payments generated by the current imbalance of the federal budget. In general, from the perspective of region *i*, there will be future tax payments associated to the current government balance. These payments will be a function of this year's deficit, which is equal to

$$\tau (\boldsymbol{Y} - Y_i) + \tau (\boldsymbol{Y} - Y_j)$$

If one internalizes these payments to calculate all current changes affecting permanent income, one obtains

$$Y_{i,p} = (1 - \tau)\, Y_i - 0.5\, [\tau (\boldsymbol{Y} - Y_i) + \tau (\boldsymbol{Y} - Y_j)]$$

Where we assume that taxes are equally divided between both regions. This expression includes all changes in today's environment that have an effect on permanent income.[16] The variance of this expression is simply

$$\sigma^2_{i,p} = (1 - 0.5\,\tau)^2\ \sigma^2_i + (0.5\,\tau)^2\, \sigma^2_j + \tau\,(1 - 0.5\,\tau)\, \sigma_i\, \sigma_j\, \rho$$

Volatility is therefore a function of three variables. First, the parameter τ which determines the stabilization effect on disposable income. Second, the variance of region *j* relative to region *i*. If the volatility of region *j* is very high, then the insurance for region *i* might be small or even negative. Third, the correlation between regional incomes. If this correlation is very high, the overall insurance potential of the system is low. We can define interregional insurance as the reduction in the volatility (standard deviation) of $Y_{i,p}$ relative to pre-tax income. That is,

$$\textbf{\textit{Interregional insurance}} = (\sigma_{i,p} / \sigma_i) - 1 \qquad (2)$$

Two extreme examples illustrate the connections between insurance and intertemporal stabilization. If the two regions' income are perfectly correlated (ρ=1) and their risks are identical ($\sigma_i = \sigma_j$), then the amount of insurance is zero as the volatility of $Y_{i,p}$ is equal to the volatility of pre-tax income ($\sigma_{i,p} = \sigma_i$). The logic is clear, if income is below its average today, the tax rate absorbs part of this fall providing some stabilization, but the government is running a deficit that needs to be financed by an increase in future period taxes. Given the symmetry of the model, the increase in will exactly offset the stabilizing effect of the first period.

[15] For example, if we measured the volatility of disposable income as the percent deviation from its mean, then a proportional tax rate would not have any stabilizing effect on disposable income as the elasticity of taxes with respect to income would always be one. A progressive tax rate could generate stabilization and, in that case, the parameter τ would represent the progressivity of the tax system and not the average tax rate.

[16] Clearly, this expression is not equal to permanent income, as future periods are not included. To simplify our analysis we are bringing to the present all future implications of current changes in the government balance. We also take the shortcut of ignoring the possibility that the interest rate faced by the government is different from the one faced by consumers. Taken into consideration these additional elements would not affect our reasoning.

Suppose now that the correlation is equal to -1, so that there is no aggregate risk. Assuming symmetry in risk ($\sigma_i = \sigma_j$), the insurance effect is exactly equal to the stabilization effect. In other words, the volatility of $Y_{i,p}$ is equal to the volatility of disposable income ($\sigma_{i,p} = (1- \tau)\ \sigma_i$). In this special case, where there is no aggregate risk, the government can achieve as much insurance as needed by setting a very high τ. For example, if income is completely shared (τ=100%) and the excess of tax revenues over government expenditures split between the two regions, the variability of $Y_{i,p}$ will be zero. Therefore, we conclude that, in a two-country symmetric federation (same average income and volatility), the stabilization effect sets an upper bound for the amount of insurance that the system can provide.[17]

In the next section, we use the above expression (2) to estimate the interregional insurance benefits provided by the US fiscal federation.

4. INSURANCE AND STABILIZATION: THE U.S.

We apply the logic of the previous model to data from US states. The question to be answered is how much of the stabilization of state disposable income achieved through the federal budget can be identified as interstate insurance. Our starting point is to take as given previous estimates of the elasticity of taxes and transfers to income. We use these estimates to calibrate the `stabilization' parameter (τ) of the model of Section 3. We set τ=30%, a value which is close to the estimates of Sachs and Sala-i-Martin (1992) and Bayoumi and Masson (1996a). We then combine this value with estimates of the distribution of state risks (using volatility and correlation) to assess the amount of interregional insurance generated by the federal budget for each of the US states.

Measuring Volatility

The first question in our empirical analysis is the measure of volatility or risk to be used. We choose the standard deviation of the growth rate of state income.[18] The advantages of using the growth rate of state income are that it is a simple measure of volatility and that is likely to be stationary. Simplicity might be an important argument when it comes to implementing a system of transfers. As an example, the recent Stability Pact in the EU takes growth rates of GDP as reference values. Stationarity is crucial if one wants to avoid redistribution. At the same time, we recognize the limitations of income growth as a measure of volatility. First, by using growth rates, we might be capturing permanent shocks to income that one might want to leave outside of the insurance system. One way to avoid this problem is to separate between permanent and transitory shocks but any decomposition between permanent and transitory shocks is going to be very dependent on the method to decompose the shocks. Also, the short length of the available time series makes the separation between the long-term and short-term components

[17] If the volatility of income is different for different regions, then the amount of insurance that the most volatile regions gets can be larger than the stabilization effect.

[18] In our later analysis, when we look at European regions, because of data availability, we will use employment growth.

even more arbitrary. We have performed some robustness tests and looked at alternative measures of volatility such as detrended state income or the residuals of an autorregresive process, the results are practically unchanged. The second difficulty with identifying the standard deviation of the growth rate with volatility is that it does not take into consideration the dynamic properties of a shock. If a state-specific shock might be propagated across several periods, we might be only capturing the impact of the shock but not the propagation effects.[19]

Volatility and Correlation

Table 1 presents basic statistics of the series.[20] The table calculates the volatility of state income, its ratio to the volatility of the aggregate and the correlation coefficient between the region and the aggregate. When calculating the last two variables we remove from the aggregate the state in question.

