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Liability-Creating Versus Non-Liability-Creating Fiscal Stabilization Policies: Ricardian Equivalence, Fiscal Stabilization, and EMU[1]

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Abstract

This paper looks at theoretical and empirical issues associated with the operation of fiscal stabilizers within an economy. It argues that such stabilizers operate most effectively at a national, rather than local, level. As differing cycles across regions tend to offset each other for the country as a whole, national fiscal stabilizers are not associated with the same increase in future tax liabilities for the region as local ones. Accordingly, the negative impact from the Ricardian effects associated with these tax liabilities is smaller. Empirical work on data across Canadian provinces indicates that local stabilizers are only 1/3 to ½ as effective as national stabilizers that create no future tax liability.

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SUMMARY

A debate has arisen in Europe concerning the lack of fiscal stabilization at the EU level, in contrast to the existence of important fiscal stabilizers at the federal or national level in other monetary unions. Effective fiscal stabilization is all the more important in EMU given the loss of the exchange rate instrument for that purpose—especially since other shock absorbers, like labor mobility, are unlikely to be very potent. In this paper we examine the impact of fiscal policy in federal systems, and provide empirical evidence concerning the relative effectiveness of stabilization at different levels of government.

If consumers are Ricardian, automatic stabilizers operating through (nondistorting) taxes and transfers will have no effect in cushioning shocks at the national level, since they will involve creation of debt whose debt service will be anticipated by consumers. The same is true of attempts to use stabilization policy by lower levels of government. However, regional stabilizers that involve redistribution across a federation can be more effective because they do not create regional tax liabilities. We test this hypothesis using data for Canada.

Our empirical results confirm the larger impact on consumption of fiscal deficits that do not create a future regional tax liability compared to deficits that do. The two coefficients are significantly different from each other and differ by a factor of two. Thus, stabilization policy within a federal system that involves some degree of redistribution is much more effective in cushioning shocks to consumption.

Though acknowledging that there may be problems designing a system that does not involve persistent transfers of revenue from some countries to others, we would interpret this evidence as providing another argument for Europe to consider expanding fiscal policy at the Union level, rather than relying on national fiscal policies to offset idiosyncratic shocks.

I. INTRODUCTION

Plans to create a single European currency have generated work in many areas of economics, as researchers try to assess both the implications and the advisability of this undertaking. One of these areas has been the operation of fiscal stabilizers. Without the monetary flexibility provided by separate currencies, labor mobility, wage flexibility, and fiscal stabilizers all represent potentially important ways of reducing the impact of idiosyncratic cyclical disturbances across regions of the projected currency union.[2] The function of fiscal stabilization policies in monetary unions has already generated an extensive academic literature, going back to Mundell (1961) and Kenen (1969).[3] In the European context, it has also been the subject of an official report, European Commission (1977), and the Commission has more recently published a collection of papers devoted to the fiscal requirements for the successful operation of EMU.[4]

The recent debate in Europe on the role of fiscal stabilizers after EMU has not, however, focused on the appropriate size of fiscal stabilizers, important though that question might be. Rather, the central issue has been the level of government which should be used to operate them. Within existing national currency unions, most fiscal stabilization is carried out at the national (federal) level, rather than at lower levels of government.[5] Empirical estimates of the size of federal fiscal stabilizers within the United States and other countries generally find them to be significant, with fiscal flows offsetting as much as 20-30 percent of the initial reduction in income.[6] As far as EMU is concerned, the logical counterpart to this behavior within countries would be to give a significant role in fiscal stabilization to a central authority of the Union. This is not, however, the approach which the EU countries intend to adopt, with several of them resisting any moves toward federalism. Rather, fiscal stabilization within the new currency union will be primarily carried out at the level of the nation state.[7]

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[2]Cohen and Wyplosz (1989), for instance, argue that EMU could be put at risk by transitory, asymmetric shocks.

[3]For a survey, see Masson and Taylor (1993).

[4]European Commission (1993).

[5]Bayoumi and Eichengreen (1995). They also provide evidence that the level of centralization of government matters, with the role of lower levels of government in offsetting the cycle tending to be larger for federal governments than for non-federal ones.

[6]Sala-I-Martin and Sachs (1992), Bayoumi and Masson (1995), and Goodhart and Smith (1993). Significantly lower estimates of the size of fiscal stabilizers in the United States, however, are found by von Hagen (1994).

[7]Several schemes has been proposed for providing fiscal stabilization at the EU-wide level

A question which naturally arises is whether the level of government at which fiscal stabilization occurs has any effect on its net impact. This paper argues that there are good reasons for believing that there is such a difference. When local governments provide fiscal stabilization within their own region there is a direct impact on the level of local government debt. To the extent that citizens take account of the future tax liabilities implicit in this increase in debt in their current saving decisions, they will partially offset the fiscal boost provided by the government. If a federal government provides stabilization across a number of regions all experiencing different disturbances, however, the impact on federal debt will tend to cancel out, there will be no expectation of future tax liabilities, and hence there will be less of a private sector offset to fiscal stabilization.

The issue is best seen in the context of the Ricardian equivalence proposition originally due to Barro (1974). In the extreme case of complete Ricardian equivalence, local governments are unable to provide fiscal stabilization within their locality, as their actions will be offset by the private sector. To the extent that deficits across differing regions cancel out, however, federal governments *can* provide fiscal stabilization across regions (although not for the economy as a whole) as fiscal insurance is being provided across regions rather than across time, unless the shocks they respond to are perfectly correlated and the regional cycles perfectly synchronized, which is unlikely. The same logic can be used to argue that federal stabilizers will be more effective than local ones even in the more realistic case where Ricardian effects are only partial.

This issue has several implications for the design of federal systems, and the allocation of powers between central and lower levels of government. There is an extensive literature on fiscal federalism, which discusses, among other issues, at what level public goods should be provided, the implications of factor mobility for taxation, and the extent services should be equalized across states through federal taxes and transfers (Tiebout (1956), Musgrave (1960)). The role of redistribution within a federation has been extensively discussed, and it is recognized that redistribution is the *ex post* result of insurance (e.g., Rawls (1971)). As concerns macroeconomic stabilization, Oates (1972) argues that fiscal stabilization policy is more effective at the national, rather than local, level, for two reasons: 1) small local economies are highly open, and hence leakages are greater; and 2) since capital flows freely within a country, Keynesian deficit finance will "tend to saddle the community with an external debt...[which, in later years], will necessitate a transfer of real income from the residents of the community to outsiders." (Oates (1972), p.5.) Recent work on fiscal federalism by Persson and Tabellini (1996a, 1996b) studies the tradeoffs between risk sharing on the one hand and moral hazard and redistribution on the other.

