

BANCO DE ESPAÑA

SAVING, INVESTMENT AND INTERNATIONAL  
CAPITAL MOBILITY IN EC  
COUNTRIES

Isabel Argimón and Jose M<sup>a</sup> Roldan

SERVICIO DE ESTUDIOS  
Documento de Trabajo nº 9110

BANCO DE ESPAÑA

SAVING, INVESTMENT AND INTERNATIONAL  
CAPITAL MOBILITY IN EC  
COUNTRIES

Isabel Argimón and José M<sup>a</sup> Roldán (\*)

(\*) The authors are grateful to J. J. Dolado for his help and advice and to J. C. Delrieu, J. M. González-Páramo, A. Marcet, J. Marín, J. Pérez and J. L. Vega for their comments and suggestions.

SERVICIO DE ESTUDIOS  
Documento de Trabajo nº 9110

In publishing this series, the Banco de España seeks to diffuse worthwhile studies that help acquaint readers better with the Spanish economy.

The analyses, opinions and findings of these studies represent the views of their authors; they do not necessarily coincide with those of the Banco de España.

ISBN: 84-7793-101-1

Depósito legal: M. 21040 - 1991

## ABSTRACT

For the past fifteen years, capital movements have been increasingly liberalised in most industrialized countries. From a theoretical point of view, if capital is perfectly mobile between countries, national savings should respond to global investment opportunities and national investment should be financed drawing on the global pool of capital. Accordingly, there should be no empirical relationship between national saving and investment; yet this was not observable in the analysis.

To explain such a result a simple macroeconomic model of an open economy is developed. Drawing on different assumptions on the behaviour of the private and public sectors and on alternative scenarios of international capital mobility, causality relationships are derived between saving and investment and between the private-sector and public-sector saving-investment gaps. Cointegration is used to measure the resulting relationships between these sets of variables in EC countries over the 1960-88 period.

The paper shows that there has been a lack of any reaction by budgetary policy to the current-account balance in all the countries under study. Furthermore, the empirical results suggest that capital controls have been the main instrument used to target the external balance.



## 1. INTRODUCTION

The effect of the liberalisation of capital movements on the relationship between domestic saving and investment has been subject to considerable debate. From a theoretical point of view, if capital is perfectly mobile between countries, national savings should respond to global investment opportunities and national investment should be financed drawing on the global pool of capital. Accordingly, there should be no empirical relationship between national saving and investment. However, Feldstein and Horioka (1980) found that saving and investment were highly correlated, in the sense that the estimated coefficients of the regression of the ratio of saving to output on the investment-output ratio was generally not significantly different from one. Furthermore, no decline in these coefficients was observed, leading Feldstein and Horioka to conclude that the level of international capital mobility was very low and, moreover, had not increased in recent years.

Despite the existence of these high correlations, other tests of capital mobility using different approaches challenged their conclusions (see, among others, Ghosh (1990), Feldstein and Bacchetta (1990), Baxter and Crucini (1990), Frankel (1990)). Subsequent research has offered alternative hypotheses to explain the high correlation observed between national saving and investment (see Bacchetta (1990) for a survey of this literature). Among such hypotheses are those indicating that this relationship might be determined, at national level, by the behaviour of the private sector. Factors which affect the private sector and which might explain this high correlation include demographic growth, productivity shocks and segmentation in the goods market as a result of imperfect substitutability between domestic and foreign consumer goods. Nevertheless, the empirical tests performed by Bayoumi (1990) would appear to refute such interpretation of the role of the private sector.

A competing explanation links the existence of this high correlation to the importance of current account targets in the design of economic policy. From a theoretical point of view, there is no clear-cut explanation why the external equilibrium is desirable. However, from a policy perspective (see Artis and Bayoumi (1989) and Bacchetta (1990)) the adoption of such a target might be given some rationale. The test on the adoption of this target in some countries, carried out in Artis and Bayoumi (1989), demonstrates that monetary policy appears to respond to the current-account balance.

This paper seeks to measure the observed correlations between national saving and investment in EC countries over the 1960-88 period and to explain the reasons for their occurrence. A simple macroeconomic model of an open economy is developed. Drawing on different assumptions on the behaviour of the private and public sectors and on alternative scenarios of international capital mobility, causality relationships between saving and investment and between the private-sector and public-sector saving-investment gaps are derived. Cointegration is used to measure the resulting relationships between national saving and investment and between sectoral gaps. The use of cointegration is a methodological novelty in this line of research. By not having to resort to estimation in differences, the distinction between short-term and long-term responses is retained and the long-term causality direction can be observed. The comparison between the empirical results and the model's predictions allows to determine whether capital has been mobile among economies.

The main conclusion of the paper is that budget policy has not been used in EC countries to target the external balance. Furthermore, the predictions on the degree of international capital mobility, derived from the tests, do not conflict with the aprioristic ideas about the effectiveness of capital controls. The results on correlations between saving and investment and on the degree of capital mobility reflect the presence or absence of capital controls at country level.

The paper is organized as follows. Section 2 outlines the theoretical framework and the model's predictions as far as

causality relationships are concerned. Section 3 presents the empirical results obtained with annual data for the 1960-88 period for all the EC countries except Luxembourg, Portugal and Greece (1964-89 for Spain). Finally, section 4 summarises the main findings. The Appendix develops the theoretical model, describes the tests and presents the tables with the results.

## 2. A SIMPLIFIED ANALYTICAL FRAMEWORK

This section briefly describes the main features of a highly simplified theoretical model drawn from Feldstein (1983) and Levy (1990) and discusses its main predictions. A more formal presentation is left to the Appendix, where the implications for the investment-saving relationship and for the public-private sector gaps relationship of a perfect capital mobility and a lack of it are analytically derived.

The starting point is the basic national accounting identity of an open economy, which states that the difference between national saving (S) and national investment (I) must be financed (if negative) through capital inflows. If these variables are broken down by sector, the identity can be written as

$$(S_p - I_p) + (S_g - I_g) = K$$

where K represents net capital outflows, and the subscripts p and g refer to the private sector and the public sector, respectively.

Causality relationships between saving and investment and between the sectoral gaps  $(S_p - I_p)$  and  $(S_g - I_g)$  as a percentage of Gross National Product are analysed under alternative assumptions.

First, fiscal policy will be allowed to be endogenous, in the sense that the public sector targets the current-account through budgetary policy. Accordingly, the public sector gap will be set as to offset a proportion  $\alpha$  of the private saving-investment gap in response to current account imbalances. Some reasons have been put forward to justify this kind of policy reaction. One such reason relates to the correction of social inefficiencies in the private allocation of foreign investment. While on social grounds the



correct stance would be to compare foreign returns after tax with domestic returns before tax (since tax remains in the home country), when domestic agents decide about investing abroad they only take into account expected returns after tax. Another argument, mostly non-economic, is the desire to restrict the impact of foreign capital on the domestic economy. Further reasons that have been put forward are the need to restrain the negative effects on external equilibrium of inflationary pressures arising from excess domestic demand, and to bring the current-account balance back onto a sustainable path, thus preventing potential external-deficit-sustainability problems.

Private-sector saving will be allowed to offset a portion  $\beta$  of the budget deficit. This behaviour can be justified under Ricardian equivalence, i.e. private agents foresee in the budget deficit the future taxes that will have to be paid to close the budget gap. Conversely, when there is a budget surplus, private agents foresee the future tax reductions associated with the present accumulation of wealth.

It will further be assumed that private investment is a decreasing function of the real rate of interest and that private saving is an increasing function of the same variable. Public investment will be kept exogenous, and capital outflows will be assumed to depend inversely on the real rate of interest.

Two polar scenarios are considered. In the first, there is perfect capital mobility, whereas in the second, mobility is null. Taking into account the effects on the endogenous variables under study (private and public saving and private investment) of different shocks to public and private investment and saving, the model predicts that (i) there is bi-directionality in causality between saving and investment when capital mobility is low, irrespective of whether there is a public- or private-sector reaction; and (ii) the direction of causality is from investment to saving when there is perfect capital mobility and the public or the private sector react. Moreover, (iii) the direction of causality between sectoral saving-investment gaps is from the public sector to the private sector if capital mobility is low or if there is a private-sector reaction, and (iv) when there is a public-sector

reaction, there will be bi-directionality in the causality between sectoral gaps. Table 1 summarises the causality directions derived from the model under these alternative scenarios.

Before concluding this section it should be pointed out that while the model presented above is static, the empirical tests carried out are inter-temporal. Furthermore, the theoretical model is rather crude as regards the definition of the government's reaction function. In particular, the assumption on how the external balance is targeted obviates the possibility of the public sector using other policy instruments - monetary policy, for instance - to attain external equilibrium.

The next section presents the results of the long-term causality tests between saving and investment and between the sectoral gaps, using 1960-88 data. It also compares these results with the predictions of the theoretical model.

### **3. LONG-RUN CAUSALITY IN EC COUNTRIES**

#### **3.1 Methodological issues and empirical findings**

A non-stationary series can be transformed into a stationary one by successive differencing of the series. Traditionally, this is how the problem of incorrect specification in levels of unit root variables has been tackled (see Bayoumi (1990) and Artis and Bayoumi (1989) for an application of this approach to the subject under study here).

A key shortcoming of the specification of dynamic models in terms of only differenced variables is that it disregards the long-run properties of the model and, thus precluding any inference on the long-term causality directions. The analysis of cointegration may be used to interpret regressions using non-stationary variables and to test the long-run relationships underlying their dynamics. The concept of cointegration states that a linear combination of two non-stationary variables may be stationary without differencing, so that deviations with respect to an equilibrium relationship can be easily estimated. When two variables are cointegrated, the long-run

Table 1

DIRECTION OF CAUSALITY

	<u>S ↔ I (a)</u>	<u>D<sub>p</sub> ↔ D<sub>g</sub> (a)</u>
With public sector reaction ( $\alpha \neq 0, \beta = 0$ )		
Null capital mobility	↔	←
Perfect capital mobility	←	→
With private sector reaction ( $\alpha = 0, \beta \neq 0$ )		
Null capital mobility	↔	←
Perfect capital mobility	← (b)	←
With public and private sector reaction ( $\alpha, \beta \neq 0$ )		
Null capital mobility	↔	←
Perfect capital mobility	←	↔
Without reaction ( $\alpha = 0, \beta = 0$ )		
Null capital mobility	↔ (c)	←
Perfect capital mobility	-	-

Source: Table A.1.

(a) S: national saving; I: national investment; D<sub>p</sub>: saving-investment gap of the private sector; D<sub>g</sub>: saving-investment gap of the public sector. All as GNP ratios.

(b) This result is dependent on the origin of the shock. If the shock is in private investment, there is no causality.

(c) If private saving is not a function of the rate of interest, there is no bi-directionality; rather, saving causes investment.

causality may be determined through the specification of an Error Correction Mechanism (ECM) (Engle and Granger (1987)).

Turning to the empirical results, the correct specification of the relationship to be estimated involves a previous test for the presence of unit roots in the series of national investment and saving (expressed as a proportion of GNP). The Augmented Dickey-Fuller (ADF) test and the test derived from the application of the Johansen method (both described in the Appendix) are performed. Table 2 reports these results, which show that the national saving and investment series exhibit a unit root for all countries, except Ireland. Therefore, for all these countries (except Ireland) the cointegration approach could be applied.

The method used in this paper to analyse and test for cointegration relationships is the one proposed in Johansen (1988). The advantages of this approach over the Engle and Granger (1987) two-step regression procedure lie in the absence of finite-sample bias and in that it relaxes the implicit assumption that the cointegration vector is unique. Although the second advantage does not apply to the two-variable case (if a cointegration relationship exists the cointegration vector must be unique), Johansen's methodology can be used in this case as an indirect test of the presence of unit roots in both time series. A general description of this method and its associated tests can be found in the Appendix.

The results of the application of this methodology to the data is shown in Table A2 in the Appendix. Cointegration relationships between saving and investment could be found in five countries: Spain, France, Italy, Denmark and Belgium. Accordingly, for these countries it is possible to estimate the long-term causality direction through an ECM representation. For three countries - Germany, the United Kingdom and the Netherlands - it was not possible to reject the hypothesis of no cointegration. In the case of Ireland, the results pointing to the non-existence of unit roots in the series meant that the cointegration methodology could not be applied.

Table 2

DEGREE OF INTEGRATION OF THE SERIES OF SAVING, INVESTMENT AND CURRENT  
ACCOUNT IN EC COUNTRIES (1960-88)

	Saving	Investment	Current account
Belgium	I(1)	I(1)	I(1)(a)
Denmark	I(1)	I(1)	I(0)(b)
France	I(1)	I(1)	I(0)
Germany	I(1)	I(1)	I(1)
Ireland(c)	I(0)	I(0)	I(0)
Italy	I(1)	I(1)	I(0)(d)
Netherlands	I(1)	I(1)	I(1)
Spain(e)	I(1)	I(1)	I(0)(b)
United Kingdom(c)	I(1)	I(1)	I(1)(f)

(a) According to the ADF test and from the results of the application of Johansen's method to the sectoral gaps, the current account series should be I(1). However, when the cointegration test is applied to saving and investment, the result suggests that the series is I(0).

(b) With a mean different from zero (negative).

(c) According to the ADF test, S and I are I(1) series; however, from the application of Johansen's method the results suggest that both variables should be I(0).

(d) According to the ADF test, the current account series is I(0); however, from the application of Johansen's method the results suggest that it is I(0).

(e) (1964-89)

(f) According to the ADF test and from the results of the application of Johansen's method to national saving and investment, the current balance is I(1); however, when the cointegration test is applied to the sectoral gaps, the result suggests that the current account balance is an I(0) series.

Since the cointegration relationship between two (or more) variables shows the long run equilibrium, the interpretation of the long-run saving/investment relationship requires some consideration. In the steady state,  $I=S$ , i.e. the current-account balance is in equilibrium in the long run ( $S-I=0$ ). A contrast of this equilibrium condition requires a test of whether the parameter of the estimated long-run saving/investment relationship significantly differs from one in all countries where such relationship exists. The results of such a test show that the hypothesis of the parameter being different from one could not be rejected, except in the case of Denmark.

An indirect means of checking the robustness of this estimated long-term relationship is to test the stationarity of the current-account balance which, by definition, is  $S-I$ . The results of the ADF test, which are given in the last line of Table A2, tend to support the previous results for all countries except Italy and Belgium. Moreover, Denmark's current-account balance is stationary but, with a mean different from zero.

Since the fact that two variables are cointegrated necessarily implies causality in at least one direction, this direction of long-term causality is studied using an ECM representation which is estimated applying OLS (see Table A4). The summary results are given in Table 3. It can be seen that for the five relevant countries where the cointegration approach could be applied, the direction of long-run causality is from saving to investment, i.e. the level of saving may have acted as a constraint on long-term investment.

The role played by the public and private components of saving and investment in the result obtained for the national series is next evaluated. Accordingly, it is tested whether there is a relationship between the sectoral components that could explain the saving/investment relationship at national level. Table A3 in the Appendix gives the results. These show that none of the data sets reject the hypothesis of a lack of a long-run stationary relationship between the private saving and investment series. Likewise, the public saving and investment series were found not to be cointegrated.