Table 1. Volatility and Correlation

State Income Growth Rates. US. 1960-1990

State	(1)	(2)	(3)	State	(1)	(2)	(3)
ME	2.23	1.40	0.65	**NC**	2.20	1.39	0.92
NH	2.28	1.43	0.75	**SC**	2.11	1.33	0.91
VT	2.23	1.40	0.80	**GA**	2.16	1.36	0.89
MA	1.86	1.16	0.66	**FL**	2.31	1.45	0.75
RI	1.95	1.22	0.75	**KY**	2.17	1.36	0.77
CT	2.09	1.31	0.71	**TN**	2.20	1.38	0.93
NY	1.84	1.11	0.53	**AL**	1.85	1.16	0.82
NJ	1.64	1.02	0.71	**MS**	2.66	1.67	0.69
PA	1.55	0.96	0.86	**AR**	2.70	1.70	0.75
OH	2.31	1.48	0.93	**LA**	2.59	1.61	0.29
IN	2.96	1.89	0.90	**OK**	2.55	1.59	0.20
IL	2.01	1.27	0.91	**TX**	2.02	1.22	0.29
MI	3.54	2.32	0.86	**MT**	4.05	2.54	0.46
WI	2.07	1.30	0.90	**ID**	3.54	2.22	0.50
MN	2.64	1.67	0.82	**WY**	4.55	2.85	0.13
IA	4.07	2.58	0.70	**CO**	2.05	1.28	0.37
MO	1.84	1.16	0.88	**NM**	1.61	1.01	0.29
ND	10.36	6.53	0.39	**AZ**	2.97	1.87	0.66
SD	6.06	3.81	0.51	**UT**	1.89	1.18	0.42
NE	3.34	2.09	0.55	**NV**	3.58	2.25	0.51
KS	2.13	1.34	0.73	**WA**	2.48	1.55	0.60
DE	2.24	1.41	0.72	**OR**	2.62	1.65	0.77
MD	2.01	1.26	0.82	**CA**	1.65	1.01	0.78
VA	1.64	1.03	0.88				
WV	2.08	1.30	0.32	**Average**	**2.17**	**1.36**	**0.72**

(1) Standard deviation; (2) Standard deviation relative to aggregate; (3) Correlation with aggregate

[19] This issue is not critical in our analysis given that we are only interested in separating intertemporal stabilization from interregional insurance. As long as our correction also applies to future periods, the ratio of insurance to stabilization will not be affected.

[20] See the appendix for the meaning of the state codes.

Columns (2) and (3) provide a first estimate of the insurance potential of the federation. The state-to-aggregate volatility ratio suggests that the amount of idiosyncratic variability is small. One can indeed interpret the numbers in column (2) as the maximum amount of insurance that can be provided to each of the states. Using the average of all states (1.36) we conclude that even if all the idiosyncratic risk is insured, the volatility of state income (or employment) growth will only be reduced by approximately one fourth. This result is caused by the high correlation between state and aggregate variables. The weighted average of the correlation is 0.72.

An important additional finding in these tables is the large differences across states. Some states have a volatility that is almost as low as the aggregate. This low volatility, combined with very high correlations, leaves very little room for insurance. Although this asymmetry might not be very important for the case of the US states, where the federation already exists, it could become a key issue in Europe if countries can decide whether or not to join a newly created federation.

Insurance

Using the methodology described in Section 3, we estimate the insurance benefits of the federal budget. We use the expression for *interregional insurance* (equation (2)) modified to take into account the differences in sizes across states.[21] We assume that the tax system reduces volatility of regional disposable income by 30% (in line with the estimates of Sachs and Sala-i-Martin (1992) or Bayoumi and Masson (1996a)). We match this estimate to the parameter τ of our model and by using (2) we can calculate the amount of volatility that is being insured. Note that insurance is defined as the reduction (%) of volatility, measured by the standard deviation, of state permanent income.

Table 2 presents the results. As it is clear from these numbers, the estimate of insurance is much lower than the estimate implied by the static analysis that focuses on the stabilization of disposable income and ignores the implications of the intertemporal budget constraint of the federal budget. The amount of insurance is around one third of the estimates of the static analysis. In other words, the static analysis overestimates insurance by a factor of 3.[22]

Table 2 also confirms that not all states benefit in the same magnitude from the system. While some states see their permanent income variability reduced by almost the value of τ, some other states do not see at all the benefits of the system.

[21] To adjust for differences in sizes, we replace the coefficient 0.5 in equation (2) by the share that a state's income represents in aggregate income. This is equivalent to assume that a state is responsible for a fraction of federal taxes which is equal to its relative size.

[22] Interestingly, this estimate is very close to that of von Hagen (1992) who appropriately controls for the effects of state shocks on the federal budget. One can show that the empirical specification of von Hagen (1992) leads to estimates almost equivalent to our calculations.

Table 2. Insurance			
State Income Growth Rates. US. 1960-1990			
State		**State**	
ME	14.49	**NC**	9.58
NH	13.06	**SC**	8.85
VT	11.85	**GA**	9.65
MA	10.51	**FL**	12.86
RI	10.11	**KY**	11.79
CT	12.02	**TN**	9.40
NY	11.82	**AL**	7.44
NJ	6.64	**MS**	16.51
PA	1.82	**AR**	15.87
OH	10.29	**LA**	22.16
IN	15.05	**OK**	23.63
IL	7.54	**TX**	18.40
MI	17.90	**MT**	23.80
WI	8.51	**ID**	22.29
MN	14.34	**WY**	27.87
IA	21.18	**CO**	18.07
MO	6.28	**NM**	16.30
ND	28.01	**AZ**	18.34
SD	25.63	**UT**	15.94
NE	21.08	**NV**	22.28
KS	12.22	**WA**	16.76
DE	13.24	**OR**	15.08
MD	9.35	**CA**	4.53
VA	3.25		
WV	19.48	**Average**	**11.13**

Interstate insurance assuming $\tau = 30\%$. See text for details on calculations.

What are the conclusions from Table 2? What can Europe learn from the US experience? Our results show that some of the previous estimates in this literature of the benefits of the federal budget overestimate (by a factor of three) the amount of interregional insurance of the US system. Interregional insurance is only one third of the overall stabilizing effect and the other two thirds can be associated to intertemporal transfers. Given that the possibility of generating intertemporal transfers through countercyclical government balances will still be available to European national governments after the introduction of the single currency, our estimates indicate that the possible benefits for Europe of a system such as the US fiscal federation are modest. It remains to be seen whether the European situation is different. If we find that there is more idiosyncratic risk among European countries than among US states, the insurance potential of a European federation could still be much larger than the one estimated for the US.

Before we move to estimating the insurance potential of a hypothetical European fiscal federation, it is worth to discuss two caveats about our methodology. First, we have calibrated the parameter τ to match the estimates of Sachs and Sala-i-Martin (1992) or Bayoumi and Masson (1996a). The empirical specification of both papers is very different (regressions in levels versus regressions in growth rates) and none of them makes a clear distinction between insurance and stabilization. Therefore, it is very difficult to find a perfect map between their

estimates and any theoretical model. We believe that our calibration is a good approximation because the intuition behind the parameter τ is almost identical to the spirit of their empirical estimates. In both cases, the key concept is the response of state taxes and transfers to changes in state income.

A second important issue is the connections between insurance and redistribution. The approach of von Hagen (1992) or Bayoumi and Masson (1996a) of separating both effects by running regressions in levels or growth rates is just an approximation. If output shocks are persistent and output has a unit root, then a shock to state income will reduce the relative income of that state forever. If transfers take place as a result of this shock, it is unclear whether one should classify these transfers as insurance or redistribution. The design of a tax system that can separate between the two functions is an extremely complicated task that is certain beyond the scope of this paper. For the sake of simplicity, in Table 2 we have abstracted from this issue. We will return back to it in Section 7.