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with little increase in the EU budget by a highly directed set of fiscal transfers (Pisani-Ferry, Italianer, and Lescure (1993), and Mélitz and Vori (1992)). However, there does not appear to be any interest by national policy makers in adopting such a scheme at present.

To our knowledge, however, the link between the effectiveness of stabilization policy and the fact that in a federation the taxes used to finance it do not fall solely on the region experiencing a negative shock has not been discussed in the literature. Several points need to be recognized concerning the need for, and effectiveness of, stabilization policy. First, the need for regional stabilization depends on the existence of asymmetric regional shocks—something that is assumed away by Oates in point (1) above. Second, the shocks to income can be even more localized—e.g., affect only an individual—and a tax and transfer system would help to cushion them. But such shocks would not show up at even the regional level, much less the national one. Third, factor mobility within a federation tends to increase the effectiveness of regional stabilization policies, to the extent that residents of that region do not expect to have to pay the future taxes. However, it also constrains the ability of regions to incur debt because of investor concerns that they may not be able to service it. Fourth, if Ricardian equivalence holds perfectly, then the need for government stabilization policy is diminished; consumption should vary only in response to permanent income, and cyclical income fluctuations could only be the result of myopia or lags affecting other components of demand, e.g., investment. But in the face of partial Ricardian equivalence, stabilization policy would retain its justification, and the issue of its effectiveness would remain.

The link with insurance also raises the issue whether private financial markets and capital flows can provide a substitute for a federal stabilization policy. In principle, private insurers could insure individuals for income shocks, or states could do so for shocks to their region by holding a diversified portfolio of claims on other income streams. In practice, it does not seem that this is empirically important; even within the United States, where there are no barriers to capital flows, the bulk of consumers do not appear to use private capital markets to insulate their consumption flow from fluctuations in regional income (Atkeson and Bayoumi (1993)). Such private insurance may not be available because of adverse selection problems: governments can solve these problems through enforcement of the tax laws, making the *ex post* redistribution compulsory (Sinn (1995)).

The implication of our results for EMU is that stabilization by national governments is likely to produce less bang for the same buck than an equivalent EU-wide policy. However, while the sign of the effect is unambiguous, the potential size of the effect is unclear. Existing estimates of the size of the Ricardian offset to fiscal policy, and hence the potential increase in the stabilization bang from a federal policy, vary widely.[8] We look at this issue directly using data on fiscal policy across differing levels of government for Canadian provinces. The impact of changes in federal fiscal deficits on private consumption is contrasted with the impact of changes in fiscal deficits by lower levels of government. The results indicate that idiosyncratic shocks are cushioned more effectively by federal fiscal policy that involves a degree of redistribution across provinces.

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[8]See Bernheim (1987) and Seater (1993) for surveys.

The plan for the remainder of this paper is as follows. The next section outlines in more detail the theoretical argument about why fiscal stabilization at the federal level may be more effective than its local counterpart. Section III introduces the Canadian data, provides a brief discussion of the system of fiscal federalism in Canada, and reports estimates of the degree to which different levels of government stabilize output over the provincial business cycle. Section IV explores whether there are significant differences in the effectiveness of fiscal stabilization across these different levels of government. Section V concludes.

II. THEORETICAL CONSIDERATIONS

In order to consider the different effects of stabilization policies at federal and regional levels, it is useful to sketch out their implications in the widely-used model of partial Ricardian equivalence due to Yaari (1965), Blanchard (1985), and Frenkel and Razin (1987). In this model, uncertain lifetimes produce a higher discount rate for the consumer than for the government.[9] A constant probability of death that is independent of age allows aggregation of all individuals into a representative consumer. It can be shown that the resulting consumption path is not independent of the choice between taxes and debt financing.[10]

In this model, if consumers maximize utility which is logarithmic, income is exogenous, and taxes are lump sum, consumption can be written:

$$C_t = \rho \left\{ B_t + \sum_{i=0}^{\infty} [(1+r)(1+\delta)]^{-i} E_t \left(Y_{t+i} - T_{t+i} \right) \right\} \tag{1}$$

where $\rho \geq 0$ is the rate of time preference, r is the interest rate (assumed constant), δ is a constant probability of death, Y is income, and T and B are taxes and beginning-of-period government debt, respectively. The government satisfies an intertemporal budget constraint which implies that the bond stock equals the discounted present value of taxes minus government spending, G:

$$B_t = \sum_{i=0}^{\infty} (1+r)^{-i} E_t \left(T_{t+i} - G_{t+i} \right) \tag{2}$$

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[9]Though it is true that governments last only a few years, they typically honor the debt incurred by previous governments. Risk of default would raise the government's borrowing cost—perhaps even above the private sector's discount rate. In practice, however, consumers cannot borrow at as low a rate as governments except in exceptional circumstances.

[10]In the special case where the birth rate and the probability of death are zero, however, Ricardian equivalence holds.

Consider now the case of a federation of several regions (labeled provinces, and indexed by j), with both regional and federal fiscal policies. Now, consumption in region j depends on the paths of both sets of fiscal variables, where an "F" superscript will denote federal taxes or spending, "R" regional taxes or spending, and B^F_j and B^R_j the region j claims on federal and provincial governments (rates of time preference and mortality as well as interest rates are assumed to be identical across regions and over time):

$$C_{tj} = \rho \left\{ B^F_{tj} + B^R_{tj} + \sum_{i=0}^{\infty} [(1+r)(1+\delta)]^{-i} E_t \left(Y_{t+ij} - T^F_{t+ij} - T^R_{t+ij} \right) \right\} \tag{3}$$

subject to two budget constraints

$$\sum_j B^F_{tj} = \sum_{i=0}^{\infty} (1+r)^{-i} E_t \left(\sum_j \left(T^F_{t+ij} - G^F_{t+ij} \right) \right) \tag{4}$$

and

$$B^R_{tj} = \sum_{i=0}^{\infty} (1+r)^{-i} E_t \left(T^R_{t+ij} - G^R_{t+ij} \right) . \tag{5}$$

The important thing to note is that federal fiscal policy satisfies a budget constraint that is both inter-temporal and inter-regional; the region benefitting from an excess of spending over taxes (i.e., a deficit) need not incur budget surpluses later. Equivalently, federal deficits in a region need not involve the creation of a future regional tax liability, whose anticipated service would weaken stimulative effects in the region, because the deficits would be compensated, at least in part, by surpluses elsewhere and because debt service would be shared with other regions. The fact that there was ex post redistribution would therefore increase the effectiveness of federal deficits in stabilizing regional consumption in the face of shocks to income. In contrast, regional deficits do create a future tax liability which needs to be serviced in the region, and this has depressing effects on consumption today.