Table 3

LONG-RUN CAUSALITY

	From saving to investment	From investment to saving	From public to private sector deficit	From private to public sector deficit
Belgium	Yes	No	Yes (a)	No (a)
Denmark	Yes	No	Yes	No
France	Yes	No	Yes	No
Germany	No	No	No	No
Ireland	Yes	No	Yes	No
Italy	Yes	No	Yes	No
Netherlands	No	No	No	No
Spain	Yes	No	Yes	No
United Kingdom	No	No	Yes	No

For a more detailed explanation, see table A4.

(a) Although there is no cointegration according to Johansen's methodology, the estimation of the long-term causality direction points to there being so.

Given the implications of the theoretical model, it is interesting to test whether there is any equilibrium relationship between the sectoral gaps. The results reported in Table A3 show that such a relationship could be found for Spain, France, Italy, Denmark and the United Kingdom. In fact, the results seem to indicate that the sectoral gaps offset each other in equilibrium, i.e. that  $(S_p - I_p) = - (S_g - I_g)$  in the long run. However, when the test of the restriction that the parameter of the long-term relationship between sectoral gaps is unity was performed, only the series for Spain and the United Kingdom accepted it. The fact that no such relationship could be found for Belgium and that only Spain and the UK accepted the restriction, seems to contradict the result reported above on the relationship between national saving and investment, given that:

$$S = I \leftrightarrow (S_p + S_g) = (I_p + I_g) \leftrightarrow (S_p - I_p) = - (S_g - I_g)$$

i.e. if the current account is balanced in the long run, saving must match investment and the sectoral gaps must offset each other.

The direction of long-term causality is also tested for the sectoral gaps, taking into account the results obtained in the cointegration test. Tables 3 and A4 report the results. It can be seen that in no country does the private sector gap cause the public sector gap. Further, the result of no causality from the public to the private sector gap was found only in Germany and the Netherlands. The cointegration results for Belgium would not allow the application of the causality analysis to this country. However, given the contradiction pointed out in the preceding paragraph, the estimation was carried out so as to determine whether there is causality between the sectoral gaps. The result is shown in Tables 3 and A4.

In the case of Ireland, although the cointegration methodology is not applicable given that the series are stationary, OLS techniques are. Accordingly, regressions were run for national saving and investment and for the sectoral gaps, in order to determine causality directions. The results presented in Table A4, closely resemble those obtained for Spain, France, Italy, Denmark



and Belgium, i.e. investment causes saving and the public saving-investment gap causes the private one.

To conclude, a long-run saving/investment relationship has been found for most of the countries under study. In particular, saving has been a constraint on investment. Moreover, the existence of such a relationship indicates that the series of the current account balance is stationary. The stationarity of the current account is a feature closely linked to the sustainability of an economy's external deficit (see Dolado and Viñals (1990)). Additionally, for the same group of countries, the sectoral saving-investment gaps can be seen to offset each other in the long run. The causality direction is from the public sector to the private sector. These results also point to the stationarity of the external balance, thus reinforcing the results presented above.

Finally, it is worthwhile to highlight an implication from the results: in no country the public sector's reaction function (budgetary policy) seems to offset the fluctuations in the external balance.

### **3.2 Causality, sectoral reaction and capital mobility**

The simple model used in this paper gives predictions of the causality directions between national saving and investment and between the sectoral saving-investment gaps under several alternative scenarios and under two polar assumptions on international capital mobility (see Table 1). The comparison of the empirical results with the model's predictions reported in Table 4 indicates that the causality directions found for the different countries are compatible with different behavioural hypothesis. In the case of Spain, France, Italy, Denmark, Belgium and Ireland, the causality direction - from the public gap to the private gap and from saving to investment - could be regarded as the outcome of three different causes: low capital mobility, inelasticity of private saving to the rate of interest and absence of reaction either by the public or the private sector.

On the other hand, the German and Dutch causality results are compatible with the prediction on how economies behave in the

Table 4

## SUMMARY BY COUNTRY

Countries	$S \leftrightarrow I$	$D_p \leftrightarrow D_g$	Compatible with
Belgium (1960-88)	→	←	$K' = 0, S' = 0$ without reaction
Denmark (1960-88)	→	←	$K' = 0, S' = 0,$ without reaction
France (1960-88)	→	←	$K' = 0, S' = 0$ without reaction
Germany (1960-88)	-	-	$K' = -\infty$ without reaction
Ireland (1960-88)	→	←	$K' = 0, S' = 0$ without reaction
Italy (1960-88)	→	←	$K' = 0, S' = 0$ without reaction
Netherlands (1960-88)	-	-	$K' = -\infty$ without reaction
Spain (1964-89)	→	←	$K' = 0, S' = 0$ without reaction
United Kingdom (1960-88)	-	←	$K' = -\infty,$ with private sector reaction (a)

$K' = 0$  indicates that there is null capital mobility;  $K' = -\infty$  that there is perfect international capital mobility; and  $S' = 0$  that private saving is inelastic with respect to the rate of interest.

(a) If the disturbance does not originate in public-sector investment.

presence of perfect capital mobility, and in absence of reaction by either the public sector or the private sector to the external imbalances. Finally, the results for the United Kingdom correspond to an open economy with perfect capital mobility where private agents react to the volume and size of the budget gap (along the lines of Ricardian equivalence) provided that the source of the shock is not public investment.

The comparison of the empirical findings with the causality directions derived from the theoretical model results in two main group of countries: economies which have applied important capital controls have been grouped with countries with low capital mobility, and conversely for those with few capital controls. The group of countries whose empirical results are compatible with low international capital mobility economies includes those which have most frequently had balance-of-payments problems, and where causality from the private to the public sector could not be found. These results suggest a common pattern of behaviour: budgetary policies have not responded to either the sign or volume of the external balance, and that external-balance-sustainability problems have been resolved via capital controls and monetary policy. On these grounds, it would be interesting to evaluate with more precision the role of monetary policy in coping with these problems. However, such an evaluation is beyond the scope of this paper.

The causality from the public to the private saving-investment gap (associated with a null capital mobility scenario) may be a reflection on how private investment has been crowded out, thereby causing an increase in the public-sector borrowing requirement.

The former results on low capital mobility should not be interpreted in the sense that most EC countries have behaved as closed economies. In fact, our findings are consistent with the behaviour of open economies where the targeting of the external balance is attained with capital controls.

#### **4. CONCLUSIONS**

The simple theoretical model of an open economy used in this paper predicts the existence of long-term saving/investment

relationships, even in a context of unrestricted capital mobility, provided that the private sector or the public sector exerts an offsetting effect. Further, it indicates that even if the offsetting effect is on the public-sector side, the causality direction always runs from public- to private-sector saving-investment gaps when there is low capital mobility. These apparently paradoxical results call for caution in interpreting empirical findings when a theoretical model of reference is lacking.

Comparison of the empirical results with the predictions of our theoretical model indicates that the countries studied may be divided into two groups. The first, made up of Germany, the Netherlands and the United Kingdom, is characterised by a high degree of international capital mobility. Within this group, only in the United Kingdom a private-sector reaction to the sign and volume of the budget balance was found. On the other hand, there is no indication of a reaction by either sector in the other two countries. In particular, the budget balance does not seem to react to the external balance.

The second group, made up of Spain, France, Italy, Denmark, Belgium and Ireland, comprises economies with low international capital mobility. For these countries saving has been a constraint on investment and the public sector has crowded out the private sector. This result should not be interpreted strictly, i.e. it does not imply that these five countries have been closed economies. This result is consistent with open economies where capital controls have been used to target the external balance or to solve external-debt-sustainability problems.

Provided that the degree of capital mobility is an acceptable proxy of the effectiveness of capital controls, then the results presented here show that where such capital controls have been applied, the volume of capital flows has been very low.

The paper has also shown the lack of budgetary policy reactions to the external balance in any of the countries under study. Furthermore, the evidence for the second group of countries suggests that capital controls were the main instrument used to target the external balance. Theoretically, under fixed exchange

rates and perfect capital mobility, budgetary policy is the only effective policy instrument to cope with external imbalances, caused by an excessive domestic demand. This paper shows that this policy has not been used. The use of capital controls, rather than fiscal policy, lessens the degree of capital mobility and therefore increases the effectiveness of monetary policy.

Economic and Monetary Union will entail the loss of one of these instruments (capital controls) and will minimise the effectiveness of the other (monetary policy). The conclusions put forward in this paper may be seen as predicting an abandonment of the current assignment of policy instruments in favor of a more prominent role of fiscal policy. As capital mobility becomes greater we should observe either an increasing spread of the external balances or increasing responsiveness by the public budget to the external balance.

## APPENDIX

### A) The model

From the macroeconomic identity of an open economy and expressing the variables as ratios of GNP, we have:

$$S - I = S_p - I_p + S_g - I_g = K \quad (1)$$

where  $S$ ,  $I$  and  $K$  are saving, investment and capital outflows and where  $p$  and  $g$  denote the private sector and the public sector, respectively.

Fiscal policy is allowed to react to the presence of an external imbalance. Therefore, the public sector will set its savings so as to offset a fraction  $\alpha$  of the private saving-investment gap. To put it differently, the public sector is assumed to target the current account through its budgetary policy. For public saving, a planned component and a random shock,  $\varepsilon_g$ , are distinguished. Furthermore, public-sector investment is assumed to be exogenous and unaffected by any disturbance. Formally:

$$S_g = -\alpha(S_p - I_p) + \varepsilon_g \quad \alpha \in [0,1] \quad (2)$$

$$I_g = \bar{I}_g \quad (3)$$

With regard to the private sector, both saving and investment (as GNP ratios) are assumed to be functions of the rate of interest. Again, a planned component and a random shock that affects both saving and investment ( $\varepsilon_p^s, \varepsilon_p^i$ ) are considered. Moreover, the private sector may react to the volume and sign of the budget balance. As long as the private sector anticipates future taxes associated with a negative public gap, its saving decisions will be affected, so that private saving offsets a fraction  $\beta$  of the budget balance. Thus:

$$S_p = -\beta(S_g - I_g) + S_p(r) + \varepsilon_p^s ; S_p' > 0 ; \beta \in [0,1] \quad (4)$$

$$I_p = I_p(r) + \varepsilon_p^i ; I_p' < 0 \quad (5)$$

where  $r$  is the rate of interest.

Finally, capital outflows are assumed to depend inversely on the rate of interest. Accordingly, breaking down the planned component and the random shock once more, net capital outflows are given by:

$$K = K(r) + \varepsilon_K ; K' < 0 \quad (6)$$

Our simple model consists of equations (2), (4), (5) and the following identity:

$$S_g + S_p - I_p - I_g = K(r) + \varepsilon_K \quad (7)$$

Solving this system, and from the expressions reported in Table A1 it is possible to determine expected causality directions.

## B) Brief description of the tests used

### - ADF test

Given a time series  $X_t$ , the ADF test is a test on the statistical significance of  $\beta$  in the regression:

$$\Delta X_t = \alpha + \beta X_{t-1} + \sum_{j=1}^n \gamma_j \Delta X_{t-j}$$

If the null hypothesis that  $X_t$  is a first-order integrated series ( $X_t \sim I(1)$ ) can be rejected, i.e. if we can reject that  $\beta=0$ , then  $X_t$  is said to be stationary. If  $\beta$  is not significantly different from zero, it must then be tested whether the coefficient of  $\beta'$  in the regression:

$$\Delta^2 X_t = \alpha' + \beta' \Delta X_{t-1} + \sum_{j=1}^n \gamma_j' \Delta^2 X_{t-j}$$

is different from zero. If it can be rejected that the series is I(2) (it can be rejected that  $\beta' = 0$ ), then,  $X_t$  is said to be integrated of order one,  $X_t \sim I(1)$ .

McKinnon (1990) gives the critical value of the t statistic that is needed for our contrasts on  $\beta$ . Critical values vary with the sample size and with the presence or absence of a constant in the regression.

- Johansen method

Johansen's proposed method is more powerful than the two-step one proposed by Engle and Granger because it avoids finite-sample biases and it allows for more than one cointegration vector. With two time series, the latter property enables the character I(0) or I(1) of such series to be tested indirectly (see Dolado, Jenkinson and Sosvilla-Rivero (1990) for a survey of the literature on cointegration and unit roots).

Johansen's method is based on the autoregressive representation (VAR) of the vector  $x_t$  of the p variables to be studied,  $x'_t = (x_{1t}, \dots, x_{pt})$  such that:

$$x_t = \sum_{i=1}^k \Pi_i x_{t-i} + \varepsilon_t \quad \varepsilon_t \sim NI(0, \Omega) \quad t = 1 \dots T$$

where k is the smallest number which meets the conditions imposed on the structure of the errors.

Reparametrization gives:

$$\Delta x_t = \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} - \Pi_k x_{t-k} + \varepsilon_t$$

$$\text{with } \Gamma_i = -I + \Pi_1 + \dots + \Pi_i \quad i = 1 \dots k-1$$

and

$$\Pi = I - \sum_{i=1}^k \Pi_i$$



Johansen's maximum likelihood estimation procedure is based on the sequential test of the rank  $r$  of the matrix  $\Pi$ . In the case of two variables, if this rank is zero it means there is no cointegration and, therefore, that the relationships between both variables must be specified in differences. If  $r=1$ , the series are cointegrated and, therefore, the combination of these variables is such that the relationships can be specified in levels. Finally, if the rank is two, then any linear combination of the variables is stationary. The test is computed as a likelihood ratio (LR), where the null hypothesis is  $H_0:r=r^*$  and the alternative one  $H_1:r=r^*+1$ . The critical values for this test at the 5% level of significance are (see Dolado (1989)):

$r = 0$	$LR^* = 11,527$
$r \leq 1$	$LR^* = 4,087$

Thus in the first step, if  $LR > LR^*$ , the null hypothesis that there is no cointegration ( $r=0$ ) is rejected. In the second step, if the null hypothesis that  $r=1$  cannot be rejected, then the variables are cointegrated.

The cointegration parameter estimated under this method shows the linear combination of both variables which is stationary in the long run.

