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# Profitability, real interest rates and fiscal crowding out in the OECD area 1960-1985

(An examination of the crowding out hypothesis within a portfolio model)

by Jørgen Mortensen (*)

Internal paper

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## ABSTRACT

This paper presents the results of a study of the causes of change in the real rate of interest in the OECD area during the period 1961 to 1984 with a particular attention given to the impact on the real rate of interest of the increase in the aggregate government budget deficit for the OECD area as a whole since the late 1970s. Using both time series analysis and cross-section data the paper concludes that the global rise in real interest rates can be attributed to a large extent to the increase in the real government borrowing (as appropriately adjusted to measure the effect on the private sector's holding of public debt in proportion to GDP). The study, however, also shows that the development of real interest rates in the individual countries may diverge substantially from the global pattern and that, consequently, the link between real interest rates and fiscal deficits may not be as evident for a single OECD country as for the area as a whole. This paper argues that since the gains from budgetary consolidation may not be evident for a single country there has been and still is a tendency to underestimate the risks for the OECD area as a whole of a persistently strong increase of public debt in proportion to GDP and to overestimate the deflationary impact for the world economy of a reduction of the federal budget deficit in the United States.

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## 1. Introduction

Although interest rates have fallen world-wide since the peak in 1981, they are still significantly higher than on average for the 1960s, notably when adjusted for the current or prospective rate of inflation. What are the causes for the rise in rates in the period up to 1981? Can a consistent explanation be given for the persistence of high real rates in recent years? What is the role of fiscal and monetary policy in the determination of interest rates?

These questions have been raised and contradictory answers have been given in the economic literature in the last few years. While, on one hand, there has been a certain degree of consensus that the emerging budget deficit in the United States has been one of the causes of the increase in real rates of interest, the hypothesis that the global increase in rates was caused by expansionary fiscal policy was, nevertheless, discarded by Blanchard and Summers (1984). The two authors, in fact, argued that there had been at most a negligible fiscal expansion worldwide, the rise in the US budget deficit having been compensated by a fiscal contraction in Europe and Japan. Charles Wyplosz (1984), on the other hand, found that the change in public debt in proportion to GDP exerts a strong effect on the long-term rate of interest, as indicated by a high coefficient in aggregate regression equations for the major OECD countries as a whole.

This paper presents the results of an attempt to answer these questions using the portfolio approach as suggested by Brunner and Meltzer (1976) and basing, like Wyplosz, the quantitative analysis upon aggregate data for a group of countries representative for the whole of OECD. Section 2 first provides a brief review of the attempts to explain the level and development of interest rates. A conceptual framework for an analysis of interest rate movements in a closed economy is presented in section 3 and section 4 provides a review of the statistical data. The econometrical findings using this conceptual framework are presented in section 5. Section 6 takes a

look at recent developments and section 7 contains a summary of the paper and some broad conclusions.

## 2. Modelling interest rates

While the bulk of interest rate theory in the classical economic literature focussed on the real rate of interest, Fisher (1930) stressed than the nominal rate of return on monetary assets includes an element which compensates the lender for the rate on inflation expected to occur over the lifetime of the asset. Subsequently interest rate research has tended to split into two streams, one concentrating on the inflation component and the determination of nominal rates and the other on the determination of the real rate of interest.

### 2.1 Inflation component and nominal rates

Given that, according to the Fisher approach, the inflation component of the interest rate is determined by anticipated rather than actual inflation, a large amount of research has gone into analyzing the formation of inflation expectations and their effect on interest rates. An example of such research is found in Tanzi (1980) which presents, notably, various least square regressions to explain the formation of inflation expectations and then uses these results to explain movements in nominal interest rates. His model for inflation expectations, however, only included survey data and actual price developments and, thus, did not approach the important issue of the effect on interest rates and inflation expectations of monetary and budgetary policy or other "exogeneous" factors as examined, i.a. in the study by Wyplosz referred to in the Introduction. It is noteworthy, however, that as soon as the simple Fisher equation is abandoned in favour of a broader approach, the distinction between the real component and the inflation compensation becomes increasingly blurred. Moreover, some authors also rightly point out that

distortions of the interest rate determination may result from the tax treatment of interest payments and receipts in inflationary conditions. These distortions are caused by "nominal" taxation but influence the equilibrium value of the real interest rate - which, then, becomes dependent upon the rate of inflation!

In an open economy, moreover, interest rates may interact with exchange rates in a way determined by the degree of substitutability of domestic and foreign monetary assets and the flexibility of the exchange rate.

Although governments often with a varying degree of success have attempted to influence interest rates through general monetary policy measures or through control with certain financial markets, the determination of the interest rate level remains of a highly endogenous nature, depending upon the operation of the whole economic system. Consequently, one might expect that a broader macroeconomic model, including equations describing the key demand and supply relationships, would be likely to provide a more satisfactory explanation of interest rate developments than single equation models of the Fisher-type. This is, notably, the case for the "real" component of the interest rate.

## 2.2 Modelling the real rate of interest

While the estimates of the Fisher-equations generally assume that the real rate of interest is constant apart from possible cyclical fluctuations, research aimed at analyzing the determination of the real rate clearly must operate with the hypothesis of some link between the real rate of interest on bonds and the rate of return on other types of assets and also of some degree of interaction between the rate of growth of the economy and the profitability of investment. Single-equation models of interest rates cannot appropriately describe this net of interactions and conceptual analysis of the development of the real rate of interest has, therefore, mainly been done within the framework of general-

equilibrium models including a supply side bloc in addition to the IS-LM bloc. An approach along such lines will be used in the following.

## 3. A closed-economy framework

The conceptual framework presented below does not pretend to provide a full modelisation of the economy but only to identify and analyze the interaction of key variables likely to influence the medium-term performance of an economy. The study, thus, may serve as a starting platform on which to construct a more comprehensive macro-economic model or, at least, underpin arguments for extending or revising the macro-economic models already in use and which often ignore the interaction of stock and flow variables analyzed here.

### 3.1 The basic three-asset model

This analysis takes as a starting point the three-asset steady-state growth model presented in Cukierman and Mortensen (1983 and 1985) and which specifies a system of four equations determining the capital-output ratio, the ratio of public debt to GDP, the ratio of high-powered money to GDP and the real rate of interest as a function of the rate of growth of high-powered money, the government budget deficit excluding interest payments, the marginal productivity of capital and the rate of growth of labour input (the rate of growth of the labour force as uplifted to include the rate of technical progress). It is shown in Cukierman and Mortensen (see notably appendix A) that an increase in the government budget deficit excluding interest payments on public debt under plausible assumptions with respect to the value of the other exogenous variables will lead to a rise in the real rate of interest.

The formal structure of the model as presented in Cukierman and Mortensen is as follows:

$$K/Y = g_1(f_k(v(K/Y)),r,g-m) \qquad (1)$$

$$B/Y = g_2(f_k(v(K/Y)),r,g-m) \qquad (2)$$

$$H/Y = (1/a)g_3(f_k(v(K/Y)),r,g-m) \qquad (3)$$

$$D/Y + rB/Y = g(B/Y + H/Y) + pH/Y. \qquad (4)$$

The variables are defined as follows (with slight changes compared to the terminology used in the Cukierman-Mortensen study):

K = stock of real capital
B = real stock of government bonds
H = real stock of base money (high powered money)
D = real government deficit, excluding interest on debt
Y = real gross domestic product
r = real rate of interest
g = real rate of growth
m = rate of increase in high powered money
a = the money market multiplier
p = rate of inflation.

The function v(K/Y) in equation 1 to 3 determines the real rate of return on fixed capital which is assumed to be equal to the marginal productivity of capital and determined in its turn by the capital/labour ratio. It is, moreover, assumed that the three assets are gross substitutes; an increase in the rate of return on asset j is expected to lead to a rise in the demand for this asset and to a decline in the demand for the other two assets. The real rate of return on money is equal to the rate of inflation with a negative sign. Consequently, an increase in the rate of inflation should be expected to lead to a fall in the demand for money and an increase in the demand for bonds and fixed capital (enter with a negative sign in the equation determining the demand for money and with a positive sign in the other two equations).

## 3.2 A disequilibrium specification of the supply function.

As it is outlined above, the three-asset growth model determines the steady-state growth conditions in "neo-classical" terms, with, notably, the rate of growth of output determined by the rate of growth of the labour force and the rate of technical progress. Full employment of the production factors is supposed to prevail, apart from possible cyclical fluctuations. In recent years, however, several researchers have underlined that significant changes have occurred in the capital/labour ratio and which cannot be assumed simply to reflect the rate of technical progress. In fact, a part of the rise in the capital/labour ratio appears to be attributable to "capital deepening" over and above a "normal" increase in the stock of capital per employed and reflecting the response of enterpreneurs to "monopolistic" wage fixing by unions. The labour market may, therefore, not settle in equilibrium between supply and demand for manpower. Let us for reasons of simplicity assume that the real wage is determined exogenously. For the enterprises the level of the real per capita wage is, thus, a given element which in its turn will influence the desired level of capital stock and output per unit of labour.

As an illustration of the argument let us assume that the long term production function can be approximated by the Cobb-Douglas expression with disembodied, Hicks-neutral technological progress[1]:

$$Y = e^{ct} K^{a} L^{1-a} \qquad (7)$$

We assume, furthermore, that labour is compensated according to its marginal product:

$$w = \frac{dY}{dL} = (1-a)\frac{Y}{L} \qquad (8)$$

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1 Subscripts indicating time periods are omitted in the following equations. The Cobb-Douglas specification is used due to its handiness but the analytical arguments are broadly valid also for a CES specification as long as the elasticity of substitution is relatively high in the longer term.

Dividing through with L in equation (7) we obtain:

$$(Y/L) = e^{ct} (K/L)^a \qquad (9)$$

which can be introduced in equation (8) to obtain :

$$w = (1-a)\, e^{ct} (K/L)^a \qquad (10)$$

By solving equation (10) for K/L we obtain:

$$K/L = (((1/(1-a))(w/e^{ct}))^{1/a} \qquad (11)$$

expressing the capital/labour ratio as a function of the distributive share (a) and the real wage (w) in proportion to the level of factor productivity ($e^{ct}$).

The rate of return on capital will in this case be a residual variable, determined by the production function as:

$$r = (Y - wL)/K \qquad (12)$$

or

$$r = (Y/K) - (wL/K) \qquad (13)$$

Although in practice the distributive share may vary somewhat notably in the short run, the smooth adjustment of steady state conditions as a function of the relative rates of return on the three asset types as assumed in equation 1 to 3 above will no longer prevail and the process of fixed capital formation will be influenced by the difference between the growth of the real per capita wage and the rate of technological progress. A rise in this "real wage gap"[1] will then tend to lead to a rise in the capital/labour ratio (equation 11). This may result in an increase in the capital/output ratio despite the fact that the rate of return on capital will be falling (equation 13).

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1 This definition of the real wage gap is radically different from definitions based only upon the development of distributive shares often used in the past.

As will be shown in section 4 below the actual development of the OECD economy since 1960 has, in fact, shown a combination of a rise in the capital/output ratio and a strong decline in the rate of return on capital. The quantitative analysis has therefore been based on the general assumption that the steady state conditions have not prevailed during this period and that the OECD economy has been going through a phase of disequilibrium both in the labour market and in the portfolio structure.

### 3.3 The budget constraint and stock-flow consistency

The budget constraint specified in equation 4 above shows how the main flow variables in the government budget relate to the debt/GDP and base money/GDP ratios, but does not in itself add new structural relationships to the model. Attention is, however, often paid to the budget balance as an indicator of the fiscal policy stance and this section, therefore, examines further the key budget balance concepts implicit in equation 4.

Equation 4, in fact, as it stands, is limited to the case of steady state growth and shows that the overall budget deficit (the left hand side of the equation) in a process of steady state growth must be equal to the change in the ratio of public liabilities to GDP caused by real growth plus the inflation induced change in the real value of base money. In other words in steady state the overall deficit must be such as to maintain the ratio of public debt and base money respectively to GDP.

Expressing both the left hand and the right hand side of equation 4 in nominal terms (a trivial change, involving multiplying all variables in equation 4 with the price index for GDP) the budget constraint can be transformed to show various budget balance concepts relevant for the crowding out analysis.

The unadjusted nominal budget deficit which is composed by the balance on transactions excl. interest payments and interest payments on public debt can be expressed as follows:

$$NADF = D/Y + n(B/Y) \qquad (16)$$

The simple growth adjusted budget budget balance is defined as the unadjusted nominal balance less the change in the ratio of public debt and high powered money to GDP resulting from growth of nominal GDP:

$$GADF = D/Y + n(B/Y) - (g+p)((B/Y)+(H/Y)) \qquad (17)$$

This budget balance definition is a measure of the overall change in liabilities of the public sector in proportion to GDP and may, therefore, be considered to be the most appropriate indication of the real stance of fiscal policy or of potential (future or current) crowding out.

Finally, when the effect of the actual change in base money (as opposed to the effect of growth on the base money/GDP ratio) is deducted in the preceding budget balance definition, we obtain a budget balance expression which can be assumed to indicate the size of current crowding out (that is, total, potential crowding out less the pure monetary "crowding out" brought about through a rise in the monetary base in proportion to GDP):

$$GWDF = D/Y + n(B/Y) - ((g+p)(B/Y) + m(H/Y)) \qquad (18)$$

As can be easily seen, the two latter budget balance concepts are equivalent if $m=(g+p)$, i.e. if the rate of expansion of base money is equal to the rate of growth of nominal GDP. The implication of this is that, within the context of this growth model, the change in the base money/GDP ratio is the measure of the rate of monetary financing - in analogy with the change in the debt/GDP ratio as a measure of the extent of bond financing. (In the following, quantitative, analysis

the sign of GWDF is inverted to express the change in private holdings of public debt).

As pointed out in Cukierman and Mortensen (1985) chapter 4, the conceptual framework presented above implies that the central bank is included in the government sector and that consequently the transactions between the central bank and the rest of the government are netted out. Conceptually the flow data, thus, should count the net income of the central bank as a government revenue and should, on the other hand, deduct from the public debt the part which is held by the central bank as a collateral for money. As discussed more in detail in the technical annex there are good reasons to assume that the available public debt series on the whole include the government's debt to the central bank and that it, therefore, could be appropriate to consolidate the public debt and the base money series by deducting the latter from the former to obtain an approximation of the amount of public debt held by the public. This procedure is questionable as a general approach as there may be cases where the debt series, in fact, already excludes the government's debt to the central bank. Since, on the other hand, a systematic adjustment of the available series in order to obtain conceptually correct statistical definitions is beyond the scope of the present study, it has, nevertheless, in the following been assumed that the general public's holdings of public debt best can be approximated be deducting base money from the currently available data on public debt.

A change in the general public's holdings of public debt which is of a transitory (cyclical) nature may, however, not be expected to exert the same influence upon interest rates as a regular underlying rise or fall in the debt/GDP ratio. Indeed, a cyclical weakening of activity is often associated with a particular downturn of the stockcycle or of fixed investment and may, therefore, lead to an increase in the financial saving of the enterprise sector. To the extent that this, transitory, rise in financial saving of the enterprise sector is taken up by a fall in the financial saving of the government sector one would not expect long-term interest rates to be affected. The budget

balance concept which could be expected to be the most appropriate indicator for "crowding out" and, thus, to show the highest correlation with the (long-term) rate of interest would, therefore, seem to be the growth- and cyclically adjusted deficit less the change in the base money/GDP ratio.

The quantitative evidence on the development of the basic variables will be examined in detail in the following section.

## 4. Quantitative findings

### 4.1 Facts and figures: general comments

In view of the fact that interest rate developments in a single country - even in the United States - are strongly influenced by capital transactions with the rest of the world, an attempt has been made in the present study to overcome this analytical difficulty by operating, at least in the initial phase of the analysis, with aggregate data covering a large part of the OECD area. The countries included here (Denmark, Germany, France, Ireland, Italy, the Netherlands, the United Kingdom, the United States, Canada and Japan) cover about 85% of the OECD area's GDP and may therefore for practical purposes be considered to represent the whole area, functioning in important respects, although not fully, as a closed economy. (The capital stock and rate of return data have been generated on the basis of statistics for the non-agricultural business sector for the six major countries only. The technical annex provides more detailed information on sources and methods).

