OPTICA REPORT 1976

INFLATION AND EXCHANGE RATES :
EVIDENCE AND POLICY GUIDELINES
FOR THE EUROPEAN COMMUNITY

This Report has been prepared by a group of independent experts set up by the Commission. Its main task has been to verify and complete, chiefly through statistical and econometric studies, the results contained in the report presented at the end of 1975 by the first group of experts "OPTICA".

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CONTENTS

I N T R O D U C T I O N

Chapter 2 of the OPTICA 75 Report reviewed the theoretical relationships between changes in exchange rates on the one hand and changes in the level of economic activity on the other. The conclusion concerning the real and monetary effects of exchange-rate changes in a relatively open economy was that

> "... all the schools of thought surveyed agree that in long-run situations money illusion disappears and exchange-rate changes therefore are not an instrument of economic policy with real effects on the economy. The essential difference among them on this issue is that while the monetarists believe that the short run is very short, the other schools do not share this view ..."

The first Report reasoned that in an inflationary environment, where market participants are likely to form their expecations in full awareness of the impact on domestic costs and prices of exchange-rate adjustments, the period during which such adjustments   have real effects is likely to be short. The Report went on to argue for firm management of intra-Community exchange rates and money supply growth rates. It also stressed the desirability of introducing a European Parallel Currency (EPC) in competition with national currencies. The proposed new currency should be made attractive to asset holders by offering . partial protection against inflation. This was expected to make its rapid acceptance likely, at least in the case of the more inflationary economies.

The present Report takes up some of the themes of OPTICA '75. Chapter I surveys empirical evidence relating to the nominal nature of the exchange rate :   its tendency over longer periods towards conformity with inflation rate differentials (Purchasing Power Parity), the processes by which this comes about, and especially the experiences of the two member countries that have inflated and devalued most, namely Italy and the United Kingdom. Its conclusion is that the evidence is largely consistent with the theoretical relationships between exchange-rate changes and macroeconomic adjustments set out in the first Report.

In Chapter III of the present Report simulation experiments are used to explore the properties of the EPC proposed last year. These experiments show that the EPC appears a little less attractive relative to selected national currenties than was originally envisaged; as a consequence the fear of some critics that it would be so attractive that it would quickly replace national currencies appears unfounded. The conclusion remains that the launching of an EPC, approximately in the form discussed in OPTICA '75 and the present Report, would indeed represent a sound approach to the long-run monetary unification of Europe.

But in the year that has passed since OPTICA '75 was written, progress towards European monetary and economic integration has been blocked and, indeed, set back by the persistence of large discrepancies in rates of inflation among EC member countries, high levels of unemployment and a succession of crises in the exchange markets. The reaction to these crises has been a reintroduction of foreign exchange controls and of trade restrictions of more or less disguised kinds. These, if maintained, threaten to destroy the chance of further progress toward European economic union. The concern of policy makers has turned to the dampening of further centrifugal tendencies in the exchange markets and it would therefore appear inadequate to propose as the only approach to European monetary unification the launching of an EPC, without paying specific attention to these centrifugal tendencies. Firmer cooperation on exchange rates is of prime importance in the present situation, and a prerequisite for the eventual launching of an EPC.

This is the background to the proposal in Chapter II for the management of exchange rates. The evidence of Chapter I indicates that it would not be inconsistent with long-run equilibrium to limit the movement of a country's exchange rate to the differences between an average of recently observed inflation rates at home and abroad. This is far less ambitious than many other schemes that have been proposed in the past. It gives concreteness to broad ideas that have recently been put forward in official circles but which would probably be inoperative in their original form because they leave too much discretion to national authorities in defining exchange-rate targets. At a minimum, the present proposal would check the type of positive feedback between exchange markets and domestic inflation witnessed in 1976. Its objectives are the stabilisation of expectations and the reinforcement of the kind of monetary guidelines which are increasingly being adopted in Community countries. In this context, however, it recognises that differences in national inflation rates can be eliminated only very gradually.   ./.

The present recommendation concerning exchange rates is consistent with that of OPTICA '75 concerning the EPC, despite apparent differences in their respective time perspectives. Furthermore, this Report reiterates the view expressed in OPTICA '75 that the introduction of an EPC does not imply any particular exchange-rate regime inside the Community. But it argues that it is difficult to conceive of progress being made towards an EPC without, at a minimum, the sort of exchange-rate cooperation proposed here.

CHAPTER I

ORIGINS AND CONSEQUENCES OF EXCHANGE-RATE
CHANGES

Although OPTICA '75 $/$ 6 $_/$ referred to   the origins and
consequences of exchange-rate changes in European countries, it did not
attempt to back this up with a systematic survey of relevant empirical work.
However, since the main issue is clearly empirical, it is necessary to attempt
such a survey, thus contributing to the already considerable literature on the
interactions among exchange rates, price and cost levels and other monetary and
real variables.

    This chapter provides such an assessment in three sections.

1. Analysis of the extent to which observed changes in the exchange rates of
Community currencies vis-à-vis each other and outside currencies may be
attributed to differentials in national inflation rates.

2. Analysis of the ways in which changes in the prices of internationally traded
goods have worked their way through the cost and price structures of EC member
countries. One important aspect of this is the effect of linking various
categories of income to the cost of living index, and this is briefly dealt
with in Annex I-B.

3. Evaluation by means of econometric models of how devaluation has worked in
Italy and the United Kingdom.

    Besides reviewing the published evidence on these three closely related
subjects, the authors of this report have undertaken some additional empirical
investigation. The results of these investigations are in the main text, the
references and much of the survey material are incorporated in the annexes.

1. Exchange-Rate Changes as an Adjustment to Divergent Inflation Rates

    One natural starting assumption, underlying much of the analysis
of European integration and the feasibility of economic and monetary union,
is that the marked increase in intra-Community trade and capital flows over
the past 25 years has enforced a high degree of parallelism in national price

and cost trends of the member countries, when measured in a common numéraire. Clearly the latter qualification has to be added, since intra-Community exchange rates have not been exactly stable in recent years. But the assumption would still be valid, if it turned out that the changes in bilateral nominal exchange rates between Community currencies - or c hanges in effective (trade-weighted) terms for each of them - tended to offset differentials between the domestic inflation rate and those in other Community countries or other trading partners. In other words, if the real exchange rate between two currencies, i.e. the nominal exchange rate corrected for the inflation differential, is stable, this may be taken as an indication of a high degree of integration. Similarly, in a system of fixed rates, it would be justifiable to regard parallel cost and price trends, measured in national currencies, as a sign that integration was far advanced.

What is at issue is whether observed exchange-rate changes for Community currencies over the past one or two decades conform to Purchasing Power Parity (PPP). According to a recent survey by L. Officer $/^-$ 18 $_7$ the crucial issues involved in this approach to exchange-rate analyses are

> "... (1) that the short-run equilibrium exchange rate is a function of the long-run equilibrium exchange rate in the sense that the former variable tends to approach the latter, and (2) that PPP is either the long-run equilibrium exchange rate or the principal determinant of it." $/^-$ 18, p. 3 $_7$

In the applications of PPP to be reviewed here the implicit assumption is made that it is legitimate (after three or four years of floating exchange rates) to regard recently observed rate constellations as an approximation to the market-clearing, short-run equilibria which would tend to emerge in a system of unmanaged floating. Since this assumption lacks realism, care is required in the interpretation of specific cases.

The evidence presented in this section does not claim to test a theory of exchange-rate determination. It has long been recognized, by proponents of PPP among others, that the causal links between differential inflation rates and exchange-rate changes are by no means one-way, i.e. only from prices to exchange rates. Indeed, reasons for believing the reverse causation to have been important in recent years are discussed in Section 3 of this chapter and forms part of the justification for the

rules of exchange-rate management outlined in Chapter II. The first step, however, is to assess the extent to which movements in relative inflation and in exchange rates are correlated with one another.

There are many ways of presenting the evidence on PPP. A fundamental problem is the choice of appropriate price indices to measure relative inflation. There are strong a priori grounds for ranking the possible candidates by their degree of conformity to PPP. Other problems are to choose appropriate base and terminal periods for the data and to determine whether PPP is more appropriately observed in bilateral or in multilateral currency relationships. It is not surprising that the many possible formulations of PPP have produced a bewildering maze of results some of which conflict with one another. Given this situation, it has been necessary to undertake additional calculations, tailored to the needs of this report.

Turning first to the choice of price indices, there are four main candidates to be reviewed : export prices, unit labour costs, wholesale prices and consumer prices. Some summary comments on these data will be made here whilst a detailed review of the available statistical series may be found in Annex I-A. A further review is to be found in Officer $\underline{/}$ 18 $\underline{/}$.

The closest approximation of exchange rates to PPP may be expected if PPP is calculated on the basis of export prices. Indeed, with perfect competition, a liberal trade and payments system and zero transport costs both prices and exchange rates should tend to adjust in such a way as to equalise price levels internationally when measured in a common numéraire. This equality may be called the law of one price or absolute PPP. Specialization, structural imperfections in markets, transport costs and governmental trade and payments restrictions will cause deviations from this equality; but to the extent that these various factors are stable over time, changes in export prices - as generally in tradeable goods prices - in different countries should still be parallel when converted into a common numéraire. It is this version of PPP on which we have focussed, as has most of the empirical research available.

There are, however, both conceptual and statistical difficulties in using export price indices. At the conceptual level these prices do not take into account changes in the profitability of the export industries. If, for example, costs in export industries rise due to an increase

in wages or in imported inputs (e.g. oil), profit margins will be squeezed, provided - as appears realistic in the case of Community countries individually - exporters do not allow their prices expressed in a common numéraire to diverge significantly from those of their competitors.Observance of PPP in such a case could not be interpreted at last in the short-term as an equilibrium relationship; there would be pressure for the domestic production of tradeables to shrink. At the statistical level, the problem is that the available series refer to export industries only, and that the series are typically average or unit value indices (AVX) rather than genuine price indices.

The use of an index of unit labour costs (ULC) in the tradeables sector remedies some of these defects. By combining information on hourly wages and output per man-hour it would appear that one could obtain more reliable information on PPP as an equilibrium relationship. But here again there are serious conceptual and statistical difficulties. Ideally, information is required on total factor costs and productivity rather than just on one single major factor. But probably the poor quality of the available statistics is more serious; since indirect labour costs such as pay-roll taxes, unemployment insurance etc. are largely excluded, moreover for two Community countries the relevant statistics are not available at all,and in four others they are not published nationally.
These problems and the generally poor empirical results obtained in testing PPP with these data lead to the conclusion that unit labour costs should not be relied upon either in analysing past inflation and exchange-rate behaviour or in implementing the proposals for exchange-rate management set out in Chapter II.

The third candidate examined is a wholesale price index (WPI), which ideally measures the prices of tradeable outputs. It is preferable to an export price series because it includes import-competing goods, and it offers a stronger test of PPP by giving greater weight to domestic cost elements. While this index seems satisfactory conceptually, it is not free of statistical problems. In particular its coverage and weighting differ substantially between countries. Despite these difficulties and the fact that the conformity of PPP based upon WPI with market exchange rates is slightly weaker than that found for AVX in most of the calculations made for this Report, if a single index is to be used in the formulation of PPP the WPI is probably the most appropriate.
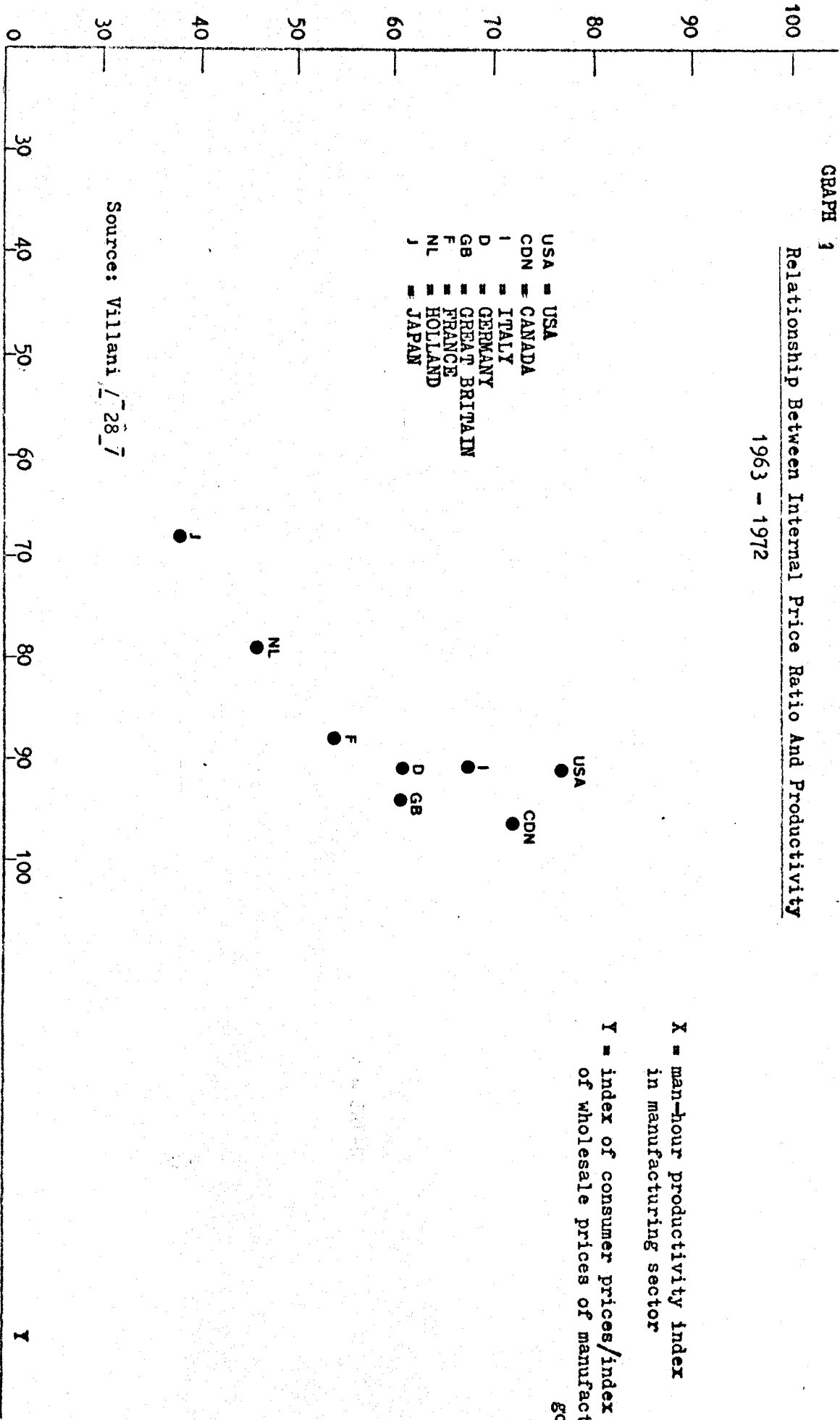
The fourth candidate is the consumer price index (CPI). This index includes non-tradeable goods and services to a much larger extent than WPI and a formulation which uses it should a priori be the least favourable to PPP. Indeed, there is a substantial literature as to why there is likely to be a "productivity bias" in measuring PPP on the basis of CPI. In particular, Balassa $/\bar{\ } 2 \_/$ has argued that the ratio of the price index for non-tradeables to the price index for tradeables - the "internal price ratio" - can be expected to rise with the level of productivity of a country (as measured by real per capita income or output per man). If, indeed, the change over time in the productivity advantage of the richer country is mainly concentrated in the production of tradeables, measuring PPP by relative CPI's which contain a large share of non-tradeables, will make the currency of the richer country look overvalued.

Balassa's point was originally demonstrated for a sample of countries at very different levels of per capita income. It is more doubtful whether this point is important when the analysis is focussed on industrial countries at approximately the same level of development, such as member countries in the Community. A thorough empirical study recently done by Officer $/\bar{\ } 18 \_/$ casts serious doubt on this, at least as far as absolute PPP is concerned. Officer's findings are however inconclusive with respect to relative PPP. Graph 1 which is taken from a study by Villani et al. shows $/\bar{\ } 28 \_/$ a clear positive relationship between the ratio of CPI to WPI and an index of productivity. It is based on cross-section data for five Community countries and three non-Community countries in the decade 1963-72. It appears that even in a relatively homogeneous group of countries the productivity bias may be sufficiently important to cast doubt on the usefulness of testing PPP by means of CPI.

This is important because much work on exchange-rate determination continues to be formulated in terms of CPI. Thus in a recent major investigation of real exchange-rate variability and the implications for monetary integration Vaubel $/\bar{\ } 27 \_/$ concludes that significant departures of exchange rates from PPP in the Community between 1959 and 1975 and in the 1970's when a CPI formulation is used, indicate a need for real exchange-rate changes between Community currencies. Vaubel's argument that the absence of real exchange-rate changes is the most appropriate single criterion for evaluating the cohesion of a group of countries and the feasibility of their currency unification may hold provided one can identify an empirical counterpart to his theoretical concept of real exchange rate. Indeed we think that the substantial departures from PPP which he finds are probably more reflective of productivity bias and differences in the composition

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GRAPH 1

Relationship Between Internal Price Ratio And Productivity

1963 - 1972

USA = USA
CDN = CANADA
I = ITALY
D = GERMANY
GB = GREAT BRITAIN
F = FRANCE
NL = HOLLAND
J = JAPAN

Source: Villani /¯28¯7

X = man-hour productivity index in manufacturing sector

Y = index of consumer prices/index of wholesale prices of manufactured goods

$lgy = a+blgx$

coefficients		T	D.W.	R^2	$(\bar{R})^2$
a =	1.16441	8.03803	1.28	0.82674	0.76899
b =	0.43845	5.35079			

of national CPI's (see the information on Community CPI's supplied by
Vaubel himself in /⁻ 27, p. 468_/ and by Vannereau /⁻26_/ than real
exchange-rate changes.

On balance then, WPI's appear to be most appropriate on conceptual and
statistical grounds for testing PPP; but evidence from tests using AVX and
CPI is presented below alongside those using WPI.

A number of possible base periods have been considered for the
testing of PPP. The analysis appears to be fairly robust to the choice of
base periods between 1959 and 1963. Indeed, between the French devaluation
in 1958 and the U.K. devaluation in 1967, the only change in nominal exchange-
rates were the German and Dutch 5 per cent revaluations in early 1961. Cost
and price trends measured in national currencies were not far apart before
1967, the maximum divergence between average annual rates of change of
comparable national series in the present member countries being of the order
of 1 1/2 percentage points. In a new study undertaken for this report 1961
has been used as a starting point for bilateral PPP-calculations and 1963 for
multilateral or effective PPP-calculations[1].Results will also be presented
for a shorter period, starting with the exchange rates agreed at the Smithsonian
Institutin in December 1971 and average prices and costs for the year between
mid-71 and mid-72. The Smithsonian rates were intended to be consistent
with longer-run external equilibrium for the currencies involved and they
should accordingly present a more appropriate reference point than, for
example, 1970 which was used by the OECD.

The terminal point for most of the calculations was the end of 1975.
It may be argued that this is inappropriate in view of the dramatic changes
in nominal exchange rates observed in 1976. Any cut-off point in a period
as turbulent as 1975-76 is open to criticism. For example choosing mid-76
when the inflationary impact of sharp lira and sterling devaluations was
being felt is also suspect. Yet it must be admitted that ending the
observation period at the end of 1975 tends on balance to put PPP in a
more favourable light than a later cut-off would have done.

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(1) The later base period was chosen because the Commission of the European
    Communities made available_in_September 1976 the results of a study
    on price competitiveness /⁻7_/.

It may be argued that pegging some of the Community currencies to
a major currency violates the assumption of market-clearing exchange rates
which are necessary for PPP to work. The Luxembourg franc and the Irish
pound are rigidly pegged to, respectively, the Belgian franc and the U.K.
pound; and they have accordingly not been reported in most of the
calculations. The existence of fixed margins for cross rates between the
snake - since the departure of the French franc in March 1976 the "mini-snake"-
currencies creates a similar problem for the smaller Community currencies and,
marginally so, for the DM. Though the October 1976 adjustments of exchange
rates inside the "mini-snake"went some way towards making these approximate
more closely to PPP, they were less radical than the adjustment that would
have taken place without the intervention rules. In this respect at least
the data do not constitute a fair test of PPP.

There remains the problem of whether to measure PPP bilaterally or
multilaterally, i.e. by means of the double-weighted index of inflation
trends in other countries and of effective(trade-weighted) exchange rates.
A more detailed review of the issues involved may be found in Annex I-A. The
results presented in Graphs 2 - 3 are based partly on bilateral PPP between
Germany and each of six other Community countries, the US, Japan and
Switzerland; partly on multilateral PPP for a total of 18 currencies.
The multilateral framework is probably   more important for it is in closer
correspondence with the concept of PPP. But the bilateral comparisons supply
useful additional information, notably in relation to the "mini-snake"
currencies for which it is sensible to use the DM as a point of reference.

The most striking feature of the evidence is the high degree of
conformity to PPP over 1961-75 shown in Graph 2 and the underlying regressions
in table 1. The results of this cross-section study of the DM exchange rates
of nine currencies and the effective rates of eighteen currencies are most
strongly in favour of PPP when AVX is used, but only slightly less so with WPI,
when the CPI and ULC(not reported here)are used the relationship is much weaker.
The results in Sections b and f of Graph 2 are striking; more than 80 per cent of
the variation in effective exchange rates for the countries studied appears
to be attributable to inflation differentials. Given the statistical
imperfections, even in the best of circumstances, this is a surprisingly close

Graph 2 : Inflation Differences and Changes in DM and Effective Exchange Rates - Compound average annual rates -

Inflation differences and changes in DM exchange rates
1961 - 1975
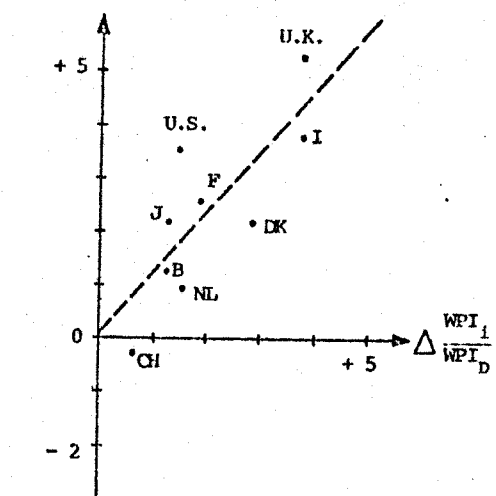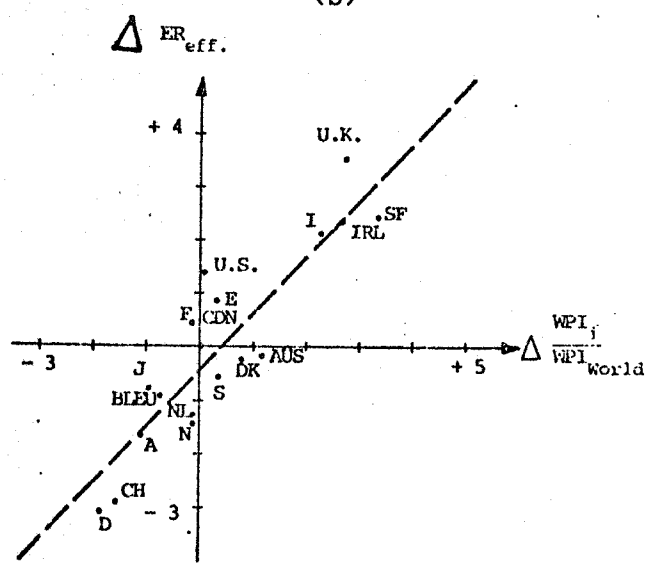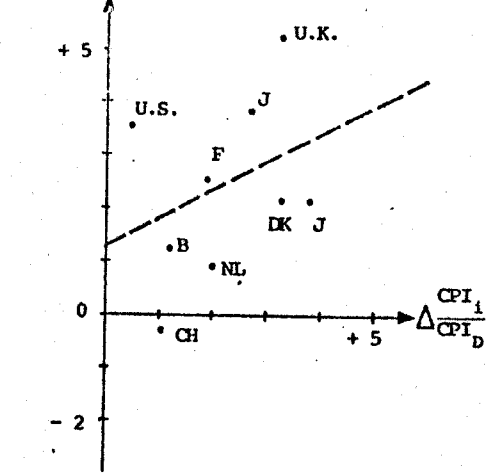
Inflation differences and changes in effective exchange rates
1963 - 1975

Wholesale Prices

(a)

(b)

Consumer Prices

(c)

(d)

Average value of exports

(e)
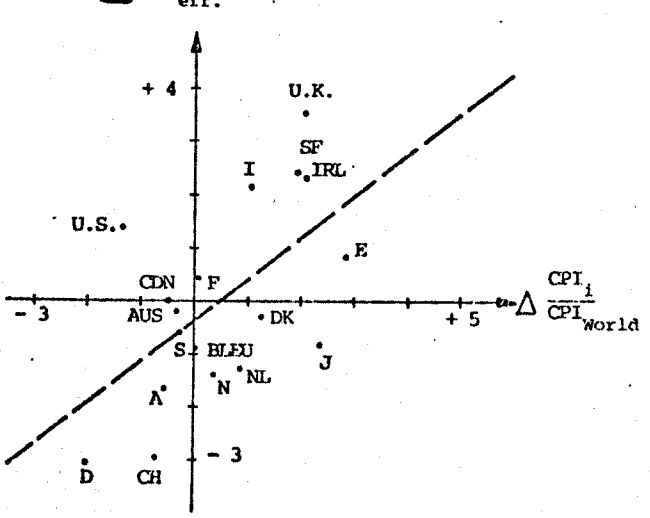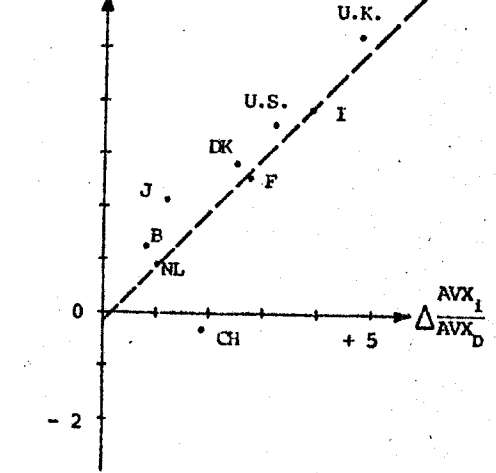
(f)
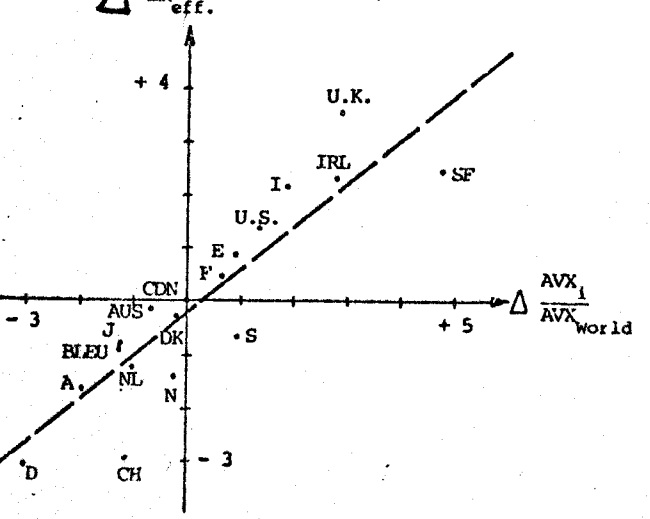
Note: Effective rates are doubly weighted by export shares.

Table 1 :   Statistical Inflation Rates and Changes in DM and Effective
            Exchange Rates
            - Results of Cross-Section Analyses -

Independent Variable	Equation	t_{β}	DW	R^2
a) Inflation differences and changes in DM exchange rates[a] 1961 - 1975				
Change in WPI	$\Delta ER_{DM} = .023 + 1.160\Delta wpi_D$	3.468	2.211	.632
Change in CPI	$\Delta ER_{DM} = 1.309 + .498\Delta cpi_D$	.975	.935	.120
Change in AVX	$\Delta ER_{DM} = - .182 + 1.049\Delta avx_D$	4.253	2.205	.721
b) Inflation differences and changes in effective exchange rates[b] 1963 - 1975				
Change in WPI	$\Delta ER_{eff} = - .437 + 1.083\Delta wpi_{eff}$	8.049	2.297	.802
Change in CPI	$\Delta ER_{eff} = - .402 + .802\Delta cpi_{eff}$	2.968	1.581	.355
Change in AVX	$\Delta ER_{eff} = - .245 + .858\Delta avx_{eff}$	8.176	1.759	.807

a) Nine countries
b) 18 countries. Effective rates are doubly weighted by export shares.

Notes: Δ ER = compound annual rate of change in exchange rate; Δ wpi (Δ cpi, Δavx) = compound annual rate of change in wholesale prices (consumer prices, average value of exports) relative to Germany (D) and to the rest of the world (eff), respectively; t_{β} = t-value of regression coefficient; DW = Durbin-Watson; R^2 = coefficient of determination.

relationship. It underlines the views, expressed already in OPTICA '75, that the external value of a currency is predominantly a nominal magnitude, and conversely, that on average since the early 1960's changes in nominal exchange rates have tended to be almost entirely offset, over a number of years, by changes in inflation differentials.

Before offering more detailed points of interpretation it may be useful to underline the policy implications of this offset. If one considers a country which believes that it can depreciate its real exchange rate by, say, 10 per cent relative to what would happen under unchanged policies in order to restore external balance. If it attempts to do that by depreciating its nominal exchange rate, it will have to devalue by a multiple $-1/(1-a)$, where a is the estimated offset through domestic inflation induced by the desired rate adjustment. In the limiting case of conformity to PPP, the offset is approaching unity and the country cannot durably change its prices relative to those of other countries. Even when the offset is significantly below unity - because conditions are more favourable than the longer-run average situation reflected in the cross-section study - it is by no means obvious that the welfare costs of the real adjustment required would be increased if the adjustment were achieved by methods other than devaluation.

Graph 3 shows for the shorter period 1972 to mid-76 how seven Community currencies and the US dollar have conformed to multilateral PPP since the Smithsonian agreement. Concentrating on the WPI formulation, the conformity to PPP was close in Germany, France the United States; the guilder and particularly the Danish krone were above PPP, while the Belgian franc and lira, but particularly the U.K. pound were below PPP in mid-1976.

Additional and more detailed evidence may be found in Annex I-A. One observation that emerges from Graphs 2 and 3 as well as from the tables of Annex I-A is that conformity to PPP, or at least parallel behaviour, is not more evident among the Community currencies than among the wider group

Graph 3
Percentage Deviations of Current Effective Exchange Rates from Current Effective PPP, 1972 Q 1 - 1976 Q 2
- Double Export Weighted Rates -
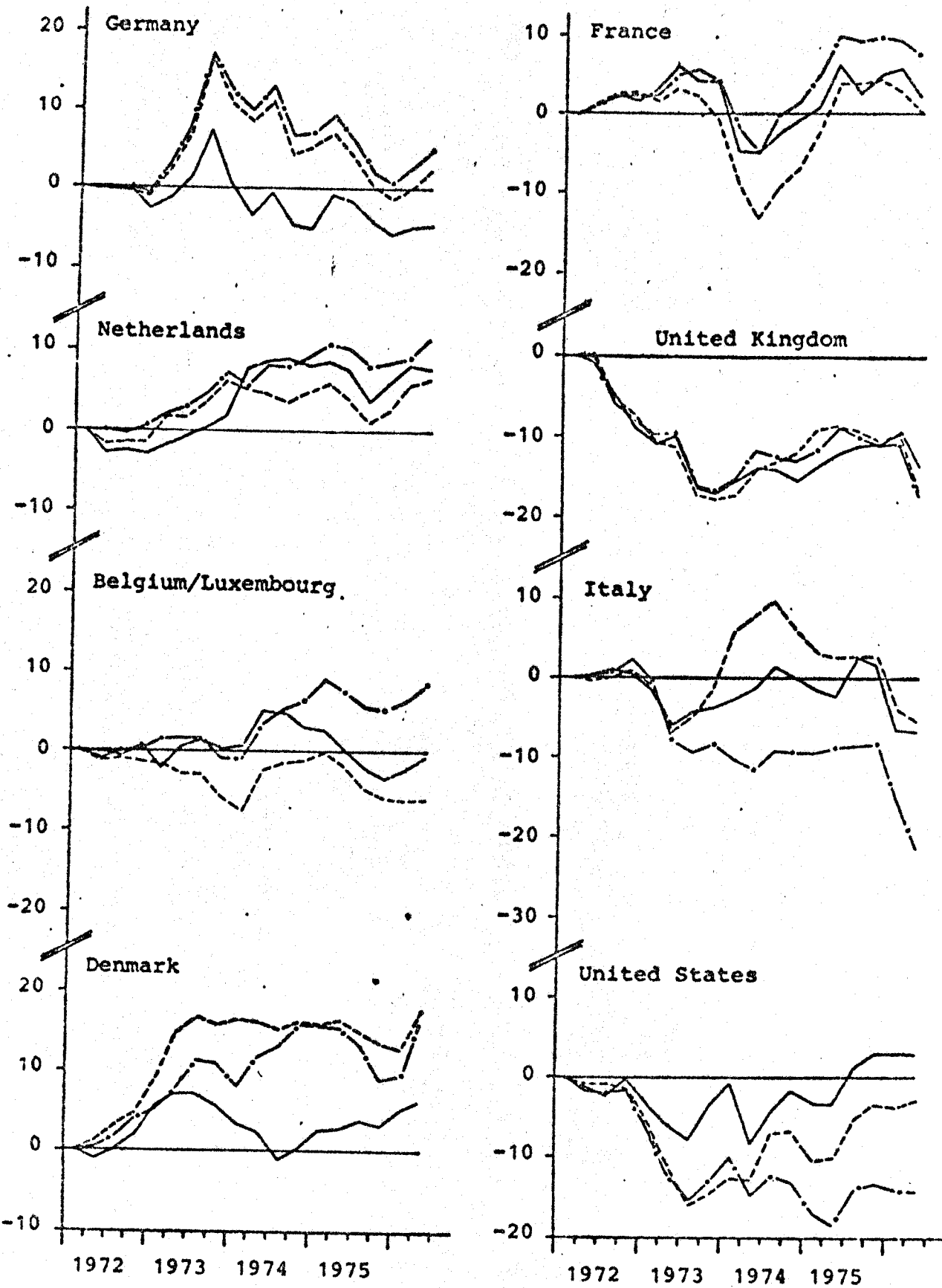
1972 Q 1 = 0

Germany

France

Netherlands

United Kingdom

Belgium/Luxembourg

Italy

Denmark

United States

1972   1973   1974   1975

1972   1973   1974   1975

Legend:—·—·—Relative consumer price index; —————relative wholesale
price index; ——————— relative export unit value index
+ = Appreciation, - = Depreciation   in real terms vis-à-vis the
rest of the world (17 industrial countries)

of industrial countries. A possible exception is the Swiss franc whose
appreciation above PPP since the Smithsonian agreement is more pronounced
than for any of the Community currencies. OECD data suggest that Canada
(below PPP) and Sweden (above PPP) may be other examples of currencies that
lie outside the range of deviations from PPP spanned by the most deviant
Community currencies. But there is nothing to suggest that the general
conclusion of conformity to PPP is significantly weakened by extending the
group of currencies to include most industrial countries. As is evidenced
by the calculations done for the DM on Annex I-A, p. 53.

One implication of this is that there are no obvious economic
grounds for restricting the proposal for exchange-rate management, outlined
in Chapter II, only to Community currencies. The generality of the conclusion
that there is a high degree of conformity to PPP is also underlined by
the fact that PPP appears to work better when formulated multilaterally rather
than bilaterally vis-à-vis other Community currencies. This appears to
be the case even for the "mini-snake" currencies, which might have been
expected to align themselves to Germany. A similar test has not been
undertaken systematically for all bilateral relationships; but the
relationship is thought to hold so generally that in the proposal for
exchange-rate management made in Chapter II, a specially European orienta-
tion, i.e. linkage to the DM or to a European Unit of Account has been
abandoned as statistically unattractive.

