# SOME CROSS-COUNTRY EVIDENCE ABOUT DEBT, DEFICITS AND THE BEHAVIOUR OF MONETARY AND FISCAL AUTHORITIES

## Jacques Mélitz

# ABSTRACT

## Some Cross-country Evidence about Debt, Deficits and the Behaviour of Monetary and Fiscal Authorities*

This paper assesses how monetary authorities behave and how they interact. Pooled data for the 15 members of the European Union except Luxembourg and five other OECD countries serves to answer these questions. Three basic conclusions emerge. First, fiscal policy responds to the ratio of public debt to output in a stabilizing manner. Second, coordinated macroeconomic policy exists: easy fiscal policy leads to tight monetary policy, and easy monetary policy to tight fiscal policy. Third, both monetary and fiscal policy respond to the cycle in a stabilizing manner, but automatic stabilization through fiscal policy is much weaker than generally perceived. Expansion raises tax receipts but also government expenditures. The destabilizing response on the expenditure side is also extremely marked.

Jacques Mélitz
CREST–INSEE
15 Boulevard Gabriel Péri
92245 Malakoff
FRANCE
Tel: (33 1) 4117 6034/26
Fax: (33 1) 4117 6046
Email: melitz@ensae.fr

# NON-TECHNICAL SUMMARY

The fiscal criteria of the Maastricht Treaty and the recent Pact for Stability raise many questions about the behaviour of monetary and fiscal authorities. For example: how do fiscal authorities respond to government debt? How does loose fiscal policy impinge on monetary policy? How does tight monetary policy affect fiscal policy? This study deals exclusively with these sorts of questions. The difficulty in examining the issues lies in the brevity of the time series concerning public action, particularly in the case of fiscal policy. Monetary policy can be studied on the basis of monthly or quarterly series, but fiscal policy cannot. Quarterly series for tax receipts are highly seasonal and those for government expenditures are subject to accident and manipulation. Annual data must serve, and as a result, even as many as 40 observations for a country is a lot. In order to overcome these difficulties, this research uses pooled data for the largest possible number of OECD countries, 19 in all. The 14 members of the European Union (all of them except Luxembourg) are also examined separately. These 14 members are all present in the 19-country sample, including also Australia, Canada, Japan and the United States.

The chosen measure of monetary policy is the intervention rate of the monetary authorities on the money market. The similar measure of fiscal policy is the primary surplus (or the surplus exclusive of interest payments) as a percentage of potential output. But government tax receipts and expenditures are also examined separately. More specifically, the study divides up government consumption plus transfer payments on the one side and tax receipts minus public investment spending on the other. In a late section of the paper, a further distinction is made between the behaviour of government consumption and transfer payments.

The hypotheses about monetary and fiscal policy suppose both policies to depend partly on initial information and partly on current developments. In the case of monetary policy, the relevant initial information is assumed to regard the nominal long-term interest rate, the relation of output to potential output, and the weight of the public sector in the economy, as measured either by the ratio of taxes to output or by the ratio of debt to output, or both. In principle, the long-term interest rate reflects official concern with inflation. The pertinent current events regard output, inflation, and desired portfolio shifts in and out of money. With respect to fiscal policy, the pertinent initial conditions concern output, inflation, and the burden of the public debt, as measured either by the debt/output ratio or by the interest on debt relative to output. Recent movements in the burden of debt enter too. The current developments pertain

to output and inflation. The study also considers the monetary policy instrument as a possible influence on the fiscal policy instrument and the converse influence of the fiscal on the monetary instrument. Measuring the relevant new events poses a delicate problem since all data could be affected by current policy responses, and for the purposes of the investigation, these events must be independent of policy. Accordingly, the study tries to control for monetary- and fiscal-policy effects on the relevant variables. The estimation methods of the tests of the main equations consist of two-stage and three-stage least squares.

Important results follow on three fronts: (1) the responses to public debt; (2) the interactions between monetary and fiscal policy; and (3) the responses to the business cycle.

The results about public debt can only be described as heartening. According to the estimates, government debt provokes remedial action, and it does so where it counts, namely in respect to fiscal policy. In addition, not only do taxes rise in response to a higher debt burden, but expenditures also fall. Any mere reaction of taxes would have stabilized the debt-output ratio at a higher level of government spending relative to output. But since government spending also adjusts, permanent increases in the share of government spending in output are not implied.

Next, monetary and fiscal policy interact negatively in the international sample of countries. That is, loose fiscal policy leads to tight monetary policy, and conversely, tight monetary policy leads to more expansionary fiscal policy. The response of monetary policy, in fact, depends heavily on the Bundesbank and the Federal Reserve. Yet even for the rest of the sample, no evidence can be found to support the assumption of Lamfalussy and others of a general tendency towards looser monetary policy in the case of low fiscal discipline. In any case, since the Maastricht Treaty provides for an independent central bank, the results incorporating the Fed and the Bundesbank will be more relevant anyway. In sum, models of coordinated behaviour by monetary and fiscal authorities suit the evidence much better than models of competing monetary and fiscal authorities pressuring one another. As a matter of broad generalization in the OECD, loose fiscal policy does not endanger monetary control, and tight monetary policy, rather than exercising a leash on deficit spending, induces the fiscal authorities to provide more help to the private sector. If evidence of the study is to be trusted, in a future EMU with member governments facing lower prospects of tight monetary policy when engaging in expansionary fiscal policy, the governments will ease fiscal policy *less*, not

more. Such extrapolation from the past may be dangerous, but this is what such extrapolation would say.

The results concerning the impact of the business cycle on policy are the most challenging. Both monetary and fiscal policy respond in a stabilizing manner to the cycle with a one-year lag. This is to be expected. The surprise comes in connection with the response of fiscal policy to current economic activity. Taxes move in a stabilizing manner, but governmental expenditures (more exactly, public consumption plus transfer payments) destabilize. Thus, a positive shock to output not only causes taxes to rise, but also government spending. Automatic stabilization then relies on a larger response of taxes than expenditures, which is in fact what happens, but only to a moderate degree.

Understanding the result is not difficult; it makes perfect sense. The literature on bureaucracy and public choice offers an obvious perspective. Like many organizations, government loosens its purse strings when tax receipts abound, and does the opposite when tax receipts merely trickle in. A rational flavour can also be added to the argument by appealing to a government's desire to limit deficit spending (concern for the future?). The fundamental intellectual challenge comes from the fact that ordinary macroeconomic analysis treats the government differently. We generally regard taxes and unemployment compensation as the only elements of the public budget which move automatically with economic activity. Other items are supposedly exogenous, and hence a matter of discretionary policy. But the enormous statistical significance of the positive coefficient of the exogenous current developments in the relevant equations clearly implies a fairly automatic response, and therefore less strength in automatic stabilizers than we generally suppose. Systematic overestimation of the automatic stabilizers means corresponding underestimation of the importance of discretionary fiscal policy. In addition, our measures of *structural* deficits are biased toward exaggerated deviations of the actual from the actual deficit figures over the cycle. Quite significantly too, the currently high levels of government deficits in the OECD have less to do with the business cycle than we usually assume and owe more to other considerations.

The conclusions about EMU are also important. One major implication is that some coordination of monetary and fiscal policy will be necessary under EMU to maintain the useful interaction between the two policies that exists today. Had the study supported the idea that fiscal laxity promotes loose monetary policy, the conclusion would be different; instead there may be some benefit from EMU simply by virtue of the weakening of the influence of fiscal

authorities over monetary policy. The multiplication of the number of finance ministries facing the single central bank in the new monetary union might have been helpful simply because of the dilution of the damaging political influence of each, and hence the collective influence the ministries exert on monetary policy. As it is, coordinated activity between fiscal and monetary authorities seems to exist, so that EMU opens up the quite different prospect of reduced macroeconomic policy coordination unless steps are taken to avoid it.