DETERMINATION OF CAUSALITY


---

1. Effect of a change in private investment on saving:

$$\frac{dS_p}{dI_p^i} = \frac{(1 - \alpha)S_p^i - \alpha\beta K^i}{(1 - \alpha)(S_p^i - I_p^i) - (1 - \alpha\beta)K^i}$$

$$\frac{dS_g}{dI_p^i} = \frac{-\alpha K^i}{(1 - \alpha)(S_p^i - I_p^i) - (1 - \alpha\beta)K^i}$$

2. Effect of a change in public investment on saving:

$$\frac{dS_p}{dI_g} = \frac{-\beta(K^i + I_p^i) + S_p^i}{(1 - \alpha)(S_p^i - I_p^i) - (1 - \alpha\beta)K^i}$$

$$\frac{dS_g}{dI_g} = \frac{\alpha\beta K^i - \alpha(S_p^i - I_p^i)}{(1 - \alpha)(S_p^i - I_p^i) - (1 - \alpha\beta)K^i}$$

3. Effect of a change in private saving on private investment:

$$\frac{dI_p}{dS_p^s} = \frac{-(1 - \alpha)I_p^i}{(1 - \alpha)(S_p^i - I_p^i) - (1 - \alpha\beta)K^i}$$

4. Effect of a change in public saving and investment on private investment:

$$\frac{dI_p}{dI_g} = -\frac{dI_p}{dI_g} = \frac{-(1 - \beta)I_p^i}{(1 - \alpha)(S_p^i - I_p^i) - (1 - \alpha\beta)K^i}$$

5. Effect of a change in public saving on private saving:

$$\frac{dS_p}{dS_g} = \frac{\beta(K^i + I_p^i) - S_p^i}{(1 - \beta)(S_p^i - I_p^i) - (1 - \alpha\beta)K^i}$$

6. Effect of a change in private saving on public saving:

$$\frac{dS_g}{dS_p^s} = \frac{\alpha K^i}{(1 - \alpha)(S_p^i - I_p^i) - (1 - \alpha\beta)K^i}$$


---

Table A.2

## COINTEGRATION BETWEEN NATIONAL SAVING AND INVESTMENT (1960-88)

## Johansen method

	Spain(a)	Germany	France	U.Kingdom	Italy	Denmark	Belgium	Netherlands	Ireland
Cointegration national saving-investment	Yes	No	Yes	No	Yes	Yes	Yes	No	No(b)
- Order of VAR	2	2	2	1	1	1	2	1	1
- Test of $r^* = 0$	15.45	9	19.93	13.34	11.59	22.72	13.95	8.72	16.21
$r^* = 1$	1.57	2.67	0.79	4.92	0.78	1.39	3.11	1.89	6.42
- Estimated parameter $i = \gamma s$	0.98		1.11		1.51	1.27	1.43		
- Test of the restriction $\hat{\gamma}=1$ (c)	Yes( $\neq 0$ )		Yes(2.81)		Yes(2.38)	No(9.11)	Yes(3.03)		
Current account stationarity (s-i)									
t-ratio of $(s-i)_{t-1}$ (d)	-4.42(e)	-2.14	-3.44	-2.61	-2.67	-3.76(e)	-1.56	-2.37	-1.86

s: gross national saving/gross national product; i: gross national investment/gross national product, except for the case of Spain, where gross disposable national income has been used.

(a) (1964-89)

(b) Given that two cointegration vectors are found, both variables must be stationary.

(c) Description of the test: It is a likelihood ratio test where the null hypothesis is represented by the restricted model. In particular, if the value of the test is lower than the value of a chi-square with one degree of freedom, whose value at 5% is 3.86, then the null hypothesis cannot be rejected. (Dolado (1989)). The values of this test are in brackets in the corresponding line.

(d) The critical value of the ADF test is -2.98 (see Mc Kinnon (1990)).

(e) With a mean different from zero (negative).

	Johansen method								
	Spain	Germany	France	U.Kingdom	Italy	Denmark	Belgium	Ireland	Netherlands
Cointegration $s_p, i_p$	No	No	No	No(a)	No	No	No	No	No
- Order of VAR	1	2	3	2	2	2	2	2	2
- Test of $r^* = 0$	10.67	4.80	10.38	16.4	7.6	11.42	6.56	7.26	6.90
$r^* = 1$	1.63	0.19	0.09	2.46	1.79	3.43	1.71	3.05	3.32
- Estimated parameter $i_p = \delta s_p$	-	-	-	(a)	-	-	-	-	-
- Test of the restriction $\hat{\delta} = 1$ (b)	-	-	-	-	-	-	-	-	-
Cointegration $s_g, i_g$	No	No	No(c)	No	No(c)	No	No(c)	No(c)	No(c)
- Order of VAR	1	2	2	2	2	2	2	2	2
- Test of $r^* = 0$	11.64	10.74	12.54	11.43	16.39	8.53	15.81	14.9	16.14
$r^* = 1$	2.00	1.52	2.07	1.61	2.59	1.14	1.35	2.15	0.05
- Estimated parameter $i_g = \lambda s_g$	-	-	(c)	-	(c)	-	(c)	(c)	(c)
- Test of the restriction $\hat{\lambda} = 1$ (b)	-	-	-	-	-	-	-	-	-
Cointegration $(s_p - i_p)(s_g - i_g)$	Yes	No	Yes	Yes	Yes	Yes	No	No(d)	No
- Order of VAR	2	3	2	3	2	2	3	3	3
- Test of $r^* = 0$	16.02	6.81	16.95	12.67	16.00	16.69	6.08	16.58	8.48
$r^* = 1$	1.15	0.03	2.49	2.32	1.94	3.25	0.32	2.88	1.47
- Estimated parameter $(s_p - i_p) = r(s_g - i_g)$	0.98	-	0.68	1.55	0.76	0.73	(0.81)	-	-
- Test of the restriction $\hat{r} = 1$ (b)	Yes(=0)	-	No(5.34)	Yes(1.45)	No(5.93)	No(6.16)	-	-	-

(a) The vector of the relationship  $(s_p, i_p)$  is (1 0) and indicates the stationarity of private saving.

(b) See Table A.2 for a description of the test.

(c) The vector of the relationship  $(s_g, i_g)$  is close to (0 1) and indicates the stationarity of public investment.

(d) This result might indicate the stationarity of one of the sectoral gaps.

Table A4

## LONG-TERM CAUSALITY

$$\Delta y_t = a_0 + \sum_{i=1}^p a_i \Delta y_{t-i} + \sum_{i=1}^p b_i \Delta x_{t-i} + c(y-x)_{t-1}$$

	From saving to investment	From investment to saving	From public to private sector deficit	From private to Public sector deficit
Belgium	-0.39 (-2.54)	-0.19 (-1.02)	0.40 (a) (2.43)	-0.12 (a) (-1.12)
Denmark	-0.69 (-2.90)	-0.01 (-0.03)	0.73 (1.88)	0.10 (0.29)
France	-0.91 (-3.42)	-0.15 (-0.59)	0.84 (3.00)	0.23 (1.36)
Ireland	-0.27 (a) (-2.69)	0.02 (a) (0.18)	0.41 (a) (2.93)	0.15 (a) (1.68)
Italy	-0.55 (-3.18)	-0.12 (-1.18)	0.70 (1.96)	-0.17 (-0.67)
Spain	-0.54 (-3.76)	-0.11 (0.92)	0.58 (2.70)	-0.15 (-1.51)
United Kingdom	- -	- -	0.36 (2.30)	-0.21 (-1.79)

The table reports the estimated values for c. In brackets are the values of the t statistic.

(a) In these cases, the coefficients of the variables that go into the ECM are estimated separately.

Having accepted the constraint that they are equal, the results obtained with such restriction are presented.

GRAPHICAL AND STATISTICAL APPENDIX

Definition of variables (in % of GNP):

S : national saving

$S_p$  : private saving

$S_g$  : public saving

I : national investment

$I_p$  : private investment

$I_g$  : public investment

BELGIUM

	S	Sp	Sq	I	Ip	Iq
1960	19,16	19,90	-0,74	19,03	17,10	1,93
1961	20,91	19,97	0,94	20,98	18,89	2,09
1962	21,70	20,54	1,16	21,09	18,78	2,31
1963	20,40	19,79	0,61	20,89	18,34	2,56
1964	23,91	21,55	2,36	23,76	20,75	3,01
1965	23,55	22,43	1,12	22,99	20,46	2,53
1966	23,44	21,40	2,03	23,71	20,87	2,84
1967	23,99	21,95	2,04	23,18	20,04	3,14
1968	23,11	21,95	1,16	22,24	18,76	3,47
1969	24,21	22,55	1,65	23,06	19,79	3,27
1970	26,86	24,44	2,42	24,12	20,63	3,48
1971	25,41	23,45	1,96	23,30	19,25	4,05
1972	25,29	24,38	0,92	21,68	17,67	4,01
1973	24,53	23,70	0,83	22,58	19,22	3,36
1974	25,15	23,54	1,61	24,79	21,67	3,12
1975	21,71	22,20	-0,49	21,84	18,49	3,34
1976	22,37	23,62	-1,25	22,10	18,73	3,37
1977	20,75	22,20	-1,44	21,89	18,62	3,28
1978	20,53	22,59	-2,06	21,78	18,62	3,16
1979	18,66	21,42	-2,76	21,54	18,23	3,31
1980	17,65	22,04	-4,39	21,98	18,42	3,56
1981	14,19	22,58	-8,39	17,97	14,45	3,53
1982	13,90	21,08	-7,18	17,67	14,39	3,28
1983	14,89	22,88	-7,99	15,73	12,79	2,94
1984	15,99	22,18	-6,18	16,56	13,97	2,58
1985	15,38	21,33	-5,95	15,09	12,91	2,18
1986	17,45	24,01	-6,56	15,37	13,45	1,92
1987	17,55	22,60	-5,05	16,32	14,55	1,77
1988	19,51	24,06	-4,55	18,47	16,78	1,69

SOURCE:O.E.C.D.

## DENMARK

	S	Sp	Sg	I	Ip	Ig
1960	24,86	17,49	7,37	25,98	22,22	3,76
1961	23,44	19,11	4,34	25,13	21,03	4,11
1962	22,88	17,75	5,13	26,04	21,90	4,15
1963	22,96	16,69	6,27	22,85	18,76	4,09
1964	24,01	17,47	6,54	26,23	21,94	4,29
1965	24,58	17,81	6,77	26,41	21,78	4,63
1966	22,95	15,38	7,58	24,87	20,06	4,81
1967	21,84	15,87	5,97	24,25	18,91	5,34
1968	22,32	15,14	7,18	23,99	18,44	5,55
1969	23,00	15,27	7,73	25,85	20,06	5,79
1970	21,84	13,13	8,71	25,70	19,56	6,13
1971	22,43	12,95	9,48	24,87	20,14	4,73
1972	24,53	15,66	8,87	24,89	20,48	4,40
1973	24,54	14,95	9,59	26,24	22,45	3,79
1974	22,25	14,30	7,95	25,38	21,44	3,95
1975	19,52	16,21	3,32	21,05	17,12	3,92
1976	19,23	14,87	4,36	24,17	20,43	3,75
1977	19,06	15,36	3,70	23,11	19,31	3,80
1978	19,05	15,13	3,92	21,83	18,15	3,68
1979	16,96	14,27	2,69	21,76	17,87	3,89
1980	15,23	14,46	0,77	18,98	15,43	3,56
1981	12,83	15,65	-2,82	15,95	12,85	3,10
1982	12,54	18,16	-5,63	16,96	14,02	2,93
1983	13,89	18,05	-4,16	16,57	14,12	2,45
1984	15,80	17,27	-1,47	19,23	17,05	2,17
1985	15,61	14,69	0,91	20,43	17,95	2,48
1986	16,70	10,86	5,84	22,39	20,33	2,07
1987	16,18	11,38	4,80	19,34	16,99	2,35
1988	16,18	13,07	3,11	18,06	15,35	2,71
	0,00	0,00	0,00	0,00	0,00	0,00

SOURCE: O. E. C. D.



## FRANCE

	S	Sp	Sg	I	Ip	Ig
1960	25,71	21,49	4,22	23,53	21,27	2,27
1961	25,13	20,81	4,33	23,55	21,08	2,48
1962	25,84	22,19	3,65	24,23	21,49	2,73
1963	25,01	21,07	3,94	24,27	21,40	2,87
1964	26,30	21,27	5,03	25,91	22,83	3,08
1965	27,08	21,85	5,24	25,57	22,32	3,24
1966	27,20	22,03	5,17	26,41	23,17	3,24
1967	27,01	22,32	4,69	26,31	22,89	3,42
1968	25,94	22,20	3,74	25,84	22,55	3,29
1969	26,43	21,60	4,82	26,74	23,81	2,93
1970	27,53	22,40	5,14	26,75	23,01	3,73
1971	27,00	22,35	4,65	26,10	22,46	3,64
1972	27,27	22,52	4,76	26,32	22,73	3,59
1973	27,78	23,34	4,44	27,14	23,87	3,27
1974	26,73	22,45	4,28	28,02	24,67	3,35
1975	24,28	22,22	2,06	23,44	19,64	3,80
1976	24,49	20,42	4,07	25,34	21,66	3,68
1977	24,30	21,44	2,86	24,40	21,29	3,11
1978	24,55	23,22	1,32	23,13	20,19	2,94
1979	24,53	21,75	2,78	23,60	20,51	3,09
1980	23,52	19,78	3,73	24,11	20,88	3,23
1981	21,03	19,34	1,69	21,83	18,68	3,14
1982	19,74	18,79	0,94	21,86	18,51	3,35
1983	19,11	18,76	0,35	19,91	16,73	3,19
1984	19,07	18,50	0,57	19,08	16,08	3,00
1985	19,04	18,49	0,54	18,98	15,82	3,17
1986	20,02	19,56	0,47	19,55	16,36	3,20
1987	19,56	18,52	1,04	19,88	16,61	3,26
1988	20,55	18,48	2,07	20,96	17,42	3,54

SOURCE: O. E. C. D.

## GERMANY

	S	Sp	Sg	I	Ip	Ig
1960	28,89	21,55	7,34	27,32	24,11	3,21
1961	28,19	20,14	8,05	27,21	23,75	3,45
1962	27,28	19,74	7,54	27,35	23,38	3,96
1963	26,46	19,74	6,72	26,25	21,77	4,48
1964	28,31	21,23	7,08	28,15	23,17	4,98
1965	27,23	21,92	5,31	28,50	23,95	4,55
1966	26,81	21,46	5,35	26,56	22,21	4,35
1967	25,24	21,58	3,66	23,03	19,20	3,82
1968	26,75	22,53	4,23	24,45	20,58	3,87
1969	27,55	21,03	6,52	26,13	22,16	3,97
1970	28,12	21,81	6,32	27,56	22,93	4,63
1971	27,05	20,99	6,06	26,68	22,18	4,51
1972	26,32	21,11	5,20	25,93	21,83	4,10
1973	26,53	19,93	6,59	25,22	21,40	3,82
1974	24,79	20,32	4,47	22,09	18,02	4,07
1975	20,87	20,93	-0,05	19,82	15,90	3,92
1976	22,46	20,52	1,94	21,56	18,06	3,51
1977	21,81	18,95	2,86	21,01	17,73	3,28
1978	22,49	19,90	2,59	21,09	17,77	3,31
1979	22,61	19,98	2,64	23,41	19,99	3,42
1980	21,72	19,25	2,47	23,54	19,93	3,61
1981	20,15	19,02	1,13	20,96	17,72	3,24
1982	20,28	19,16	1,12	19,75	16,91	2,83
1983	21,03	19,58	1,45	20,35	17,87	2,49
1984	21,67	19,62	2,06	20,41	18,05	2,36
1985	22,10	19,44	2,66	19,53	17,21	2,31
1986	23,87	21,44	2,44	19,48	17,07	2,40
1987	23,64	21,77	1,87	19,60	17,21	2,38
1988	24,50	23,15	1,35	20,40	18,06	2,34

SOURCE: O. E. C. D.