5. EMU AND FISCAL FEDERALISM

In a currency area, absent monetary policy, governments have to use fiscal policy to deal with asymmetric shocks. European Countries that join EMU will be able to use fiscal policy as a stabilizing tool but they will lack the automatic interregional transfers that are normally present in currency areas (because currencies are usually associated to autonomous national fiscal systems). Therefore, the question of how potentially important these transfers can be is crucial for European countries.

In the case of the European Union, given that a fiscal federation does not currently exist, we can only estimate the potential effects of a hypothetical system. Our strategy is to assume that the hypothetical European fiscal federation achieves the same degree of stabilization (of disposable income) as the current US fiscal system. Then, using the same methodology that we applied to the US, we use data for volatility and correlation of national business cycles to calculate how much of this stabilization can be translated into cross-country insurance. The benefits of a European fiscal federation will depend on how important insurance is. If only a small part of the stabilization of disposable income is considered insurance, then there would be no need for a European-wide system as the intertemporal stabilization could be done by fiscal policy at the level of national governments. [23]

[23] There is also the question of whether it will be easier to implement stabilization policies at the national level or the European level. One could make the argument that the limits imposed on budget deficits and debt by the Stability Pact, make stabilizing policies at the national level very difficult to implement. This argument would call for the need of a European fiscal federation, even if it can only perform the role of stabilizing disposable income. On the other hand, for political economy reasons one might also argue that it would be harder for a European-wide budget to run large deficits or surpluses. We abstract from these issues in this paper and leave them for further research.

Volatility and Correlations

Table 3 shows some basic statistics about the series used in the analysis. As we did in the case of the US, we perform all our calculations for GDP growth.[24] We consider the current composition of the European Union (15 countries) as our unit of analysis. The table reports the standard deviation of the variables, the standard deviation relative to the aggregate and the correlation between the country and the aggregate. We always exclude the country in question from the aggregate.

In the first three columns, we can see that the correlations between the country and the European aggregate are generally quite high. The (weighted) average is 0.66. The ratio of country to European volatility is 1.31 for the case of GDP. Although not directly comparable because of differences in the level of disaggregation, these numbers are close to the ones of the US states. Correlations are generally lower but the ratio of volatility is practically identical. Both the ratio and the correlation are indications of the insurance potential of a European fiscal federation. For example, the average ratio of volatility is 1.31 which implies that the maximum potential for insurance is (on average) around one fourth (if all idiosyncratic risk is eliminated, the volatility of countries will be reduced by approximately 25%).

As it was the case for the US, the numbers in columns (2) and (3) show large differences across countries. Income in countries like Greece is between two and three times more volatile than in countries like France or Austria.

An interesting question is how these correlations have changed over time. The second set of columns in Table 3 presents estimates for correlation and volatility during the second part of the sample. We break the sample in 1979 (starting point of the EMS) to test for the effects of European integration and increase coordination of economic policies. These results have to be taken with great care given the short length of the period and the fact that German unification seems to have a significant effect on these figures. There seems to be a fall in the overall correlation and an increase in the volatility ratio. Absolute country volatility falls but less than the volatility of the aggregate. If one looks at individual countries, in countries such as Italy or the Netherlands, the correlation with the aggregate has increased and the ratio of national to aggregate volatility has fallen. Other countries, like Britain, display opposite trends with stable or falling correlation with the aggregate and an increase in idiosyncratic volatility relative to the aggregate. [25]

[24] Given that we want to make comparisons at different levels of aggregation, we use PPP estimates of GDP which allows us to aggregate output across countries to obtain aggregate GDP.

[25] Artis and Zhang (1995) present more detailed estimates of synchronization of business cycles of European countries with Germany. Their results show a larger increase in the degree of synchronization than the one we present in Table 3. The use of a different series for GDP, a different frequency and a different detrending method might be responsible for the apparent contradiction with some of our results.

Table 3. Volatility and Correlation						
	GDP Growth Rates					
	1961-1996			1979-1996		
Country	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
GER	2.11	1.28	0.67	1.80	1.46	0.43
FRA	1.92	1.18	0.85	1.31	1.07	0.75
ITA	2.34	1.46	0.68	1.57	1.33	0.74
NET	2.10	1.28	0.74	1.48	1.23	0.71
BEL	2.10	1.29	0.85	1.53	1.29	0.68
LUX	2.79	1.71	0.67	1.85	1.56	0.76
UK	2.06	1.16	0.43	2.16	1.72	0.25
IRE	2.08	1.26	0.13	2.07	1.74	0.31
DEN	2.40	1.47	0.60	1.61	1.34	0.33
SPA	2.98	1.82	0.73	1.74	1.46	0.68
GRE	3.47	2.14	0.64	1.58	1.33	0.60
POR	3.17	1.95	0.76	2.29	1.93	0.62
SWE	2.08	1.26	0.66	1.76	1.49	0.75
FIN	3.12	1.91	0.54	3.40	2.88	0.49
AUT	1.81	1.10	0.76	1.32	1.11	0.77
Average EU	**2.15**	**1.31**	**0.66**	**1.71**	**1.41**	**0.56**

(1) Standard deviation; (2) Standard deviation relative to aggregate;
(3) Correlation with aggregate

Insurance

We now use the previous estimates of volatility and cross-country correlations to measure the insurance potential of a European fiscal federation. As mentioned before, our goal is to estimate the insurance that could be provided by a European fiscal federation under the assumptions that the tax structure resulted in a certain amount of disposable income stabilization. As we did for the case of the US states, we set the parameter τ equal to 30%. Table 4 reports the results.[26]

As it was the case for the US, the average insurance is approximately one third of the parameter that measures the smoothing of disposable income. As mentioned before, there are important differences across countries. Countries with low volatility like France and Austria benefit very little compared to countries like Greece, Finland or Luxembourg (their benefits are three times larger).

We also estimate these numbers for the post-1979 sample. The estimates confirm the results of Table 3 regarding the evolution over time of the correlations between regions and the aggregate. The average insurance potential slightly increases over time. This evolution is greatly influenced by Britain and Germany, which have a large weight in the average.

[26] These estimates are, once again, measuring interregional insurance using expression (2) in Section 3.

Table 4. Insurance		
GDP Growth Rates		
Country	**1961-1996**	**1979-1996**
GER	10.00	14.99
FRA	6.20	5.99
ITA	12.20	10.03
NET	10.84	10.63
BEL	9.08	12.15
LUX	17.21	14.36
UK	13.36	19.72
IRE	22.99	22.79
DEN	15.88	19.54
SPA	17.20	14.81
GRE	19.89	14.32
POR	17.43	19.17
SWE	12.16	13.41
FIN	20.13	23.99
AUT	7.41	7.28
Average EU	**10.94**	**13.01**

Intercountry insurance assuming $\tau = 30\%$. See text for details on calculations.