The above discussion implies that we need to distinguish federal flows between those that create a future tax liability for the region and those that do not create such a liability (involving redistribution), as well as distinguishing federal from regional flows. This we do in the empirical section. For the moment, and to illustrate formally the points made above, we assume that *all* federal fiscal policy is non-liability-creating, and, in particular, involves a balanced national budget. Moreover, in expected values, "federal" fiscal policy is assumed to be balanced in each region; there are no expected gainers or losers ex ante. Thus, for any period t and region j

$$\sum_{j} T_{tj}^{F} = \sum_{j} G_{tj}^{F} \tag{6}$$

and

$$E_{t} \left(T_{t+i\,j}^{F} - G_{t+i\,j}^{F} \right) = 0,\ i \geq 1. \tag{7}$$

In contrast, regional deficits involve accumulation of a liability which needs to be repaid. We will assume that this repayment takes place in the following period. To simplify the presentation we will assume that there is no debt initially. Then, the regional budget constraint (5) implies that

$$G_{t+1\,j}^{R} - T_{t+1\,j}^{R} = -(1+r)\,(G_{tj}^{R} - T_{tj}^{R}). \tag{8}$$

Now, consumption in region j can be expressed in terms of the two types of (primary) deficits (the j subscript is omitted henceforth)

$$DEF_{t}^{F} = G_{t}^{F} - T_{t}^{F}$$

$$DEF_{t}^{R} = G_{t}^{R} - T_{t}^{R} \tag{9}$$

as follows

$$C_{t} = \rho \left\{ \sum_{i=0}^{\infty} [(1+r)\,(1+\delta)]^{-i}\, E_{t} \left(Y_{t+i} - G_{t+i}^{R} - G_{t+i}^{F} \right) + DEF_{t}^{F} + \frac{\delta}{1+\delta}\, DEF_{t}^{R} \right\} \tag{10}$$

Because future **federal** deficits are solely redistributive, and their expected value is zero, they do not offset the stimulus to current consumption. In contrast, future **regional** deficits partially offset the stimulus to consumption from running a regional deficit in the current period, DEF_{t}^{R}.[11]

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[11]Alternatively, suppose that the surplus is delayed until period t+τ. In this case, it can easily be shown that the last term on the RHS of (10) is instead $DEF_{t}^{R} \left[1 - \dfrac{1}{(1+\delta)^{\tau}} \right]$, so the

(continued...)

In conclusion, federal fiscal policy is shown to be more effective in stimulating consumption (and hence in carrying out stabilization policy) than its regional equivalent. Moreover, it retains its effectiveness even when $\delta=0$ and Ricardian equivalence holds. In this case, it is clear from (10) that only the path for regional government spending affects consumption, not the choice between regional taxes and bond issues (i.e., the timing of taxes).

III. DATA AND ESTIMATION ISSUES

The theory outlined above implies that inter-regional automatic stabilizers provided by the federal government which create no new regional tax liability (because net receipts by one region are offset by net payments from another) will be more effective at changing regional demand than equivalent stabilizers provided by regional governments. The reason is that the Ricardian offset, in which private individuals foresee the impact of fiscal policy on future tax liabilities and therefore reduce consumption accordingly, will not fully operate in the federal context to the extent that deficits in one region are offset by surpluses in another and that any debt servicing is shared with other regions.

The obvious method of testing such a proposition is to compare the impact of federal deficits on consumption across regions within a country with the impact of deficits of lower levels of government. Few countries provide the necessary regional detail in their fiscal accounts. Canada, however, does provide such data. Specifically, Statistics Canada publishes detailed fiscal accounts by province for all significant levels of government (federal, provincial, local, hospitals, and pension plans) in the *Provincial Economic Accounts* (various issues).[12] In addition, the same source provides data on gross provincial product (the provincial equivalent of GDP) and on the major sub-categories of spending, such as private consumption, public consumption and investment. These accounts, therefore, provide all of the data necessary to look at the relative impact of automatic stabilizers at different levels of government across provinces within Canada.

The nominal *Provincial Economic Accounts* start in 1961 and the latest data available to us were for 1993. However, some of the fiscal data for the early 1960s appeared unreliable, so that the estimation period was limited to 1966-93, implying 28 years of annual data by province. Some of the data on lower levels of government were missing for one province, British Columbia, as well as for the Yukon and Northwest Territories. Accordingly, these

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effect on consumption of DEF_t^R is still less than that of DEF_t^F, though closer to it. The possibility that period $t+\tau$ would be infinitely delayed (and hence that $1 - \dfrac{1}{(1+\delta)^\tau} \to 1$) is ruled out by the transversality condition.

[12]All parts of the deficit, including such components as debt interest payments, are allocated across provinces.

regions were dropped, leaving a total of nine provinces in the analysis.[13] To increase the power of the empirical tests, the data were generally estimated as a panel, combining the data across different provinces into a single stacked time-series regression.

The five different levels of government identified in the Canadian provincial accounts were aggregated into those levels of government whose debt liability is incurred on a national basis and those whose debt liability is province specific. Accordingly, the fiscal accounts for the federal government were aggregated with those for the two public pension plans (the Canada Pension Plan and the Quebec Pension Plan).[14] The fiscal accounts for the other three lower levels of government—provincial governments, hospitals (which are the responsibility of the provincial governments) and local government—were aggregated together. For simplicity, the two resulting aggregates will be referred to hereafter as the federal and provincial levels of government, respectively.

It should be noted that the federal fiscal accounts include equalization grants that explicitly aim to transfer tax revenues from richer provinces to poorer ones, in order to enable the latter to provide similar levels of government services without imposing crippling taxes on their residents. On some occasions, the sets of provinces gaining and losing, as well as the size of the transfers, have changed on account of asymmetric shocks. We would argue that this endogenous response of equalization grants clearly should be attributed to fiscal federalism, and should properly be picked up in any test of the effectiveness of federal stabilization policy. This is the case in the regressions reported below.

Before looking at the impact of fiscal deficits upon aggregate demand, it is useful to compare the extent that different levels of government provide automatic stabilizers in the face of provincial business cycles. Accordingly, the change in the fiscal deficit was regressed on the change in gross provincial product (GPP). To make the data comparable across different provinces and to take account of the secular growth of the economy, both sides of the equation were deflated by trend output.[15] This produced the following regression:

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[13]Alberta, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, Quebec, and Saskatchewan.

[14]It was decided to treat the Canada and Quebec pension plans (CPP and QPP) in the same way. The QPP is run at the provincial level, while the CPP covers Canadians in all provinces except Quebec. Despite this difference, the provisions of the two Plans are essentially identical. As membership in the two Plans is also transferable depending on the province in which an individual is resident, to all intents and purposes the CPP and QPP represent a single, national, pension policy.