Finally, to what extent have inflation trends in unified currency
areas been parallel? Departures from PPP between the various parts of a
currency area appear to be limited. Vaubel /‾ 27‾/ has studied data
for Germany, Italy and the United States and found a very much greater
uniformity of prices between regions than between countries. The
average annual inflation rate has been about 1/2 percentage point higher

·in Belgium and Ireland over the past 15 years than in the rest of the
currency areas of which they form a part: the BLEU and the United Kingdom
respectively.   It may not be far from the mark to suggest that a persistent
annual inflation rate differential in terms of CPI of one percentage point
is an approximate upper limit to what would be feasible in a Community
currency union. This is not negligible over a run of years, yet it may
not be enough if the departures from PPP by some Community currencies,
cf. Graphs 2 and 3, are interpreted as indicative of "needed" real
exchange-rate changes.

It would be wrong to draw a firm conclusion that differential
price increases would be insufficient since the data are imperfect and
the regression models leave some residual variation unexplained.Nevertheless,
some economists would admit $\underline{/\ 27\ \underline{/}}$ that there may be a residual need for
real exchange-rate changes in the case of individual Community currencies.
This together with differences in attitude towards inflation, may justify
use of nominal exchange-rate adjustments.

Furthermore, no evidence has come to light, which would show that
adjustment of the nominal exchange rate is a necessary or even a useful
instrument for bringing about changes in the ratio of a country's export
to its import prices (the terms of trade) which is typically considered as the
aim of an exchange-rate adjustment. The terms of trade are in the long run
determined by real factors and   are consistent with a wide range
of nominal exchange-rate constellations. The main impediments to monetary
unification in the Community are the differences in member countries'
attitudes towards inflation, and the perception that the adjustment costs
of aligning national inflation rates on that of the least inflationary
country are intolerably high in the transitional state. These impediments
are a reality which any proposal for exchange-rate management has to
keep in mind; they have influenced the proposal in Chapter II.

The conclusions of this first section are that

(i) observed exchange rate changes in the Community have approximately matched inflation differentials;

(ii) approximate conformity to PPP also appears to hold for the currencies of other industrial countries; it is not specific to the Community;

(iii) the basis for conclusions (i) and (ii) is soundest when the analysis is based on wholesale prices (or export prices), on multilateral relationships and on long observation periods.

2. "Imported" Inflation and National Wage/Price Mechanisms

To establish a firmer basis for the tentative conclusion that PPP applies, it is necessary to explore the mechanism which brings exchange-rate changes and inflation differentials into approximate equality with one another. This requires that the analysis be refined to include both the direct effects on a country's price structure of changes in the prices of tradeables (via the country's nominal exchange rate) and the indirect effects on inflation through demand effects. The present section looks at some evidence on the direct effects on domestic costs and prices of externally generated price increases without taking into account the effects through higher demand. Despite its partial nature such an analysis seems useful; the direct price effects act quickly and put a lower limit on the size of the adjustment between inflation differentials and nominal exchange-rate changes.

The relevant framework for analysis is input-output tables. These show how an X per cent increase in the prices of tradeables measured in domestic currency - due to an increase in tradeables prices measured in a numéraire or to a devaluation of the domestic currency - works its way through the economy. The consequences are shown for the domestic prices of non-tradeables, the profits of the sectors producing tradeables and the other cost and price variables which determine whether the initial impulse leaves any real effects.

A recent paper by de Grauwe and Holvoet $\underline{/}$ 10 $\underline{/}$ distinguishes between sectors producing tradeables, i.e. subject to international competition, and sectors producing non-tradeables, i.e. sheltered from international competition. The distinction largely follows a classification suggested by van Poeck $\underline{/}$ 25 $\underline{/}$ on the basis of pricing behaviour in the Belgian economy. It suggests that the share of traded goods in total consumption is close to one third; and that traded goods' share of total production is 40 to 50 per cent. There are only small differences between the six economies in these respects - and no observable tendency for the two smaller economies to be more oriented towards consuming and/or producing traded goods, than the four large economies. While this apparent uniformity may to some extent be due to the uniform classification which was imposed, it nevertheless throws serious doubt on the assumption often made; that considerable differences in size between countries make a parallel reaction to externally generated inflation unlikely.

The results obtained by de Grauwe and Holvoet are summarized in Table 2 which shows the effect of a one per cent devaluation of the effective exchange rate of the domestic currency on consumer prices (CPI), the ratio of traded to non-traded goods prices (P_T / P_N) and the profit margin (S/T) in the traded goods sector. Two figures are shown for each entry; the first disregards wage indexing on the CPI, while the second assumes wages to be fully indexed in percentage terms without delay to the CPI. (These two cases might be labelled complete and no money illusion, respectively).

TABLE 2

The Effects of a 1 Per Cent Devaluation

	on CPI	on P_T/P_N	on $s/_T$
Belgium	0.47 (0.64)	0.75 (0.51)	0.32 (0.20)
France	0.45 (n.a.)	0.81 (n.a.)	0.46 (n.a.)
Germany	0.53 (0.70)	0.73 (0.46)	0.43 (0.27)
Italy	0.45 (0.62)	0.80 (0.56)	0.46 (0.30)
Netherlands	0.50 (0.71)	0.75 (0.44)	0.31 (0.18)
United Kingdom	0.47 (0.66)	0.76 (0.49)	0.40 (0.22)

The impact of a devaluation is to push up consumer prices by one half to two thirds of the devaluation percentage depending on the degree of indexation; to increase traded goods prices relative to non-traded goods prices by three-fourths of the devaluation percentage , declining to one half in the case of full indexation; and to increase profit margins in the traded goods sector by 30-45 per cent of the devaluation percentage, declining to 20-30 per cent under full in- dexation. In all cases the intra-country differences are modest, though there is a tendency for the shift in the income distribution towards profits to be at a minimum in the two smallest economies, Belgium and the Netherlands.

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While the results are obviously mechanical and much in need of further analysis, they lead to two important conclusions which are :

(1) The direct transmission of the effects of devaluation to domestic prices is strong, even without indexation. Keeping in mind that the impact is typically compounded by factors neglected in the simple input-output framework, the results underline the difficulties of influencing real factors - relative prices and the income distribution - even in the short run through nominal changes; this emerges most clearly in the results for the profit margin.

(2) The effect of indexation, though important, is not as decisive as might have been expected. All countries find themselves in the interval between the figures indicated in each column of Table 2, whether they have formal indexation clauses in wage and salary agreements or not since observed and expected increases in the CPI are an important determinant of wage and salary increases.

In view of the timeless nature of the results presented in Table 2, the conclusions should not be overstated. The calculations show the total effects on prices and incomes, but convey no information as to the speed of the transmission. Clearly, the degree of automatic indexation is one important determinant of this speed. The EC Commission has made available some material on the methods of wage indexation currently in use in member countries and on possible modifications to make these methods more flexible /⎺8⎽/.Some of this information is set out in Annex I-B. as it cannot be discussed in detail here. But, it brings out three interesting conclusions (1) there has been a tendency in most countries for the interval to be shortened between CPI increases and the release of the consequent allowances. This tendency, most clearly in evidence in Belgium and Italy, has speeded up the transmission of inflation.(2) It is not a priori obvious that formal indexation ensures a stronger transmission of external inflation; the survey shows,as many observers have already noted,that there is no correlation between the inflation rate of individual countries and the degree of formal indexation. Notably, the two countries with the highest inflation rate - Italy and the United Kingdom - have in the past used indexation far less extensively than,say, Belgium or Denmark.

(3) In no country has it proved possible to devise generally acceptable methods for removing from the index used,deteriorations in the terms of trade in the form of strongly rising import prices. Though intensive efforts were deployed in this direction following the increase in the international price of oil in early 1974, wage and salary indexation continues to be of a comprehensive and automatic kind

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It would have been desirable to supplement the comparative analysis of de Grauwe and Holvoet by more detailed work on individual countries. In any case a review has been undertaken of existing work on the international transmission of inflation in three of the smaller Community countries and for Germany /‾9,11,12,14,21,22,25/ Most of this literature is based on national input-output tables. It demonstrates broadly the applicability in the short run of the so-called Scandinavian model of inflation. This model, developped by Norwegian and Swedish authors in the lates 1960's, accepts the assumption that PPP applies to traded goods prices, and focusses attention on the mechanism whereby inflationary impulses spread to non-tradeables through the tendency towards equalization of wage increases in the two sectors. The model envisages a greater inflationary impulse than has been considered here for it assumes that wage earners in the traded goods sector succeed in raising their wages in line, with the (high) productivity increases in this sector.

To the extent that wage earners in the traded goods sector prevent the limited shift towards profits shown in Table 2 and wage earners in the non-traded goods sector succeed in keeping their nominal pay increases in step with the pay of their colleagues, the transmission of an external inflationary impulse, e.g. a devaluation, may eventually raise the CPI by more than the original percentage devaluation. If output per man rises more slowly in the non-traded goods sector, a parallel increase in wages in the two sectors will raise the internal price ratio (P_N/P_T) and the CPI which is an average of the two output prices will tend to rise faster than P_T.

While it is possible for such processes to occur, they go beyond the confines of a purely supply, or input-output orientated model. If applied over longer periods the Scandinavian model implies that demand adjusts passively through an accommodating economic, particularly monetary, policy. As Branson and Myhrman /‾4_/ amongst others have pointed out, a satisfactory analysis of inflation requires a model combining demand and supply factors, particularly for the longer-run adjustments which are the main concern of this Report. Partly for this reason, partly because of the difficulties of presenting the various national studies which are of a largely supply-oriented nature in a comparable way, this Report concentrates on the experience of the two countries that have inflated and devalued the most.

3. The Effectiveness of Exchange-Rate Changes in EEC Countries : Case Studies of the U.K. and Italy

3.1. Purpose and Methodology

The main aim of section 3 is to establish whether exchange-rate changes are effective in the two countries under review and in particular to throw light on

(a) the short, medium and longer-run effects of exchange-rate changes on a country's external account;

(b) the "New Cambridge School" assertion that the effectiveness of exchange-rate changes on the current account depends upon a sustained change in the size of the government sector budget rather than directly on the exchange-rate change itself;

(c) the "monetarist" assertion that, in the long run, exchange-rate changes have no sustained effect other than on nominal variables.

The methodology of this section is based on the use of macro-econometric models. For the U.K. studies already available were drawn upon, for Italy direct access was obtained to the model developed at the Università di Bologna /¯ 24 _7.

The limitations of econometric models are many and some of them are well-known. The essential one to be emphasized here is that models cannot reveal more than is built into their structure. Thus they cannot prove or disprove an hypothesis unless their structure is built according to the theory to be tested. Consequently, none of the models referred to here are able to test the "monetarist" theory of devaluation because, among other reasons, they do not treat the money supply as endogenous under fixed exchange rates.

3.2. U.K. Studies

Three recent studies on the U.K. are analysed here. The first one is partial equilibrium in character, whereas the other two focus on a general equilibrium analysis of the effects of exchange-rate changes.

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3.3. The First U.K. Study

The study by Artus $\underline{/\,1\,\underline{/}}$ is partial equilibrium in character since devaluation is taken to have no effect on the level of aggregate demand, and hence national product. This feature follows from the assumption that the change in the exchange rate is accompanied by appropriate aggregate demand management policies which leave aggregate demand unchanged. As a consequence, the internal inflation generated by devaluation is only the result of the higher price of imports and exports and their subsequent impact on wages and prices. Inflation, indeed, is not the most suitable word to describe such a process which represents a change in the relative price of imports and exports, and of traded vs. non-traded goods. Devaluation, in this study, plays only a role of "expenditure switching", while it is assumed that "expenditure reducing" is obtained through an active policy of demand management. The analysis therefore follows the traditional "elasticity approach", rather than the "absorption approach". Because of these limitations, the study by Artus can only partially contribute to the analysis of the three points enumerated above. Nevertheless, its main objective, the analysis of the effectiveness of the November, 1967 sterling devaluation is carefully done. In the present section the review of Artus's many findings is confined to two effects of the devaluation : first on the internal wage and price structure, and then on the current account of the balance of payments.

(a) Effects on the Wage and Price Structure

These effects bear directly on the questions raised in point 3.1(c) above :
the "monetarist" assertion that, in the long run, exchange-rate changes have only nominal effects.

In November 1967 sterling was devalued by 14.3 % with respect to the dollar. However, since this devaluation was accompanied by changes in some other currencies' exchange rates, Artus computes an effective devaluation which is equal to 13.9 %. Because of the assumption of a constant full-employment output. Artus's estimate of the increase in the wage level is based exclusively on devaluation induced supply forces, namely the increase in the prices of imported materials and foodstuffs; the consequent increase in the cost of living and hence the effects on price expectations and, ultimately, wages. The cumulative final outcome from 1968-1971 is an increase in wages of 6.8 % which represents 48.9 % of the effective devaluation and of consumer prices of 5.6 % which represents 40.3 % of the devaluation.

Artus also computes the time pattern of this reaction. During
the first two years after the devaluation ('68 and '69), the UK incomes
policy meant that wages were not allowed to respond to the devaluation,
while prices reacted only slowly. It was only by the end of the fourth
year (1971) that the full effects were felt.

(b) Effects on Traded Goods' Prices and on the Current Account

The prices of products competing with imports rose eventually up to
13.1 % in the case of semi-manufactured products (94 % of devaluation) and
by at least 4.0 % for foodstuffs (29 % of devaluation). The export prices
of goods and services rose, in sterling, by an average of 10.3 % (74 % of
devaluation). The terms of trade (ratio of export to import prices) fell
by - 1.9 %. Since the change in the prices of non-traded goods due to de-
valuation is estimated by Artus to be low, devaluation was found to have
a switching effect partly through the substitution of non-traded for traded
goods in domestic demand (and vice-versa in domestic production), but even
more through the substitution of real exports for real imports. The net
result on the current account was substantial and remarkable in its time
pattern. By 1971, only three years after devaluation, the trade balance had
improved by ₤ 709 million, equal to 1.7 % of 1971's GDP. The corresponding
final improvement in the current account was ₤ 996 million, and by 1970 it
had again already overshot that figure, and was equal to 2.4 % of GDP.

Even though devaluation initiated a substantial and fast improvement
of both trade and current account, the initial effect on the trade balance
was perverse. In other words, the existence of low short-run elasticities
gave rise to the J-curve effect. During the first half of 1968 the trade
account deteriorated by ₤ 134 million (annual rate), but this was more than
compensated by the improvement in the second half of the year (+ ₤ 140 million
at annual rates). Thus the J-curve effect was important but it only lasted
six months and there was a cumulative net surplus within a year.

Artus concludes that the 1967 devaluation of the pound had positive
effects on the current account of the balance of payments, which "occurred
relatively rapidly and were large in their magnitude"/ ̄1 , p.595/.It should
be underlined, however, that these positive effects depended on the off-
setting nature of the accompanying demand management policies and policies on
incomes, rent controls and administered prices, which slowed down the

transmission of inflationary effects onto the wage-price spiral.

3.4. The Second U.K.-Study

Burns and Warburton $\underline{/}$ 5 $\underline{/}$ examine the operations of a Nordic in-
flation model with monetarist features using quarterly data for 1961-1975.
They prefaced their discussion with an argument that the varying importance
of imperfections in domestic markets for manufactured goods and for food
and minerals (coupled with imposed imperfections such as prices and incomes
policies) will cause substantial but variable lags in the adjustment of
domestic prices to world prices. If this is true, PPP will not hold in the
short run though it may eventually dominate. In such circumstances, exchange
rate adjustments in a fixed exchange rate system, especially if reinforced by
"pay pause policies", fiscal drag and an inflation-eroded subsidy system,
may well act as a useful short-run policy instrument for tackling external
disequilibrium. Domestic export-and-import-competing goods will be relative-
ly cheap and inflation will erode the wage rate. Exchange-rate illusion,
measured by the existence of a differential between the domestic and the
international purchasing power of a unit of domestic currency, will exert an
influence on the external sector's trade position either through the
Keynesian substitution effects, as argued by Artus, or perhaps through the
monetarists' own transmission mechanism.

On the basis of this model, Burns and Warburton obtained corroborating
evidence that there was a substantial lag before U.K. prices adjusted to
world prices and changes in the exchange rate; that the level of unemploy-
ment influenced the speed of adjustment; and that the imposition of an in-
comes policy also played a significant role. In addition devaluation had an
impact on income distribution in that earnings in the manufacturing sector
rose relative to total disposable income's share of GDP. However, once these
lagged influences of past world price levels or exchange-rate changes had
been fully worked out, their effects on domestic factor and product prices
were not substantial.
A rise in world prices by 1 % would induce after a year and a half a
1.05 % rise in the price of U.K. manufactured goods; the long-run elasticity
of U.K. manufactured goods prices to changes both in world prices and exchange
rates were, respectively, 1.08 and 0.863. Consumer prices, wholesale prices and

earnings were also closely tied to previous world price levels or exchange-
rate changes after an adjustment period of four years.

Unlike Artus's findings, which were that, though pervasive, movements
in world price levels did not eventually influence U.K. prices to such an
extent that the competitiveness gained by devaluation was eventually eroded,
Burns and Warburton conclude that in the long run their estimates provide
evidence which is consistent with the Nordic inflation model. "The long
run effect of world price changes and exchange rate changes appear forcibly
and repeatedly at the level of export prices, wholesale prices, earnings and
by implication consumer prices" /⁻ 5, p.9 ⁻/.In the long run, as defined above,
the exchange-rate illusion will not exist as there will be no gap between
the internal and the external purchasing power of the currency. Any per-
manent gain of exchange-rate depreciation in terms of the external position
must be induced by another channel - the inflation reduced real purchasing
power of non index-linked government transfer payments which leads to a
"permanent" reduction in real domestic expenditure relative to real GDP.

3.5. The Third U.K.-Study

The study by Ball, Burns and Laury /⁻3 ⁻/is capable of throwing more light
on the questions raised in Section 1, than the partial equilibrium analysis
employed by Artus. It uses the London Business School (LBS) model, which in
1976 was not a completely general equilibrium model, but which at least
treated the government budget as largely endogenous. The model treats monetary
policy explicitly, even though at the time of this exercise it did not
deal satisfactorily with the flow of funds between the balance of payments,
the government budget and the balance sheets of the banking and private
sectors. Thus, the model was not able to satisfy all the theoretical re-
quirements for testing either the monetarist or the portfolio approach to
the balance of payments. Even so, it does throw some light on the "New
Cambridge School" approach, at least in its simple formulation which, as was
seen in OPTICA '75, is akin to the absorption approach to the balance of
payments.

Various simulations were performed on the LBS model, covering the
period from the first quarter of 1975 to the first quarter of 1980. They are
based on the effects of a notional 20 % devaluation of the pound.

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(a) <u>Devaluation and the Time Pattern of the Current Account</u>

Two simulations are particularly important for analysing this effect. Simulation I (cf. Graph 4) evaluates the impact of a change in the exchange rate with all tax and benefit rates unchanged. The current account shows a familiar J-curve pattern[1] The deterioration of the current account lasts five quarters and has only been reabsorbed by the tenth quarter though by the end of the period its improvement relative to the control Simulation corresponds to 0.7 % of GDP.

In Simulation II, government current expenditure is varied so as to maintain output at the control level. This is done so as to isolate the resource transfer effect from the total output effect of the exchange rate change. Thus, this Simulation is close to the exercise contained in Artus's study. The long-run results are not substantially different from those of Simulation I, however, the magnitude of the improvement in the current account is markedly affected in the middle periods. By quarter 10 (2 1/2 years), the improvement in the current account as compared with Simulation I, roughly doubled. However, by 1980 Q IV it is 24 % below that of the unconstrained change reached in Simulation I. The behaviour of prices and earnings is boradly similar as between the simulations, though the rise in consumer and export prices and wages and salaries is at first more accentuated in Simulation II as compared to Simulation I

(b) The Current Account and Budgetary Policy
One contention of the "New Cambridge School", as discussed in OPTICA '75, is that a persistent change in the current account can be obtained only through a persistent change in the government sector budget. To test this hypothesis, the effects of a 20 % devaluation were simulated subject to a constraint which restrained the government deficit to the control solution from period 9 onwards (Simulation IV, cf. Graph 5). The result is that, while in Simulation I the improvement in the current account was accompanied by a similar improvement in the government deficit, in Simulation IV the current account remains almost identical to that of the control solution. As the

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). "In the initial quarters the current account deteriorates as the lag in the response f the volume of exports means that higher import prices are not offset by higher export earnings. Following the improvement in export volume the current account improves and remains in surplus throughout the simulation period. However, by the end of he period this cannot be attributed to the impact of the relative price change because ...) by the end of 24 quarters the 20 % devaluation has led to export and import rices rising by the full extent of the exchange rate change whilst earnings, consumer rices and the GDP deflator are up between 18 % and 19 % (...) The surplus is the reult of the squeeze on real incomes brought about by the higherratio of taxes to income relative to the control and the lower real value of government grants."/ 3 /

GRAPH 4 – Effects Of A One-Step 20% Devaluation In The U.K. – Simulation 1 from Ball, Burns and Laury [3]

£ million

$\triangle$ (X – M) = change in the current account relative to the control solution

$\triangle$ (T – G) = change in the public sector budget relative to the control solution

$\triangle$ (X – M) = —·—·—

$\triangle$ (T – G) = ··········
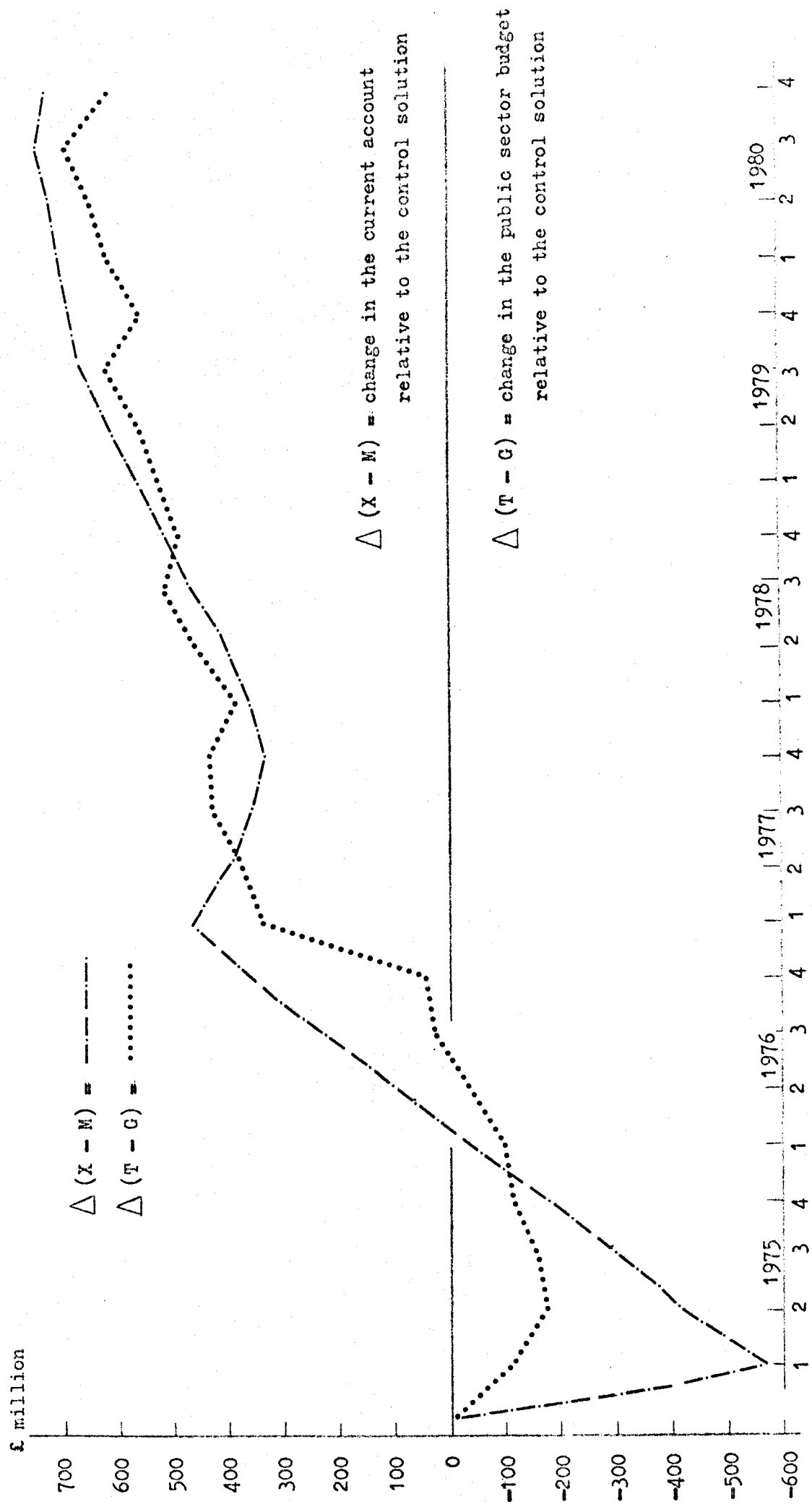
GRAPH 5 — Effects Of A One-Step 20% Devaluation In The U.K. — Simulation IV from Ball, Burns and Laury /37/

£ million

(X — M) = —·—·—·— change in the current account relative to the control solution

(T — G) = ············· change in the public sector budget relative to the control solution

700

600

500

400

300

200

100

0

−100

−200

−300

−400

−500

−600

1975   2   3   4   1976   1   2   3   4   1977   1   2   3   4   1978   1   2   3   4   1979   1   2   3   4   1980   1   2   3   4
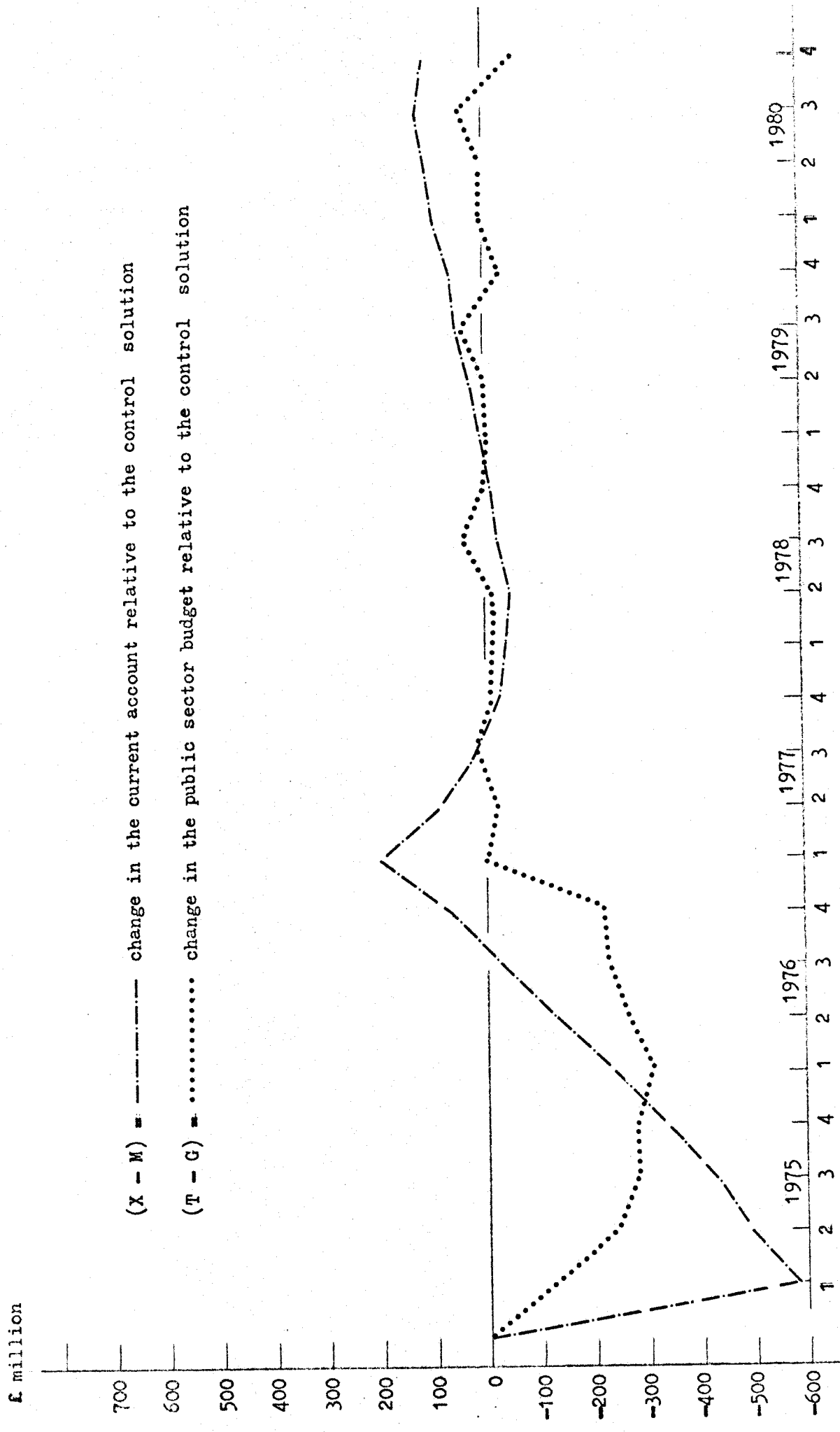
authors say, "it follows quite clearly from a comparison of Simulations I and IV (...) that, to provide even a temporary improvement in the current account of the balance of payments following a devaluation, the government's financial deficit in the long run must adjust by approximately the same amount. If the authorities (as in the case of Simulation IV) do not permit this adjustment in the government's financial deficit to take place (or do not ensure that it does) then apart from a transitory effect on total output the long-run effect of the change in the exchange rate will simply be to raise the domestic price level to a new long-term level" $/ \overline{3}/$

For our purposes, the main conclusions that are drawn from the U.K. study by Ball and others, are that :

(i) The domestic rate of inflation tends to adjust to the external rate, and in the long run completely offsets the relative price effects of devaluation (cf. Graph 6). As the authors say "although the mechanism is different (...) the model is consistent with the proposition made by those using a monetary approach" $/\overline{3}/$

(ii) "The public sector deficit and the current account deficit tend to move together... This supports one of the major conclusions of the "New Cambridge School", although in this case there is no question of causality flowing from the public sector to the overseas sector" $/\overline{3}/$

(iii) "The output effect of the single exchange-rate change is effectively transitory since the competitive advantage is subsequently wiped out by the adjustment of incomes to import prices restoring domestic costs to previous levels" $/\overline{3}/$ Thus "the exchange rate cannot be regarded as it has been in the past as an __instrument__ of economic policy. On the contrary, it should be seen as a symptom of the behaviour of fiscal and monetary policy" $/\overline{3}/$

GRAPH 6 - Effects Of A 20% Devaluation On U.K. Wages (W), Consumer Prices (PC), And Export Prices (PX)

Simulation 1 from Ball, Burns and Laury [3]

W = ———————— Wages

PC = •••••••••••••• Consumer Prices

PX = —·—·—·—·— Export Prices
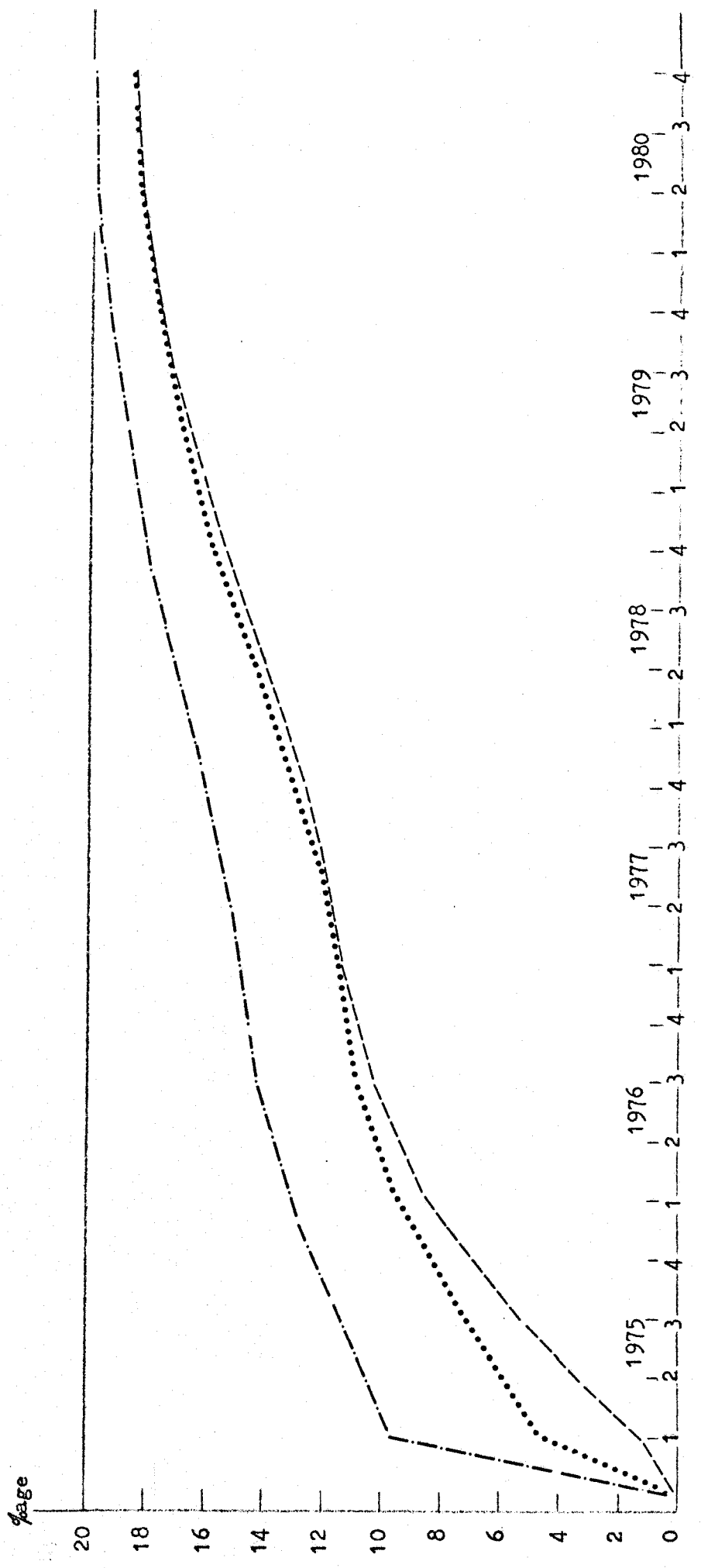
3.6. Italian Study

The Italian model used for this exercise is the one developed at the Università di Bologna, in connection with Project LINK. It is very similar in form to the U.K. models, but is somewhat less complete on the monetary side. Thus, as in the U.K. models, it is not able to test fairly the monetarist approach to the balance of payments. Moreover, even for the simple version of the "portfolio approach", the "New Cambridge School" position, the Italian model is not completely satisfactory, since the government sector is largely exogenous to the model, and its financing does not feed back into the monetary variables of the model. Thus, loosely speaking, the Italian model stands between the model used by Artus and the LBS model.

Effects on the Current Account

Two basic experiments were performed using the Italian model. They give a first idea how over time the current account responds to devaluation.

The first is a historical simulation over the period 1963-68. It was assumed that the 1963 balance of payments crisis in Italy resulted in a devaluation rather than the maintenance of a fixed exchange rate[1]. In order to have comparability with the LBS study which is concerned only with forecasts rather than historical simulations, the lira was notionally devalued by 20 % at the beginning of the period (1963.1) and the effects were traced, particularly on the current account, throughout the following six years, quarter by quarter.