As seen from the upper panel of Graph 1, the ratio between capital and output in the OECD area, which was declining in the early 1960s, started to rise from about 1966 and has apparently continued to do so up to recently, albeit with some fluctuations mainly of a cyclical nature.

(3)

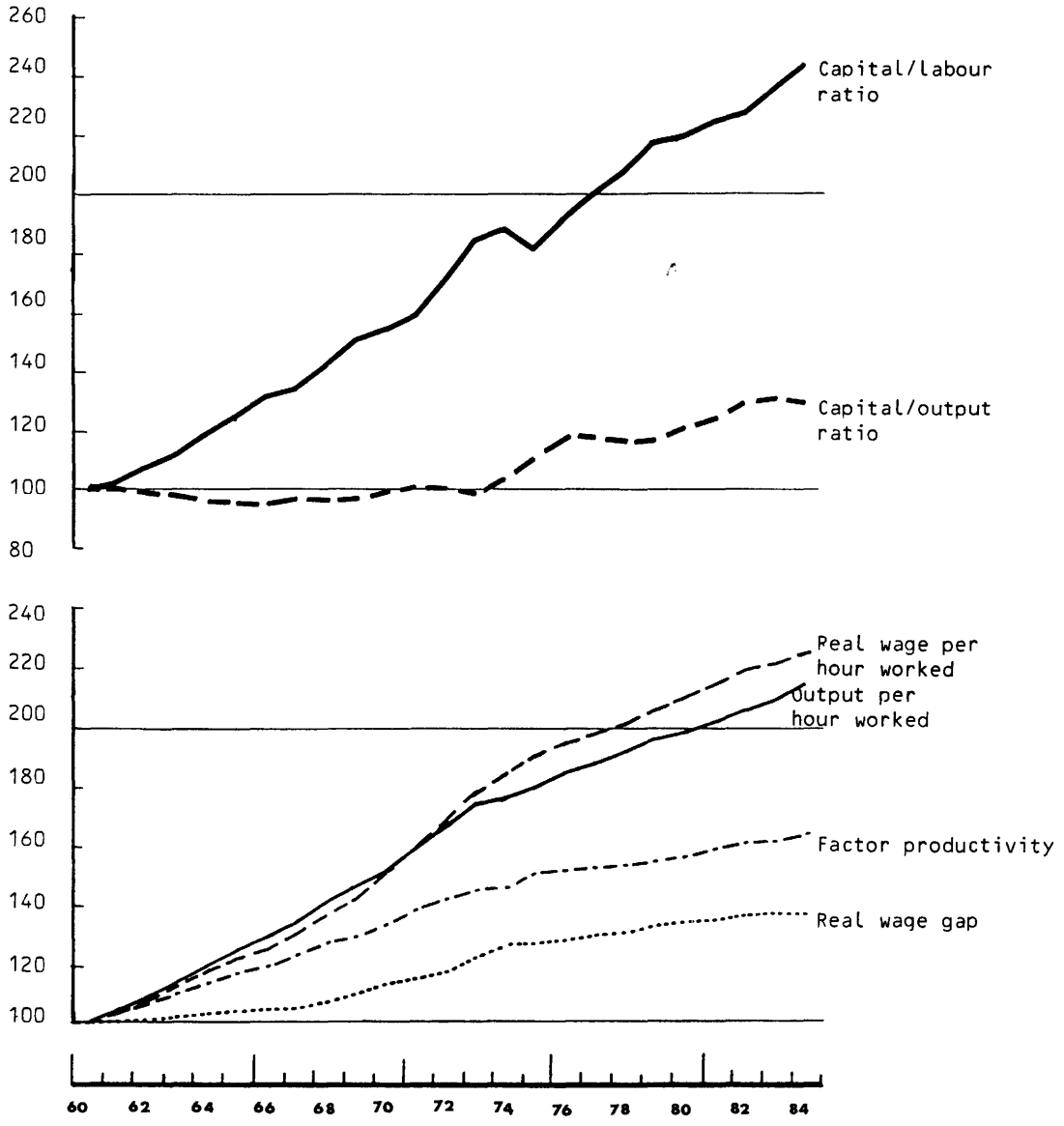
Turning now to the capital/labour ratio and to the real wage gap, it is seen from Graph 1 that the ratio of the capital stock to total hours worked has increased by almost 144% in the 1960-1984 period. Factor productivity has increased at a decelerating rate and in 1984 was some 64% higher than in 1960. The real wage per hour has increased by 124% over the period as a whole, but also at a decelerating rate. The wage gap, defined, as indicated above, as the index of real wages per hour divided by the index of factor productivity, thus, in 1984 amounted to close to 40% as compared to the situation in 1960.

The ratio of public debt to GDP - shown in Graph 2 - was on a declining trend until 1974 but has since then risen rather regularly; by 1984 it had reached a level practically identical to the one observed for 1960. Base money in proportion to GDP, in contrast to the capital/output ratio and the public debt/GDP ratio, has shown a moderately declining trend from about 10% of GDP in 1961 to 7.5% in 1974. Fluctuations around this trend have, however, been strong in relative terms. As seen more clearly from Graph 3, the base money/GDP ratio in relation to the long-term trend, thus, showed a sharp rise from 1969 to 1973, followed by a contraction lasting up to 1981, with only a brief interruption in 1978. In the period 1982-1984 the base money/GDP ratio has developed broadly in line with the trend. The private sector's holdings of public debt, which, as indicated above, in this study is approximated by the difference between the series on public debt and the series on base money, broadly follow the development of the overall public debt, but with a more pronounced increase at the end of the period, as a reflection of the trendwise fall in the base money/GDP ratio already referred to above.

Money supply (broad definition) has been on a rising trend in proportion to GDP over the whole of the 1961-1984 period, albeit with rather strong fluctuations from one year to the next. Some further details of the monetary development, presented in Graph 3, show, in particular, that the percentage deviation of the base money/GDP ratio from its trend have been larger than the fluctuations in the money

GRAPH 1

Capital/labour, capital/output ratios and the real wage gap
1960=100, OECD total



supply. The money market multiplier, the ratio between the money supply and base money has shown a considerable rise during the period.

With respect to the return on the three categories of assets, it is seen from Graph 4 that the rate of return on fixed capital was on the rise up to 1967 but thereafter has been declining, with particularly sharp drops observed in 1970, in 1974-75 and in 1981-82. In the intermediary periods a certain, cyclically determined, improvement was observed but the impression of a long-term decline is strong, at least up to the very recent years where signs of a stabilisation appear.

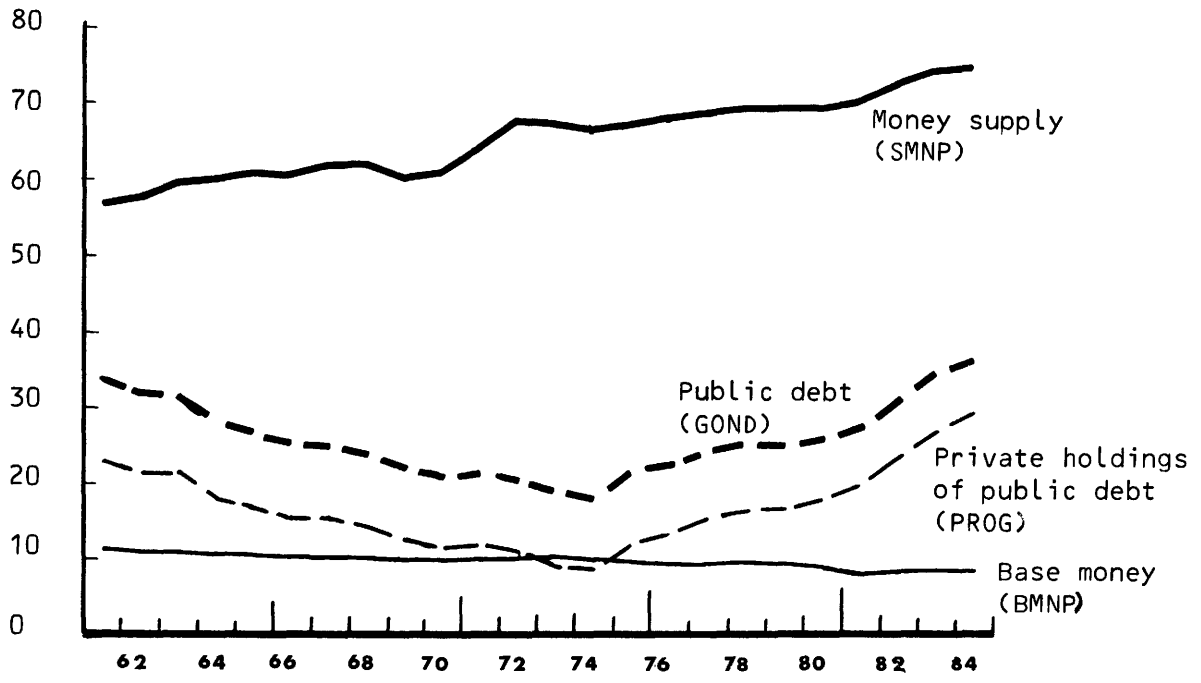
The nominal long-term interest rate, on the other hand, has exhibited a pronounced increase over the 1961-1984 period with a peak of 13% on average for the OECD area in 1981, when a combination of high inflation and tight money (as shown in Graph 3) created strong tensions in the financial markets. The rate of inflation (measured as the rise in the GDP deflator) has shown a different pattern with the peak occurring in the wake of the first oil price hike and with a clear subsequent underlying slowdown interrupted by the 1979-1980 acceleration.

The difference between the nominal rate of interest and the rate of inflation, which can be taken - with a large degree of uncertainty and precaution - as a first approximation of the real rate of interest on bonds, showed (even abstracting from the outlying figures of 1974-75) a moderately declining trend from the mid-1960s to about 1978 but has since then risen steeply, with the level in 1984 actually exceeding the measured level of the rate of return on fixed capital. It is difficult to assess the extent to which the recent rise in "real" rates contains transitory elements but there would appear to be little doubt that a certain increase in the underlying level of the real rate has taken place as compared to the average level observed in the 1960s. Even with account taken of possible transitory elements the difference between the rate of return on fixed capital and the real rate of return on bonds (the yield gap) thus seems to have narrowed very markedly since the 1960s when it amounted (on a pre-tax basis) to