[15]Potential output in nominal terms was calculated as the fitted values of a regression of real gross provincial product on an exponential trend and then multiplied by the implicit price

(continued...)

$$\Delta \ (DEF_j^k / YPOT_j)_t \ = \ \alpha_j \ + \ \beta \ \Delta (Y_j / YPOT_j)_t \ , \tag{11}$$

where DEF is the fiscal deficit, superscript k is the level of government (national or provincial), and $YPOT_j$ and Y_j are potential and actual gross provincial product (in nominal terms), respectively, of province j. First differences are used so as to abstract from any secular trends which may be present in the data.

Two concepts of the fiscal deficit were used in the estimation, namely the negative of net lending and the negative of gross saving. Net lending measures the total amount of funds lent (or borrowed) by the government over a given period, while gross saving takes borrowing for government investment out of this total. The correct concept to use depends upon the return provided by government investment. If the investment is expected to generate a market return for the government, then borrowing for investment will generate no expected future tax liability, and gross saving should be used to measure the Ricardian offset. By contrast, if the investment produces no budgetary return, then net lending should be used.

Table 1 indicates that, using federal saving to measure the fiscal position, each $1 reduction in gross provincial product produces an offsetting increase in the federal deficit attributed to that province of 29 cents, and that this parameter is highly statistically significant. Using federal net lending to measure the fiscal position produces an almost identical estimate (28 cents in the dollar), indicating that federal government investment plays little role over the cycle. This supposition is confirmed by regressions which measure the response of real federal government consumption and real federal government investment to the cycle; they indicate that neither federal consumption nor investment plays a significant cyclical role. This role is therefore limited to taxes and transfer payments. F-tests of the stability of the parameters across the individual regressions, also reported in the Table, indicate that the restrictions that behavior is the same across all provinces can be accepted.

The table reports similar results for provincial governments. The results indicate that a one dollar reduction in real GPP increases the provincial fiscal deficit by 9-10 cents, depending upon the definition that is used. Again, these responses are highly statistically significant at conventional levels, indicating that both levels of government provide some level of stabilization. Overall, fiscal automatic stabilizers total about 40 cents in the dollar, with the

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deflator. As no provincial product deflators are available from the *Provincial Economic Accounts*, implicit consumption deflators were used to calculate real provincial product. These deflators are province-specific back to 1971, before which the deflator was spliced on to the aggregate Canadian CPI series.

federal government providing three-quarters of this total, and lower levels of government the remaining quarter.[16]

Having established that fiscal positions at both levels of government vary significantly over the cycle, we turn to estimating the impact of deficits at different levels of government on private consumption. While recognizing that this is only one channel through which the government can influence the cycle, private consumption is by far the largest component of aggregate demand. The relationship between consumption and government policy therefore appears to be of particular significance.

We start from the Euler equation for consumption behavior discussed by Hall (1978). This equation says that, for a infinitely lived forward looking consumer with no liquidity constraints, a constant real rate of interest, and (implicitly) no difference between private and government discount rates, the growth in consumption should be unrelated to any predictable current or past data (as anticipated events are already incorporated into the consumer's assessment of permanent income), although it can be affected by unexpected current data. This equation can be thought of as the empirical equivalent of a full Ricardian model.

The Euler equation approach has generated a large empirical literature, much of which has dealt with the issue of whether consumption depends on predictable changes in current income. The weight of existing empirical results indicates that it does, although the reason for this dependence—whether it reflects liquidity constraints or precautionary saving—remains in dispute.[17] A simple method of taking this dependence into account is to assume the existence of a proportion of individuals whose consumption tracks current income rather than permanent income (Campbell and Mankiw, 1989 and 1990). This implies that the change in current income, suitably instrumented so as to take account of the dependence of permanent income on unexpected changes in current income, should be included in the regression. Again normalizing by trend real GPP, this produces the following estimating equation

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[16]These results can be compared to those reported in earlier studies. Bayoumi and Eichengreen (1995) use a similar econometric approach to estimate the counter-cyclical fiscal changes in Canada at different levels of government using national, rather than provincial, data. Their estimates of the cyclical offsets were 34 cents in the dollar for the federal government (including pension plans), and 17 cents in the dollar for provincial governments, broadly similar to the estimated coefficients reported above. Bayoumi and Masson (1995) measure the federal government fiscal offset at only 18 cents for every dollar fall in personal income by province. The difference may reflect the different concept of income used in the study.

[17]See Browning and Lusardi (1995) for a survey of (largely U.S.) microeconomic evidence. Other recent papers dealing with these issues include Zeldes (1989), Carroll (1992), Townsend (1994), and Hubbard, Skinner and Zeldes (1994 and 1995).

$$\Delta \ (C_j/YPOT_j)_t \ = \ \alpha_j \ + \ \beta \ \Delta(Y_j \ / \ YPOT_j)_t \ , \tag{12}$$

where C is private consumption and Y is income.

To measure the impact of fiscal stabilization on consumption we add the fiscal variables suggested by the Blanchard-Yaari framework discussed earlier. This implies that consumption should depend positively both on deficits which do not create a future regional tax liability (hereafter called non-liability-creating deficits) and, to a lesser extent, on deficits which do create such a liability (hereafter called liability-creating deficits). It should also depend negatively on pre-existing levels of debt (as the date at which this debt is anticipated to be repaid comes nearer, the negative impact of the required future fiscal surpluses on future discounted income rises), and negatively on levels of government consumption. As the specification uses first differences of consumption, this implies including the change in both liability-creating and non-liability-creating deficits (for the impact of current deficits), first lags of liability-creating deficits (for the impact of past debt, as the change in debt is equal to the deficit), and the change in government consumption.

Implementing this specification requires differentiating the non-liability-creating part of the federal fiscal deficit from the liability-creating part, which in turn requires a model of the incidence of federal taxes. Accordingly, we ran a cross-sectional regression of the average of federal revenues per capita for each province relative to the Canadian average over 1970-90 on the average level of per capita GPP, also measured relative to the Canadian average over the same period. This regression produced the following results

$$TAX_j^{FED}/POP_j \ = \ \begin{array}{c} -0.11 \\ (0.12) \end{array} \ + \ \begin{array}{c} 1.06 \\ (0.13) \end{array} \ (Y_j/POP_j) \ . \tag{13}$$

The coefficient on GPP is close to, and insignificantly different from, unity, and the constant term is insignificantly different from zero, which indicates that the Canadian federal taxes are approximately proportional to income.[18] Accordingly, the share of the overall Canadian deficit which the taxpayers in any province can be expected to shoulder in the future (the liability-creating part of the deficit) can be assumed to be equal to their share of trend

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[18]These results use total revenues from individuals and businesses. Bayoumi and Masson (1995), who report similar regression results using personal taxation, also find that personal taxes are approximately proportional to personal income.

income, $(YPOT_j/YPOT_{CA})*DEF^{FED}_{CA}$, while the part of the federal deficit for which they can assume they will not be responsible (the non-liability-creating part of the deficit) is the province-specific federal deficit less this value,

$$(DEF^{FED}_j - (YPOT_j/YPOT_{CA})*DEF^{FED}_{CA})_t \tag{14}$$

The liability-creating part of the federal deficit will be subject to a Ricardian offset, as consumers anticipate the future impact of the deficit on their taxes. By contrast, the non-liability-creating part of the deficit does not generate any expectation of future regional tax liabilities, so that this part of the deficit should have a larger impact on that province's consumption. Finally, changes in the provincial deficit (DEF^{PRV}_j), are exactly like deficits which cause a change in federal debt at the national level. Increases in the deficit being run by provincial and local levels of governments produce a future tax liability that must be serviced by residents of the province, and hence produce a Ricardian offset.

