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Inflation adjusted government
budget deficits and their impact
on the business cycle:
empirical evidence
for 8 industrial countries

Giuseppe Tullio*

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Introduction

In a recent paper on the effect of Federal Budget Deficits published in the American Economic Review, Robert Eisner and Paul Pieper (1984) have shown that the inflation adjusted high employment surplus explains a significantly higher proportion of the variance of US real output growth and unemployment changes than the non-adjusted high employment surplus. In a later study (1986) they extended their analysis to six other industrial countries using inflation adjusted and unadjusted high employment surpluses calculated by Cukierman and Mortensen (1983). They found that their previous result reached for the United States is confirmed for most countries. In addition they found that in explaining real GDP growth for countries other than the US, the US inflation adjusted high employment budget surplus has a greater explanatory power than the country's own adjusted high employment surplus.

There are three major problems with Eisner and Pieper's study. First they use reduced form equations. It follows that their estimated coefficients are subject to the likelihood of a simultaneous equations bias which is larger the more effective policy makers are in stabilizing the business cycle. The effect of economic policy on the business cycle should therefore be estimated within the context of a model containing also reaction functions of fiscal authorities. The use of the high employment budget surplus as a measure of the fiscal policy rather than the cyclically unadjusted surplus may reduce this bias somewhat, but is unlikely to eliminate it. Second, their reduced forms include only the lagged high employment budget surplus as explanatory variable, neglecting other factors which could affect the business cycle, mostly monetary policy and supply side shocks. Thus the regression coefficients they estimate could also be biased owing to a mis-specification of the output equation. Michael Bruno (1984) has shown in pooled cross-country regressions for 7 industrial countries that lagged changes in the terms of trade and lagged changes in

domestic and US real money growth contribute significantly to explain
changes in real aggregate GDP. In previous pooled regression analysis
explaining changes in real manufacturing output he showed that lagged
changes in real wages, in the real money stock, in the ratio of import to
consumer prices and in the lagged change in the share of the government
deficit to GDP are important explanatory variables (Bruno, 1980).

Third, Eisner and Pieper use the high employment surplus expressed
as a ratio to GNP to explain the rate of change of real GNP, as if a higher
surplus entailed a permanently higher rate of growth of real GNP. They
implicitly assume, following Modigliani's life-cycle hypothesis and
Friedman's permanent income theory, that real private consumption depends
on the level of real wealth, of which public debt is a component. As a
result they relate the rate of change of real GNP to the first difference
of public debt i.e. to the level of the government budget deficit. But
there are several problems with the use of the high employment surplus as a
proxy for changes in wealth. First public debt is only one component of
wealth. Second the high employment surplus is a hypothetical construct
that does not necessarily bear a close relationship to changes in the
actual stock of public debt. For instance in the case of a prolonged
depression it is possible that the high employment budget is slightly in
deficit or even shows a surplus, while the actual deficit is large and the
real stock of public debt is rising sharply. This consideration casts
doubts on the meaning of the cyclical adjustment of the surplus. On the
other hand, the inflation adjustment is applied to the actual stock of
public debt, so that the inflation adjusted high employment surplus is to a
large extent a "hybrid" concept. Third, wealth holders may also be
influenced by their current income and low income groups are certainly
income constrained. In this case consumption will be a function of income
also. The level of government expenditure, especially transfers, and of
taxation influence household disposable income and government expenditures
on goods and services is a direct component of aggregate demand. Under
these keynesian assumptions the rate of change in GNP becomes a function of
the first difference of the government budget surplus. The latter
specification of the output equation is used by Bruno (1980). In this
paper both the level and the first difference of the government budget
surplus are introduced as explanatory variables in the output equations.

This paper has three main objectives. First, to reassesses the validity of Eisner and Pieper's conclusion about the usefulness of the inflation adjustment of the surplus for the US by estimating output equations in which the real money stock, real wages and the real price of oil are used as explanatory variables along with the inflation adjusted or unadjusted surplus. Secondly, to estimate similar output equations also for 7 other industrial countries to check the robustness of Eisner and Pieper's main conclusion for other industrial countries and to check whether there is a systematic relationship between the size of the country and the relative importance of domestic versus foreign variables in determining the business cycle. Third, to analyze the sensitivity of Eisner and Pieper's main conclusion to the choice of the sample period and to the introduction of the first difference of the full employment budget surplus in addition to its level as a separate regressor.