IRELAND

	S	Sp	Sg	I	Ip	Ig
1960	15,87	14,91	0,96	15,99	13,20	2,80
1961	17,42	16,73	0,69	17,25	14,08	3,17
1962	17,24	16,55	0,69	19,01	15,58	3,44
1963	17,29	16,02	1,27	20,02	16,25	3,77
1964	17,83	16,67	1,16	21,25	17,06	4,19
1965	18,85	17,64	1,22	23,10	18,65	4,45
1966	18,55	16,11	2,44	20,10	16,00	4,10
1967	20,53	18,08	2,45	19,18	14,89	4,29
1968	20,22	17,82	2,40	21,50	17,24	4,25
1969	20,49	18,27	2,22	25,20	20,66	4,54
1970	20,09	18,30	1,79	24,05	19,55	4,50
1971	19,87	17,68	2,19	23,65	19,68	3,97
1972	22,59	21,01	1,58	24,73	20,47	4,26
1973	23,27	22,28	0,98	26,70	21,94	4,76
1974	19,03	20,24	-1,21	28,83	21,80	7,03
1975	21,79	27,58	-5,79	23,31	18,66	4,65
1976	20,24	22,98	-2,74	25,59	21,81	3,78
1977	22,93	24,99	-2,06	28,45	23,13	5,32
1978	23,01	26,64	-3,63	30,05	25,46	4,58
1979	20,37	25,39	-5,02	34,24	28,62	5,62
1980	16,70	22,18	-5,48	28,93	24,75	4,17
1981	14,26	21,22	-6,96	29,69	25,70	3,99
1982	18,48	26,62	-8,14	29,84	24,35	5,49
1983	18,42	25,42	-7,00	25,90	20,88	5,02
1984	19,37	24,93	-5,56	25,81	20,55	5,27
1985	18,55	25,66	-7,11	23,01	17,90	5,12
1986	18,09	25,04	-6,96	21,31	16,69	4,62
1987	20,34	26,83	-6,49	18,93	15,72	3,22
1988	20,44	20,83	-0,39	18,40	16,19	2,22

SOURCE: O. E. C. D.

ITALY

	S	Sp	Sg	I	Ip	Ig
1960	29,59	25,40	4,19	29,41	25,56	3,85
1961	31,00	26,21	4,78	30,42	26,85	3,57
1962	30,16	25,63	4,53	30,00	26,67	3,33
1963	27,51	23,59	3,93	29,31	26,15	3,16
1964	27,61	23,21	4,40	26,29	22,92	3,37
1965	27,31	26,17	1,14	23,26	20,23	3,03
1966	26,42	25,71	0,71	22,90	19,87	3,03
1967	26,38	23,72	2,67	24,08	21,42	2,65
1968	27,37	25,49	1,88	23,33	20,38	2,95
1969	28,26	26,93	1,32	25,24	22,49	2,75
1970	28,07	26,80	1,27	27,29	23,44	3,84
1971	26,23	27,81	-1,58	24,82	21,17	3,64
1972	25,48	29,43	-3,95	23,94	20,30	3,64
1973	25,52	28,87	-3,36	27,09	23,98	3,11
1974	25,98	28,69	-2,71	30,16	26,66	3,50
1975	23,85	32,59	-8,75	24,01	19,66	4,35
1976	25,76	31,64	-5,88	27,00	22,19	4,81
1977	26,03	31,17	-5,14	24,91	21,04	3,87
1978	26,28	32,71	-6,43	24,13	20,53	3,60
1979	26,23	32,25	-6,02	24,59	20,83	3,77
1980	24,68	29,21	-4,53	26,91	22,40	4,51
1981	22,61	29,60	-6,98	24,86	20,75	4,11
1982	22,08	29,17	-7,09	23,67	19,32	4,35
1983	22,18	29,03	-6,85	21,86	17,88	3,97
1984	22,51	29,68	-7,18	23,15	18,56	4,59
1985	21,77	28,73	-6,97	22,69	18,01	4,68
1986	21,34	28,13	-6,79	20,85	16,78	4,08
1987	20,69	27,05	-6,36	20,91	16,97	3,94
1988	20,86	26,75	-5,89	21,49	17,28	4,22

SOURCE: O. E. C. D.

NETHERLANDS

	S	Sp	Sq	I	Ip	Iq
1960	29,77	23,95	5,82	26,76	22,80	3,96
1961	28,25	22,15	6,10	26,85	22,68	4,17
1962	26,51	21,63	4,87	25,61	21,23	4,38
1963	25,00	21,07	3,92	24,49	19,85	4,63
1964	26,86	23,00	3,86	27,87	23,14	4,72
1965	26,61	22,32	4,29	26,59	21,99	4,60
1966	26,07	21,64	4,43	27,19	22,50	4,69
1967	26,35	22,13	4,22	26,87	22,04	4,83
1968	27,31	22,09	5,22	27,25	22,04	5,22
1969	26,74	22,11	4,63	26,50	21,81	4,69
1970	26,38	21,96	4,42	27,77	23,11	4,66
1971	26,08	21,39	4,69	26,40	21,54	4,86
1972	26,76	22,01	4,75	23,96	19,67	4,29
1973	28,12	22,41	5,71	24,33	20,53	3,80
1974	27,15	22,86	4,28	24,06	20,43	3,63
1975	23,13	20,54	2,59	20,63	16,70	3,93
1976	23,54	21,10	2,44	20,60	16,85	3,75
1977	22,35	19,96	2,39	21,58	18,21	3,37
1978	21,06	19,72	1,35	21,98	18,72	3,25
1979	20,34	19,49	0,85	21,57	18,46	3,11
1980	20,11	18,60	1,51	21,57	18,31	3,26
1981	20,53	20,29	0,24	18,33	15,17	3,15
1982	21,11	22,83	-1,73	17,95	15,07	2,88
1983	21,46	22,86	-1,40	18,35	15,68	2,67
1984	23,25	24,26	-1,01	19,09	16,29	2,80
1985	23,76	23,55	0,21	19,76	17,14	2,61
1986	22,96	23,67	-0,71	19,74	17,36	2,38
1987	21,41	22,32	-0,91	19,60	17,29	2,31
1988	23,62	24,05	-0,43	20,87	18,57	2,30

SOURCE: O.E.C.D.

SPAIN

	S	Sp	Sg	I	Ip	Ig
1964	25,53	21,76	3,78	25,43	22,81	2,63
1965	24,83	21,34	3,49	26,91	24,28	2,64
1966	25,03	21,31	3,72	27,12	24,29	2,83
1967	24,28	19,91	4,36	25,78	23,06	2,72
1968	24,91	21,42	3,48	25,72	23,42	2,31
1969	26,87	22,98	3,89	27,99	25,48	2,51
1970	26,75	22,92	3,83	26,56	24,06	2,51
1971	26,53	23,52	3,01	24,36	21,43	2,94
1972	27,02	23,53	3,49	25,55	22,95	2,60
1973	27,57	23,42	4,15	26,74	24,34	2,40
1974	26,31	23,17	3,14	29,76	27,39	2,37
1975	25,35	22,11	3,24	28,27	25,67	2,59
1976	22,88	20,56	2,32	26,78	24,52	2,25
1977	23,17	20,55	2,61	24,91	22,32	2,58
1978	23,88	23,10	0,78	22,86	20,79	2,07
1979	22,78	22,24	0,54	22,31	20,60	1,72
1980	20,95	20,38	0,57	23,35	21,54	1,82
1981	18,84	18,78	0,06	21,55	19,39	2,16
1982	18,88	19,41	-0,52	21,39	18,43	2,96
1983	18,76	18,71	0,05	20,29	17,53	2,76
1984	20,36	21,08	-0,72	18,94	16,04	2,90
1985	20,55	21,95	-1,40	18,89	15,30	3,58
1986	21,60	22,09	-0,49	19,93	16,36	3,57
1987	21,95	20,31	1,64	21,83	18,50	3,33
1988	22,46	20,55	1,91	23,64	19,88	3,77
1989	22,49	19,35	3,14	25,40	21,14	4,26

SOURCE:Corrales y Taguas(1989),B.E.(1990)

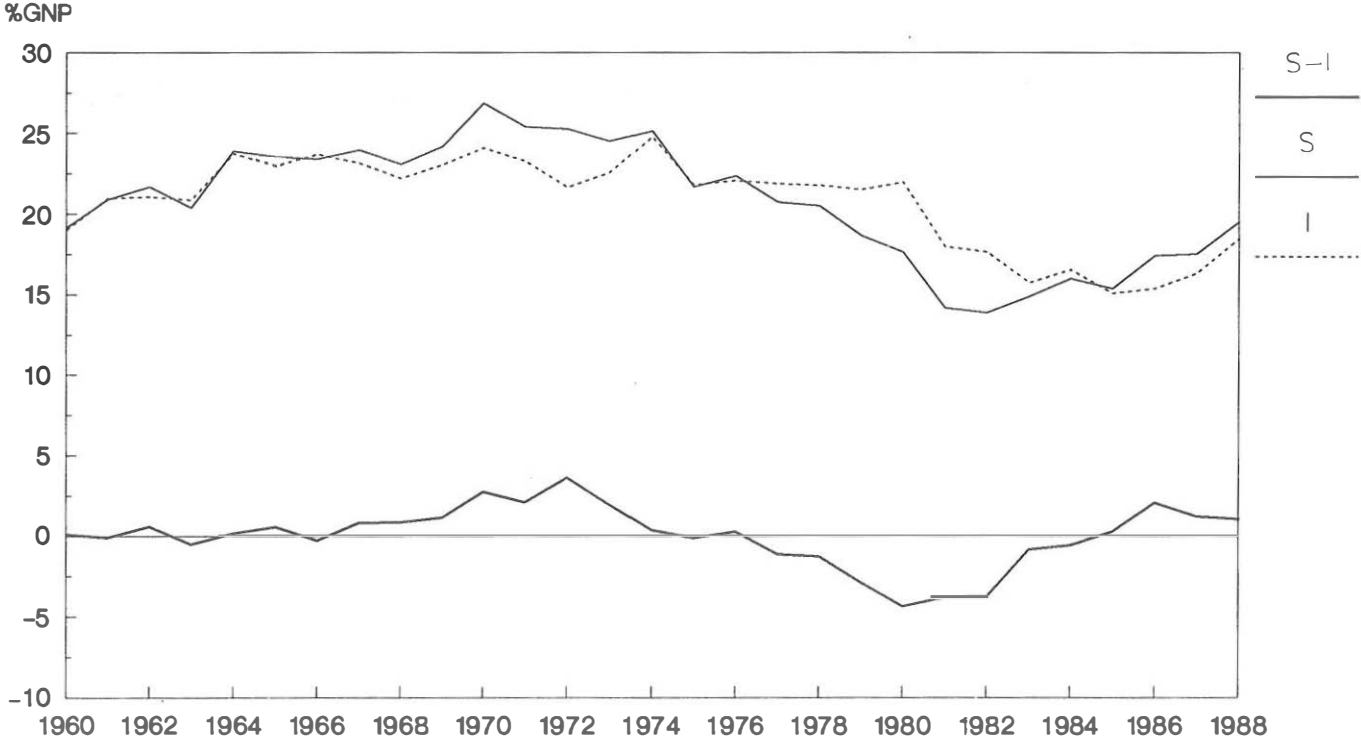
UNITED KINGDOM

	S	Sp	Sg	I	Ip	Ig
1960	17,90	16,14	1,76	18,42	15,18	3,24
1961	17,80	15,73	2,06	18,23	14,86	3,36
1962	17,04	13,94	3,10	16,85	13,26	3,59
1963	17,03	15,39	1,64	17,19	13,53	3,65
1964	18,47	15,82	2,65	20,26	16,04	4,22
1965	19,34	15,95	3,39	19,53	15,35	4,18
1966	18,91	14,82	4,09	19,07	14,62	4,45
1967	17,83	13,70	4,13	19,71	14,78	4,94
1968	18,37	13,12	5,24	20,42	15,37	5,05
1969	20,94	13,20	7,74	19,82	14,96	4,86
1970	21,09	12,64	8,45	19,47	14,76	4,71
1971	19,36	12,69	6,67	19,00	14,53	4,46
1972	18,53	15,03	3,50	18,45	14,19	4,26
1973	19,67	16,63	3,04	21,73	16,79	4,94
1974	15,26	12,97	2,29	21,96	16,75	5,21
1975	14,71	13,67	1,05	18,64	13,91	4,72
1976	15,40	15,16	0,24	20,34	16,00	4,34
1977	18,65	17,77	0,88	19,85	16,50	3,35
1978	18,52	19,11	-0,59	19,55	16,76	2,79
1979	19,02	18,93	0,09	19,62	17,06	2,57
1980	17,70	17,97	-0,26	16,88	14,48	2,40
1981	16,81	16,95	-0,14	15,16	13,39	1,77
1982	16,92	17,00	-0,07	15,68	14,11	1,57
1983	17,21	17,62	-0,41	16,46	14,47	1,98
1984	16,90	17,77	-0,87	17,30	15,32	1,98
1985	17,73	17,88	-0,15	17,15	15,12	2,03
1986	16,32	16,44	-0,12	17,08	15,14	1,94
1987	16,31	16,29	0,02	17,95	16,10	1,86
1988	16,40	14,65	1,75	20,09	18,34	1,75

SOURCE: O. E. C. D.

