

Fiscal flows in the United States and Canada: Lessons for monetary union in Europe [☆]

Tamim Bayoumi ^{*}, Paul R. Masson

International Monetary Fund, Research Department Washington, DC 20431, USA

Received June 1992, final version received April 1993

Abstract

Regional flows of federal taxes and transfers within the United States and Canada are used to analyze long-term fiscal flows (the redistributive element) and short-term responses to regional business cycles (the stabilization element). In the United States, long-run flows amount to 22 cents in the dollar while the stabilization effect is 31 cents in the dollar. In Canada the redistributive effect is larger (39 cents) and the stabilization effect smaller (17 cents). Federal flows appears to depend on the institutional structure of the country concerned; however, in both countries the redistributive element is considerably larger than the amounts involved in the EC Structural Funds program. As for stabilization, national fiscal policies in the EC appear to have been as effective as federal governments in the United States and Canada in cushioning shocks to incomes.

Keywords: Fiscal policy; European Monetary Union

JEL classification: H11, H23, H77

[☆] We are grateful to Andy Atkeson for the U.S. data, to Youkyong Kwon for research assistance, and to Barry Eichengreen, Daniel Gros, Stephen Hall, Bruce Montador, Jean Pisani-Ferry, Steven Poloz, Jürgen von Hagen, and two anonymous referees for discussion and comments. Part of this work was done while Tamim Bayoumi was visiting the Bank of England, whose support he gratefully acknowledges. The views expressed here are personal to the authors and do not represent those of the International Monetary Fund.

^{*} Corresponding author.

1. Introduction

The Maastricht Treaty on Economic and Monetary Union (EMU) provides for the establishment of a common currency area among EC countries, but not a common fiscal policy. Some have argued (notably, Sala-i-Martin and Sachs, 1992) that a community-wide tax and transfer system would be desirable in order to cushion asymmetric shocks, since member countries in a monetary union are not able to use the exchange rate instrument for that purpose. Indeed, according to those authors, such a federal system may be essential for the survival of EMU.¹ Sala-i-Martin and Sachs estimate that federal taxes and transfers in the United States offset 30–35 percent of deviations of per capita income from the national average. In contrast, the EC currently has no fiscal mechanisms at the Community level for offsetting short-run, or cyclical, fluctuations – such as unemployment insurance or an EC-wide income tax. However, the Sala-i-Martin and Sachs analysis has not gone unchallenged. In particular, von Hagen (1992) estimates the income offset from federal taxes and transfers to be only 10 percent, making it a much less important factor in protecting against asymmetric shocks. Others have argued that even a modest EC budget could nevertheless finance a substantial cushioning of national shocks if it were properly designed (Italianer and Pisani-Ferry, 1992).

Another aspect of fiscal policy in a federal system is the capacity to make continuing income transfers from richer to poorer countries or regions. The role of such transfers varies. Regional transfers can, in principle, finance investment needed to promote the development of poorer parts of a monetary union, which might not be forthcoming in the absence of government intervention because of various market failures. Over time, productivity levels of residents of these regions would be raised toward the national average, and there would be convergence of living standards. Alternatively, income transfers may just supplement the income of those who have chosen to live in peripheral regions which have low productivity due to climatic or geographic disadvantages; in this case, income transfers may discourage labor mobility and convergence of productivity but be justified on equity grounds and because outmigration has social costs that are not incorporated in private decisions (Boadway and Flatters, 1982). The EC has acknowledged that there is a problem with respect to long-term regional income differentials, and has fashioned several programs aimed at reducing them. In particular, in 1988 the EC agreed to double the size of the transfers from ‘structural funds’ by 1992,² and the Maastricht Treaty provides for the establishment of a ‘cohesion fund’ to help

¹ There is a large literature on fiscal federalism. See, for example, Krasnik (1986), and Rosen (1986, 1988).

² See Gordon (1991) for a detailed description of the operation of these structural funds.

poorer regions. Nevertheless, the size of these EC transfers is still quite limited compared to some federations. In Canada, for instance, the constitution explicitly grants to the federal government a responsibility for ‘equalization’ – transfers from rich to poor provinces in order to enable them to provide similar government services at similar tax rates.

This paper extends the existing literature in several respects. *First*, we supplement the U.S. data with data for Canada, another federation with a different division of powers between national and regional governments. *Second*, in analyzing their experience, we use both cross-sectional and time-series evidence, in order to distinguish between redistribution and stabilization. It is important to attempt to distinguish empirically the two functions (see EC Commission, 1977, 1990; von Hagen, 1992); the results of Sala-i-Martin and Sachs (1992) however combine the two. *Third*, we decompose the effect of the federal system in a way that more accurately captures the respective roles of taxes and transfers. In contrast to Sala-i-Martin and Sachs (1992), we find a major stabilization role for transfers. *Fourth*, we go on to compare these estimates with estimates of the ability of EC countries to stabilize *national* per capita income relative to the EC average – in the absence of a federal system. Our estimates suggest that independent national fiscal policies are able to perform a similar degree of stabilization as operates within the two federations that we consider. Therefore, there we find no case on stabilization grounds for an EC-wide fiscal policy.

As for the importance of redistribution, our cross-sectional estimates differ considerably between the United States and Canada. Given that the real effects of the choice of an exchange rate regime concern mainly short-run flexibility of relative wages and prices (including the real exchange rate), but not their long-run values, we see little reason to argue that redistribution must necessarily accompany monetary union. We see the differences between the United States and Canada as primarily the result of *political* choices, not economic necessities.³ Nevertheless, we would argue that EC countries should address the precise form that economic union is intended to take, since other aspects of European integration (including EMU) are likely to lead to calls for greater ‘solidarity’ among member countries.

The plan of the paper is as follows. The next section considers how to measure the importance of redistribution and stabilization. Section 3 then looks at data for the United States and Canada, using cross-sectional regressions for long-run redistribution and time series regressions to uncover fiscal responses to short-term, cyclical fluctuations in personal income. In Section 4 the extent of stabilization accomplished by national governments in the EC is examined. Section 5 contains conclusions and implications.

³ See also Masson and Méliitz (1991).

2. Measuring redistribution and stabilization

2.1. Long-term redistribution

There are many reasons why a federal fiscal system may tend to support the relative income of poor regions and reduce that of rich regions. For example, to the extent that taxes are higher in regions with higher incomes, they will tend to equalize after-tax incomes across regions. Businesses also pay taxes which are likely to be related to income. Similarly, to the extent that poor regions are in more social need, their residents are more likely to receive personal transfer payments associated with the alleviation of poverty (such as social security payments). Finally the government may deliberately redistribute income for political reasons, such as social cohesion.