The final estimating equation was therefore

$$\Delta C_{jt} = \alpha_j + \beta \Delta Y_{jt} + \delta \Delta G_{jt} + \pi \Delta (DEF^{FED}_j - DEF^{FED}_{CA}*YPOT_j/YPOT_{CA})_t$$

$$+ \lambda \Delta (DEF^{FED}_{CA}*YPOT_j/YPOT_{CA})_t + \eta \Delta DEF^{PRV}_{jt} \tag{15}$$

$$+ \phi(DEF^{FED}_{CA}*YPOT_j/YPOT_{CA})_{t-1} + \gamma DEF^{PRV}_{jt-1} .$$

As in equation (12), all of the variables are divided by trend provincial output $(YPOT_j)$, so that the trend increase in the size of the economy over time did not create heteroscedasticity in the estimated residuals.

The theoretical framework implies that the coefficients (λ and η) on the change in the federal deficit at the national level and the provincial deficit should be equal as both variables reflect actions which create future tax liabilities for residents of the province,[19] while the coefficient on the province-specific part of the federal deficit (π) should be larger than λ or η, as it does not create future tax liabilities for the region. The coefficients on lagged federal and provincial deficits (ϕ and γ), which represent the negative impact of past debt accumulation,

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[19]This ignores the fact that individuals can avoid future provincial taxes by moving elsewhere in Canada. In the empirical work we find that we cannot reject the equality of the coefficients on the two liability-creating deficits, suggesting that mobility within Canada is not a very significant factor in determining the effects of provincial fiscal policy on the path of consumption.

should also be equal,[20] while the anticipated sign of the coefficient on government consumption (δ) is also negative. (Note, however, that its magnitude need not equal the coefficient on income, as the income term includes the impact of liquidity constraints). Finally, the constant terms were allowed to vary by province so as to take account of province-specific differences in consumption behavior.

Two further data issues arise in implementing this equation. One is whether the income variable should include the impact of personal taxes and transfers or not. A measure such as personal disposable income, which includes the effect of personal taxes and transfers, will tend to lower the estimated impact of fiscal stabilizers, as some of the impact of fiscal policy will already be captured by changes in income. For this reason, we focus primarily on results using gross provincial product as our measure of income, as it is clearly not directly affected by changes in fiscal deficits.[21] As a check on the robustness of the results, however, we also report regressions using personal disposable income.

Another data issue has to do with the provincial impact of business taxes. Using the total deficit to measure the fiscal position of the government involves an implicit assumption that business taxes only affect residents of the province in which they are levied. However, there are a number of reasons why such taxes may by paid by non-residents.[22] We therefore estimate the model using alternative measures of deficits which both include and exclude direct business taxes.[23] For the sake of brevity, the reported empirical work is limited to regressions involving gross provincial product and total deficits, and personal disposable income and deficits excluding business taxes.

Instrumental variable techniques were used in the estimation, as unexpected changes in income can be associated with changes in permanent income, implying a correlation between unanticipated changes in income and the error term. The fiscal variables were also instrumented as the fiscal position varies with income. In addition to the province-specific constant terms, the instruments used were the first and second lags of the change in income,

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[20]This assumes that the expected time at which the debt will be repaid is the same across both levels of government.

[21]Gross provincial product is calculated from the income side as the sum of domestic labor income, profits (including unincorporated enterprises and farms), net investment income, indirect taxes less subsidies, and capital consumption allowances. It is therefore a good proxy for changes in provincial personal incomes, although it does include corporate retained earnings.

[22]For example, if these taxes are incorporated in output prices and the goods are sold in another province.

[23]Data on indirect business taxes were not available.

the changes in the three fiscal deficits (the federal deficit at the national level, the province-specific federal deficit, and the provincial deficit), and the change in consumption, plus the lagged difference between consumption and income.[24] Assuming some predictability in the cycle, current changes in income and fiscal stance should be useful in predicting future changes in these variables. In addition, since the consumption model underlying our approach is the permanent income model, it follows that current consumption will summarize agents' information about the future path of income, thus the change in consumption and the relationship of the level of consumption compared to income should be useful in predicting future income (Campbell, 1987). Given the relatively large number of instruments and the fact that government consumption does not vary significantly with income (Table 1), government consumption was not instrumented.

IV. EMPIRICAL RESULTS

The results from regressing equation (15) using gross provincial product and total deficits are shown in the first column of Table 2. As the coefficient estimates for the fiscal variables were very similar whether gross saving or net lending was used to measure the fiscal stance, only results for gross saving (with sign reversed, so that it corresponds to the deficit) are reported.[25]

The coefficients on the fiscal and income variables are almost all correctly signed. The parameter estimates indicate that every dollar increase in the federal deficit which is specific to the province in question raises private consumption by (a highly significant) 44 cents. An equivalent increase in the federal deficit at the national level or in the provincial deficit raises consumption by 16 cents in the dollar (although neither of these coefficients is significant at conventional levels). The results for the lagged deficits, which measure the impact of past debt accumulation, show some variation. The coefficient on the lagged federal deficit is small, incorrectly signed, and insignificant, while that on the lagged provincial deficit, which is marginally significant at the 5 percent level, has the correct negative sign and indicates that each dollar in past accumulated provincial debt lowers consumption by 11 cents in the dollar. Raising government consumption by a dollar is estimated to lower private consumption by 13 cents, although the coefficient is not significant at conventional levels. Finally, the coefficient on the change in real GDP is 0.31, indicating that about one third of the predicted change in income comes through onto consumption.

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[24]The instruments were differentiated by province by multiplying them by the province-specific dummy variables. Hence, each province had, in essence, its own forecasting equations. In all cases, variables are divided by potential output.

[25]Experiments adding changes in government investment were also carried out, but the results were unpromising and are not reported. Adding government investment to the regressions was the one case in which the coefficients varied significantly depending upon the definition of the deficit that was used.