As for the major result of the study – the presence of less automatic stabilization than is usually assumed – the implications for EMU fly off in opposite directions. But on the one hand, the greater relative importance of discretionary fiscal policy leaves more room for fiscal policy coordination in the future. On the other hand, the interference of the fiscal criteria of the Maastricht Treaty and the Waigel Pact in fiscal policy can be expected to be greater, since we can assume that these features of EMU will interfere more with discretionary behaviour than automatic policy. This last result would seem the more important one of the two. It deals with actual behaviour rather than an eventuality. What good is a greater potential for fiscal policy coordination if EMU is about to crush discretionary fiscal policy?

The fiscal criteria of the Maastricht Treaty and the recent Pact for Stability raise many questions about the behavior of monetary and fiscal authorities; for example: How do fiscal authorities respond to government debt? How does loose fiscal policy impinge on monetary policy? How does tight monetary policy affect fiscal policy? This study will deal exclusively with these sorts of questions. The difficulty in examining the issues lies in the brevity of the time series concerning public action, particularly in the case of fiscal policy. Monetary policy can be studied on the basis of monthly or quarterly series, but fiscal policy cannot. Quarterly series for tax receipts are highly seasonal and those for government expenditures are subject to accident and manipulation. Annual data must serve, and as a result, even as many as 40 observations for a country is a lot. This may explain why efforts to study discretionary fiscal policy often limit themselves to single-equation estimates and why the question of the interactions between monetary and fiscal authorities is mostly a theoretical topic.

In order to overcome the difficulties of empirical work on fiscal policy behavior, I propose to use pooled data for the largest possible number of OECD countries, 19 in all. I will also examine the 14 members of the European Union (all of them except Luxembourg) separately. These 14 members are all present in the 19-country sample, including also the US, Canada, Japan, Australia and Japan. Approximately the same 19 countries serve in recent, related studies of fiscal policy by Alesina and Perotti (1995), Giavazzi and Pagano (1996) and Cour, Dubois, Mahfouz and Pisani-Ferry (1995).[1] The obvious reason is that adequate data are simply lacking for any others. The basic difference between these other studies and the present effort is one of focus. While the rest are largely concerned with the economic impact of fiscal policy, the present work will center exclusively on official behavior.

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[1] Giavazzi and Pagano study the identical 19 countries; Alesina and Perotti manage to add Switzerland; and Cour *et al.* eliminate two or three of the countries in the sample for reasons of their own.

## I. Hypotheses

My measure of monetary policy will be the intervention rate of the monetary authorities on the money market, $R_m$. The appropriate measure of this rate obviously differs by country, and in making the choice, a compromise was often necessary between the need for continuous data and the desire for the best possible index of the marginal cost of central bank funds. My chosen measures of $R_m$ follow in the first appendix. The basic measure of fiscal policy in the study will be the primary surplus (the surplus exclusive of interest payments), $S_p$, as a percentage of potential output, $Y^*$. Corrections for interest payments and for the business cycle produce a measure that reflects policy behavior more accurately. But those steps do little to distinguish between "automatic" and "discretionary" fiscal policy. That is an important and deliberate choice. One of the basic issues in the present study is the right distinction between the two kinds of policy. Indeed, the work will cast doubt on the usual way of drawing the distinction.

I will also examine government tax receipts and expenditures separately, as is done with increasing frequency. Quite specifically, the study will divide up $S_p/Y^*$ between government consumption plus transfer payments, $(G_c+TR)/Y^*$, and tax receipts minus public investment spending, $(T-G_i)/Y^*$. The choice of this particular division privileges the distinction between government net saving and "exhaustive" government expenditures. At a later point I will even go further and try to distinguish the behavior of $G_c/Y^*$ and $TR/Y^*$.

The hypotheses about monetary and fiscal policy suppose both policies to depend partly on initial information, partly on fresh developments (whether anticipated or not). In the case of monetary policy, I assume the relevant initial information to regard the nominal long term interest rate $R_{lt}$, the relation of output to potential output, $Y/Y^*$, and the weight of the public sector in the economy, as measured either by the ratio of taxes to output, $T/Y$, or else by the ratio of debt to output, $D/Y$, or both. The relevance of the long term interest rate reflects official concern with inflation. A general failure to respond to rises in $R_{lt}$ by increasing $R_m$ would be inflationary. The relevant current events

regard output, inflation, and desired portfolio shifts in and out of money. With regard to fiscal policy, the pertinent initial conditions concern $Y/Y^*$, inflation $\pi$, and the burden of the public debt, as measured either by $D/Y$ or by the interest on the debt relative to output. Recent movements in the burden of the debt $\Delta D/Y$ may also be relevant. The current developments pertain to output and inflation. The study also prominently considers $R_m$ as a possible influence on $S_p/Y^*$, and $S_p/Y^*$ as a possible influence on $R_m$.

Measuring the relevant fresh events poses a delicate problem, since all the data could be affected by current policy responses, and for purposes of the investigation, these events must be independent of policy or exogenous. Therefore, I tried to control for monetary- and fiscal-policy effects on the relevant variables. The current developments in output and inflation are then measured as follows:

$$\Delta\left(\frac{Y}{Y^*}\right) = a_o + a_1(L) \times \Delta(R_m - R_{lr})(L) + a_2(L) \times \frac{\Delta(S_p/P)}{(S_p/P)_{-1}}(L) + \theta_y$$

$$\Delta\pi = b_o + b_1(L) \times \Delta(R_m - R_{lr})(L) + b_2(L) \times \frac{\Delta(S_p/P)}{(S_p/P)_{-1}}(L) + \theta_\pi$$

where the notation $x(L)$ refers to current and lagged values of $x$ ($x = \Delta(R_m - R_{lr})$, $\Delta(S_p/P)/(S_p/P)_{-1}$, $a_1$, $a_2$, $b_1$, or $b_2$) and the residuals, $\theta_y$ and $\theta_\pi$, represent the exogenous current events. In the instance of separate treatment of $T-G_i$ and $G_c+TR$ rather than $S_p$, corresponding definitions of $\theta_y$ and $\theta_\pi$ follow.

The adoption of $R_m - R_{lr}$ instead of $R_m$ and $(S_p/P)/(S_p/P)_{t-1}$ instead of $S_p/Y^*$ in the previous equations needs a word of explanation. While $R_m$ is clearly the basic instrument of monetary policy, there is reason to consider the impact of this policy as depending upon movement in $R_m$ relative to $R_{lr}$ rather than $R_m$ alone. If $R_m$ as such were present in the equations, then whenever $R_{lr}$ rose for any reason, including anticipated inflation, the resulting impact of the fall of $R_m - R_{lr}$ on inflation and output would be treated as unaffected by monetary policy. Yet if the authorities kept $R_m$ the same, the impact of $R_{lr}$ on macroeconomic behavior could best be regarded as stemming from expansionary

monetary policy. On this ground, $R_m - R_{lr}$ seems to be superior to $R_m$ as a measure of monetary policy in the equations.

With respect to fiscal policy, the use of $\Delta(S_p/P)/(S_p/P)_{t-1}$ stems from the absence of a separate deflator for $S_p$ as distinct from $Y$ (and $Y^*$). As a result, whether we measure $S_p$ and $Y^*$ at current prices or constant prices, $S_p/Y^*$ will be the same. Yet it seems right to choose a measure of fiscal policy reflecting a real influence to the utmost. For this reason, I adopted $\Delta(S_p/P)/(S_p/P)_{t-1}$ in preference to $\Delta(S_p/Y^*)$.

As this last reference to $S_p/P$ implies, I also chose to measure $S_p$ at current rather than constant prices. This choice makes no difference so far as the ratios $S_p/Y^*$ and $Y/Y^*$ are concerned. But there is good reason to think of the public debt $D$ and the debt/output ratio $D/Y$ in current prices. Consequently, I decided to measure $D$, $S_p$, $Y$ and $Y^*$ uniformly at current prices.