6. THE ROLE OF NATIONAL SYSTEMS

The current European situation with a small EU budget unrelated to cyclical stabilization has led to the conclusion that interregional insurance is absent in the European Union. For example, Sachs and Sala-i-Martin conclude that "if a European region or country suffers a one dollar adverse shock, its tax payments to the European Community will be reduced by half a cent. This contrasts with the 34 cents we found for the United States". This conclusion might be true for countries but not if one considers European regions-subunits of countries. European regions receive transfers from the current 15 national systems that are much larger than the "half a cent" received from the EU budget. This section applies the previous methodology to study the insurance benefits that national fiscal systems provide and compares them to the benefits that these regions would obtain from a European-wide system. Of course, studying subunits of countries will not modify our previous results about the amount of national risk that can be insured at the European level. In that sense, one could argue that a European fiscal federation is a complement to national systems. National systems insure regional risks within countries while the European federation can insure country risk. Our approach is to analyze the current national systems to gain additional perspective on the debate about the need for a fiscal federation. By providing estimates of the insurance potential of national fiscal systems we can better assess the benefits that a European-wide system would bring to European regions.[27]

[27] This is indeed related to the general debate on EMU. By studying subunits of countries one can gain perspective on the issue of Europe as an optimum currency area beyond the limited comparison between the current arrangement of 15 currencies and the alternative of a single currency.

In this case, because of data availability, we do not use GDP growth, as the available series for regional income or GDP are too short. Instead, we use at the standard deviation of employment growth as a measure of volatility.[28] The analysis is restricted to 5 countries for which long-enough regional time series are available. The regions analyzed are 8 regions for Germany, 7 for France, 11 for Italy, 7 for Spain and 11 for Great Britain.

Regional, National and European Volatility

Table 5 shows the basic statistics for these regions. We summarize the information by providing only the (weighted) average of regions for a given country. The appendix shows the numbers for all the regions.

Table 5. Volatility and Correlation

Regional Employment Growth Rates

	1961-1995				1979-1995			
Country	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
GER	1.25	2.29	0.74	0.50	1.27	1.91	0.72	0.52
FRA	1.21	0.95	0.74	0.50	1.21	0.89	0.75	0.59
ITA	1.34	1.97	0.68	0.41	1.29	1.75	0.71	0.55
UK	1.26	2.33	0.70	0.54	1.26	2.39	0.70	0.55
Average (*)	**1.26**	**1.89**	**0.72**	**0.49**	**1.26**	**1.74**	**0.72**	**0.55**
SPA	-	-	-	-	0.93	2.53	0.80	0.78

(1) Standard deviation relative to country aggregate; (2) Standard deviation relative to European aggregate; (3) Correlation with country aggregate; (4) Correlation with European aggregate. (*) Excludes Spanish regions. All numbers are weighted averages of regional data. See appendix for availability of data for different countries.

We calculate the relative volatility and the correlation between regional to national and regional to EU15 employment growth rates. As usual, we exclude the region in question from the aggregate. The region to country volatility is within the range found for the US states or for the European countries. The region to European volatility is much higher except for France. The reason is that France is the only country in this sample where the volatility of national employment growth is lower than the European one.[29] The numbers in columns (1) and (2) is simply another way of presenting the information contained in Table 3 where we showed that there is a certain amount of idiosyncratic national risk among European countries.

The size of the regional to European volatility is larger than the state to national in the US or the country to Europe. This implies that from the perspective of one of these regions, the potential for European-wide insurance is larger than the potential for insurance of US states. The average, 1.89, implies that the maximum insurance is approximately 45% compared to 25% in the case of the US.

[28] To check for the implications of using employment growth instead of GDP growth, we have replicated Table 2 and Table 3 (GDP country data) using employment. All the estimates are very similar. The results are available from the author.

[29] This effect would be smaller if we were using GDP. As Table 3 showed, French to European volatility of GDP growth rates is close to but above 1.

When we compare the evolution of these coefficients over time, we see that within country correlations have been quite stable while there has been an increase in correlations across countries (with the exception of the UK). Similarly, although the ratio of regional to national volatility has not changed, the regional to European volatility has decreased.

Insurance

In this section we estimate the insurance benefits that European regions can obtain from both national and European fiscal systems. Our estimates do not reflect the actual insurance that the current national systems provide (for that we would require detailed knowledge on the exact tax structure of each of the national systems). They do not measure either the insurance that a European system would provide as it will be a function of the size of the budget and the design of the system. We estimate the potential for insurance of both systems based on the evidence presented in Table 5. The methodology is, as before, to set the parameter τ that measures intertemporal stabilization equal to 30%. From this value, and the numbers of Table 5, we can infer the insurance that such a system could provide. In that sense, our estimates will show the relative contribution of national-based and European-wide fiscal systems under the assumption that the European system is an exact replica of the national-based system.

Table 6 presents these estimates and summarizes the information by calculating the (weighted) average of regions that belong to the same country.[30]

Table 6. Insurance

Regional Employment Growth Rates

	1961-1995		1979-1995	
Country	**(1)**	**(2)**	**(1)**	**(2)**
GER	8.74	21.72	8.65	19.61
FRA	8.23	9.10	7.12	4.53
ITA	10.75	21.48	8.87	17.37
UK	9.54	21.39	9.62	21.49
Average (*)	**9.31**	**18.42**	**8.57**	**15.75**
SPA			5.37	19.67

Interregional insurance assuming τ = 30%. See text for details on calculations. (1) National insurance; (2) European insurance. (*) Excludes Spanish regions. All the numbers are Weighted average of regional data. See appendix for availability of data for different countries.

The estimates of national insurance range from 7% to 11%. On average, national insurance is close to 10%. The estimates for European insurance range from 9% to 22%, the average being 18%. Therefore, national systems can insure more than 50% of a European system. For the EMS sample, while the potential for national insurance does not significantly change except for the case of Italy, the insurance potential of a European system declines for all countries except

[30] Strictly speaking, the estimates of Table 6 cannot considered a measure of insurance because we are using employment growth instead of income. One would need to specify how the system of transfers translates changes in employment to changes in taxes and transfers. As a result, the numbers in Table 6 should be read as our estimate of the insurance potential under the assumption that employment growth volatility is a good proxy for income volatility.

the UK. The case of Spain shows, as expected, that countries with higher than average volatility could benefit more from the European system. Spanish regions, although they have a very high correlation with other European regions, have a volatility that is more than double the volatility of the aggregate. As a result, its national fiscal system insures less than a third of the European insurance.