In extending Eisner and Pieper's analysis in this way only the second and the third problem of their empirical work is dealt with in this paper. There was also no attempt to eliminate the simultaneous equation bias. To try and do so would have taken us too far from their starting framework and would have made the analysis for a large number of countries very cumbersome. For this reason the results of this paper have to be interpreted with some caution. The coefficients of foreign policy variables are, however, likely to be subject to a smaller simultaneous equation bias, as economic policy choices in large countries are not generally believed to depend significantly on the business cycle in smaller countries.

There are three main conclusions derived from the empirical evidence presented in this paper. First the inflation adjusted full employment surplus does not unambiguously possess a greater explanatory power than the non adjusted one, contradicting Eisner and Pieper's main finding. Second, the evidence in favour of a positive short run effect of domestic fiscal expansion on domestic real output is strong only for the US and Japan. For all medium and small sized countries there is instead some evidence of more than full crowding out of domestic fiscal expansion and strong evidence

that fiscal expansion in large countries leads to a contraction in output in small and medium sized ones. Third, the smaller the country, the more foreign fiscal and monetary policy variables dominate the domestic business cycle with respect to domestic ones.

The sample includes 8 industrial countries, the US, Japan, Germany, the UK, France, Italy, the Netherlands and Denmark. The structure of the paper is as follows: Section 1 explains how the estimated equation is derived from a short run aggregate demand and aggregate supply framework following Bruno (1984) and summarizes the main problems raised in literature with the inflation adjustment of budget deficits. Section 2 presents empirical tests of the output equation for the US. The sample period is 1967-1981 as in Eisner and Pieper (1984a). In Section 3 additional estimates of the output equation which use a different source for the cyclically and inflation adjusted budget surplus (Mortensen 1985) are presentd for the US and for 7 other industrial countries. Section 4 contains a summary of the findings and concluding comments.

1. The derivation of the short run output equation and the rationale for the inflation adjustment of public sector deficits.

In standard textbook models of aggregate demand and aggregate supply, output is determined in the short run in the aggregate output-aggregate price level plane at the intersection of the two curves of aggregate demand and aggregat supply. Aggregate supply is a marginal short run cost curve schedule which is upward sloping, implying rising marginal costs as output increases. At low levels of output the curve is generally assumed to be relatively flat because of under-utilisation of resources while at high levels of output its slope is generally assumed to be steeper. An increase in the cost of raw materials shifts the supply curve to the left. So does an increase in wages, thus tending to reduce output for a given demand.

The downward sloping aggregate demand schedule is influenced by monetary and fiscal policy, but also by the wage rate. An increase in the money supply shifts the demand curve outwards and increases output. So

does an increase in the government budget deficit. The real wage rate has uncertain effects on the demand curve. An increase in real wages leads to an increase in consumption by wage earners, but it tends to reduce profits at the same time. Only if the spending propensity out of wage income is higher than that out of profit income, will the demand curve shift to the right thus tending to increase output. Using the same symbols as in Bruno (1984) the output equation derived from the aggregate demand-aggregate supply model is:

$$(1) \quad \dot{y} = a_0 + a_1 DF + a_2 \Delta DF + a_3 \dot{m} + a_4 \dot{P}_{oil} + a_5 \dot{w}$$

$\dot{y}$ = rate of change of real GDP/GNP

DF   = cyclically adjusted public sector surplus expressed in percentage of GDP.

$\dot{m}$ = rate of change of the real monetary base

$\dot{P}_{oil}$ = rate of change of the domestic currency price of oil deflated by the domestic consumer price index

$\dot{w}$ = rate of change of the gross compensation of employees deflated by the GNP/GDP deflator

Δ = first difference of a variable.

Since, especially for small countries, foreign influences are important, also the rate of change of the foreign real monetary base (m^f) and the aggregated foreign cyclically adjusted public sector surplus (DF^f) have been added as explanatory variable in the equation. Foreign influences could be measured also in a more traditional way by world trade. The former specification was preferred because the focus of this paper is on the effect of inflation adjusted and non-adjusted budget deficits on the business cycle. However, the foreign policy variables can be regarded as determining world trade, although they do not fully explain it.

$$(2) \quad \dot{y} = a_0 + a_1 DF + a_2 \Delta DF + a_3 \dot{m} + a_4 \dot{P}_{oil} + a_5 \dot{w}$$
$$a_6 DF^f + a_7 \Delta DF^f + a_8 \dot{m}^f$$

where the foreign variables are obtained by calculating the GDP weighted average of the US, Japanese and German monetary base or cyclically adjusted budget surplus. For the latter three countries the foreign variables are calculated as the GDP weighted average of the other two. Appendix 2 contains a description of the data used and the sources.