The second basic exercise is an alternative forecast for the six years 1975-80. A comparison is made between a "probable" solution (in which the lira is devalued to take account of what has already happened in 1975-76 and the further devaluation which may well take place up to 1980) relative to a "control"solution in which the lira rate is kept constant at its average 1975 level vis-à-vis the dollar.

(1) Such a policy may appear unlikely in retrospect in view of the
short-term nature of the external crisis. Following the tightning /..
of fiscal and monetary policies in the second half of 1963, the current
account improved rapidly in 1964; and it remained in surplus in the
1965-68 period. A lire devaluation in 1963 should therefore be regarded
as illustrative only and not as a realistic alternative policy.

(a) Effects of a 20 % Devaluation of the Lira at the Beginning of the
Period 1963 - 1968

Effects on imports. In the first year after the devaluation there is
a fall in physical volume of imports by 2 - 5 % due to the switch from
higher priced imports to their domestic substitutes. This switching effect
is reduced by internal inflation generated by the same devaluation whilst
in addition the expansionary effect of devaluation on real income (which,
as we shall see, is dominant during the second year) expands the demand
for imports. Thus, overall, the physical volume of imports decreases
by much less in the second year relative to the control solution (- 0.9 %)
and actually rises in the third year (+ 0.6 %). In the long run (as will
be seen in greater detail later on) the model does not generate an internal
inflation capable of eliminating completely the original price advantage
which the 20 % devaluation gave to domestic products relative to imports.
Thus, in the long run, the physical volume of imports stays at a lower
level relative to the control solution (about - 3 % by the fifth and
sixth year).

The value of imports, expressed in lire, increases from the beginning
and throughout the period, reaching a peak of almost 20 % above control
during the third year and slowing down, for the reasons already explained,
to a difference of 15.4 % in 1968.

Effects on exports.   During the first two years there is an increase
in the physical volume of exports relative to the control solution because
of the price advantage allowed by devaluation, which reaches a peak of
almost 5 % in the second year. In the medium run the improvement is partly
reduced by internal inflation which also pushes up the Italian export price.
Nevertheless, even in the long run (contrary to the "monetarist" expecta-
tion) internal inflation does not erode the whole competitive advantage,
and the volume of exports in the sixth year (1968) stays at 2.9 % above
control.

The value of exports, in lire, increases by up to 20.6 % relative to
control at the end of the second year, and in the long run stays approximately
20 % above control. However, this 20 % long-run increase is not purely

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a nominal effect of a 20 % devaluation (as in a monetarist model), but is the net result of a persistent real increase in exports (of about 3 %) plus an increase in the lire price of exports, which is correspondingly lower than the rate of devaluation.

Net effects on the current account (See Graph 7) As a result of all these effects on imports and exports, the balance on current account shows the familiar J-curve pattern; an initial deterioration before it improves. When measured in lire, the deterioration reaches a maximum during the first quarter and lasts for three quarters. The deterioration of the current account during the first year is not offset by the improvement in the following year. Moreover, there is only a modest improvement in the medium term (third and fourth year); it is only in the long run (fifth and sixth year) that this becomes substantial. The reasons for this long-run behaviour, as we shall see later on, are essentially linked to the incomplete transmission of inflation into the economy following the 20 % devaluation.

(b) Effects of the Devaluation from 1975 - 1980

This exercise is not really comparable to the preceding one, nor to those performed by Ball and others over the same period for the U.K. The "control" solution here is one in which the exchange rate is kept constant at approximately its 1975 average. On the other hand, when devaluation is simulated, the effective exchange rate is not changed by a one-step 20%, as in the 1963-68 exercise or in the study by Ball and others but rather lowered gradually according to the forecasts of the Bologna model. Thus, neither the timing nor the amount are comparable to those in the two other exercises. In particular, the rate is devalued relative to control by about 47 % by the end of the period, and this happens mainly in the second (1976) and third year (1977).

Effects on imports. The physical volume of imports decreases substantially in the years when devaluation exerts its maximum impact (76 : - 5.4 %; 77 : - 4.7 %); but by the end of the period it reaches its initial level. This is contrary to the preceding exercise, where a permanent decrease in physical terms was obtained. Nevertheless, the behaviour of both real national product and consumers' non-durables expenditure are similar by the end of the period. The evidence suggests

GRAPH 7 — Effects Of A One-Step 20% Devaluation In Italy —

Billions of Lire

(X — M)

36.
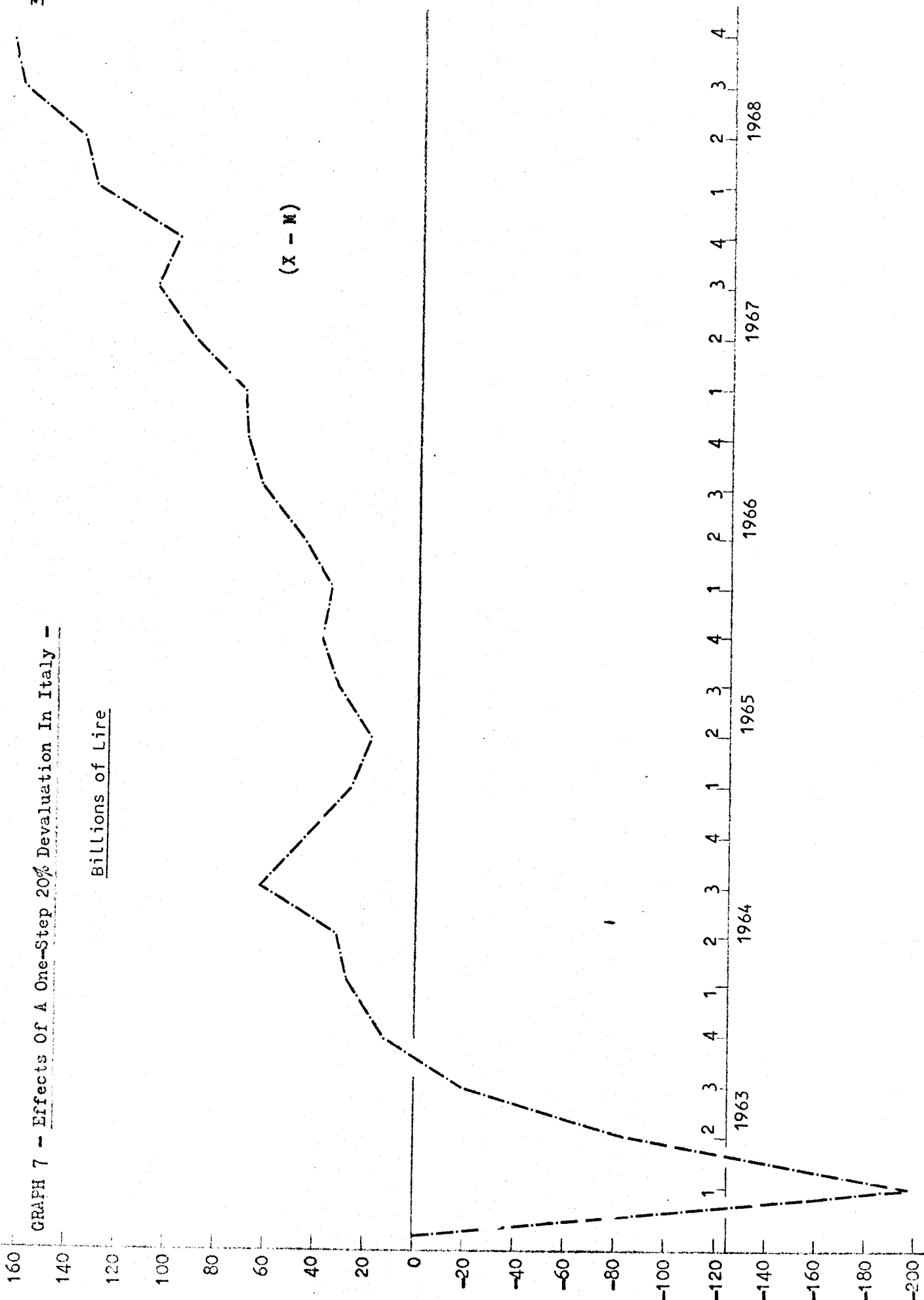
that this result is not due to an absorption effect lower than the one
in the previous exercise, but to a lower expenditure switching effect,
i.e. a more complete transmission of devaluation into inflation.

Effects on exports. There is an increase in the physical volume of
exports, particularly in the first few years following devaluation. But
this increase is not maintained in the long run (+ 0.72 % in 1980). Due
to a higher transmission of inflation in this exercise than in the pre-
vious one (when even in the long run the effect was a sustained higher level
of real exports : + 2.9 % in 1968). Indeed, while at the end of the
period the export price of Italian products had risen (in lire) by only
82.5 % of devaluation in the previous exercise, it now rises by 99.7 %
of devaluation. Thus PPP appears to apply with increasing and considerable
precision to Italian export prices.

Net Effects on the Current Account. Since devaluation does not occur
in one step, the time profile of the current account cannot be compared with
the previous Italian exercise, nor with the results of the U.K. model.
Nevertheless, a deterioration preceding the improvement as well as a sub-
stantial improvement by the end of the period can be observed here too.
But, contrary to the preceding Italian exercise, this long-run improvement
is below the peak improvement, which occurs in 1978.

The effectiveness of devaluation can be measured to some extent by
the fact that after six years the current account shows an elasticity of
0.12 to devaluation, i.e. for every percentage point change in the exchange
rate, the current account improves by 0.12 % of the end of period current
value of imports plus exports. This elasticity was much higher for the
1963-68 period, namely 0.68. (If we take beginning of period rather than end
of period values of total trade, we have the following elasticities :
1.21 for 63-68, and 0.22 for 75-80). Thus the long-run elasticity of the
current account to devaluation has been reduced to about one sixth from
63-68 to 75-80 (and for a greater amount of devaluation). While it has not
been reduced to zero, as the "monetarist" theory would maintain, these re-
sults seem to suggest that "exchange-rate illusion" is smaller now than

10 years ago, and that it is inversely correlated to the degree of devaluation.

The Current Account and Budgetary Policy

The results of the U.K. study for the 1975-80 period, were consistent with the "New Cambridge School" approach, even though the effect of devaluation in the study operates through the deflationary influence that the inflation it produces has on the government budget. The Italian case study does not give such a clear picture, essentially because the model is not equipped to do so.

(a) The 1963-68 Exercise. While devaluation, by provoking inflation, sets in motion the built-in stabilizers of the government budget and thereby generates a differential surplus of the public sector relative to control, in the long run this does not match the differential current account surplus as in the U.K. study. In fact, by 1968, the change in the current account is + 596 billion lire, whereas the change in the government budget is only + 104 billion lire. Over the whole period the accumulated change in the current account is + 1171 billion lire and the accumulated change in the government budget is + 998 billion lire, thereby suggesting that the change in the net financial position of the private sector vis-à-vis the two other sectors, public and external combined, is not very significant. This conclusion is in line with the "New Cambridge School" but, on the other hand, it is not validated by the apparently persistent and growing surplus of the current account relative to the government sector budget. As already pointed out, in the Italian model this is due to the persistent price advantage that devaluation confers on domestic producers (import substituters and exporters). This is contrary to what happens in the U.K. model, where as suggested by the "monetarist" school, devaluation is completely offset by inflation at the end of the period.

(b) The 1975-80 Exercise. The conclusions of the "New Cambridge School" are even less validated in this exercise than in the 1963-68 one. Even though devaluation generates a substantial and persistent differential surplus on the current account, relative to control there is no differential surplus in the government sector.

Devaluation and Price Increase

In the monetarist model, devaluation is in the long run completely offset by the price inflation that it produces. This is confirmed in the third U.K. study but not in the Italian study.

(a) The 1963-68 Exercise. The evidence suggests that devaluation has a positive and substantial long-run effect on the current account due to two main reasons :

   (i)   the persisting expenditure-switching effects of devaluation caused by the incomplete transmission of inflation into the domestic price structure :

   -   while the price of Italian exports rises substantially at the beginning of the period, by the end of the second year 80 % of the price advantage given to Italian exporters has been eroded by international inflation. The domestic price increase then levels out and by the end of the period internal prices have only risen by 16.5 %, thereby leaving a substantial competitive margin on the export side. (See Graph 8).

   -   on the import side, the prices of import substitutes also rise, but more slowly and even less completely. By the end of the period the internal price structure has risen only between 60 % and 70 % of the amount of devaluation. Thus an advantage is left to domestic producers which enables them to compete with and substitute for imports.

   (ii)   the persisting expenditure-reducing effects of inflation, particularly the reduction of real consumers expenditures on non-durables, which, at the end of the period, are very depressed (- 2.7 % in 1967 and - 2.4 % in 1968). These, in turn, affect particularly the imports of food and agricultural products, which in real terms are 7.1 % below control in 1968, whereas in the same period total real imports are only 2.8 % below control. The importance of the expenditure-reducing effect relative to the expenditure-switching effect is confirmed by another exercise performed over the same period. In this exercise devaluation has been accompanied by

GRAPH 8 —

Effects Of A One—Step 20% Devaluation In Italy On Wages (W), Consumer Prices (PC) And Export Prices (PX)
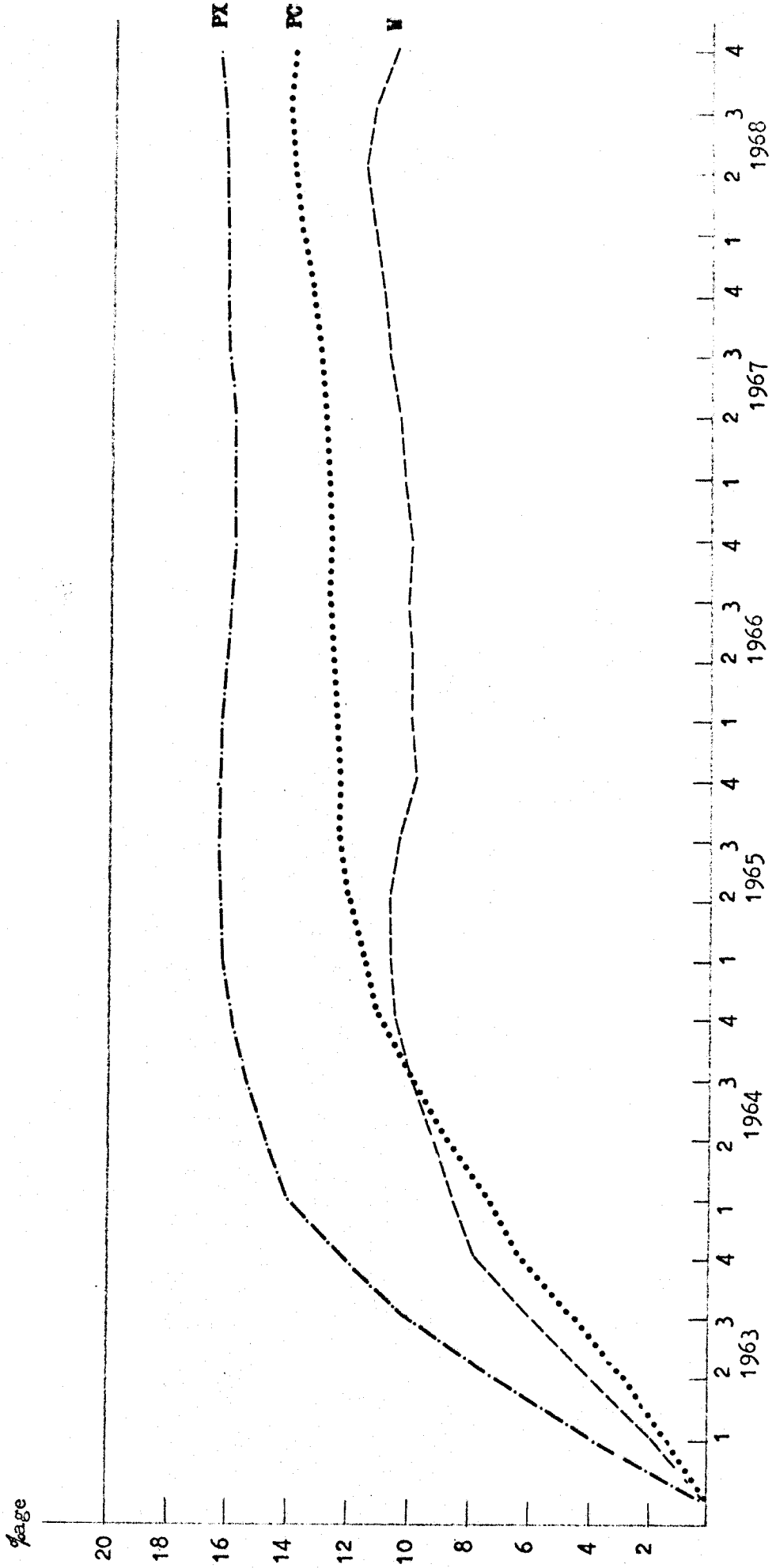
measures to keep total domestic expenditure (absorption) constant.
As a result the current account at the end of the period improves
by only 249 instead of 596 billion lire.

These results do not disprove the monetarist view of the adjustment process.
In particular, the monetarist approach implies that the expenditure-reducing
effect is only temporary because once real cash balances have been rebuilt
through lower expenditure, the latter returns to its long-run level. This
cannot be tested by the model since expenditure in these types of Keynesian
models is mainly determined by real disposable income rather than by real
wealth. In addition, in this model, contrary to the typical monetarist model,
it is assumed that monetary authorities are able to offset the increase in
money supply that results from the differential current account surplus
created by the devaluation.

(b) The 1975-80 Exercise. As we have seen above the long-run effective-
ness of devaluation on the current account is greatly reduced relative to the
1963-68 exercise. This is due mainly to the almost complete disappearance of
a long-run expenditure-switching effect, rather than to the decreased role of
the expenditure-reducing effect on absorption. In fact, by the end of the
period Italian export prices in lire rise by 99.7 % of the devaluation
eliminating completely the competitive advantage exporters initially gained
from devaluation ; in addition the internal price structure rose in a range
between 78.8 % and 82.5 %, greatly reducing the advantage given to import
substituters.
 The expenditure-reducing effects are similar to those of the pre-
ceding exercise, so while in the 1963-68 exercise the level of private con-
sumers expenditure on non-durables was depressed by 2.4 % at the end of the
period, in this exercise it is depressed by 2.1 %. The level of GNP in the
two exercises reduced by 0.6 % and 0.9 % respectively.

Considering the limitations of the Italian model relative to the U.K.
model, and, even more, relative to the requirements of general equilibrium
approaches such as the portfolio and monetarist approaches to the balance of
payments, it is surprising how close the results come to confirming those al-
ready obtained by Ball and others. In particular, they support the view that

the price advantage of a devaluation is eventually offset by the inflation which devaluation generates. This is especially true for the most recent period and the larger the devaluation.

This completes the review of selected empirical evidence on the origins and consequences of exchange-rate changes. The evidence seems consistent with the view expressed in the OPTICA '75 Report, namely that a country's exchange rate is very largely a nominal phenomenon. On the one hand its movements in a system of floating exchange rates tend to offset the differential between the domestic and the international inflation rates, when appropriately measured. On the other hand the simulation experiments for the U.K. and Italy suggest that sizeable downward movements in the external value of the pound and the lire have over longer periods been offset to a larger and increasing extent by more rapid inflation, leaving only few traces on the current external account and on domestic real variables. While the impact on real variables may not be negligible over short periods - and may be enlarged somewhat by government action on prices and incomes - the usefulness of exchange-rate changes in effecting macroeconomic adjustments seems more limited than is generally believed. In Chapter II some policy implications of this for exchange-rate management and monetary policy are presented.

ANNEX I-A

EMPIRICAL EVIDENCE ON THE CONFORMITY OF EXCHANGE-
RATE CHANGES WITH RELATIVE RATES OF COST AND PRICE
INFLATION

1. Purpose of this Annex

Among the theoretical assumptions underlying the OPTICA'75 report the
notion that - apart from temporary and erratic fluctuations - exchange rates
move in line with relative rates of inflation plays a prominent role.
In Chapter I of the present Report empirical evidence on the validity of the
purchasing power parity (PPP) hypothesis is summarized. The purpose of this
annex is to provide some additional and more detailed information on that
issue. The findings will be reviewed mainly under the following aspects :

- How strong is the correlation between actual exchange rates and (differently
  defined) PPP, both on a bilateral and an effective basis ?

- How large are short-term as well as long-term deviations of exchange rates
  from PPP ?

- Are there systematic differences in intra-EC exchange rate conduct as opposed
  to variations vis-à-vis third countries ?

The findings have a bearing on the proposals for an EC exchange-rate
regime presented in Chapter II of this Report and on the definition of an eventual
European Parallel Currency (EPC) of stable purchasing power as discussed, inter
alia, in OPTICA'75.

2. Method

The analysis makes use of available empirical studies on PPP as far
as they are relevant to our problem. In addition, some supplementary original
research was undertaken in order to shed light mainly on the performance of
EC currencies, both on a bilateral and an effective basis.

In the bilateral case, we refer in our work as in OPTICA'75 to the
"most stable" currency. Therefore, the DM was generally chosen as the base
unit. Exchange rate averages are derived from daily spot rates in Frankfurt.

For matters of simplicity, in the period 1961-1967 the official parities were used as a proxy for the market rates which were fluctuating within a small margin of $\pm$ 1.5 percent around parity (Dollar/DM :$\pm$ .75 percent).

Effective exchange rates (and effective PPP) were calculated by different methods. In our own calculations of effective DM rates, single bilateral trade weights are utilized, the weights applied being the 1968 shares of German trade with the individual economies in total German trade with the respective country group (sixteen industrial countries; six EC countries, excluding Ireland and Luxemburg; Snake countries excluding/including France). Towards the end of 1976 the EC Commission's calculations of doubly weighted effective exchange rates (and relative PPP) became available $\underline{/}$7 $\underline{\overline{/}}$. The purpose of using double instead of single weights is to allow not only for bilateral trade relationships between the standard country and its trading partners but also for their competition on third markets. The method is therefore conceptually superior to the traditional weighting procedure although simulations done by the IMF indicate that the numerical results obtained by different weighting schemes are rather small, at least when the weights are related to the specific trade pattern of the country under review (rather than to world trade shares) $\underline{/}$ 20 $\underline{\overline{/}}$. Our calculations are done on the basis of (double) export weights the results being recorded in tables I-A 8 - 9 of this Annex and in table 1 and graphs 2 - 3 of the main report.

Exchange rates and price index numbers are mostly quarterly averages.

Two time-periods were chosen for investigation. First, a long-term period extending from the early 1960s to the mid 1970s. For data reasons the actual length of the period varies slightly depending upon the indices considered. In selecting 1961 as the base period for the computations on the DM it was assumed that the DM revaluation in March 1961 succeeded in bringing the DM exchange rates of most currencies roughly in line with absolute bilateral PPP [1]. In fact, no further par value adjustments were undertaken for more than six years, i.e. until autumn 1967, 1963 and 1964 which in some cases had to be taken as base periods are only slightly inferior to 1961, (differences in) rates of inflation being generally rather small in the early Sixties. The period covers mainly years in which exchange rates were pegged.

Secondly, the Smithsonian Agreement of December 1971 was taken as the starting point of a medium-term period which again stretches till 1975 Q 4 or 1976 Q 2. The post-Smithsonian exchange-rate structure represents the outcome

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(1) For the US dollar and probably also the pound sterling, this assumption is open to doubt. ./.

of a currency realignment comprising all major currencies and being
based upon objective economic analysis (though "corrected" by
political bargaining). The turn of 1971/72 appears therefore as
a better base period than any other date in the late Sixties or
early Seventies. In the computations on effective DM exchange rates
recorded in tables I-A.2-6 and graph I.A4 the Smithsonian DM cross-
rates and the average price levels in the period 1971 Q 3 to 1972 Q 2 have
been used as index bases. The other calculations are based upon 1972
Q 1 market exchange rates and prices. As to the terminal period,
reference is made to chapter I of this report.

For measuring changes in competitiveness the following sources
of price and cost indices have been used : calculations referring to
the DM   were made on the basis of IMF data published inthe historical
and current series of International Financial Statistics (IFS); doubly
weighted price data for 18 countries are from the EC Commission* $\underline{/}$ 7 $\underline{/}$;
unit labour cost data are from the OECD Secretariat. Figures from
different sources are not fully compatible, major divergencies being
noticeable especially in the case of wholesale prices. More generally,
all time series have a number of shortcomings limiting their evidence
on "true" changes in PPP, the most important imperfection being that
national indices are computed according to different statistical
concepts, and therefore show considerable variations in both coverage
and weighting schemes [1].

Purchasing power parities have been calculated for the following
types of indices :

(a) The consumer price index (CPI) is taken as a proxy for changes
    in the general price level. This index which is generally used
    as a major policy indicator has probably the best quality of all
    indices considered. The index includes services, and also
    agricultural commodities whose domestic prices are more
    or less politically determined and therefore sheltered from international
    competition. On the other hand it does not include investment
    goods, a major category of internationally traded goods. There
    are great differences in national weighting patterns $\underline{/}$26,27$\underline{/}$. Taken
    by itself, the CPI is therefore of only limited value for the
    diagnosis of changes in a country's competitive position. It may,
    however, serve as a useful yardstick against which changes in
    other indices can be checked.

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(1) On the problem of international index comparisons see, e.g. :
    Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen
    Entwicklung, Jahresgutachten 1968, Bundestagsdrucksache V/3550,
    Bonn, 2. Dezember 1968, pp. 106-113 (Letter of the President of
    the Statistisches Bundesamt).

(b) The index of average value of exports (AVX) - or export unit values - is being utilized to record changes in the price level of traded goods. The index is a substitute for a genuine export price index which at present is compiled in Germany, Sweden, Finland, Japan and Australia only. Besides the inaccuracies thereby generated other methodological and theoretical drawbacks limit the explanatory power of PPP calculations based upon AVX. First, to the extent that exports are invoiced in foreign currency, the amounts (or prices) entering the AVX (or export price) index are themselves heavily influenced by the current exchange rate - i.e. by the variable to be explained -, as the relevant values are translated into domestic currency. Secondly, AVX indices are calculated by different methods : whereas most indices are Paasche indices, some countries are computing Laspeyres or Fisher's Ideal indices. Thirdly, according to the law of one price one would expect export prices always to adjust to exchange rate-changes. This equality is not necessarily an indication of a sustainable production equilibrium; profit rates in the export sector may be heavily squeezed under the impact of an overvalued currency, inducing production adjustments despite apparent international "competitiveness".

(c) The wholesale price index (WPI) is intended to measure shifts in competitiveness due to changes in relative prices of tradeables. Whereas the law-of-one-price objection raised against AVX (or any export price index) is in principle also relevant to WPI, this index gives more weight to domestic cost and price factors, thus providing a more balanced indication of "true" competitive changes. Given the resource endowment and production structure of most industrial countries, for the purpose of our analysis the index should ideally record price movements of domestically produced manufactured goods. In fact, only some countries compute WPI and meet this requirement. The indices published in International Financial Statistics which have been used in calculating PPP vis-à-vis Germany are defined as follows :

France	Industrial Goods, Tax Excl.
Germany	Wholesale Prices, Industrial
USA	Industrial Goods
United Kingdom	Industrial Output
Belgium, Denmark Switzerland	Home Goods
Netherlands	Home and Import Goods
Italy, Japan	not defined.

The EC data on WPI underlying the "effective" PPP calculations though being classified as covering "Manufactures" are also "not strictly comparable between one country and another. For a few countries indeed separate indices of wholesale prices of manufactured goods do not even exist and for others their coverage is so restricted as to cast some doubt upon their reliability as indicators." $\underline{/}$ 7 $\underline{/}$.

(d) Even greater statistical weaknesses and intercountry differences in methodology affect the unit labour cost(ULC) index [1].
It is a tool which ought to be interpreted with special care. As both wage and productivity changes enter the computation of the ULC index, deficiencies in both series may be cumulative. Indeed, supplementary labour income, employers' contributions to social security and pension funds, payroll taxes and other wage-related cost elements are usually not included in the calculation of the wage component of the index. Many countries do not even publish ULC indices themselves. ULC data for France, Belgium, the Netherlands, Switzerland and (partly) Italy are OECD estimates derived from the component series published in OECD Main Economic Indicators. The poor quality of this index is at variance with the great need for an index measuring changes in domestic cost elements (the most important being wages).

The shortcomings of the indices have to be borne in mind when interpreting the results of the PPP calculations.

As to the <u>presentation of the findings</u> both graphical and quantitative methods are applied. For the problem and the period considered the graphical approach is a particularly useful tool to supplement the quantitative analysis, as numerical results can often be explained by special political or market factors easily visible or traceable from the graphs (sticky parities and major interventions into floating rates on the one hand, large swings in market rates on the other).

In addition to the standard coefficients of regression analysis the Root Mean Square Error (RMSE) is employed. For the purpose of our subject RMSE is defined as

$$ RMSE = \sqrt{\frac{\sum_i (PPP_i - ER_i)^2}{\sum_i (PPP_i)^2}} $$

(1) For a short description of data problems and methodological ./.
    variations see <u>OECD Economic Outlook</u>, No. 18 (Dec. 75)
    Technical Annex, pp. 119-120.

where PPP is the (relative) purchasing power parity and ER the exchange
rate, both expressed as index numbers. Rather than measuring variations
of exchange rates around their mean, RMSE gives an indication of the average
percentage deviation, irrespective of sign, of actual exchange rates from
the value to be expected on the grounds of the PPP theorem.

3. Long-term Correlation

When evaluating the empirical evidence one must bear in mind
that the analysis is referring to conformity between PPP and actual rather
than equilibrium exchange rates. Thus the fact that prior to 1973 parities
were generally fixed is important. The (rather short) floating period since
1973 Q 2 was, at least in the beginning, distorted by the aftermath of
disequilibria which had been built up during the past. Moreover, exchange
rates far from being fully flexible, were more or less subject to interven-
tions by monetary authorities ("managed floating"). The countries participant
to the European currency block ("Mini-Snake") are still maintaining fixed
cross rates within a margin of $\pm$ 2.25 p.c. around parity. Therefore,
rather than detracting from the PPP hypothesis, deviations of observed
exchange rates from PPP will often indicate the need for an adjustment
of sticky exchange rates.

Bearing this reservation - and the reservation on the index
quality - in mind we first consider some long-term relationships.
Available studies generally record a strong correlation between long-term
exchange rate changes and changes in PPP, both on a bilateral and an
effective basis, ULC being the exception to this rule. In table I-A-1
the results of some recent cross-section studies are summarized. $/^-18$ _/
These show that, close to 90 p.c. of the dollar exchange rate changes
of major currencies in the period 1955-1974 are explained by changes
in relative WPI (vis-à-vis the U.S.), correlation being somewhat lower
for the fixed-exchange-rate sub-period 1955-1971. The results also
demonstrate the superiority of WPI over CPI which is especially apparent
for the full twenty-years period 1955-1975.

Our findings, though generally supporting this evidence, give a
more differentiated picture. As to <u>bilateral</u> price and exchange-rate relations
(with Germany as the reference country)   correlation coefficients
of cross-section analyses (see table 1 and graph 2 of main text) are
lower than in the studies mentioned where the U.S. dollar was taken as the

Table I.A 1   Results of recent cross-section studies on correlation between exchange-rate changes and changes in PPP

Source	Variables	Period	Number of Countries	Equation	R^2
Kern	y = percentage change in trade-weighted exchange rate	1955-74	13	y = 4.53 - 1.14 x	.84
	x = percentage change in WPI				
Dennis	id..	id.	14	y = 4.48 - 1.35 x	.92
	id.	1955-71	14	y = 3.50 - 2.04 x	.84
Kern	y = percentage change in US $ exchange rate of each currency	1955-74	12	y = 1.44 + 1.20 x	.88
	x = percentage change in WPI in each country less percentage change in WPI of US				
Dennis	id.	id.	13	y = -1.57 + 1.26 x	.89
	id.	1955-71	13	y = -.53 + .97 x	.83
Kemp	id.	June 1970 -March 1976	8	n.a.	.89
	id.	March 1973 -March 1976	8	y = .347 - .698 x	.90
	y = id.	June 1970 -March 1976	9	n.a.	.62
	x = percentage change in CPI in each country less percentage change in CPI of US	March 1973 - March 1976	9	y = 6.765 - .936 x	.85

Sources: D. Kern, "Inflation implications in foreign exchange rate forecasting", Euromoney, April 1976, p. 65. G.E.J. Dennis, "Price and quantity adjustments in exchange rate forecasting", Euromoney, August 1976, p. 54. D.S. Kemp, "The U.S.Dollar in International Markets: Mid-1970 to Mid-1976, Federal Reserve Bank of St. Louis Review, Vol. 58 (1976), No. 8, p. 14.

standard currency, yet, they are still satisfactory as far as WPI and
AVX are concerned. However, correlation between exchange-rate changes and
changes in relative consumer prices is poor.

Looking at time series data (see graph I-A-1 and tables I-A-2 to I-A-5)
again on a bilateral basis, the coefficients of determination for Denmark,
the U.K., Italy, France and Japan are above .80 (WPI Japan . 68),
for the Netherlands, Belgium and the U.S. they are somewhat lower.
There is only little correlation in the case of Switzerland. As to the
type of index, AVX gives the best fit with WPI and CPI being only slightly
inferior.

RMSE provides more distinct results by establishing the clear
inferiority of CPI and the clear superiority of AVX, with WPI holding
the middle rank. This outcome agrees both with theoretical expectations
and the graphical evidence produced in graph I-A-5.

In addition to their generally low value, AVX coefficients
fluctuate only slightly across countries (with the exception of
Switzerland). It appears, therefore, that there is indeed a rather
strong international connection of prices for traded commodities, export
prices being primarily determined by the prices prevailing on the highly
competitive world markets and only to a limited degree by (differential)
domestic cost and price conditions. Because of the flexible adjustment
of export prices to changes in exchange rates, AVX is a poor indicator
of changes in international competitiveness.