We need to emphasize that the previous estimates are constructed under the assumption that the European system is a perfect replica of the national systems in terms of the parameter τ. This parameter represents the stabilization that the tax system builds into regional disposable income. This stabilization is a function of the size of the budget and the countercyclical behavior of taxes (net of transfers). The fact that we assume that the European system is a replica of the national systems does not imply that the size of the budget needs to be identical to the size of the national government budgets. One can achieve a very high level of insurance with a small budget where taxes and transfers are very reactive to income changes.

An Example: Italy and Germany

All the previous calculations have been done under the assumption that all countries form part of the European fiscal federation. What would happen if only a subset of them joins EMU? We analyze here a federation with only two countries: Germany and Italy. Out of the 5 countries for which regional data was available, we have chosen these two for the availability of data (the data starts in 1960) and because Italy is a country that has had frequent realignments in the EMS.

We repeat the calculations of Table 6 but now we measure the insurance provided by national systems and the insurance provided by a hypothetical federation of German and Italian regions. In this case we only present the results for the pre-EMS period (1960-1979) and the post-EMS period (1979-1994). Results are shown in Table 7.

Table 7. Insurance

Regional Employment Growth Rates				
	1961-1979		1979-94	
Country	**(1)**	**(2)**	**(1)**	**(2)**
GER	7.80	19.85	8.58	13.29
ITA	12.25	26.41	8.79	12.25

Interregional insurance assuming τ = 30%. See text for details on calculations. (1) National insurance; (2) Federal insurance.

Overall, the numbers are similar to the ones of Table 6 but now there is a more pronounced change between the pre-EMS period and the post-EMS period.[31] While in the pre-EMS period national insurance is only 40% of the insurance provided by the federation, in the post-EMS

[31] The numbers are not directly comparable because in Table 6 we did not report the data for the pre-EMS period given that the data available for the other countries was not long enough.

period, national insurance is almost 70% of the insurance of the federation. Based on these estimates, if Italy and Germany were to form a currency union, the additional benefits of merging their fiscal systems into a unique federal system are not only small but they have also been substantially decreasing over time. If there are reasons to believe that this trend is to be continued, the benefits of a fiscal federation will become even smaller in the future. This is an important result that allows us to extrapolate our estimates to a future EMU. All the estimates presented in this paper are based in historical data that can be the result of institutions, economic policies or even fundamental shocks that are likely to change with the creation of EMU. The comparison between the pre- and post-EMS period provides some information on the likely changes that EMU will bring. Bayoumi and Eichengreen (1997), Fatás (1997) or Frankel and Rose (1997) provide additional evidence in favor of the idea that EMU will increase the synchronization of European business cycles.[32]

7. REDISTRIBUTION OR INSURANCE?

In previous sections we have studied the risk-sharing potential of a European-wide fiscal federation. In this section we review some of the problems associated to its implementation stressing the difficulty of avoiding redistribution.

The first issue is to define and measure the risk that needs to be insured. Risk is directly related to the unexpected component of output, usually associated to what we refer as its cyclical component. For the system to respond to cyclical fluctuations, we need to specify a long-term reference value or trend for income and transfers would be defined in response to deviations from the trend. The problem is that defining a reference value requires the identification of the long-term component of the variable in question. In order to avoid redistribution, one would need to update the fitted model as new data are released. If there is clearly no agreement among economists about how to filter the long-term component of a time series it seems even more problematic to design a system that would be agreed by politicians and where automatic adjustments are made as new data become available.[33]

To understand the importance of this issue, the following figure plots Spanish GDP relative to the aggregate of the other 14 countries.[34] As it is evident from the graph, although there might be a pattern of convergence, the trend is anyhting but stable. There are large deviations from the trend around the oil crises of the 70's or the recession of the early 90's. How do we classify

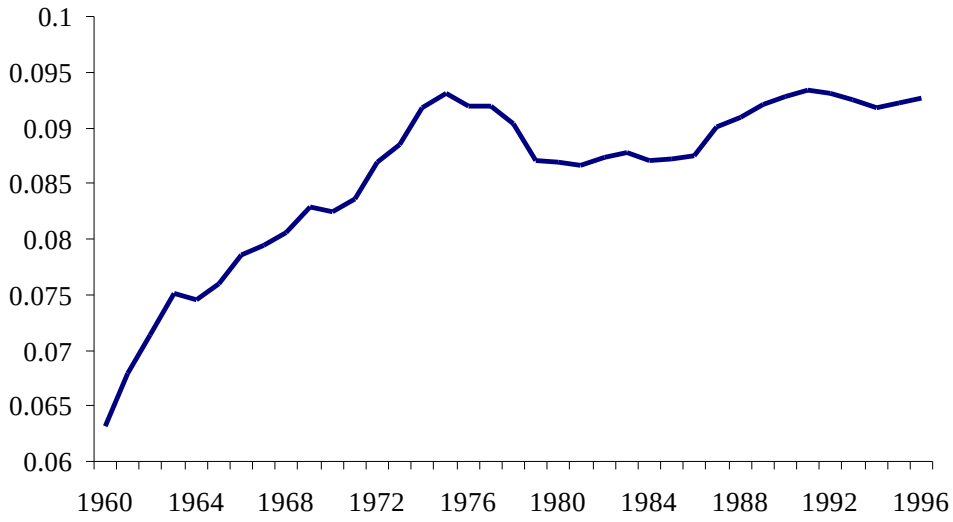
[32] The results of Table 7 can be interpreted in terms of the criteria for optimum currency area. This evidence suggests that the benefits for Germany and Italy to form a currency area are larger in the second part of the sample. Given that the second part of the sample coincides with the existence of the EMS, this means that the criteria for optimum currency area are endogenous and that countries are more likely to satisfy these criteria once they enter EMU.

[33] Von Hagen and Hammond (1996) test alternative methods to construct an insurance system that avoids redistribution. They find that although simple models create large errors, a fairly complex econometric model could easily avoid redistribution transfers. Their methodology ignores the problems of updating the system as new data are released.

[34] More precisely, the variable plotted is 1000 times the ratio of Spanish GDP to the aggregate GDP for the other 14 countries.

these movements and, more importantly, should a fiscal federation insure them? A possible interpretation of some of the observed changes is that a structural break in the growth rate of relative GDP has taken place. In this case, an adjustment would need to be made to the reference value (or trend) to calculate the cyclical deviations from this trend. But, at which point in time could we have concluded that there was a structural break in the growth rate of GDP in the early 70's? What this an unexpected break? What would happen if, after having agreed that there has been a structural break, new data overturned our conclusion? These are questions that highlight the difficulties that any European system of insurance would have faced if it had been in place in the last three decades.