The expected signs of the coefficients are:

$$a_3, \; a_8 \gtrless 0$$
$$a_4 \quad \leqslant 0$$
$$a_5 \lessgtr 0$$

and the coefficients of the fiscal variables a_1, a_2, a_6 and a_7 are expected to be negative if a fiscal expansion stimulates aggregate demand, and positive if a fiscal expansion leads to more than full crowding-out of private expenditure. The inclusion in the equation of the budget surplus and its first difference should shed light on the relative importance of the channels of transmission of fiscal policy: the wealth effect on consumption or the simple keynesian multiplier effect. The expected sign of a_5 is also ambiguous for the reasons explained above. In general one would expect domestic policy variables to matter relatively more for large countries than for small ones. For the latter the coefficients a_1, to a_3 could well tend to zero due to the openness of their economies and the rapid balance of payments effects of domestic policies.

The coefficients of foreign policy variables are expected instead to tend towards zero for large countries and be significantly different from zero for small ones. This follows simply from the different impact of large and small countries on the world business cycle.

The channels through which fiscal and monetary variables in large countries can influence GDP in small ones are manifold and depend on the exchange rate regime. Expansionary policies in large countries influence domestic aggregate demand and this in turn influences foreign aggregate demand via the foreign trade multiplier. Under the assumption of integrated capital markets an increase in real interest rates in large countries is

transmitted abroad. For instance in the case of the US fiscal monetary policy mix from 1982 to 1985, foreign output growth was influenced positively via the foreign trade multiplier, while the increased level of world real interest rates reduced aggregate demand outside the United States. Other effects were at work as well: the depreciation of the European currencies and of the yen led to a negative term of trade effect in Europe and Japan while the increased competitiveness of European and Japanese goods reinforced the positive foreign trade multiplier effect. The depreciation of European currencies and of the yen, the larger current account surpluses and the higher interest rates also influenced the development of European and Japanese wealth and in turn consumption (in an ambiguous way). Since these effects do not all work in the sale direction, it is not possible to establish on theoretical grounds the sign of the effect of fiscal expansion in larger countries or real GDP in smaller ones. In principle one should construct a full scale macroeconomic model of the world economy incorporating all the effects mentioned above. However, this would take us much beyond the scope of this paper.

Two definitions of the cyclically adjusted government budget surplus were used: the cyclical and non-inflation adjusted one (DF1), the cyclical and inflation adjusted one (DF2). The methodology used to calculate these budget balances and the rationale behind the corrections is explained in Eisner and Pieper (1984) and in Cukierman and Mortensen (1983). In Section 2 the test of equation (1) for the United States uses the data published by Eisner and Pieper (1984) to facilitate comparisons. They use the concept of the high employment budget surplus, while the cyclical adjustment of the fiscal balances done by Cukierman and Mortensen is made in a more rudimentary fashion by calculating full employment total tax revenues and total expenditure on the basis of deviations of GDP from trend. Rather than comparing regressions which contain alternatively DF1 and DF2, an alternative way to test for the relevance of the inflation adjustment of the surplus is to introduce in the same equation both DF2 and the inflation adjustment itself as separate regressors. The latter method does not retrict a priori the coefficient of the inflation adjustment to be either zero or equal to the coefficient of DF2. However, introduction of the inflation adjustments as separate regressors (in level and first difference, domestic and foreign) would greatly limit the numbers of degree

of freedom and would be virtually impossible in the individual country
regressions.

Eisner and Pieper and Cukierman and Mortensen believe that inflation
distorts the published public sector balances because as inflation and
nominal interest rates rise so do nominal interest payments on the public
debt.   These payments do not represent a genuine increase in disposable
income of households; they only compensate households for the capital
losses on the government bonds they hold.   Thus, according to them,
inflation artificially raises government deficits, measured disposable
income and measured household saving.   While it cannot be denied that
inflation distorts national accounts, it is extremely difficult to correct
the published sector balances in a fully satisfactory way.   First, the
method used by the above authors to adjust public sector balances for
inflation presupposes that individuals   are totally free from money
illusion, i.e. that they are able to distinguish fully between real
interest income and interest income compensating them for the erosion of
the real value of the stock of government bonds they hold.   It is unlikely
that individuals are totally free of money illusion.   The degree to which
individuals are subject to money illusion can vary through time and across
countries.   In particular, it is probably also, a function of the history
of inflation in the country.   In addition the institutionalization and
professionalization of the savings process which is being observed in many
countries is likely to have reduced in time the degree of money illusion.
Another way to look at this problem is by distinguishing between current
and expected changes in inflation.   Individuals are likely to react to the
change in the real value of the debt they anticipate for the future in
addition to the change they are experiencing at present.   Individuals may
react in only a small degree to a short run increase in prices that <u>is not</u>
expected to continue.   A small reaction to an increase in prices which is
not expected to continue does not necessarily imply "money illusion".   But
as inflation develops and people become accustomed to it and expect it to
continue it would appear implausible for individuals not to react to the
increase in the price level.   Miller (1985) showed that the appropriate
inflation adjustment depends on the preferred income concept.   If the
current income concept is preferred then the rate of inflation expected to
prevail in the short run should be used for the correction, if the