GRAPH 2

Public debt and money supply

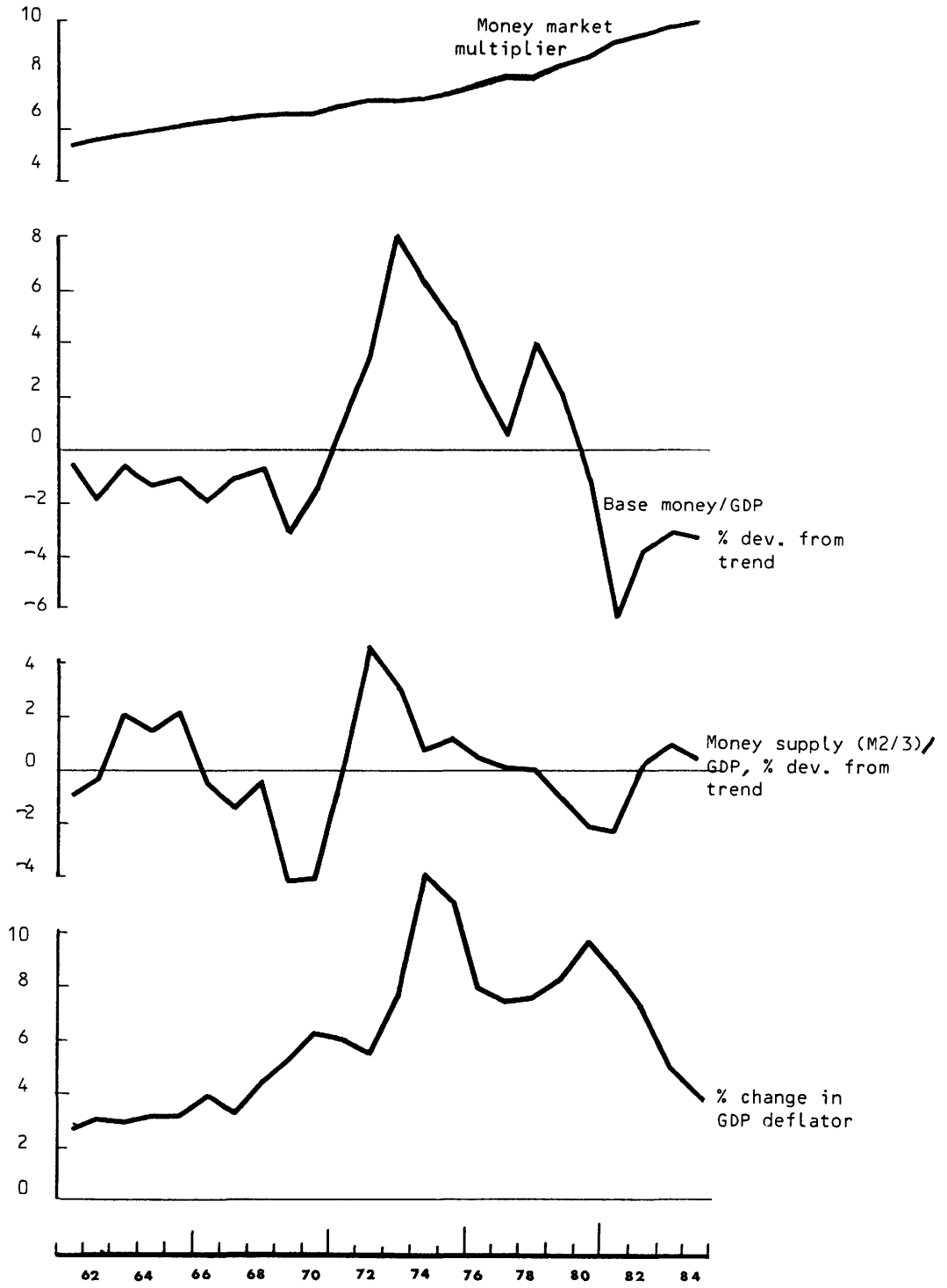
% of GDP, OECD total



GRAPH 3

Additional aspects of monetary developments

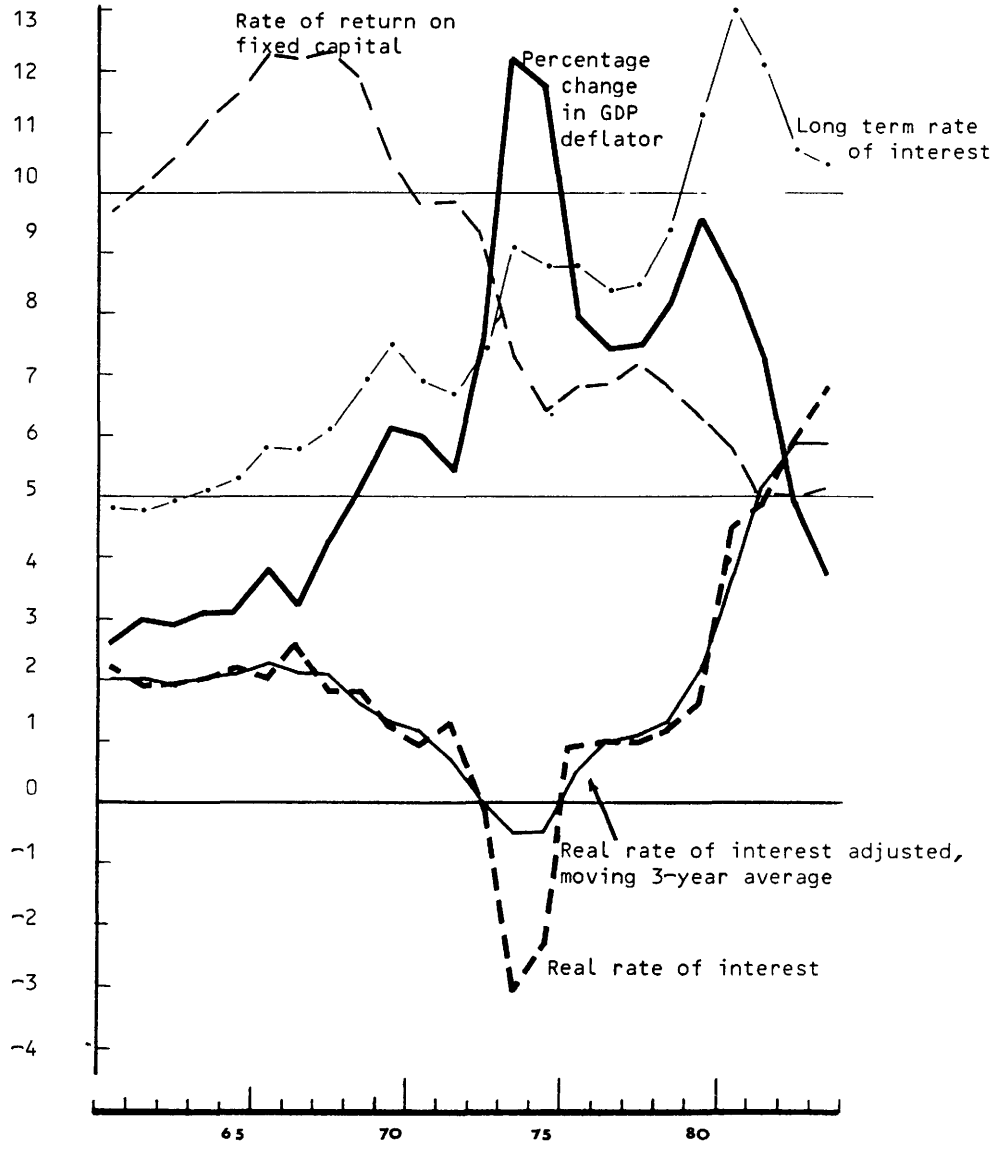
OECD total



GRAPH 4

Rate of return on main assets of private sector

OECD, total



as much as 6-7%. Graph 4 also shows a smoothened series for the real rate of interest, obtained as the moving three-year average of the original series and in which the outlying observations of 1974 and 1975 have been replaced by a rough estimate of the underlying trend. The latter, adjusted, series is used in the following time series analysis as the indicator of the real rate of interest for the OECD area as a whole.

## 4.2 Different faces of the budget balance

As already suggested by the development of the public debt/GDP ratio, the general government budget balance has, on average for the OECD area, deteriorated significantly during the 1960-1984 period. As shown in Table 1 the unadjusted net lending of general government in the early 1960s showed a deficit of relatively modest size in proportion to GDP. Indeed, when account is taken of the growth of nominal GDP the balance was positive, implying a decline in the net debt in proportion to GDP as already shown above, in Graph 2. The level of both the unadjusted and the growth-adjusted budget balance is approximately maintained up to 1975, when a major deterioration is observed; although with some fluctuations the aggregate OECD budget deficit during the following 10 years remains much less favorable than before the 1975 recession.

A closer examination of these figures, however, suggest that cyclical fluctuations have exerted a strong influence upon the short-term variations in the budget balance. As shown in the fourth column of Table 1 a tentative adjustment for the impact of cyclical fluctuations upon the budget balance may range from a deduction of 1.7 points in the year 1979 when activity was high in relation to trend and a positive adjustment of 2.1 points in 1975 when the gap between actual and trend GDP was as high as 3.6%. (As discussed more in detail in the technical annex, the adjustments for the effect of cyclical fluctuations are calculated so as to add up to approximately zero over the whole period).

Given that the base money/GDP ratio has been on a declining trend on average over the 1961-1984 period, "monetary financing" in this - narrow - sense of the expression has not for the period as a whole contributed to the financing of the public borrowing requirement. Nevertheless, the annual changes in the monetary base as a percentage of GDP fluctuate between an increase of 0.4% of GDP in 1973 and a decrease of 0.5% of GDP in 1981 and may, therefore, on the margin, have exerted a measurable influence on interest rates.

Since, moreover, the cyclical adjustment and the effect of monetary financing may go in the same direction (notably in the 1979-1981 period) the underlying (cyclically adjusted) change in the private sector's holdings of public interest bearing debt, as presented in column 6 of Table 2, may, in fact, in certain years exhibit an evolution which is quite different from the one suggested by the unadjusted figures in column 1 (see also Graph 5).

In very broad terms, this indicator of potential crowding out in the OECD area shows that, in contrast to the views expressed by certain authors, notably Blanchard and Summers (1984), the government's claim upon financial resources of the private sector has shifted very markedly in the course of the 1960-1984 period. In fact, on average for the years 1961 to 1974, private holding of public interest bearing debt fell by some 1.6 percentage points per year (cyclically adjusted). In sharp contrast to the reduction observed from 1961 to 1974 this ratio, on average for the years 1975 to 1984, rose by 0.9 points per year, with a peak of 1.5 points in 1981 and with the annual increase remaining at or above 1 point during the 1979-1984 period. The shift in this indicator of potential current crowding out between the averages for 1961-1973 and 1979-1984, thus, is as large as 2.8 GDP points, indeed a very significant change in the government's claims upon financial resources and which could be expected to exert a strong influence upon the level of interest rates.

(4)

Table 1:
Various budget balance definitions (OECD Total)

% of GDP

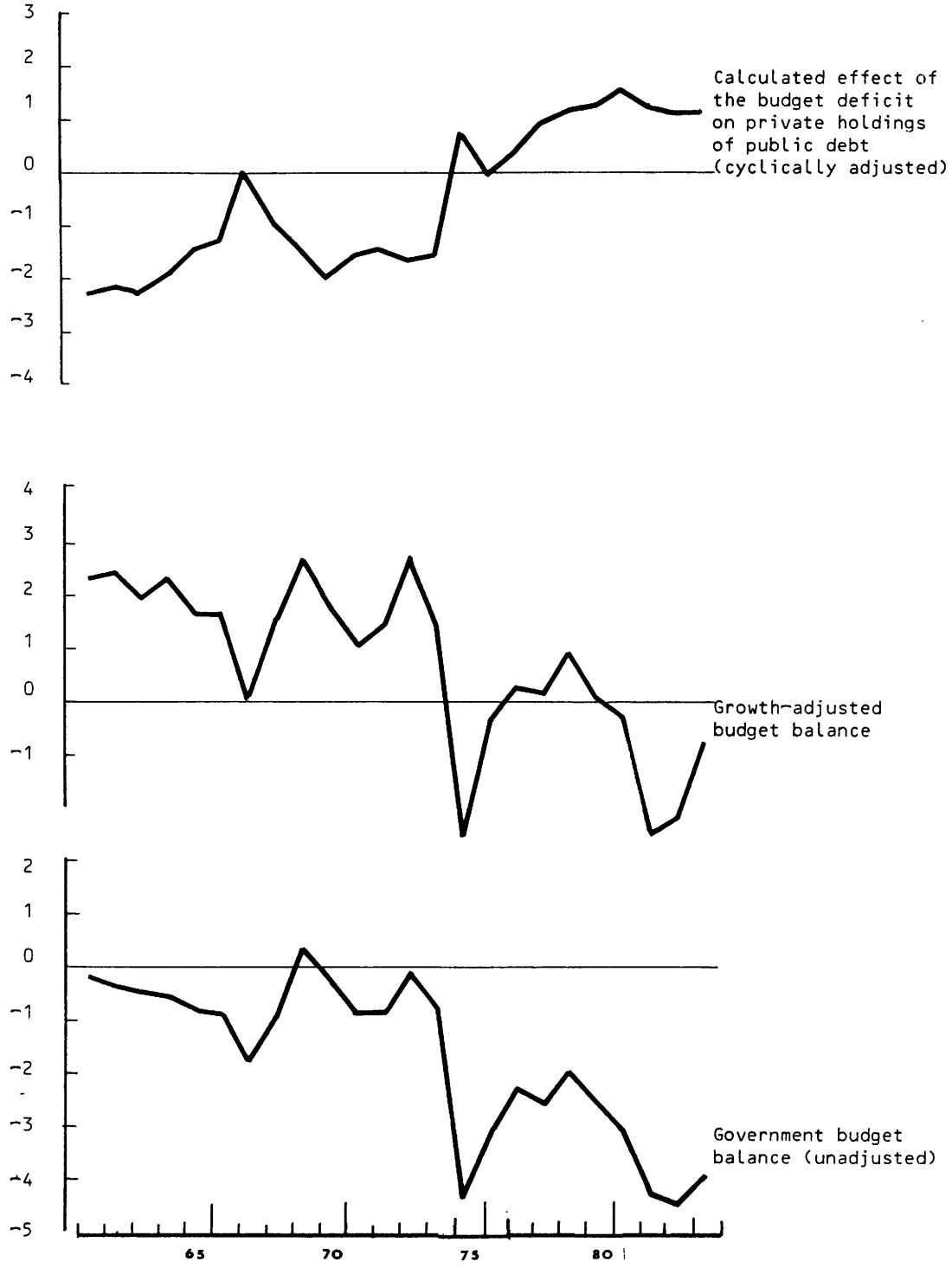
| | Unadjusted balance (NADF) | Effect of growth of nominal GDP on debt/GDP ratio | Growth adjusted balance (GADF) (1) | Cyclical adjustment (2) | Monetary financing (3) | Net cyclically adjusted change in private holdings of public debt (GWDF) (4) |
|---|---|---|---|---|---|---|
| 1961 | -0,2 | 2,5 | 2,3 | 0,1 | -0,1 | -2,3 |
| 62 | -0,4 | 2,8 | 2,4 | 0,1 | -0,3 | -2,2 |
| 63 | -0,5 | 2,4 | 1,9 | 0,4 | 0,0 | -2,3 |
| 64 | -0,6 | 2,9 | 2,3 | -0,1 | -0,2 | -2,0 |
| 65 | -0,8 | 2,4 | 1,6 | -0,0 | -0,1 | -1,5 |
| 66 | -0,9 | 2,5 | 1,6 | -0,1 | -0,2 | -1,3 |
| 67 | -1,8 | 1,8 | 0,0 | 0,2 | -0,1 | -0,1 |
| 68 | -1,0 | 2,5 | 1,5 | -0,4 | -0,1 | -1,0 |
| 69 | 0,3 | 2,4 | 2,7 | -0,8 | -0,4 | -1,5 |
| 70 | -0,3 | 2,0 | 1,7 | 0,2 | 0,1 | -2,0 |
| 71 | -0,9 | 1,9 | 1,0 | 0,5 | 0,1 | -1,6 |
| 72 | -0,9 | 2,3 | 1,4 | -0,1 | 0,2 | -1,5 |
| 73 | -0,1 | 2,8 | 2,7 | -1,4 | 0,4 | -1,7 |
| 74 | -0,8 | 2,2 | 1,4 | 0,5 | -0,3 | -1,6 |
| 75 | -4,4 | 1,8 | -2,6 | 2,1 | -0,2 | 0,7 |
| 76 | -3,1 | 2,7 | -0,4 | 0,8 | -0,3 | -0,1 |
| 77 | -2,3 | 2,5 | 0,2 | -0,2 | -0,3 | 0,3 |
| 78 | -2,6 | 2,7 | 0,1 | -1,2 | 0,2 | 0,9 |
| 79 | -2,0 | 2,9 | 0,9 | -1,7 | -0,3 | 1,1 |
| 80 | -2,6 | 2,6 | 0,0 | -0,8 | -0,4 | 1,2 |
| 81 | -3,1 | 2,8 | -0,3 | -0,7 | -0,5 | 1,5 |
| 82 | -4,3 | 1,7 | -2,6 | 1,3 | 0,1 | 1,2 |
| 83 | -4,5 | 2,2 | -2,3 | 1,4 | -0,1 | 1,0 |
| 84 | -4,0 | 3,1 | -0,9 | 0,0 | -0,1 | 1,0 |

(1) Unadjusted budget balance as corrected for the effect on the ratio of public liabilities to GDP of the change in nominal GDP.
(2) Adjustment for the estimated effect on the budget balance of the gap between actual real GDP and the trend. (For a further discussion of the calculation of the effect of cyclical fluctuations on the budget deficit see the technical annex).
(3) Percentage points change in the base money/GDP ratio.
(4) Growth-adjusted budget balance as corrected for the effect of cyclical fluctuations and monetary financing (column 3 plus column 4 plus column 5) (with inverted sign).

GRAPH 5

Different budget balance concepts

OCDE total



## 5. Econometric analysis

As already pointed out above the actual development of the OECD economy since 1960 has not followed a steady-state growth path. In addition to cyclical fluctuations in activity the basic asset structure appears to have been influenced, in particular, by a process of capital deepening and a rise in the capital/output ratio despite a pronouced fall in the real rate of return on capital and a market increase in the real rate of interest. Econometric analysis using the steady-state model, therefore, gives results that are incompatible with the conceptual model developed in equation 1-3 above.

The econometric analysis presented in the present paper, therefore, has been based on the modified conceptual framework including the real wage gap, the real rate of interest and the rate of increase in high-powered money as the main determining variables. This chapter first looks briefly at the bilateral correlations in this system and then presents a time series analysis of the development of the main ratios in the model. A reduced form analysis of the effect on the real rate of interest of the budget balance is presented in the third section of this chapter and the stability of these results are examined in section 5.5. Section 5.6 and 5.7 finally present a cross-section analysis of the key relations in this conceptual model.

### 5.1 A review of bilateral correlations

As seen from Table 2, which presents a schematic overview of the sign and strength of the bilateral correlations (the table of bilateral correlation coefficients is given in the technical annex), the actual behaviour of the OECD economy seems to correspond relatively well to the conceptual model outlined above:

- the real wage gap - (WPRO: the real wage per hour worked divided by the index of factor productivity) - appears to be strongly and positively correlated with the capital/output ratio and the capital/labour ratio;

- the real rate of interest (RLAN: the nominal long-term rate of interest less the rise in the GDP deflator, calculated as a moving average with a reduced weight for outlying observations in 1974/1975) appears to be strongly correlated with the public debt/GDP ratio and even more so with the private holdings of public debt.

- a striking phenomenon is the strong triangular correlation between the real wage gap, the capital/output ratio and the level of nominal interest rates. This may perhaps be interpreted as an indication that the rise in the wage gap and the consequential increase in the capital/output ratio may have been one of the factors behind the rise in nominal interest rates.

In any case, however, spurious correlations may easily occur in a covariance matrix of this size and a deeper analysis of the quantitative evidence is, therefore, required before conclusions can be drawn.

The following sections present and examine regression analysis of the capital/output and capital/labour ratios and of the debt/GDP ratios. No attempt is made to analyse money demand equations.