Spanish relative GDP



In addition to the above issue of structural breaks in the growth rate of GDP, the system would also need to manage permanent shocks to the level of GDP. In other words, even if we can agree on the existence of a long-term trend defined by an average growth rate, some of the cyclical (unexpected) movements can be quite persistent or even leave permanent effects on the level of GDP. Should these fluctuations be insured? In principle, any risk associated to income fluctuations could be part of an insurance mechanism. However, it would be natural to restrict the insurance role of a possible European fiscal federation to transitory fluctuations. The main reason is that the debate on the creation of a fiscal federation in EMU is related to the possible use of fiscal policy to `replace' the role currently played by exchange rates. As a result, in the presence of permanent shocks to income, the system might be designed to deal with the cyclical component of these shocks but not with its permanent consequences. If the fiscal system were to generate transfers in response to the permanent effects on output, it will be generating transfers that would look very much like redistribution.[35]

[35] Once we allow for cyclical shocks to be permanent, the distinction between cycle and trend disappears. We avoid some of these issues in our discussion by making a clear distinction between structural changes in output growth and permanent shocks to the level of output. As it becomes obvious in our discussion, these two

To measure the importance of permanent shocks we have performed a simple exercise consisting on measuring the volatility of the permanent component of relative GDP for the 15 countries in our sample. This measure provides us with a rough estimate of how well a naive system, designed around a deterministic trend, would perform. The logic of our analysis is that a system where payments are generated in response to income deviations from a trend will serve its purposes only if the size and frequency of permanent shocks (relative to transitory shocks) is small. If, on the other hand, the permanent component of income is very volatile, the system will frequently create permanent interregional transfers.

To perform our empirical exercise we look at a measure of the contribution of the permanent component of relative GDP to its overall volatility using a ratio of variances. We prefer this measure to more traditional ways of decomposing fluctuations in temporary and permanent shocks because it does not specifically rely on any time series model to describe the variable in question. The variance ratio that we use simply looks at whether the economy tends to damp cyclical disturbances (in which case relative GDP returns to a deterministic trend after a shock) or, on the contrary, it tends to amplify them leading to permanent effects to the level of GDP. The estimate we use, proposed by Cochrane (1988), is a weighted average of GDP growth autocorrelations.

$$V_J = \frac{1}{J}\frac{\text{var}(y_t - y_{t-J})}{\text{var}(y_t - y_{t-1})} = 1 + 2\sum_{j=1}^{J-1}\frac{1-j}{J}r_j$$

where *y* is the log of GDP, *?j* is the *j-th* autocorrelation of the growth rate of output. *J* is the `window' for which the ratio is calculated. Taking the limit of this expression as *J* tends to infinity, we obtain a measure of long-run persistence. If a variable is trend stationary, we expect higher-than-normal growth to be followed by lower-than-normal growth (negative autocorrelations). In this case, the variance ratio will be very small. Indeed, given the construction of the ratio, if a variable is trend stationary, the ratio will be equal to zero. If the variable were a random walk with a drift, the ratio would be equal to one.[36]

Table 8 provides the estimates of this variance ratio for each of the 15 European countries in our sample. We have calculated the variance ratio for three `windows': 5, 10 and 15 years. For each country, we look at the GDP relative to the aggregate of the other 14 countries. As it is evident from the table, in all cases the ratio is much larger than zero. This result indicates that relative GDP is far from being a stationary variable and that permanent shocks are large and frequent. Indeed, in some cases (France, Spain or Greece), the ratio is very high and reflects the instability of their GDP growth rates relative to the growth rate of GDP of the aggregate.[37]

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phenomena are theoretically related and, in most cases, empirically undistinguishable. This highlights, even more, the difficulty of measuring cyclical deviations in income.

[36] We refer to Cochrane (1988) for further details on the interpretation of this ratio.

[37] In the cases of Spain or Greece, the fact that their average growth rate has been much higher than the growth rate of the European aggregate can explain the instability. This reinforces our claims about the difficulties of separating trend and cycle.

Overall, the estimates of Table 8 confirm the difficulties associated to designing and implementing any form or cyclical insurance across European regions or countries. Any simple design based on measuring deviations from a reference value or trend, will certainly lead to significant permanent transfers. These transfers can, of course, go in any direction (e.g. from poor to rich regions) which will undermine the support for the system and will further create tensions among its members. More complicated mechanisms based on models that decompose output (or unemployment) changes into permanent and transitory components might correct some of these deficiencies but will create endless debates about both the design of the model and the data that are inputted into the system. It is hard to imagine a system that finds enough support and credibility to be politically viable.

Table 8. Variance Ratio

Relative GDP Growth Rates

Country	V_5	V_{10}	V_{15}
GER	1.072	0.884	0.778
FRA	1.698	2.501	2.921
ITA	0.829	0.986	1.005
NET	1.014	1.031	0.689
BEL	1.028	0.816	0.841
LUX	1.314	1.563	1.648
UK	1.460	1.530	1.853
IRE	1.514	1.594	1.398
DEN	0.887	0.318	0.282
SPA	2.291	2.694	2.980
GRE	1.705	2.703	3.165
POR	0.898	0.890	0.920
SWE	0.930	0.613	0.440
FIN	1.288	0.907	0.619
AUT	0.940	0.698	0.425

Having seen that fluctuations are long lasting and that permanent shocks are large and frequent, an interesting issue is to measure the insurance potential regarding output fluctuations at lower frequencies. In other words, we want to measure the cross-country correlation of GDP growth rates at longer horizons. Table 9 presents the correlation between national and European GDP growth rates for three different frequencies: one, three and five years.[38] The numbers show that as the horizon gets longer, cross-country correlations increase. The (weighted) average at a five-year horizon is 0.84, 25% higher than the correlation of one-year growth rates. This result is consistent with our previous findings of long lasting fluctuations. It also suggests that, given the high correlation associated to low-frequency fluctuations, there is also little room for insurance at those frequencies.

[38] As before, the country in question is removed when calculating the aggregate.

Table 9. Correlation			
GDP Growth Rates			
Country	***1 yr.***	***3 yr.***	***5 yr.***
GER	0.67	0.69	0.82
FRA	0.85	0.93	0.96
ITA	0.68	0.77	0.90
NET	0.74	0.89	0.94
BEL	0.85	0.91	0.95
LUX	0.67	0.62	0.68
UK	0.43	0.45	0.64
IRE	0.13	0.32	0.52
DEN	0.60	0.64	0.80
SPA	0.73	0.86	0.93
GRE	0.64	0.88	0.91
POR	0.76	0.87	0.95
SWE	0.66	0.79	0.87
FIN	0.54	0.59	0.70
AUT	0.76	0.86	0.92
Average EU	0.66	0.73	0.84

Correlation of GDP growth rates with European aggregate at different horizons.