The importance of the redistributive flows can be measured by cross-sectional regressions which estimate the relationship between personal income after federal taxes and transfers and pretax personal income.⁴ By using data averaged over long time periods, these regressions abstract from short-term cyclical factors. The regression coefficients obtained give a direct measure of the degree to which the federal tax system reduces inequalities in incomes. In addition, by running intermediate regressions it is possible to estimate the contribution of different elements in the fiscal system (such as the federal tax system, personal transfers, etc.) to the overall total.

The importance of federal fiscal flows in redistributing income across regions is estimated using cross-section regressions of the following form:

$$(Y - TAX + TRAN)_i / (Y - TAX + TRAN) = \alpha + \beta Y_i / Y + \epsilon_i, \quad (1)$$

where Y is per capita personal income before all federal taxes and transfers; TAX and $TRAN$ are per capita federal taxes and transfers, respectively; and subscript i refers to the individual states or provinces while unsubscripted variables indicate the national average. The equation measures the relationship between personal income before and after the influence of federal fiscal flows. The difference between the coefficient β and unity represents the size of the offset to personal income caused by these flows. Hence, for example, a coefficient of 0.80 indicates that 80 percent of the initial differences in relative incomes remains after federal fiscal payments have been taken into account, i.e. that the federal government in the United States or Canada redistributes 20 cents of any dollar difference between richer and poorer states or provinces.

⁴ Throughout, the definition of personal income has been adjusted to exclude federal transfer payments.

2.2. Fiscal stabilization

The stabilization role of federal fiscal flows measures the impact of the federal fiscal system in response to temporary deviations in income from an underlying growth path, as opposed to redistribution, which involves flows associated with long-term income differentials. In the empirical results reported below, stabilization is captured by estimating time series models on data which are detrended by first-differencing in order to remove the low frequency fluctuations that are the basis for redistribution.⁵ Dickey–Fuller tests indicate that the levels data are generally nonstationary whether or not a time trend is included, but that the first-differences are stationary.

The stabilization role was estimated using the following system of equations:

$$\Delta\{(Y - TAX + TRAN)_i / (Y - TAX + TRAN)\}_t = \alpha_i + \beta_i \Delta\{Y_i / Y\}_t + \epsilon_{it}, \quad (2)$$

where i ranges over regions and t over time. In order to limit the number of observations and to conform to other studies, regional data were used for the United States (using the eight regions defined by the U.S. Bureau of Economic Analysis) rather than the state-by-state data; for Canada data for the provinces were used.⁶

Our specification is somewhat different from the specification used in earlier work in this area (EC Commission, 1977; Sala-i-Martin and Sachs, 1992; von Hagen, 1992; Masson and Taylor, 1992). In these papers, regressions were run relating tax and transfer payments (including grants) to movements in pretax personal income (both measured relative to the national average). The elasticities from these regressions were then used to estimate the size of the stabilization effects upon income. The reasons for using our specification are twofold. First, it provides a more direct method of evaluating the overall effect of stabilization; rather than using auxiliary results to infer the effect, it is estimated directly. Second, the elasticities approach may well overstate the role of taxes in stabilization and understate the importance of transfers because of the role of the cycle.

⁵ It could be argued that *redistribution* occurs also in response to high frequency fluctuations; however, the paper makes the identification assumption that the two roles can be distinguished as described.

⁶ To the extent that the regional time series are co-integrated (as they should be if redistribution operates), it is arguable that an error correction mechanism should be added to the estimating equation, in which case both redistribution and stabilization could be estimated from the time-series regression. Experiments with this type of functional form provided similar results to Eq. (2) on the first-differenced variables, while the long-run coefficients were not well determined. Hence the separate cross-section and time-series results are reported.

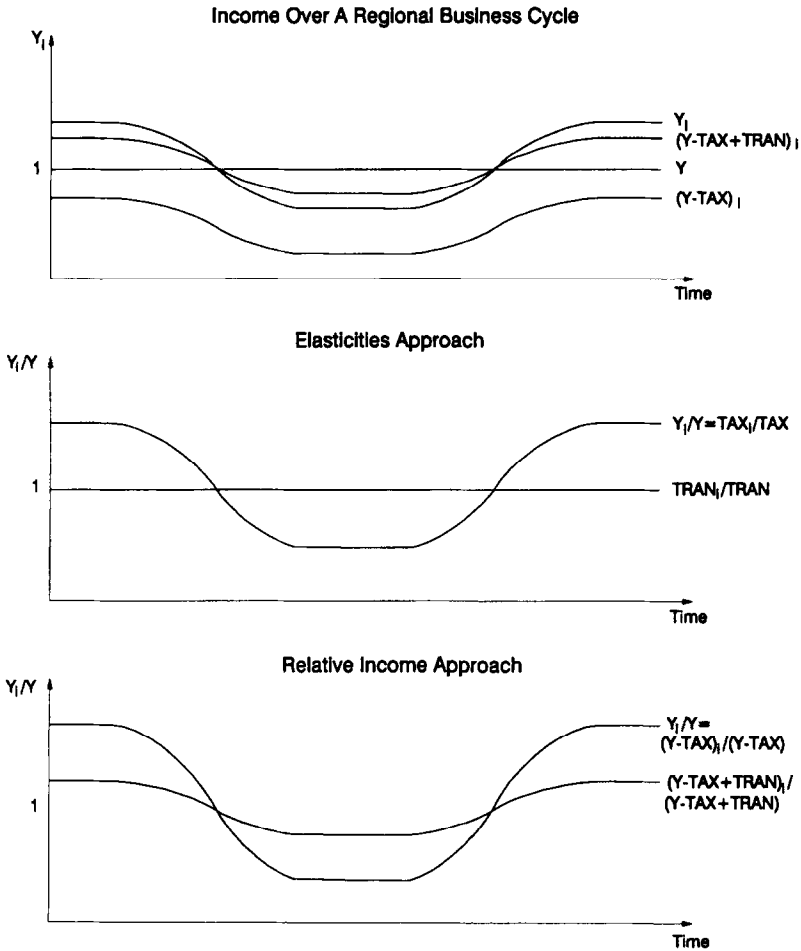


Fig. 1. Different measures of stabilization.