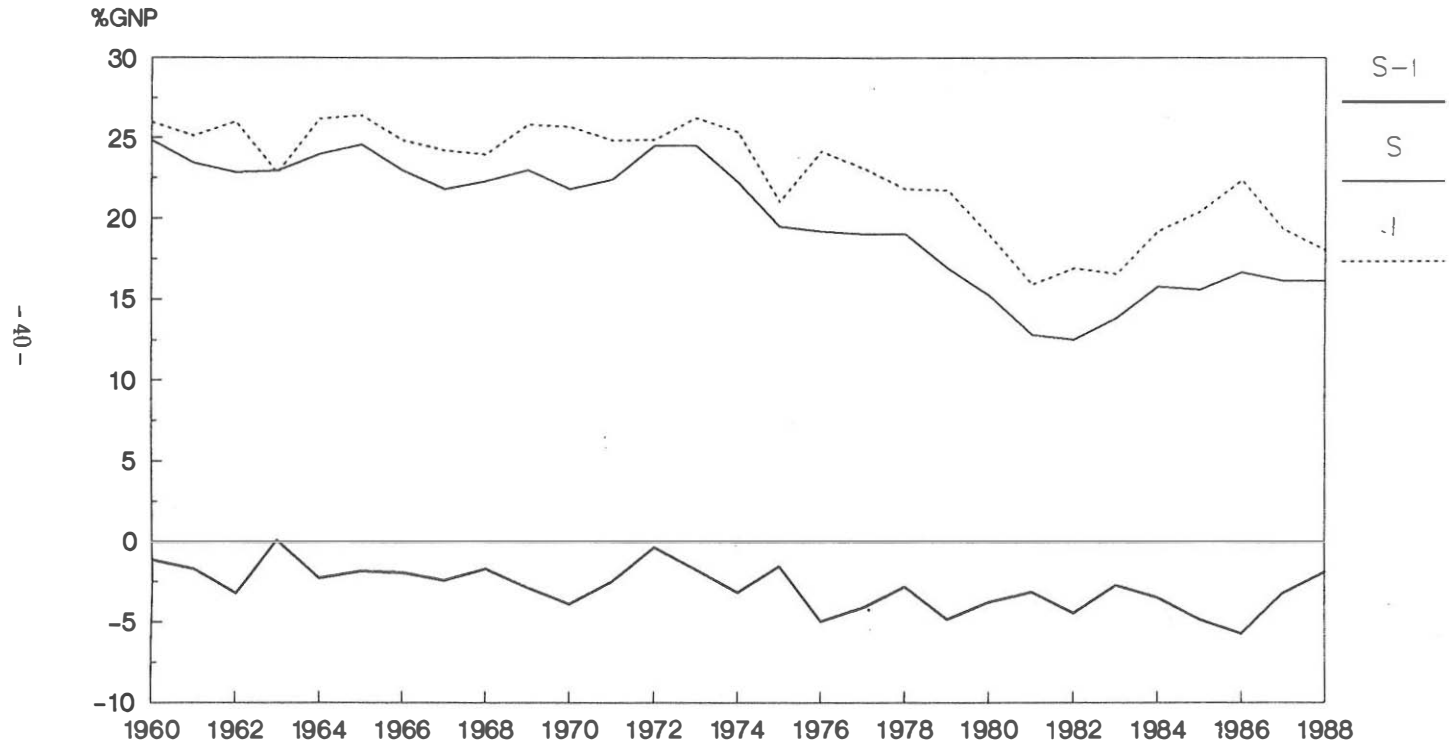
21

BELGIUM

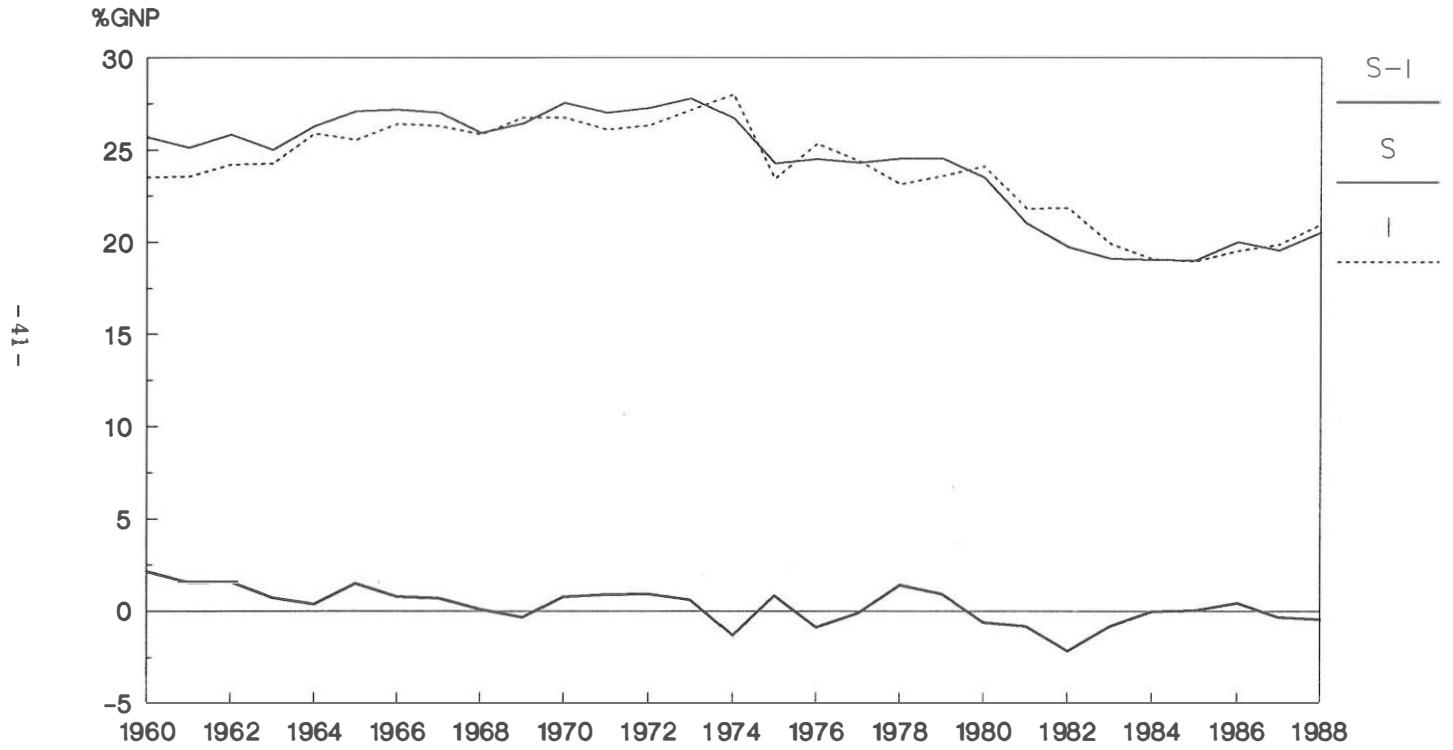




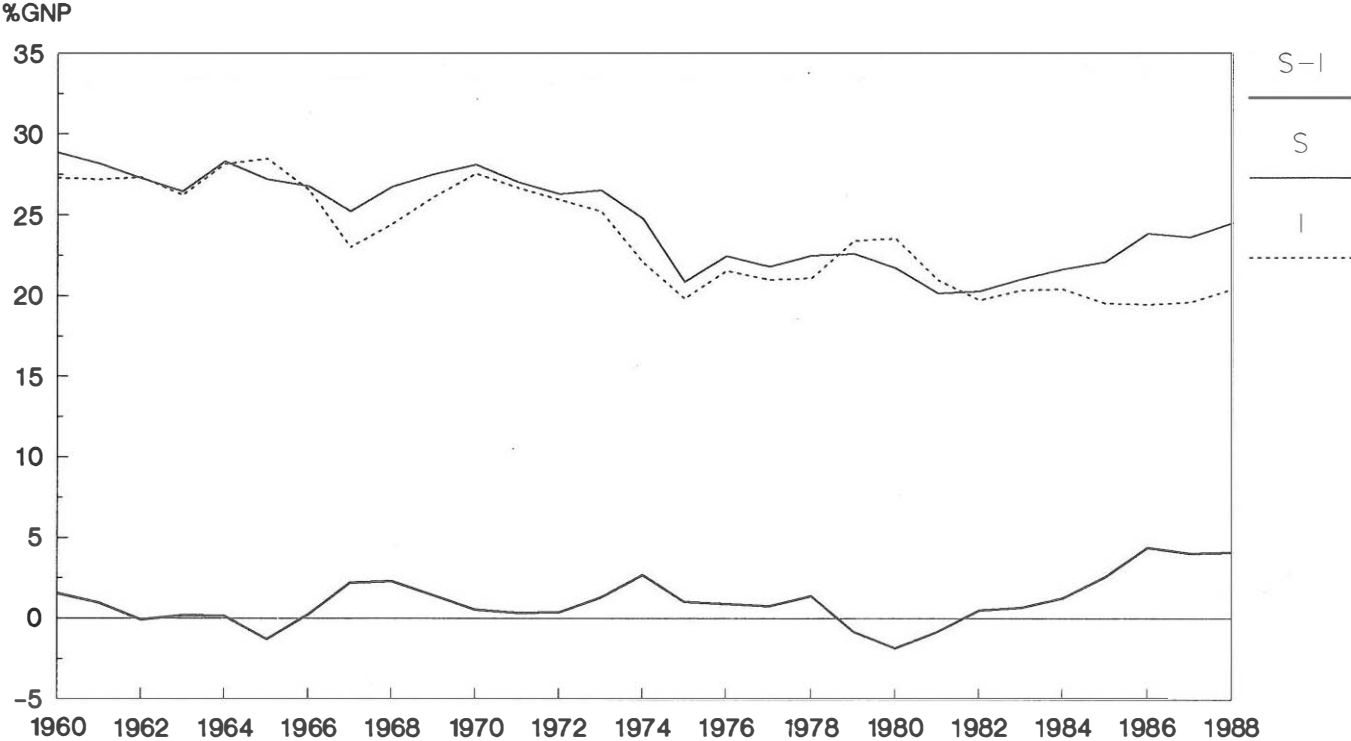
DENMARK



# FRANCE

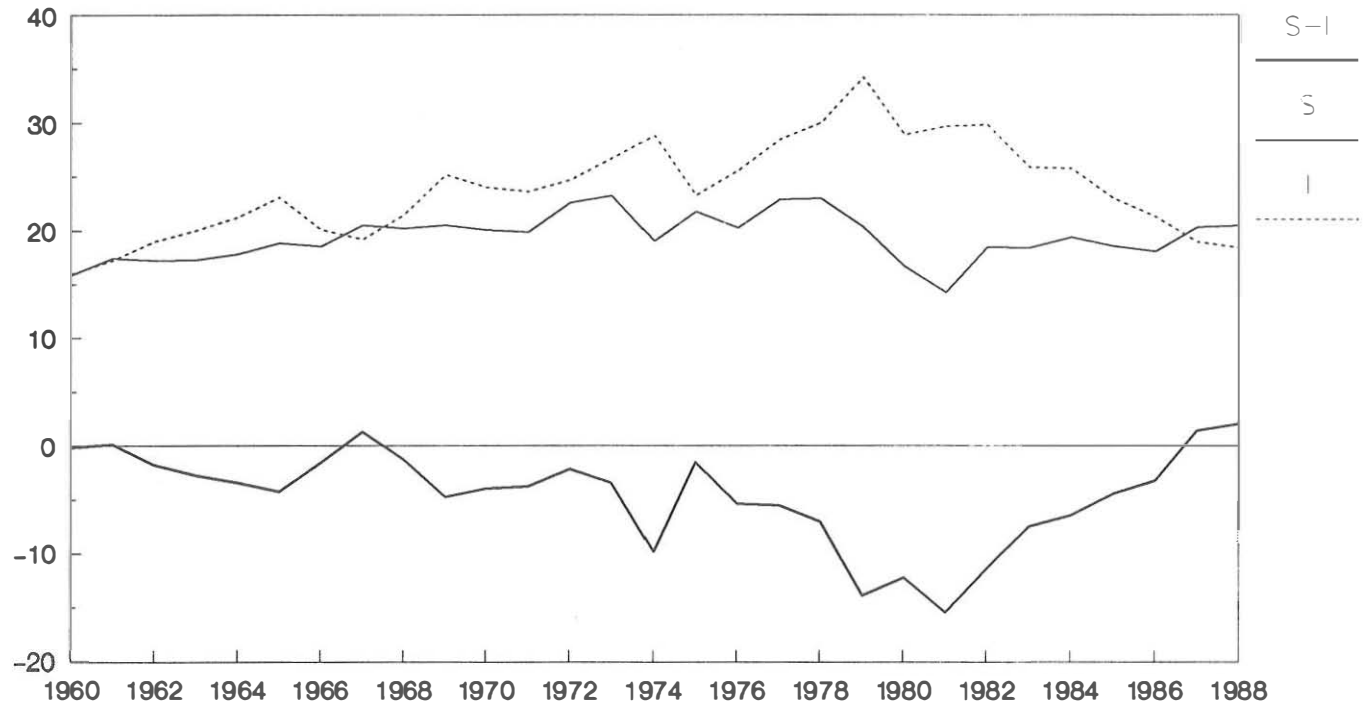


GERMANY



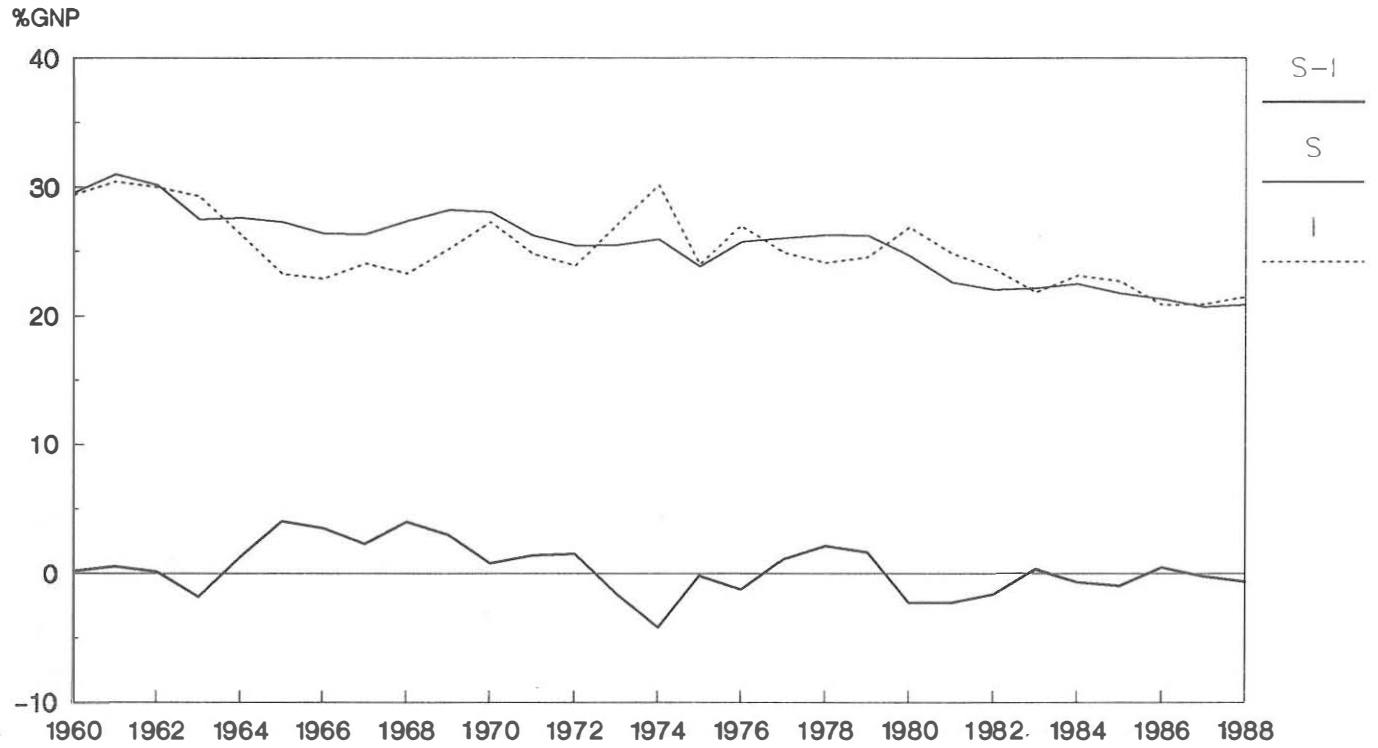
# IRELAND

% GNP



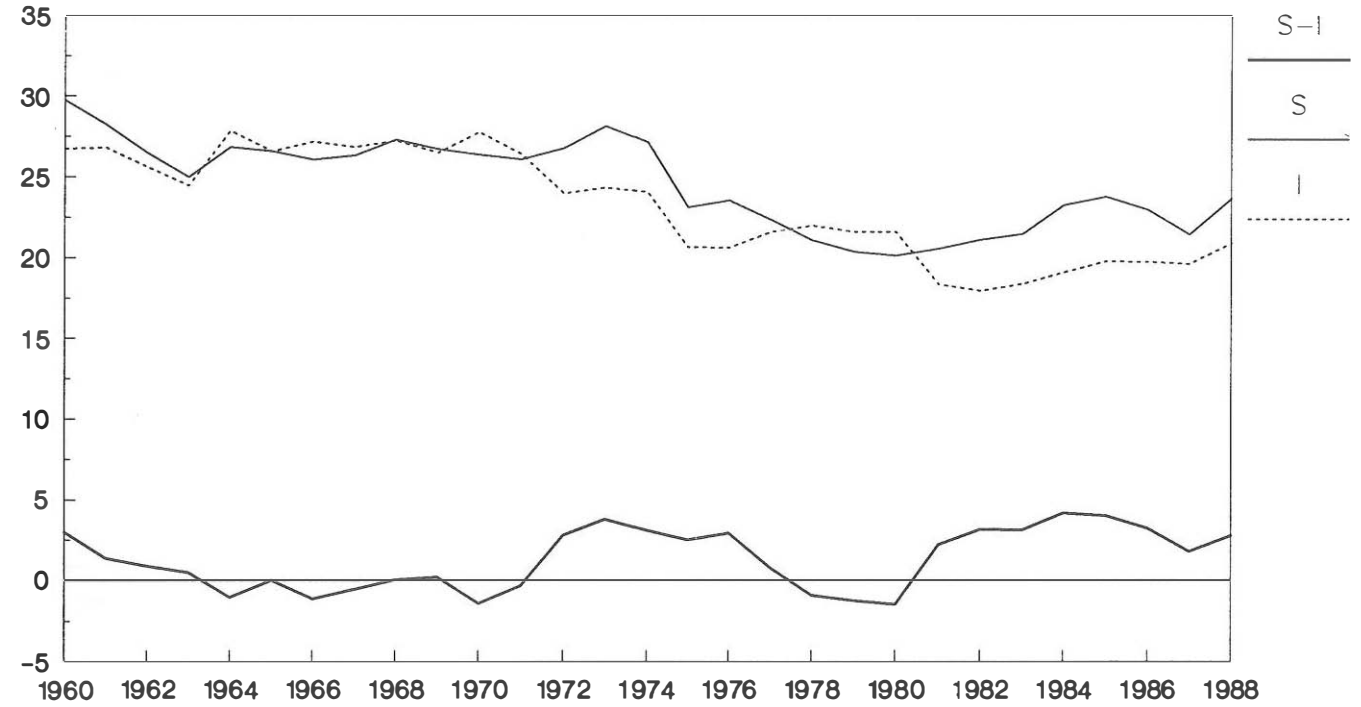
- 43 -

ITALY

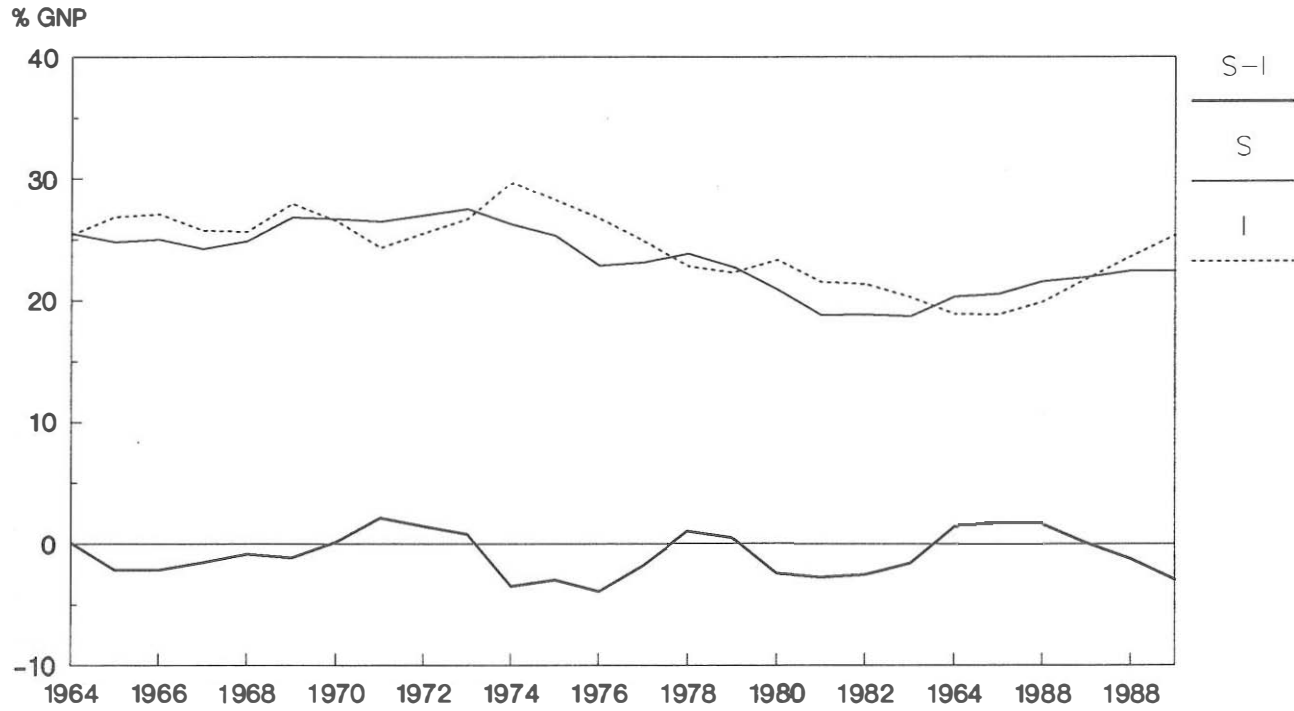


# NETHERLANDS

%GNP

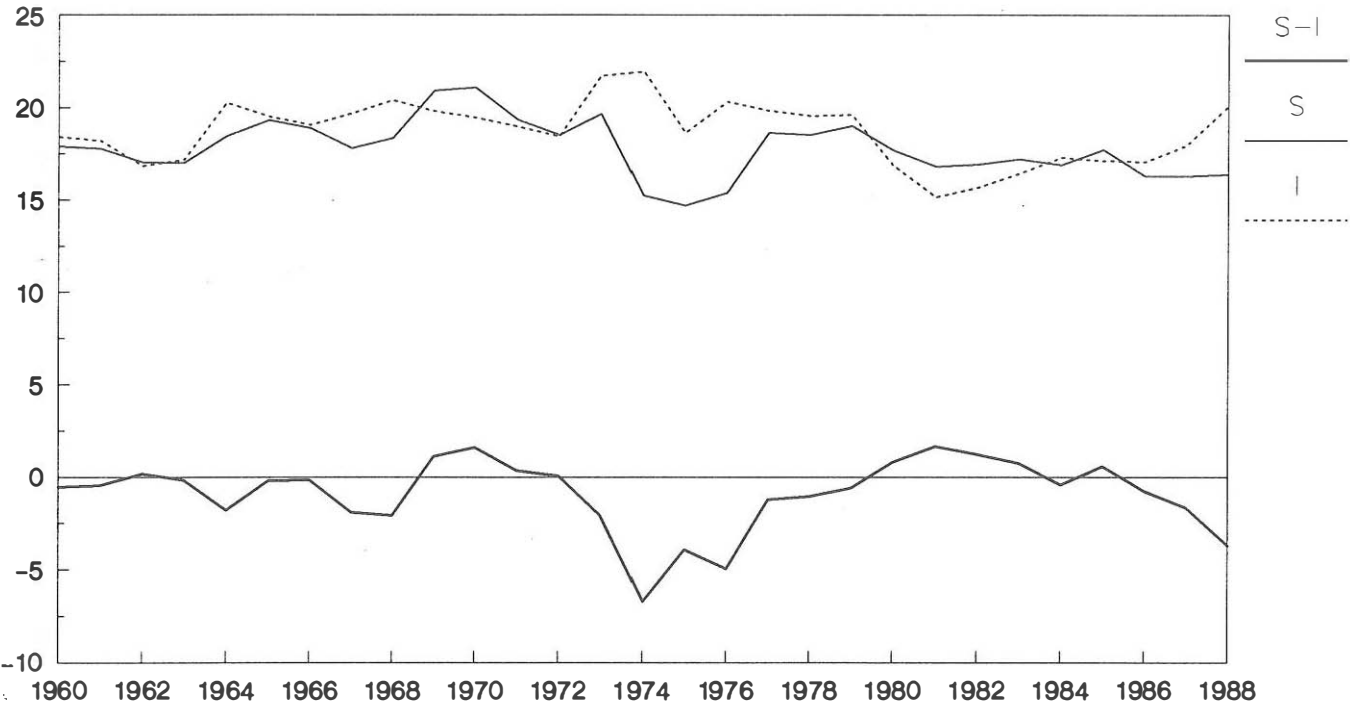


SPAIN



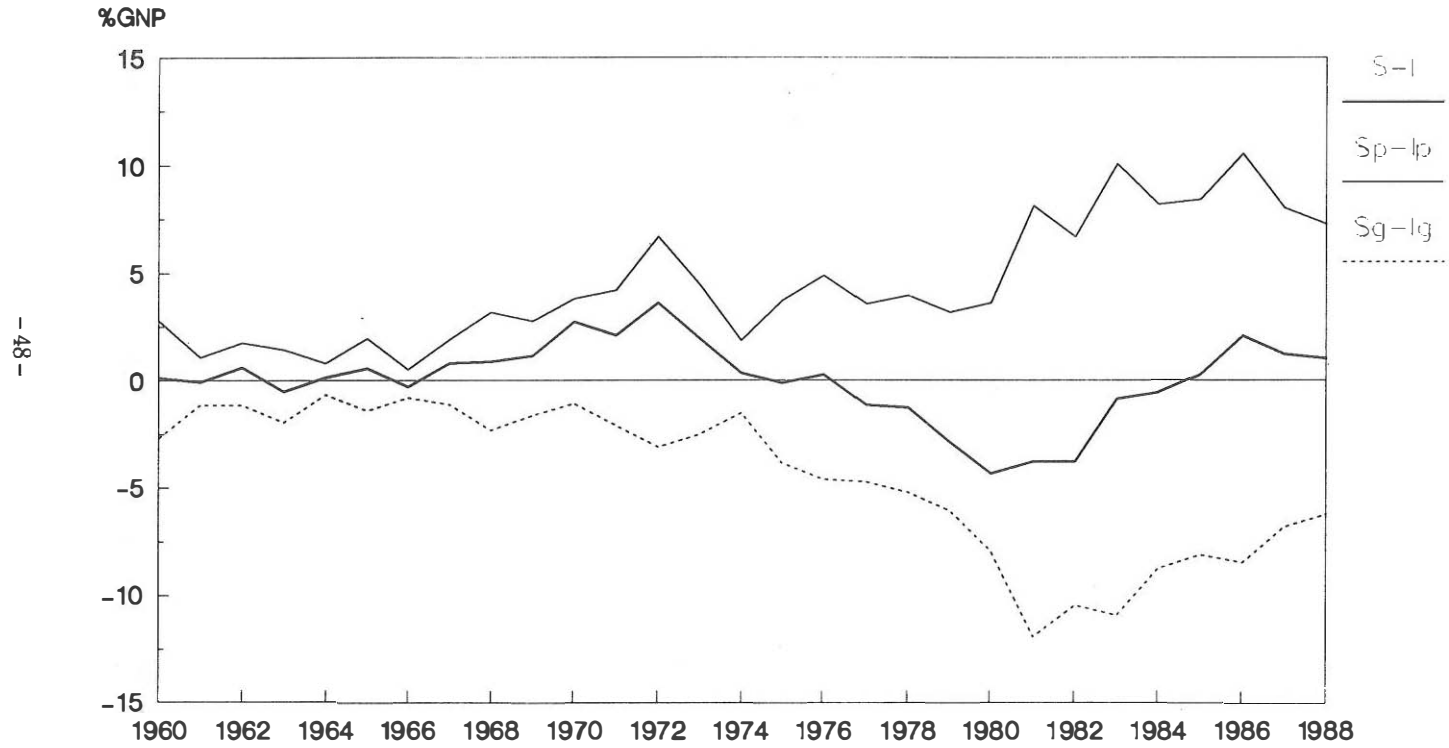
# UNITED KINGDOM

%GNP

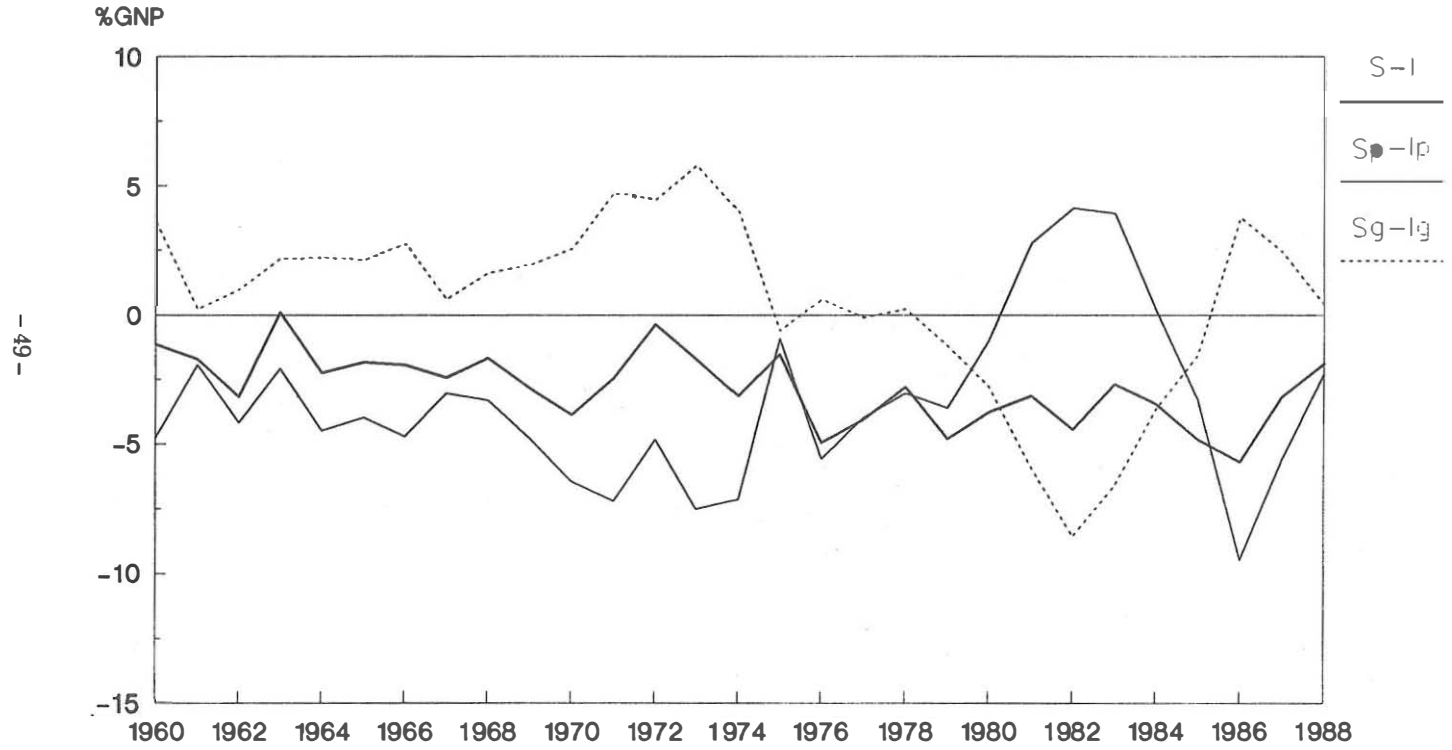




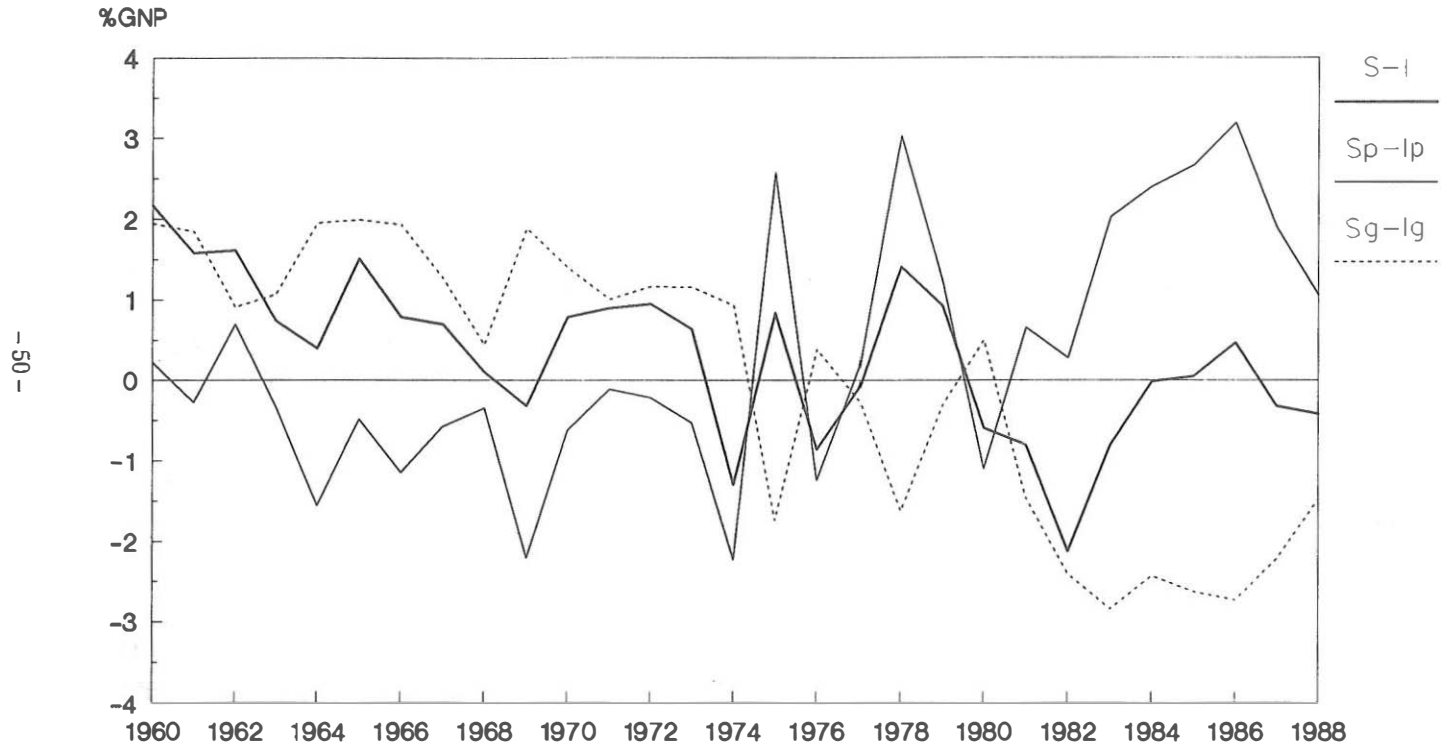
# BELGIUM



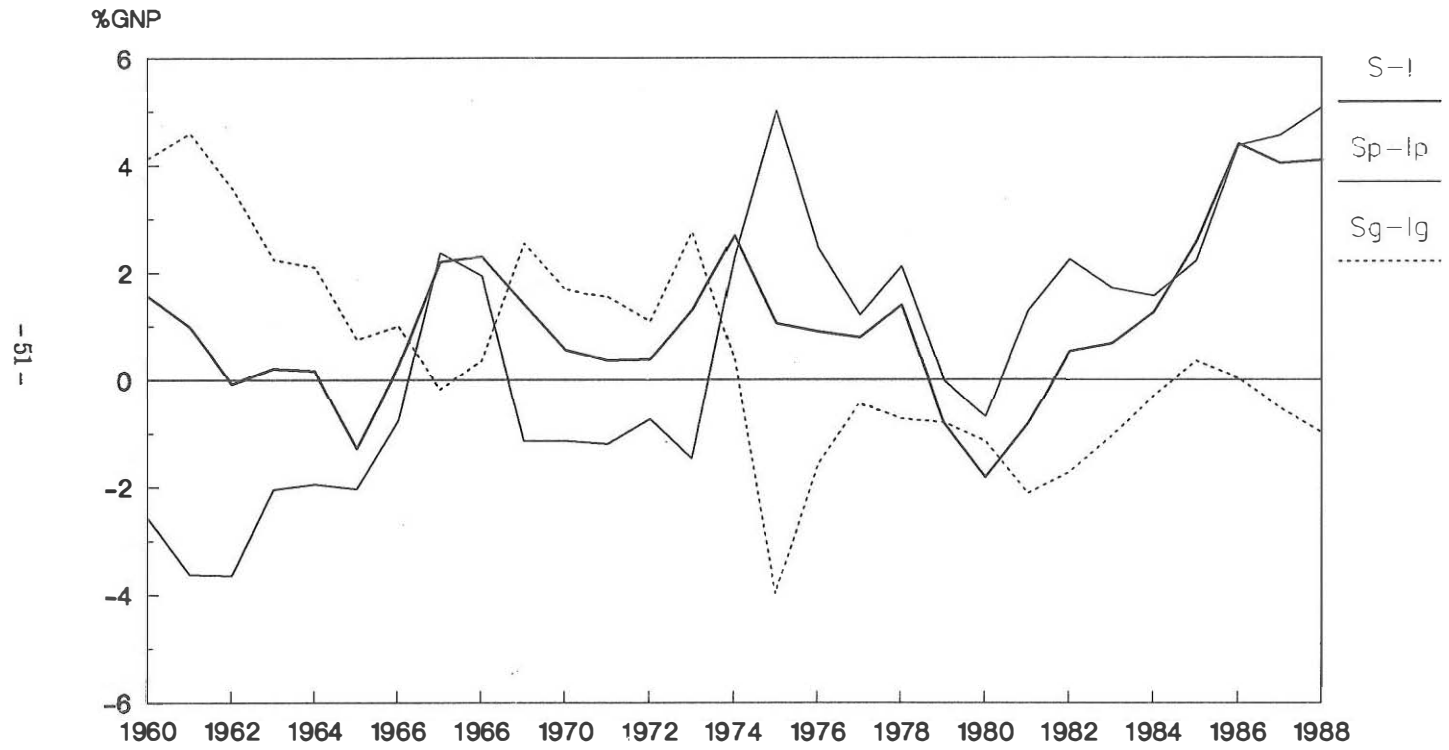
# DENMARK



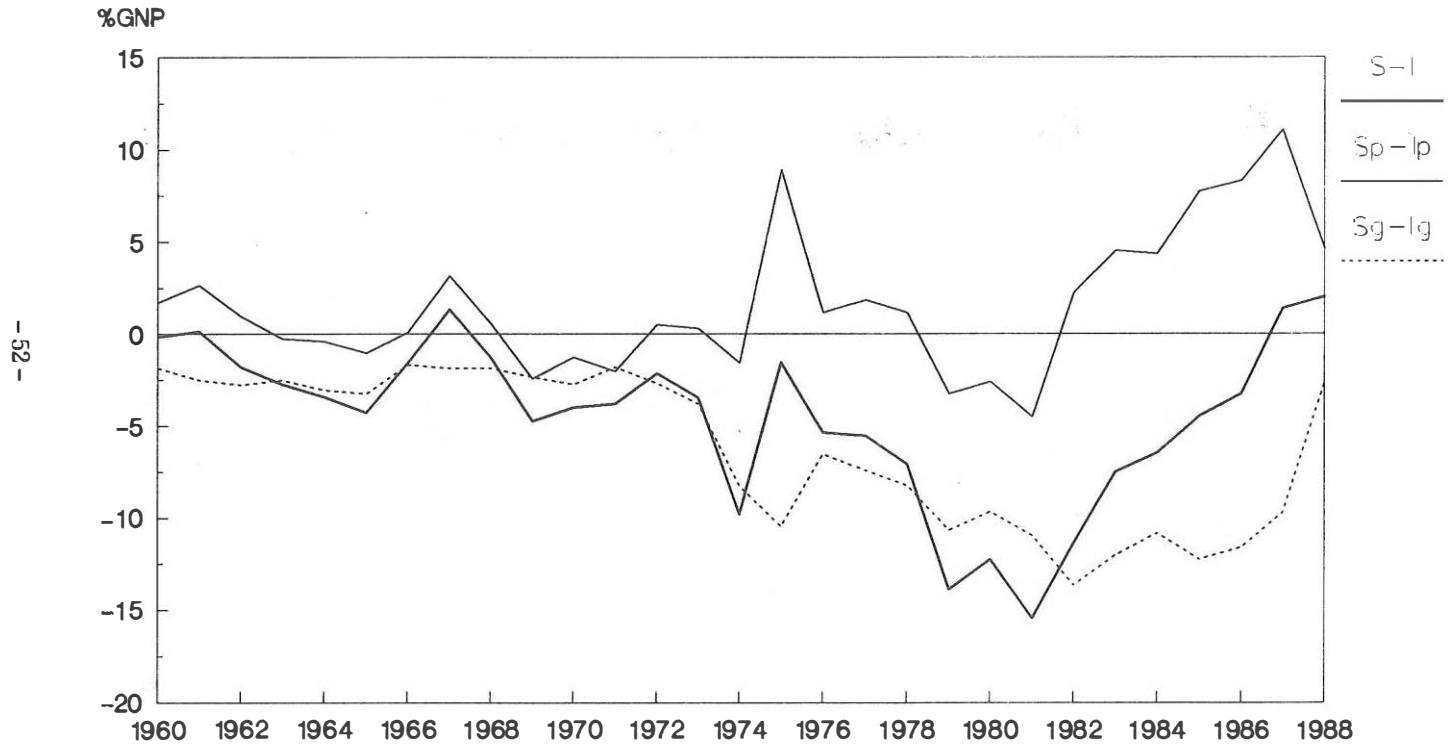
FRANCE



# GERMANY

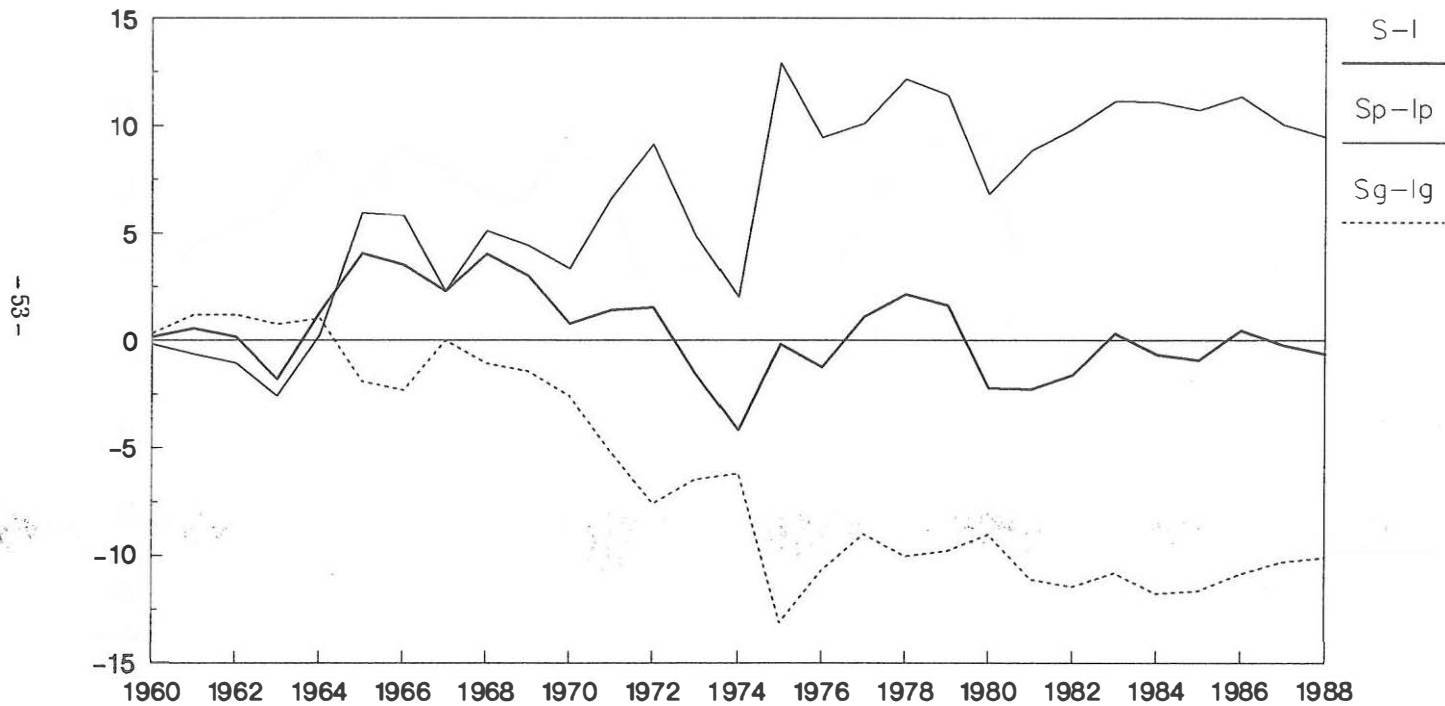


IRELAND



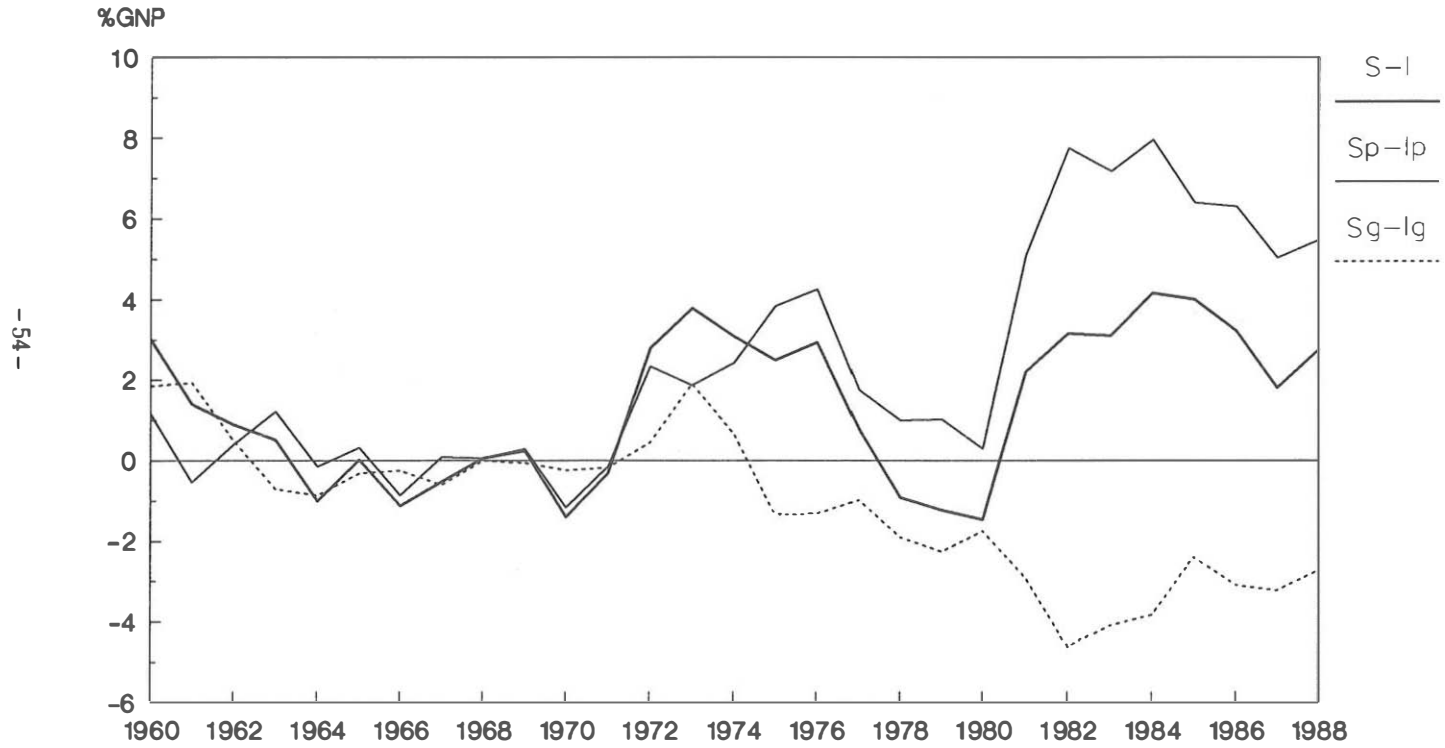
# ITALY

%GNP

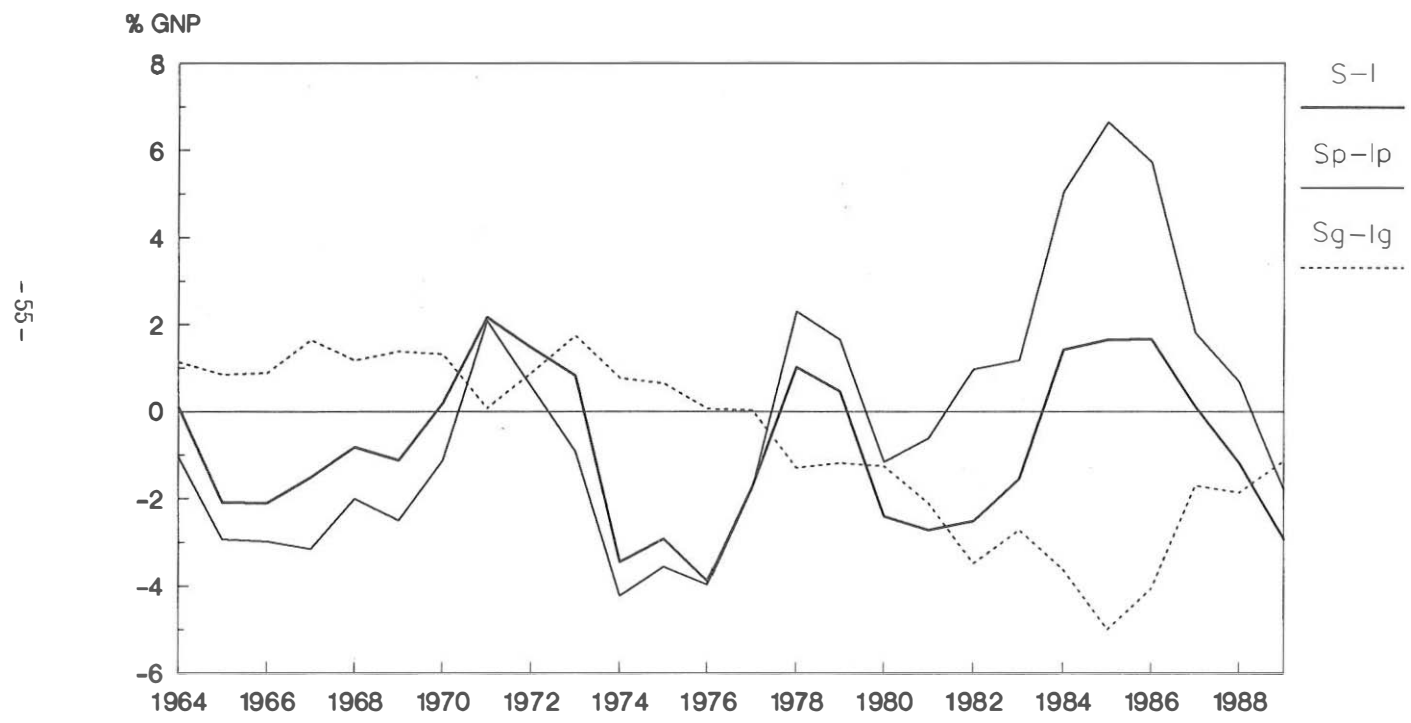


-53-

NETHERLANDS



SPAIN





UNITED KINGDOM



## REFERENCES

- Artis, M. y T. Bayoumi, 1989, Saving, investment, financial integration, and the balance of payments, IMF Working Paper WP/89/102.
- Bacchetta, P., 1990, Ahorro, inversión y movilidad internacional de capitales, octubre, mecanografiado.
- Banco de España, 1990, Cuentas financieras de la economía española (1980-1989) (Madrid).
- Baxter, M. y M.C. Crucini, 1990, Explaining saving/ investment correlations, University of Rochester and Rochester Center for Economic Research, Working Paper 224.
- Bayoumi, T., 1990, Saving-Investment correlations: immobile capital, government policy, or endogenous behavior?, IMF Staff Papers, Vol 37, 2, 360-387.
- Corrales, A. y D. Taguas, 1989, Series macroeconómicas para el período 1954-88: un intento de homogeneización, Monografía 75 (Instituto de Estudios Fiscales, Madrid).
- Dolado, J.J., 1989, Cointegración: una panorámica, Documento de Trabajo 8902, Banco de España, Servicio de Estudios.
- Dolado, J.J., T. Jenkinson, y S. Sosvilla-Rivero, 1990, Cointegration and unit roots: a survey, Journal of Economic Surveys, Vol. 4, 3, 249-273.
- Dolado, J.J. y J. Viñals, 1990, Macroeconomic policy, external targets and constraints: the case of Spain, Documento de Trabajo 9009, Banco de España, Servicio de Estudios.
- Engle, R. y C. Granger, 1987, Cointegration and Error Correction: Representation, Estimation and Testing, Econometrica 49, Vol. 55, 2. 251-276.