8. CONCLUSIONS AND POLICY IMPLICATIONS

The future adoption of a single currency among European countries has raised many concerns about how national governments will deal with shocks that are asymmetric (specific to regions or countries). Some of these concerns have their origin in the comparison between the US and Europe. From this comparison, the literature has concluded that the US states are better equipped to deal with asymmetric shocks not only because of the higher level of labor mobility but also because of the existence of automatic transfers provided by the federal budget. When a state suffers a recession, the combination of lower taxes and additional transfers absorbs a significant part of the initial decrease in income. Empirical estimates of this effect suggest that in response to a fall in state income by 1 dollar, disposable income only falls between 56 and 65 cents. These estimates are presented as evidence that the US federal budget provides significant interregional insurance not present in EMU.

This paper presents four sets of findings that suggest that the benefits associated to the creation of a European fiscal federation are much smaller than previously thought. First, we show that the some of the previous estimates of the amount of interstate insurance provided by the US federal budget overestimate the true amount of insurance by a factor of 3. The reason is that the original estimates simply measured the stabilization effect of the tax system on disposable state income. This can only be identified as insurance under the assumption that there is no aggregate risk in the federation. Otherwise, when a state suffers a recession, and the fall in its tax revenues is not compensated by revenue increases coming from other states, then the federal budget will run a deficit that will need to be paid in the future by all states. As a result, the state in a recession does not benefit as much as indicated by the smoothed disposable income and, moreover, the other states suffer because of the future tax payments. We apply the same

reasoning to data from countries of the European Union and find estimates of insurance potential which are very close to those for the US. Even if a European-wide fiscal system managed to reduce the volatility of disposable income by 30%, it would be providing less than 10% insurance. The other two thirds would be intertemporal stabilization through countercyclical budgets, a tool that is already available to European countries and will be available to future member countries of EMU.

This result highlights the importance of maintaining the future flexibility in conducting fiscal policy at the national level, and signals the possible costs of the stability pact. If government deficits are constrained by the limits of the stability pact, the ability of the current national systems to adjust to shocks through intertemporal transfers will disappear.[39] Under this scenario, there will be a much greater need for a European fiscal federation. In the absence of national fiscal policies, the benefits of a European fiscal federation will also include the intertemporal stabilization role that the national systems, constrained by the stability pact, will not be able play.

Second, Europe already has national tax systems which partially insure regions from idiosyncratic risk. We estimate the importance of these systems by comparing the current system with a hypothetical European-wide system that would replicate the stabilizing properties of the national systems. We find that the current national systems insure more than 50% of a European fiscal federation.

Third, we find some evidence that the potential insurance benefits of a European fiscal federation have decreased over time. When we break the sample in 1979 we find that in the post EMS period, because of increased correlations across countries, the potential for insurance of a European fiscal federation has been reduced. If, as a consequence of EMU, this trend persists in the future the insurance possibilities of a fiscal federation will continue to fall.

Fourth, we look at cross-country differences with respect to the insurance benefits that a European fiscal federation would provide. These benefits are a function of the amount of risk that different countries have and the correlation with the European aggregate. Some countries, the UK or Ireland, could greatly benefit from the system but others, France or Austria, could benefit much less. This implies, that if these countries are offered the possibility of joining the federation, they will possibly decline, which will in turn reduce the overall insurance possibilities of the federation. If all countries are forced into the system, the only solution to solve this tension is to have a different risk premium for different countries depending on their volatility. This asymmetry adds to the already complicated design of the system and would make its implementation even more problematic.

In the last part of the paper we review some of the practical difficulties associated to the implementation of interregional risk sharing through a fiscal federation. We show that there is a very high probability that any system designed to share risk across regions or countries generate permanent transfers. The nature of these transfers, which might go in any direction (for

[39] This is specially true if governments start with deficits being close to the upper limit of 3%.

example, from poor to rich regions), will very likely create conflicts with the redistribution goals of structural funds.

Overall, we conclude from our analysis that the potential to provide additional interregional insurance by creating a European fiscal federation is modest. We find difficult to argue that these benefits can compensate the many problems associated to the design and implementation of a European fiscal federation.

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10. APPENDIX

Data sources. US**,** *Real State Income*, state income at current prices deflated by the US GDP deflator. 1960-1990. European countries**.** *Real GDP*, GDP converted at PPP rates, source: OECD economic outlook, 1960-1996; *Employment*, total employment, source: OECD economic outlook, 1960-1995 (except France, 1966-1995). European Regions**.** *Employment*, France 1970-1990, Italy 1960-1994, Germany 1960-1994, UK 1965-1994, Spain 1981-1995; source: Eurostat and different national sources.

Table A1. Regional Codes. US

Code	State	Code	State
ME	Maine	**WV**	West Virginia
NH	New Hampshire	**NC**	North Carolina
VT	Vermont	**SC**	South Carolina
MA	Massachusetts	**GA**	Georgia
RI	Rhode Island	**FL**	Florida
CT	Connecticut	**KY**	Kentucky
NY	New York	**TN**	Tennessee
NJ	New Jersey	**AL**	Alabama
PA	Philadelphia	**MS**	Mississippi
OH	Ohio	**AR**	Arkansas
IN	Indiana	**LA**	Louisiana
IL	Illinois	**OK**	Oklahoma
MI	Michigan	**TX**	Texas
WI	Wisconsin	**MT**	Montana
MN	Minnesota	**ID**	Idaho
IA	Iowa	**WY**	Wyoming
MO	Missouri	**CO**	Colorado
ND	North Dakota	**NM**	New Mexico
SD	South Dakota	**AZ**	Arizona
NE	Nebraska	**UT**	Utah
KS	Kansas	**NV**	Nevada
DE	Delaware	**WA**	Washington
MD	Maryland	**OR**	Oregon
VA	Virginia	**CA**	California

Table A1b. Regional Codes. Europe

Country	Code	Region	Country	Code	Region	Country	Code	Region
Germany	**G1**	Schleswig-Holst. /Hamburg	**France**	**F1**	Ile de France	**Spain**	**S1**	Noroeste
	G2	Niedersachsen /Bremen		**F2**	Bassin Parisien		**S2**	Noreste
	G3	Nordrheim-Westfalen		**F3**	Nord/P.de Calais		**S3**	Madrid
	G4	Hessen		**F4**	Est		**S4**	Centro
	G5	Rheinland-Platz/Saarland		**F5**	Ouest		**S5**	Este
	G6	Baden-Wurttemberg		**F6**	Sud-Ouest		**S6**	Sur
	G7	Bayern		**F7**	Centre-Est		**S7**	Canarias
	G8	Berlin		**F8**	Mediterrane			
Italy	**I1**	Nord-Ovest	**UK**	**U1**	North			
	I2	Lombardia		**U2**	York and Humberside			
	I3	Nord-Est		**U3**	East Midlands			
	I4	Emilia Romagna		**U4**	East Anglia			
	I5	Centro		**U5**	South-East			
	I6	Lazio		**U6**	South-West			
	I7	Campania		**U7**	West-Midlands			
	I8	Abruzzi-Molise		**U8**	North-West			
	I9	Sud		**U9**	Wales			
	I10	Sicilia		**U10**	Scotland			
	I11	Sardegna		**U11**	Northern Ireland			