The results conform to the prediction of the model. An increase in the fiscal deficit which does not involve a higher future tax liability for the province—measured by the province-specific part of the federal deficit—has a larger impact on consumption than an equivalent increase in deficits which do produce such a liability. Wald tests confirm that the coefficients on the three fiscal variables are significantly different from each other, but that the coefficients on the two forms of deficit spending which create future tax liabilities (the federal deficit at the national level and the provincial deficit) are not significantly different from each other. In addition, a Wald test also finds no significant difference between the coefficients on the two lagged deficit variables. The parameter restrictions predicted by the theoretical model are thus confirmed.

The second column in the Table therefore reports the results from a restricted regression in which the coefficients on the change and the lagged levels of the federal deficit at the national level and the provincial deficit are made equal. The results indicate that changes in the deficit which do not create future regional tax liabilities raise consumption by 45 cents in the dollar, while those that do create such liabilities raise consumption by (a significant) 20 cents in the dollar. A Wald test indicates that the two coefficients are different from each other at the 1 percent level of significance. The results imply that liability-creating fiscal deficits have only about one half of the impact on consumption of non-liability-creating deficits. The coefficient on the lagged value of both federal and provincial deficits indicates that each extra dollar in existing debt lowers consumption by 3 cents, although it is not significant at conventional levels. Similarly, the coefficient on government consumption remains correctly signed but insignificant. The coefficient on changes in income, by contrast, continues to be large and highly significant.

Several variants on the basic model were estimated to test the robustness of these results. First, a more general specification was estimated in which each coefficient on the independent variables was allowed to vary by province. A Wald test of the restriction that the coefficients on the fiscal variables and real output were equal across provinces was accepted, indicating no significant variation in behavior across provinces.[26] Next, the equation was rerun using ordinary least squares to see how important the use of instrumental variables was to the estimation results. The results, reported in column 1 of Table 3, indicate that the absolute sizes of the coefficients on the change in the fiscal variables (including government consumption) all fall. Apparently, positive shocks to consumption (and income) show up as lower deficits, which, if not allowed for using instrumental variables, lower the implied stabilization effects. However, the Wald tests indicate that the difference between the coefficient on liability-creating and non-liability-creating fiscal policy remains large and significant.

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[26]As there were so many independent variables, this regression was run using only the changes in the deficits and the change in income. The $\chi^2(32)$ statistic was 27.6, compared to a critical value at the 5 percent level of 44.0.

The equation was also re-estimated with second and third lags of the instruments (column 2 of Table 3), rather than first and second lags. The concern with using first lags in the instruments is that, to the extent that consumption follows a random walk, time averaging can induce a correlation between the change in consumption and its first lag.[27] The coefficient on the province-specific federal balance is somewhat smaller than in the base case regression; however, the basic message is very similar. In particular, the impact of non-liability-creating deficits remains significantly larger than that of liability-creating ones. The restricted regression (not reported) indicates an impact on private consumption from liability-creating fiscal policy that is 16 cents in the dollar, half the 32 cents estimated for non-liability-creating policy.

Next, the change in government consumption and the lagged values of the deficits were dropped from the specification, to see if the results were robust to the exclusion of these additional (and generally insignificant) variables. The results, shown in column 3 of Table 3, continue to show a large difference between the impact of liability-creating and non-liability-creating deficits.

We also looked at different definitions of income and deficits. Table 4 shows results from estimating the same regressions as in Table 2, but using personal disposable income to measure of income and excluding direct business taxes from the definition of the deficit. The results are qualitatively similar to those in Table 2. Both non-liability-creating and liability-creating deficits affect consumption, with non-liability-creating deficits having a significantly larger impact. The main difference in the results is that the coefficients on the fiscal variables are considerably smaller using this data set than the earlier one, plausibly reflecting the fact that some of the impact of personal taxes and transfers is coming through changes in personal disposable income.[28] By contrast, the coefficient on income is very similar across the two sets of regressions.

We also experimented with adjusting the regressions to take account of the possibility that the tax system is progressive. Rather than assuming that each province's future tax burdens move in proportion to its output, so the liability-creating element of the federal deficit for any province is $(YPOT_j/YPOT_{CA})*DEF^{FED}_{CA}$, in the alternative regressions this initial estimate was multiplied by the average value of per capita income in that province relative to Canada as a whole. This procedure raises the implied elasticity of per capita taxes to per

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[27]Working (1960).

[28]This supposition is supported by intermediate regressions (not reported) which use gross provincial product to measure income and deficits excluding direct business taxes for fiscal policy. The resulting impacts of non-liability-creating deficits from these regressions are more similar to those using gross provincial product and total deficits than those using personal disposable income and deficits adjusted for debt. (The results for liability-creating deficits are less clear).

capita income from one to two. For example, in the case of Ontario, where GPP per capita averaged 10 percent more than in the country as a whole, instead of assuming that per capita taxes are 10 percent higher than the average, under the new weighting scheme they were assumed to be 21 percent (10 percent squared) higher. The non-liability-creating part of the federal deficit was then adjusted accordingly.

The results from these regressions (not reported for the sake of brevity) are very similar to those reported in Table 2. In the restricted regression, the impact of liability-creating deficits on consumption is estimated to be 43 cents in the dollar while that on non-liability-creating deficits is estimated to be 15 cents in the dollar, with the difference between the coefficients being significant at the one percent level. Hence, the results appear robust to reasonable changes in our assumption about the incidence of future tax liabilities.

Finally, we also investigated the relative variances of our three components of fiscal stabilization, the liability-creating federal deficit, the non-liability-creating federal deficit, and the provincial deficit (all measured as a proportion to trend GDP). The idea was to assess the relative importance of variations in non-liability-creating deficits compared to liability-creating ones. Clearly, if non-liability-creating deficits are relatively unimportant for overall fiscal policy then their superiority as a way of providing automatic stabilizers would be of limited interest. In practice, however, the non-liability-creating part of the federal deficit has a variance which is one-and-a-half times that of provincial deficits and three times that of the national federal deficit. As these variables are approximately orthogonal, this implies that about half of the variation in fiscal deficits across Canadian provinces is non-liability-creating.

V. CONCLUSIONS

The debate in Europe has focussed on the lack of fiscal stabilization at the EU level, in contrast to the existence of important fiscal stabilizers at the federal or national level in other monetary unions. Little evidence has, however, been provided concerning the effectiveness of stabilization at different levels of government in a federation, though the issue is of obvious relevance for Europe. In this paper we examine the impact of fiscal policy in federal systems, and provide empirical evidence concerning the relative effectiveness of stabilization at different levels of government.