That domestic conditions vary greatly and that the price links
(i.e. the internal price ratios) between the exposed and sheltered sectors
are by no means identical across countries becomes evident when the RMSE
coefficients for CPI are considered. Not only are they much higher than
for AVX but they show significant differences, especially for the U.S.
and the U.K. These countries have high RMSE coefficients indicating large
average deviations of exchange rates from PPP. Whereas it appears from
graph I-A-1 that the high numbers are at least partly due to the choice
of the base period, 1961, which was a year when both dollar and pound were
already overvalued - this explanation does not rule out a possible contri-
bution of other factors. No attempt is made to explain the summary
deviations (in terms of CPI) on a country-by-country basis. In addition
to structural economic and institutional factors - e.g. degree of openness
of an economy, existence of wage-indexing schemes etc. - the following
elements may have influenced the RMSE coefficient :

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Graph I·A·1: DM Exchange Rates and Relative Prices of Six E.C. Countries and the U.S. vis-à-vis Germany, 1967 I - 1975 IV

1961 = 100

	R^2	RMSE
Netherlands		
WPI	.493	.084
CPI	.808	.082
AVX	.576	.040
Belgium		
WPI	.584	.058
CPI	.684	.052
AVX	.709	.044
Denmark		
WPI	.887	.082
CPI	.859	.115
AVX	.929	.043
France		
WPI	.885	.066
CPI	.821	.104
AVX	.955	.040

HWWA
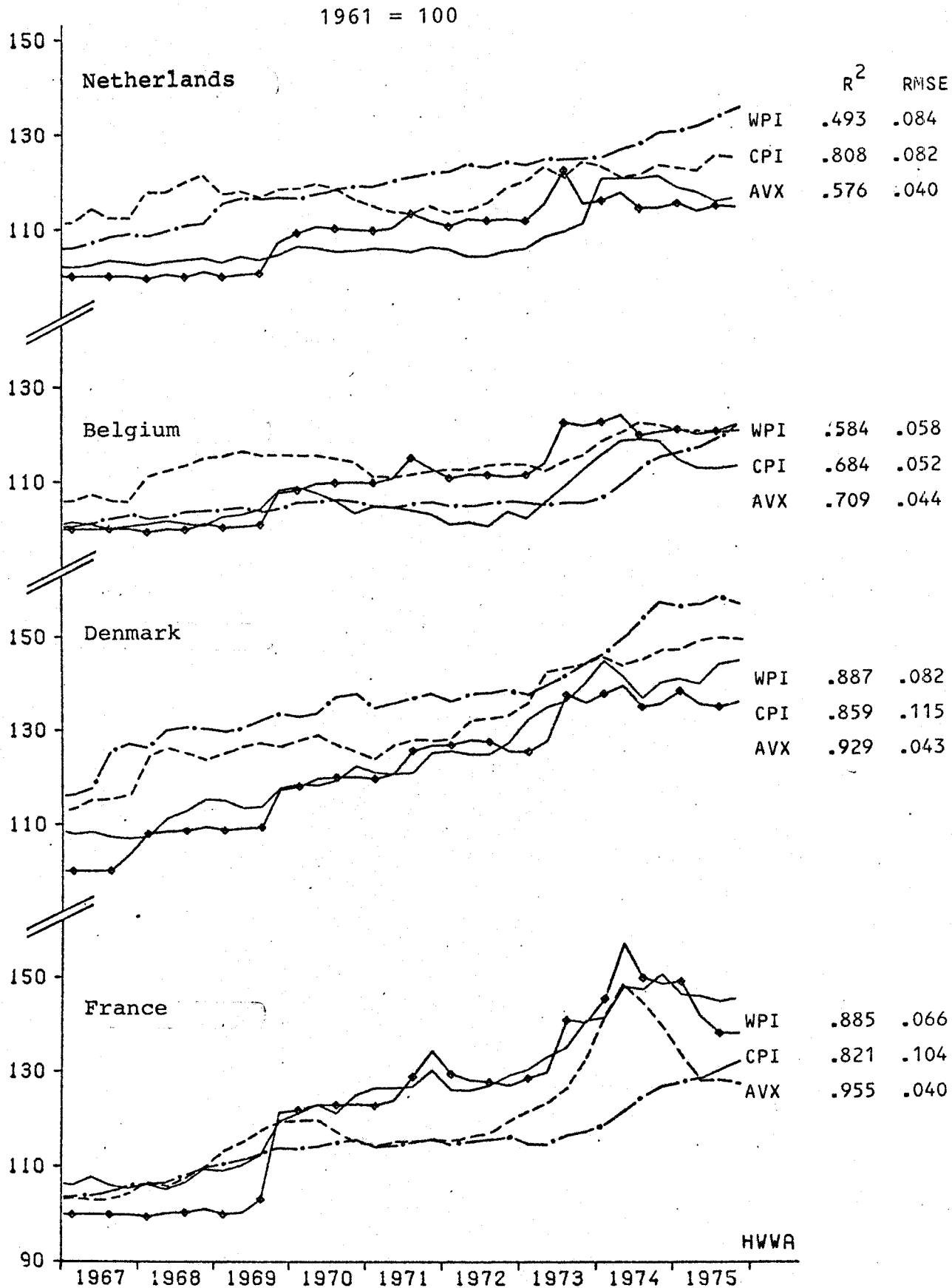
Legend: —◇—◇— DM exchange rate index; —·—·—·— relative consumer price index; ——————— relative wholesale price index; ——————relative export unit value index

Note : All correlation coefficients are significantly different from zero at the 99 percent level.

Graph I.A 1 : continued   52.

United Kingdom

	R^2	RMSE
WPI	.897	.162
CPI	.908	.214
AVX	.962	.071

Italy

WPI	.922	.071
CPI	.812	.121
AVX	.916	.064

United States

WPI	.610	.193
CPI	.426	.260
AVX	.914	.067

HWWA

1967 1968 1969 1970 1971 1972 1973 1974 1975
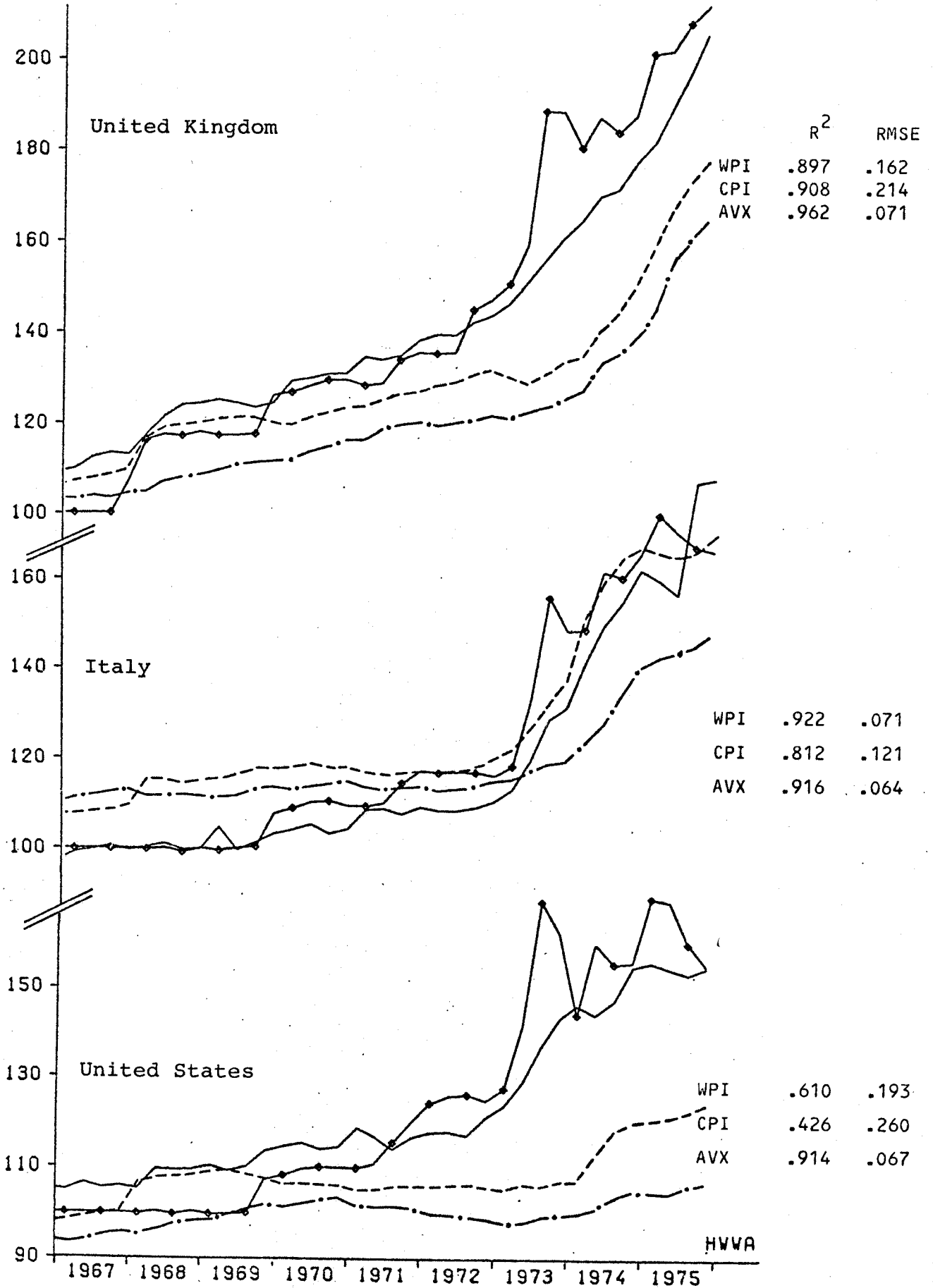
Table I.A 2 :   Statistical Evidence on Conformity
between DM-exchange Rates and PPP
- Summary of Time series Analyses

	Coefficient of Determination[a]			RMSE		
	WPI	CPI	AVX	WPI	CPI	AVX
a) 1961 - 1975						
Netherlands	.493	.808	.576	.084	.082	.040
Belgium	.584	.648	.709	.058	.052	.049
Denmark	.887	.859	.929	.082	.115	.043
France	.885	.821	.955	.066	.104	.040
U.K.	.897	.908	.962	.162	.214	.071
Italy	.922	.812	.916	.071	.121	.064
USA	.610	.426	.914	.193	.260	.067
Japan	.681	.819	.819	.070	.173	.069
Switzerland	.135	.122	.343	.070	.067	.175
16 Industrial countries	.845	.869	.943	.061	.064	.035
6 EC countries	.874	.859	.945	.058	.067	.036
Mini-Snake	.646	.826	.780	.066	.059	.035
Snake incl. France	.790	.834	.920	.054	.047	.031
b) 1972 - 1975						
16 Industrial countries	.767	.539	.815	.041	.077	.036
6 EC countries	.869	.584	.859	.028	.071	.034
Mini-Snake	.593	.307[b]	.630	.028	.038	.053
Snake incl. France	.821	.335[b]	.757	.029	.042	.039

a All but two coefficients are significantly different from zero at
the 99 percent level.

b Significantly different from zero at the 95 percent level.

1961-1975 : see Graph I.A 1
1972-1975 : see Graph I.A 4

Table I.A 3 : Regression Analyses : DM Exchange Rates and Relative wholesale prices

	Equation		t_{μ}	DW	$\bar{R}^2$
	a) 1961 - 1975				
Netherlands	ER_{NL} =	40.005 + $.578$ wpi_{NL}	7.512	.182	.493
Belgium	ER_B =	-2.854 + $.990$ wpi_B	9.019	.175	.584
Denmark	ER_{DK} =	4.698 + $.890$ wpi_{DK}	21.475	.238	.887
France	ER_F =	-35.987 + 1.334 wpi_F	21.173	.295	.885
U.K.	$ER_{U.K.}$ =	-82.119 + 1.760 $wpi_{U.K.}$	22.462	.203	.897
Italy	ER_I =	-21.530 + 1.138 wpi_I	26.067	.350	.922
United States	ER_{US} =	-142.292 + 2.461 wpi_{US}	9.516	.192	.610
Japan	ER_J =	-9.602 + 1.433 wpi_J	11.135	.379	.681
Switzerland	ER_{CH} =	53.540 + $.450$ wpi_{CH}	3.012	.215	.135
16 Industrial Countries	ER_{IC} =	-36.748 + 1.311 wpi_{IC}	17.764	.237	.845
E.C.	$ER_{E.C.}$ =	-29.622 + 1.236 $wpi_{E.C.}$	20.015	.229	.874
Mini-Snake	ER_{MSn} =	13.898 + $.825$ wpi_{MSn}	10.287	.180	.646
Snake (incl. France)	ER_{Sn} =	-14.731 + 1.103 wpi_{Sn}	14.756	.203	.790
	b) 1972 - 1975				
16 Industrial Countries	ER_{IC} =	-3.930 + 1.057 wpi_{IC}	6.780	n.a.	.767
E.C.	$ER_{E.C.}$ =	$-.795$ + 1.015 $wpi_{E.C.}$	9.657	n.a.	.869
Mini-Snake	ER_{MSn} =	27.075 + $.727$ wpi_{MSn}	4.516	n.a.	.593
Snake (incl. France)	ER_{Sn} =	15.512 + $.834$ wpi_{Sn}	8.000	n.a.	.821

Quarterly data, 1961 = 100 and 1972 Q 1 = 100, respectively. Note that for technical reasons parities had to be substituted for exchange rates in the period 1961 - 1967.

Explanation: ER_i = DM exchange rate index of the currency of country i,

$wpi_i = \dfrac{WPI_i}{WPI_D}$ = ratio of wholesale price indices of country i and Germany,

t_{μ} = t-value of regression coefficient, DW = Durbin-Watson, R^2 = coefficient of determination.

Table I.A 4 : Regression Analyses : DM Exchange Rates and Relative Consumer Prices

	Equation		t_ρ	DW	R^2
	a) 1961 - 1975				
Netherlands	ER_{NL}	$= 44.205 + .542\ cpi_{NL}$	15.656	.363	.808
Belgium	ER_B	$= -25.671 + 1.271\ cpi_B$	10.337	.184	.648
Denmark	ER_{DK}	$= 17.715 + .756\ cpi_{DK}$	18.837	.177	.859
France	ER_F	$=-102.435 + 1.959\ cpi_F$	16.322	.239	.821
U.K.	$ER_{U.K.}$	$=-114.747 + 2.138\ cpi_{U.K.}$	23.914	.280	.908
Italy	ER_I	$=-100.142 + 1.877\ cpi_I$	15.803	.154	.812
United States	ER_{US}	$=-292.116 + 4.114\ cpi_{US}$	6.565	.133	.426
Japan	ER_J	$= 42.740 + .507\ cpi_J$	16.227	.438	.819
Switzerland	ER_{CH}	$= 68.287 + .318\ cpi_{CH}$	2.837	.199	.122
16 Industrial Countries	ER_{IC}	$= -54.783 + 1.501\ cpi_{IC}$	19.554	.257	.869
E.C.	$ER_{E.C.}$	$= -55.403 + 1.501\ cpi_{E.C.}$	18.811	.211	.859
Mini-Snake	ER_{MSn}	$= 23.625 + .741\ cpi_{MSn}$	16.601	.273	.826
Snake (incl. France)	ER_{Sn}	$= -16.901 + 1.133\ cpi_{Sn}$	17.030	.237	.834
	b) 1972 - 1975				
16 Industrial Countries	ER_{IC}	$= 3.054 + 1.029\ cpi_{IC}$	4.044	n.a.	.539
E.C.	$ER_{E.C.}$	$= 8.994 + .966\ cpi_{E.C.}$	4.435	n.a.	.584
Mini-Snake	ER_{MSn}	$= 61.916 + .403\ cpi_{MSn}$	2.490	n.a.	.307
Snake (incl. France)	ER_{Sn}	$= 47.951 + .549\ cpi_{Sn}$	2.655	n.a.	.335

1971 Q 3 -

Quarterly data, 1961 = 100 and 1972 Q 1 = 100, respectively. Note that for technical reasons parities had to be substituted for exchange rates in the period 1961 - 1967.

Explanation: ER_i = DM exchange rate index of the currency of country i,

$cpi_i = \dfrac{CPI_i}{CPI_D}$ = ratio of consumer price indices of country i and Germany,

t_ρ = t value of regression coefficient, DW = Durbin-Watson,

R^2 = coefficient of determination.

Table I.A.5 : Regression Analyses : DM Exchange Rates and Relative Export Unit Values

	Equation		t_β	DW	R^2
	a) 1961 - 1975				
Netherlands	ER_{NL}	$= 14.928 + .858 \, avx_{NL}$	8.878	.261	.576
Belgium	ER_B	$= -24.700 + 1.264 \, avx_B$	11.910	.290	.709
Denmark	ER_{DK}	$= -3.871 + 1.003 \, avx_{DK}$	27.743	.471	.929
France	ER_F	$= -13.692 + 1.097 \, avx_F$	35.146	.662	.955
U.K.	$ER_{U.K.}$	$= -30.284 + 1.239 \, avx_{U.K.}$	38.847	.449	.962
Italy	ER_I	$= -1.695 + 1.039 \, avx_I$	24.971	.557	.916
United States	ER_{US}	$= -25.613 + 1.230 \, avx_{US}$	24.808	.621	.914
Japan	ER_J	$= - .094 + 1.054 \, avx_J$	16.227	.574	.819
Switzerland	ER_{CH}	$= 76.775 + .212 \, avx_{CH}$	5.511	.264	.343
16 Industrial Countries	ER_{IC}	$= -13.039 + 1.110 \, avx_{IC}$	30.907	.516	.943
E.C.	$ER_{E.C.}$	$= -15.777 + 1.143 \, avx_{E.C.}$	31.272	.427	.945
Mini-Snake	ER_{MSn}	$= -5.656 + 1.062 \, avx_{MSn}$	14.343	.295	.780
Snake (incl. France)	ER_{Sn}	$= -13.790 + 1.124 \, avx_{Sn}$	25.662	.396	.920
	b) 1972 - 1975				
16 Industrial Countries	ER_{IC}	$= 22.838 + .788 \, avx_{IC}$	7.852	n.a.	.815
E.C.	$ER_{E.C.}$	$= 24.222 + .778 \, avx_{E.C.}$	9.261	n.a.	.859
Mini-Snake	ER_{MSn}	$= 60.128 + .408 \, avx_{MSn}$	4.894	n.a.	.630
Snake (incl. France)	ER_{Sn}	$= 37.429 + .629 \, avx_{Sn}$	6.594	n.a.	.757

Quarterly data, 1961 = 100 and 1972 Q 1 = 100 [1971 Q 3], respectively. Note that for technical reasons parities had to be substituted for exchange rates in the period 1961 - 1967.

Explanation: ER_i = DM exchange rate index of the currency of country i, $avx_i = \dfrac{AVX_i}{AVX_D}$ = ratio of average value of export indices of country i and Germany, t_β = t value of regression coefficient, DW = Durbin-Watson, R^2 = coefficient of determination.

- Exchange rates may not have coincided with PPP in the base year 1961 (U.S., U.K.)

- Stickiness of exchange rates under conditions of diverging inflationary trends may have brought about (temporary) real exchange-rate changes which would not have occured under more flexible conditions (Snake countries)

- Financial transactions, for interest arbitrage or speculative reasons (both economic and political) may have caused nominal exchange rates to deviate temporarily from current PPP, internal price adjustments taking place with a time lag and/or being not fully accommodating in the short run.

Graph I-A-1 demonstrates that these factors have indeed played a more or less significant role for the countries under review.

As to WPI, in six out of nine cases the RMSE coefficients are significantly lower than for CPI. Again the U.S. and the U.K. are shown to have by far the largest deviations of exchange rates from PPP (RMSE : .193 and .162, respectively) whereas coefficients for the other seven countries of the sample (including Japan) cluster relatively close together within a band ranging from .058 for Belgium to .084 for the Netherlands. Graphs I-A-1 and I-A-5 provide additional information on the course of relative wholesale prices with respect to exchange-rate movements.

Finally, as far as relative costs are concerned, graph I-A-2 demonstrates that for only two countries out of six (United Kingdom, Italy) is there a positive correlation between changes in relative unit labour costs and exchange rates in the long run, the negative correlation in four other cases (Netherlands, Belgium, France, United States) being contrary to theoretical expectations and to the results obtained for relative prices. It was felt, therefore, that calculating the correlation coefficient or RMSE was of little use in the bilateral case.

Turning now to the "effective" case, cross-section analyses of (differently defined) inflation differentials and exchange rate changes - both doubly weighted by export shares - for a group of 18 countries over the 1963 - 1975 period exhibit a good correlation in the WPI and
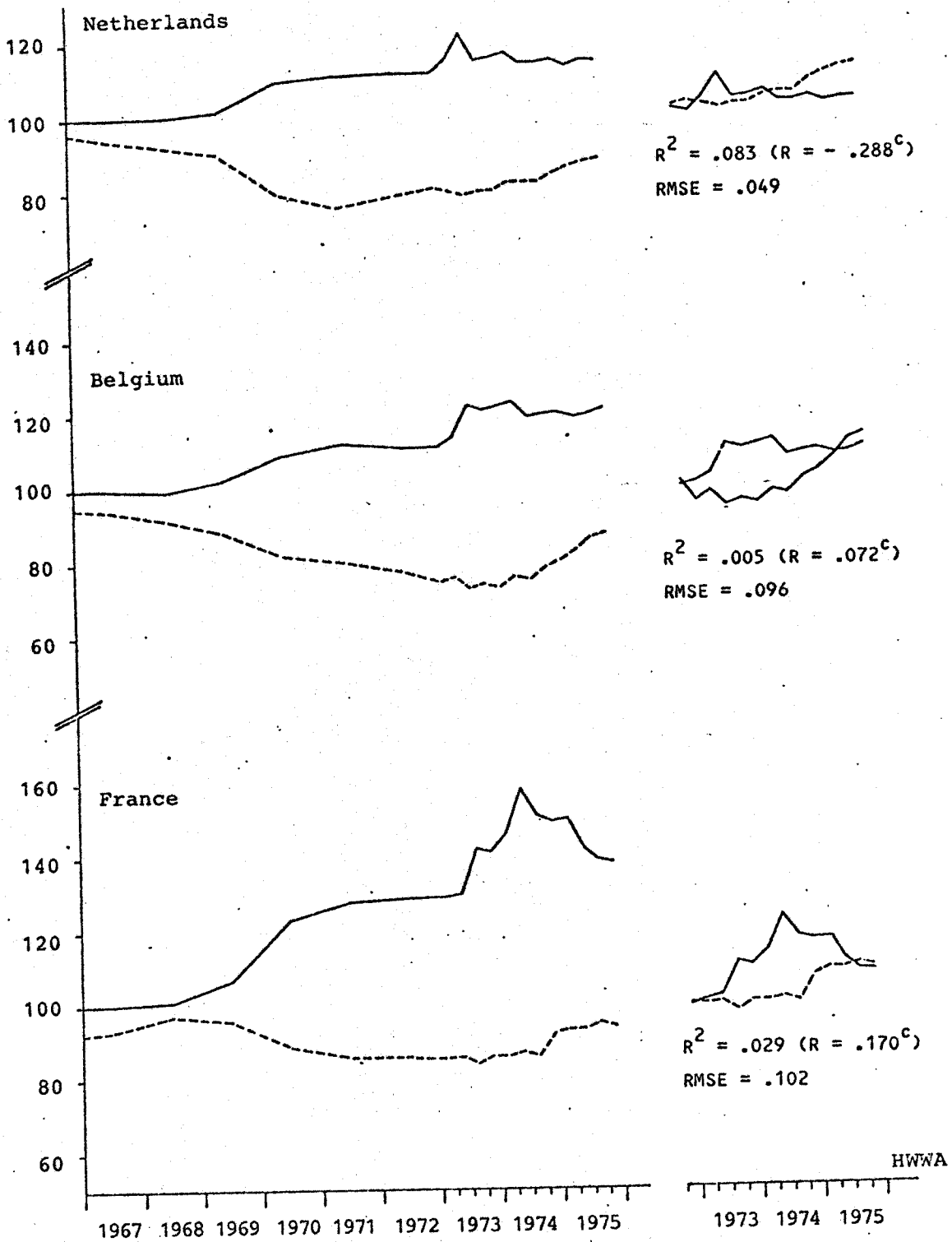
AVX cases (with coefficients of determination of .802 and .807, respectively; cf. table 1 and graph 2 of main text). Again, CPI performs rather poorly. As one would expect, correlation is gererally higher than in the bilateral example (with Germany as the reference country). On an average, exchange-rate changes appear to be largely accommodating to changes in relative prices: the slopes of the regression lines are close to unity.

For Germany, correlations between effective relative prices and effective DM exchange rates vis-à-vis four groups of countries - 16 industrial economies; EC countries, Mini-Snake, Snake, including France - have been examined (see tables IA-2-5 and graph IA-3), using simple export weights for the period 1961 - 1975. It is interesting to note that correlation for the groups of sixteen industrial and six EC countries turned out to be better than for the Mini-Snake. No significant differences between groups are observable as far as RMSE is concerned, the Snake (incl. France) coefficients being only slightly superior to those of the rest of the sample. Altogether the effective DM rate has been more in line with "effective" PPP than was noticeable for any of the bilateral relationships (with the partial exception of the German-Belgian case).

Graph I.A 2: DM Exchange Rates and Relative Unit Labour Costs of Five E.C. Countries and the U.S. vis-à-vis Germany, 1967 - 1975

$$1964 = 100^a \qquad\qquad 1972 = 100^b$$

Netherlands

$R^2 = .083$ $(R = - .288^c)$
RMSE = .049

Belgium

$R^2 = .005$ $(R = .072^c)$
RMSE = .096

France

$R^2 = .029$ $(R = .170^c)$
RMSE = .102

HWWA

1967 1968 1969 1970 1971 1972 1973 1974 1975   1973 1974 1975

a   1967 - 1972 annual averages, 1973 I - 1975 IV quarterly averages.
b   Quarterly averages.
c   The correlation coefficient did not stand the t-test at the 95 percent significance level.
d   Significantly different from zero at the 99 percent level.

Legend : ———— DM exchange rate index; ————————relative ULC.

Graph I.A 2: continued

1964 = 100   **1972 = 100**

United Kingdom
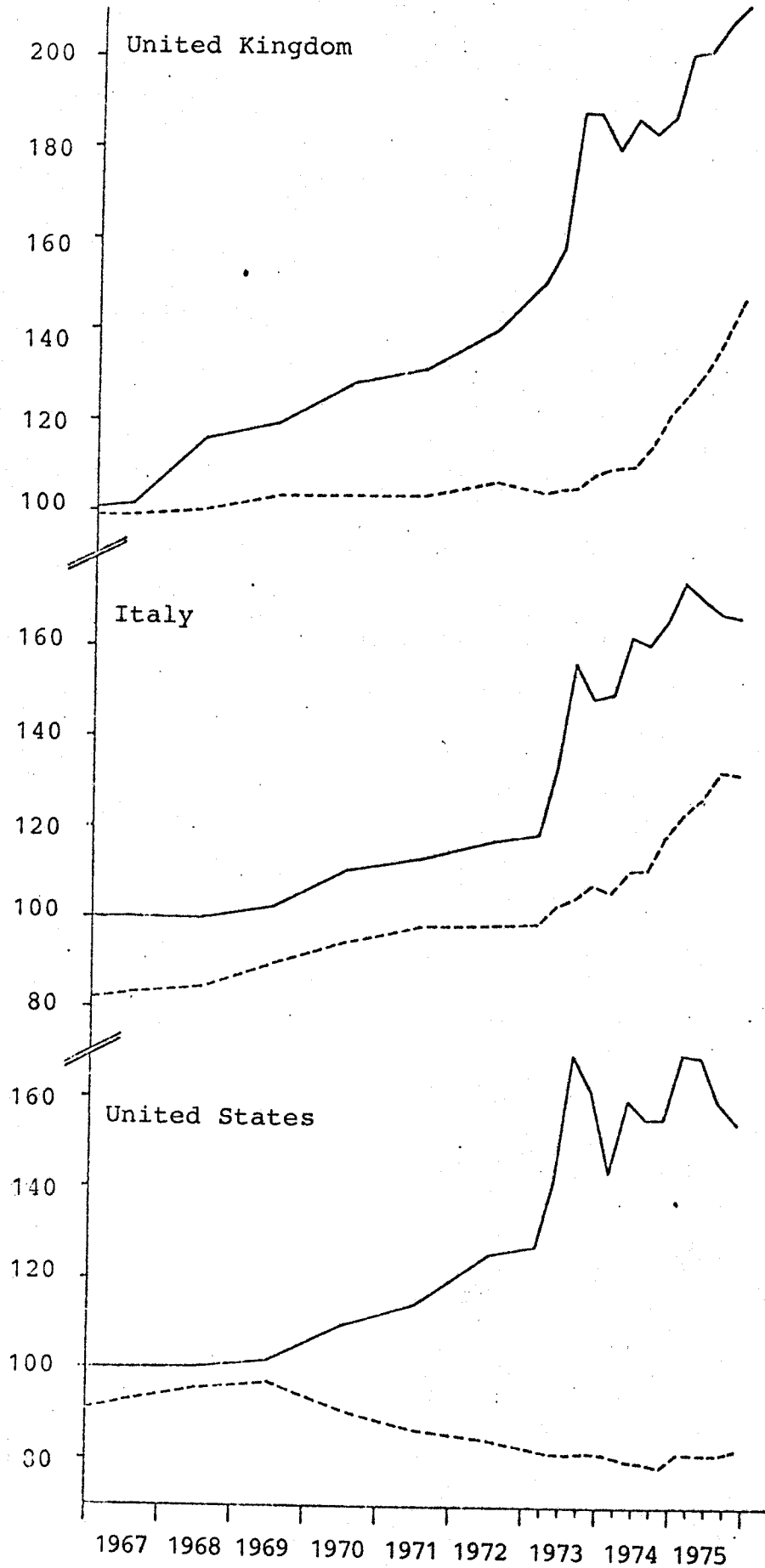
$R^2 = .626$ (R = $.791^d$)
RMSE = .200

Italy

$R^2 = .686$ (R = $.828^d$)
RMSE = .156

United States

$R^2 = .256$ (R = $.506^c$)
RMSE = .298

HWWA

1967 1968 1969 1970 1971 1972 1973 1974 1975

1973 1974 1975
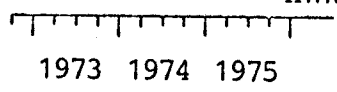
Graph I.A 3: Effective DM Exchange Rates and Trade-Weighted PPP[1] for Various Country Groups vis-à-vis Germany, 1967 I - 1975 IV

1961 = 100

Sixteen Developed Countries

	R[2]	RMSE
WPI	.845	.061
CPI	.869	.064
AVX	.943	/035

Six EC Countries (excl. Ireland and Luxembourg)

WPI	.874	.058
CPI	.859	.067
AVX	.945	.036

"Mini-Snake" Countries (excl. France)

WPI	.646	.066
CPI	.826	.059
AVX	.780	.035

"Snake" Countries (incl. France)

WPI	.790	.054
CPI	.834	.047
AVX	.920	.031

HWWA

1967 1968 1969 1970 1971 1972 1973 1974 1975
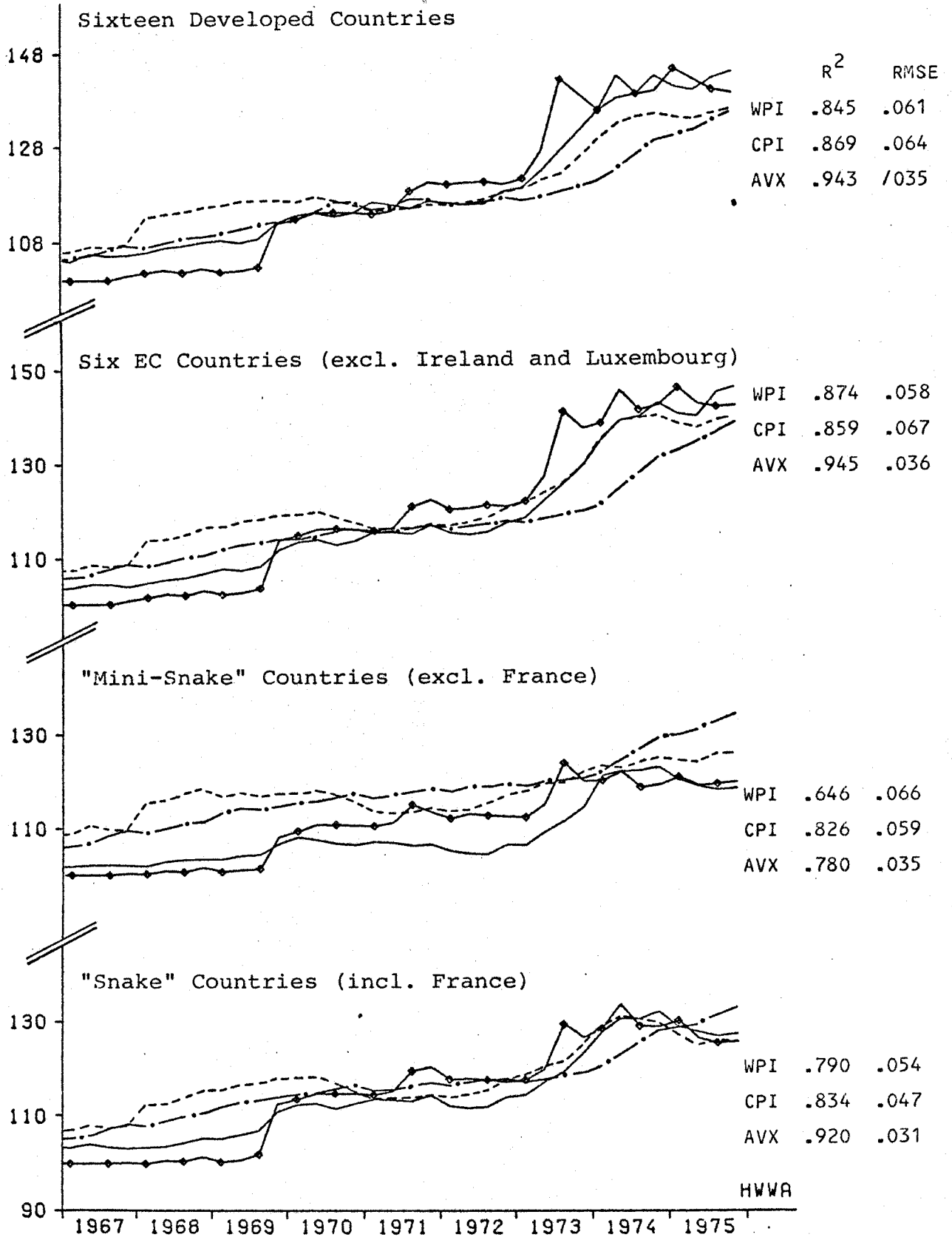
1 Weighted by the individual countries' shares in German trade with the respective group in 1968.