Table A2. Volatility and Correlation

Regional Employment Growth Rates

	Full Sample				EMS Sample			
Region	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
G1	1.16	2.15	0.70	0.41	1.11	1.70	0.61	0.41
G2	1.06	1.99	0.69	0.43	1.06	1.61	0.79	0.48
G3	1.32	2.35	0.85	0.50	1.39	2.00	0.79	0.46
G4	1.00	1.86	0.86	0.61	1.02	1.55	0.95	0.69
G5	0.98	1.84	0.71	0.56	0.88	1.36	0.83	0.68
G6	1.35	2.44	0.88	0.57	1.13	1.69	0.91	0.58
G7	1.27	2.46	0.47	0.44	1.53	2.42	0.36	0.41
G8	1.85	3.42	0.53	0.61	1.86	2.86	0.38	0.74
F1	1.32	1.04	0.63	0.73	1.48	1.08	0.62	0.84
F2	1.24	0.95	0.84	0.54	0.98	0.73	0.90	0.79
F3	1.32	1.03	0.80	0.22	1.10	0.82	0.84	0.42
F4	1.16	0.90	0.90	0.47	1.09	0.81	0.87	0.62
F5	1.28	1.02	0.58	0.17	1.39	1.04	0.53	0.11
F6	0.74	0.60	0.72	0.59	0.69	0.53	0.85	0.67
F7	1.39	1.08	0.71	0.36	1.51	1.09	0.69	0.27
F8	1.12	0.88	0.87	0.62	1.19	0.88	0.86	0.71
I1	1.06	1.57	0.78	0.49	0.95	1.32	0.78	0.76
I2	1.00	1.52	0.75	0.46	1.06	1.47	0.76	0.63
I3	1.03	1.58	0.61	0.47	0.89	1.26	0.63	0.67
I4	1.00	1.51	0.65	0.56	0.83	1.15	0.70	0.67
I5	1.20	1.78	0.69	0.26	0.95	1.32	0.71	0.41
I6	1.64	2.38	0.62	0.32	1.67	2.23	0.60	0.29
I7	2.19	3.07	0.65	0.23	2.25	2.91	0.66	0.37
I8	1.68	2.47	0.60	0.54	1.35	1.82	0.68	0.65
I9	1.61	2.34	0.62	0.33	1.62	2.14	0.70	0.48
I10	1.76	2.54	0.69	0.37	1.97	2.55	0.84	0.50
I11	1.94	2.84	0.67	0.63	1.95	2.61	0.82	0.66
U1	1.34	2.48	0.66	0.52	1.29	2.43	0.66	0.54
U2	1.28	2.37	0.71	0.66	1.25	2.39	0.67	0.66
U3	1.24	2.28	0.74	0.49	1.23	2.31	0.74	0.51
U4	1.44	2.68	0.47	0.41	1.38	2.62	0.41	0.37
U5	1.09	2.09	0.67	0.50	1.15	2.23	0.67	0.51
U6	1.29	2.36	0.90	0.67	1.26	2.35	0.93	0.70
U7	1.26	2.33	0.78	0.66	1.20	2.27	0.77	0.64
U8	1.48	2.68	0.80	0.56	1.54	2.83	0.79	0.56
U9	1.92	3.47	0.75	0.47	1.99	3.67	0.76	0.48
U10	0.91	1.74	0.65	0.57	0.84	1.63	0.61	0.55
U11	1.95	3.61	0.30	0.29	1.97	3.72	0.30	0.27
S1	-	-	-	-	1.67	1.42	0.57	0.66
S2	-	-	-	-	1.06	2.09	0.95	0.88
S3	-	-	-	-	0.82	2.68	0.72	0.63
S4	-	-	-	-	1.04	2.16	0.77	0.72
S5	-	-	-	-	0.69	2.96	0.90	0.87
S6	-	-	-	-	0.70	3.05	0.85	0.80
S7	-	-	-	-	0.75	2.92	0.65	0.46

(1) Standard deviation relative to country aggregate; (2) Standard deviation relative to European aggregate; (3) Correlation with country aggregate; (4) Correlation with European aggregate.

Table A3. Insurance

Regional Employment Growth Rates

	1961-1979		1979-94	
Region	**(1)**	**(2)**	**(1)**	**(2)**
G1	9.38	22.92	10.22	20.91
G2	7.38	21.88	5.35	19.06
G3	7.17	21.64	8.68	20.82
G4	2.80	18.76	1.69	15.14
G5	5.47	19.42	0.16	13.25
G6	8.50	21.65	4.53	17.86
G7	13.99	23.09	17.75	23.30
G8	19.32	24.15	21.49	21.81
F1	11.05	6.60	12.66	5.26
F2	7.22	8.65	1.39	-5.05
F3	10.25	18.22	5.62	8.45
F4	5.73	9.47	4.59	2.58
F5	12.73	19.25	14.70	21.07
F6	-2.51	-6.73	-8.20	-15.28
F7	11.99	15.58	13.43	17.87
F8	5.39	4.94	6.73	2.73
I1	5.49	18.65	3.23	11.34
I2	4.78	18.61	5.71	15.27
I3	8.54	19.00	4.87	12.12
I4	7.35	16.96	1.36	10.39
I5	9.92	23.56	4.85	17.75
I6	16.02	24.68	16.63	24.74
I7	18.77	26.84	18.97	25.26
I8	17.51	22.67	12.93	18.31
I9	15.54	24.46	14.42	22.00
I10	16.23	24.60	15.58	23.25
I11	18.44	22.82	16.61	21.87
U1	13.03	22.80	12.23	22.42
U2	10.94	20.78	11.27	20.78
U3	9.94	22.42	9.73	22.35
U4	17.60	24.56	18.15	24.81
U5	6.71	20.62	7.51	20.98
U6	7.95	20.61	6.95	20.27
U7	9.37	20.57	8.60	20.58
U8	11.60	22.72	12.37	23.13
U9	16.90	25.38	17.21	25.55
U10	5.20	18.54	3.78	18.12
U11	23.52	27.08	23.57	27.27
S1	-	-	-5.16	14.41
S2	-	-	-0.50	16.92
S3	-	-	9.36	22.19
S4	-	-	3.52	19.26
S5	-	-	7.92	20.49
S6	-	-	9.80	21.55
S7	-	-	13.40	24.62

Interregional insurance assuming $\tau = 30\%$. See text for details on calculations. (1) National insurance; (2) European insurance.