Notes: Assumptions: $TAX_i = tY_i$; $TRAN_i = TRAN$; subscripts represent regional per capita values.

This last point is best illustrated with an example.⁷ Consider an economy with a large number of identical regions where the federal government levies a national income tax and provides regional transfers. We will assume that the tax is proportional to income and that the transfer payments are defined at a fixed per capita level, independent of the level of activity. The first panel in Fig. 1 shows the path of federal taxes and transfers over a regional business cycle. As activity

⁷ The example we use involves changes over time. However, it is easy to see that the same arguments operate in cross-sectional comparisons.

relative to the national aggregate falls, tax payments are reduced by the same percentage while transfer payments remain at their former level; in the upswing the opposite happens. Clearly, in this economy it is the federal transfer payments which are providing insurance against the regional cycle, since tax payments simply mirror the overall cycle.

The next panel shows how this stabilization would be estimated using the elasticities approach adopted by other authors. Per capita regional tax payments (TAX_i) as a ratio to national per capita tax payments (TAX) vary with the cycle, while the same ratio for transfers ($TRAN_i/TRAN$) does not. As a result, the elasticities approach would attribute any stabilization that occurs to the tax system, not to transfers. The third panel illustrates the approach adopted in this paper. It shows the ratio of regional and national incomes, adjusted for taxes ($(Y - TAX)_i / (Y - TAX)$), and adjusted for taxes plus transfers ($(Y - TAX + TRAN)_i / (Y - TAX + TRAN)$). The post-tax income ratio varies in exactly the same way as the pre-tax ratio, while the ratio including transfers has a smaller cyclical variation. As a result, the estimation based on these ratios correctly ascribes the stabilizing effects of the fiscal system to federal transfers, not to the tax system. This illustrates the advantages of our approach as compared with the elasticities approach (both give the same overall effect from taxes and transfers together). However, while we believe our approach to be superior, there are inevitable ambiguities involved in ascribing parts of the overall stabilization effect to any particular part of the fiscal system, because spending and raising revenue cannot be divorced (on the assumption that the government must satisfy an intertemporal budget constraint).

3. Estimates for the United States and Canada

It is important to compare the United States to another federal system in order to gauge the generality of any conclusions. Canada is a good benchmark, because there are important differences with the United States. On the one hand, Canada has a considerably looser federation than the United States, and its federal taxes make up only about half the percentage of income that they do in the United States.⁸ Compared to U.S. states, most of which have balanced budget provisions,⁹ Canadian provinces have considerable fiscal freedom, which they can, and do, use to operate their own counter-cyclical policy. On the other hand, the Canadian

⁸ In Canada, though personal income tax rates are set by the provinces, taxes are based on federal taxable income and are collected by the federal government for all provinces except Québec. Hence federal tax changes induce automatic changes in provincial government revenues, unless there are discretionary changes in provincial tax rates or tax credits.

⁹ Advisory Council on Intergovernmental Relations (1991) has details of these constraints. All states except Vermont have some type of formal balanced budget requirement. For an analysis of the effects of these constraints on states' borrowing costs, see Goldstein and Woglom (1992).

Table 1

Redistribution through federal fiscal flows: cross-sectional regressions for the United States and Canada^a

Adjustment to income	United States (1969–86)		Canada (1965–88)	
	β	R^2	β	R^2
Taxes	0.934 (0.010)	0.995	0.976 (0.021)	0.996
Taxes and social insurance	0.923 (0.024)	0.969	–	–
Taxes, social insurance and transfers	0.824 (0.029)	0.944	0.824 (0.018)	0.996
Taxes, social insurance, transfers and grants	0.781 (0.028)	0.945	0.608 (0.025)	0.987

^a Data are averages over the relevant time periods. Number of observations: 48 for the United States, 10 for Canada. See appendix for data definitions. Standard errors are in parentheses.

welfare system is more highly developed, and the Canadian constitution gives the federal government a responsibility for ‘equalization’ transfers to poorer provinces in order to enable them to provide similar levels of government services at similar tax rates. Hence, while the stabilization role of the Canadian federal government in the economy may be smaller, it may have a more important role in the redistribution of regional incomes. The Appendix gives a summary of the data, indicating the size of the various flows.

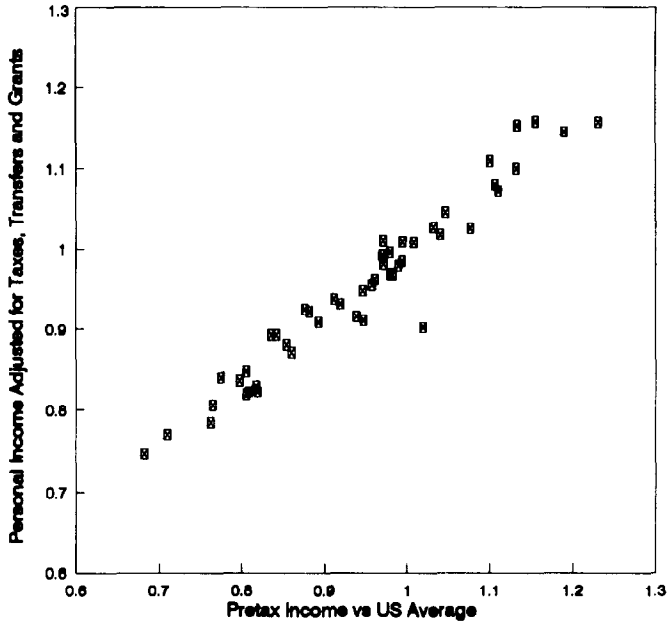
3.1. Redistribution

Table 1 shows the results from estimating Eq. (1) using data averaged over the longest periods for which the relevant variables were available. The first column indicates how the dependent variable is calculated, in particular, what adjustment was made to the pretax personal income data. Hence, the first row shows the results when pretax income is adjusted by federal taxes, the second the results when adjusted by both federal taxes and social insurance payments, etc. The regressions were estimated using ordinary least squares on data for the continental 48 states and the 10 Canadian provinces.