Legend: ——◇——◇—— Effective DM exchange rate; ——·——·—— relative consumer price index; —————— relative wholesale price index; ———————— relative export unit value index

Graph I.A 4: Effective DM Exchange Rates, Trade-Weighted PPP[1] and their Percent-
age Deviations for Various Country Groups vis-à-vis Germany,
1972 I - 1975 IV
Smithsonian Rates and Prices in 1971 III - 1972 II = 100

Sixteen Developed Countries

R^2 : WPI .767
CPI .539
AVX .815

Percentage Deviations
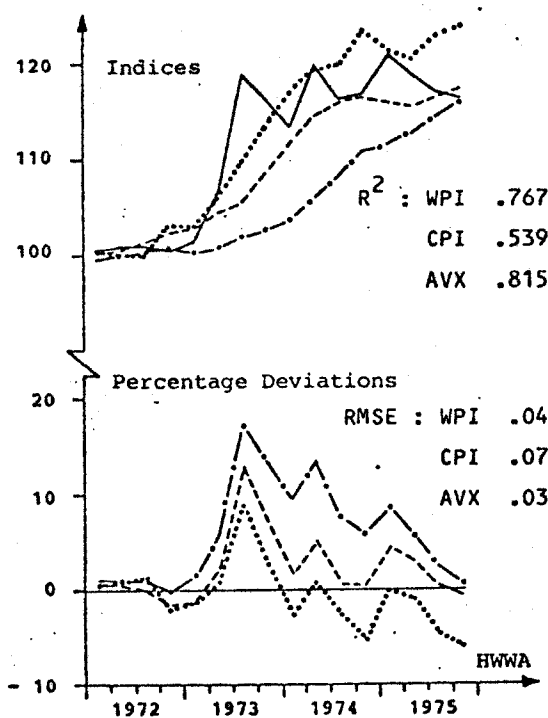
RMSE : WPI .041
CPI .077
AVX .036

Six EC Countries (excl. Ireland and Luxembourg)

R^2 : WPI .869
CPI .584
AVX .859

Percentage Deviations

RMSE : WPI .028
CPI .071
AVX .034

"Mini-Snake" Countries (excl. France)

R^2 : WPI .593
CPI .307[a]
AVX .630

Percentage Deviations

RMSE : WPI .028
CPI .038
AVX .053

"Snake" Countries (incl. France)

R^2 : WPI .821
CPI .335[a]
AVX .757

Percentage Deviations

RMSE : WPI .029
CPI .042
AVX .039
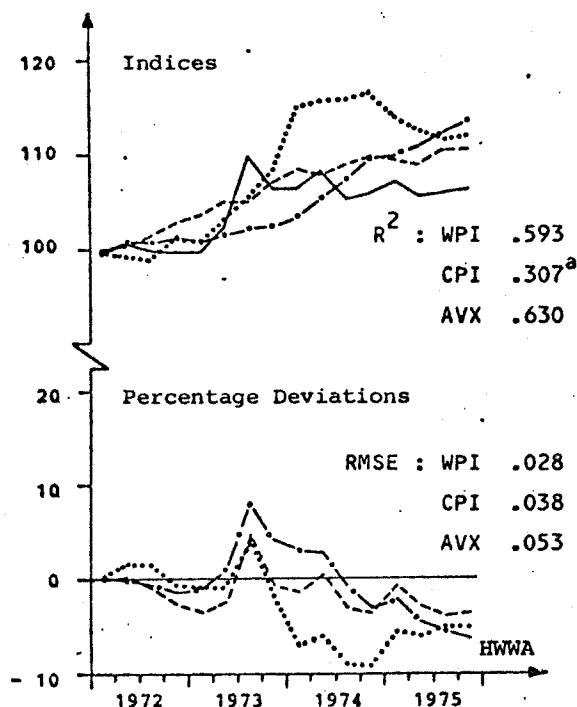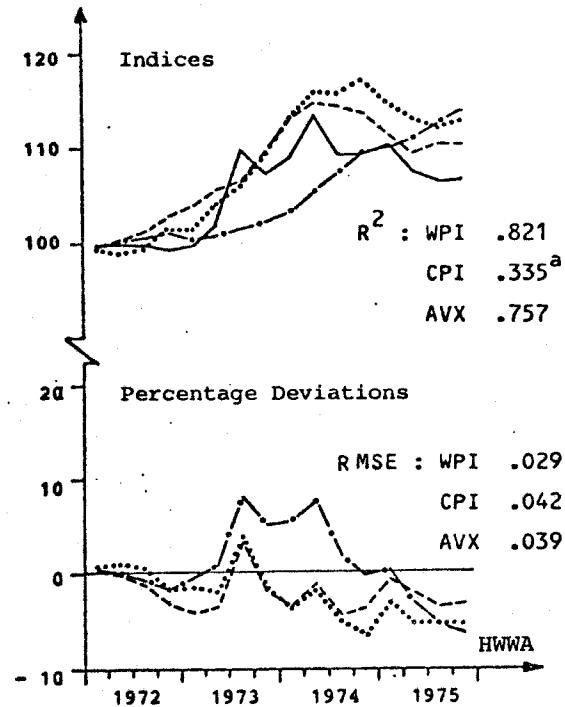
a significantly different from zero at the 95 percent level. All other coefficients are
significant at 99 percent level.
Legend: ─────── Effective DM exchange rate; ─·──·── relative consumer price index;
─ ─ ─ ─ ─ relative wholesale price index; ············ relative export unit value
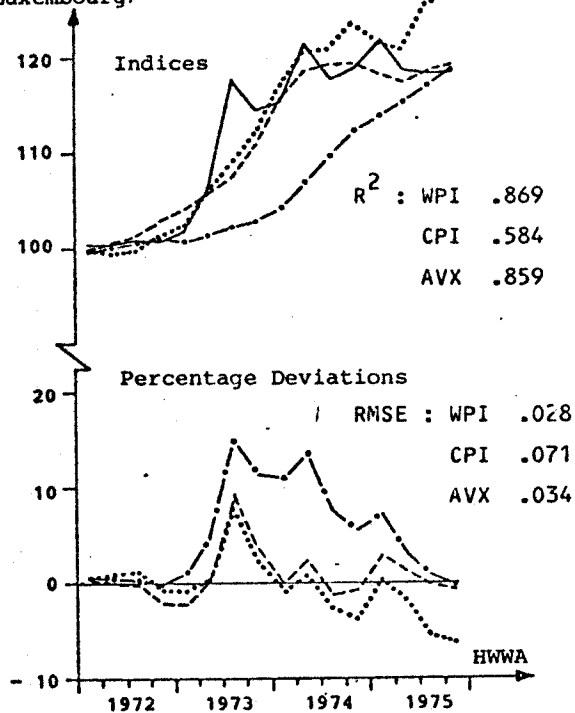index

4. Medium-Term Correlation

For an investigation of the medium term the period 1972-1975 was
chosen, assuming that the Smithsonian Agreement did in fact succeed
in aligning par values at a level consistent with absolute PPP (see
above).The analysis has been confined to the "effective" DM and the
ULC.

In the effective DM   case, correlation between trade-weighted PPP
and the DM rate is generally lower than for the longer period 1961-1975;
for the Mini-Snake correlation is rather poor (see tables I-A-2 - 5 and
graph I-A-4).With respect to RMSE the effective DM rate vis-à-vis the
Mini-Snake and Snake currencies performs quite well, the same being true,
as far as relative WPI and AVX are concerned, vis-à-vis the groups of EC
currencies and industrial countries' currencies. Once again, PPP
based upon CPI has the worst fit. It appears that the average per-
formance of the effective rate vis-à-vis the industrial and E C
economies was mainly impaired by the large deflection of the nominal
DM rate in 1973 whereas,within the (Mini-) Snake,deviations of effective
DM rates from effective PPP have mainly been due to the increasing
inflation differential which was not compensated by equivalent parity
adjustments.

An examination of the ULC case produces results which are no better
than those obtained for the longer period 1961-1975 (see graph I-A-2).
only three out of eight [1] cases (U.K., Italy, Japan) , there is
a reasonably good correlation between relative ULC vis-à-vis Germany
and DM exchange rates   whereas in three other cases (Belgium,
France, Switzerland) there is virtually no correlation and in two
cases (Netherlands, U.S.) correlation is even negative. As to RMSE
the U.S. and U.K. again stand out for their high coefficients (signi-
fying large deviations), the rest of the sample being characterized

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[1] The coefficients for Japan and Switzerland which are not given in
graph I-A2 are as follows :
Japan : R^2 = 691 (R = 831), RMSE = .075.
Switzerland : R^2 = .024 (R = .154), RMSE = .058
The correlation coefficient for Japan is significantly different from
zero at the 99 per cent level. The coefficient for Switzerland did not
stand the t-test at the 95 per cent significance level.

by a wide dispersion of numerical values. On the whole the data do
not support the hypothesis of a close conformity of exchange rates
with relative ULC, at least as far as the bilateral case (with Germany
as reference country) is concerned. Among the reasons explaining this
outcome the methodological weaknesses of the index mentioned above
appear to be of major importance. Also, the neglect of other cost
elements, apart from labour, is likely to have influenced the result.

5.   Real Exchange-Rate Variability

As is evident from the RMSE coefficients, the margins by which
nominal exchange rates have been deviating from relative PPP vary
greatly depending upon the countries and indices considered. In order
to obtain additional insight into the time distribution, size structure
and causes of variations in real exchange rates $\underline{/}$ 27 $\underline{\smash{/}}$ we have plotted them
(graphs IA4-6 and graph 3 of main report) and classified them according
to size (tables I-A-6 and 7).

On the whole our findings support Vaubel's findings of a substantial
variability of real exchange rates though it appears that his results
have been much influenced by his choice of price index (consumer prices)
$\underline{/}$ 27 $\underline{\smash{/}}$. Indeed, both the graphs and the figures demonstrate that ex-
change-rate deviations are largest when relative consumer prices are
taken as the standard of reference. 87 per cent of all bilateral
quarterly AVX observations over the 1961-1975 period are concentrated
within the 10 per cent margin of deviations, 61 per cent within the
5 per cent margin, the rest is mainly explained by special movements
of AVX in Switzerland. As to WPI, again 80 per cent of all quarterly re-
sults are within the 10 per cent margin, with 48 per cent in the 5 per-
cent range. On the other hand, only two thirds of all quarterly exchange
rate deviations from bilateral CPI are below 10 per cent, and only
41 per cent below 5 per cent. For the "effective" DM cases concentration
in the lower brackets (under 5 and 10 per cent deviations, respectively)
is even higher (see tables I-A-6 and 7).

Graph I-A-5: Percentage Deviations of Current DM Exchange Rates from Current Bilateral PPP¹ (Standard Country: Germany), 1967 I - 1975 IV
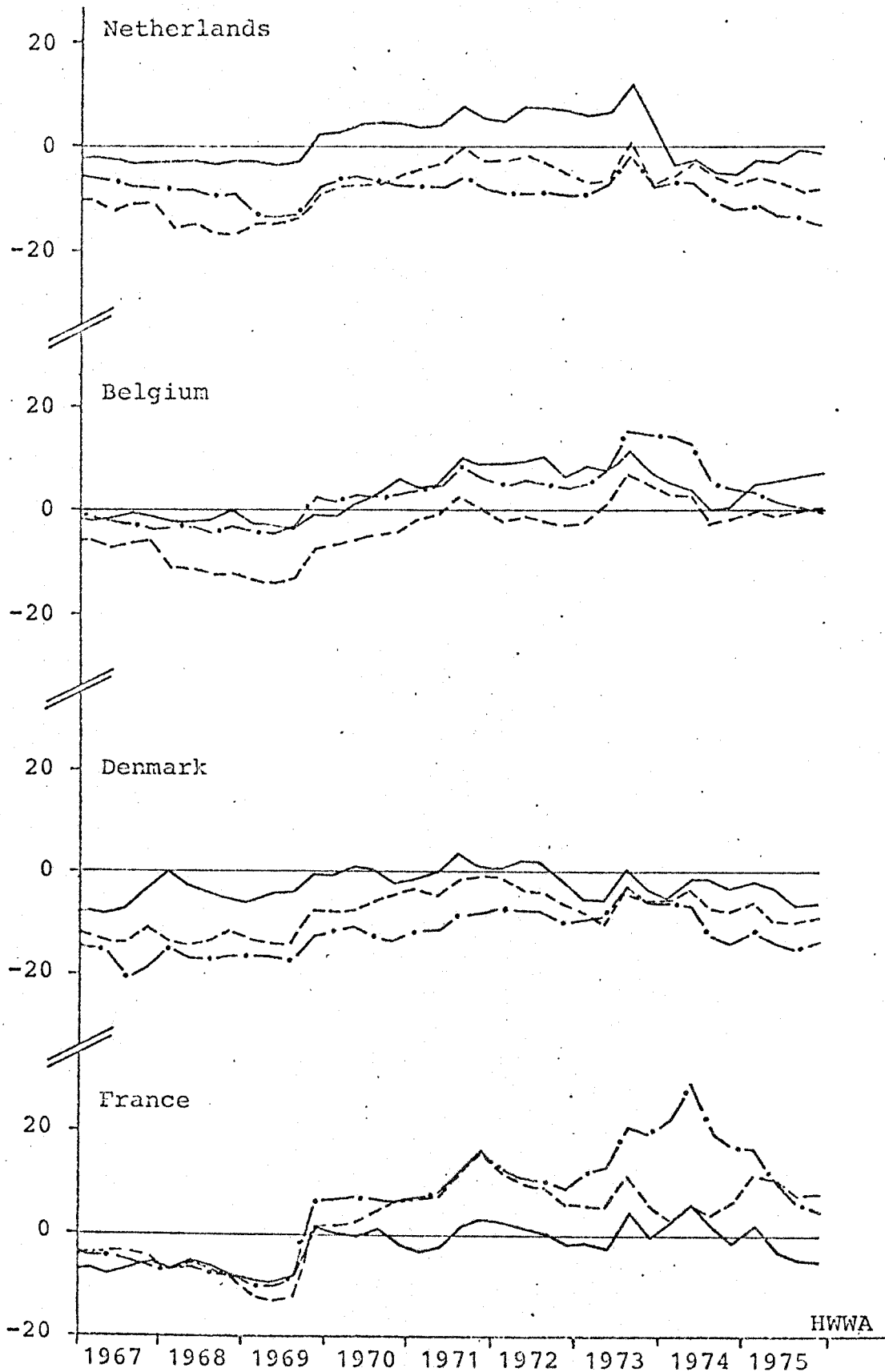
1961 = 0

1 Current PPP are calculated as relative rates on the basis 1961 = 100.

Legend:——·——·—— Relative consumer price index; ——————— relative wholesale price index; ——————— relative export unit value index

+ = Appreciation, - = Depreciation of DM in real terms vis-à-vis the respective currency since 1961

Graph I-A-5 : continued

United Kingdom

Italy

United States

1967 1968 1969 1970 1971 1972 1973 1974 1975

HWWA

Graph I-A-6: Percentage Deviations of the Current Effective DM Exchange
Rates from Current Trade-Weighted PPP¹ vis-à-vis Germany,
1967 I - 1975 IV

1961 = 0
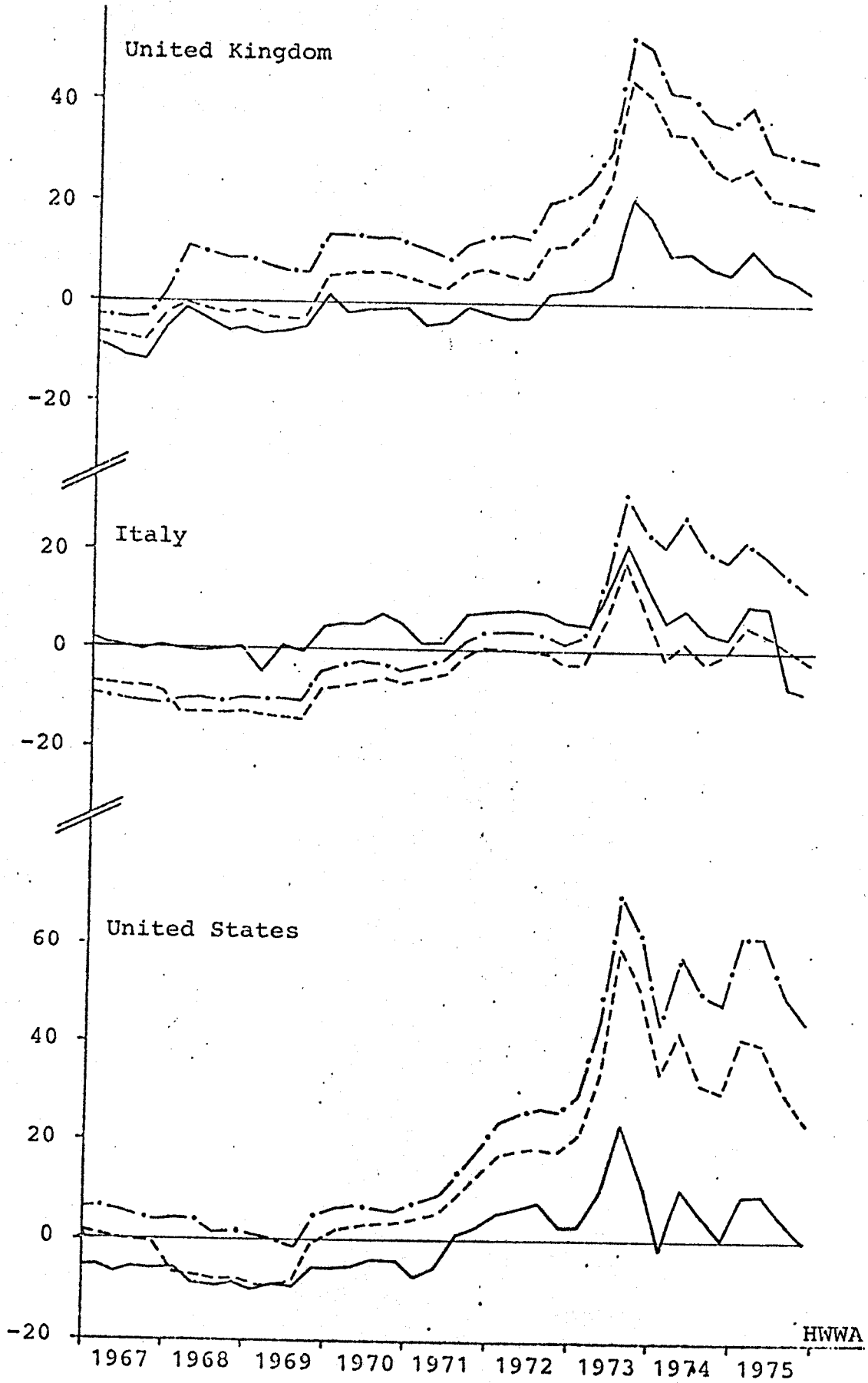

1 Current PPP are calculated as relative rates on the basis 1961 = 100.

Legend: —·—·—·— Relative consumer price index; —————————re-
lative wholesale price index; ———————— relative export
unit value index
+ = Appreciation, - = Depreciation of DM in real terms vis-à-vis
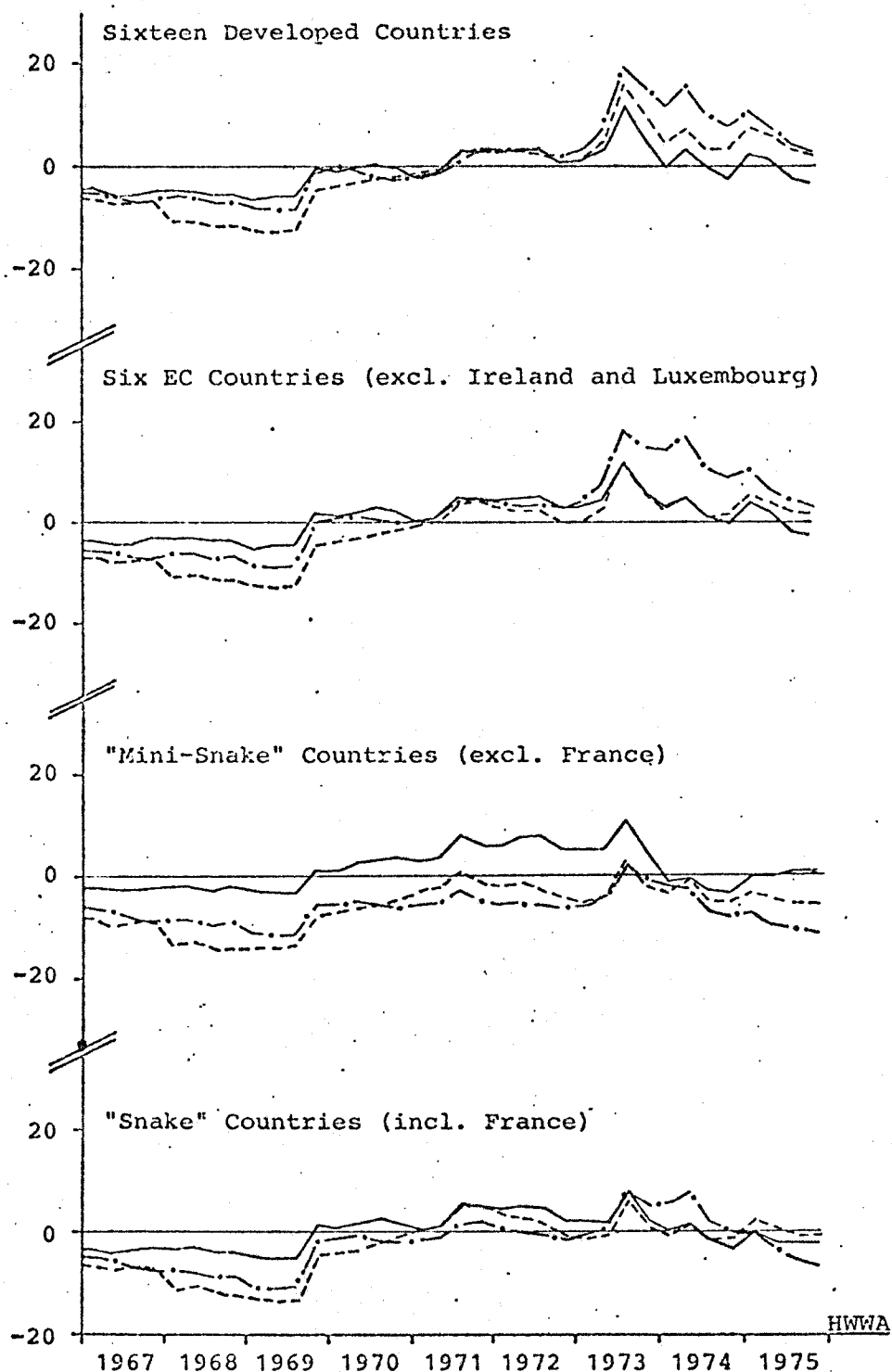the respective group of currencies

Table I-A-6 : Percentage Deviation of DM-Exchange Rates from Current PPP

1961 - 1975: Quarterly averages; 1975: Annual averages

a) 1961 - 1975

| | Number of Deviations by Classes | | | | | | | | | Average Deviation in 1975a in percent | | |
| | WPI | | | CPI | | | AVX | | | | | |
	0-5%	5-10%	10-%	0-5%	5-10%	10-%	0-5%	5-10%	10-%	WPI	CPI	AVX
Netherlands	20	26	14	21	30	9	50	9	1	- 7,8	- 13,9	- 2,2
Belgium	34	19	7	47	9	4	43	13	4	- 0,04	+ 2,0	+ 6,7
Denmark	19	27	14	8	22	30	40	19	1	- 8,6	- 13,7	- 4,3
France	34	17	9	24	21	15	42	18	-	+ 9,5	+ 9,3	- 2,8
Great Britain	31	15	14	28	7	25	31	23	6	+ 22,0	+ 31,7	+ 6,4
Italy	24	28	8	22	12	26	44	13	3	+ 1,4	+ 16,9	+ 0,3
United States	34	9	17	24	18	18	35	22	3	+ 33,9	+ 54,4	+ 5,9
Japan	37	12	11	8	7	45	33	19	8	+ 13,1	+ 20,1	+ 14,0
Switzerland	27	21	12	41	14	5	9	7	44	- 11,6	- 16,9	- 25,8
16 Industrial countries	39	12	9	41	13	6	53	6	1	+ 4,8	+ 6,7	- 0,1
6 EC countries	34	18	8	38	16	6	56	3	1	+ 3,1	+ 5,7	+ 0,3
Mini-Snake	32	21	7	30	25	5	51	8	1	- 4,2	- 9,3	+ 0,8
Snake (incl. France)	37	16	7	44	13	3	55	5	-	+ 0,7	- 3,0	- 0,6

b) 1972 - 1975

| | Number of Deviations by Classes | | | | | | | | | Average Deviation in 1975a in percent | | |
| | WPI | | | CPI | | | AVX | | | | | |
	0-5%	5-10%	10-%	0-5%	5-10%	10-%	0-5%	5-10%	10-%	WPI	CPI	AVX
16 Industrial countries	14	1	1	7	6	3	13	3	-	- 0,65	+ 0,58	- 6,00
6 EC countries	15	1	-	9	3	4	13	3	-	+ 0,77	- 0,35	- 6,27
Mini-Snake	16	-	-	13	3	-	8	8	-	- 3,82	- 6,50	- 5,12
Snake (incl. France)	16	-	-	10	6	-	11	5	-	- 3,32	- 6,44	- 5,53

a) Period 1972 - 1975; 1975: 1975 Q 4

Note: + = Real appreciation of DM (real depreciation of respective currency)
— = Real depreciation of DM (real appreciation of respective currency)

Table I-A-7 : Distribution of Real Exchange Rates for Relative AVX,
WPI and CPI, 1961 - 1975

— in percent of total number of quarterly data —

	Deviations of exchange rates from PPP in percent			
	0 - 5%	5-10%	10- %	total
— Bilateral DM relations[a] —				
AVX	60.6 %	26.5 %	13.0 %	100 %
WPI	48.2 %	32.2 %	19.6 %	100 %
CPI	41.3 %	25.9 %	32.8 %	100 %
— Effective DM relations[b] —				
AVX	89.6 %	9.2 %	1.2 %	100 %
WPI	59.2 %	27.9 %	12.9 %	100 %
CPI	63.8 %	27.9 %	8.3 %	100 %

a) 540 quarterly data per index   b) 240 quarterly data per index

From the graphs it appears that large real exchange-rate oscilla-
tions have mainly occurred prior to 1969 and since 1973. Two main
explanations lend themselves. First, the stickiness of official ex-
change rates under the Bretton Woods system and in the Mini-Snake has
produced (temporary) real exchange-rate changes among participants of
the arrangements as their inflation rates continued to differ. This is
particularly obvious in our case where the least inflating country
was taken as the reference country. Graphs I-A-5 and 6 demonstrate that
all economies experienced "real" appreciations of their currencies vis-à-
vis the D-Mark between 1961 and 1969. The 1969 DM revaluation and again
the 1971 realignment (partly) wiped out previously accumulated dis-
parities (in terms of CPI and WPI). Large and persistent inflation diffe-
rentials among the members of the European currency block (Mini-Snake)
since 1974 once again brought about real exchange-rate changes; this is
clearly shown by graphs I-A-4 - 6 For the total period since the Smith-
sonian Agreement till 1975 Q 4 the real appreciation of the Mini-Snake
currencies with respect to the DM   amounted to 6.5 per cent in terms
of CPI and 3.8 per cent in terms of WPI (see table I-A-6).

Secondly, large fluctuations of floating exchange rates - for the
DM   as well as for other floating currencies - have resulted in
(sometimes temporary) real exchange-rate movements. This has mainly
been true for the DM   in 1973 and 1974 and for the Pound Sterling, the
Lira and the French franc since the oil crisis (see graph 3 of main
report).

Deficiencies of the exchange market mechanism : rigidity of parities
on the one hand; destabilising speculation fostered by lack of reliable
criteria to judge the future course of monetary and exchange rate
action, on the other, and the (arbitrary) choice of the terminal period
explain in part the 1975 (1976 Q 2) real exchange-rate changes relative to
1961/1963 and 1972 Q1 (see table I-A-6 for the DM   tables I-A-8 to 9 for
eleven currencies), changes which have sometimes been substantial, both
in CPI and in WPI terms. These deficiencies explain also part of the
real exchange-rate changes observed by Vaubel $\underline{/}$ 27 $\underline{/}$ over the 1959-1975
period which, while being calculated as compound annual average rates, are
comparable in size.

Table I-A-8: Competitive positions vis-à-vis Rest of the World, 1963[a] – 1976 Q 2 in Terms of Doubly weighted Effective Exchange Rates and Relative Prices[b], Indices, 1963[a] = 100

	Germany	Nether-lands	Belgium	Denmark	France	U.K.	Ireland	Italy	USA	Japan	Switzer-land
Average Value of Exports											
1963	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1972 Q 1	103,9	96,6	97,8	99,0	104,4	96,4	109,4	96,4	99,9	97,5	115,5
1975 Q 4	97,9	102,4	92,8	100,8	103,9	98,1	104,8	98,1	102,9	89,4	126,5
1976 Q 2	99,0	104,2	95,5	103,8	101,3	90,0	105,4	89,7	102,9	93,2	130,7
Wholesale Price Index											
1963	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1972 Q 1	113,0	111,3	105,4	98,8	105,9	88,2	104,0	98,9	91,9	97,2	99,1
1975 Q 4	111,4	114,1	99,3	112,3	115,8	91,0	100,1	100,7	88,8	96,9	115,3
1976 Q 2	115,6	118,6	99,3	116,3	122,9	83,7	98,6	93,7	89,2	99,9	120,7
Consumer Price Index											
1963	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1972 Q 1	109,1	117,5	104,3	105,9	104,8	93,9	109,3	96,4	97,2	97,2	99,1
1975 Q 4	109,7	127,9	110,0	115,8	115,8	83,5	100,1	98,1	96,9	115,3	115,8
1976 Q 2	114,4	130,9	113,3	122,9	113,3	77,7	98,6	93,2	99,9	120,7	120,7
Unit Labour Costs											
1964	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1972	124,9	117,5	104,3	105,9	88,2	93,9	104,0	96,4	85,2	129,1	102,7
1975 Q 4	130,3	127,9	110,0	115,8	97,0	83,5	93,2	88,5	73,9	145,3	129,5
1976 Q 2	n.a.	130,9	113,3	122,9	95,0	77,7	94,3	75,7	73,2	153,2	136,9

a) ULC: 1964   b) AVX, WPI, CPI: EC weighting scheme ; ULC: OECD weighting scheme

A rise in the index indicates real appreciation of respective currency; i.e. worsening of competitive position relative to the rest of the world, and v.v.

Sources: Commission of the European Communities (AVX, WPI, CPI); OECD (ULC); own calculations.

Table I-A-9: Competitive positions vis-à-vis Rest of the world, 1972 Q 1 – 1976 Q 2, in Terms of Doubly weighted Effective Exchange Rates and Relative Prices[a], Indices, 1972 Q 1[b] = 100

	Germany	Nether-lands	Belgium	Denmark	France	U.K.	Ireland	Italy	USA	Japan	Switzer-land
Average Value of Exports											
1972 Q 1	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1975 Q 4	94,2	96,6	103,1		89,3	95,7	101,8	103,0	91,8	109,7	
1976 Q 2	95,3	99,4	106,2		86,2	96,3	103,0	95,7		113,2	
Wholesale Price Index											
1972 Q 1	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0		100,0	100,0
1975 Q 4	98,6	102,5	94,1	113,6	104,5	91,6	102,9	96,6		99,6	112,6
1976 Q 2	102,3	106,5	94,1	117,7	100,4	90,2	94,7	95,7		116,8	121,8
Consumer Price Index											
1972 Q 1	100,0	100,0	100,0		100,0	100,0	100,0	100,0	100,0	100,0	100,0
1975 Q 4	100,6	108,8	109,3		104,5	89,0	89,7	91,8	86,7	112,6	126,2
1976 Q 2	104,8	111,4	116,1		100,4	82,8	90,7	78,6	85,9	118,7	133,2
Unit Labour Costs											
1972	100,0	100,0	100,0	n.a.	100,0	100,0	n.a.	100,0	100,0	100,0	100,0
1975 Q 4	104,3	115,0	103,5	n.a.	105,5	96,1	n.a.	96,0	88,2	111,1	114,3

a) AVX, WPI, CPI: EC weighting scheme; ULC: OECD weighting scheme

b) ULC: 1972

Sources: Commission of the European Communities (AVX, WPI, CPI); OECD (ULC); own calculations.

What part of the observed real exchange-rate changes is to be attributed
to these deficiencies cannot be easily answered since other elements -
index number problems, productivity bias, terms-of-trade changes - are
also important and require "needed" changes in real exchange rates.
Our proposal on a system of coordinated monetary and exchange-rate
management in the EC (Chapter II of this report), implies that re-
quired changes would tend to be small if an appropriate index was
applied to PPP calculations and that such changes would gain weight
in the longer term only. Under the current circumstances the
economic benefits of stabilising exchange rates within a band around
PPP therefore appear to be higher than the costs.

ANNEX I-B[1]

WAGE AND SALARY INDEXATION IN EC COUNTRIES

Belgium

Automatic adjustment of wages and salaries to a cost-of-living
index has been widespread in Belgium since 1948. At present about 95 % of
all wage and salary earners are coverd by automatic adjustments based on
the CPI. The exact method of adjustment varies from sector to sector,
according to collective agreements. The reference period for calculating
changes in CPI varies from one to three months. The lag with which adjustment
is made has been shortened gradually in recent years; it often occurs with less
than a month's delay. Adjustment is usually contingent on the change in the
index exceeding 2 %. In some cases, notably the banking sector, the adjustment
provides for wages to increase by a larger percentage than the corresponding
increase in the CPI, in order to cover a faster rise in items which are not
included in this index, such as rent and progressive taxes. Indexation of
pay in the public sector was introduced by law in 1960, and the same
provisions apply to social security payments and to wage scales used in
calculating social security contributions. During the first three quarters
of 1976 indexation was suspended on monthly earnings above B.fr. 40,000.

On the whole Belgium at present has the most complete and continuous
indexation system in the Community.

Denmark

Wage and salary indexation has been widespread in Denmark since the
1920's and practically universal since 1945. Indexation is embodied in
legislation concerning the majority of public employees whereas indexation of
wages and salaries in the private sector is subject to the two-year collective
agreements. Regulation takes place twice a year and was until 1975 in the form
of a percentage addition in the public sector; since then all cost-of-living
allowances have been fixed in absolute terms. In the private sector the
cost-of-living allowance has been fixed in the collective agreements, usually
in the form of a standard amount for all wage and salary earners. In the

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(1) This annex draws heavily on "Some Issues in Wage Indexation", a working
    paper submitted by the Commission staff to the Group for Coordination of
    Short-term Economic and Financial Policy in November 1976. For a more
    detailed, but less up to date survey, see Braun, Anne Romanis, "Indexation
    of wages and Salaries in Developed Economics", International Monetary
    Fund Staff Papers, March 1976.

private sector the allowances have compensated on average 60-70 % of the increase in the cost-of-living; they have been triggered twice annually with a short delay.

In 1976 a departure from automatic indexation was introduced by a stipulation that no more than two cost-of-living adjustments would be released in 1977. Any additional allowances would be paid by the Government into a supplementary pension fund and not used for an increase in take-home pay. On two previous occasions the Government has temporarily compensated employers for cost-of-living allowances paid out.

The widespread system of indexation has met with criticism from many quarters particularly for its failure to distinguish between higher import prices (deteriorating terms of trade) and others sources of inflation. A Government Commission, reporting in 1974, was unable to devise generally acceptable ways of applying this distinction.

France

There are no common rules on cost-of-living adjustment; indeed, an Ordonnance of December 1958 gradually outlawed indexation of wages and salaries by the general price index. Nevertheless, a number of different methods are in use, depending on whether the agreements relate to the large public sector enterprises or to the private labour market.

For a number of public sector employees an ex-ante indexation applies. One or two year agreements are concluded, covering branches of activity or single public sector firms. In these agreements a certain percentage increase in real purchasing power is aimed for over the coming year. The agreements then add to that rate the expected inflation rate. If the cost-of-living rises faster than expected in the collective agreements, a proportional compensation is made. For example, at the beginning of 1973 collective agreements which entered into force with an increase in nominal wages of 6 % were aimed at guaranteeing an increase in real wages of 2-3 %.

For a small part of the work force (less than one million workers) a special minimum wage (SMIC) applies. The SMIC is indexed on the cost-of-living for certain employees and is increased beyond this by the rise in productivity for the nation as a whole.

In the private labour market there exist a number of collective agreements which contain a right to renegotiate agreements if the price index rises faster or if there is in other respects a major change in the economic situation.

The Barre Plan of September 1976 recommended that wage increases in the private sector be confined to 6 1/2 per cent in 1977, corresponding to the official target for rises in the CPI for that year; increases in the public sector would similarly be limited.

Germany

Under Article 3 of the Currency Law of June 1948, as interpreted since 1961, any indexation of the nominal value of DM financial assets is forbidden without express authorization by the Deutsche Bundesbank. The application of this law to wage settlements has been questioned as being contrary to the principle of free collective bargaining. In practice, the law has been taken to prohibit automatic adjustment clauses but not provisions for automatic renegotiation of contracts when the cost-of-living index exceeds a certain level. Beginning in 1963, in connection with the conclusion of long-term contracts covering more than one year, clauses of this type were introduced in a limited number of cases. German trade unions consider that they can obtain a review of wage contracts even in the absence of formal renegotiation clauses, in the case of sharp price accelerations.

Ireland

Wage increases are determined under a national agreement between employers and the Congress of Trade Unions, which applies to the private sector and to public employees whose pay is subject to collective bargaining. Agreements at industry level are concluded under this master "frame" agreement. The indexation is basically an assurance against increases in the cost-of-living index beyond a certain figure. For example, it was agreed, at the end of 1973, that increases in the CPI beyond 10 % would be fully compensated by cost-of-living adjustments. For employees in the public sector cost-of-living adjustments follow the same pattern as the national wage and salary agreement in the private sector.

Italy

Cost-of-living adjustments were introduced in certain industries after the Second World War, and this system was gradually extended under the national wage agreements to other sectors. Almost all wage and salary earners in the private and public sectors are now covered by some form of sliding scale (scala mobile).

In the private sector, adjustment is usually made at quarterly
intervals, but it applies only to that part of earnings distinguished as
"indemnification for the cost of living". This is a fixed amount depending
on the wage earner's qualifications and age. Except in banking and insurance,
where the value of each point on the sliding scale is established as a
percentage of the total earnings of the worker, the compensation applies
to less than half the level of earnings. For each increase of 1 % in the
cost-of-living index, wage earners receive a sum equal to 1 % of the average
wage for that type of work in 1957, the base-year for the calculation of
the index. The CPI used is based on the average expenditure of a family
with two children in 1957. This system of adjustment has come in for
criticism in recent years because of the sharp rise in the cost-of-living
relative to the base-year and because of the considerable discrepancies in
compensation between occupational groups.