permanent income concept is preferred, then the long run expected inflation should be used. Owing to the difficulties of satisfactorily measuring expectations of inflation and agreeing on the proper income concept any attempt to calculate a real fiscal deficit could be misleading. Second, there are problems with the data on government debt net of holdings of government assets in virtually every country, not to mention the amount of government bonds held by households.

For the above reasons great care is needed in pointing out the limits of the inflation corrections of the deficits whenever they are used. Also important is to specify clearly the purpose of the analysis for which the inflation correction is made. As Buiter has put it: "To determine the significance of the behaviour of public debt and deficits, we must get away from the dangerous short-cuts of 'model free' single figure indeces of fiscal stance" (Buiter, 1985).

2. Estimates of output equations for the US and the high employment budget surplus: a comment to Eisner and Pieper.

Estimates of the output equation (2) for the United States are contained in Table 1. The measures of the degree of restrictiveness of fiscal policy used are the high employment budget surplus and the inflation adjusted high employment budget surplus as published by Eisner and Pieper (1984a). The sample period is 1967-81 as in Eisner and Pieper and the data used is annual. The first two regressions of the table are reproduced from their study. They include only the full employment surplus as a ratio to GNP as explanatory variable. From the two regressions they infer first that an expansionary fiscal policy affects economic activity positively with a one year lag and secondly that the inflation adjusted surplus explains a higher fraction of the variance of output. They conclude that the inflation adjusted full employment surplus is a superior measure of the degree of fiscal stance. Regressions (3) and (4) duplicate Eisner and Pieper's estimates of the output equation. They confirm their findings.

Table 1 - United States: High Employment Surplus and changes in real GNP, Annual data 1967 - 1981

Regr. No.	Measure of deficit	Const. term	DF(-1)	$\triangle$DF	$\dot{P}_{ol}$	$\dot{w}(-1)$	D68/69	R^2	DW	F	ρ	Source of regression
1	DF1	0,52 (0,69)	-2,90 (3,97)	-	-	-	-	0,45	1,61	N.A.	-	Eisner and Pieper (1984a)
2	DF2	4,43 (8,94)	-2,32 (5,28)	-	-	-	-	0,60	2,02	N.A.	-	"
3	DF1	0,70 (0,96)	-2,60 (3,68)	-	-	-	-	0,51	1,64	13,51(1)	-	Present study
4	DF2	4,30 (8,29)	-2,10 (4,43)	-	-	-	-	0,60	1,78	19,58(1)	-	"
5	DF1	0,20 (0,65)	-2,92 (10,41)	0,41 (1,61)	-0,019 (7,37)	0,88 (8,24)	-3,83 (9,21)	0,97	1,85	32,24(2)	-0,57 (2,64)	"
6	DF2	4,68 (19,12)	-1,88 (10,31)	0,88 (5,03)	-0,021 (8,35)	0,24 (2,20)	-3,61 (9,47)	0,93	2,53	31,17(2)	-0,71 (3,63)	"

The dependent variable is the rate of change of real GNP. DF1 is the full employment surplus and DF2 the inflation adjusted full employment surplus, both expressed as a ratio to GNP. The source of the full employment surplus is Eisner and Pieper (1984a). $\triangle$ indicates a first difference of a variable. ρ is the coefficient of autocorrelation and the number in parenthesis are t-statistics.

(1) F(1/13)
(2) F(5/7)

Regressions (5) and (6) also include the first difference of the budget surplus, the rate of change of the real compensation of employees lagged by one year and of the real price of oil, reflecting oil supply shocks and a dummy variable for the years 1968 and 1969, during which US monetary policy was restrictive. The coefficient of this dummy variable is very significantly negative, while the coefficient of the rate of change of the real monetary base, was never statistically significant.[1] The coefficient of the rate of change of real wages has a positive sign while that of the real price of oil is statistically significant and has the expected negative sign. The explanatory power of regression (6), which uses the inflation adjusted budget surplus as a regressor is lower, contracting Eisner and Pieper's conclusion that the inflation adjusted high employment budget surplus has a higher explanatory than the non-inflation adjusted one. However the results presented in Table 1 confirm Eisner and Pieper's finding that an expansionary fiscal policy leads to a higher rate of growth of output[2]. It is interesting to observe that the negative coefficient of DF(-1) implies a positive wealth effect of increased public debts à la Keynes, while the positive coefficient of $\triangle$ DF, reflecting the more Keynesian income effect, implies more than full crowding out.