The same principles serving in identifying $\theta_y$ and $\theta_\pi$ were also applied in identifying the exogenous current changes in the demand for money $\theta_m$. In this next case, the dependent variables in the regressions were either $\Delta(M/P)$ or $\Delta(M/Y)$ (instead of $\Delta(Y/Y^*)$ or $\Delta\pi$) and various measures of $M$ were tried.

We can now proceed to the tests.

## II. Data, Tests and Main Results

As mentioned earlier, requisite data for the tests were possible to collect for 19 OECD countries altogether. The annual data begin as early as 1959 for some countries and as late as 1976 for others. They all go up through 1995. I chose to carry out the econometric tests in the error-correction form. Quite specifically, therefore, I estimated

$$\Delta_t X = f(X_{t-1}, \Delta_{t-1}Y, \theta_t, \Delta_t Z)$$

where $\Delta_t X$ is the current change in the monetary- or fiscal-policy variable, as the case may be, $X_{t-1}$ is its lagged value, $\Delta_{t-1}Y$ the matrix of lagged changes in values of relevant initial conditions (starting with the change from $t-2$ to $t-1$), $\theta_t$ the matrix of current developments, and $\Delta_t Z$ the change in the opposite policy variable from $X$. Regardless of

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the use of $S_p$ or $T-G_i$ and $G_c+TR$, $\Delta_t Z$ in the monetary policy equation is always $\Delta_t(S_p/Y^*)$.

The main test methods were two-stage-least-squares (TSLS), and generalized TSLS (or three-stage-least-squares, 3SLS). In the case of two separate fiscal policy equations, the appropriate constraint on $S_p/Y^*$ was applied in the monetary policy equation.

Table 1 reports the outstanding results for the full sample period and all 19 countries. First in order of presentation are the results for the two-equation system, concerning strictly $\Delta R_m$ and $\Delta(S_p/Y^*)$, and next those for the three-equation system or the one decomposing $\Delta(T-G_i)/Y^*$ and $\Delta(G_c+TR)/Y^*$. In the first stage of the estimation, some instruments were added as exogenous variables. These are past inflation rates for recent years (in both consumer and producer prices) and extra lags in $X_{t-1}$, or the levels of the preceding year's dependent variables. The exact beginning dates for the estimates, which differ for individual countries, follow by footnote below.[2] Starting the tests in 1973 (instead of 1964) would have given rise to a more cylindrical treatment of the different countries. But otherwise it would yield little change, experiments show; if anything, the results improve. A fully cylindrical treatment of all countries would have meant limiting the study period too much.

All of the variables mentioned in discussing the hypotheses were tested. But the estimates in the table exclude most of those that proved insignificant in earlier experiments. Thus, the lagged values of the levels of the fiscal variables (either $[(T-G_i)/Y^*]_{-1}$ or $[(G_c+TR)/Y^*]_{-1}$) do not appear. It seems, therefore, that full adjustment of fiscal policy takes place within one period, or one year. But the same is not true regarding monetary policy, where $(R_m)_{-1}$ can be seen to be highly significant. Its

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[2] Canada and Germany 1964; the US 1965; Australia, Denmark, Greece, France, Italy, the Netherlands, Sweden and the UK 1972; Belgium and Japan 1973; Austria 1975; Norway and Spain 1977; Finland 1978; Ireland 1979; and Portugal 1981.

coefficient in the relevant equation(s) in table 1 says that a bit over two-thirds of the adjustment of monetary policy occurs within the current year, while the rest follows one year later. Likewise, current developments about inflation and the demand for money are absent, and the only current events in the table concern output.[3] All the estimates took place with constant terms and dummies for all countries but one.

In case of the two-equation system, the general fit of the 2SLS estimate of the fiscal policy equation can be seen to be quite poor, even though the F value of the equation is highly significant (in light of the large number of observations). The separation of $(T-G_i)/Y^*$ and $(G_r+TR)/Y^*$ yields an enormous improvement. Yet the estimates of the two-equation system are worth keeping in mind, as they agree remarkably well with those of the three-equation system. I will center the rest of my comments on the latter.

In this next model, fiscal policy performs much better than monetary policy. The adjusted $R^2$ for the tax-minus-investment equation is 35 percent and 46 percent for the expenditure one, as opposed to only 17 percent for the monetary policy equation (in the 2SLS estimates). Some of the national dummy variables (unshown) prove to be important in the monetary policy equation (those for Greece, Spain, Portugal and Italy especially). But despite the presence of these variables, omitted cross-country differences remain essential in explaining most of the variance in monetary-policy behavior in the study period. The obvious inference would be that international differences in exchange rate regimes, openness, and wage-price flexibility play a large role in connection with monetary policy. Similar national distinctions (if no others) apparently matter less in explaining the variance of fiscal policy. This is true with or without the national dummy variables in the fiscal policy equations, which are not important there. Independently of

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[3] The estimates of the exogenous current events which gave the best results subsequently in the model, and which were consequently retained, proved to be those without any lagged values of monetary and fiscal policy.

their presence or absence, the degree of international uniformity in government spending behavior is surprising.

To begin the detailed examination of the individual equations with the monetary-policy one, the long term interest rate appears as the only reflection of the impact of anticipated inflation. As indicated before, current developments about inflation and the demand for money do not emerge as influences on official monetary behavior. Earlier tests also showed monetary policy not to react to the burden of taxation or financing the public debt. In fact, the only initial condition besides $R_{lt}$ affecting monetary policy regards the level of economic activity. As can be seen, monetary authorities respond to the business cycle in a stabilizing manner. In regard to new events, the only current information impinging on monetary policy seems to be fiscal policy as such. Quite interestingly, the monetary authorities tend to tighten when fiscal policy loosens. We shall return to this important point later.

In the case of fiscal policy, the tests reveal no reaction to inflation -- whether past inflation or current developments about inflation. This is not necessarily cause for surprise, since taxes are largely indexed, and the Olivera-Tanzi effect could cancel any tendency that might otherwise exist for inflation to raise real taxes. In addition, there is no obvious reason why inflation should systematically alter aggregate real government spending. On the other hand, fiscal policy clearly responds to government debt in a stabilizing manner, both on the tax and the spending side. The impact of $(D/Y)^2$ on taxes says that the response to debt heightens as the debt-output ratio rises. In fact, D/Y and the interest on the debt relative to output performed just as well as $(D/Y)^2$ in earlier tests, and the use of $(D/Y)^2$ simply represents a choice but an acceptable one. Experiments with $(D_{t-1}-D_{t-2})/Y_{t-1}$ also proved to be futile. There is no evidence of any sensitivity of fiscal policy to the mere *deterioration* of the debt.

Most interesting of all are the responses of fiscal policy to the business cycle and to monetary policy. Based on the estimates, the automatic stabilizers are much weaker than generally supposed. While an adverse shock to output (a negative $\theta_y$) reduces taxes,

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it reduces government spending as well, and any automatic stabilization results from a stronger reaction on the tax side. This stronger reaction can be marginally accepted because of the enormous Student t's on both sides. In fact, the estimate of the two-equation system sheds light on this issue, since it shows a stabilizing response of the deficit as such to $\theta_y$ at the 10-15 percent confidence level.

Nonetheless, the only clear stabilizing response of fiscal policy to the cycle relates to $(Y/Y^*)_{t-1}$ and comes with a lag. As seen in the estimate of the three-equation system, this next response also occurs exclusively on the spending side: $(G_c+TR)/Y^*$ reacts negatively to the lagged value of $Y/Y^*$. According to the tests, therefore, government spending reacts in a destabilizing manner to a recession at first (a negative $\theta_y$) before turning around a year later and promoting stability. More will follow about the interpretation later. But a simple account would be that a certain bureaucratic impulse prevails at the start. When tax receipts falter, government tends to nibble at individual ministerial budgets and transfer programs, and when tax receipts flow in from everywhere, the government becomes lenient in meeting budget requests from the individual ministries and in disbursing transfer payments that are permitted by existing legislation.