- Feldstein, M. 1983, Domestic saving and international capital movements in the long run and the short run, *European Economic Review* 21, 129-151.
- Feldstein, M. y P. Bacchetta, 1990, National saving and international investment, en: J. Shoven y D. Bernheim, eds.: *The economics of savings* (University of Chicago Press).
- Feldstein, M. y Ch. Horioka, 1980, Domestic saving and international capital flows, *Economic Journal*, 90, 314-329.
- Frankel, J. A., 1989, Quantifying international capital mobility in the 1980s, en J. Shoven y D. Bernheim, eds.: *The economics of savings* (University of Chicago Press).
- Ghosh, A.R. 1990, International capital mobility and optimal current account behaviour: an empirical investigation, Princeton University, Discussion Paper 50.
- Johansen, S., 1988, Statistical analysis of cointegration vectors, *Journal of Economic Dynamics and Control* 12, 231-259.
- Levy, D., 1990, Investment saving comovement, capital mobility, and fiscal policy, Irvine Economics Paper 90-91-04.
- McKinnon J., 1990, Critical values for cointegration tests, University of California, San Diego, Discussion Paper 90-4.

## DOCUMENTOS DE TRABAJO (1)

- 8701 **Agustín Maravall:** The use of ARIMA models in unobserved components estimation: an application to Spanish monetary control.
- 8702 **Agustín Maravall:** Descomposición de series temporales: especificación, estimación e inferencia (con una aplicación a la oferta monetaria en España).
- 8703 **José Viñals y Lorenzo Domingo:** La peseta y el Sistema Monetario Europeo: un modelo del tipo de cambio peseta-marco.
- 8704 **Gonzalo Gil:** The functions of the Bank of Spain.
- 8705 **Agustín Maravall:** Descomposición de series temporales, con una aplicación a la oferta monetaria en España: comentarios y contestación.
- 8706 **P. L'Hotellerie y J. Viñals:** Tendencias del comercio exterior español. Apéndice estadístico.
- 8707 **Anindya Banerjee and J. Dolado:** Tests of the Life Cycle-Permanent Income Hypothesis in the Presence of Random Walks: Asymptotic Theory and Small-Sample Interpretations.
- 8708 **Juan J. Dolado and Tim Jenkinson:** Cointegration: A survey of recent developments.
- 8709 **Ignacio Mauleón:** La demanda de dinero reconsiderada.