As a result of these criticisms it was agreed with the social
partners to harmonize by February 1977 the compensatory amounts in practically
all sectors at the highest level which existed under the old system.
During the transitional phase most industrial workers have been receiving
more than proportional compensation for cost-of-living increases. The
Andreotti government, formed after the June 1976 elections, has aimed -
so far without success - at modifying the degree of automaticity of
indexation.

Luxembourg

Automatic indexation of wages and salaries to the CPI (excluding
rent) has been applied since 1921 and now covers nearly the entire labour
force. All wages in the public sector and a minimum wage in the private
sector are regulated by the same method. If agreements between employers
and employees in the private labour market presuppose a further cost-of-living
adjustment, this is made along the same lines. No ceiling applies to the
cost-of-living adjustments. According to the present system, every change
in the average value of the CPI over a six months' period, relative to the
previous date of regulation, of at least 2 1/2 %, entails a proportional
wage change.

Netherlands

Until approximately 1970 the social partners were left with a certain degree of freedom with respect to wage indexation, but following the passing of a law in January 1972 on the statutory minimum wage, approximately 90 % of all wage and salary incomes in the private labour market, covered by collective agreements, have become indexed on the CPI.

Indexation usually takes place twice a year, but varies from industry to industry. In some agreements, indexation is made retroactively at the expiry of the agreement and depends on the rise in the CPI, while in other agreements a preliminary allowance is given, depending on the increase in the price level as estimated at the time of the agreement; a final regulation is then made at the expiry of the agreement. Occasionally the role of the index in the regulation is limited to a certain share of the observed price increases, while in other cases, there is no such limitation. In some cases wage adjustments are made as a percentage of the wage, while in other cases a fixed amount is added.

Public sector employees have no immediate cost-of-living adjustment, but through an assurance of a trend, parallel to the wages in the private sector, public sector employees are assured a similar rise in percentage terms. The adjustment here is of an ex-ante kind, building on a forecast of wage trends in the private labour market, subsequently adjusted when the statistics of wages become available. In the public sector cost-of-living adjustments are made once a year retroactively; the employees are also compensated for the loss of income due to the fact that their wages are adjusted at a later point in time than in the private labour market.

United Kingdom

At no time in the post-war period has there been automatic cost-of-living adjustment of wages and salaries in the United Kingdom of a national kind. Some local agreements, however, embody wage indexation. In November 1973 so-called threshold agreements, originally recommended by the Trade Union Congress in 1971, were introduced as part of the Government's income policy. These threshold agreements stipulate maxima for the kind of cost-of-living allowances, which the social partners were free to set up in their agreements; negotiations on the release of these allowances were triggered once the CPI exceeded certain thresholds. More recently even this feature of semi-automatic indexation has been removed. In mid-1976 the Government obtained the consent of the TUC to limit pay increases to 4 1/2 per cent up to mid-1977 in return for certain tax cuts and increased social allowances.

ENFORCING PPP IN THE EXCHANGE MARKETS : A RULE FOR THE CONVERGENCE
OF INFLATION RATES AT A LOW LEVEL

1. Monetary Policy and Exchange Rates

Currency exchange rates evolve according to the evidence shown
in Chapter I so as to offset differences in national inflation rates.
This relationship /purchasing power parity (PPP)7 does not constitute a
theory of exchange-rate determination, but rather a condition for long-run
equilibrium. Exchange rates, together with prices, are jointly
determined by more fundamental factors, of which the domestic excess money
supply relative to imbalances in money markets abroad plays an essential role.
Price increases, required to cover increases in wages that exceed
productivity gains, can materialize only through an accommodating monetary
expansion. Thus, a more or less firm control of the money stock by the
monetary authorities helps to determine expectations about the future
evolution of prices, and hence of the real rate of return on holdings
of cash balances. Changes in the expected real rate of return on a
country's money, in turn, determine its exchange rate vis-à-vis foreign
moneys.

It follows that by controlling the money stock, the authorities
indirectly control the exchange rate, and vice-versa. Under a fixed
exchange-rate system, for example, the money stock loses the character
of a policy instrument as the central bank is obliged to buy and sell
its currency against foreign currencies at given rates. On the other
hand, with a purely floating rate, the money stock would be the exogenous
variable, and its policy control would determine the exchange rate, given
monetary policy in the rest of the world.

If all wages and prices were set in competitive markets, full
employment would be assured by the flexibility of the wage and price
structure : monetary policy (under floating exchange rates) or exchange-
rate policy (under fixed but adjustable rates) would take the role
of determining a given rate of inflation for each country relative to
the rest of the world. In reality, however, prices and wages are not
perfectly flexible, so that a given money stock under floating exchange
rates (or a choice of an exchange rate under a fixed exchange-rate system)
does not ensure over the short run a desired value of the price level
and of its rate of change (the rate of inflation). Thus, in the short run
the pace of inflation, together with the level of employment, depend on
the price setting behaviour of trade unions and producers in the labour
and product markets as well as on how all economic operators anticipate
future changes in the price level. In this situation, control of the   ./.

money stock under flexible exchange rates may no longer be sufficient
to ensure a predetermined rate of inflation consistent with full employment.
The feedback from exchange-rate changes leads to cost increases which, if
validated by monetary policy, give further impetus to the inflationary
mechanism, and possibly lead to a spiral of ever increasing inflation. While
it is clear that this mechanism can only continue so long as monetary
policy is accommodating, price and exchange-rate expectations play a
fundamental role in this process and their formation is unlikely to be
uniquely determined by monetary policy.

The danger of accelerating inflation in the system increases when
the stronger chain of causality goes from exchange rates to prices, rather
than vice-versa. In fact, it may happen that, due to political uncertainty
and big fluctuations in expectations, large and sudden falls in exchange
rates which are not warranted by PPP could be quickly validated through the
incorporation of higher inflationary expectations into new wage and price
settlements. In other words, excessive departures of exchange rates from PPP
may become self-fulfilling. If such a process develops, it is likely that,
in order to break the reverse chain of causation, the authorities will
introduce exchange controls and trade impediments. They will thus take the
road of protectionism and financial disintegration.

Such an unsatisfactory outcome could not occur if a non-inflationary
incomes policy were coupled with a firm control of money supply. This in
turn would require controlling the government sector deficit and that
part of it which is financed through money creation. Thus quantitative rules
on money and credit supply, though necessary, are not sufficient. They
may not be credible, particularly when there are strong social and political
pressures for a validating monetary policy. In these cases, quantity rules
for monetary policy should be reinforced by ceilings placed on government
expenditures and budget deficits; by guidelines on factor input remuneration
and, last but not least, rules for managing the exchange rate. In the course
of this chapter a rule or rather a set of rules will be put forward which
is aimed at reducing the extent to which potentially destabilizing
expectations operate in the foreign exchange market and fostering expectations
which promote stability.

In the recent past there has been a gradual shift in official
thinking about the importance of announcing specific monetary targets.
Some central banks indeed have experimented with the setting of targets
for periods of up to a year ahead. However, sizable departures of exchange
rates from their PPP value typically occur in the short run. Exogenously
determined falls in the external value of a currency raise the prices
of imported inputs and the cost of living, and these increases are quickly
incorporated into the wage and price setting mechanism. Traditional
guidelines for incomes policy do not help here, since the problem is not
one of income distribution between wages and profits, but on the one hand
of income distribution between foreigners' and nationals and on the other
hand between the tradeable and the non-tradeable sector. While this problem
could be dealt with by modyfying the automatic indexation mechanism built
into cost of living clauses, its inflationary potential can be reduced
by smoothing short-run exchange rate changes through some rules for managing
the foreign exchange markets.

Clearly, any rule that requires central bank intervention in
the foreign exchange market may come into conflict with the maintenance
of a money supply target. In fact, intervention on the foreign exchange
markets, unless successfully sterilized, implies a one to one creation
or destruction of domestic base money or central bank money. However,
while the two sets of rules viewed simultaneously appear contradictory,
often in a sequential perspective they may reinforce each other.

2. Alternative Guidelines for Managing the Exchange Rate

The importance of this wider framework emphasises the urgency
of recent proposals for managing exchange rates; and the rest of this chapter
adds a proposal of its own. This is that a country should manage its
exchange rate so as to stabilize the path of price inflation along the trend
implied by its monetary policy, possibly aided by an incomes policy.

Recent schemes do not seem to meet this guiding principle. For example, the IMF guidelines for floating /15_7, a minor variant of which has recently been endorsed by the Cromer group /_23_7 does not meet it. The main elements of this last proposal, neatly paraphrased by Oort /_19_7 are that :

> " 1. A country should smooth out fluctuations in the value of its exchange rate. It should not normally act agressively, i.e. it should not depress the rate when it is falling or push up the rate when it is rising.
>
> 2. A country is allowed to act agressively if in so doing it brings its exchange rate closer to a so-called "target zone of rates", which it has established with the concurrence of the Fund.
>
> 3. The Fund will consult with a member-country and challenge its policies when the exchange rate has moved outside what the Fund considers a reasonable range, to an extent that the Fund considers likely to be harmful to the interests of members. But a member would not be asked to hold any particular rate against strong market pressure."

The disadvantage of this IMF proposal is that it is too vague, and as a result leaves far too much to the discretion of the relevant authorities in interpreting the objectives. Oort (same reference) has proposed a modification of the IMF guidelines in the following direction :

- the target zone is to be stated in terms of an effective exchange rate;
- the periodic review of the "target zone" is to be accomplished according to a crawling-peg formula (e.g. a moving average over a specified period);
- and the crawling-peg formula can be altered by a "qualified majority decision."

While this proposal would reduce the variation of exchange-rate changes and the rate of inflation around their long-run path, it could not prevent the inevitable inflationary effects of exchange-rate deviations from their implied PPP value.

In recent months the E C Monetary Committee has been considering a proposal of the Dutch authorities (the "Duisenberg proposal") to fix non-binding "target zones" in terms of effective exchange rates either for the floating currencies alone or for all Community currencies. These target zones would serve initially only as a trigger for consultation at the Community level when market rates move outside them. According to the proposal, each country would accept an obligation to refrain from intervention or other monetary measures which would drive its effective exchange rate below the target zone.

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While any attempt to put exchange-rate policy on the agenda of the
Community must be welcomed, the disadvantage of the Duisenberg proposal in
its present form is that it suffers from the same fundamental weakness as
the IMF guidelines namely, too much discretion is given to national
authorities in setting their targets.

To summarize, existing proposals to restore more or less orderly
development in foreign exchange markets do not adequately tackle the
central danger that transitory fluctuations of exchange rates, outside
of their implied PPP values, can initiate a process whereby the transitory
values of the exchange rate can become permanent.

3.   A Proposal for a New Exchange-Rate Agreement for the European Community

An alternative to the proposals which have been made so far would be
a new agreement among EC members whereby exchange rates are managed in relation to
reference rates which crawl on the basis of countries' relative performance in
terms of their wholesale price indices. The use of wholesale prices here follows
from the empirical results presented in Chapter I. The proposal can be summarized
as follows :

   (a) The reference rate for each country participating in the arrangement
       is defined in terms of an effective exchange rate. The reference
       rate is subsequently expressed in units of EUA for purposes of
       standard measurement.

   (b) An effective PPP index is calculated for each participating country
       by dividing its wholesale price index by a weighted average
       of the wholesale price indices of its competitors, the weights
       being the same as those entering into the formula of its
       effective exchange rate.

   (c) A country's reference rate is changed periodically (at least
       quarterly) in proportion to the change of a moving average of
       its effective PPP index. The length of the moving average and
       the weights to be attached to the individual time elements in the
       average would be the same for all countries in the arrangement.

   (d) The authorities set margins around the reference rate.

(e) At the beginning of each period (e.g. month, quarter) the
authorities ascertain, on the basis of the computation described
in (b) and (c), whether their country's reference rate has
appreciated or depreciated relative to the preceding year. In the
case of an appreciated currency the authorities intervene by
selling their currency on the spot market if the market rate tends
to exceed the lower bound of the band. Conversely, in the case of
a depreciated currency the authorities intervene by buying their
currency on the spot market if the market rate tends to exceed
the upper bound of the band.

(f) The authorities do not sterilize the monetary counterpart of
their foreign exchange interventions in the spot market.

(g) The mechanism of intervention and reserve borrowing currently in
use among members of FECOM would have to be extended in order to
make this scheme operational. Borrowing countries are to pay
a positive real rate of interest on outstanding loans. Borrowing
privileges are reduced or completely abolished in the case of
a country contravening (e) and (f).

(h) "Snake" countries can keep their present arrangement but at the
same time would need to coordinate their economic policy so as
to progressively align their exchange rates to their implied
PPP value.

4.   Implementation of the Scheme

Some comments on this proposal are in order.

First, concerning (a), (b) and (c) it should be noted that the use
of country-specific effective exchange rates and effective PPP indices implies
uniform and consistent intervention. However, as is shown in the Appendix
to this chapter, it does not enforce a correspondence between changes in
bilateral exchange rates and in bilateral PPP. Nevertheless, the Appendix
shows that this is not a drawback of the proposal since, as was demonstrated
in Chapter I, bilateral PPP performs statistically worse than multilateral
(i.e. effective) PPP. Alternatively, however, as is shown in the same
Appendix, the scheme could also function by aligning reference exchange rates,
measured in a common basket numéraire (EUA), to PPP indices based on the same
weighting scheme of the basket.

Second, neither the length of the moving average nor the weights to be given to each (quarterly) element in the average, should make the crawling parity unduly sticky. They should simply smooth seasonal and exceptional elements that may otherwise push exchange rates away from their recent trend. For example a four quarter moving average would have this effect. The length and the time of the weighting scheme must be identical for all participating countries to avoid the emergence of inconsistent reference rates.

Third, concerning (d) and (e), the proposal envisages intervention, if any, in only one direction for a given currency during any given period. Relatively depreciated currencies are not permitted to depreciate by more than the amount indicated by their purchasing power (plus the margin), but they are free to appreciate if the market so indicates. Conversely, relatively appreciated currencies are not permitted to appreciate more, during any period, than the amount implied by their purchasing power (plus the margin), but they can depreciate if the market so indicates. The rationale for this one-sided intervention scheme can easily be understood.
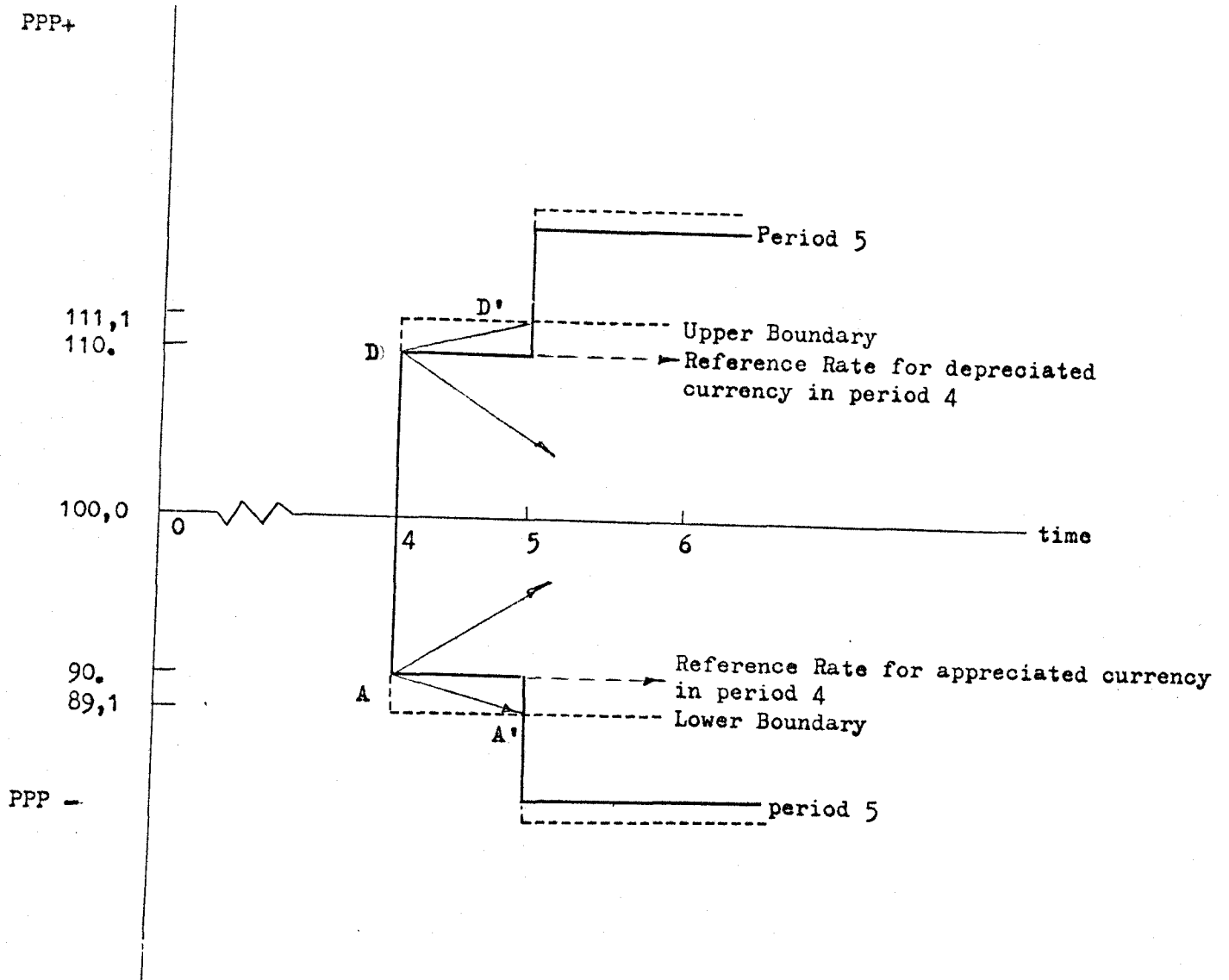
On the one hand, the scheme aims at avoiding the building up of exchange-rate-wage-price spirals that have been described in Section 1 of this Chapter as possibly leading to hyperinflation or exchange and trade restrictions in devaluing countries. It does not aim, however, at frustrating market forces where these enable a country to do better on the exchange-rate front than is indicated by its past performance on the inflation front.

On the other hand, the scheme aims at avoiding too rapid appreciation of strong member currencies, but allows them to appreciate by as much as what seems granted by their past relative price performance, when market forces imply this result.

These considerations can be illustrated with the aid of graph 9 on which is plotted on the vertical axis the country's index of effective PPP. Higher values of the index denote an inflation rate higher at home than in the rest of the world, and vice-versa. The intervention period are indicated on the horizontal axis. Assuming a four-quarter moving average and a quarterly-periodic rule, the graph illustrates the case of country D having depreciated in terms of PPP by 10 % relative to a year before and country A finding itself in the opposite situation. A band of +/- 1 per cent is also assured. Currency D can further depreciate in the exchange market during the first fixed rate intervention period (fifth quarter) up to a minimum value of 111,1, at which point the central bank will start buying it. If D were to appreciate along the path marked by D-D" the central bank will follow a "hands-off" policy . A

GRAPH 9

INTERVENTION RULES

PPP+

111,1
110.

100,0   0

90.
89,1

PPP —

D'

D)

Period 5

Upper Boundary
Reference Rate for depreciated
currency in period 4

4   5   6   time

Reference Rate for appreciated currency
in period 4
Lower Boundary

A

A'

period 5

similar argument, but in the opposite direction, applies to the appreciated
currency A. Theoretically, it could happen that A depreciates in the market
during a given intervention period by such an amount that it becomes "de facto"
a depreciated currency, (the line A-A "crosses the "time" axis). This, however,
is unlikely and to make it even less likely the proposal envisages that
whether a currency has appreciated or depreciated in a particular time period
be computed with respect to the change in the PPP from the same period
of the preceding year.

On the whole, the scheme puts the emphasis on stabilizing expectations
in the exchange markets and on lessening the disparity of inflation rates
among member countries. Such a goal, however, is not sought through the
imposition of a straitjacket in the form of shrinking margins of fluctuation.
Inflation rates will continue to diverge so long as member countries do not
harmonize their incomes and monetary policies. The proposal only aims at
preventing inflation rates from diverging even more as the consequence of
disturbances in the foreign exchange markets. The scheme in no way implies
that low-inflation countries would be induced to raise their inflation rate.

Fourth, to appreciate the importance of (f) the proposal should be
seen as a supplement to monetary policy. To see it otherwise would be to
commit the error of expecting rules governing exchange rates to produce
results which can only be obtained by more fundamental policies. To clarify,
consider the following example. Assume that a yearly money supply target is
set at a 5 % growth level. It may still happen that the target is temporarily
overshot and that this or other exogenous factors push the exchange rate
upward (a devaluation) during a quarter. Intervention to slow such a movement
will require destruction of base money at a rate that may restore the growth
of money supply to the target or temporarily reduce it below 5 %. Over the
whole year, however, if the exchange rate is smoothed on the PPP path implied
by the yearly target for money supply, the foreign exchange intervention should
be nil, so that the evolution of the exchange rate would indeed be determined
by the target of money supply relative to the demand for it.

On the other hand, if the smoothing rule on foreign exchanges were
not followed, the excessive departure of the exchange rate from the PPP trend
that is implied by the yearly target for money supply may feed back into prices
and wages to such an extent that the authorities' capacity to keep to the yearly
money supply target may lose credibility. In fact, abiding by the money supply
rule in the face of the unexpected inflationary push (implied by the unexpected
devaluation) means a more stringent credit squeeze and/or a reduction of
the central bank's willingness to finance the government deficit, either and
both of which may be politically unacceptable.

Since money supply targets are difficult to enforce on a short-term basis, temporary deviations from the target may be reflected in unexpected changes in the exchange rate, which, if allowed to manifest themselves and be transmitted into price expectations, may make it more difficult for the authorities to stick to their preannounced money supply target. By requiring the authorities to smooth the excessive depreciation of a devalued currency (or, less likely in this example, the excessive appreciation of a revalued currency), the scheme as proposed here puts a brake on their abnormal money creation. It thus constitutes a built-in stabilizer for the short-term conduct of their monetary policy.

It may well happen that the authorities wrongly estimate the variables on which they base their money supply target. For example, the demand for a money whose currency area tends to increase (e.g. the DM) may be underestimated by the authorities supplying that money (e.g. the Bundesbank). As a result, their money supply target may turn out to be deflationary and tend to provoke an unexpected (on the basis of past inflation performance) appreciation of their currency. By requiring them to intervene in order to slow down the appreciation of their currency, the scheme here proposed would in this case compel the authorities to create more of their currency (which they sell against foreign exchange) than they had planned on the basis of their estimates – which is indeed what is required, given the unexpectedly larger demand for their money. Thus, again, the scheme provides a built-in stabilizer which, in this case takes the form of correcting inaccurately set targets, rather than the short-term adaptation of actual quantities to correctly set targets (as was the case in the previous example).

Clearly, the stabilizing features of this scheme have also some drawbacks. While on the whole the scheme has the advantage of making it difficult for devaluing countries to accelerate their money supply too rapidly, on the other hand it makes it difficult for revaluing countries to decelerate their money supply too rapidly. In other words, as already pointed out, the scheme puts a premium on monetary convergence. However, the practical signifi-cance of this difficulty should not be exaggerated especially if allowance is made for (i) the moderate length of the moving average (a year),(ii) the frequent

periodicity in resetting the reference rates (every quarter or month) and
(iii) the margins applied to the reference rate. As an example, with a
periodicity of one month and a margin of +/- 1 % an appreciating country can
revalue by more than the sum of its reference rate and the margin through
the deflationary impact that lower traded goods prices have on the PPP itself
and, thus, ultimately on future reference rates. Clearly, this process can
be cumulative.

In conclusion, how effective constraints will be depends, among
other things, on (i) the width of the margin beyond the crawling parity;
(ii) the length and weights of the moving average formula; (iii) the
periodicity of the crawl; (iv) the lags between money and prices; (v) and
whether expectations in foreign exchange markets are formed more on the basis
of adaptive processes or of rational behaviour. In particular, the way
expectations are formed is crucial in reconciling the use of the proposal
with a market system.

Consider the case of expectations formed differently by speculators
and central banks. If, for example, speculators expect a lower inflation
rate than that envisaged by the central bank, there will be a tendency
for the depreciated currency to appreciate. Sticking to the rule would
imply a higher inflow of reserves, a faster growth of the money supply and
an inflation rate higher than originally estimated by speculators. It is
obvious then in this case the authorities must let the market solution prevail.

On the other hand, if   specualtors expect a 10 % rate of
inflation and the central bank sets a target of 8 %, then according to the
rule the central bank will be forced to buy its own money which will bring
the money supply and, consequently, the rate of inflation down to the lower
level. In this case the rule forces a "good" solution. The guiding principle
is that the rule is operational for relatively depreciated currencies when
the exchange rate runs through the floor; it is not operational when the
exchange rate runs through the ceiling. The converse is true for relatively
appreciated currencies.

Fifth, with respect to (g), the danger of excessive use of FECOM
resources should not be exaggerated. From the empirical analysis in Chapter I
it appears that the currencies of the U.K. and Italy are at present
probably undervalued on the basis of their purchasing power. Since the scheme
is not required to realign initial reference rates on the basis of the current
level of absolute purchasing power, but simply to crawl from those reference

rates on the basis of changes in purchasing power from the initial period, it is not to be expected that the weak currencies - if indeed currently undervalued - will put too much pressure on the working of the scheme. Nor, for that matter, is the converse to be expected for strong currencies, if - as it appears at present- they are overvalued in terms of purchasing power.

Despite the belief that the use of FECOM resources required to sustain the proposed scheme would indeed be modest - particularly as the exchange markets become familiar with the operating methods of the proposal and incorporate them in the formation of expectations - it is recognized that the initial scepticism of the countries who see themselves as likely creditors will be considerable. To overcome this understandable attitude we want to underline two possible supplementary features of the proposals : (i) It would be expedient to begin with relatively wide margins around the parities, thus limiting the need for interventions; margins could be narrowed substantially after an initial period of, say, one year. When the system has reached normal operation, margins should be narrow enough to make effective the automatic corrective pressures which the scheme is designed to introduce on domestic monetary management. (ii) While it is essential that the scale of lending facilities be adequate to strenghten the credibility of the reference rate structure, automatic drawings would be repayable over a short period, as is presently the case in FECOM; to the extent that drawings could only be repaid by mobilizing short and medium-term credit facilities, access to the latter would, as is already the case in the Community, be conditional on the borrower's compliance with collectively agreed standard of behaviour - in the proposed scheme points (e) and (f) on intervention rules and absence of sterilization respectively.

Since the reference rates in the proposed scheme are formulated in effective rate terms, the choice of the medium of intervention is left open. The national monetary authorities in their concerted interventions may choose to defend a particular reference rate by intervening in one or more Community currencies or in dollars; and the choice will no doubt vary from time to time. Claims and debts arising out of interventions should be denominated in European Units of Account (as is the case for the reference rates); this will spread exchange risks more fairly than in the present FECOM rules where they are assumed by the debtors. But it is recalled that borrowers should be charged a positive real interest rate on their drawings.

This proposal for exchange-rate management has been inspired by the experiences of 1976 for the individually floating currencies. At first no changes were envisaged in the management of the five Community currencies which (together with two non-Community currencies) constitute the snake. It is obvious, however, that adoption of the proposed scheme would present problems for the snake currencies.

First, enforcing PPP on the non-snake currencies would raise the question why it should not also be enforced on the others. As it emerges from Chapter I some snake currencies were overvalued in a PPP-perspective and this overvaluation was certainly one of the factors which prompted the October 1976 realignment in the snake. If it is recognized that countries within the snake do not meet the requirements for maintaining fixed nominal rates bilaterally, i.e. their inflation trends are not parallel and their monetary policies are not coordinated, would it not appear logical by the same principle to apply the proposal for the individually floating currencies to the snake ?

Second, preserving the snake creates technical problems in managing the PPP-rule, when the interventions to operate the rule take place in snake currencies. No consideration is given here as to how such problems could be overcome, e.g. by the snake as a whole following a PPP-rule based on the average performance of the members' inflation and exchange rates, or by the simple alternative of letting the dominant snake currency, the DM observe the PPP rule, and the other snake countries continuing to observe fixed DM intervention limits. Nevertheless, it is obvious that the technical problems would be easier if each snake currency were managed according to the PPP-rule - a symmetry of treatment which would no doubt be suggested in preparatory negotiations by the countries now floating individually.

The abandonment of the present snake is not proposed here for it would be inconsistent with the aim of breaking the vicious circle of depreciation and inflation so as ultimately to stabilize nominal exchange rates and harmonize national inflation rates at a low level. To propose the discontinuation of the one remaining element of monetary cooperation in the Community which explicitly shares this aim - though the associated efforts so far have not been impressive - is not the intention. Nevertheless, the proposed rule cannot avoid drawing attention to the inadequacy of the snake

arrangements. If it can thereby help to push the constituents towards firmer coordination, so much the better; if it cannot and the snake proves to be only partly viable, the smaller currencies have in the proposed PPP-rule a more attractive alternative than individual floating.

In conclusion, it should be emphasized again that not too much should be claimed for this management scheme. It is essentially a scheme for converting the European system of exchange rates into a "real snake" rather than a "nominal snake", a terminology we owe to S-C. Kolm, who in a perceptive short article outlined the main features of the proposed intervention system $/ \bar{} 16 \bar{} /$. The scheme recognizes the unfortunate fact that inflationary propensities differ in the member countries. Differences in inflation rates are mainly nominal and the small part, if any, due to real terms of trade changes could be accommodated through structural readjustments of the economies of the member states. The scheme outlined here emphasizes the predominantly nominal character of these divergent inflation rates and it allows exchange rates to offset no more than differences in inflation trends.

Recognition of the fact that inflation rates differ is both the strength and the weakness of the scheme. It constitutes its weakness, because it means that the scheme cannot contribute in a major way to the harmonization of inflation rates in the Community at a low level, unless member countries coordinate their incomes and monetary policies. It constitutes its strength, because it means that - contrary to the snake arrangement - this scheme cannot be endangered by a persistent divergence between member countries' monetary and incomes policies.

APPENDIX – RELATIONSHIP BETWEEN THE REFERENCE RATE, BILATERAL AND

MULTILATERAL PURCHASING POWER PARITY

We define r_{iE} as the reference exchange rate between currency i and a given numéraire, E.

The determination of the percentage changes in the reference rate $(\dot{r}_{iE})$, in general, is

$$\dot{r}_{iE} = \Pi_i - \sum_K \alpha_K \Pi_K \quad (1)$$

where K = all participating countries

Π_i = the average inflation rate in country i over the relevant period

α_K = weights relevant to all participating countries

$\sum_K \alpha_K = 1$

Expression (1) is general and does not imply a particular weighting procedure.

A. The Case of Non-Country Specific Weights

A particular weighting scheme would use the same set of weights for all participating countries. This is the case, for example, of the weights adopted in a basket formula like the European Unit of Account (EUA). It would thus be expedient to define α_K as equal to the weights in the EUA as well as choosing E = EUA.

Of course, any other uniquely (i.e. non-country specific) unit of account, say the SDR, would do as well from this point of view. Indeed, a broader numéraire, like the SDR, would be preferable if the crawling reference rate arrangement were to be adopted by a wider group of countries than the E.C. members. The adoption of a narrower numéraire such as the EUA, would imply for the members of the agreement, that some common exchange rate policy should be agreed upon vis-à-vis the currencies not included in the EUA basket.

One form in which this problem has already been discussed is the issue
of the European level of the dollar, but it obviously also applies to
any other currency outside the arrangement. The necessity of a nego-
tiated common exchange rate policy vis-à-vis outside currencies arises
from the fact that their importance is obviously not the same for all
the members in the agreement (e.g. the exchange rate of the US dollar,
from, a trade weighted point of view, is more important for the lira or
the pound, than for the Belgian franc or the guilder). In order to re-
duce the likelihood of conflicts and stresses, it would perhaps be pre-
ferable that the common exchange rate policy vis-à-vis major outside
currencies, like the dollar or the yen, be also based on the same
purchasing power formula as the one adopted within the common European
arrangement. This could be obtained by requiring from the authorities
of any one country in the agreement that they fix their crawling refe-
rence rate vis-à-vis the dollar (the yen, etc.) on the basis of their
bilateral purchasing power as defined above. Alternatively, this aspect
of the joint exchange rate policy could be entrusted to the authorities
managing the FECOM.

Using (1) the percentage change in the reference rate for country j is

$$\dot{r}_{jE} = \Pi_j - \sum_K \alpha_K \Pi_K \qquad (2)$$

K = all participating countries

Substracting (2) from (1) we obtain :

$$\dot{r}_{iE} - \dot{r}_{jE} = \Pi_i - \Pi_j = \dot{r}_{ij} \qquad \text{for all } i \neq j \qquad (3)$$

which says that currencies i and j move in proportion to the difference
in the percentage change of their average inflation rates.

As to the intervention procedure, the authorities of country i can either
intervene in all exchange markets or, more simply, restrict their trans-
actions in one market. The first procedure implies that the authorities'
target be (3); the second procedure, although technically much simpler,
implies a set of targets which can be quantified through an elaborate
calculation. This can be shown as follows. By definition,

$$\dot{r}_{iE} = \sum_{K=1}^{n} \alpha_K \dot{r}_{iK} \tag{4}$$

By combining (1) and (4) one obtains

$$\sum_K \alpha_K \dot{r}_{iK} = \Pi_i - \sum_K \alpha_K \Pi_K \tag{5}$$

Taking currency 1 to be the intervention currency, we can rewrite (5)

$$\sum_K \alpha_K (\dot{r}_{i1} + \dot{r}_{1K}) = \Pi_i - \sum_K \alpha_K \Pi_K \quad \text{for } i=2,3,\ldots,n \tag{6}$$

Noting that $\sum_K \alpha_K = 1$, $\dot{r}_{ij} = 0$ for $i = j$ and $r_{ij} = -r_{ji}$ (6) is a system of n-1 equations in n-1 unknowns (the cross rates) whose solution is given by

$$\begin{bmatrix} \dot{r}_{21} \\ \vdots \\ \vdots \\ \dot{r}_{n1} \end{bmatrix} = \begin{bmatrix} (1-\alpha_2) & -\alpha_3 & \cdots & -\alpha_n \\ \vdots & & & \\ \vdots & & & \\ -\alpha_2 & -\alpha_3 & \cdots & (1-\alpha_n) \end{bmatrix}^{-1} \begin{bmatrix} \Pi_2 - \sum_K \alpha_K \Pi_K \\ \vdots \\ \Pi_n - \sum_K \alpha_K \Pi_K \end{bmatrix} \tag{7}$$

and becomes the necessary knowledge monetary authorities must possess to enforce PPP in terms of a common basket formula. It is implicit in (7) that the monetary authorities of country 1 behave passively.

B. <u>The Case of Country-specific Weights</u>

It has been seen that the use of non-country-specific weights compels bilateral reference rates (r_{ij}) to move in accordance with bilateral PPP. This feature is a weakness of case A to the extent that the empirical evidence presented in Chapter I shows that bilateral PPP does not conform to bilateral exchange rates as well as effective PPP to effective exchange rates. Our proposal, therefore, is based on country specific weights. Formulae (1) and (2) become respectively

$$\dot{r}_{iE} = \Pi_i - \sum_K \alpha_K^i \Pi_K \qquad (8)$$

$$\dot{r}_{jE} = \Pi_j - \sum_K \alpha_K^j \Pi_K \qquad (9)$$

where r_{iE} = an effective exchange rate although expressed in a numéraire.

α_K^i = any weighting scheme so long as it is specific to country i and provided $\sum_K \alpha_K^i = 1$. These are the same weights which define the effective exchange rate

Subtracting (9) from (8) we obtain

$$\dot{r}_{iE} - \dot{r}_{jE} = \Pi_i - \Pi_j - \sum_K (\alpha_K^i - \alpha_K^j)\Pi_K \qquad (10)$$

A comparison of (3) with (10) reveals that the difference between the percentage change of the two effective reference rates is not equal to the difference of the average rates of inflation in the two countries.