The influences of monetary policy on fiscal policy are also challenging. Evidently fiscal policy eases when monetary policy tightens. Here again, the action takes place essentially on the spending side. Quite significantly, this next response cannot be ascribed strictly to anticipated macroeconomic effects of monetary policy, since those are separately taken into account in the tests.

### III. Further Tests

A variety of important and related questions regard robustness, the possible distinction between the behavior of government consumption and transfer payments, and the performance of the model during episodes of unusually energetic fiscal policy.

*(1) Robustness*

It is important to consider the results of the estimates for the 14 member countries of the European Union only. The first set of equations in table 2 relate to the

issue. The estimates show improvement in the general fits, but also exhibit some deterioration in regard to monetary policy. The response of the monetary authorities to fiscal policy becomes muddier and no plain evidence emerges of any reaction of monetary policy to the business cycle. While the negative response of monetary policy to expansionary fiscal policy survives, an important doubt arises as to whether this response does not depend entirely on Germany. The second set of estimates in table 2 confirms the previous suspicion: the presence of the German central bank in the sample does indeed contribute notably to the conservative response of monetary policy to expansionary fiscal policy. Similarly, it can be reported, though it is not shown in the table, that if we leave out both the US and Germany from the full 19-country sample, the same deterioration occurs in the monetary policy equation: neither the fiscal policy variable nor the cycle $(Y/Y^*)$ continue to be important. Thus, the presence of the Federal Reserve and the Bundesbank in the sample has a lot to do with the conservative stance of monetary policy.

Another series of questions about robustness relate to the stability of reported behavior during the sample period. Chow tests clearly reject stability if we break-up the study period into two parts around the middle. But a different way to proceed is to introduce dummy variables for separate time intervals. This other method (suggested by Giavazzi and Pagano (1995)) permits some control for common changes in policy under the possible influence of common problems -- to say nothing of some possible control for international fads in policy decisions. The technique does indeed yield an increase the quality of the fits but, if carried too far -- that is, if too many separate dates are included -- the interaction between monetary and fiscal policy disappears. Yet a compromise is possible. The third set of estimates in table 2 shows that if we limit ourselves to dummy variables for six intervals, or restrict ourselves to indices for consecutive five-year stretches only, then the quality of the estimates increases while the interaction between monetary and fiscal policy stays fairly clear. In this last case, it is also of interest that the estimate for the EU sample without Germany yields better results than before regarding

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monetary policy. The fourth and last set of equations in table 2 pertains to this last point. It shows a negative reaction of monetary to fiscal policy at the 10 percent confidence level for the sample consisting strictly of the EC14 without Germany.[4]

*(2) Decomposition of government consumption and transfer payments*

Major interest also centers on the question whether the responses of government spending concern adjustments in consumption or transfer payments. Table 3 shows what happens when the 2SLS and 3SLS estimates of table 1 are repeated for the four-equation model breaking up fiscal policy into three parts: $(T-G_i)/Y^*$, $G_c/Y^*$ and $TR/Y^*$. As can be seen, the weighted $R^2$ for the 3SLS estimate covering all 19 countries drops to 29 percent, well below the earlier 35 percent level. If we look further behind this deterioration, we also find that the cross-equation correlation between the 2SLS residuals of the $G_c/Y^*$ and $TR/Y^*$ equations is almost 50 percent -- much higher than for any other pair of equations. There is therefore room for doubt that governments really draw a clear line between public consumption and transfer payments in adjusting their spending. Of course, statistical flaws could also be at work. Informed sources agree that the official statistical divisions in different countries make some conflicting choices of distinctions between public consumption and transfer payments (see the associated reflections in Perotti (1996)). Thus, the four-equation model seems less reliable than the preceding three-equation one. But nonetheless, the estimates of table 3 look reasonable enough to warrant comment.

The estimates imply much more uniformity in behavior of government consumption than transfer payments internationally. The $G_c/Y^*$ equation yields a notably better fit than the one for $TR/Y^*$. It is also interesting that the earlier destabilizing responses of government spending to current news about output appear to be evenly divided between consumption and transfer payments. This even division does not

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[4] Of course, German behavior could still underlie the result, since other monetary officials could be following the Deutsche mark. Nonetheless, the other monetary authorities would still be acting of their own volition.

necessarily accord with expectations. Unemployment compensation is stabilizing, and we might have anticipated a lower destabilizing effect for transfer payments than government consumption. That does not happen. The division between the responses of $TR/Y^*$ and $G_c/Y^*$ to $\theta_v$ also agrees perfectly with the earlier estimate of the sum of the two. In addition, the stabilizing response to the cycle after one year can be seen to come essentially from transfer payments. This could be partly the reflection of delayed responses of unemployment compensation to the cycle associated with the sluggishness of movements of unemployment. Notably too, the opposite reaction of fiscal policy to monetary policy shows up exclusively on the side of transfer payments. But the adjustment to debt comes principally from government consumption.

*(3) Episodes of vigorous fiscal policy*

Giavazzi and Pagano (1995) aroused a lot of interest with their suggestion that the private sector may respond differently to fiscal policy measures depending on how sustained and vigorous they are (see also Bertola and Drazen (1993) and Sutherland (1995)). Perhaps even more to the point at present is the contention of Alesina and Perotti (1994) that during episodes of energetic fiscal policy behavior, governments make atypical choices between taxes and public investment, on the one hand, and public consumption and transfers, on the other. During major expansions, politicians predominantly raise consumption and transfers, while during vigorous consolidations, they raise taxes and limit investment. If Alesina and Perotti are right, the current estimates might not capture episodes of highly energetic uses of fiscal policy as well the rest. Or at least, the estimates might perform quite differently in the two cases. A simple way of digging into the matter is to introduce a dummy variable for the country-years of vigorous policy action. In doing so, I experimented with other definitions of country-years of large-scale fiscal expansion and fiscal retrenchment besides those of Alesina and Perotti. Cour *et al.* (1996) also identified such episodes, as have the OECD (1996) and the IMF (1996), the latter two doing so for periods of fiscal adjustment alone.

All four previous sets of definitions involve corrections for automatic responses of government budget balances to the business cycle. Alesina and Perotti base their correction on the suggestion of Blanchard (1990) to center attention on the rate of unemployment. The other three hew to the more widespread practice of using some indicator of potential output in order to deduce a "structural" government balance. In other respects, the differences between the four definitions basically concern amplitude and duration of required changes in order to qualify for a "large-scale" fiscal episode. In my experiments, the OECD measure of large-scale fiscal adjustments yielded fairly similar results to those of Cour *et al.*, while the IMF measure was entirely unsuccessful.[5] Thus, I will limit my discussion to the results using the Alesina-Perotti and Cour *et al.* measures -- the only two which include both periods of expansion and retrenchment. The country-years (within the present study period) based on those two measures are presented in Appendix 2. In testing the two, I used a separate dummy variable for the country-years of vigorous expansion (equal one for those country-years, zero for the rest) and for those of vigorous retrenchment (same).