## 5.2 The capital/output and capital/labour ratios

The bilateral correlation coefficient between the real wage gap and the capital/output ratio is, at 0,785, relatively high and also statistically significant. Analysis of the details of the regression, however, shows that changes in the wage gap, despite this strong overall correlation, cannot provide a satisfactory description of the fluctuations from one year to another in the capital/output ratio. In fact, as seen from Table 3, the value of the Durbin-Watson statistic is extremely low, suggesting a considerable amount of auto-correlation of the residuals. One obvious explanation for this result may be that the capital/output ratio (as already suggested in section 3.2 above) can react only with a certain lag to changes in the wage gap and that,

Table 2

Covariance matrix of variables and parameters

(sign and size of bilateral correlation coefficients)

| | | WPRO | RLAN | PGDP | LINT | SINT |
|---|---|---|---|---|---|---|
| Real wage gap | WPRO | °° | 0 | ++ | +++ | +++ |
| Real long term interest | RLAN | + | °° | + | + | + |
| Inflation | PGDP | ++ | + | °° | ++ | ++ |
| Long term interest rate | LINT | +++ | + | ++ | °° | +++ |
| Short term interest rate | SINT | +++ | + | ++ | +++ | °° |
| Public debt % of GDP | GOND | 0 | +++ | -- | 0 | 0 |
| Private holdings of public debt | PROG | 0 | +++ | - | 0 | 0 |
| Capital/output ratio | CAPY | +++ | ++ | + | +++ | +++ |
| Capital/labour ratio | CALO | +++ | + | ++ | +++ | +++ |
| Base money/GDP | BMNP | --- | -- | - | --- | --- |
| Base money/GDP % dev. from trend | BMNT | 0 | --- | + | 0 | 0 |
| % change in base money | BMCH | 0 | + | 0 | 0 | 0 |
| Money supply/GDP | SMNP | +++ | + | ++ | +++ | +++ |
| Money supply/GDP % dev. from trend | SMNT | 0 | 0 | 0 | + | + |
| % change in money supply | SMCH | 0 | 0 | + | 0 | 0 |
| Government net lending | NADF | --- | - | - | --- | -- |
| Growth-adjusted budget balance | GADF | -- | - | - | --- | -- |
| Change in private holdings of public debt | GWDF | +++ | + | + | +++ | +++ |

+ : Positive correlation (+=0,26-0,50, ++=0,51-0,75, +++=0,76-1,0

- : Negative correlation (-=0,26-0,50, --=0,51-0,75, ---=0,76-1,0

0 : Correlation weak (-0,25()+0,25).

thus, the actually observed ratio is unlikely to represent the level desired by the entrepreneurs. A correction for the auto-correlation of the residuals (the Corchran-Orcutt correction), in fact, yields a substantially more satisfactory result, including a higher coefficient for the real wage gap. Another, generally applied method for estimating the relative importance of adjustment lags is to introduce a "Koyck lag" (the lagged dependent variable) in the regression, the size of the coefficient of this variable being interpreted as a first indication of the speed with which the dependent variable adjust to changes in the other variables. A value of the "Koyck-coefficient" close to one, thus, indicates a relatively slow adjustment process, while a value close to zero, other things being equal, indicates a rapid adjustment[1]. Table 3 shows for the capital/output ratio the results of this approach which may be summarised as follows:

- the capital/output ratio shows a considerable degree of short-term inertia;

- the coefficient of the dominant independent variable (the real wage gap), which is high and significant in the simple bilateral equation, is substantially reduced and also loses statistical significance when the lagged dependent variable is introduced in the equation.

- the long run value of the coefficient of the real wage gap in the equation including the lagged dependent variable is at 0,212/(1-0,721)=0,76) higher even than in the simple bilateral equation.

---

1 The long run value of the coefficient can be calculated from the equation $y = a+bx+cy_{-1}$ as $b'=b/(1-c)$. The speed of adjustment is equivalent to (1-c). If for example c= 0,8 only 0,2 of the effect of a change in "x" will be felt in the first period.

Table 3

Regression equations for the capital/output ratio (OECD Total)

| | | | |
|---|---|---|---|
| 1. | Simple bilateral regression | | |
| | CAPY = 39,716 + 0,540 WPRO | R-sq | D-W |
| | (5,497) (8,971) | 0,785 | 0,451 |
| 2. | With lagged dependent | | |
| | CAPY = 4,158 + 0,212 WPRO + 0,721 CAPY(-1) | R-sq | D-W |
| | (0,622) (3,105) (6,197) | 0,935 | 1,617 |
| 3. | With lagged dependent and full specification | | |
| | CAPY = 19,375 - 0,160 WPRO + 1,710 RLAN | | |
| | (3,375) (-1,653) (5,508) | | |
| | + 1,684 PGDP + 0,874 CAPY(-1) | R-sq | D-W |
| | (5,512) (6,991) | 0,979 | 2,777 |

CAPY = Capital/output ratio

WPRO = Real wage gap (index for real compensation per hour divided by the index for total factor productivity).

RLAN = Real rate of interest (adjusted, moving 3-year average).

PGDP = Change in GDP deflator.

NOTE: T-values are indicated in parenthesis under the coefficients.

These results clearly suggest that, although there is broad and strong consistency between the conceptual framework and the actual behaviour of the capital/output ratio on one side and the real wage gap on the other side there is little hope of obtaining an exact tracking of the year-to-year movements of the former as a function of the changes in the real wage gap. Moreover, a full specification including the real rate of interest and the rate of inflation (equation 3 in Table 3) yields parameter values out of line with expectations.

As far as the relation between the real wage gap and the capital/labour ratio is concerned, the findings are on some points different. The simple bilateral regression equation yields a high and significant coefficient for the real wage gap (WPRO). Introducing the lagged dependent variable in the equation, in order to analyse the adjustment process, however, entails a substantial reduction both of the value of the coefficient of the real wage gap and of its statistical significance (reduction of the T-value). The long run value of the coefficient of the real wage gap, however, remains close to the "static" value in equation 1, suggesting that the main difficulty is to specify the pattern of adjustment.

An adaptive model for the capital/labour ratio, including the real rate of interest and the rate of inflation (full specification) yields negative coefficients for both these variables. This is in line with the hypothesis as far as the coefficient of the real rate of interest is concerned but contrary to the hypothesis as fas as the coefficient of the rate of inflation is concerned. Moreover, the similar specification for the capital/output ratio gave positive values for both these coefficients, suggesting that a regression of time series along these lines, while perhaps a feasible way to verify the main correlations in the model, is not appropriate for estimating cross-elasticities.

These regression results, nevertheless, suggest the strong conclusion that changes in the capital/labour ratio apart from a certain

(5)

Table 4

Regression equations for the capital/labour ratio (OECD Total)

| | | | |
|---|---|---|---|
| 1. | Simple bilateral regression | | |
| | CALO = -218,300 + 3,274 WPRO | R-sq | D-W |
| | (-16,649) (29,963) | 0,976 | 0,494 |
| 2. | With lagged dependent | | |
| | CALO = -9,860 + 0,280 WPRO + 0,920 CALO(-1) | R-sq | D-W |
| | (-0,313) (0,535) (6,343) | 0,99 | 1,947 |
| 3. | With lagged dependent and full specification | | |
| | CALO = -26,875 + 0,458 WPRO - 2,264 RLAN | | |
| | (-0,893) (1,036) (-2.358) | | |
| | - 2,450 PGDP + 0,987 CALO(-1) | R-sq | D-W |
| | (-3,551) (6,755) | 0,995 | 2,391 |

CALO = Capital/labour ratio, 1960=100

WPRO = Real wage gap (index for real compensation per hour divided by the index for total factor productivity).

RLAN = Real rate of interest (adjusted, 3-year moving average).

PGDP = Change in GDP deflator.

adjustment lag can be largely explained by the changes in the real wage gap.

5.3 The public debt/GDP ratio

An examination of the relation between the real rate of interest and the public debt/GDP ratio, following the same approach as for the capital/output and the capital/labour ratios, provides a comparatively strong confirmation of the working hypothesis as expressed in the conceptual framework:

- the simple bilateral correlation yields an R-square of 0,656 and a coefficient of the real rate of interest of 2,4. The D-W statistic is low, but a correction for the autocorrelation of the residuals, while dramatically increasing the D-W statistic, does not significantly reduce the coefficient of the real rate of interest or its statistical significance;

- introducing the lagged dependent variable (the "Koyck-lag") entails a certain lowering of the coefficient of the real rate of interest but without rendering it statistically insignificant. Moreover, the long run value of the coefficient of the real rate of interest is even higher (3,23) than the "static value" and the adjustment is relatively fast;

- an attempt to estimate cross-elasticities by introducing the real wage gap and the rate of inflation in this equation (regression 3) does not yield convincing results. Neither a specification using the absolute value nor one using the change from one year to the next in the independent variables, in fact, yield statistically significant coefficients and do not improve the overall fit.

The fitted equations for the ratio of privately held public debt (as approximated by the difference between the total public debt and the base money) show the same overall performance as the equations for the public debt/GDP ratio, but with higher and statistically more

Table 5

Regression equations for public debt/GDP ratio (OECD Total)

| | | | |
|---|---|---|---|
| 1. | Simple bilateral regression | | |
| | GOND = 20,241 + 2,404 RLAN | R-sq | D-W |
| | (31,068) (6,482) | 0,656 | 0,263 |
| 2. | With lagged dependent | | |
| | GOND = 5,932 + 1,075 RLAN + 0,677 GOND(-1) | R-sq | D-W |
| | (2,854) (4,120) (6,900) | 0,921 | 1,106 |
| 3. | With lagged dependent and full specification | | |
| | GOND = -7,965 + 0,510 RLAN + 0,077 WPRO | | |
| | (-1,567) (1,539) (1,701) | | |
| | +0,050 PGDP + 0,897 GOND(-1) | R-sq | D-W |
| | (0,201) (8,076) | 0,95 | 2,125 |

GOND = Public debt/GDP ratio

WPRO = Real wage gap (index for real compensation per hour divided by the index for total factor productivity).

RLAN = Real rate of interest (adjusted, moving 3-year average, see section 4.1).

PGDP = Change in the GDP deflator.

significant coefficients for the real rate of interest:

- in the simple bilateral regression, the coefficient of the real rate of interest amounts to 2,716 as against 2,404 in the equation for total public debt and with a T-value of 8,212 as against 6,482;

- in the specifications including the lagged dependent variable the coefficient of the current value of the real rate of interest remains significant (although of course with a lower value). The long run coefficient of the real rate of interest is, at 3,66, large and the speed of adjustment quite rapid.

The figures in Tables 5 and, notably, 6, thus, provide evidence of a strong and relatively contemporaneous link between the real rate of interest and the amount of government debt held by the general public but do not allow conclusions concerning the cross-elasticities (the influence of the rate of return on fixed capital on the public debt/GDP ratio etc.).

5.4 Impact of the fiscal deficit on the real rate of interest

Although in Tables 5 and 6, above, the real rate of interest is assumed to be the "independent" variable determining the debt/GDP ratio, the relation between the two variables must be interpreted as being of an interactive nature, with the level of the real rate of interest and the debt/GDP ratio determined simultaneously within a general macro-economic framework. To the extent that an influence is exerted from the debt/GDP ratio on the real rate of interest, it may depend both upon the level of the ratio and upon its change from one year to another, as simulated by the appropriately adjusted government budget balance.

As already pointed out above, the budget balance concept which can be assumed to most accurately measure the change in the private sector's holdings of public debt and, thus, to represent the underlying "crowding out" effect is the government net lending as adjusted for

Table 6

Regression equations for private holdings of public debt

| | | | |
|---|---|---|---|
| 1. | Simple bilateral regression | | |
| | PROG = 10,576 + 2,716 RLAN | R-sq | D-W |
| | (12,341) (8,212) | 0,754 | 0,314 |
| 2. | With lagged dependent | | |
| | PROG = 2,870 + 1,166 RLAN + 0,681 PROG(-1) | R-sq | D-W |
| | (1,968) (3,402) (5,427) | 0,921 | 0,828 |
| 3. | With lagged dependent and full specification | | |
| | PROG = -9,113 + 0,549 RLAN + 0,071 WPRO | | |
| | (-2,235) (1,596) (1,591) | | |
| | +0,150 PGDP + 0,929 PROG(-1) | R-sq | D-W |
| | (0,616) (7,938) | 0,959 | 1,980 |

PROG = Private holdings of public debt.

WPRO = Real wage gap (index for real compensation per hour divided by the index for total factor productivity).

RLAN = Real rate of interest (adjusted, moving 3-year average, see section 4.1).

PGDP = Change in GDP deflator.

three main elements:

- the effect on the public debt/GDP ratio of growth of nominal GDP;

- the impact on the budget balance of cyclical fluctuations in activity;

- the effect of changes in the base money/GDP ratio.

Moreover, in an open economy, capital transaction with the rest of the world may, but will not necessarily, influence the level of the real rate of interest.

The budget balance adjusted as indicated can be considered an approximation of the change in the private sector's holdings of public debt, but will not be exactly equivalent to the observed change in the stock variable. The latter may, in fact, be influenced also by various adjustments, such as revaluations, indexation etc.

In fact, as shown in Table 7, the approximated change in private holdings of public debt appears to exert a strong and significant impact upon the real rate of interest, when estimated in an adaptive framework of somewhat the same nature as the one used above in the analysis of the three basic structural equations[1].

The coefficient of the change in the private sector's holdings of public debt (equation 3) is positive (equal to 0,3) and statistically significant even after correction for the auto-correlation of residuals. Indeed, the equation in the third part of Table 7, reproduced below for convenience, suggests a strong and cumulative impact emanating from the budget balance, in so far as a positive

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[1] The equations in Table 7 may be interpreted as various simplified and linearized reduced form versions of the structural equations presented in section 3 but are also consistent with other specifications of the stock/flow interaction.

Table 7

The effect on the real rate of interest of various budget balance definitions

| | | | |
|---|---|---|---|
| 1. With unadjusted budget balance | | | |
| RLAN = -0,312 - 0,268 NADF + 0,999 RLAN(-1) | | R-sq | D-W |
| (-1,819)(-3,926) (14,937) | | 0,938 | 1,161 |
| 2. With growth-adjusted budget balance | | | |
| RLAN = 0,285 - 0,230 GADF + 1,016 RLAN(-1) | | R-sq | D-W |
| (1,634)(-3,446) (14,596) | | 0,932 | 1,166 |
| 3. With change in private holdings of public debt | | | |
| RLAN = 0,287 + 0,298 GWDF + 1,017 RLAN(-1) | | R-sq | D-W |
| (1,781) (4,012) (15,680) | | 0,940 | 1,362 |
| 4. With stock of and change in private holdings of public debt | | | |
| RLAN = -2,214 + 0,285 PROG(-1) + 0,419 GWDF | | R-sq | D-W |
| (-3,551) (7,527) (3,089) | | 0,791 | 0,494 |
| 5. With stock and change in private holdings of public debt and lagged dependent | | | |
| RLAN = -0,452 + 0,0698 PROG(-1) + 0,309 GWDF | | | |
| (-1,184) (2,104) (4,494) | | | |
| +0,834 RLAN(-1) | | R-sq | D-W |
| (7,891) | | 0,951 | 1,543 |

WPRO = Real wage gap (index for real compensation per hour divided by the index for total factor productivity).
WPRO (%ch) = Percentage change in real wage gap from one year to another.
RLAN = Real rate of interest (adjusted, moving 3-year average)
NADF = General government net lending (unadjusted).
GADF = General government net lending or borrowing ajusted for the effect on the debt/GDP ratio of growth of nominal GDP (growth-adjusted budget balance).
GWDF = Effect on the private holdings of public debt (growth-adjusted budget balance adjusted for cyclical fluctuations and base money financing - with inverted sign).
PROG = Calculated private holdings of public debt as % of GDP.

value of this variable (a rise in the private sector's holdings of public debt) will exert a persistent upward pressure upon interest rates:

$$RLAN = 0,287 + 0,298GWDF + 1,017RLAN(-1)$$

where RLAN=the real rate of interest, '-1' means the variable lagged one period and GWDF=the estimated change in the private sector's holdings of public debt defined as indicated above. It should be noted, however, that although the fit of the equation using the change in private holdings of public debt is marginally better than the fit obtained using the unadjusted budget balance, the difference between the two estimates is not large. Although the various adjustments of the budget balance can be justified an conceptual grounds, the explicative value, in purely econometrical terms, of these adjustments is, thus, not very large. This fact is mainly attributable to the high correlation between the various budget balance definitions when expressed in the form of time series for the OECD area as a whole. As will be shown below, the adjustments, however, are indispensable for the purpose of cross-section analysis.

The regressions in equations 2 and 3 in Table 7, however, both yield coefficients of the lagged dependent variable which are above 1, suggesting an upward trend in the real rate of interest even without any impact from the fiscal variable. This may be an indication that the specification is incomplete and that other variables may play a role. In fact, the inclusion of the stock variable (private holdings of public debt) in equations 4 and 5 yield a more convincing result, with acceptable and significant values of all coefficients and, in equation 5, an acceptable value also for the D-W statistic.