It is well known that if consumers are Ricardian, automatic stabilizers operating through (nondistorting) taxes and transfers will have no effect in cushioning shocks at the national level, since they will involve creation of debt whose debt service will be anticipated by consumers. The same is true of attempts to use stabilization policy by lower levels of government. However, as is shown here, regional stabilizers which involve redistribution across a federation can in principle be more effective because they do not create a future regional tax liability. We test this hypothesis using data for Canada, a decentralized federation which engages in fiscal stabilization policies at both the national and provincial levels. Our regressions of private consumption on various measures of fiscal position (national liability-creating, national non-liability-creating, and provincial) allow a test of Ricardian equivalence

(a zero effect for liability-creating stabilization) as well as of the greater effectiveness of non-liability-creating flows.

Our empirical results confirm that the anticipated larger impact on consumption of fiscal deficits which do not create a future regional tax liability compared to deficits which do create such a liability appears to hold empirically. In all cases, the two coefficients are significantly different from each other. Most estimates imply that liability-creating deficits are somewhat less than half as effective as non-liability-creating ones. Though we (barely) reject Ricardian equivalence for the liability-creating policies, our much stronger result is that stabilization policy within a federal system that involves some degree of redistribution is much more effective in cushioning shocks to consumption.

We would interpret this evidence as providing another argument for Europe to consider expanding fiscal policy at the Union level, rather than relying on national fiscal policies to offset idiosyncratic shocks. As pointed out by others, effective fiscal stabilization is all the more important in EMU, given the loss of the exchange rate instrument for that purpose—especially since other shock absorbers, like labor mobility, are unlikely to be very important. While monetary union will not reduce the effectiveness of existing national automatic stabilizers, such stabilizers can be expected to operate more efficiently if they are EU based, rather than operating solely at a national level.

However, one also needs to acknowledge that there are difficulties in designing fiscal stabilization at the EU level that would not involve important persistent transfers of revenue from some countries to others (Von Hagen and Hammond (1996)). Therefore, EU fiscal stabilization might be politically unacceptable. Finally, since in practice taxes are not lump sum, the distorting effects of higher tax rates also need to be taken into account when considering this option.

Table 1. Sensitivity of Fiscal Variables to the Cycle

$$\Delta(DEF^k_j / YPOT_j)_t = \alpha_i + \beta\, \Delta(Y_j / YPOT_j)_t$$

Dependent variable	Federal		Provincial	
	Coefficient on output	F-test of parameter equality across provinces	Coefficient on output	F-test of parameter equality across provinces
Minus gross saving	-0.29 (.03)**	0.62	-0.10 (.02)**	0.81
Minus net lending	-0.28 (.03)**	0.64	-0.09 (.02)**	0.64
Government consumption	-0.01 (.01)	0.30	0.00 (.02)	0.50
Government investment	-0.01 (.01)	0.90	-0.01 (.01)	0.66

Notes: Estimated constant terms are not reported. Standard errors are reported in parentheses. One and two asterisks indicate that the coefficient or test is significant in the 5 and 1 percent significance level, respectively.

Table 2. Estimating the Impact of Fiscal Stabilization
on Private Consumption

Equation (15)

	Basic Regression	Restricted Regression
Coefficients of		
Change in federal deficit:		
Non-liability-creating (province-specific)	0.44 (.08)**	0.45 (.08)**
Liability-creating (national level)	0.16 (.13)	
		0.20 (.09)*
Change in provincial deficit	0.16 (.11)	
Lagged national federal deficit	0.03 (.05)	
		-0.03 (.04)
Lagged provincial deficit	-0.11 (.06)*	
Change in government consumption	-0.13 (.11)	-0.17 (.11)
Change in income	0.31 (.04)**	0.32 (.04)**
Statistics		
R^2	0.41	0.39
Wald tests of:		
Equality of changes in all fiscal deficits $\chi^2(2)$	13.1**	
Equality of changes in liability-creating deficits $\chi^2(1)$	0.0	
Equality of changes in liability- and non-liability-creating deficits $\chi^2(1)$		10.7**
Equality of lagged deficits $\chi^2(1)$	3.5	

Notes: Estimated constant terms are not reported. For the instrument list, see the text. One and two asterisks indicate that the coefficient or test is different from zero at the 5 or 1 percent significance level, respectively.

Table 3. Results from Alternative Assumptions

Equation (15)

	Ordinary Least Squares	Different Instruments	Simpler Specification
Coefficients of			
Change in federal deficit:			
Non-liability-creating (province-specific)	0.31 (.05)**	0.32 (.08)**	0.48 (.07)**
Liability-creating (national level)	0.01 (.08)	0.08 (.12)	0.13 (.11)
Change in provincial deficit	0.08 (.07)	0.16 (.11)	0.18 (.08)*
Lagged national federal deficit	0.03 (.04)	0.02 (.05)	
Lagged provincial deficit	-0.10 (.05)*	0.09 (.06)	
Change in government consumption	0.00 (.09)	-0.06 (.11)	
Change in income	0.24 (.03)**	0.26 (.04)**	0.31 (.03)**
Statistics			
R^2	0.42	0.41	0.39
Wald test of:			
Equality of all fiscal parameters $\chi^2(2)$	20.6**	6.2*	16.5**
Equality of liability-creating deficits $\chi^2(1)$	0.4	0.4	0.2

Notes: Estimated constant terms are not reported. For the instrument list, see the text. One and two asterisks indicate that the coefficient or test is different from zero at the 5 or 1 percent significance level, respectively.

Table 4. Estimates Using Personal Disposable Income and Excluding Direct Business Taxes

Equation (15)

	Basic Regression	Restricted Regression
Coefficients of		
Change in federal deficit:		
Non-liability-creating (province-specific)	0.25 (.06)**	0.24 (.06)**
Liability-creating (national level)	-0.07 (.12)	
		0.05 (.03)*
Change in provincial deficit	0.06 (.03)*	
Lagged national federal deficit	0.09 (.05)	
		-0.02 (.02)
Lagged provincial deficit	-0.04 (.02)*	
Change in government consumption	0.00 (.09)	-0.07 (.09)
Change in income	0.35 (.05)**	0.33 (.05)**
Statistics		
R^2	0.34	0.32
Wald tests of:		
Equality of changes in all fiscal deficits $\chi^2(2)$	11.2**	
Equality of changes in liability-creating deficits $\chi^2(1)$	1.0	
Equality of changes in liability- and non-liability-creating deficits $\chi^2(1)$		10.1**
Equality of lagged deficits $\chi^2(1)$	5.1*	

Notes: Estimated constant terms are not reported. For the instrument list, see the text. One and two asterisks indicate that the coefficient or test is different from zero at the 5 or 1 percent significance level, respectively.

REFERENCES

Atkeson, Andrew, and Tamim Bayoumi (1993), "Do Private Capital Markets Insure Regional Risk? Evidence from the United States and Europe," *Open Economies Review*, 4:303-24.