In general, both the Alesina-Perotti and the Cour *et al.* indicators of large-scale fiscal policy episodes give good results. As seen in table 4, in both examples, periods of vigorous retrenchment imply tighter monetary and tighter fiscal policy, whereas periods of vigorous expansion show at least easier fiscal policy. Nothing much changes otherwise in the estimates. In particular, the negative interaction between monetary and fiscal policy still emerges. Thus, while the settings of $R_m$ and $S_p/Y^*$ are both higher during periods of major consolidation, the tightening of either tool still causes a loosening of the other. The Alesina-Perotti measure suggests more discipline in monetary policy during major consolidations than the Cour *et al.* one does. The latter, in turn, implies easier fiscal policy during expansionary episodes than the former. Indeed, the Alesina-Perotti

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[5] The criterion of the IMF seems to truncate the periods of retrenchment as compared to that of Cour *et al.*

measure does not show any particular response of taxes at all at times of vigorous fiscal expansion, whereas the Cour *et al.* one shows lower tax levels at these times. Both of the measures agree that in case of unusual fiscal retrenchment, the tighter stance of fiscal policy occurs exclusively on the side of spending (but this conflicts with Alesina and Perotti's broad assessment that unusual rises in taxes take place at times of sizeable consolidations).

The most important general conclusion of table 4, however, is that correcting the estimates by bringing into consideration episodes of unusually energetic fiscal policy makes little difference. The earlier admission of dummy variables for separate time intervals produced far greater improvement in the statistical fits. In addition, combining indices of large-scale episodes with the dummy variables for time or adding these episodes in the study of the EC14 alone sheds no extra light.

## IV. Discussion

I will center the discussion of the estimates on three aspects: (1) the responses to public debt; (2) the interactions between monetary and fiscal policy; and (3) the responses to the business cycle.

### (a) Public debt

The results about public debt can only be described as heartening. According to the estimates, government debt provokes remedial action, and it does so where it counts, namely, in respect to fiscal policy. In addition, not only do taxes rise in response to a higher debt burden, but expenditures also fall. Any mere reaction of taxes would have stabilized D/Y at a higher level of government spending relative to output. But since government spending also adjusts, permanent increases in the share of government spending in output are not implied. In addition, the quadratic formulation of D/Y* suggests increasingly stabilizing responses to debt as the debt-output ratio rises. Admittedly, this formulation was merely a choice, as pointed out before. Yet increasingly stabilizing responses to debt cannot be ruled out.

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*(b) Monetary and Fiscal Policy Interactions*

The recorded interplay between monetary and fiscal policy deserves a lot of emphasis. Two radically opposite tendencies exist in analyzing government behavior. According to one strand of thinking, loose fiscal policy promotes loose monetary policy. In the Sargent-Wallace (1981) version of the argument, the government budget constraint plays a crucial role. If government debt accumulates rapidly enough, seigniorage revenues must rise sooner or later. Therefore, the monetary authorities will eventually lose monetary control. In many versions of the argument, the pressure for accommodating monetary policy occurs more directly -- that is, apart from any issue of the solvability of the government (implicit in the emphasis on the budget restraint) -- via the finance ministry. The degree of political independence of the central bank thus enters crucially. More recent variants of the reasoning add particular emphasis on the question of credibility in anti-inflationary monetary policy. If fiscal policy is loose, tight monetary policy becomes incredible. Time-consistency requires inflation. Fiscal discipline, therefore, is a prerequisite for monetary discipline (see the summary discussion in Andersen (1996)).

It is evident that the Maastricht Treaty -- especially the fiscal criteria -- is associated with the preceding outlook. Lamfalussy's contribution (1989) to the Delors report may offer special insight into official thinking around the time of the drafting of the Treaty. Lamfalussy presumes that the cost of financing public debt exerts a basic disciplinary influence on fiscal policy. In case of monetary union, all member governments will be able to borrow on a broader capital market than before and therefore at lower interest rates. Thus, those of the governments which lack fiscal discipline will probably engage in looser fiscal policy. The outcome becomes all the more likely since those governments will no longer need to worry about paying interest rate premia as a result of the expected depreciation of their currencies relative to the rest. The looser fiscal policy in those countries will then produce pressures for expansionary monetary policy in the monetary union as a whole.

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According to a contrary tendency, the "unpleasant monetary arithmetic" of deficit spending has little practical significance: too many other adjustments in taxes can be made. Strong reliance on seigniorage and inflation for tax revenues typically follow from the presence of a weak tax administration rather than outstanding public debt. Blanchard, Buiter and Dornbusch (1985) forcefully express this viewpoint. In addition, markets tend to anticipate government propensities to inflate and to move the economy to a position where surprise inflation no longer serves official interests. The level of inflation and the maturity structure of the public debt adapt to yield this result (see Missale and Blanchard (1994), who also mention adaptations in the indexation and the currency composition of the debt). Therefore, even in the case of high deficits and debt, there is little ground for claiming that the fiscal authorities will generally pressure the monetary authorities to inflate more.

It is important to observe that usual applications of monetary rules in analyzing central bank behavior implicitly accept the second point of view (for example, Taylor (1993)). Under the assumption of official efforts to maximize social welfare, if fiscal policy is expansionary, the central bank must raise interest rates. Appreciating the currency becomes the right medicine: not only does the policy fight inflation but it promotes the financing of public dissaving through rest-of-the-world saving rather than through reduced home investment. The restrictive monetary policy becomes all the more judicious because of the defense of employment coming from fiscal policy.

Isolated empirical examples can easily be summoned in favor of either view. Following World War I, many European countries (including France somewhat later, closer to the time of the Poincaré stabilization of 1926) deliberately used inflation to expropriate government bond holders. Until the "accord" of 1951, the Federal Reserve had no choice but to finance the U.S. government debt. The Bank of Italy stood in a similar position to the Fed's prior to 1951 until the "divorce" from the Italian Ministry of Finance of 1981. On the opposite side of the fence, one can cite such famous examples as the behavior of the Federal Reserve under the first Reagan administration, or that of

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the Bundesbank during German unification -- both instances where a sizeable domestic swing toward deficit spending took place. As a different kind of example, of equal relevance, the fiscal consolidation in Ireland in 1987 was preceded by a devaluation (or expansionary monetary policy). Which view is correct -- that is, in the relevant part of the globe?

The results of the present study would clearly argue in favor of the second view: fiscal policy and monetary policy tend to move in opposite directions in the OECD. As regards monetary policy, these results may depend heavily on the Bundesbank and the Federal Reserve. Yet even for the rest of the sample, no evidence can be found to support the assumption of Lamfalussy and others of a general tendency toward looser monetary policy in case of low fiscal discipline. Over and above, the Maastricht Treaty provides for an independent central bank, and thus the results incorporating the Fed and the Bundesbank may be said to be the relevant ones. In sum, therefore, models of coordinated behavior by monetary and fiscal authorities suit the evidence much better than models of competing monetary and fiscal authorities pressuring one another. As a matter of broad generalization in the OECD, loose fiscal policy does not endanger monetary control, and tight monetary policy, rather than exercising a leash on deficit spending, induces the fiscal authorities to provide more help to the private sector. If present evidence is to be trusted, in a future EMU with member governments facing lower prospects of tight monetary policy when engaging in expansionary fiscal policy, the governments will ease fiscal policy *less*, not more. Such extrapolation from the past may be dangerous, but that is what such extrapolation would say.

The most intriguing aspect of the results about interactions between monetary and fiscal policy relates to the behavior of the fiscal authorities. The latter are generally more directly affected by popular pressures than the monetary authorities; and unlike monetary policy, discretionary fiscal policy requires time and often public debate before taking effect. It would therefore be desirable to be clearer about the processes underlying the evidence that fiscal policy moves in the opposite direction to monetary policy.

Through what channels does the action take place? Is an optimizing framework at play? According to the estimates, the response of fiscal policy comes through spending rather than taxes (and investment). The decomposition between consumption and transfer payments further suggests that the reaction stems more specifically from transfer payments. The response also occurs the same year and thus is not likely to flow from unemployment compensation. Perhaps the fiscal authorities tend to provide temporary relief to firms suffering from tight monetary policy. The example of Sweden in 1992 may be suggestive. Faced with extraordinarily tight monetary policy when the Bank of Sweden heroically (but furtively) tried to defend the kroner that year, the Swedish fiscal authorities lowered tax rates and offered special assistance to financial firms in difficulty. Does this behavior (admittedly recorded under unusual financial duress) provide a general key to the situation? In that case, of course, monetary authorities might even feel generally freer to tighten monetary policy, acting in the belief that fiscal policy would come to the aid of the injured.