Summarising the main conclusions that can be drawn from Table 1 one observes first that there are relevant variables determining short run output fluctuations such as lagged real wages and the real price of oil which have been neglected by Eisner and Pieper. Secondly, the exclusion of these variables from the output equation led Eisner and Pieper to the unwarranted conclusion that the inflation adjusted surplus is more relevant than the non-inflation adjusted surplus to explain the business cycle.

Regressions such as (3) to (6) performed for the period 1971 to 1981 (not shown here) do not change the above conclusions. In the next section the analysis will be extended to other industrial countries, the sample period will be extended to 1984 and Cukierman's and Mortensen's corrections of budget surpluses for the cycle and for inflation will be used.

3.   Cyclically-adjusted budget balances and output equations in
     8 industrial countries.

     A.   Large countries

     Table 2 contains estimates of output equations for the US, Japan and
Germany. The data used is annual and the sample period is 1973-1984. The
source of the inflation adjusted and non-adjusted budget balances is
Mortensen (1985).   The inflation adjustment is made on the basis of the
depreciation of the net debt.   The precise methodology used is described in
Cukierman and Mortensen (1983) and Mortensen (1985).   The budget balances
are available since 1971, but two years are lost because of differentiation
and lagging by one year.   The main difference with‘the US budget balances
used in the previous section is that here the cyclical adjustment is
performed at the level of the overall receipts and expenditures on the
basis of deviations from trend of real output.

     Looking first at the results for the US a dummy variable D82 has been
added among the regressors.   It reflects the degree of restrictiveness of
US monetary policy in that year.   Neither the change in the definition of
the budget balance with respect to Section 2 nor the change in the sample
period change the fundamental conclusions reached in the previous section
that the inflation adjusted surplus does not explain a higher fraction of
the variance of real GDP growth.   For Japan, as for all countries in this
sample other than the US, the coefficient of the changes in the real price
of oil is not significantly different from zero.   While somewhat
surprising, this result may be due to the fact that nominal oil prices are
more rigid abroad than in the US, both for final consumers and for
industry, as the governments are slow in changing administred prices.   In
this case changes in the import price of oil are also often reflected in
the budget deficits.   Another reason may be related to the fact that a
larger fraction of Japanese oil was imported under long term contracts and
that therefore the negative effects of the oil shocks were spread over more
years.   A fiscal expansion has significantly positive output effects in
Japan.   So do lagged real wage increases.   No systematic and significant
influence of foreign policy variables could be detected, despite the fact

Table 2 — Large countries: inflation and cyclically corrected budget balances and changes in real GNP/GDP Annual data, 1973 - 1984

Regr. No.	Country	Measure of deficit term	Con-stant term	DF(-1)	ΔDF	$\dot{p}_{oil}$	$\dot{m}$	w(-1)	D76	D78	D82	R^2	DW	F	r
1	US	DF1	1,00 (1,18)	-1,17 (2,89)	0,05 (0,12)	-0,021 (3,44)	-	1,54 (5,23)	-	-	-6,79 (6,85)	0,95	2,02	24,37(1)	-
2	US	DF2	3,89 (6,59)	-1,05 (2,86)	0,21 (0,42)	-0,025 (3,38)	-	1,13 (3,02)	-	-	-6,45 (5,69)	0,94	2,06	18,49(1)	-
3	Japan	DF1	-	-1,00 (9,86)	-2,10 (8,76)	-	0,15 (5,93)	0,21 (3,33)	-	-5,04 (4,50)	-	0,98	1,86	N.A.	-
4	Japan	DF2	-	-0,99 (10,29)	-1,91 (9,81)	-	0,15 (6,34)	0,35 (6,99)	-	-4,26 (4,39)	-	0,98	2,33	N.A.	-
5	Germany	DF1	2,05 (2,14)	0,11 (0,36)	0,002 (0,007)	-	0,28(2) (6,48)	-	5,20 (6,76)	-	-	0,93	2,24	13,60(3)	0,46 (3,55)
6	Germany	DF2	1,91 (2,20)	0,008 (0,24)	-0,004 (0,13)	-	0,28(2) (6,60)	-	5,25 (6,79)	-	-	0,93	2,19	13,64(3)	0,46 (3,37)