- 8801 **Agustín Maravall:** Two papers on ARIMA signal extraction.
- 8802 **Juan José Camio y José Rodríguez de Pablo:** El consumo de Alimentos no elaborados en España: Análisis de la información de MERCASA.
- 8803 **Agustín Maravall and Daniel Peña:** Missing Observations in Time Series and the «DUAL» Autocorrelation Function.
- 8804 **José Viñals:** El Sistema Monetario Europeo. España y la política macroeconómica. (Publicada una versión en inglés con el mismo número.)
- 8805 **Antoni Espasa:** Métodos cuantitativos y análisis de la coyuntura económica.
- 8806 **Antoni Espasa:** El perfil de crecimiento de un fenómeno económico.
- 8807 **Pablo Martín Aceña:** Una estimación de los principales agregados monetarios en España: 1940-1962.
- 8808 **Rafael Repullo:** Los efectos económicos de los coeficientes bancarios: un análisis teórico.
- 8901 **M<sup>a</sup> de los Llanos Matea Rosa:** Funciones de transferencia simultáneas del índice de precios al consumo de bienes elaborados no energéticos.
- 8902 **Juan J. Dolado:** Cointegración: una panorámica.
- 8903 **Agustín Maravall:** La extracción de señales y el análisis de coyuntura.
- 8904 **E. Morales, A. Espasa y M. L. Rojo:** Métodos cuantitativos para el análisis de la actividad industrial española. (Publicada una edición en inglés con el mismo número.)
- 9001 **Jesús Albarracín y Concha Artola:** El crecimiento de los salarios y el deslizamiento salarial en el período 1981 a 1988.
- 9002 **Antoni Espasa, Rosa Gómez-Churruga y Javier Jareño:** Un análisis econométrico de los ingresos por turismo en la economía española.
- 9003 **Antoni Espasa:** Metodología para realizar el análisis de la coyuntura de un fenómeno económico. (Publicada una edición en inglés con el mismo número.)
- 9004 **Paloma Gómez Pastor y José Luis Pellicer Miret:** Información y documentación de las Comunidades Europeas.
- 9005 **Juan J. Dolado, Tim Jenkinson and Simon Sosvilla-Rivero:** Cointegration and unit roots: A survey.
- 9006 **Samuel Bentolila and Juan J. Dolado:** Mismatch and Internal Migration in Spain, 1962-1986.
- 9007 **Juan J. Dolado, John W. Galbraith and Anindya Banerjee:** Estimating euler equations with integrated series.

- 9008 **Antoni Espasa y Daniel Peña:** Los modelos ARIMA, el estado de equilibrio en variables económicas y su estimación. (Publicada una edición en inglés con el mismo número.)