*(c) The business cycle*

With respect to macroeconomic performance, the one result requiring a good deal of attention is the pro-cyclical response of government spending. The rest comes as no surprise. We would expect the stabilizing responses of monetary policy and tax receipts to deviations from potential output. These are more than merely acceptable: they confirm widespread assumptions. The lagged stabilizing response of government expenditures also fits in with usual analysis and interpretation. But the contemporaneous pro-cyclical behavior of government spending worries.

The problem is not so much understanding the result, which makes perfect sense. The literature on bureaucracy and public choice offers an obvious perspective. Like many an ordinary organization, government loosens its purse strings when tax receipts abound, and does the opposite when tax receipts merely trickle in. A rational flavor can also be added to the argument by appealing to government's desire to limit deficit spending (concern for the future?). The fundamental intellectual challenge comes from the fact that

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ordinary macroeconomic analysis treats the government differently. We generally regard taxes and unemployment compensation as the only elements of the public budget which move automatically with economic activity. Other items are supposedly exogenous, therefore a matter of discretionary policy. But the enormous statistical significance of the positive coefficient of $\theta_v$ in the spending equations of table 1 clearly implies a fairly automatic response, and therefore less strength in automatic stabilizers than we generally suppose.

Do we have independent evidence to support our usual treatment of all government spending except for unemployment compensation as independent of the cycle? I have looked at the estimates of automatic stabilizers with this question in mind, and find that, broadly speaking, we simply admit only systematic responses of taxes and unemployment compensation. The most detailed estimates of automatic stabilizers on hand, coming from the OECD, depend strictly on a separate investigation of the respective responses of personal income taxes, corporate income taxes, indirect taxes, social security taxes, and unemployment compensation to the cycle. (See Giorno *et al.* (1995)). The IMF proceeds in a similar fashion (see IMF (1993), pp. 99-103). These kinds of tests generally yield estimates of about a one-half of one percent increase in government deficits relative to output in case of a one percent reduction in output relative to the potential level -- with a significant dispersion between individual countries.[6] One recent study has proceeded differently. Bayoumi and Eichengreen (1995) estimate automatic stabilization by examining total government deficits in a cross-section of six countries: Canada, Germany, the U.S., France, Japan, and the Netherlands (in 1971-89). By so doing, these authors take into account all government receipts and expenditures, and therefore should come up with figures below the usual ones based on

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[6] See Ribe (1995).

my results. In fact, they do not do so, but find something closer to the usual one-half of one percent estimates.[7,8]

Should government spending move pro-cyclically, as I find, then we must seriously entertain the possibility that the usual decomposition of budget deficits has been biased in favor of automatic stabilization. In other words, the implication would be that we overestimate the extent of automatic stabilization and correspondingly underestimate the importance of discretionary fiscal policy. Our estimates of so-called *structural* deficits are similarly biased toward exaggerated deviations of the structural from the actual deficit numbers over the cycle (since we correct strictly for cyclical effects on taxes and unemployment compensation). Quite significantly too, on this view, the currently high levels of government deficits in the OECD have less to do with the business cycle than we usually assume and owe more to other considerations. (For a discussion of what these other considerations might be, see Shigehara (1995)). By

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[7] I obtain this one-half of one percent figure for them by adding up the stabilization at the central and the lower government levels in their study.

Bayoumi and Eichengreen also report completely inverse outcomes to mine at the state-government level for the U.S. for 1970-92 (based on quarterly data). In their tests, state government expenditures move in a countercyclical manner, whereas state government taxes move pro-cyclically, and it is the dominance on the expenditure side which assures a countercyclical effect on the whole. Those results, if correct, could hinge on the weak powers of taxation of U.S. state governments. Bayoumi and Masson (1996) find the typical outcome of a counter-cyclical movement of tax receipts in the case of the provincial governments of Canada, where the taxation powers of the relevant government units are notably higher than those of the U.S. states.

[8] Some of the results of Alesina and Perotti (1995) might also seem, on the surface, highly pertinent, since these co-authors divide up government expenditures and tax receipts and report separate estimates for the responses of the two to inflation, unemployment and growth. Furthermore, Alesina and Perotti use essentially the same sample as mine. However, they also include dummy variables for neutral, loose, very loose, tight, and very tight fiscal policy in their estimates, and thereby effectively confine the role of inflation, unemployment and growth in their regressions to explaining behavior within these five classifications. As a consequence, the proper interpretation of their results looks uncertain. Indeed, Alesina and Perotti seem to agree, as they concede that only their five-fold classification of policies ultimately matters in their work.

extension, the Waigel Stability Pact can be expected to interfere less with automatic stabilization and more with discretionary fiscal policy. A further implication concerns the strength of automatic stabilization in response to national and regional output shocks. The stabilizing reactions to regional output shocks should be the stronger of the two. In the event of a drop in the output of one region relative to the rest of the nation without any change in aggregate output, we can hardly expect central government spending to fall in the adversely affected region relative to other parts of the nation. Therefore, the usual measures of automatic stabilization, resting strictly upon taxes and unemployment compensation, should apply. If so, the automatic stabilizers will be larger regionally than nationally.

## V. Conclusion

What conclusions can we draw regarding EMU? The subject would be fitting for a separate paper, and therefore I will be brief.

Basically, some coordination of monetary and fiscal policy will be necessary under EMU in order to retrieve a certain useful interaction between the two policies that exists today. Had the study supported the frequent idea that fiscal laxity promotes loose monetary policy, the conclusion would be different: instead some benefit could be awaited from EMU simply by virtue of weakening the influence of the fiscal authorities over monetary policy. The multiplication of the number of finance ministries facing the single central bank in the new monetary union would have been helpful simply by diluting the damaging political influence of each individual one and therefore the collective influence that the ministries exert on monetary policy. As it is, coordinated activity between fiscal and monetary authorities seems to exist, and therefore EMU opens up the quite different prospect of reduced macroeconomic policy coordination unless steps are taken to avoid it.

The strongest empirical result of the study, however, concerns the presence of less automatic stabilization than usually assumed. In this connection, the implications for EMU fly off in two opposite directions. On the one hand, the greater relative importance

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of discretionary fiscal policy leaves more room for fiscal policy coordination in the future. But on the other hand, the interference of the fiscal criteria of the Maastricht Treaty and the Waigel Pact with fiscal policy can be expected to be greater, since we can assume that these features of EMU have greater scope for interference with discretionary behavior than automatic policy. This last implication would seem the more important one of the two. It concerns actual behavior rather than an eventuality. What good is greater potential for fiscal policy coordination if EMU about to crush discretionary fiscal policy (or is it?)?