Similarly, the percentage change in the bilateral cross rate, say $\dot{r}_{ij}$, will not be equal to the difference of the rates of inflation in countries i and j. This can be simply demonstrated by first defining the percentage change in the effective exchange rates for i and j :

$$\dot{r}_{iE} = \sum_{K \neq j} \alpha_K^i \dot{r}_{iK} + \alpha_j^i \dot{r}_{ij} \qquad (11)$$

$$\dot{r}_{jE} = \sum_{K \neq i} \alpha_K^j \dot{r}_{jK} + \alpha_i^j \dot{r}_{ji} \qquad (12)$$

Noting that $\dot{r}_{ij} = -\dot{r}_{ji}$ when initial values of the exchange rates are set equal to unity, subtracting (12) from (11) and substituting for $\dot{r}_{iE} - \dot{r}_{jE}$ the R.H.S. of (10) we obtain

$$\dot{r}_{ij} = \frac{1}{(\alpha_j^i + \alpha_i^j)} \left[\Pi_i - \Pi_j - \sum_K (\alpha_K^i - \alpha_K^j)\Pi_K - \sum_{K \neq j} \alpha_K^i \dot{r}_{ik} \right.$$

$$\left. + \sum_{K \neq i} \alpha_K^j \dot{r}_{jK} \right] \qquad \text{for all } i \neq j \qquad (13)$$

which shows that generally $\dot{r}_{ij}$ cannot be equal to $\Pi_i - \Pi_j$. As a check the reader can verify that when the weights are not country specific, i.e. the superscript i is set equal to the superscript j, $\dot{r}_{ij} = \Pi_i - \Pi_j$.

Concerning the intervention procedure, consider again that all countries will execute transactions only in the market for currency 1. By combining (8) and (11) and following the same reasoning underlying (6) we arrive at

$$
\begin{bmatrix} \dot{r}_{21} \\ \vdots \\ \vdots \\ \dot{r}_{n1} \end{bmatrix} = \begin{bmatrix} 1 & -\alpha_3^2 \cdots & -\alpha_n^2 \\ \vdots & & \vdots \\ \vdots & & \vdots \\ -\alpha_2^n & -\alpha_3^n \cdots & 1 \end{bmatrix}^{-1} \begin{bmatrix} \Pi_2 - \Sigma\alpha_K^2 \, \Pi_K \\ \vdots \\ \Pi_n - \Sigma\alpha_K^n \, \Pi_K \end{bmatrix} \tag{14}
$$

which is qualitatively similar to (7). In other words, intervention rules based on effective PPP are not more complex than intervention rules based on a common basket formula.

C. The intervention mechanism when some currencies do not follow a PPP rule

In this section we take up the issue of how to introduce a PPP rule for the non-snake E.C.-countries without altering the present snake mechanism.

It is immediately evident that the snake cannot survive if the countries that follow the PPP rule intervene in all exchange markets for their currency so as to ensure bilateral PPP. To take an example suppose Italy enforces bilateral PPP. This implies that :

$$
\dot{r}_{IB} = \Pi_I - \Pi_B \tag{15}
$$

and

$$
\dot{r}_{IH} = \Pi_I - \Pi_H \tag{16}
$$

where, I,B,H stand for Italy, Belgium and Holland.

From (15) and (16) the rate of change of the exchange rate of the BF vis-à-vis the guilder can be derived :

$$\dot{r}_{BH} = \dot{r}_{BI} + \dot{r}_{IH} = \Pi_B - \Pi_H \qquad (17)$$

This means that a fixed rate between the BF and the guilder cannot be maintained. We conclude that a PPP rule enforced by a multicurrency intervention system is incompatible with the existence of the snake mechanism.

This problem can be solved if the authorities enforce the PPP rule by intervening in one of the currencies of the snake. This can be shown as follows (for the case of the PPP rule based on the EUA). Let there be s snake countries and (n-s) non-snake countries. The latter follow the PPP rule.

We then have for the snake countries

$$\dot{r}_{i1} = 0 \qquad \text{for } i = 2,\ldots, s \qquad (18)$$

i.e. the exchange rate of currency i vis-à-vis the intervention currency remains unchanged. For the non-snake countries equation (6) holds. It can be rewritten as

$$\dot{r}_{i1} - \sum_K \alpha_K \dot{r}_{K1} = \Pi_i - \sum_K \alpha_K \Pi_K \qquad \text{for } i = s+1,\ldots,n \qquad (19)$$

Substituting (18) into (19) and solving for r_{i1} (i = s+1,...,n) yields

$$\begin{bmatrix} \dot{r}_{s+1,1} \\ \vdots \\ \dot{r}_{n,1} \end{bmatrix} = \begin{bmatrix} 1 - \alpha_{s+1} & \cdots\cdots & -\alpha_n \\ & \vdots & \\ -\alpha_{s+1} & \cdots\cdots & 1 -\alpha_n \end{bmatrix}^{-1} \begin{bmatrix} \Pi_{s+1} - \sum_K \alpha_K \Pi_K \\ \vdots \\ \Pi_n - \sum_K \alpha_K \Pi_K \end{bmatrix} \qquad (20)$$

A similar expression can be obtained if the PPP rule is expressed in terms of effective exchange rates.

This intervention mechanism implies that the effective exchange rates of the snake currencies is not under the control of the authorities of these countries.

CHAPTER III

THE ATTRACTIVENESS OF A EUROPEAN PARALLEL CURRENCY

The OPTICA '75 Report advocated the creation of a European parallel currency (EPC) with a view to stepping up progress towards European monetary unification :

> "As regards economic efficiency the (next) best step would be a fully-indexed European parallel currency; but the OPTICA group has also taken into account the political feasibility of such a proposal because the governments concerned have European and national aims: thus, if national aims - which may, even for some time, remain the dominant force - are not taken into account, any proposal for European monetary unification would meet strong political opposition". / 6, p. 4._/.

This reasoning led the OPTICA '75 Report to advocate partial indexation of the EPC, to be more precise, making the EPC as effective, in the long term as the most stable national currency. The EPC maintains its value in terms of either the currency suffering the least marked erosion of internal purchasing power or the currency depreciating least against the other currencies. It was also suggested that it would be useful to have a closer understanding of the way in which such a parallel currency might function in its various formulations and to carry out simulation exercises in respect of past developments. At the same time, these simulations should shed more light on the possible attractiveness of a parallel currency and hence its likely speed of penetration. The discussions prompted by publication of a Manifesto in The Economist by nine European economists /‾ 13 _/ and of OPTICA'75 appear to have focussed on the last point in particular. Some policy makers fear unduly keen competition and too speedy an introduction of the parallel currency, particularly in the form advocated in the Manifesto which in their view would undermine national monetary sovereignty too swiftly, whilst other take the view that the national currencies should be rapidly replaced by an EPC (in this case the term parallel would not be relevant for very long). This is the reason for discussing, after a number of simulations on the functioning of the EPC, the speed of acceptance of the EPC in section 2. In section 3 the problem of possible competition between the EPC and other international currencies such as the Euro-dollar is considered.

1. Simulations of the Functioning of the European Parallel Currency

The simulations cover the period 1967-75. Consistent series are readily available for all the countries from 1963 onwards; but for weighting purposes five-year averages for a number of variables were necessary. Hence, 1967 had to be taken as the starting date for the exercise.

Some of the technical and statistical options open are explained in Annex III-A. For the time being, the weights used for each country in the study of the EPC have been calculated on the basis of the average of the GNP values for the five years prior to that for which the value of the EPC is calculated. These weights are therefore variable and can be justified on the following grounds :

- the composite structure of the EPC needs to be adjusted in line with changes over time in the different GNPs;

- entry of new member countries must be taken into account. In turn, this necessitates a redefinition of the EPC based on the GNP values as of the date of entry. It is better, therefore, for the weights to be changed gradually;

- the risk of having a "disequilibrium" exchange rate in the base year is considerably lessened using the above procedure.

The consumer price index and the wholesale price index have been used as alternative measures to deflate nominal series [1]. The simulations, which are presented below, compare the yield of an investment denominated in EPC with that of an investment denominated in French francs. The French franc has been chosen because it occupies a position midway between the strongest and the weakest currencies in the Community. It is, of course, easy to switch from the exchange rate of the EPC against the French franc to the exchange rate of the EPC against another currency by resorting to the appropriate cross rate.

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(1) See Chapter I and Annex I-A thereto for a theoretical discussion and an empirical assessment of the choice of the different indices as a measure of a currency's purchasing power.

1.1. Full Indexation of the EPC

The formula for calculating a fully-indexed parallel currency is

$$\frac{a_i}{r_i} \ (1 + \pi_i)$$

where a_i represents the weight of currency i, r_i the exchange rate between currency i and a reference currency, and π_i is the rate of inflation in country i.
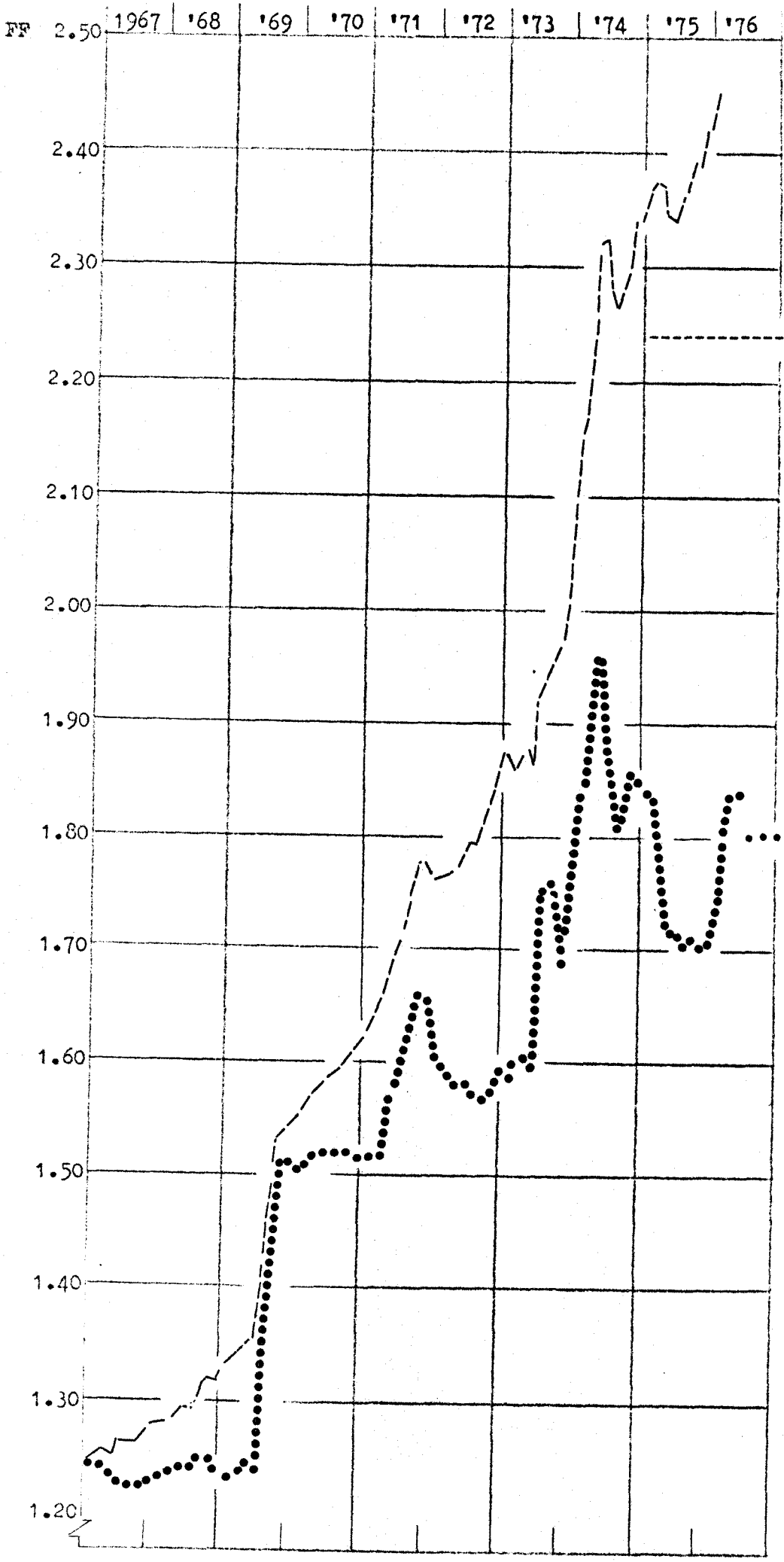
Use of Consumer Prices

Graph 10 gives changes in the price of the EPC in terms of the French franc and changes in the price of the DM in terms of the French franc between 1967 and 1975. As could be expected, the EPC, if it had existed, would have been a better store of value than the DM and a fortiori the FF particularly in the most inflationary period 1972-75. The gap between the two curves measures the gain in purchasing power made possible by holding fully-indexed EPCs as opposed to DMs.

It will also be noted that the purchasing-power protection afforded by the fully-indexed EPC to, say, a Frenchman, is very similar to the protection he would obtain with a currency indexed solely to the French consumer price index, a fact which constitutes a substantiation of the purchasing power parity theory. For instance, between January 1967 and December 1975, consumer prices in France rose by 88.31 % and the exchange rate between the fully-indexed EPC and the franc by 94.29 %.

Use of Wholesale Prices

Graph 11 shows that the trend of the EPC indexed to wholesale prices closely follows that of the EPC indexed to consumer prices.
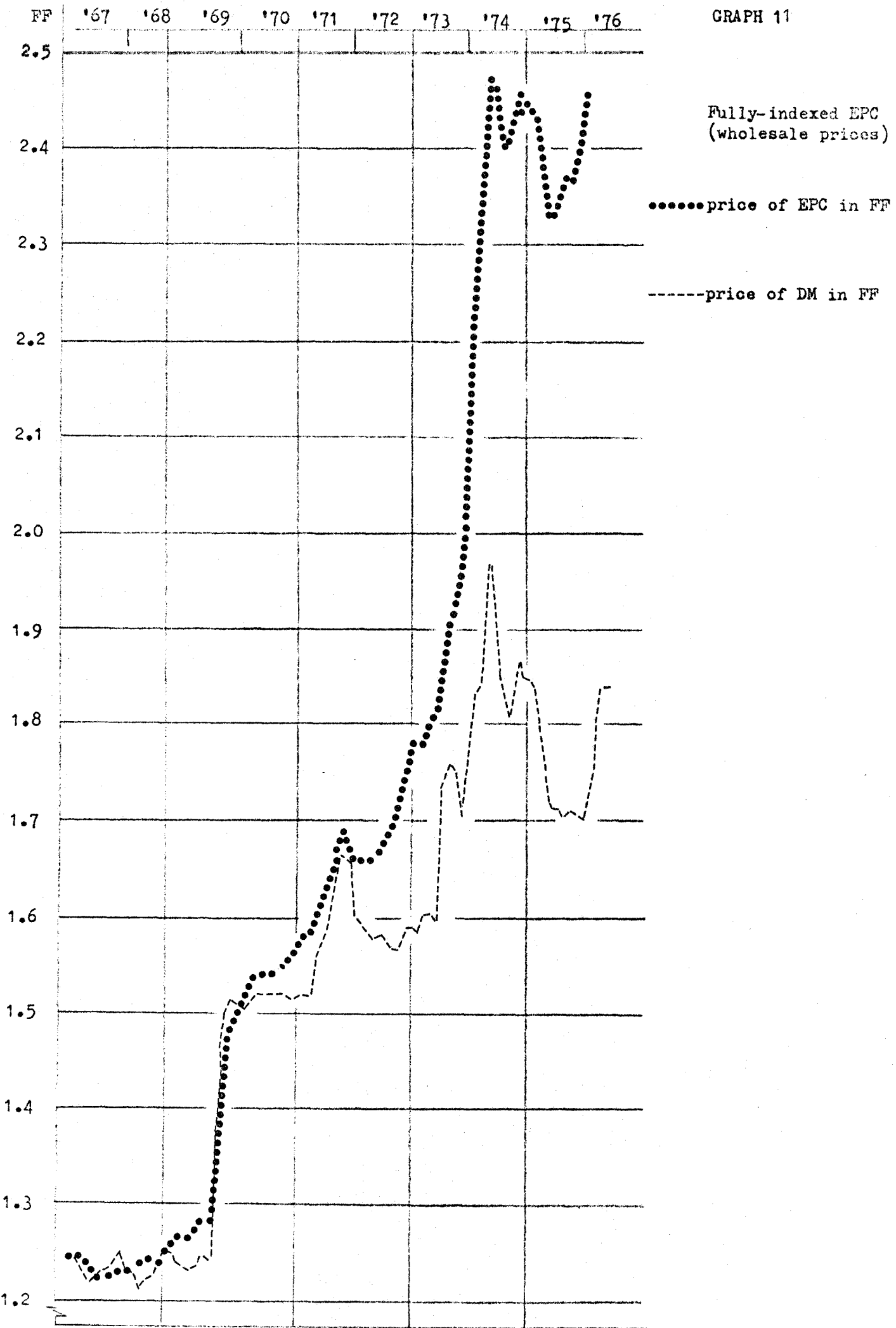
GRAPH 10
Fully indexed EPC
consumer prices

FF

2.50 | 1967 | '68 | '69 | '70 | '71 | '72 | '73 | '74 | '75 | '76

-------------- Price of the EPC
in FF

•••••• Price of the DM
in FF

GRAPH 11

Fully-indexed EPC
(wholesale prices)

●●●●●●price of EPC in FF

------price of DM in FF

1.2. Semi-Indexation of the EPC (OPTICA '75)

The OPTICA '75 report proposed a EPC which would move in line with the "best" European currency, and, in turn, two closely related formulae were suggested : (i) linking the EPC with the currency of the country with the lowest inflation rate; (ii) linking the EPC with the national currency that has depreciated least or appreciated most since the base period. It is obvious that in the long term, the same currency will normally be the reference currency for the EPC in both alternatives. Yet, it may happen that, during certain periods, a different reference currency will prevail according to the chosen criterion.

(i) The lowest inflation rate

Graph 12 shows that the consumer price index in Germany was consistently lower than that in the other countries of the Community during the period under investigation. The exchange rate between the EPC and each of the Community currencies other than the DM would, therefore, have followed exactly the same course as the exchange rate between the DM and these currencies.
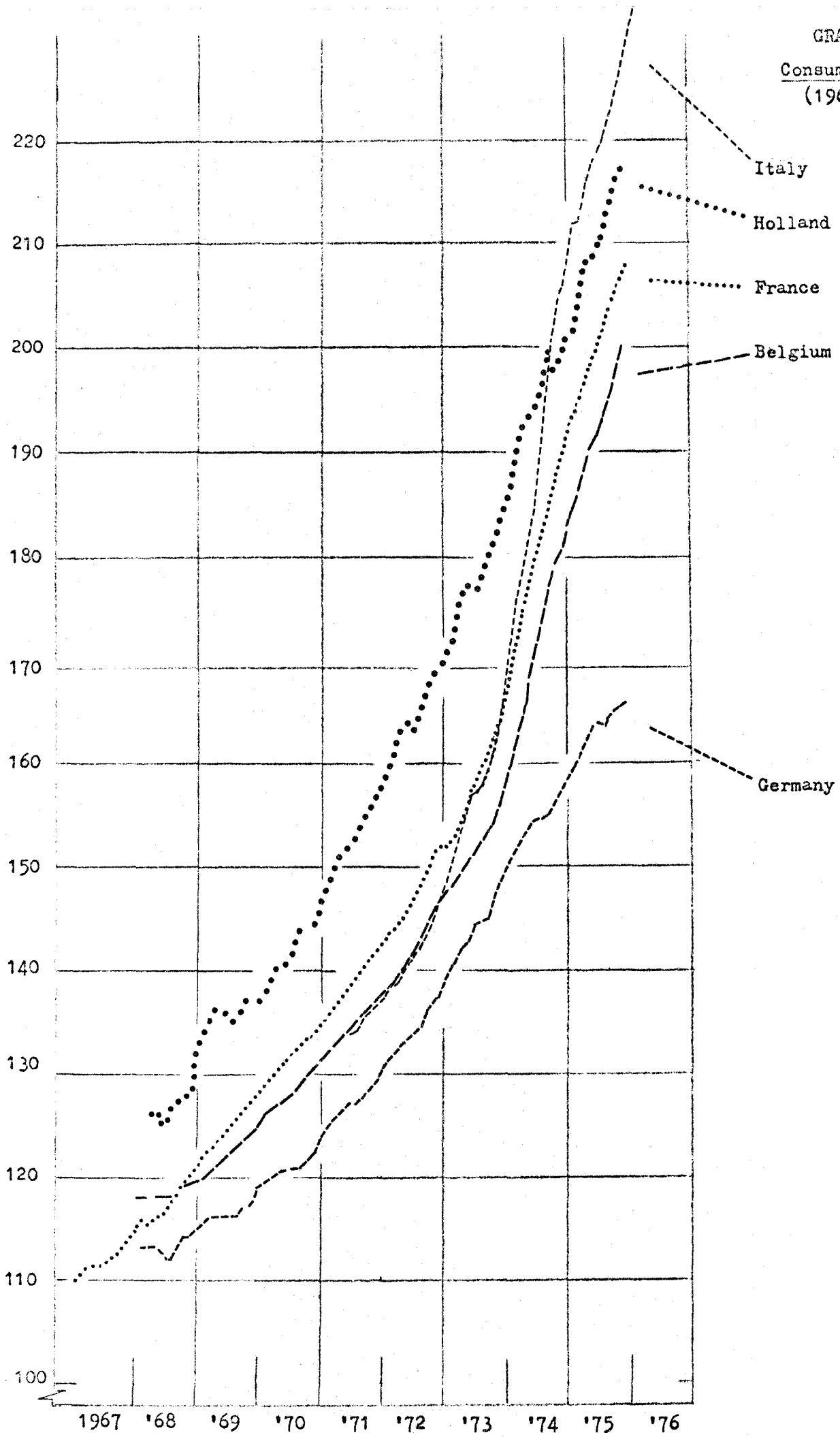
The same is true if wholesale prices are used (Graph 13).

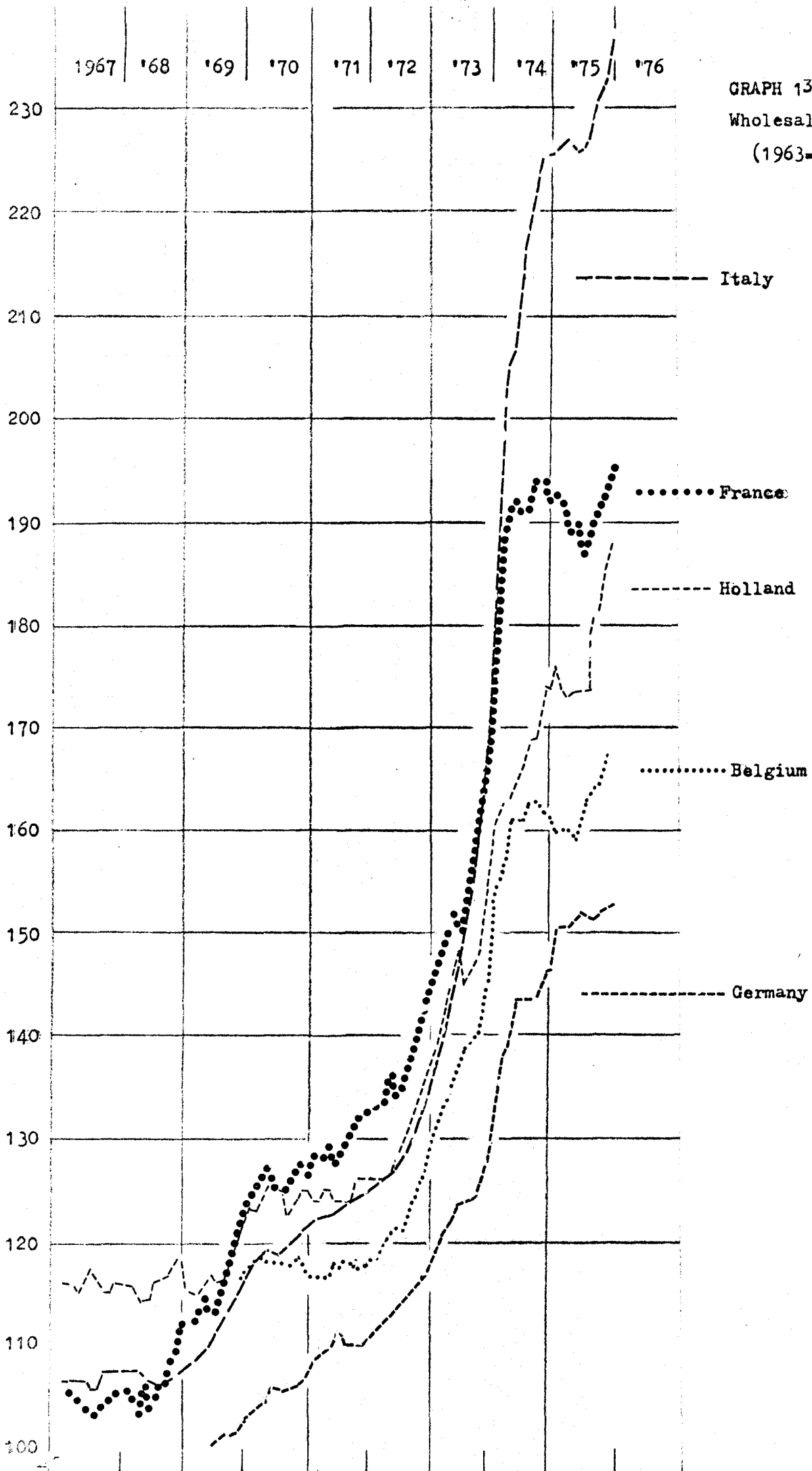(ii) The lowest rate of depreciation

Graph 14 shows that all the currencies depreciated against the DM in the period 1967-75. Once again, the exchange rate between the EPC and the currencies other than the DM would have moved in the same way as the exchange rate between these currencies and the DM.

Slightly different results might have been obtained using other indices or other time periods. For instance, if 1970 and not 1967 were taken as the base year and using the wholesale price index, then the "best" currency would have been the FB from June 1970 to August 1973, the DM from October 1973 to October 1974 and the FB after November 1974. Graph 15 shows how the price of the EPC in terms of both the FB and the DM would have fluctuated.

GRAPH 12

<u>Consumer prices</u>
(1963 = 100)

...... Italy

.... Holland

.... France

– – – Belgium

– – – Germany

220

210

200

190

180

170

160

150

140

130

120

110

100

1967 '68 '69 '70 '71 '72 '73 '74 '75 '76

GRAPH 13.
Wholesale prices
(1963=100)

— — — — — Italy

•••••••• France

— — — — Holland

•••••••• Belgium

— — — — — Germany

GRAPH 14   Value Of The Currencies In DM

(1963=100)

'67 '68 '69 '70 '71. '72 '73 '74 '75 '76

DM

●●●●●● Fl

- - - - - FB

-·-·-· Dk

········· FF

········ Lit

- - - - - £

'67 '68 '69 '70 '71 '72 '73 '74

'75 '76
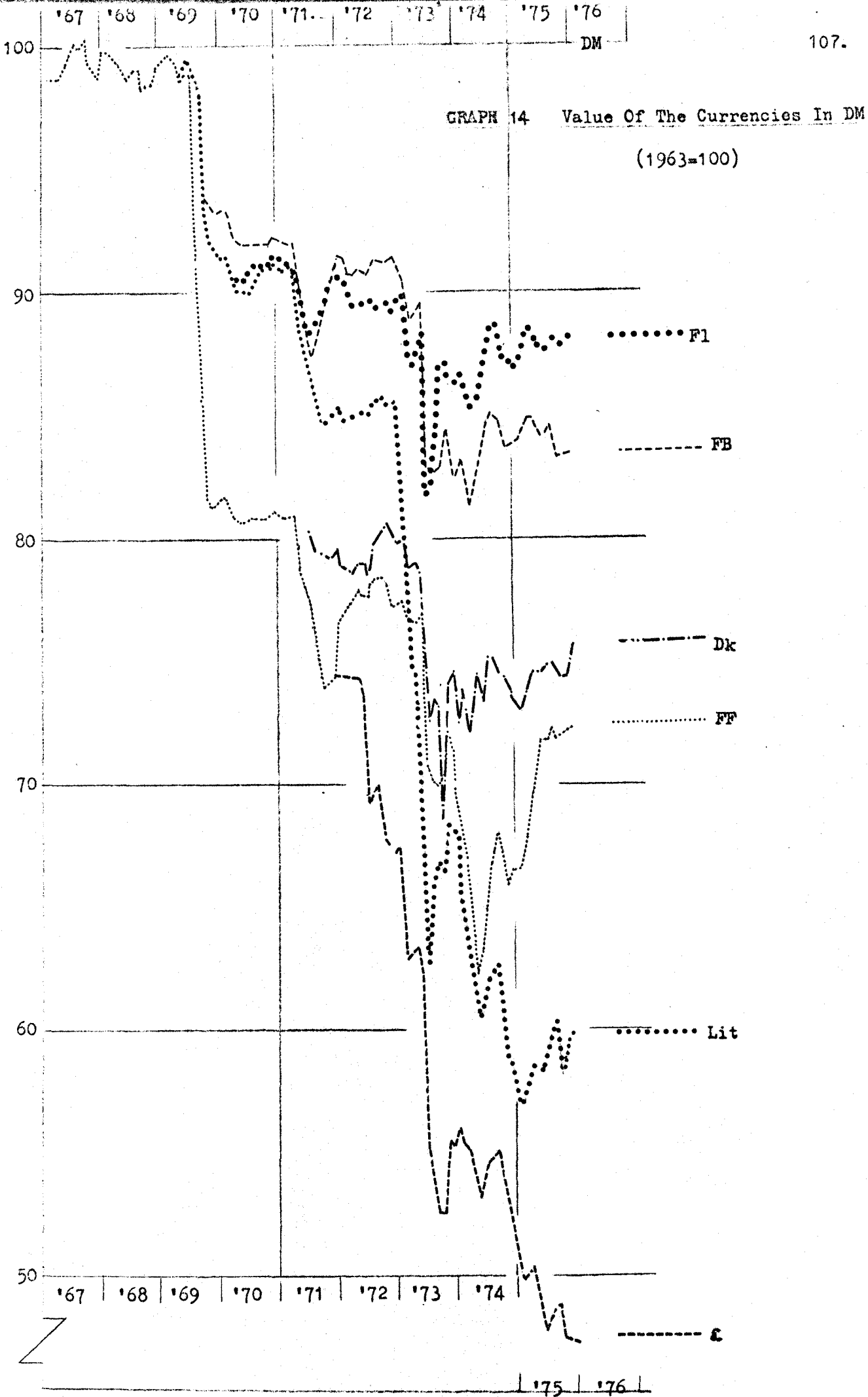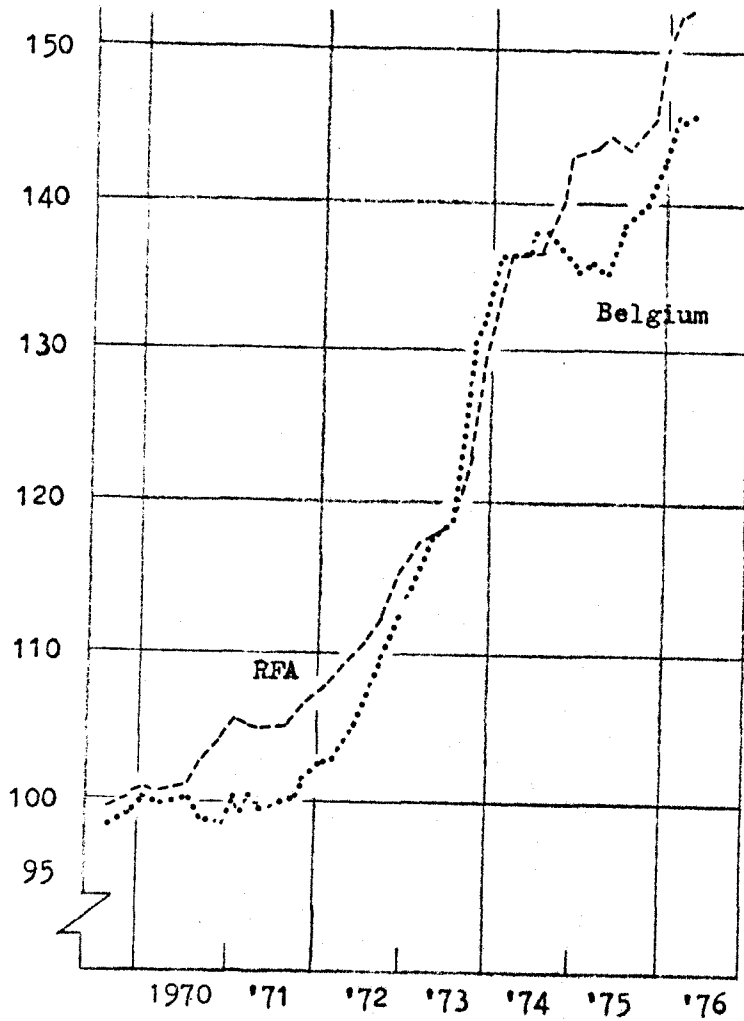
GRAPH 15
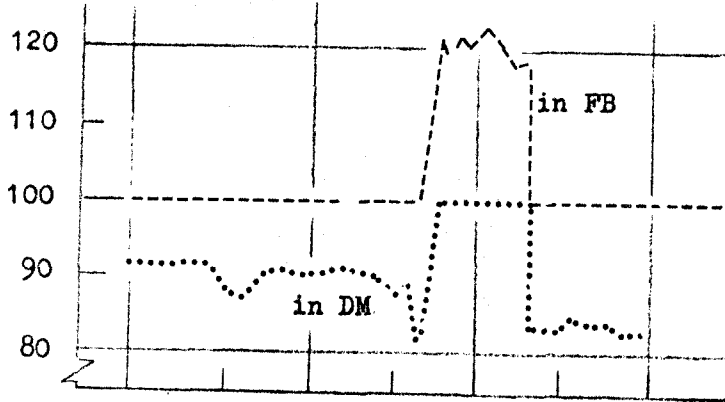
Price indices of the
EPC in FB and DM

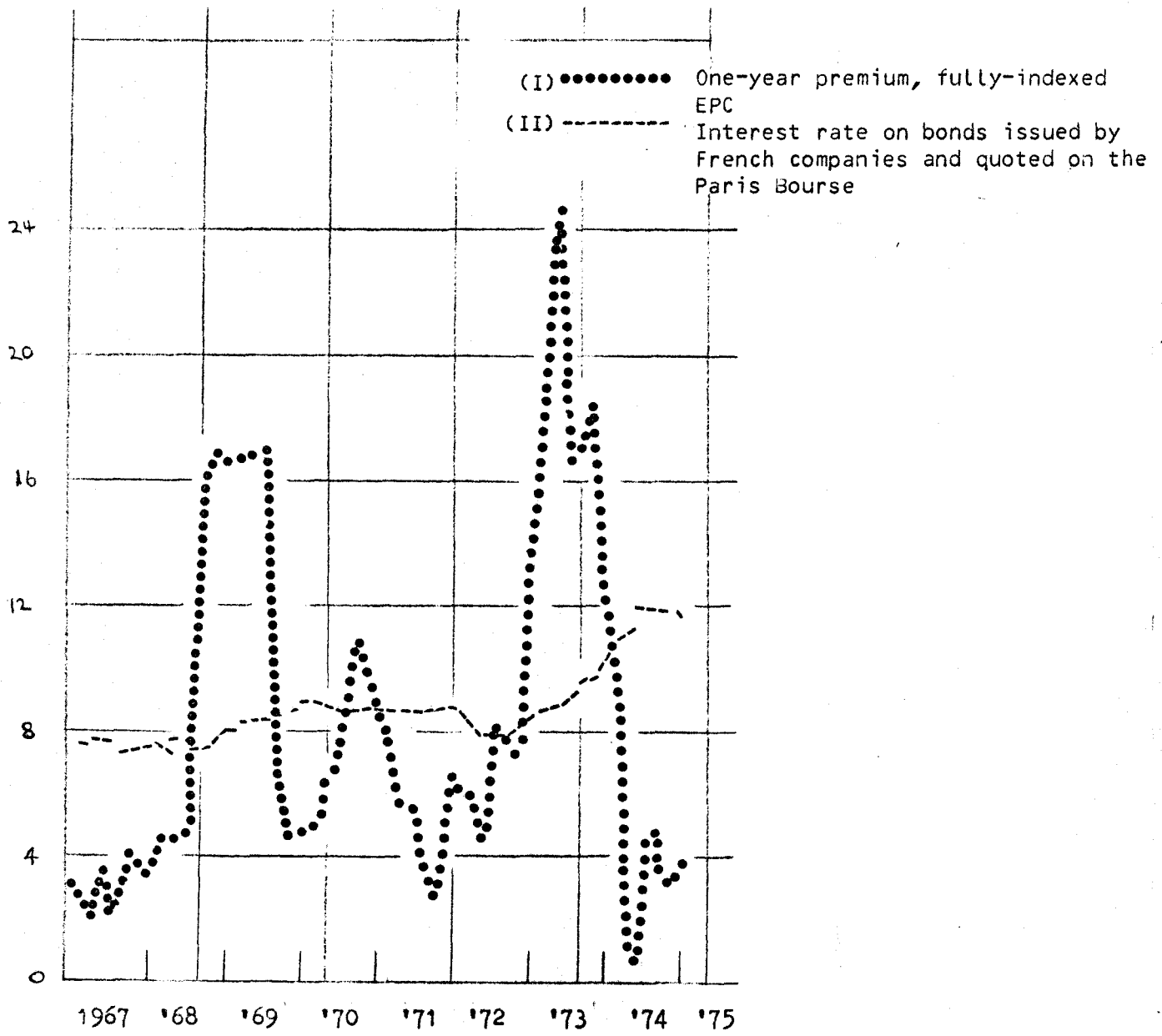Wholesale price index
of Belgium & Germany

1.3. Assessment of the Competitiveness of the EPC

If the competitiveness of the EPC vis-à-vis the national currencies and hence its speed of acceptance is to be assessed, then some idea of the gain - equivalent to an interest rate - which can be made in a given period by holding EPC as opposed to a national currency or a security denominated in national currency is needed. Therefore, the percentage change in the value of the EPC (in both the fully-indexed and partially-indexed formulations) between month k in a given year m and the same month in the following year m + 1 in terms of currency i, were calculated. In order to compete with the EPC, currency i would have had to carry an interest rate equal to the rate of change of the CPI. The rate of change in the value of the EPC in terms of francs between (k, m) and (k, m + 1) corresponds to the interest rate which would be needed for an individual not to show any preference for either EPC or securities denominated in francs, under the assumption of perfect forecasting.