Despite the problems of identification of coefficients, the regression results, notably in equation 5, are fully consistent with and, in fact, strongly underpin the hypothesis that the sharp deterioration in real fiscal balances since the late 1970s is the main, if not necessarily the only, factor behind the rise in real rates of interest

in the early 1980s. The subsequent examination of stability problems, on the other hand, suggests that the "crowding out" effects have been considerably stronger in the 1970s and, notably, the 1980s than in the 1960s - where, in any case, public debt was on the decline for the OECD area as a whole and where, consequently, no crowding out phenomena can be assumed to have occurred.

## 5.5 Stability of coefficients

In order to test the stability of the structural equations some of the key regressions presented in Table 7 above have been estimated for varios sub-periods using two approaches:

- a testing of forward stability by estimating first the equation for the period 1962 to 1973 and then successively re-estimating the same equation adding one year at the end of the period;

- a testing of the backward stability by estimating first the equation for the period 1973 to 1984 and then successively re-estimating the same equation adding one year at the beginning of the period.

A first impression of the results of the stability tests is given in Table 8 which shows the value of coefficients in the key equations as estimated for the following periods: 1962 to 1984, 1962 to 1973 and 1973 to 1984. Details of the intermediary results are presented in graphic form in the annex. Combining the two sets of stability information the following conclusions are suggested:

- the effect of the current increase in private holdings of public debt on the real rate of interest seems to have been considerably stronger in the period subsequent to 1973: the coefficients both of the flow variable (GWDF) and of the stock variable (PROG) are small and insignificant when estimated for the period 1962 to 1973 but high and significant when estimated for the period 1973 to 1984. Consequently the coefficient of the lagged dependent variable is

Table 8

Stability of key coefficients

| Dependent variable | Independent variable | Value of coefficient (1) 1962-84 | 1962-73 | 1973-84 |
|---|---|---|---|---|
| RLAN | PROG(-1) | 0,0698 | 0,0338 | 0,0372 |
| (Real long | | (2,1045) | (1,101) | (0,2476) |
| term rate | GWDF | 0,309 | 0,0337 | 0,4343 |
| of interest) | | (4,4943) | (0,1943) | (1,6621) |
| (Table 7, eq. 5) | RLAN(-1) | 0,834 | 1,1785 | 0,8897 |
| | | (7,8908) | (4,4723) | (2,5769) |
| RLAN | GWDF | 0,2976 | -0,1049 | 0,4792 |
| (Real long | | (4,0121) | (-0,8686) | (2,6963) |
| term rate | RLAN(-1) | 1,0173 | 1,4179 | 0,9719 |
| of interest) | | (15,6801) | (9,4171) | (10,9051) |
| (Table 7, eq.3) | | | | |

(1) T-value in parenthesis

much higher when estimated for 1962 to 1973 than for 1973 to 1984, suggesting than the lags of adjustment of the real rate of interest to changes in the stance of fiscal policy have been shortened. This would seem to provide some confirmation of the thesis that the scope for influencing real demand through fiscal policy has been significantly reduced in the 1970s as a result of a faster-than-earlier pushing up of real rates of interest.

The stability tests - and notably the estimates of coefficients for the two main sub-periods, 1962-73 and 1973-84, - suggest that the effect of fiscal deficits on the real rate of interest has been stronger and notably more rapid in the last ten years or so than in the period up to 1973. "crowding out" effects, thus, are likely to have been stronger in the 1980s than in the early years of the 25 year period examined here.

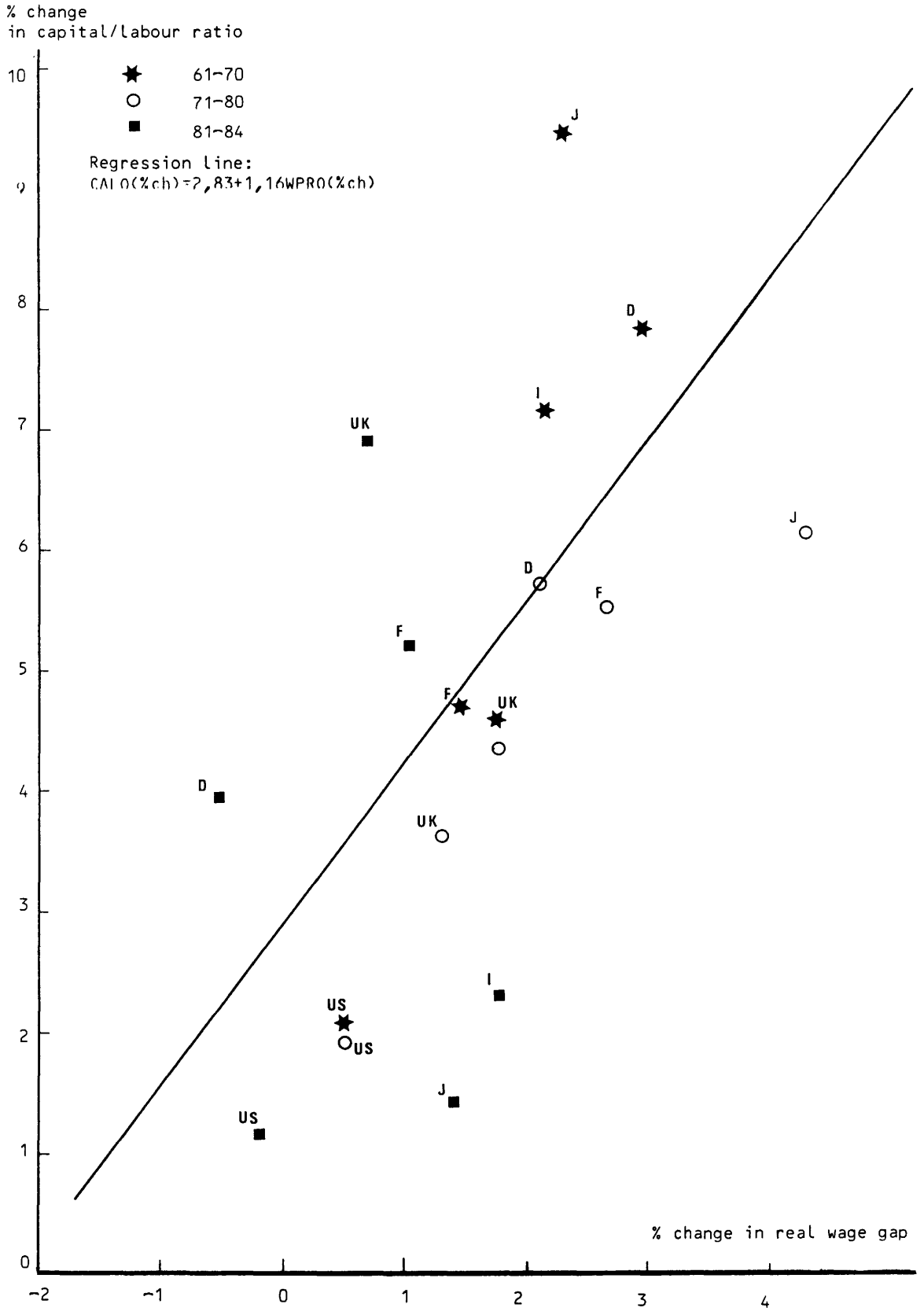
## 5.6 A review of evidence based on cross-section data

Despite various adjustments for serial correlation and stability tests such as those referred to above it is difficult to overcome the basic weakness inherent in time-series analysis: the identification problem resulting from the fact that, as already indicated above, the data represent ex post observations of points of equilibrium but do not provide information on the underlying "tension" which may have induced a change in the desired value of a certain variable, for example the level of private holdings of public debt in proportion to GDP or the real rate of interest.

Since economics offer no possibility for carrying out a controlled scientific experiment involving changes in only one exogenous variable, the only response to the identification problem inherent in time-series analysis is to examine data for several countries in different relative positions which respect to the relevant criteria, and with the hope that this additional information at best will confirm and at least will not contradict the results of the time-series analysis. This section, therefore, presents an examination

GRAPH 6

**Cross-section analysis of the relation between the capital/labour ratio and the real wage gap.**



of data for the six major OECD countries with the aim of testing further two key postulates of the present study: the effect of the real wage gap on the capital/labour ratio and the effect of the real fiscal deficit on the real rate of interest.

As shown in Graph 6, which plots the average annual percentage change in the capital/labour ratio (vertical axis) against the average annual percentage change in the real wage gap (horizontal axis) for the six major OECD countries and for three sub-periods: 1970/60, 1980/70 and 1984/80, the cross-section data show a broad and significant positive correlation between these two variables: the coefficient of '1,16' of the change in the real wage gap, indeed, indicates a strong tendency for an increase in the real wage gap to be fully compensated by a combination of an increase in the stock of capital and a fall in employment. As seen from Table 9 the coefficient of the real wage gap is statistically significant (T-value=2,762) but the overall fit of the equation is not very good, suggesting that other factors than changes in the real wage gap influence the relative positions of the individual countries and changes over time in these positions. It is tempting to assume that cross-country differences with respect to the level of real rates of interest could be an explicative element in this equation but the introduction of the real rate of interest into the equation for the capital/labour ratio does not yield a statistically significant improvement of the fit (see the second equation in Table 9).

Cross-section data also confirm the finding of a strong correlation between the calculated change in domestic private holdings of financial assets (changes in private holdings of public debt less borrowing or lending of the nation) and the real rate of interest. Graph 7, which presents the data for the same countries as above with averages for the periods 1961-1970, 1971-1980 and 1981-1984, shows that high values of the change in domestic private holdings of financial assets are associated with high values of the real rate of interest and vice versa. A significant exception is the position of the United Kingdom for the period 1961-1970 where the real rate of

Table 9

Cross-section analysis (1) of the correlation between the real wage gap and the capital/labour ratio.

(% change in the capital/labour ratio and % change in the real wage gap)

| Dependent variable | | Const. | Indep. variable | R-sq |
|---|---|---|---|---|
| CALO | = | 2,833 | + 1,159 WPRO | 0,323 |
| | | (3,532) | (2,762) | |
| CALO | = | 2,518 | + 1,231 WPRO + 0,085 RLAN | 0,330 |
| | | (2,209) | (2,633) (0,399) | |

(1) Countries: Germany, France, Italy, United Kingdom, United States, Japan.
Periods: 1961-1970, 1971-1980, 1981-1984.

interest appears substantially higher than warranted by the financial variable. This may be explained by the special problems encountered by the United Kingdom in the 1960s as a result of the "sterling balances" (sterling deposits and other assets held by non-residents) and which may have led to a more prudent monetary policy than would otherwise have been the case and, indeed, was a main argument for running a tight fiscal policy in the United Kingdom during this period. As seen from Table 10, a regression based on a set of data adjusted for the special UK-position[1] yields a very significant improvement of the fit, as regards both the overall R-square and the T-value of the coefficient. On the other hand, the coefficient of the change in the private holdings of public debt (GWDF) and the change in domestic holdings of financial assets (i.e. the change in private holdings of public debt less the external borrowing of the nation, PFIN) are practically the same and with a similar T-value. These findings, thus, suggest that the countries included in this sample have not been in a position to significantly influence the domestic level of the real rate of interest by borrowing or lending abroad.

The high and statistically significant correlation between the real rate of interest and the change in private holdings of public debt (GWDF) observed in this cross-section analysis contrasts sharly with a complete absence of correlation between the real rate of interest and the unadjusted government budget balance. In fact, as seen from Table 10, a regression of the real rate of interest on the data for general government net lending yields a low and statistically insignificant coefficient of the latter and a zero value of the R-square. The adjustments of the budget balance, which proved of little econometrical significance in the time-series analysis, thus prove to be highly justified in this cross-section analysis.

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1 The adjusted UK position is indicated in Graph 7.

Table 10

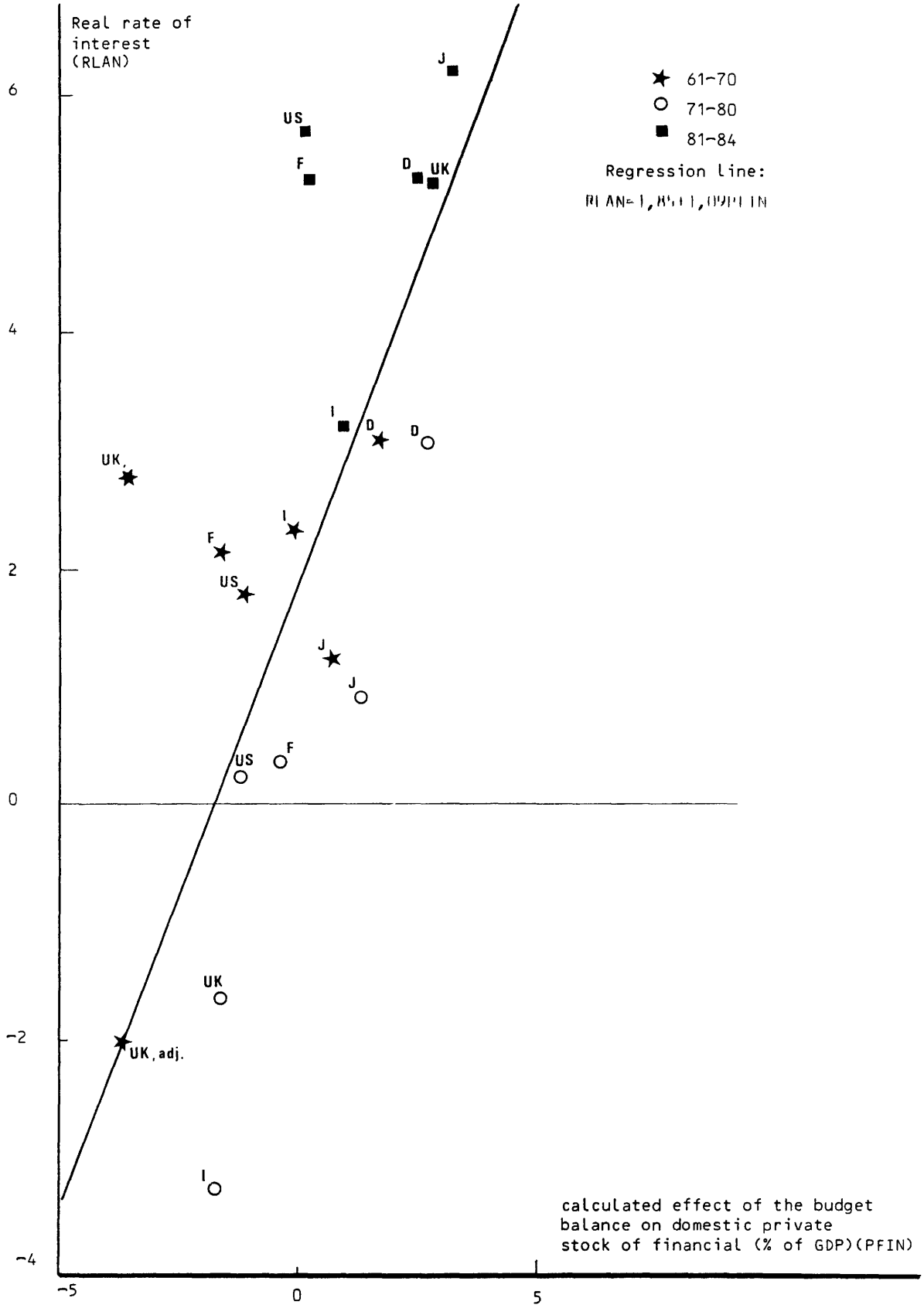
Cross-section analysis of the correlation between the real rate of interest and the budget balance

| Depend.variable | Const. | Indep. variable | | R-sq |
|---|---|---|---|---|
| RLAN = | 2,190 | + 0,776 PFIN | | 0,328 |
| (unadjusted) | (4,306) | (2,798) | | |
| RLAN = | 1,186 | + 1,087 PFIN | | 0,554 |
| (adjusted)(1) | (4,128) | (4,457) | | |
| RLAN = | 2,261 | + 0,805 GWDF | | 0,297 |
| (unadjusted) | (4,367) | (2,599) | | |
| RLAN = | 1,940 | + 1,159 GWDF | | 0,528 |
| (adjusted) | (4,242) | (4,234) | | |
| RLAN = | 2,562 | + 0,063 NADF | | |
| (unadjusted) | (3,104) | (0,317) | | 0,006 |
| RLAN = | 2,129 | + 0,003 NADF | | |
| (adjusted) | (2,383) | (0,013) | | 0,000 |
| RLAN = | 3,486 | + 0,775 GWDF | - 0,787 WPRO | 0,424 |
| (unadjusted) | (4,205) | (2,671) | (-1,820) | |
| RLAN = | 3,194 | + 1,127 GWDF | - 0,805 WPRO | 0,643 |
| (adjusted) | (4,534) | (4,576) | (-2,192) | |

NOTE:
RLAN = real rate of interest
RLAN adjusted = real rate of interest with adjusted value for the United Kingdom, 1961-70.
NADF = general government net lending or borrowing (unadjusted).
GWDF = change in private holdings of public debt.
PFIN = change in domestic private holdings of financial assets (GWDF less the net lending of the nation).
WPRO = % change in the real wage gap (real wage less factor productivity).