All of the data concerning output, potential output, prices, goverment expenditures and receipts come from the OECD data base. The following table indicates the series for the central bank intervention rate, $R_m$, and the long term interest rate, $R_{lt}$

| COUNTRY | INTERVENTION RATE : $R_m$ | LONG TERM INTEREST RATE : $R_{lt}$ | SOURCE |
|---|---|---|---|
| AUSTRALIA | Short term money market rate | Long term obligations: secondary market | OECD |
| AUSTRIA | 3-month VIBOR | Government bonDs | IMF |
| BELGIUM | Rate on cash surpluses at the central bank | Government bonds | OECD & IMF |
| CANADA | Weekly tender rate of the central bank | Government bonds | OECD |
| DENMARK | Rate on trade bills charged by banks | Government bonds | OECD |
| FINLAND | Daily interbank rate | Rate on bank loans | OECD |
| FRANCE | Money market rate | Public and semi-public bonds | OECD |
| GERMANY | 3-month FIBOR | Long term obligations: secondary market | OECD |
| GREECE | Central bank intervention rate | Government bonds | IMF |
| IRELAND | Central Bank intervention rate | Government bonds | IMF |
| ITALY | Money market rate | Government bills | OECD |
| JAPAN | Daily central bank rate | Government bonds | OECD |
| NETHERLANDS | Brokers' call rates | Government bonds | OECD |
| NORWAY | Central bank intervention rate | Government bonds | IMF |
| PORTUGAL | Central bank intervention rate | Government bonds | IMF |
| SPAIN | Daily interbank rate | Government securities (medium term) | OECD |

| | | | |
|---|---|---|---|
| **SWEDEN** | Central bank daily rate | Government bonds | OECD |
| **UK** | Money market rate | Government bonds | OECD |
| **US** | Federal funds rate | Government bonds | OECD |

Many of the money series which served to calculate the money demand shock $\theta_m$ came from the IMF, others from the OECD. But since none of those shocks were retained, the details about sources and definitions are omitted.

## ALESINA AND PEROTTI (1995)

| COUNTRY | LARGE EXPANSION | LARGE RETRENCHMENT |
|---|---|---|
| AUSTRALIA | 1975, 76, 91, 92 | 1974, 77, 87 |
| AUSTRIA | 1975 | 1977, 84 |
| BELGIUM | 1975, 81 | 1982, 84 |
| CANADA | 1975, 82, 91 | 1981 |
| DENMARK | 1975, 87, 88 | 1983, 84, 85, 86 |
| FINLAND | 1978, 87, 90, 91, 92 | 1984, 88 |
| FRANCE | 1975, 81, 92 | |
| GERMANY | 1974, 75, 90 | 1969, 73, 76, 89 |
| GREECE | 1981, 85, 88, 89 | 1982, 86, 87, 90, 91, 92 |
| IRELAND | | 1984, 87, 88, 89 |
| ITALY | 1972, 75, 81 | 1974, 76, 80, 89, 92 |
| JAPAN | 1975 | 1984 |
| NETHERLANDS | 1975, 87 | 1985, 91 |
| NORWAY | 1977, 86, 91 | 1979, 80, 83, 84, 89, 90 |
| PORTUGAL | 1981, 83, 87 | 1982, 84, 89 |
| SPAIN | 1982 | 1986, 87 |
| SWEDEN | 1974, 77, 79, 88, 91 | 1976, 83, 84, 87 |
| UK | 1972, 90, 91, 92 | 1969, 76 |
| US | 1967, 75 | 1969, 76 |

**COUR, DUBOIS, MAHFOUR, AND PISANI-FERRY (1996)**

| COUNTRY | LARGE EXPANSION | LARGE RETRENCHMENT |
| --- | --- | --- |
| AUSTRIA | 1975, 76 | |
| AUSTRALIA | 1975, 76 | 1980-82, 1985-88 |
| BELGIUM | 1980, 81 | 1982-87, 1993, 94 |
| CANADA | 1975-78 | 1979-81 |
| DENMARK | 1974-77, 1979-83, 1987-94 | 1983-86 |
| FINLAND | 1978-80, 1990-92 | |
| GERMANY | | 1980-83 |
| IRELAND | 1979 | 1982-84, 1986-89 |
| ITALY | | 1976, 77, 82, 83, 1991-93 |
| JAPAN | 1975-78, 1990-94 | 1979-87 |
| NETHERLANDS | | 1991-93 |
| SPAIN | | 1992-95 |
| SWEDEN | 1972-74, 1977-79, 1990-93 | 1986, 87, 94, 95 |
| UK | 1972-73, 1992-93 | 1979-82 |

NOTE . The only episodes mentioned are those falling within the present study period.

See footnote 2.

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York.

| ESTIMATION METHOD | DEPENDENT VARIABLE | $(R_A)_{-1}$ | $\Delta_{-1}R_b$ | $\Delta_{-1}\left(\frac{D}{Y}\right)^2$ | $\Delta_{-1}\frac{Y}{Y^*}$ | $\theta_t$ | $\Delta\frac{S_p}{Y^*}$ | $\Delta R_m$ | |
|---|---|---|---|---|---|---|---|---|---|
| 2SLS | $\Delta R_m$ | -0.31 (8.9) | 0.21 (2.5) | | 0.06 (2) | | | | $\overline{R^2}=0.18$ F=5.085*** |
| | $\Delta\frac{S_p}{Y^*}$ | | | 0.07 (4.3) | 0.08 (3.5) | 0.03 (1.4) | -0.48 (3.2) | -0.15 (2.2) | $\overline{R^2}=0.10$ F=2.017** |
| 3SLS | $\Delta R_m$ | -0.26 (7.6) | 0.17 (2.2) | | 0.08 (2.8) | 0.03 (1.5) | | | system weighted $R^2=21$ |
| | $\Delta\frac{S_p}{Y^*}$ | | | 0.04 (3) | 0.08 (3.7) | | -0.86 (6.1) | -0.26 (4.1) | |
| 2SLS | $\Delta R_m$ | -0.32 (9) | 0.22 (2.6) | | 0.06 (2) | | | | $\overline{R^2}=0.17$ F=4.98*** |
| | $\Delta\left(\frac{T-G_t}{Y^*}\right)$ | | | 0.03 (2.5) | 0.01 (0.6) | 0.31 (14.9) | -0.42 (2.4) | 0.06 (1) | $\overline{R^2}=0.35$ F=11.52 |
| | $\Delta\left(\frac{G_c+TR}{Y^*}\right)$ | | | -0.04 (3.3) | -0.06 (4.2) | 0.27 (16.2) | | 0.15 (3.1) | $\overline{R^2}=0.46$ F=17.53 |
| 3SLS | $\Delta R_m$ | -0.28 (8.2) | 0.22 (2.8) | | 0.07 (2.6) | | | | system weighted $R^2=35$ |
| | $\Delta\left(\frac{T-G_t}{Y^*}\right)$ | | | 0.03 (2) | 0.01 (0.6) | 0.31 (15.1) | -0.69 (4.1) | 0.02 (0.3) | |
| | $\Delta\left(\frac{G_c+TR}{Y^*}\right)$ | | | -0.03 (2.6) | -0.07 (4.3) | 0.27 (16.6) | | 0.19 (4.1) | |

Number of observations : 423

$t$ value in parentheses

** Indicates significance at the 0.5 percentage point level

*** Indicates significance at the 0.1 percentage point level (higher F values still more significant)

**TABLE 2**
**3SLS TESTS OF ROBUSTNESS**

| SUBJECT | DEPENDENT VARIABLE | $(R_{bd})_{-1}$ | $\Delta_{-1}R_{bd}$ | $\Delta_{-1}\left(\frac{D}{Y}\right)^2$ | $\Delta_{-1}\frac{Y}{Y^*}$ | $\theta_1$ | $\Delta\frac{S_D}{Y}$ | $\Delta R_m$ | |
|---|---|---|---|---|---|---|---|---|---|
| 1. THE EUROPEAN UNION | $\Delta R_{bd}$ | -0.30 (7.2) | 0.22 (2.5) | | 0.03 (1) | | -0.33 (1.9) | | system weighted $R^2 = 0.39$ |
| | $\Delta\left(\frac{T-G_c}{Y^*}\right)$ | | | 0.03 (1.9) | ≡0 | 0.31 (13.8) | | 0.03 (0.4) | |
| | $\Delta\left(\frac{G_c-TR}{Y^*}\right)$ | | | -0.03 (2.1) | -0.05 (3.2) | 0.29 (15.9) | | 0.22 (4.1) | number of observations = 302 |
| 2. THE EUROPEAN UNION WITHOUT GERMANY | $\Delta R_{bd}$ | -0.31 (7) | 0.21 (2.3) | | 0.02 (0.6) | | -0.17 (1) | | system weighted $R^2 = 0.40$ |
| | $\Delta\left(\frac{T-G_c}{Y^*}\right)$ | | | 0.03 (2.1) | 0.01 (0.4) | 0.32 (13.6) | | -0.07 (1) | |
| | $\Delta\left(\frac{G_c+TR}{Y^*}\right)$ | | | -0.03 (2.1) | -0.05 (2.8) | 0.29 (15.5) | | 0.22 (3.7) | number of observations = 271 |
| 3. COMMON INFLUENCES OF TIME[1] | $\Delta R_{bd}$ | -0.38 (10) | 0.19 (2.4) | | 0.05 (1.8) | | -0.48 (3.1) | | system weighted $R^2 = 0.40$ |
| | $\Delta\left(\frac{T-G_c}{Y^*}\right)$ | | | 0.04 (2.6) | 0.02 (0.8) | 0.31 (15.4) | | -0.04 (0.7) | |
| | $\Delta\left(\frac{G_c+TR}{Y^*}\right)$ | | | -0.03 (2.8) | -0.06 (4) | 0.27 (16.3) | | 0.08 (1.9) | number of observations = 423 |