3.1.1. United States

The bottom row of Table 1 shows the results when all federal fiscal flows are included. For the United States, the coefficient on pretax income, β , is estimated at 0.781, with a standard error of 0.028. This indicates that, on average, U.S. federal fiscal flows reduce long-term income inequalities by some 22 cents in the dollar. Fig. 2, panel A, shows a scatter plot of the raw data, with pre-tax relative personal income on the vertical axis and personal income adjusted for all federal flows on the horizontal axis. It is clear from the chart that there is an extremely close connection between the two series, which is essentially linear. This explains

(A) Redistribution Across US States



(B) Redistribution Across Canadian Provinces

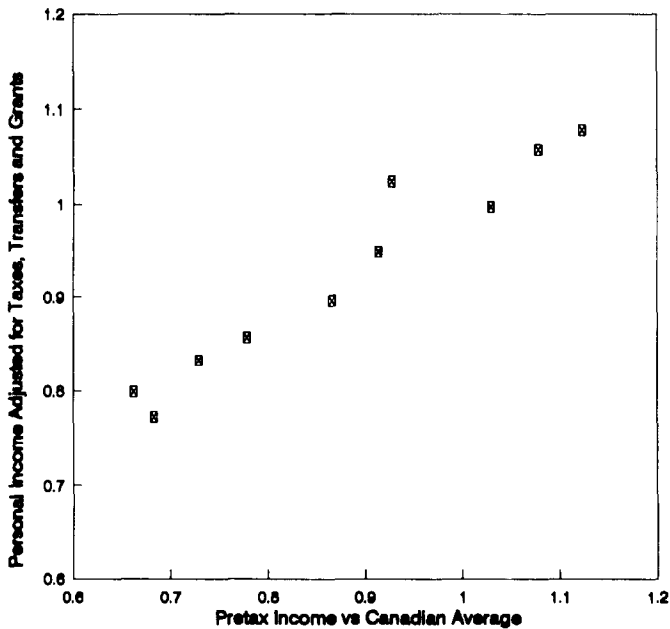


Fig. 2. Federal fiscal flows and personal income.

the relatively low standard error on the estimate of β and good fit of the equation, as indicated by the R^2 statistics.

The regression results reported in the first three rows of the Table give an indication of the relative importance of the individual elements in the overall redistributive process. Since these elements (federal taxes, social insurance payments, personal transfers, and grants to state and local government) are added in successively, the difference between the coefficient estimates indicates the effect of including that fiscal flow in the regression.

All parts of the U.S. federal fiscal system have a role in redistributing income, as can be seen from the steady reduction in the estimates of β as one moves down the Table. The largest roles in this redistribution are due to federal taxes and transfers (which reduce inequalities by some $6\frac{1}{2}$ cents and 10 cents in the dollar, respectively), with the contribution from federal grants being 4 cents, and social insurance payments contributing a relatively small 1 cent in the dollar. The results accord with intuition; for example the relatively small role for social insurance payments presumably reflects the flat rate nature of this payment, as opposed to the progressive nature of the federal income tax.¹⁰ Given the relatively small role played by federal grants in the redistributive process, the issue of whether they should be interpreted as giving support for personal income or not does not have a large effect on the results.¹¹ Even if all grants were excluded from the analysis, the redistributive effect would still be 18 cents in the dollar.

The results in the left panel of Table 1 are for the full period 1969–86. As documented by other authors (U.S. Department of Commerce, 1984; Barro and Sala-i-Martin, 1992), this period has seen a significant reduction in regional income differentials in the United States. It is therefore of some interest to see whether the redistributive elements of the fiscal system have changed in tandem with this narrowing of regional inequalities.¹² However, cross-sectional regressions using data averages for three sub-periods; 1963–69, 1970–79, and 1980–86 (not reported) give results for the subperiods that are relatively similar, with no evidence of a statistically significant shift in the coefficients. There does appear to be a tendency for the role of U.S. federal transfers to have increased in importance, from 8 cents in the dollar in the 1960s to nearer 12 cents in the dollar in the

¹⁰ The EC Commission (1977, Vol. 2, p. 130) estimates the level of redistribution in the United States to be slightly higher than our estimates (23–28 cents in the dollar); the main difference appears to be the larger estimated role for personal transfers, which they estimate to contribute 12–14 cents in the dollar, as opposed to 10 cents in our analysis. The significant role played by transfers and grants in the equation is noteworthy, since other empirical results (Sala-i-Martin and Sachs, 1992; von Hagen, 1992) did not find a significant role for these elements.

¹¹ Data on total government expenditure were also included in a variant of the regression, but the results suggested that these other government expenditures play no systematic role in redistributing income.

¹² Of course, there have also been changes in the tax and transfer system over this period, hence the results may also reflect changes in discretionary behavior.

1980s. Overall, however, it appears that the redistributive effect of the federal fiscal system has stayed relatively constant over time.

3.1.2. *Canada*

Results for Canada are shown in the right panel of Table 1, using data on personal income, personal direct taxes, federal transfers to persons, and grants to other levels of government.¹³ The basic data are given in panel B of Fig. 1, which shows a scatter plot of relative personal incomes before and after personal taxes, transfers, and grants. Panel B indicates that, as is the case for the U.S. data in panel A, there is a close (essentially linear) relationship between the variables.

These regression results also indicate that all of the elements of the fiscal system produce significant redistribution. Direct taxes provide an estimated 2 cents in the dollar of redistribution, somewhat smaller than in the United States. Transfers provide around 15 cents in the dollar of redistribution, and grants 22 cents, much larger than in the United States, presumably reflecting more highly developed social services and the effect of the equalization grants. At 39 cents in the dollar, the total effect in Canada is almost double that in the United States. The large role for federal grants to provincial and local governments in this regression is particularly notable since it contrasts with the United States.

We checked these results using data on gross provincial product and broader measures of taxes and transfers that include those paid and received by businesses. The estimated redistributive effect of the Canadian fiscal system was somewhat smaller (30 cents). The reduction is broad based, in that the contribution of all of the components of the fiscal system shrink. Since the main difference between personal incomes and GDP is corporate retained earnings, and there is no clear reason why the government should wish to redistribute such income, this rescaling is to be expected. Personal incomes make up some 75–80 percent of total product in Canada, hence these results are broadly consistent with the view that the parts of the fiscal system which are not associated with the personal sector have no role in redistributing income.¹⁴

Results across different time periods (not reported) indicate that there is little difference in the extent of redistribution between the 1970s and the 1980s; however the data do show somewhat lower levels of redistribution in the 1960s (28 cents as opposed to 41 cents in the 1970s and 44 cents in the 1980s). This rise over time is almost entirely attributable to the larger role of transfer payments in

¹³ As in the case of the U.S. data, the use of data in total grants will overstate the overall effect on personal incomes, since not all grants are directed at the personal sector. Social insurance payments are not available separately, and they are included with transfers, except for public pension plan contributions and benefits which are excluded.