GRAPH 7

**Cross-section analysis of the relation between the real rate of interest and the change in domestic private holdings of financial assets.**



Another feature of a particular interest is shown in Table 10: the introduction of the the real wage gap in the equation for the real rate of interest in this cross-section analysis yields both a statistically significant coefficient and a substantial improvement of the fit. The coefficient is negative, implying than an increase in the real wage gap has exerted a negative impact on the real rate of interest. This, in fact, is a result in consistency with the conceptual model: an increase in the real wage gap, other things equal, will lead to a decline in the real rate of return on fixed assets and thus increase the "attractiveness" of financial assets leading to a lower real rate of interest than would otherwise be the case. It should be stressed that this scenario by and large represents an image of a declining economy, with a fall in the rate of return on investment leading to a slowdown of the rate of growth and unemployment, much as seen in practice in Europe in the last 15 years.

The cross-section examination, thus, provides additional strong confirmation of the basic postulates of the portfolio model and of the "crowding out hypothesis": although the last regression equation in Table 10:

$$RLANadj = 3,194 + 1,127GWDF - 0,805WPRO$$

cannot pretend to explain fully the cross-country differences with respect to the real rate of interest it clearly goes a long way towards establishing a consistent model in this field for the OECD area as a whole. It also suggests that a major part of the 5 points rise in real rates of interest since the mid-1970s can be attributed to the very substantial shift in the annual change in the private holdings of public debt, from an annual decline of close to 2 GDP points in the early 1970s to an annual rise of about 1 point in the 1980s. The results of the cross-section analysis also strongly underline the need to adjust the budget balance for the effects on the debt/GDP ratio of growth in nominal GDP and for the degree of base money financing of the government borrowing requirement (although the former adjustment if by far the most important).

## 5.7 Cross-section evidence of fiscal crowding out

While the time series analysis and the examination of cross-section data tend to confirm the thesis that the rise in real fiscal deficits since the mid-1970s is the main factor behind the increase in real interest rates, the analysis leaves open the question whether these fiscal deficits and the resulting increase in real interest rates have actually "crowded out" private demand in favour of public demand. This question may best be answered by a model simulation taking account of both demand and supply aspects and of the stock-flow relations outlined and analysed above. However, it is outside the scope of the present study to construct and run a full-scale macro-economic model for the OECD-area as a whole and it is, therefore, not possible -within this framework - to present more than provisional conclusions based on a review of the available cross-section evidence.

In fact, as shown in Table 11, on the basis of the data for the six major OECD-countries with a breakdown on the three sub-periods used above (1961-70, 1971-80 and 1981-84/85) there would seem to be some evidence of crowding out, or at least no evidence that the increase in budget deficits since the mid-1970s has helped to support economic growth:

- there is no strong evidence of an impact of the real rate of interest on the rate of investment in the economy as a whole. The rate of return on fixed capital is highly correlated with gross fixed investment as a percent of GDP but the coefficient of the real interest rate is small and statistically insignificant;

- there is evidence that the real rate of interest exerts a certain negative influence upon the rate of growth of output and the coefficient is somewhat more significant than in the equation for the rate of investment. However, also in this equation the rate of return on investment is a much more powerful factor;

- an equation (equation 2b in Table 11) regressing the rate of growth of output on the rate of return on investment and the change in private holdings of public debt yields a relatively high and statistically significant (negative) coefficient of the latter independent variable: with an R-square of 0,815 the equation, indeed, gives a surprisingly good "explanation" of the rate of growth of output.

However, although these findings appear consistent with the crowding out hypothesis, the equation in question clearly hides a complicated interaction between a large number of macro-economic variables and, therefore, cannot be interpreted as an expression of a causal relationship. All that can be concluded on the basis of these findings is that, apparently, the six countries included in this sample have not been in a position to avoid the slowdown of economic growth since 1973 through the expansionary shift of fiscal policy. Moreover, it would seem rather unlikely that, by allowing fiscal deficits to rise even further in the 1980, the OECD area as a whole would have been able to increase the rate of growth (although it might have been possible, temporarily, to increase the level of activity).

## 6. A look ahead

Since several of the statistical series used in this study are available only with a long time lag it has not been possible to include observations for 1985 and estimates for 1986. Nevertheless, on the basis of available evidence it is possible to make some brief conjectures about the most recent developments.

A striking feature of the evolution of the OECD economies in the last couple of years has been the persistence of a large fiscal deficit for the area as a whole, and notably when adjusted for the growth of nominal GDP (since the latter has shown a certain slowdown as a result of the slower rate of inflation). Despite a likely small increase in base money in proportion to GDP the private holdings of public debt

Table 11

Cross-section evidence of fiscal crowding out.

| | | | |
|---|---|---|---|
| 1. Rate of investment, total economy | | | |
| GINV = | 14,51 + 0,884 RETU + 0,082 RLAN | | R-sq |
| | (7,322) (4,695) | (0,259) | 0,597 |
| 2. Rate of growth of output, non-agricultural business | | | |
| a: GVAO = | -0,509 + 0,575 RETU - 0,164 RLAN | | R-sq |
| | (-0,602) (7,163) | (-1,213) | 0,789 |
| b: GVAO = | -0,898 + 0,582 RETU - 0,362 GWDF | | |
| | (-1,297) (7,803) | (-1,951) | 0,815 |

GINV = gross fixed investment, total economy, % of GDP at constant prices
GVAO = % change in gross value added, volume terms.
RETU = net rate of return on gross capital stock, non-agricultural business.
RLAN = real rate of interest
GWDF = change in private holdings of public debt % of GDP.
NOTE: Data cover the six major OECD countries and three sub-period: 1961-70, 1971-80, 1981-84.

have, therefore, as far as can be seen, also in 1985 and 1986 risen by more than 1 GDP point per year in line with developments from 1979 to 1984. This persistence of a large additional annual claim on private financial resources may be assumed to be the main factor behind the apparent stickiness of real rates of interest in the OECD area.

As far as the real wage gap is concerned the levelling-off observed already in 1983 and 1984 seems to have prevailed in 1985 and 1986: for the area as a whole the real product wage (nominal wage per capita, deflated by the GDP deflator) does not seem to have, on average, increased by more than the growth of factor productivity. In response to the more moderate rise in real wage cost the rate of growth of employment has accelerated to somewhere above 1%. Although also the rate of growth of investment has accelerated in recent years, there has clearly been a slowdown of the rise in the capital/labour ratio. Other things equal, this somewhat more favorable employment/capital stock development, and the resulting increase in the rate of return on fixed capital may also (by going some way towards restoring a certain yield gap in favor of fixed capital) have contributed marginally to maintaining a relatively high level of real interest rates on government bonds and to maintain pressure on financial markets worldwide.

## 7. Summary and conclusions

Through an examination of quantitative evidence for the OECD area as a whole as well as cross-section data for the six major OECD countries, this paper attempts to throw light on some key questions facing macro-economic analysis in the present situation:

- why are interest rates so high?

- why did unemployment rise to the present high level?

- what can budgetary and monetary policy do to influence the level of activity?

- how can international policy coordination contribute to improving the economic performance of the OECD economies?

Starting from a conceptual framework based on a three-asset model with an exogenously determined real wage the paper examines some of the key stock-flow relationships in the OECD economy in order to test the feasibility of some of the key postulates in this approach, and notably the following:

- an increase in public interest bearing debt in proportion to GDP will lead to an increase in the real rate of interest;

- an increase in the gap between the real wage and total factor productivity will lead to (be accompanied by) an increase in the stock of fixed capital in proportion to GDP and in proportion to labour input.

These basic postulates are examined first with the help of time series analysis of aggregate data for the OECD area as a whole and second with the help of a cross-section analysis of data for the six major OECD countries: Germany, France, Italy, the United Kingdom, the United States and Japan.

The quantitative evidence suggests that the actual performance of the OECD economy over the last 25 years is compatible with the framework outlined above. More precisely, the following conclusions are drawn:

- changes over the medium and long term in the capital/labour ratio have been associated with an increase in the real wage gap. The cross-section analysis shows that the countries which have shown the lowest increase in the wage gap are also those which have shown the smallest increase in the capital/labour ratio.

- time series analysis shows a strong medium and long term correlation between the private holdings of public debt and the real rate of interest. Moreover, due to interaction between these two variables, the government budget deficit as adjusted for the effect of growth of nominal GDP on the ratio between public debt and GDP and for base money financing exerts a strong impact on the real rate of interest. The cross-section examination based on data for the six major OECD countries for three sub periods provides additional confirmation of this postulate. However, the cross-section data show this correlation only for the growth-adjusted budget balance but not for the unadjusted one, suggesting that the former is the appropriate definition for analyzing crowding-out phenomena;

- there are indications, cased on the cross-section data, that the real wage gap may exert a certain influence on the real rate of interest, a low real wage gap being associated with a relatively high real rate of interest and vice versa, an observation which is in line with the conceptual framework;

- the cross-section analysis, nevertheless, shows that the position of individual countries may diverge substantially from the situation observed for the OECD area as a whole, as regards both the development of the capital/labour ratio in relation to the real wage gap and the real rate of interest in relation to the change in private holdings of public debt. Thus, for policy makers of an individual OECD country it may well, during the past 25 years, have appeared possible for example to neutralize the effect of a rise in the real wage per hour through competitive devaluations or to escape the effect on the real rate of interest from a budget deficit

through external borrowing. For the OECD area as a whole, however, such "escape routes" have not been feasible and the impact of changes in the key parameters is, therefore, seen much more clearly in the OECD aggregates than in the data for individual countries.

The results of the present study, indeed, tend to emphasize the dangers for the OECD economy and for the rest of the world (notably the highly indebted LDCs) inherent in a continuation of the rise in the private holdings of public debt seen during the last 5-6 years for the OECD area as a whole. Although public debt in proportion to GDP is still relatively small, compared to, notably, the total amount of money and quasi-money or the total of fixed capital owned by the private sector, the annual increase of more than 1 GDP point in the private holdings of public debt is large in proportion to the financial saving of the private sector and, on the margin, is likely to exert a significant strain on financial markets.

More generally the results of the study shed some light on aspects of the international policy coordination which, hitherto, have been left somewhat in the shadow. In fact, and notably in the context of the "concerted action" of 1978 (the concerted fiscal reflation undertaken after Bonn summit, and which was reflected in both a rise in the cyclically adjusted budget deficit of the OECD countries as a whole and a significant rise in the base money/GDP ratio) the tendency has normally been to underline the gains from a undertaking a fiscal reflation in a framework of international coordination. In fact, if fiscal reflation is undertaken by a large group of inter-related countries, the balance of payments constraints on such action will be much smaller than in case a fiscal reflation is undertaken by a single country. The present study, however, shows that a concerted increase in the fiscal deficit for, say, the OECD area as a whole, as actually observed after 1978, may lead to a progressive rise in the real rate of interest which, in the medium term, will not only nullify the

beneficial effects of the fiscal reflation but actually lead to a lower level of activity and employment than would have been achieved without this fiscal reflation. Unfortunately the negative effects are not felt in the short term and are in any case only felt in a diffuse and indirect way by the single country - even if it is a dominant economy in the OECD context.

Another issue raised by this study is related to the possibility for the individual country to improve its long-term position by implementing a fiscal consolidation in isolation[1]. Since, as shown above, the relation between the real rate of interest and the budget deficit on the level of the single country is uncertain, influenced as it may be by fiscal policy in other countries and by capital movements, the perceived gains from fiscal consolidation "in a single country" may be too small to be worth the political investment required. As suggested in a recent study of the problems of international policy coordination[2] it would, therefore, be highly desirable that aggregate budgetary and monetary targets be fixed in such a way as to be consistent with a sustainable path of private financial saving and, hence, private holdings of public debt for the OECD area as a whole.

As far as the present situation is concerned, the results of the study do suggest that a sustainable reduction of the real rate of interest in the OECD area will require a significant reduction of the growth-adjusted budget deficit for the area as a whole. On the other hand, although there are some indications of a long-term crowding-out of private activity as a result of persistent government deficits, the study also underlines that the real rate of interest on government debt seems to exert a relatively weak influence on economic growth. In

1 For a further discussion of this point see also Tullio (1986) which presents findings and conclusions largely consistent with those presented above.

2 See Steinherr (1984) in European Economy N°20, July 1984.

contrast, the cross-section analysis suggests that the real wage gap and the rate of return on fixed capital interact strongly with the rate of growth of output and that a strengthening of the latter and, consequently of the growth of employment, will require not only a lowering of the real rate of interest but also, and much more significantly, a substantial improvement of the rate of return on investment.

## References

BLANCHARD, O. and SUMMERS, L.H.: "Why are world real interest rates so high?" Mimeographed version, May 1984.

BLANCHARD, O., DORNBUSCH, R., DREZE, J., GIERSCH, H., LAYARD, R. and MONTI, M.: "Employment and growth in Europe: A two-handed approach" Report by the CEPS Macroeconomic Policy Group, EC Economic Paper No. 36, June 1985.

BRUNNER, K. and MELTZER, A.H.: "An aggregative theory for a closed economy" in "Monetarism" ed. J.L. Stein, North-Holland Studies in Monetary Economics, 1976.

CHOURAQUI, J.C., and PRICE, R.W.R.: "Budget deficits in Europe and the United States: fiscal policy asymmetry and the sustainability of the current recovery", paper prepared for the Conference on "Europe and the Dollar", Turin 4th and 5th June 1984.

CUKIERMAN, A. and MORTENSEN, J.: "Monetary assets and inflation-induced distortions of the national accounts - conceptual issues and correction of sectoral income flows in five EEC countries" EEC Economic Paper No. 15, May 1983, reprinted in Studies in Banking and Finance, Vol. 1, North-Holland, 1985.

CURRIE, D.: "Crowding-out and fiscal policy in the economies of the European Community" unpublished report prepared for the Commission of the European Communities, October 1984.

LAYARD, R., BASEVI, G., BLANCHARD, O., BUITER, W. and DORNBUSCH: "Europe: the case for unsustainable growth", EC Economic Paper No. 31, April 1984.

MORTENSEN, J.: "Profitability, relative factor prices and capital/labour substitution in the Community, the United States and Japan, 1960-83", European Economy No. 20, July 1984.

STEINHERR, A.: "Convergence and coordination of macroeconomic policies: some basic issues", European Economy, No. 20, July 1984.

TANZI, V.: "Inflation expectations, economic activity, taxes and interest rates", American Economic Review, Vol. 70, 1980.

TODD, D.: "Some aspects of industrial productive performance in the European Community: an appraisal", European Economy No. 20, July 1984.

TODD, D.: "Factor productivity growth in four EEC countries, 1960-1981" EC Economic Paper No. 34, October 1984.

TULLIO, G.: "Long run implications of the increase in taxation and public debt for employment and economic growth in Europe", EC Economic Papers No. 49, August 1986.