Barro, Robert J. (1974) "Are Government Bonds Net Wealth?" *Journal of Political Economy*, 82:1095-117.

Bayoumi, Tamim and Barry Eichengreen (1995) "Restraining Yourself: Fiscal Rules and Stabilization," *IMF Staff Papers* 42 (1):32-48.

Bayoumi, Tamim and Paul R. Masson (1994), "What Can the Fiscal Systems in the United States and Canada Tell Us About EMU?" in Paul Welfens (ed.) *European Monetary Integration, Second Edition*, (Berlin: Springer-Verlag).

Bayoumi, Tamim and Paul R, Masson (1995) "Fiscal Flows in the United States and Canada: Lessons for Monetary Union in Europe," *European Economic Review*, 39:253-74.

Bernheim, B.D. (1987), "Ricardian Equivalence: An Evaluation of Theory and Evidence," in *NBER Macroeconomics Annual 1987* (Cambridge, MA: MIT Press).

Blanchard, Olivier J. (1985), "Debt, Deficits and Finite Horizons," *Journal of Political Economy*, 93 (April):223-47.

Boadway, Robin W. and Paul A. R. Hobson (1993), *Intergovernmental Fiscal Relations in Canada*, Canadian Tax Foundation Paper Number 96 (Canadian Tax Foundation, Toronto, Canada).

Browning, Martin and Annamaria Lusardi (1995) "Household Saving: Micro Theories and Micro Facts," Dartmouth College Working Paper 95-19.

Campbell, John (1987), "Does the Saving Anticipate Declining Labor Income? An Alternative Test of the Permanent Income Model," *Econometrica*, 55:1249-74.

Campbell, John, and Gregory Mankiw (1989), "Consumption, Income, and Interest Rates: Reinterpreting the Time Series Evidence," *NBER Macroeconomics Annual 1989*, ed. by O. Blanchard, and S. Fischer (Cambridge, Massachusetts: MIT Press).

Campbell, John, and Gregory Mankiw (1990), "Permanent Income, Current Income and Consumption," *Journal of Business and Economic Statistics* (July):265-79.

Carroll, Christopher D. (1992), "The Buffer-Stock Theory of Saving: Some Macroeconomic Evidence," *Brookings Papers on Economic Activity*, No. 2:61-156.

Cohen, Daniel, and Charles Wyplosz (1989), "The European Monetary Union: An Agnostic Evaluation," in R.C. Bryant et al., eds., *Macroeconomic Policies in an Interdependent World* (Washington, D.C.: International Monetary Fund): 311-37.

Courchene, Thomas J. (1993), "Reflections on Canadian Federalism: Are there Implications for European Economic and Monetary Union?" in European Commission (1993): 123-166.

European 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 (Brussels: European Economic Community).

_____ (1993), *European Economy: The Economics of Community Public Finance*, Reports and Studies, No. 5.

Frenkel, Jacob A., and Assaf Razin (1987), *Fiscal Policies and the World Economy* (Cambridge, MA: MIT Press).

Goodhart, Charles A.E., and Stephen Smith (1993), "Stabilization," in European Commission (1993):417-55.

Hall, Robert E. (1978), "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence," *Journal of Political Economy*, 86 (6):971-87.

Hubbard, R. Glenn, Jonathan Skinner, and Stephen P. Zeldes, (1994) "The Importance of Precautionary Motives in Explaining Individual and Aggregate Saving," *Carnegie-Rochester Conference Series on Public Policy*, 40 (June):59-126.

Hubbard, R. Glenn, Jonathan Skinner, and Stephen P. Zeldes, (1995) "Precautionary Saving and Social Insurance," *Journal of Political Economy*, 103:360-90.

Ip, Irene K. (1993), "Putting a New Face on Fiscal Federalism," in Peter M. Leslie, Kenneth Norrie and Irene K. Ip, *A Partnership in Trouble: Renegotiating Fiscal Federalism*, Policy Study 18, C.D. Howe Institute (Renouf Publishing, Ottawa, Canada).

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* (Chicago: University of Chicago Press).

Masson, Paul R., and Mark P. Taylor (1993), "Currency Unions: A Survey of the Issues," in P. R. Masson and M. P. Taylor, eds., *Policy Issues in the Operation of Currency Unions* (Cambridge and New York: Cambridge University Press):3-51.

Mélitz, Jacques, and S. Vori (1992), "National Insurance Against Unevenly Distributed Shocks," CEPR Discussion Paper No. 697 (London: Centre for Economic Policy Research).

Mundell, Robert A. (1961), "A Theory of Optimum Currency Areas," *American Economic Review*, 51 (September):657-65.

Musgrave, Richard A. (1960), "Approaches to Fiscal Theory of Political Federalism," in *Public Finances: Needs, Sources and Utilization*, A Conference of the Universities - National Bureau Committee for Economic Research (Princeton: Princeton University Press).

Oates, Wallace E. (1972), *Fiscal Federalism* (New York: Harcourt Brace Jovanovich).

Persson, Torsten, and Guido Tabellini (1996a), "Federal Fiscal Constitutions: Risk Sharing and Moral Hazard," *Econometrica*, 64 (May):623-46.

_____ (1996b), "Federal Fiscal Constitutions: Risk Sharing and Redistribution," *Journal of Political Economy*, 104 (October):979-1009.

Pisani-Ferry, Jean, Alexander Italianer, and Roland Lescure (1993), in European Commission (1993):511-38.

Rawls, John (1971), *A Theory of Justice* (Cambridge, MA: Harvard University Press).

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: Cambridge University Press):195-219.

Seater, John (1993), "Ricardian Equivalence," *Journal of Economic Literature*, 31 (March):142-90.

Sinn, Hans-Werner (1995), "The Subsidiarity Principle and Market Failure in Systems Competition," paper presented to a conference "Competition or Harmonization? Fiscal Policy, Regulation, and Standards," Munich, October 30-November 2.

Tiebout, Charles (1956), "A Pure Theory of Local Expenditures," *Journal of Political Economy*, 64 (October):416-24.

Townsend, Robert M. (1994) "Risk and Insurance in Village India," *Econometrica* 62 (3): 539-92.

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* (Deventer: Kluwer).

_____, and George Hammond (1996), "Insurance Against Asymmetric Shocks in a European Monetary Union," paper presented at a conference "Should we Rebuild Built-in Stabilizers," Paris, January 8-10, 1996.

Yaari, M.E. (1965), "The Uncertain Lifetime, Life Insurance and the Theory of the Consumer," *Review of Economic Studies*, 32:137-50.

Working, H. (1960) "Note on the Correlation of First Differences of Averages of a Random Chain", *Econometrica*, 28:916-18.

Zeldes, Stephen P. (1989), "Consumption and Liquidity Constraints: An Empirical Investigation," *Journal of Political Economy*, 97:305-46.