DF1 = Structural budget balances in percentage of GNP/GDP, calculated using deviations from trend of real GDP. Source: Mortensen (1985)

DF2 = Inflation adjusted DF1. Source : Mortensen (1985)

(1) F(5/6)
(2) For Germany real money is lagged by one year.
(3) F(4/5)

(3)

that the sample period includes the years 1982-84 when US fiscal policy was quite expansionary. The US fiscal expansion of those years was, however, partly compensated by Germany's fiscal contraction. The dummy D78 for 1978 has a significantly negative coefficient, and reflects the contractionary effect on Japanese GDP of the sharp appreciation of the Yen which occurred in that year. In Germany the domestic budget surplus has no systematic effects on output whether it is introduced as first difference or in level form while monetary policy is a very powerful instrument. As for Japan the foreign budget has no systematic effects on German output. However, a dummy for 1976, which reflects the general recovery abroad from the first oil shock, has a significant and positive ceofficient. As for the US and Japan the inflation adjusted surplus does not explain a higher fraction of the variance of real output growth and foreign policy variables have no influence.

The regressions in Table 2 have 6 or 7 degrees of freedom only. For this reason the data for the US, Japan and Germany have been pooled in Table 3. The main conclusions of Table 2 remain unchallenged except that now the regression whith the inflation corrected budget surplus has a slightly higher explanatory power, as found by Eisner and Pieper. Monetary policy, the real price of oil and lagged real wages have coefficients which are very significantly different from zero, with the expected signs and a domestic fiscal expansion has a significantly positive effect on the business cycle.

B. **Medium and small sized countries**

Table 4 contains pooled estimates of equation (2) for a group of 5 small and medium sized countries: the UK, France, Italy, the Netherlands and Denmark. The grouping of countries in large and medium sized is somewhat arbitrary. While the US and Japan are clearly much bigger in terms of GDP weights than the UK, France and Italy this is not so for Germany which could be equally well included in the group of medium sized countries. However owing to its very open capital markets during virtually the whole sample period and to its dominant economic role in Europe it was preferred not to include it among the latter group. The data is annual and

Table 3 - Large countries: Inflation and cyclically corrected budget balances and changes in real GDP. Pooled cross country-time series analysis, annual data, 1973-1984(1).

Regr. No.	Definition of deficit	Constant term	DF(-1)	ΔDF	$\dot{m}$	$\dot{p}_{oil}$	$\dot{w}(-1)$	R^2	D.W.	F
1	DF1	-1.45	-0.75	-0.22	0.12	-0.012	0.86	0.76	1.89	8.08(2)
		(1.20)	(2.49)	(0.75)	(3.22)	(2.41)	(4.11)			
2	DF2	-1.31	-0.73	-0.29	0.09	-0.013	0.87	0.81	2.12	10.42(2)
		(1.45)	(3.16)	(1.39)	(2.76)	(3.02)	(4.76)			

(1) The countries in the sample are the US, Germany and Japan. The regressions reported in the table also include 5 dummy variables. Three dummy variables assume in turn the value of 1 in 1976 for Germany, in 1978 for Japan and in 1982 for the US, and zero otherwise (see Table 2). Only the dummy variable for the US has a negative coefficient which is statistically significant in both regressions. In addition both regressions contain two country dummies.

2) $F(10/25)$.

Table 4 - Small and medium sized countries: Inflation and cyclically corrected budget balances and changes in real GDP: Pooled cross country-time series regressions, annual data 1973-1984.(1)

Regr. No.	Measure of deficit	Constant term	DF(-1)	ΔDF	DF^f(-1)	ΔDF^f	$\dot{m}^f$	R^2	D.W.	F
1	DF1	3,31 (6,31)	0,03 (0,48)	0,20 (1,03)	0,37 (1,30)	1,50 (5,16)	0,27 (4,84)	0,52	1,84	11,91(2)
2	DF2	2,45 (9,30)	0,08 (0,68)	0,04 (0,31)	0,04 (0,11)	1,14 (3,97)	0,28 (4,36)	0,46	1,87	9,31(2)
3	DF1	2,77 (8,57)	0,07 (1,16)	0,21 (1,10)	-	1,34 (5,03)	0,27 (4,70)	0,51	1,71	14,28(3)
4	DF2	2,45 (9,39)	0,09 (0,88)	0,04 (0,30)	-	1,12 (4,27)	0,28 (4,69)	0,46	1,86	11,84(3)

DF1 = Structural budget balances in percentage of GNP/GDP, calculated using deviations from trend of real GDP. Source: Mortensen (1985).