Graph 16 and 17 give the results of the above calculations for the period 1967-75 in respect of a fully-indexed EPC and a semi-indexed EPC. The point on curve (I) corresponding to January 1970, for instance, represents the interest rate which would have had to be paid on a deposit denominated in francs held from January 1970 to January 1971 if the franc were to compete with the EPC.

In Graphs 16 and 17, the interest rate on French bonds (curve II)) is representative of the yield obtainable on a one-year investment denominated in FF. By taking the difference between the average yield or bonds and that on a liquid investment in EPC, it was possible to work out what the corresponding rate of interest on a one-year investment in EPC would have had to be for the EPC to offer a yield equal to that accruing from an investment in francs.

Graph 16

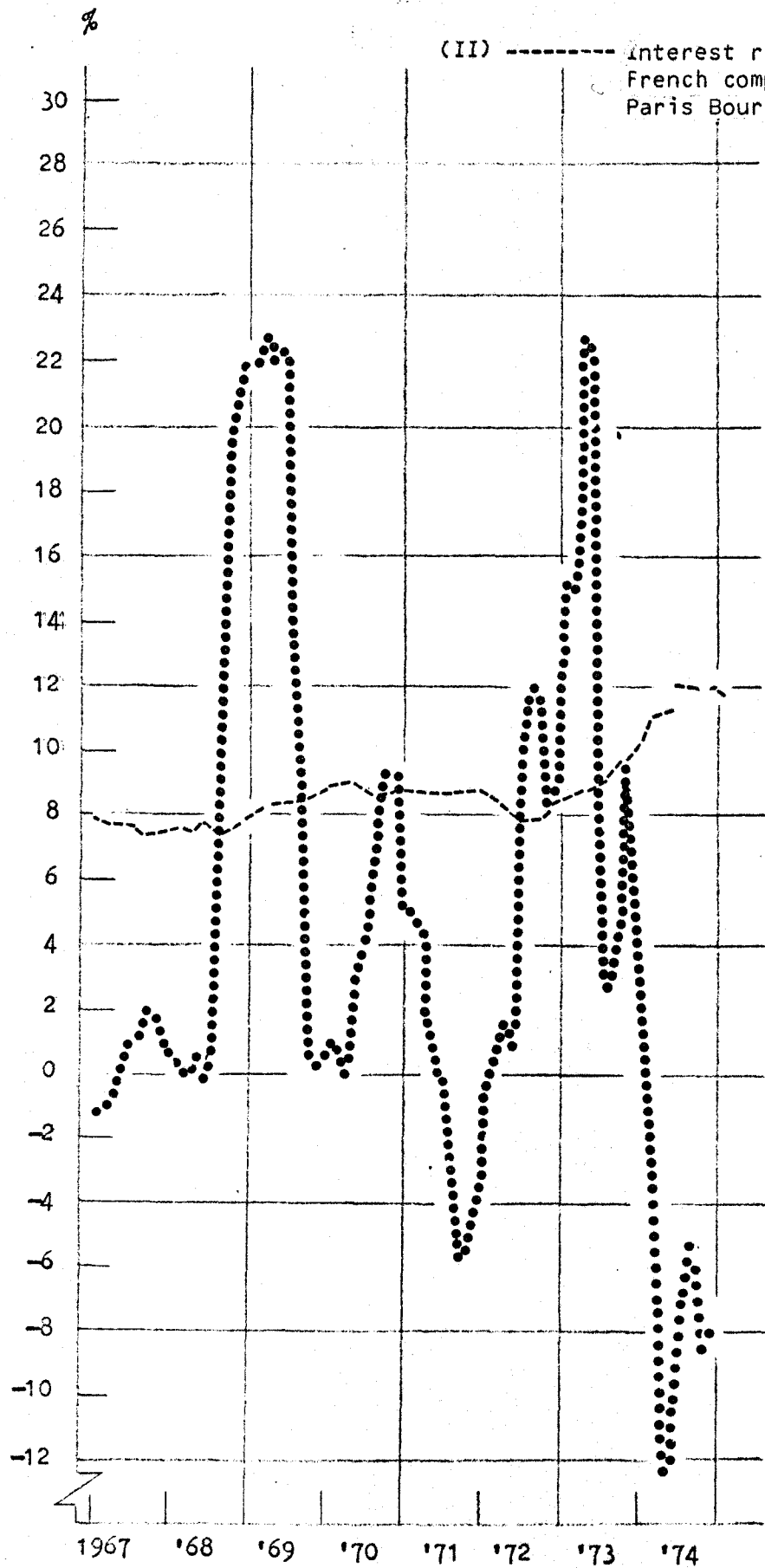|	
(I) ●●●●●●●●●	One-year premium, fully-indexed EPC
(II) ----------	Interest rate on bonds issued by French companies and quoted on the Paris Bourse

Graph 17

(I) ●●●●●●● One-year premium, semi-indexed EPC

(II) ---------- Interest rate on bonds issued by
French companies and quoted on the
Paris Bourse

It is also clear that the EPC would have a forward exchange rate which would guarantee its competitiveness vis-à-vis investments in national currency and would probably even out the fluctuations in its value compared with these of the national currencies. This would reduce the risk involved in holding EPC.

Graphs 16 and 17 show that the EPC's potential annual yield is extremely volatile, this being true of both the fully-indexed and the semi-indexed EPC, but more so for the latter. At certain moments in time - 1969 and 1973 - the EPC, whether fully-indexed or semi-indexed, offered an absolutely unrivalled annual yield of over 20 %. However, it also often happens, even in the case of the fully-indexed EPC, that the yield is lower than the French interest rate on bonds. But clearly, if interest were paid on the EPC, this would alter the situation. At times, the yield of the semi-indexed EPC would have been heavily negative, and hence short-term investments in francs would have been more attractive.

1.4. Conclusions concerning the Simulations

No general lessons concerning the working of a European parallel currency can be drawn from the above simulations. This is so because they cover only a specific period; use specific methods of calculation (cf. Annex III-A); and only analyse relationships between the EPC and the DM and the EPC and the FF. The relative advantage enjoyed by the EPC over the national currencies would clearly be greater in the case of the currencies the DM value of which had depreciated at a more rapid rate than the DM value of FF, provided these discrepancies had not been offset by a higher nominal interest rate.

The simulations show that the fully-indexed EPC affords the greatest protection. Its appreciation against the FF closely corresponds to the inflation rate recorded in France during the same period, thereby substantiating indirectly the purchasing power parity theory. Moreover, changes in the value of the EPC in FF follow quite a regular pattern (Graphs 10, 11) with the yield fluctuating (Graph 16).

The inflation-proófing offered by the different versions of the EPC advocated in the OPTICA '75 report is clearly a good deal less effective. In these versions the EPC would probably fluctuate more widely than the fully-indexed EPC : the exchange fluctuations for the different currencies against the DM given in Graph 14 give a good idea of its variability.

However, a comparative study of the short-term interest rate and the one-year premium offered by the EPC reveals that, compared with short-term investments in national currency (in French francs at any rate), the EPC is less attractive than might have been imagined. Moreover, the variable nature of the yield means that the holding of the various forms of EPC is not free of short-term risk, the yields possibly being also negative. Indeed the risk is greater than that involved in holding assets of a single maturity denominated in national currency.

In our view, however, one must be careful not to jump to the conclusion that the EPC would be an unsuitable reserve asset simply because its value in terms of national currency fluctuates. In fact, as was pointed out earlier, if the EPC were to be introduced, a forward market would probably dampen down such fluctuations.

Furthermore, the variable value of the EPC in terms of any single national currency is of significance only where the holder of EPC is mainly a net borrower or lender in national currencies. But, if at a future date the EPC were to have largely ousted the national currencies, every transactor would be mainly a borrower or lender of EPC (and would have no 'open' positions in national currencies), and hence the stability of the EPC's purchasing power would be fully assured. At that stage, it would be the value of the national currencies that would be fluctuating against the EPC and, consequently, involving a high degree of risk. Thus, changes in the value of the EPC in terms of national currency ought not to be used as a criticism against the EPC as a store of value, but simply as an argument for those who feel that the EPC needs to be "subsidized" during its "running-in" period to facilitate its acceptance.

2. The Speed of Introduction of the European Parallel Currency

The preceding simulations go some way towards resolving the question of the speed at which the European parallel currency could replace the national currencies, since they give an idea of the potential gain that holders of that currency would reap as compared with holders of other currencies or securities denominated in other currencies.

2.1. Attractiveness of Securities Denominated in EPC

The fears voiced concerning the issuing of EPC denominated securities would seem to be exaggerated. Some policy makers feel that the advantage of the EPC, particularly the fully-indexed one, would be such that loan contracts denominated in national currencies would disappear altogether while others consider that, being excessively costly for borrowers, full indexation would prove harmful.

In fact, everything hinges on the extent to which the nominal interest rate in each country adjusts to the rate of domestic inflation. If perfect adjustment took place and if exchange rates, in conformity with PPP, also perfectly mirrored the inflation rate differentials between countries, a fully-indexed EPC would prove neither more beneficial for a lender nor more burdensome for a borrower than a security denominated in national currency and carrying an interest rate that was higher by an amount equal to the rate of inflation. It may also be added that, in cases where the rate of inflation cannot be correctly anticipated, the nominal interest rate is the sum of the real interest rate, the anticipated rate of inflation and a risk premium. For instance, a risk-averse borrower will prefer to pay a real interest rate of 4 % on a liability denominated in EPC when the real value of his liability is assured rather than an interest rate of 16 %, with a forecasted rate of inflation of 12 %. This is so because there is always a risk that the realised rate of inflation will not be 12 %. But the simulations show that the average yield of the fully-indexed EPC is not very different from the nominal interest rate on FF-denominated bonds with a number of sizable discrepancies on either side.

The overall yield of the semi-indexed EPC tends to be lower than the nominal interest rate in France (also with some important exceptions). A fully-indexed EPC carrying an interest rate of between 2 and 4 % would give a much higher yield than bonds, and this might, for some lenders, offset the greater variability of the yield.

It would appear, therefore, that the fears voiced by those who see the EPC, in either form, as too strong a potential rival to the national currencies are exaggerated. It would probably even be necessary to subsidize the new currency when it is first issued by means of an interest rate payable on assets denominated in EPC.

2.2. Competition between the National Currency and the EPC

It is in this field that competition is likely to be keenest as the national currency does not, as a general rule, carry interest. In fact, competitive factors will favour both the EPC and the national currency for the following reasons.

- Durings its "running-in" period, the EPC will be handicapped by external factors. As long as the EPC is used by a small number of people, holding it will be costly due to transaction costs. Subsequently there will be a "snowball" effect because as the EPC becomes more widely used, it will prove more useful and hence will be in greater demand. Its progress at this stage and even the actual elimination of a national currency could then be very rapid.

- The fact that during the "running-in" period all prices will need to be expressed both in national currency and in EPC or, at least, that calculations for converting the national currency into EPC will need to be carried out will be a further obstacle to the introduction of the EPC. It is, however, conceivable that traders will gradually realize that it is simpler to fix prices in EPC as they will then be in a position to carry out economic calculations in real terms without having to worry about inflation. It will also be simpler to convert, where necessary, prices expressed in EPC into prices expressed in national currency. Even with a semi-indexed EPC, where it will not be possible to carry out calculations in real terms, the greater stability of this currency may lead people to prefer it.

- Those who fear that the EPC will supersede too rapidly national currencies can also take heart from the following argument.
The first people to use the EPC will probably be those whose inflationary expectations are strongest. Now, at least in certain cases and in certain

countries, the supply of money may be highly elastic, that is to say
the monetary authorities will be reluctant to combat the repercussions
of inflationary expectations with monetary policy measures and will "ratify",
as it were, these inflationary factors. The fact that individuals, whose
expectations are the most inflationary, will now seek to hold EPC and not
national currency will ease this pressure on the monetary authorities.
Competition from the EPC may also induce the monetary authorities to curb
the rate of growth of the national money stock.

- It is also important to emphasize that the EPC involves a significant
  element of risk since its exchange rate may fluctuate in the short and
  medium term. The problem would appear in a very different light if we were
  discussing competition between an indexed and a non-indexed national
  currency. It is obvious that the former would immediately be preferred
  by everyone since it involves no information costs and is risk-free.
  The same is not true of the EPC. While the EPC affords a satisfactory
  guarantee of constant purchasing power in the "long term" it will not
  necessarily do so in the short term. Assume, for example, that a German
  has liabilities denominated in DM and assets denominated in EPC . It may
  be that the day he has to honour his liabilities the exchange rate of the
  DM will be such that he receives fewer DM than he would have done if he
  had stayed in DM. There is little likelihood of this happening with
  a fully-indexed EPC. However, the value of a EPC in terms, say, of DMs
  will occasionally fall from one month to the next (Annex III-B). This
  risk is, of course, much greater in the case of the semi-indexed EPC where
  it would perhaps be better for the German to hold DM rather than EPC
  since the risk associated with the EPC would be greater, even though
  initiatially both DMs and EPC offer the same protection. Thus, the EPC
  may, for a certain period of time, follow a currency other than the DM
  because the inflation rate in the country in question is lower; also
  the DM value of that currency does not move exactly in line with the
  short-term purchasing power parity and because the DM is overvalued
  in relation to that currency and hence in relation to the EPC.

The point was also made earlier that there would be a risk in holding
EPC   only during the period in which use of national currencies still
predominated.

To the extent that the EPC   is seen basically as a rival to the Euro-currencies,
at least in an initial stage, its variability in terms of national currency
would probably be no greater than is that of the Euro-currencies currently in
use.

Finally, if the intervention rule proposed in Chapter II had been applied in the
past, exchange-rate fluctuations would have been very largely cushioned, with
the result that the value of the EPC   in terms of national currency would have
varied to a much lesser degree. The rule is, therefore, an important adjunct
to the introduction of the EPC.

2.3. Another Strategy for the European parallel currency ?

In spite of the reservations expressed above, the EPC   is likely to be an
extremely competitive currency, particularly if fully indexed. In OPTICA'75
reasons were put forward in favour of allowing the national currencies
to continue in circulation and which, in turn, had led to the advocacy of a semi-
indexed   EPC and the inclusion of safeguard clauses. However, a further
possibility might be explored.

It is difficult to say with any degree of precision how long it would take the
EPC,   whether fully-indexed or semi-indexed to achieve full acceptability,
since this depends on the role played by external factors; the rates of
inflation in the different countries; the interest rate paid on securities
denominated in EPC   and the expectations of transactors as to how the value
of the EPC   will fluctuate in terms of their own currency. Consideration
of these various factors leads some people to fear - or to hope - that the
EPC   will be introduced speedily or, on the contrary, slowly. The
situation in a number of countries seems clear : the EPC   would probably
win prompt acceptance in the countries with very high rates of inflation
(e.g. 20 %); what is more, the speed of introduction would probably be boosted
by external economies. In the countries with a low inflation rate, the EPC
would probably make slow progress at first, gathering momentum later on.
Elsewhere, the course of events is more difficult to predict.

In order to ensure that the EPC is not introduced too rapidly, it would probably be useful to incorporate into the system arrangements taking fuller account of policy desiderata : for instance, the national or Community authorities might decide that the EPC could or must be used for specific types of transaction. If a whole range of such precautionary measures (or, conversely, incentives) were introduced, there might perhaps be grounds for advocating a fully-indexed EPC as opposed to the semi-indexed EPC proposed in OPTICA '75. One advantage of this is that creation of the EPC would present "a historic opportunity". If a fully-indexed EPC, which, in our view, is justified for reasons of effectiveness and equity, is not adopted now, it would be more difficult to introduce it in the future. Steps can, however, be taken to ensure that a fully-indexed EPC does not force the national currencies out of circulation too quickly, and the speed of introduction can, in a way, be managed by the national or Community authorities. Such a strategy would be in keeping with the scheme for integration at different speeds.

3. Potential Competition between the Euro-dollar and the EPC

In an attempt to assess how far the EPC could compete effectively with the Euro-dollar, we have traced in Graphs 18 and 19 the three months yield of EPC in terms of FF and the yield of a Euro-dollar investment covered in terms of FF. The curve representing the EPC (fully-indexed in Graph 18, and partially-indexed in Graph 19) was calculated on the basis of the average quarterly values of the EPC in FF. The yield, expressed in annual terms, was calculated by comparing the price of the EPC during a given quarter with its price during the following quarter : for instance, the yield indicated in the graphs for any quarter represents the change in value, in annual terms, of the FF value of the EPC between the quarter in question and the following quarter.

To calculate the yield of the Euro-dollar in FF, we added together the three-month Euro-dollar interest rate and the difference between the three-month forward exchange rate and the spot rate. This yield is also expressed in annual terms.

It can be seen that the yield of the fully-indexed EPC and that of
the Euro-dollar covered in terms of FF are similar. The yield of
the semi-indexed EPC is, of course, lower than that of the covered Euro-
dollar rate. The difference could be offset by the payment of an interest
rate on the EPC.

Here too, the FF value of the EPC fluctuates more markedly than
that of the Euro-dollar. However, if these results are to be correctly
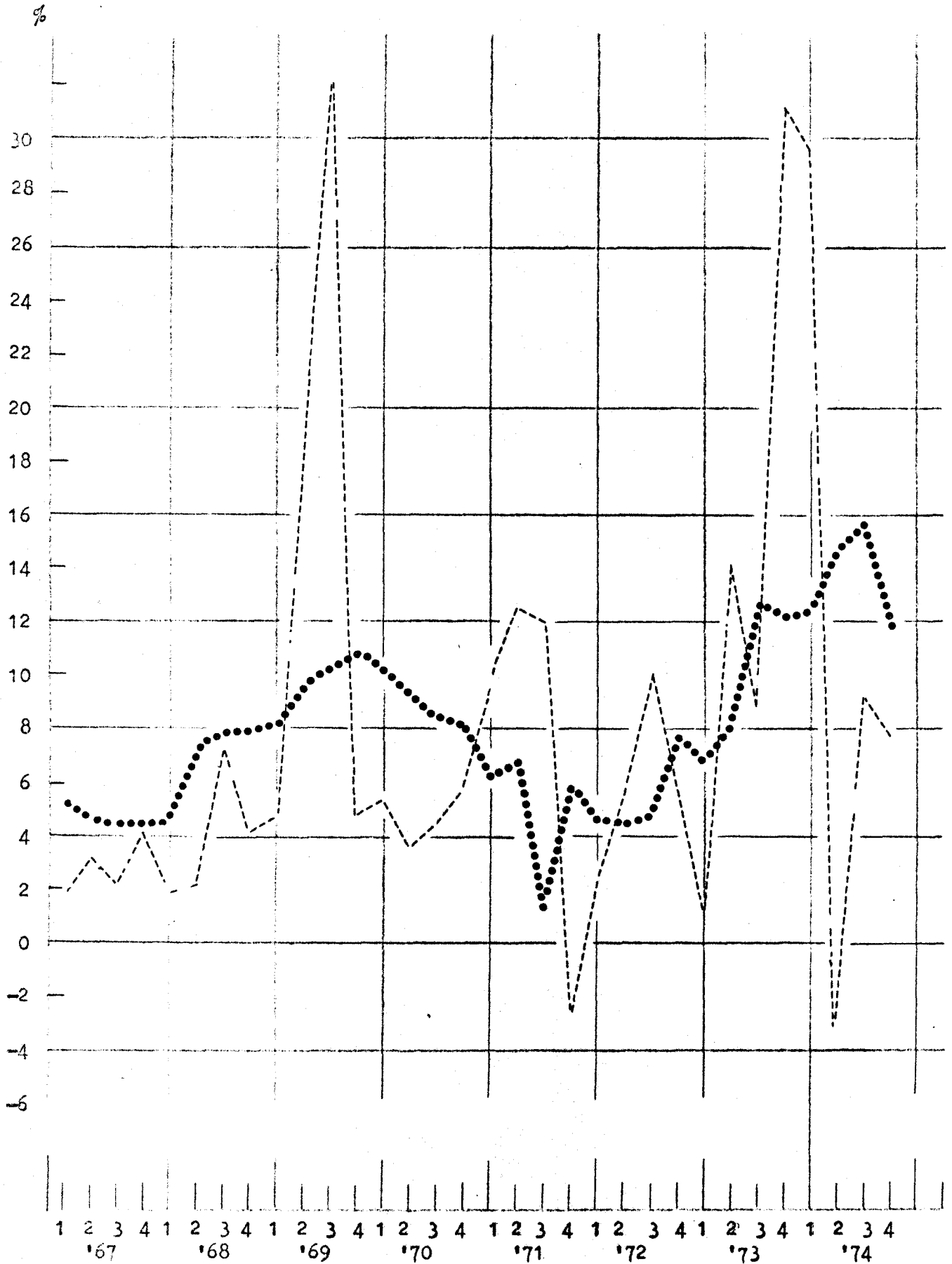interpreted, the following points should be borne in mind .

- If the year 1969 and the period covering late 1973 and early 1974 are
  disregarded, the differences in the changes in value would be much less
  substantial. The high yield of the EPC in the third quarter of 1969
  is, of course, attributable to the devaluation of the franc and the sharp
  fluctuations recorded in the second period to the disturbances that
  occurred at the time [1] .

- The yield of the covered Euro-dollar is guaranteed, while that of the
  EPC is not. It can, however, be reiterated that introduction of the
  EPC would surely entail a forward market in this currency and this
  would guarantee its yield in terms of a national currency and would limit
  the extent to which its value would fluctuate.

- Finally, Graphs 18 and 19 enable us to examine the choices open to a
  transactor in France who is seeking the best possible combination of yield
  and risk in terms of his national currency. This assumes, therefore, that
  his liabilities are denominated in national currency. The graphs in question
  do not help in deciding whether the EPC is a better instrument for financing
  intra-Community transactions than the Euro-dollar, in other words whether
  it does, or does not, satisfy a "European monetary need". Moreover,
  as mentioned earlier, the greater variability of the EPC compared with
  the Euro-dollar rate could be seen as signifying a greater variability
  of the Euro-dollar in terms of the EPC once the circulation of the latter
  were such that liabilities and claims were expressed predominantly in EPC.

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(1) The same is true as regards comparison of the EPC and the investment
in FF (Section 1). As stated earlier, the rule referred to in Chapter
II would, if applied, have tempered the fluctuations.

GRAPH 18

Yield at three months of EPC fully indexed in terms of francs -------

Yield of an investment in Euro-dollars covered in terms of FF ●●●●●●●

GRAPH 19

--- Yield at three months of semi-indexed EPC
     in terms of FF

••••• Yield of an investment in Euro-dollars covered
     in terms of FF

(Yield expressed in annual terms)
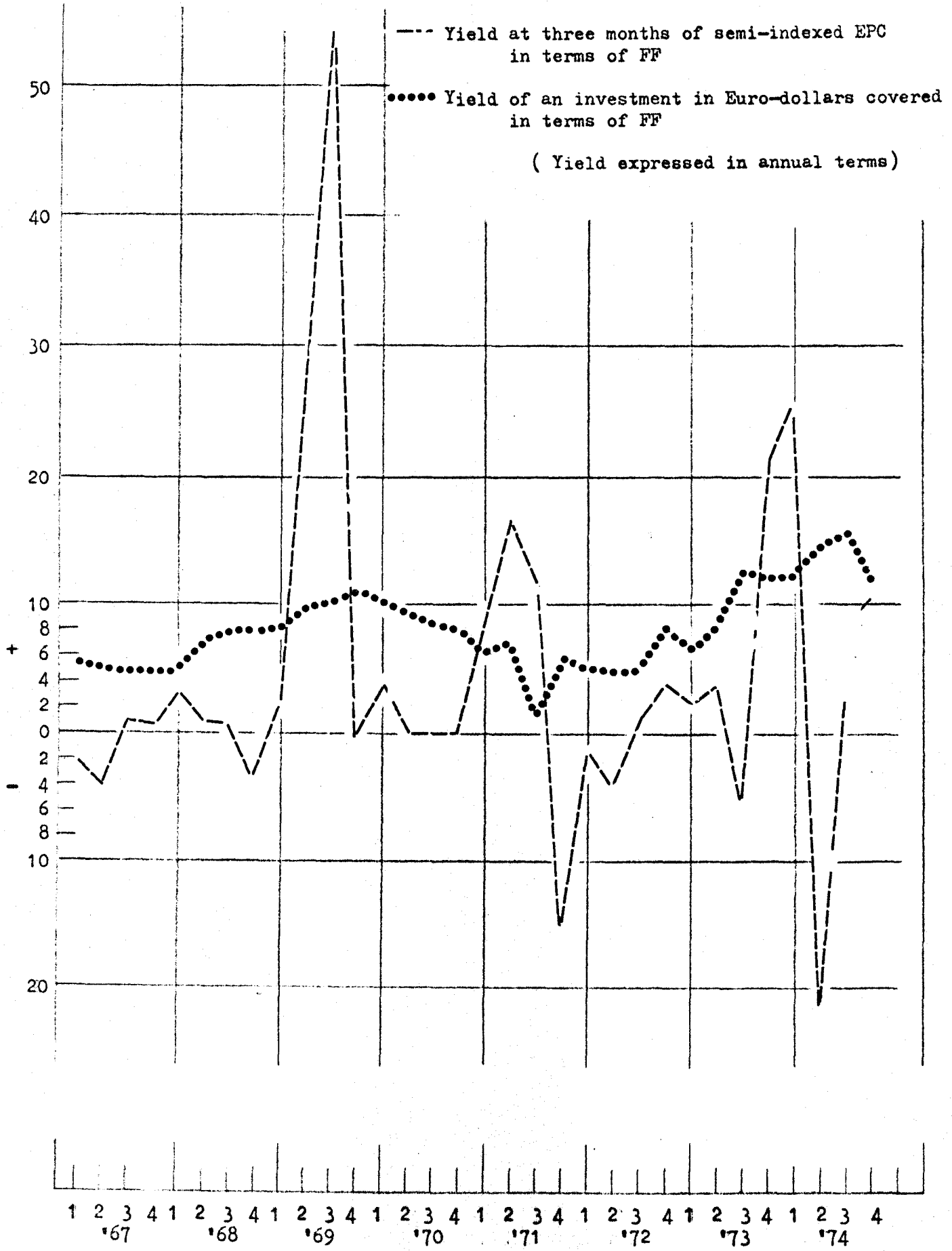
TECHNICAL PROBLEMS OF SIMULATION

The aim of this Annex is to explain a number of the technical choices concerning the simulation exercises in Chapter III.

Base period

The base period was choosen on the basis of the available statistical series. It was impossible to obtain homogeneous series for all the countries before 1963. As a result, the statistics have been compiled from that year onwards. However, there is no way of being sure that 1963 was an equilibrium year. So, the average value of each variable from 1963 - 67 was used to determine the weight of each currency necessary for calculating the value of the fully indexed EPC. As a result, the starting year for the simulations is 1967.

Weights

The weight given to each currency is proportional to the GNP of the country in question. If the money supply of each country had been used as the relevant criterion, the weights would have been much the same. It would also have been possible to use the European Unit of Account.

To prevent cumulative distortions it was decided to adjust the weights each year. The weights were calculated on the basis of the average GNP over the preceding five years, with the exchange rates used for converting the GNP figures into dollars being the rates recorded in those same five years.

Clearly, as a result of the weighting adjustments, the price of the EPC changes in January each year for reasons other than price or exchange-rate movements : this change,however, is relatively small. The weights could have been staggered, but this would have further complicated the computation and, consequently, increased information costs to potential users.

New member countries

Different simulations could conceivably be carried out for the period before December 1972 and for the period commencing January 1973. However,

if the EPC were to exist one day, the problem of adjusting the weights would arise owing to the entry of new members, and a solution would have to be found.

The technique we have chosen is simply to adjust the weights. If the coefficients a_i represent the number of units of currency i in the EPC and if the coefficients α_i represent the weights for that currency, the following requirements need to be met. The value of one EPC in terms, say, of FF in January 1973 must be that calculated by applying the EPC formula to the five currencies of the "existing" member countries; the change in the value of the EPC between December 1972 and January 1973 must be determined on the basis of the exchange-rate changes and the changes in inflation rates between these two dates. Furthermore, we have redefined the EPC in such a way that one new unit equals one old unit. The new coefficients, a'_i and α'_i; the α'_i represent the structure (and not the dimension) of the EPC and are calculated on the basis of the criterion specified above (dollar GNP). The dimension factor is determined by the fact that one new unit of the EPC equals one old unit, and this enables a'_i to be calculated (given the exchange rates between the new currencies and one of the currencies constituting the old EPC).

Other information

The exchange rate of the FF is calculated on the basis of the average monthly rates quoted in Paris.

ANNEX III-B

INFLUENCE OF THE DATE WHEN THE INDICES TO CALCULATE THE EPC
ARE RECORDED

Let us assume that the price indices are published on the tenth day of
every month, with a time-lag of forty days (e.g. indices released on 10 March
relate to January). It is sometimes argued that everyone will convert his
cash balances into EPC on the ninth of the month, certain in the knowledge
that he will make a profit by reselling the EPC on the eleventh, provided
that the EPC is not yet in sufficiently wide circulation for him to wish to
hold on to his EPC . This would be one way of shifting the burden of the in-
flation "tax" onto the central banks without this encouraging wider use of the
EPC, the opposite of what is desired. However, for such a transaction to be
worthwhile, the anticipated gain must exceed the transaction costs and, what
is more, the potential risk must not involve a subjective cost outweighing this
gain.

Tables III-B-1 and III-B-2 show that the month-on-month increase in the value of
the EPC in terms of DM is generally less than 1 % (the maximum increases re-
corded being 3.48 %, 2.33 % and 1.98 %) and that, in a number of cases, its value
fell (the maximum figures recorded being - 5.18 %, - 2.94% and - 2.25 %).
The monthly changes in the value of the EPC when converted into FF,
were naturally more marked, although negative figures were still recorded.

It is difficult to assess transaction costs and the risk involved.
If, however, there seemed to be some element of risk in the temporary conversion
of national currencies into EPC, on the eve of the adjustment of the value of
the EPC one of the following steps could be taken :

- spread the change in the value of the EPC over an entire month, in
  other words, alter the value of the EPC daily, from one calculation
  date to the next;

- fix a margin of fluctuation of, say, + 0.5 % : a transactor in the
  Community would then exchange EPCs against the national currencies
  only if the market price touched its ceiling or floor.

TABLE III-B-1

Month-on-month changes in the value of the Europa in terms of FF (as %)
(Consumer prices)

Year						
1967	.	0.10	0.40	0.60	0.10	0.50
	0.60	- 0.20	0.10	0.30	0.10	- 0.10
1968	1.08	- 0.20	- 0.30	- 0.20	0.30	- 0.10
	0.20	0.20	- 0.20	0.97	0.20	0.40
1969	1.07	0.60	0.40	0.10	- 0.40	0.50
	0.0	- 2.25	- 1.20	- 2.94	- 0.20	0.20
1970	0.73	0.54	0.32	- 0.32	0.32	0.43
	0.10	0.32	0.32	0.42	0.63	0.52
1971	0.42	0.32	0.74	0.63	- 1.04	- 0.42
	0.10	- 0.63	- 0.21	0.21	0.53	.
1972	2.44*	0.43	0.53	0.42	0.74	0.??
	0.52	0.62	1.03	0.72	0.51	0.??
1973	0.81	- 0.21	- 1.60	0.65	0.54	- 0.4?
	- 5.18	- 0.23	0.46	1.02	3.48	0.?1
1974	0.87	0.0	0.56	0.11	- 0.56	1.6?
	1.98	1.62	1.91	- 0.31	- 0.42	0.??
1975	0.94	0.98	1.51	2.33	1.35	0.61
	0.81	1.01	0.60	- 0.20	1.49	0.29
1976	0.20					

* Change on November

TABLE III-B-2

Month-on-month changes in the value of the Europa in terms
of DM (as %)

(Consumer prices)

Year						
1967	.	0.11	0.46	0.49	− 0.50	− 0.10
	1.17	− 0.23	0.15	0.17	0.49	0.03
1968	0.99	− 0.20	0.02	0.03	0.53	0.35
	0.12	0.09	0.75	1.17	0.22	− 0.30
1969	0.88	0.29	0.50	0.41	0.35	0.25
	0.03	5.78	2.82	3.76	0.80	0.21
1970	0.38	0.33	0.69	0.35	0.39	0.40
	0.10	0.36	0.31	0.40	0.59	0.20
1971	0.57	0.46	0.70	0.56	1.61	0.56
	0.76	1.28	1.57	1.46	0.24	.
1972	− 0.96*	0.17	0.10	0.08	0.22	0.71
	0.61	− 0.14	0.86	0.82	1.00	1.25
1973	0.77	− 0.51	− 0.64	0.92	0.47	− 0.90
	3.41	0.57	0.69	0.49	0.65	1.00
1974	4.21	2.26	1.34	2.91	3.81	0.27
	1.97	− 0.73	0.81	0.84	1.73	− 0.05
1975	0.92	0.58	0.10	− 0.29	− 1.19	− 0.06
	0.86	0.27	1.17	− 0.28	1.20	0.13
1976	1.38					

* Change on November

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