## TABLE 2
## 3SLS TEST OF ROBUSTNESS (cont.)

| SUBJECT | DEPENDENT VARIABLE | $(R_m)_{-1}$ | $\Delta_{-1}R_{to}$ | $\Delta_{-1}\left(\frac{D}{Y}\right)^{?}$ | $\Delta_{-1}\frac{Y}{Y^*}$ | $\theta_3$ | $\Delta\frac{S_p}{Y}$ | $\Delta R_m$ | |
|---|---|---|---|---|---|---|---|---|---|
| 4. COMMON INFLUENCES OF TIME : THE EU WITHOUT GERMANY [2] | $\Delta R_m$ | -0.38 (7.4) | 0.15 (1.5) | | | | -0.29 (1.6) | | system weighted $R^2 = 0.45$ |
| | $\Delta\left(\frac{T-G_i}{Y^*}\right)$ | | | 0.03 (2) | 0.01 (0.5) | 0.32 (13.6) | | -0.08 (0.1) | number of observations = 271 |
| | $\Delta\left(\frac{G_c+TR}{Y^*}\right)$ | | | -0.03 (2.2) | -0.04 (2.5) | 0.29 (15.7) | | 0.13 (2.3) | |

1 The dummy variables for time are 1963-68, 1969-73, 1974-78, 1979-84, 1985-90, 1991-94. The significant ones (all positive) are as follows (Student *t*'s in parentheses): in the first equation, 1979-84 (3.6) and 1985-90 (1.9); in the second equation, 1963-68 (2.1); in the third equation 1969-73 (2.6) and 1974-78 (3)

2 The dummy variables for time are 1974-78, 1979-84, 1985-90 and 1991-95 (starting date of estimation period 1973). The significant ones are as follows : (Student *t*'s and signs in parentheses): in the first equation, 1979-84 (3); in the second equation 1985-90 (-2.4) and 1991-95 (-2.6) ; in the third equation, 1974-78 (2)

## TABLE 3
## THE DECOMPOSITION OF GOVERNMENT CONSUMPTION AND TRANSFER PAYMENTS

| ESTIMATION METHOD | DEPENDENT VARIABLE | $(R_\pi)_{-1}$ | $\Delta_{-1}R_g$ | $\Delta_{-1}\left(\dfrac{D}{Y}\right)^{?}$ | $\Delta_{-1}\dfrac{Y}{Y^*}$ | $\theta_t$ | $\Delta\dfrac{S_p}{Y^*}$ | $R_\pi$ | |
|---|---|---|---|---|---|---|---|---|---|
| 2SLS | $\Delta R_\pi$ | -0.32 (9.2) | 0.22 (2.9) | | 0.05 (1.7) | | -0.27 (1.8) | | $\bar{R}^2 = 0.17$ F = 4.9*** |
| | $\Delta\left(\dfrac{T-G_t}{Y^*}\right)$ | | | 0.03 (2.1) | 0.03 (1.5) | 0.32 (14.2) | | 0.03 (0.5) | $\bar{R}^2 = 0.33$ F = 10.5 |
| | $\Delta\left(\dfrac{G_c}{Y^*}\right)$ | | | -0.03 (5.3) | -0.01 (1.3) | 0.14 (16.5) | | 0.02 (1) | $\bar{R}^2 = 0.46$ F = 17.5 |
| | $\Delta\dfrac{TR}{Y^*}$ | | | -0.01 (1.8) | -0.04 (3.5) | 0.14 (11) | | 0.07 (2.2) | $\bar{R}^2 = 0.30$ F = 9.3 |
| 3SLS | $\Delta R_\pi$ | -0.30 (8.9) | 0.22 (3) | | 0.06 (2.1) | | -0.42 (2.8) | | system weighted $R^2 = 0.29$ |
| | $\Delta\left(\dfrac{T-G_t}{Y^*}\right)$ | | | 0.03 (1.8) | 0.03 (1.6) | 0.32 (14.4) | | 0.01 (0.1) | |
| | $\Delta\dfrac{G_c}{Y^*}$ | | | -0.03 (5.2) | -0.01 (1.3) | 0.14 (16.4) | | 0.03 (1.2) | |
| | $\Delta\dfrac{TR}{Y^*}$ | | | -0.01 (1.5) | -0.04 (3.6) | 0.14 (11) | | 0.09 (2.7) | |

Number of observations: 423

*** indicates significance at the 0.1 percentage point level (higher F values still more significant)

## TABLE 4
## LARGE-SCALE FISCAL POLICY EPISODES (3SLS)

| DEPENDENT VARIABLE | $(R_m)_{-1}$ | $\Delta_{-1}R_{tt}$ | $\Delta_{-1}\left(\dfrac{D}{Y}\right)^2$ | $\Delta_{-1}\left(\dfrac{Y}{Y^*}\right)$ | $\theta_y$ | $\Delta\left(\dfrac{S_p}{Y^*}\right)$ | $\Delta R_m$ | LARGE EXPANSION | LARGE RETRENCHMENT |
|---|---|---|---|---|---|---|---|---|---|
| **ALESINA-PEROTTI** | | | | | | | | | |
| $\Delta R_m$ | -0.3 (8.9) | 0.29 (3.7) | | | | -0.4 (2.6) | | -0.55 (1.6) | 0.91 (2.8) |
| $\Delta\left(\dfrac{I-G_i}{Y^*}\right)$ | | | 0.03 (2.4) | 0.05 (2) | 0.31 (14.8) | | 0.07 (11) | 0.08 (0.3) | -0.17 (0.8) |
| **system weighted** $R^2=0.36$ $\Delta\left(\dfrac{G_c+IR}{Y^*}\right)$ | | | -0.03 (3.1) | -0.06 (3.6) | 0.28 (16.9) | | 0.18 (4) | 0.63 (3.4) | -0.41 (2.3) |
| **COUR ET AL.** | | | | | | | | | |
| $\Delta R_m$ | -0.31 (9.1) | 0.26 (3.3) | | 0.07 (2.4) | | -0.44 (2.7) | | -0.75 (1.7) | 0.62 (1.8) |
| $\Delta\left(\dfrac{I-G_i}{Y^*}\right)$ | | | 0.04 (2.9) | 0.01 (0.8) | 0.31 (15.1) | | 0.08 (1.3) | -0.85 (3.2) | -0.1 (0.5) |
| **system weighted** $R^2=0.37$ $\Delta\left(\dfrac{G_c+IR}{Y^*}\right)$ | | | -0.03 (3) | -0.07 (4.7) | 0.27 (16.5) | | 0.15 (3.4) | 0.53 (2.6) | -0.57 (3.2) |

Number of observations : 423