DF2 = Inflation adjusted DF1. Source: Mortensen (1985).

(1) The countries in the sample are France, the United Kingdom, Italy, Netherlands and Denmark. The source for the Italian budget balance is the Banca d'Italia, Annual Reports, various issues.

(2) F(5/54).
(3) F(4/55).

the sample period is 1973-1984. The coefficients of the domestic real price of oil, of domestic money and of the real wage rate are not significantly different from zero. An insignificant coefficient of domestic monetary growth is to be expected for small and medium sized countries, if under flexible exchange rates, a monetary expansion is reflected within the year on the exchange rate and on the domestic price level rather than on real output. For instance the author has estimated the reaction pattern of the exchange rate to monetary growth in Italy using a monetary model of the exchange rate and shown that most of the adjustment occurs within the year (Tullio, 1979). As to changes in real wages, for small and medium sized countries worsening competitiveness and balance of payments problems may quickly dampen any positive effect on the business cycle resulting from increased consumer demand, thus reinforcing the negative supply side effect of increased wages. The pooled regressions presented in Table 4 contain therefore only domestic fiscal variables and foreign fiscal and monetary variables.

The regressions show first that correcting the budget surplus for inflation does not improve their explanatory power. Second they show that domestic fiscal variables do not on average significantly influence the business cycle. Third they show that the joint fiscal policy of the US, Japan and Germany has a very high explanatory power and causes a fall in output in small and medium sized countries, while Eisner and Pieper (1986) found that a US fiscal expansion influenced positively the business cycle in four European countries, Canada and Japan. In a world of highly integrated capital markets, a joint fiscal expansion of the large countries not financed by money creation causes an increase in world real interest rates. This negative effect seems to outweigh the positive effect of higher exports to the large countries. Thus the results presented here suggest that the US fiscal expansion of 1982-84, which was however partly compensated by Japan and Germany's fiscal contraction, has led to a reduction in output growth in small and medium sized countries. Real GDP in the European Community (12 countries) grew by 0.5 per cent in 1982, 1.2 per cent in 1983 and 2.0 per cent in 1984; GDP at constant prices accelerated instead in the US from -2.0 per cent in 1982 to 3.8 per cent in 1983 and 7.0 per cent in 1984. Thus the remarkable acceleration of growth in the US was not accompanied by a visible acceleration in Europe.

The finding of crowding out of demand in small and medium sized countries as a result of a US fiscal expansion does not seem therefore at odds with the 1982-84 experience. Finally the regressions show that a monetary expansion in the large countries has instead a very positive and significant influence on the business cycle of smaller countries.

4. Summary and conclusions

The regressions presented in Sections 2 and 3 show that the adjustment for inflation does not unambiguously improve the predictive power of output equations in the industrial countries analysed here, contrary to Eisner and Pieper's conclusions. They also show that a contraction of output occurs in small and medium sized countries, as a result of fiscal expansion in larger countries ("international crowding out"). This also contradicts Eisner and Pieper as they found that the positive foreign trade multiplier effect prevailed. Furthermore the tests show that the business cycle in large countries is only influenced by domestic policy variables. In contrast, in small and medium sized countries it is determined largely by fiscal and monetary policy in large countries. Finally they show that domestic monetary policy is a powerful instrument to influence the business cycle in Japan and Germany. Instead in smaller countries domestic money does not matter, while foreign money does.

The results presented in this paper have to be interpreted however, with some caution, due to the simultaneous equations bias implicit in reduced form equations of the type used. A more comprehensive empirical analysis of the interactions between fiscal and monetary policy on the one hand and the business cycle on the other requires in the first place the modeling of the behaviour of fiscal and monetary authorities. In the second place the various channels of transmission in the propogation of fiscal and monetary policy from large to smaller countries, would have to be explicitly considered.

Appendix - Symbols and Sources of Data Used

I. Basic Variables

CLA = Claims of Central Bank on Government. Source: International Monetary Fund, International Financial Statistics, various issues.

DF1 = Budget balance (net lending or borrowing of General Government) cyclically adjusted, in per cent of GDP. Source: Mortensen (1985), except for Italy where the source is Banca d'Italia (1985) and the concept of the deficit used is the Treasury Financing Requirement. For Italy DF1 is not cyclically adjusted. For the US in Table 1 the high employment budget surplus as per cent of GNP, was used from Eisner and Pieper (1984a).