- 9009 **Juan J. Dolado and José Viñals:** Macroeconomic policy, external targets and constraints: the case of Spain.
- 9100 **Anindya Banerjee, Juan J. Dolado and John W. Galbraith:** Recursive and sequential tests for unit roots and structural breaks in long annual GNP series.
- 9101 **Pedro Martínez Méndez:** Nuevos datos sobre la evolución de la peseta entre 1900 y 1936. Información complementaria.
- 9101 **Javier Valles:** Estimation of a growth model with adjustment costs in presence of unobservable shocks.
- 9102 **Javier Valles:** Aggregate investment in a growth model with adjustment costs.
- 9103 **Juan J. Dolado:** Asymptotic distribution theory for econometric estimation with integrated processes: a guide.
- 9104 **José Luis Escrivá y José Luis Malo de Molina:** La instrumentación de la política monetaria española en el marco de la integración europea. (Publicada una edición en inglés con el mismo número.)
- 9105 **Isabel Argimón y Jesús Briones:** Un modelo de simulación de la carga de la deuda del Estado.
- 9106 **Juan Ayuso:** Los efectos de la entrada de la peseta en el SME sobre la volatilidad de las variables financieras españolas. (Publicada una edición en inglés con el mismo número.)
- 9107 **Juan J. Dolado y José Luis Escrivá:** La demanda de dinero en España: definiciones amplias de liquidez. (Publicada una edición en inglés con el mismo número.)
- 9108 **Fernando C. Ballabriga:** Instrumentación de la metodología VAR.
- 9109 **Soledad Núñez:** Los mercados derivados de la deuda pública en España: marco institucional y funcionamiento.
- 9110 **Isabel Argimón y José M<sup>a</sup> Roldán:** Ahorro, inversión y movilidad internacional del capital en los países de la CE. (Publicada una edición en inglés con el mismo número.)

---

(1) Los Documentos de Trabajo anteriores a 1987 figuran en el catálogo de publicaciones y en los últimos «Informe Anual» y «Cuentas Financieras de la Economía Española» editados por el Banco de España.

<p align="center"><b>Información:</b> Banco de España  Sección de Publicaciones, Negociado de Distribución y Gestión  Teléfono: 338 51 80  Alcalá, 50. 28014 Madrid</p>
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------