¹⁴ These estimates are very similar to the redistributive effect reported in EC Commission (1977) of 28–32 cents in the dollar, although the role of transfers is larger, and that of government grants smaller than in this earlier study.

Table 2

Stabilization through federal fiscal flows: Time-series regressions for the United States and Canada^a

Adjustment to income	United States (1965–86)			Canada (1967–88)		
	β	R^2	DW	β	R^2	DW
Taxes	0.927 (0.011)	0.90– 0.98	1.60– 2.71	0.966 (0.010)	0.94– 0.99	1.17– 2.89
Taxes and social insurance	0.914 (0.014)	0.85– 0.97	1.69– 2.66	–	–	–
Taxes, social insurance and transfers	0.770 (0.015)	0.77– 0.97	1.46– 2.99	0.857 (0.012)	0.57– 0.98	0.78– 1.90
Taxes, social insurance, transfers and grants ^b	0.698 (0.018)	0.69– 0.96	1.55– 2.81	0.826 (0.022)	0.52– 0.96	1.72– 2.34

^a Estimated using three-stage least squares across 8 U.S. regions and 9 Canadian provinces. See Appendix for data definitions. R^2 and DW are given as ranges across regions and provinces. The instruments used were a constant term, a time trend, and the first lag of the change in pretax personal income for each region or province. Standard errors in parentheses.

^b Sample period is 1971–86 for the United States, 1967–88 for Canada.

redistribution in the 1970s and 1980s, as a result of the general expansion of federally-sponsored social programs over this period.

3.2. Stabilization

3.2.1. United States

Table 2 reports the results from estimating Eq. (2). The equations were estimated using three-stage least squares since there is the possibility that changes in fiscal variables will themselves affect pretax incomes by stimulating the regional economy;¹⁵ the instruments used were a constant, a time trend and the first lags of the change in the regional pretax income series. The value of β is constrained to be equal across regions, but the constant terms (the α_i 's) are allowed to vary across regions.¹⁶

Turning first to the regressions involving only taxes, the first row reports a point estimate of β of 0.927, indicating that for each one dollar that pre-tax

¹⁵ This problem does not arise in the cross-sectional regressions since the data are averages over very long time periods.

¹⁶ The estimates of the α_i 's, which are not reported, were all insignificant in this and all other regressions run using this first-difference formulation. (Since the α_i 's can vary across regions, there is no econometric problem associated with the fact that the average across regions equals the national figure, except for possible efficiency gains from imposing the constraint. However, standard errors of our estimates of beta are small.)

incomes change, post-tax incomes vary by only 93 cents, hence taxes stabilize incomes by 7 cents in the dollar, almost identical to the estimate of the redistributive effect from the cross-sectional regression. The descriptive statistics for the individual equations are satisfactory here and for the other regressions; R^2 values indicate that a high proportion of the variance is explained by the regression, while the Durbin–Watson statistics do not indicate any problem of misspecification. Tests using the QLR statistic (Gallant and Jorgenson, 1979) indicate that the constraint that the coefficient β is the same across regions cannot be rejected for any of the regressions.

When the dependent variable is adjusted for taxes, personal transfers, and grants, the constrained coefficient takes a value of 0.698. Thus, stabilization of short-term fluctuations rises to 30 cents in the dollar, larger than the 22 cent estimate of the redistributive effects provided by the cross-sectional regressions, reflecting the fact that personal transfers and grants vary more in response to short-term fluctuations than to long-term income differentials.¹⁷ Comparing the results with those from Table 1, it can be seen that personal transfers play a larger role in stabilization of short-term economic fluctuations than they do in reducing long-term income differentials, while the role of U.S. federal taxes, social insurance payments, and grants appears similar across the two sets of regressions.

Comparing the results reported here with those reported in earlier studies using U.S. data by Sala-i-Martin and Sachs (SS) and von Hagen (vH), two features stand out. In terms of the *size* of the stabilization effects, our estimate of 30 cents in the dollar is within the range suggested by SS, who estimated a value of 30–35 cents, but very different from the estimate of under 10 cents in the dollar produced by vH.¹⁸ We are uncertain as to why our results are so greatly at variance with vH, except that he used a different data set and estimation procedure.¹⁹ In terms of the *composition* of the stabilization effects, the results in this paper are radically different from both of the earlier studies, which concluded that almost all of the stabilization comes from the tax system and very little from transfers. Our results indicate that transfers are, if anything, the largest component in stabilization. As discussed above, the elasticity procedure used by both SS and vH may have tended to overstate the role of tax payments.

¹⁷ Estimates of β from the individual regions indicate some heterogeneity across regions. In contrast to the results using only taxes, these coefficient estimates tend to be larger than the constrained coefficients (again the restriction of equality cannot be rejected, however).

¹⁸ The EC Commission (1977, Vol. 1, p. 35) quotes a figure of 1/2 to 2/3 as the regional stabilization effect in the U.K. and France, but no further details are given.

¹⁹ VH used state-by-state data over a rather shorter time period (1981–86). In addition, he excluded social security payments, used gross state product as his activity variable, and estimated a slightly different functional form than SS.

3.2.2. Canada

The right panel of Table 2 presents estimates of the federal stabilization role in Canada.²⁰ In contrast to the United States, the personal income regressions for Canada indicate that when taxes, transfers, and grants are included, federal fiscal flows have a smaller role in the stabilization of personal income than they have in its long-term redistribution. At 17 cents in the dollar, the overall stabilization role of the federal government is considerably smaller than in the United States. The descriptive statistics indicate a good fit and few signs of autocorrelation, except possibly in the case of the regressions net of taxes and personal transfer payments.

4. Redistribution and stabilization in the EC

It is useful to compare the results for the United States and Canada with redistribution and stabilization across EC states. Redistribution across EC states is primarily carried out through the EC budget.²¹ The small size of this budget (EC budgetary receipts were 1.1 percent of EC GDP in 1992), and the wide differences in income levels across EC countries, means that the potential for redistribution across EC states is small. It is sufficient to examine the data in order to get a rough estimate of the redistributive impact of the EC budget; in any case, cross-sectional regressions of the type used across U.S. and Canadian regions are unlikely to produce accurate estimates for such small flows.