DF2 = Inflation and cyclically adjusted budget balance, in per cent of GDP. Source: Mortensen (1985). The inflation adjustment is based on the net public debt. For the US in Table 1 the source is Eisner and Pieper (1984a).

p = Consumer price index. Source: International Monetary Fund, International Financial Statistics, various issues.

$\dot{p}_{oil}(\$)$ = Saudi Arabia Export price of crude Petroleum in US \$/Barrel. Source: International Monetary Fund, International Financial Statistics, various issues.

M = Reserve money. Source: International Monetary Fund, International Financial Statistics, various issues.

XR = Exchange rate with respect to the US Dollar. Source: International Monetary Fund, various issues.

y = GDP at constant prices. Sources: same as p_n.

Y = GDP at current prices. Sources: same as p_n.

w = Real total compensation of employees. Source: OECD (National Accounts, various issues). The deflator used is the GNP/GDP deflator.

II. Created variables

P_{oil} = Real price of oil expressed in national currency=$(p_{oil}(\$)*XR)/P$

$\dot{m}$ = $\dot{M} - \dot{P}$ = annual percentage change of reserve money deflated by the rate of inflation of the previous year.

II.A. Rest of the world variables

1. Real Money

* for IT, NL, UK, FR, DK:

Rest of the world real money growth ($\dot{m}^f$) is the weighted average of the rate of growth of nominal money in the US, Japan and GE minus the weighted average of the rate of inflation in those three countries, lagged one year.

The weights are based on the 1975 real GDP's converted into dollars at the average exchange rate for 1975.

$\dot{M}^f$ = 0.1337 $\dot{M}_{GE}$ + 0.1598 $\dot{M}_{JA}$ + 0.70364 $\dot{M}_{US}$

$\dot{p}^f$ = 0.1337 $\dot{P}_{GE}$ + 0.1598 $\dot{P}_{JA}$ + 0.70364 $\dot{P}_{us}$

$\dot{m}^f$ = $\dot{M}^f - \dot{p}^f$

* for the US, JA, GE:

Rest of the world real money growth ($\dot{m}_f$) is the weighted average of the money growth in the other two countries, minus the weighted average of inflation in those two countries lagged one year.

weights of ⟍ for	US	JAPAN	GE
GE	0.4555	0.1591	–
JA	0.5445	–	0.1844
US	–	0.8409	0.8156
Total	1.00	1.00	1.00

For US

$$\dot{M}^f = 0.4555\ \dot{M}_{GE} + 0.5445\ \dot{M}_{JA}$$

$$\dot{p}^f = 0.4555\ \dot{P}_{GE} + 0.5445\ \dot{P}_{JA}$$

$$\dot{m}^f = \dot{M}^f - \dot{p}^f$$

For JA

$$\dot{M}^f = 0.1591\ \dot{M}_{GE} + 0.8409\ \dot{M}_{us}$$

$$\dot{p}^f = 0.1591\ \dot{P}_{GE} + 0.8409\ \dot{P}_{us}$$

$$\dot{m}^f = \dot{M}^f - \dot{p}^f$$

For GE

$$\dot{M}^f = 0.1844\ \dot{M}_{JA} + 0.8156\ \dot{M}_{us}$$

$$\dot{p}^f = 0.1844\ \dot{P}_{JA} + 0.8156\ \dot{P}_{us}$$

$$\dot{m}^f = \dot{M}^f - \dot{p}^f$$

2. Budget balance variables

- The budget balance for the rest of the world was calculated using the same weights as for real money of the rest of the world.

* for IT, NL, UK, FR, DK:

$$DF^f = 0.1337DF_{GE} + 0.1598DF_{JA} + 0.70364DF_{US}$$

* for the US:

$$DF^f = 0.4555DF_{GE} + 0.5445DF_{JA}$$

* for JA:

$$DF^f = 0.1591DF_{GE} + 0.8409DF_{US}$$

* for GE:

$$DF^f = 0.1844DF_{JA} + 0.8156DF_{US}$$

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Footnotes

(1) One should be careful, however, in inferring from the insignificance of this coefficient that monetary policy had no systematic effect on the growth of real GDP in the US. First there is multicollinearity between the rate of change of real wages, the unadjusted budget surplus and the rate of change of the real monetary base. Second the monetary base may not have been the aggregate which best reflected the degree of stringency or ease of monetary policy in the United States.

(2) In regression 5 of Table 1 the coefficient of DF(-1) is -2.92 and the coefficient of $\triangle$DF is +0.41; -2.92DF(-1) + 0.41$\triangle$DF can be rewritten as: 0.41DF-(2.98 + 0.41)DF(-1) or 0.41DF - 3.33DF(-1).

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