WYPLOSZ, C.: "International aspects of the policy mix in six OECD countries", Paper prepared for the World Bank - Brookings workshop on the International consequences of budgetary deficit and the monetary-fiscal policy mix in the OECD, September 1984.

"Productive supply in the Community", in Annual Economic Review, European Economy, No. 29, July 1986.

# TECHNICAL ANNEX

## A. Statistical data: sources and methodology

### A.1 Gross domestic product and GDP deflator

Data on GDP and the GDP deflator have been extracted from the EUROSTAT data bank (CRONOS). Series covering the EC Member States correspond to the standardized national accounts system (SEC) while for the non-EC countries compatibility is not fully guaranteed.

Except where otherwise indicated the aggregates for the OECD area as a whole have been calculated as weighted geometrical means of the country data. The weights correspond to the country's share of the OECD area's gross domestic product, converted at current purchasing power parity, following the methodology of the EUROSTAT-statistics. Purchasing power parities for the years subsequent to 1980 - the last year for which a relative price survey was available - have been approximated by extrapolation using the relative changes in the GDP-deflator. For further details on the purchasing power parity approach the reader is referred to EUROSTAT publications.

The use of current purchasing power parity weighting is clearly preferable to a weighting scheme based on current exchange rates, since the latter entails major short term changes in the relative weight of, notably, the United States. At the same time the current purchasing parity based weight ensure that the weight of, notably, Japan in the OECD average is gradually raised in the course of the period in line with the relative expansion of the output of the Japanese economy.

The geometrical weighting scheme, which in practice is equivalent to calculating the area average on the basis of the percentage changes in the country data is necessary to ensure "reversability" of the calculation. In fact, an arithmetically weighted Laspeyre index leads to a gradual increase in the weight of the series with rising values over time - a feature which may not always be appropriate, and which, in any case, entails a distortion in case the aggregate (average) is calculated with moving weights. The chosen weighting scheme has the advantage of being applicable both for current price and for volume series alike.

### A.2 Interest rate data

Interest rate data were extracted from the data bank of the Commission services and originate from national sources. Typically the series on long term interest rates cover yields on government bonds and/or semi-public institutions and public enterprises while the short term interest data in most cases cover yields on 3-month interbank deposits or, in a few cases, on 3-month treasury bills. Area aggregates were calculated as the weighted geometrical mean of the country data. In

the case of Japan data were lacking for most of the 1960 and rates were simply extrapolated backwards from the known level.

A.3 Base money and money supply data

Data on base money developments were extracted directly from the IMF International Financial Statistics. The series include money in circulation outside the banks and commercial bank reserves with the central bank (item 14 in IFS statistical tables).

The money supply series used in the paper correspond to the broad definition of money supply, the M2/3 definition, which includes circulating notes and coins, current bank deposits and various assets with banks and other financial institutions in the form of deposit accounts, savings accounts or short-term notes. Details on the definitions of series for EC Member States can be found in the technical annex to European Economy No. 26, 1985.

A.4 Data on factor inputs, factor cost and productivity

The data on capital/output ratio, capital/labour ratio, labour cost and productivity presented above cover only Germany, France, Italy, the United Kingdom, the United States and Japan. They are extracted from a data bank created by the Commission services in 1985-86 for the purpose of analyzing profitability and productivity developments more thoroughly than had been the case in the past. The series cover non-agricultural business, excluding housing (data for the manufacturing sector are available in the data bank). Details on the definitions and on certain estimation procedures have been provided in an internal paper (DGII 05077 of 6. June 1986) and are therefore not reproduced here.

The capital stock series used in this study have been adjusted for fluctuations in capacity utilization following the methodology outlined in the article on "Productive supply in the Community" - European Economy No. 29, July 1986. The rate of capacity utilization used is that indicated in the Community business surveys with earlier data coming from national sources or being based on deviations from trend rates of growth in the early 1960s. The data for employment take account of an adjustment for change in working hours per week. In fact, since the weekly working time has fallen considerably faster in Europe than in Japan and the United States, the series on hours worked provide a more appropriate indication of the relative developments of labour input than series on the number of persons employed.

The figures on factor productivity have been calculated using the methodology described in the article referred to above and in Douglas Todd: "Factor productivity growth in four EEC Countries" (EC Economic Paper No. 34, October 1984). The broad aim of this calculation is to separate the growth in labour productivity in two parts:

- a part attributable to a "genuine" growth in output per unit of factor input taking account not only of the input of labour but also of the input of capital;

- a part attributable to an increase in the amount of capital used per unit of labour input.

The first-mentioned part of productivity increases is termed "factor productivity" since, as indicated, it is based on total factor input, while the second part is termed "productivity effect of the change in factor mix" or "effect of factor substitution".

The calculation of factor productivity growth is done as follows:

$$TFP = LP - aCI$$

where 'TFP' is the percentage change in factor productivity, 'LP', the percentage change in output per unit of labour input (in this case, the number of hours worked), 'a' is the share of profits in national income and 'CI' is the percentage change in the amount of capital per unit of labour input (capital intensity).

The factor productivity growth defined as indicated above has been used to calculate the 'real wage gap' which, in this study, is identified as a key "driving force" in the economic system, alongside the changes in the portfolio structure. The real wage gap is calculated as the real wage per unit of labour input divided by the index of factor productivity. The real wage per unit of labour input is calculated as a cost concept, using the value added deflator and for the purpose of this study based on hours worked.

In calculating the real wage gap on the basis of factor productivity growth rather than on the basis of labour productivity growth, account is taken of the possibility that the apparent labour productivity growth may be brought about in part through elimination of unproductive jobs and/or an increase in the capital intensity of production. In fact, as have been observed in practice in Europe over a long period, the actually observed increases in labour productivity tend to "cover" the real wage increases ex post, but do not give any indication as to the "ex ante" tension which may have existed between the underlying productivity increase and the rise in real wage costs per hour as perceived by the firms. The calculated factor productivity growth, on the other hand, can be assumed to correspond (or to approximate) the underlying rate of "technical progress" in the economy and the difference between the rise in real wage cost per hour and the rise in factor productivity is, therefore, the most unbiased indicator for the part of real wage increases which are not ex ante covered by productivity increases. A rise in the real wage gap will, therefore, be reflected either in a decline in profits in proportion to national income or in a rise in the capital/labour ratio. The latter may reflect either a fall in employment or a rise in the stock of capital but will in practice be a combination of both.

## A.5 Public debt data and the public debt/GDP ratio

The public debt concept aimed at in this study is the net financial position of the general government, calculated as gross liabilities less the financial assets of general government. As underlined in Cukierman and Mortensen (1983 and 1985) there are strong conceptual reasons for considering the central bank as a part of general government and to consolidate the two accounts, both as far as stock and flow statistics are concerned. In practice national accounts statistics most often consider the central bank as a part of the financial sector, implying that the transactions between the general government and the central bank are included in the data on transactions between general government and the rest of the economy. More specifically this procedure implies that the part of public debt which is held by the central bank as a collateral against liabilities to the banks or the general public is considered in accounting terms as government liabilities alongside debt held directly by the private sector.

This is by no means the only statistical problem arising with respect to the interpretation of data on public debt. In fact, since the standardised system of national accounts adopted by the international organisations in the post-war period focussed exclusively on the flow statistics, no clear guidelines have until recently been worked out for balance sheet data and the official, national series on government assets and liabilities, consequently, are highly heterogeneous with respect both to the items covered and to the sectoral classification. Thus, in some cases the available data cover only central government but not local government and social security while, in others, the data cover only gross liabilities but not financial assets. An attempt to produce internationally comparable series was done in the context of the study of "monetary assets and inflation-induced distortions af national accounts" undertaken by the Commission services in 1983/1984 and published in volume I of Studies in Banking and Finance. However, these data are not available on a permanent basis and it has been considered outside the scope of the present study (and indeed beyond the possibilities of a single person within the time available for the study) to extend these adjustments both in time and in space (to cover the non-EC countries).

As a second best approach, it has generally been assumed that the available statistical series in most cases come close to representing the total net monetary liabilities of general government, including the debt to the central bank. In terms of the conceptual framework presented in the study above, is has, thus, been assumed that the official data on public debt found in national statistical publications constitute an approximation of total monetary liabilities of the extended government sector, including the central bank. Consequently the amount of government debt which is held outside the central bank can be approximated by deducting the amount of base money from the total of monetary liabilities. As shown in the analysis of regression results in the main text, there are strong indications that, at least for the OECD area as a whole, this approach provides a "reasonable" approximation of the true figure for interest bearing

debt in the hands of the general public of the banking system (as a collateral for deposits).

As far as sources of the statistical data are concerned, the series for the EC-member states have been extracted from national publications while the series for the three non-EC member states have been extracted from the IMF International Financial Statistics (line 88 in the IFS Yearbook). Certain debt data for the early 1960s have been estimated by the author on the basis of existing debt statistics combined with the budget balance data and using the stock/flow consistency relation defined in the main body of this study.

A.6 Adjustment of budget balance data for cyclical fluctuations

In various attempts made in the 1960s with the purpose of determining whether the stance fiscal policy was "adequate" with a view to the full employment objective it was quite common to calculate the "full employment budget balance" as a measure of the level at which the budget balance could be supposed to settle under conditions of full employment in the economy. This approach, which is still followed in some institutions, involved recalculating a theoretical budget balance "as if" all elements of the economic system were requalibrated to a level of full employment.

The calculation of a "full employment budget surplus", if valid at all, will provide biassed results if a part of the unemployment is "classical", that is, due to a real wage gap, rather than "keynesian", that is, attributable to fluctuations of activity around a medium- or long-term trend. As indicated above, there are rather strong indications that the rise in unemployment in the OECD area in the 1970s and the 1980s may to a considerable extent be due to the steady rise in the "real wage gap" (the real wage per unit of labour input as divided by an index for factor productivity) and, thus, be largely of a classical nature.

Given that, under those conditions, any measure of the "adequacy" of fiscal policy would create a false picture of the real underlying trend movement of public debt in proportion to GDP the present study has aimed at eliminating only the estimated effects on the budget balance of fluctuations of activity (GDP) around its calculated medium-term trend. Since, moreover, the trend has changed in the course of the 1961-1984 period, the adjustment has been made with the help of a "spline regression" - calculating the trend with a break in 1973. In the present study only the aggregate budget balance for the OECD area as a whole has been adjusted for cyclical variations but not the figures used in the cross-section analysis. The adjustment has been made simply by eliminating from the budget balance the effects of the deviation of GDP from its trend, estimated by ordinary least squares. The result of this regression of the budget balance on the deviation of GDP from its trend, however, gives a result which is well in line with more detailed estimates of the effect of cyclical fluctuations on the budgetary aggregates: a deviation of GDP of 1% from its trend tend to lead to a deviation of the budget balance of about 0,6% GDP points from its cyclically neutral level.

B. Bilateral correlation coefficients

| | WPRO | RLAN | PGDP | LINT | SINT |
|---|---|---|---|---|---|
| WPRO | - | - | - | - | - |
| RLAN | 0,27 | - | - | - | - |
| PGDP | 0,69 | -0,39 | - | - | - |
| LING | 0,94 | 0,41 | 0,65 | - | - |
| SINT | 0,86 | 0,34 | 0,67 | 0,96 | - |
| NADF | -0,78 | -0,49 | -0,38 | -0,77 | -0,59 |
| GADF | -0,72 | -0,44 | -0,39 | -0,72 | -0,54 |
| GWDF | 0,84 | 0,43 | 0,47 | 0,85 | 0,76 |
| GOND | -0,00 | 0,81 | -0,56 | 0,07 | -0,01 |
| PROG | 0,15 | 0,86 | -0,45 | 0,23 | 0,14 |
| CAPY | 0,89 | 0,57 | 0,44 | 0,89 | 0,75 |
| CALO | 0,99 | 0,35 | 0,61 | 0,93 | 0,87 |
| BMNP | -0,91 | -0,58 | -0,44 | -0,94 | -0,86 |
| BMNT | 0,08 | -0,78 | 0,47 | 0,17 | 0,16 |
| SMNP | 0,96 | 0,37 | 0,55 | 0,87 | 0,77 |
| SMNT | 0,09 | 0,15 | 0,13 | 0,26 | 0,34 |

## C. Stability tests

The following graphs present the value of constants and coefficients as estimated by two series of regressions testing respectively the forward and the backward stability of the coefficients.

The upper part of the graph indicates for the equation in question the outcome of regressions starting with the 1962-1973 period and ending with the 1962-1984 period. The horizontal axis of the graph, thus, indicates the end year of the regression.

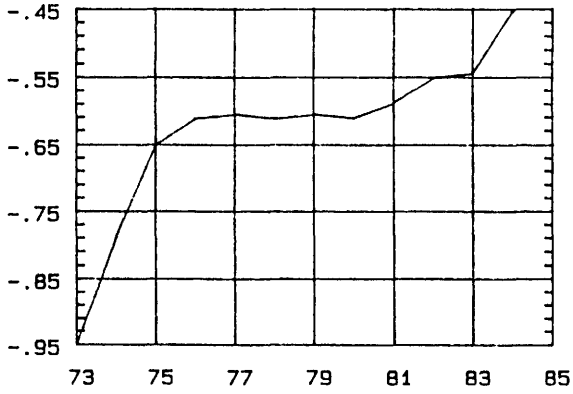
The lower part of the graph indicates for the same equation the outcome of regressions beginning with the regression over the whole period 1962-1984 and ending with the period 1973-1984. The horizontal axis of the graph, thus, indicates the starting year of the regression.

(The regressions and the graphs have been executed with the help of the TROLL-program and a plotting facility of the data room of the Directorate General for Economic and Financial Affairs.)

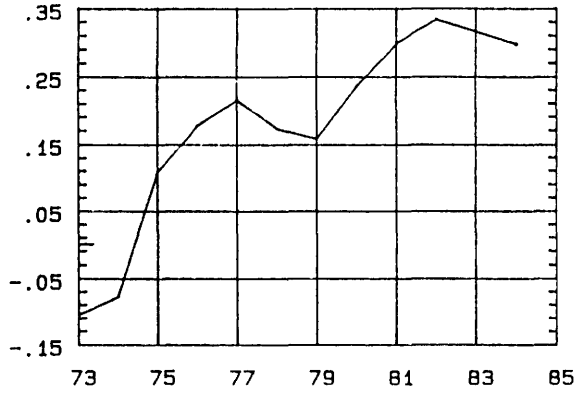
Stability test: equation 3, Table 7

RLAN=C+A1*GWDF+A2*RLAN(-1)