One part of the EC budget which is clearly directly aimed at redistribution across states is the EC Structural Funds program, which aims to transfer resources to regions whose incomes are persistently below the EC average. Gordon (1991) using pre-1989 data estimates that a \$1 fall in a member state's per capita income increases Structural Fund transfers by about \$0.01. Doubling this estimate to account for the increase in the Structural Funds, implemented over 1989–93, and allowing for induced changes in EC taxes, Gordon comes up with an estimate of \$0.03. The European Council recently decided a 41 percent increase in resources for structural policies, including the Cohesion Fund created in the context of the Maastricht Treaty on EMU, to take place over 1993–99 (EC Commission, 1993). However, even on the most generous of estimates of the EC transfers, the level of

²⁰ Regressions in which all the coefficients were allowed to vary across regions produced broadly similar results, although in this and other regressions the coefficients for individual provinces showed a fairly wide range of values. In Table 2 only data for the 9 largest provinces were used; Prince Edward Island, with a population of only about 100,000, disproportionately influenced the results, and was dropped from the sample. An alternative would be to use weighted least squares, with weights reflecting population.

²¹ In theory, redistribution could occur through direct revenue sharing agreements across member states, of the type that operate between German Länder, but there are no proposals for such a system in the EC.

Table 3
 Stabilization across the EC through national fiscal flows: time-series regressions^a

Adjustment to income	Five EC Countries (1972–89)		
	β	R^2	DW
Taxes	0.896 (0.134)	0.55–0.81	1.25–2.39
Taxes and transfers	0.692 (0.114)	0.45–0.83	1.32–2.47

^a Estimated using three-stage least squares across 5 EC countries; Germany, France, the United Kingdom, the Netherlands and Belgium. R^2 and DW are given as ranges across all countries. The instruments used were a constant term, a time trend, and the first lag of the change in pretax personal income for each country. Standard errors in parentheses.

redistribution in the EC is clearly nowhere near the levels we have estimated for either the U.S. or Canada, nor is it likely to approach them in the future.²² Another important part of the EC budget is the Common Agricultural Policy (CAP), but this program is not designed to redistribute toward poorer areas, but rather to support a particular sector; consequently, some of the richer countries (France, Denmark) are among the larger beneficiaries.

Unlike redistribution, which requires cooperation across countries, stabilization of cyclical movements in income across EC states can be carried out at the national level. Notwithstanding the EC growth initiative announced at the December 1992 Edinburgh summit (EIB loans for infrastructure investment, and increased national spending, totalling ECU 35 billion), the EC has virtually no stabilization role. In order to measure the level of national stabilization, annual data were collected on personal income, taxes, transfers and population for Germany, France, the United Kingdom, the Netherlands and Belgium from the *OECD National Accounts* for the period 1970–89.²³ Per capita levels of personal income before and after taxes and transfers in dollars were then calculated, using PPP exchange rates against the dollar obtained from the same source, and divided by the average per capita level for all five countries to obtain a similar data set to that used for the U.S. and Canada.

Before reporting the estimated levels of stabilization it is important to note a difference between the data for EC countries and the data for U.S. and Canadian regions. Changes in federal fiscal policies have a limited impact on data for the U.S. and Canadian regions, measured relative to the national aggregate, since all

²² Bureau and Champsaur (1992).

²³ These were the only countries for which the full data set could be obtained. The tax and transfer data refer to all levels of government since it was not possible to distinguish between central and local government.

of the regions in each country face the same policy change. This is not true for the EC data since each country operates an independent fiscal policy, and hence changes in the fiscal system in one country do not reflect a common EC policy change. This has two implications for the results. First, it is essential to use instrumental variable techniques in order to eliminate the endogenous impact of discretionary changes in national fiscal policies. Second, the coefficient estimates for the EC will inevitably be less precise than those for the U.S. or Canada due to the addition of noise in the data caused by differential changes in national fiscal policies.

Table 3 shows the results from estimating Eq. (2) across these five countries using three stage least squares.²⁴ The estimate of β for taxes and transfers together is 0.69, implying that, on average, taxes and transfers reduce fluctuations by 31 cents in the dollar in these countries. This is very similar to the estimate obtained for the United States, and higher than that found for Canada. The coefficient on the regression when income is only adjusted for direct taxes is 0.90, implying that 10 cents of the stabilization comes from the direct tax system, with the other 20 cents coming from transfers. This ratio of two-to-one in the relative impact of taxes and transfers is very similar to the results found in Table 2 for the United States and Canada.

The cross-equation restriction of equality across the countries cannot be rejected in either regression. This partly reflects the relative imprecision of the estimates of β ; the standard errors associated with the coefficients are both over 0.1, much higher than those associated with the equivalent U.S. and Canadian regressions. Despite this imprecision, the point estimate associated with income adjusted for taxes and transfers is significantly different from unity (the value at which no stabilization would occur) at the 1 percent significance level. National fiscal authorities create similar levels of stabilization across the EC to that produced by the U.S. and Canadian federal governments across regions of those countries. We have, of course, left out from the analyses of the United States and Canada the stabilization roles of states and provinces, which are needed to make them fully comparable to those for the EC. However, our purpose is more limited, namely to show that the *federal* stabilization role in the United States and Canada can be carried out by EC national governments – a fortiori, the latter can also exercise the fiscal powers of states and provinces.

5. Conclusions

This paper has investigated the role of federal fiscal flows in the United States and Canada in reducing long-term income differentials across regions (the redis-

²⁴ As with the earlier estimates, the instruments were a constant, a time trend and the first lags of the change in relative personal income in each country.

tributive role) and in reducing short-term regional business cycle fluctuations (the stabilization role). The former effects are investigated using cross-sectional regressions, the latter using time-series estimates. The ability of EC countries to perform these roles is then discussed.

The results indicate that the size of federal fiscal transfers varies with the type of function (stabilization or redistribution) and across countries. In the United States, where there is no federal mandate to equalize per capita incomes, redistributive flows from all federal sources²⁵ amount to around 22 cents in the dollar, while stabilization flows are somewhat larger at around 30 cents in the dollar. In Canada, where the federal government is a smaller factor in the economy but has certain responsibilities to 'equalize' the levels of government services provided across regions, the redistribution flows are around double those in the United States (39 cents in the dollar) but the stabilization flows are smaller (17 cents in the dollar). Taxes and transfers both play important roles in these flows. In the EC, there is no 'fiscal federalism'; the EC budget is small and redistribution is limited. However, national governments carry out stabilization of personal income using domestic fiscal instruments to an extent comparable to that in the United States and Canada.

These results suggest three considerations that may be relevant in the context of EMU. First, the size of the federal flows varies significantly depending on the institutional structure of the country concerned, so that neither the United States nor Canada provides a 'blueprint' for the EC. In Canada, where the individual provinces have more fiscal independence than U.S. states, the flows related to federal stabilization are smaller. Similarly, the relative size of redistributive flows appears to reflect the differing roles of the two federal governments; the Canadian federal government does considerably more to equalize long-term income differentials than the U.S. Government.

Second, the stabilization performed by national governments in the EC is comparable to that which occurs in the U.S. or Canadian federal fiscal systems. Therefore, there does not seem to be a case for a federal system among EC countries on stabilization grounds, unless increasing integration limits their ability to carry out stabilization policies (for instance, because of increasing tax harmonization and factor mobility), an issue which is beyond the scope of the paper.

Third, both federations however have significant redistributive functions. Even in the case of the United States, where there is no specific requirement for the federal government to equalize incomes, the federal fiscal system reduces long-term income differentials by 22 cents out of every dollar, which is considerably larger than the amounts involved in the EC Structural and Cohesion Funds. Clearly it is a political choice as to how much redistribution should occur across countries, rather than an economic necessity related to monetary union. However, political pres-

²⁵ Taxes, transfers and grants to state and local governments.

asures for such redistribution may grow in the EC in response other forces leading to increased integration, in particular the Single Market and EMU itself.

Appendix: Fiscal flows in the United States and Canada

A.1. U.S. data

Detailed data on personal incomes by state are available on an annual basis from the Commerce Department. In addition to pre-tax personal incomes, it is also possible to get data on payments of direct federal taxes and social insurance payments.²⁶ These make up the vast majority of federal tax revenues. The two important sources which are missing are corporate tax payments and indirect taxes and excise duties, which make up some 20 percent of federal revenues. In addition, the personal income tables provide data on personal transfer payments.²⁷ Unfortunately, these flows are reported in terms of function (e.g. unemployment compensation, medical benefits, etc.) rather than source (federal, state, or local), hence the level of federal transfers has to be constructed by making assumptions as to the source of the payments.²⁸

Finally, data on federal grants to state and local government were also collected. Clearly, not all government grants are directed at the personal sector, and hence the inclusion of all grants may imply some overestimation of the objectives of the federal government in redistributing personal income.²⁹ A more accurate method of measuring the impact of federal grants might involve deflating federal grants by state product rather than personal income. However, since personal incomes make up some 80 percent of state product, this bias is unlikely to be large, and hence no adjustment was made. The data on personal taxes, social insurance and transfers are available from 1963–86, while those on government grants are only available from 1969. Transfers and grants together make up some 65 percent of U.S. government expenditure, with the balance going to wages and salaries and government procurement. Data on federal wages and salaries and procurement by state were collected from 1981 onwards.

²⁶ Von Hagen (1992), in a similar study, excludes social security payments on the grounds that they redistribute incomes over time as well as across regions. Since they play little role in the empirical results, we do not believe that our choice to include such payments is critical to our results.

²⁷ Transfers to other sectors and interest payments on the national debt are not included in the figures.

²⁸ Two estimates of federal transfers were constructed: a 'broad' measure which was made up of all government transfers except for state and local government payments for unemployment and retirement, and a 'narrow' definition which summed federal payments for civilian retirement, unemployment and education with total payments for old age, medical benefits and veterans' affairs, all of which are dominated by the federal government. In practice, the results using the two measures were virtually identical, and hence only results using the 'broad' measure are reported.

²⁹ Though such grants may not be targeted at redistribution, they may have that effect in practice.

The time-series regressions use data aggregated into regions. The regions are those defined by the Bureau of Economic Analysis (BEA), namely New England, the Mid East, Great Lakes, Plains, South East, South West, Rocky Mountains and Far West.

A.2. Canadian data

Data on personal incomes,³⁰ federal personal direct taxes, federal transfers to persons, and federal government grants to provincial and local governments were collected for each of the 10 Canadian provinces.³¹ In addition to these data from the personal income accounts, as a check, data were also collected on total provincial output (GDP), total federal taxes (the sum of federal personal and business taxes, both direct and indirect), total federal transfers (the sum of federal personal and business transfers), and grants to other levels of government. These data allow a broader estimate of the overall impact of the federal fiscal system to be calculated, including direct effects on both the personal and business sectors and indirect effects on them through grants to provinces and municipalities that allow equalization of provincial taxes and services.³² However, since we are primarily interested in how personal income is affected, we do not report regression results using these measures in the tables, but only refer to them in passing in the text.

A.3. Comparison of the two countries' data

Table A.1 compares the structure of the tax and transfer systems in the U.S. and Canada. It reports payments of taxes and levels of transfers as a percentage of GDP at five-year intervals starting in 1965, differentiating between federal fiscal flows and those flows to or from other levels of government.³³

³⁰ Adjusted to exclude federal transfers, as in the case of the U.S. data.

³¹ The data correspond to those collected for the U.S. states, except that social insurance payments are not reported separately. Employer and employee contributions to public service pensions plans and to unemployment insurance are included with direct taxes, while federal transfers to persons include unemployment insurance benefits, public service pensions, old age security, and miscellaneous other transfers. However, Canada and Québec pension plan (CPP/QPP) contributions and benefits are excluded from our data. Moreover, interest payments made by the federal government to persons are not available on a provincial breakdown, and are also excluded.

³² However, we continue to leave out CPP/QPP payments and receipts and federal debt interest payments on the grounds that they do not involve deliberate federal policy either to stabilize cyclical income fluctuations or to redistribute income across provinces, though they may have the latter effect in practice, increasing our already large estimate of redistribution in Canada.

³³ The data come from national accounts sources. For Canada they are identical with the provincial data used in the estimation, while in the case of the United States there are some differences since the personal income accounts use slightly different definitions of some variables.