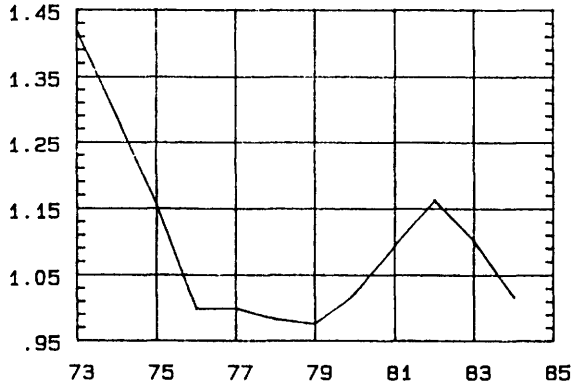
CONSTANT



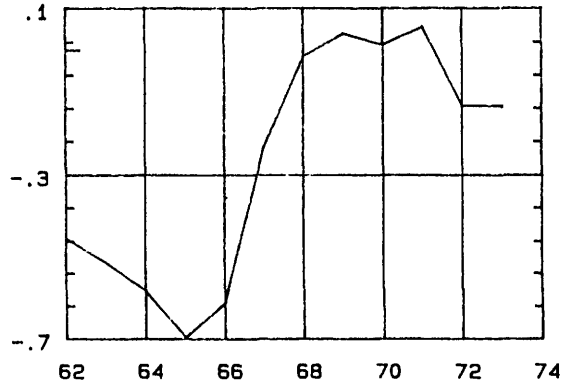

COEFFICIENT A1



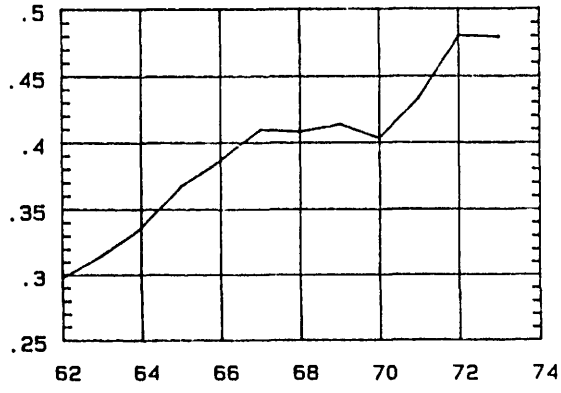

COEFFICIENT A2



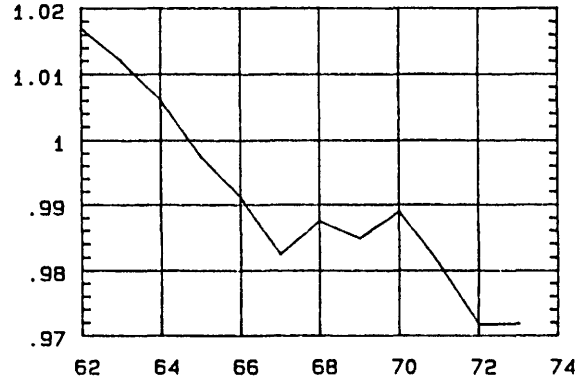

CONSTANT



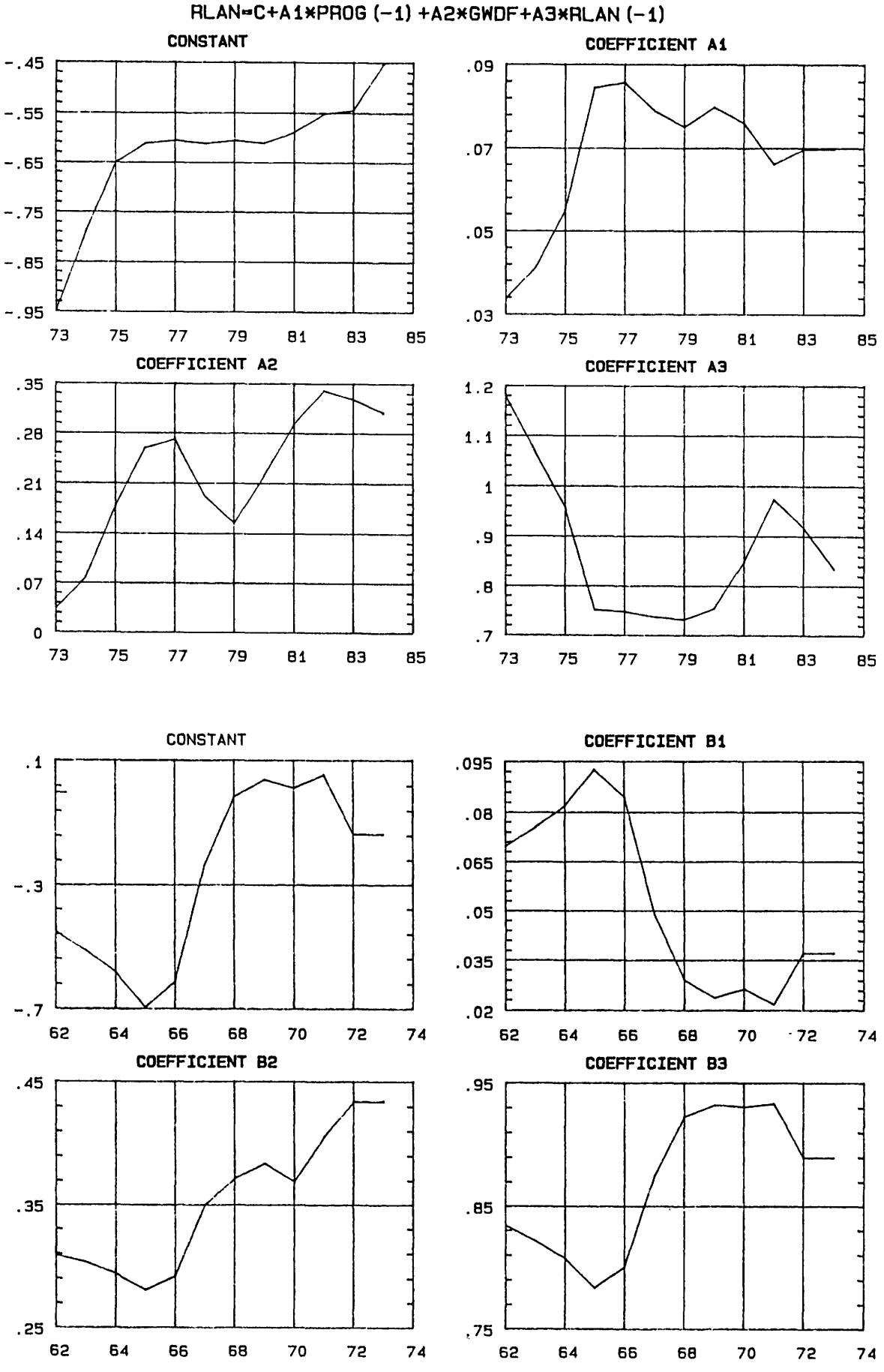

COEFFICIENT B1




COEFFICIENT B2



Stability test: equation 5, Table 7



D. Basic data, OECD total

| | CAPY 1960=100 | CALO 1960=100 | WPRO 1960=100 | RETU % | GOND % GDP | PROG % GDP | BMNP % GDP | SMNP % GDP | LINT % | SINT % | RLAN % | PGDP % ch. | GAPA % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1961 | 100,0 | 102,1 | 100,2 | 9,71 | 32,8 | 22,3 | 10,5 | 55,9 | 4,8 | 3,3 | 2,0 | 2,6 | -0,2 |
| 1962 | 99,0 | 107,3 | 101,3 | 10,09 | 30,8 | 20,6 | 10,2 | 56,8 | 4,8 | 3,5 | 2,0 | 3,0 | -0,2 |
| 1963 | 98,0 | 112,2 | 102,3 | 10,55 | 30,8 | 20,6 | 10,2 | 58,9 | 4,9 | 3,7 | 1,9 | 2,9 | -0,7 |
| 1964 | 96,0 | 118,7 | 103,5 | 11,18 | 27,3 | 17,3 | 10,0 | 59,2 | 5,1 | 4,1 | 2,0 | 3,1 | 0,1 |
| 1965 | 95,5 | 124,8 | 104,2 | 11,64 | 26,0 | 16,1 | 9,9 | 60,3 | 5,3 | 4,5 | 2,1 | 3,1 | 0,0 |
| 1966 | 95,0 | 130,6 | 104,8 | 12,26 | 24,4 | 14,7 | 9,7 | 59,4 | 5,8 | 5,2 | 2,3 | 3,8 | 0,1 |
| 1967 | 96,5 | 133,6 | 105,3 | 12,16 | 24,3 | 14,7 | 9,6 | 61,3 | 5,8 | 4,7 | 2,1 | 3,2 | -0,3 |
| 1968 | 96,0 | 142,4 | 107,5 | 12,29 | 23,1 | 13,6 | 9,5 | 61,4 | 6,1 | 5,5 | 2,1 | 4,3 | 0,7 |
| 1969 | 96,5 | 151,0 | 110,2 | 11,89 | 20,9 | 11,8 | 9,1 | 59,2 | 6,9 | 6,7 | 1,6 | 5,1 | 1,3 |
| 1970 | 99,0 | 154,5 | 113,8 | 10,56 | 20,0 | 10,8 | 9,2 | 60,0 | 7,5 | 6,8 | 1,3 | 6,2 | -0,4 |
| 1971 | 101,0 | 159,4 | 115,4 | 9,81 | 20,5 | 11,2 | 9,3 | 63,4 | 6,9 | 5,1 | 1,2 | 6,0 | -0,9 |
| 1972 | 100,0 | 171,3 | 117,9 | 9,86 | 19,4 | 9,9 | 9,5 | 67,0 | 6,7 | 4,7 | 0,7 | 5,4 | 0,2 |
| 1973 | 98,5 | 184,7 | 122,4 | 9,32 | 17,9 | 8,2 | 9,7 | 66,8 | 7,5 | 7,8 | 0,0 | 7,6 | 2,3 |
| 1974 | 104,0 | 187,9 | 126,6 | 7,26 | 17,2 | 7,9 | 9,3 | 65,9 | 9,1 | 9,3 | -0,5 | 12,2 | -0,8 |
| 1975 | 110,6 | 181,4 | 127,0 | 6,42 | 20,4 | 11,3 | 9,1 | 66,9 | 8,8 | 6,7 | -0,5 | 11,1 | -3,6 |
| 1976 | 108,1 | 192,0 | 128,2 | 6,82 | 21,4 | 12,6 | 8,8 | 67,3 | 8,8 | 6,9 | 0,5 | 7,9 | -1,3 |
| 1977 | 107,6 | 200,5 | 129,5 | 6,86 | 23,0 | 14,5 | 8,5 | 67,8 | 8,4 | 6,4 | 1,0 | 7,4 | 0,4 |
| 1978 | 106,6 | 207,9 | 130,5 | 7,22 | 24,1 | 15,4 | 8,7 | 68,6 | 8,5 | 7,0 | 1,1 | 7,5 | 2,1 |
| 1979 | 107,1 | 218,4 | 133,1 | 6,84 | 24,1 | 15,7 | 8,4 | 68,6 | 9,4 | 9,4 | 1,3 | 8,2 | 2,9 |
| 1980 | 111,1 | 219,9 | 134,2 | 6,30 | 25,2 | 17,2 | 8,0 | 68,7 | 11,3 | 11,4 | 2,4 | 9,6 | 1,4 |
| 1981 | 114,1 | 224,5 | 134,8 | 5,82 | 26,5 | 19,0 | 7,5 | 69,3 | 13,0 | 13,0 | 3,7 | 8,5 | 1,2 |
| 1982 | 119,7 | 227,2 | 136,5 | 5,04 | 30,4 | 22,8 | 7,6 | 71,7 | 12,2 | 10,7 | 5,2 | 7,2 | -2,2 |
| 1983 | 120,2 | 236,7 | 137,0 | 4,98 | 33,4 | 25,9 | 7,5 | 73,3 | 10,7 | 8,8 | 5,9 | 4,9 | -2,4 |
| 1984 | 119,2 | 244,0 | 136,7 | 5,17 | 35,6 | 28,2 | 7,4 | 73,7 | 10,5 | 9,1 | 5,9 | 3,7 | 0,0 |

## NOTES AND DEFINITIONS

CAPY = capital/output ratio, stock of capital adjusted for capacity utilisation.
CALO = stock of capital per hour worked, adjusted for capacity utilisation.
WPRO = real wage gap: real compensation per hour worked (deflated with the deflator of value added) divided by the index of factor productivity.
RETU = net rate of return on gross capital stock (at replacement cost).
GOND = general government net monetary debt, % of GDP.
PROG = general government net debt less the monetary base % of GDP.
BMNP = monetary base (notes and coins outside the banking system and reserves with the central bank) as % of GDP.
SMNP = money supply ($M_2/3$) as % of GDP.
LINT = long-term rate of interest (generally the yield on long-term government bonds or bonds issued by semi-public institutions).
SINT = short-term rate of interest (generally the yield on three-month interbank deposits or equivalents).
RLAN = Real long-term rate of interest; calculated as the moving three-year average of the difference between the long-term rate of interest and the change in the GDP deflator. Observations for 1975 and 1976 have been adjusted to eliminate the effect of a transistory increase in current inflation rates.
PGDP = Percentage change in the GDP deflator.
GAPA = Difference between actual and trend volume of GDP and trend volume of GDP as % of the trend value.

E. Basic data for the cross-section analysis

| | | WPRO | RETU non-agr.buss. | CALO | GVAO | GINV (tot.ec.) | NADF | GADF | GWDF | PFIN | GOND | PROG | RLAN | BMNP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D | 1961-70 | 2,96 | 11,6 | 7,82 | 4,8 | 24,9 | 0,41 | -0,74 | 0,90 | 1,45 | -16,9 | -27,9 | 3,16 | 11,0 |
| | 1971-80 | 2,15 | 8,4 | 5,66 | 2,9 | 22,3 | -2,07 | -2,19 | 2,20 | 2,81 | -7,8 | -18,2 | 2,79 | 10,4 |
| | 1981-84 | -0,45 | 7,6 | 3,92 | 0,4 | 20,8 | -2,90 | -2,17 | 2,25 | 2,48 | 16,0 | 6,6 | 5,27 | 9,4 |
| F | 1961-70 | 1,45 | 11,3 | 4,69 | 6,6 | 22,9 | 0,38 | 1,85 | -1,52 | -1,52 | 20,0 | 5,2 | 2,07 | 14,8 |
| | 1971-80 | 2,65 | 8,8 | 5,46 | 3,9 | 22,9 | -0,29 | 0,35 | 0,05 | -0,48 | 5,2 | -5,7 | 0,81 | 10,9 |
| | 1981-84 | 1,08 | 6,4 | 5,14 | 1,1 | 20,2 | -2,60 | -1,80 | 1,93 | 0,18 | 6,4 | -0,1 | 4,65 | 6,5 |
| I | 1961-70 | 2,16 | 8,4 | 7,15 | 6,9 | 21,3 | -2,30 | 1,45 | -1,72 | -0,03 | 37,4 | 22,8 | 2,16 | 14,6 |
| | 1971-80 | 1,79 | 4,4 | 4,29 | 3,6 | 20,1 | -8,26 | 1,34 | -1,50 | -1,72 | 40,8 | 22,6 | -3,23 | 18,2 |
| | 1981-84 | 1,76 | 3,0 | 2,29 | 0,6 | 18,8 | -12,60 | -1,90 | 2,10 | 0,95 | 65,1 | 47,4 | 3,10 | 17,7 |
| UK | 1961-70 | 1,78 | 7,4 | 4,53 | 2,9 | 18,3 | -0,62 | 3,68 | -3,53 | -3,61 | 71,7 | 61,3 | 2,78* | 10,4 |
| | 1971-80 | 1,30 | 5,2 | 3,60 | 1,6 | 19,2 | -3,26 | 1,23 | -0,83 | -1,52 | 37,8 | 30,0 | -1,65 | 7,8 |
| | 1981-84 | 0,70 | 4,4 | 6,86 | 2,0 | 16,7 | -3,57 | -1,32 | 1,52 | 2,75 | 22,6 | 17,7 | 5,25 | 4,9 |
| US | 1961-70 | 0,51 | 9,9 | 2,05 | 4,1 | 18,0 | -0,59 | 1,79 | -1,62 | -1,12 | 41,1 | 31,4 | 1,79 | 9,7 |
| | 1971-80 | 0,51 | 6,5 | 1,84 | 3,3 | 18,5 | -1,17 | 1,42 | -1,24 | -1,20 | 27,1 | 18,8 | 0,24 | 8,3 |
| | 1981-84 | -0,26 | 4,2 | 1,10 | 2,5 | 17,5 | -3,10 | -0,65 | 0,83 | -0,07 | 24,3 | 18,5 | 5,75 | 5,8 |
| Jap | 1961-70 | 2,16 | 21,4 | 9,44 | 12,5 | 32,4 | -1,54 | -0,65 | 0,64 | 0,77 | 4,2 | -4,6 | 1,14 | 8,8 |
| | 1971-80 | 4,29 | 12,9 | 6,12 | 5,9 | 32,7 | -2,18 | -0,83 | 0,71 | 1,25 | 6,4 | -2,4 | 0,68 | 8,8 |
| | 1981-84 | 1,39 | 7,4 | 1,40 | 4,0 | 29,1 | -3,55 | -1,67 | 1,64 | 3,19 | 33,1 | 23,8 | 6,20 | 9,3 |

* RLAN adjusted: -2,00

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