Table A.1
U.S. and Canada: Taxes and transfers (as a percentage of GDP)^a

	Direct taxes				Indirect taxes			Net transfers (excluding interest payments)				
	Paid by persons		Paid by business		Social insurance	Federal	Other	Federal to persons	Federal to business	Other to persons	Other to business	Federal to other
	Federal	Other	Federal	Other								
<i>United States of America</i>												
1965	7.6	1.2	4.1	0.3	3.8	2.4	6.6	4.3	0.5	1.3	-0.4	1.6
1970	9.1	1.7	3.0	0.4	5.2	1.9	7.4	6.1	0.6	2.0	-0.4	2.4
1975	7.9	2.0	2.7	0.5	6.4	1.5	7.3	9.3	0.4	2.5	-0.3	3.4
1980	9.5	2.1	2.6	0.5	6.9	1.5	6.4	9.1	0.4	2.4	-0.2	3.3
1985	8.5	2.3	1.9	0.5	7.7	1.5	6.7	9.1	0.5	2.5	-0.3	2.5
1990	8.7	2.5	2.0	0.4	8.1	1.2	6.8	9.0	0.4	3.0	-0.4	2.4
<i>Canada</i>												
1965	5.8	1.9	3.8	0.9	-	5.6	7.7	4.0	0.8	1.9	0.2	2.5
1970	8.3	3.4	3.4	0.9	1.5	4.5	8.9	4.6	0.8	3.2	0.3	3.8
1975	8.9	4.1	4.4	1.2	1.6	4.6	7.8	6.2	2.1	3.3	0.7	4.5
1980	7.6	5.1	3.9	1.2	1.8	4.0	7.5	5.3	2.1	3.7	0.9	4.1
1985	8.9	5.6	3.3	0.8	2.1	4.0	8.3	6.6	2.0	4.1	1.3	4.5
1990	10.9	7.2	1.6	0.8	2.3	3.9	9.0	6.3	0.9	4.2	1.1	4.0

^a For Canada, social insurance payments are defined as the sum of payments to the federal and Quebec pension funds. For the U.S., the data comes from the national accounts, which differ slightly in terms of definition and coverage from the regional data used in the estimation.
Source: U.S. and Canadian National Accounts

Comparing the data for the two countries, some differences in the fiscal system are clear. Focusing first on direct taxes, the most obvious differences are the importance of social insurance payments in the U.S. fiscal system and the relative importance of taxes paid to other levels of government in the Canadian system. The Canadian system also relies more heavily on indirect taxes than the U.S. system, particularly at the federal level. Turning to transfer payments, the Canadian data show a much larger role for transfers from the federal government to other levels of government than do the U.S. data, presumably reflecting the role of the federal government in equating provision of local services. In addition, as with direct taxes, non-federal levels of government play a larger role in making transfer payments to the private sector in Canada.

References

- Advisory Council on Intergovernmental Relations, 1991, Significant features of fiscal federalism: Vol. 1.: Budget processes and tax systems (ACIR, Washington, DC).
- Barro, Robert and Xavier Sala-i-Martin, 1992, Convergence, *Journal of Political Economy*, Vol. 100, no. 2, 223–251.
- Bayoumi, T. and B. Eichengreen, 1993, Shocking news about European Monetary Union, in: F. Giovannini and F. Torres, eds., *The transition to economic and monetary union in Europe* (Cambridge University Press, Cambridge).
- Boadway, Robin and Frank Flatters, 1982, Efficiency and equalization payments in a federal system of government: A synthesis and extension of recent results, *Canadian Journal of Economics* 15, 613–623.
- Bureau, Dominique and Paul Champsaur, 1992, *Federalisme budgétaire et unification économique européenne, Observations et Diagnostics Economiques* 40, April, 87–99.
- Cohen, Daniel and Charles Wyplosz, 1989, The European Monetary Union: An agnostic evaluation, in: R. Bryant, D. Currie, J. Frenkel, P. Masson and R. Portes, eds., *Macroeconomic policies in an interdependent world* (International Monetary Fund, Washington, DC).
- EC Commission, 1977, Report of the study group on the role of public finance in European integration, collection of studies, *Economic and Financial Series*, nos. A12/B13 (European Economic Community, Brussels).
- EC Commission, 1990, One market, one money, *European Economy*, no. 44, Oct.
- EC Commission, 1993, Annual report for 1993 (Commission of the European Communities, Brussels) Feb.
- Gallant, A. Ronald and Dale Jorgenson, 1979, Statistical inference for a system of simultaneous, non-linear, implicit equations in the context of maximum likelihood estimation, *Journal of Econometrics* 11, 275–302.
- Goldstein, Morris, and Geoffrey Woglom, 1992, Market-based fiscal discipline in monetary unions: Evidence from the U.S. municipal bond market, in: Matthew Canzoneri, Vittorio Grilli and Paul R. Masson, eds., *Establishing a central bank: Issues in Europe and lessons from the U.S.* (Cambridge University Press, Cambridge) 226–260.
- Italianer, Alexander and Jean Pisani-Ferry, 1992, Systèmes budgétaires et amortissement des chocs régionaux: Implications pour l'Union économique et monétaire, *Economie Prospective Internationale* 51 (3rd Quarter), 49–69.
- Kenen, Peter B., 1969, The theory of optimal currency areas: An eclectic view, in: R. Mundell and A. Swoboda, eds., *Monetary problems of the international economy* (University of Chicago Press, Chicago, IL).

- Krasnick, Mark, 1986, *Fiscal federalism* (University of Toronto Press, Toronto).
- Masson, Paul R. and Jacques Mélitz, 1991, Fiscal policy independence in a European Monetary Union, *Open Economies Review* 2, 113–136.
- Masson, Paul R. and Mark P. Taylor, 1993, Common currency areas and currency unions: An analysis of the issues, Parts I and II, *Journal of International and Comparative Economics* 1. nos. 3–4, 231–250 and 265–294.
- Rosen, Harvey S., ed., 1986, *Studies in state and local public finance* (University of Chicago Press, Chicago, IL).
- Rosen, Harvey S., ed., 1988, *Fiscal federalism: Quantitative studies* (University of Chicago Press, Chicago, IL).
- Sala-i-Martin, Xavier and Jeffrey Sachs, 1992, Fiscal federalism and optimum currency areas: Evidence for Europe from the United States, in: Matthew Canzoneri, Vittorio Grilli and Paul R. Masson, eds., *Establishing a central bank: Issues in Europe and lessons from the U.S.* (Cambridge University Press, Cambridge) 195–219.
- U.S. Department of Commerce, 1984, *State personal income: Estimates for 1929–1982* (USGPO, Washington, DC) Feb.
- von Hagen, Jürgen, 1992, Fiscal arrangements in a monetary union: Evidence from the U.S., in: Don Fair and Christian de Boissieux, eds., *Fiscal policy, taxes and the financial system in an increasingly integrated Europe* (Kluwer, Deventer).