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3 Exchange Rate Variability, Misalignment, and the European Monetary System

Paul De Grauwe and Guy Verfaille

3.1 Introduction

The European Monetary System (EMS) was launched in March 1979. It came as a reaction to the large fluctuations of the dollar and was stimulated by the belief of policy makers that the intra-European exchange rate uncertainty was detrimental to trade and investment in Europe. The primary purpose of the founders of the EMS was therefore to create a zone of relative exchange rate stability which, if successful, could contribute to better prospects for growth of income and trade in Europe. Moreover, it was hoped that the workings of the EMS would facilitate the convergence of the economies of the EEC. By doing so, it would create the necessary conditions for further economic and political integration in Western Europe.

In this paper we first analyze to what extent the EMS has been successful in stabilizing the exchange rates among its member currencies (section 3.2) and in avoiding the misalignments of exchange rates which have been prevalent outside the system (section 3.3). In section 3.4 the salient features of the growth of trade between EMS countries and a group of non-EMS countries are presented. This section leaves us with a puzzle. Despite the relative success in stabilizing exchange rates, the EMS zone is faced with a slow growth of its internal trade.

The rest of the paper is an attempt at explaining this puzzle. In order to do so, we specify an econometric model (section 3.6) and use it to

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quantify the contribution of several factors in the explanation of the slowdown of intra-EMS trade.

3.2 The EMS and Exchange Rate Stability

How successful has the EMS been in reducing exchange rate variability within the system? This question has been discussed in great detail in recent studies (see, e.g., Ungerer 1983, 1986, EC Commission 1984, Rogoff 1985). The general conclusion to be drawn from these studies is that the EMS indeed contributed to a relative stability of the intra-EMS exchange rates.

Some additional evidence on the variability of real exchange rates is provided here. The way we proceed is to compare measures of exchange rate variability of the EMS countries before and after 1979 and inside and outside the system.

Table 3.1 presents the standard deviations of the monthly changes in the real effective exchange rates of the EMS during 1973–78 and 1979–86. Tables 3.2 and 3.3 do the same for the quarterly and yearly changes, respectively, in the real effective exchange rates. These effective exchange rates were computed for each EMS country relative to the rest of the EMS and relative to a control group of countries consisting of the eight major industrial countries outside the EMS (Austria, Canada, Japan, Norway, Sweden, Switzerland, the United States, and the United Kingdom). This allows us to compare the exchange rate variability of EMS currencies inside and outside the system.

The results of table 3.1 (monthly changes) suggest the following interpretation. First, the intra-EMS effective exchange rates generally tend to become significantly less variable after 1979. This decline in intra-EMS exchange rate variability is most pronounced for the newcomers in the EMS (i.e., those countries that prior to 1979 did not participate in an exchange rate arrangement) and for Germany. The latter can be explained by the fact that a significant part of the German trade is with France and Italy, two countries that joined the EMS arrangement.

Second, the variability of the exchange rates of the EMS countries with the industrialized countries outside the EMS does not change significantly after 1979. The exception here is Ireland, which uncoupled its currency from the pound sterling when entering the EMS. Third, we observe that the variability of the EMS exchange rates with the currencies outside the EMS is for all countries significantly higher than the intra-EMS variability.

This broad picture of the short-term (monthly) exchange rate variability can also be found in table 3.2, which presents evidence concerning quarterly exchange rate variability. There is a difference,

Table 3.1 **Standard Deviation of the Monthly Changes of the Real Effective Exchange Rates (%)**

	Intra-EMS		Extra-EMS[a]	
	1973–79[b] (1)	1979–86[b] (2)	1973–79 (3)	1979–86 (4)
Belgium	0.82	0.86	1.56	1.72
Denmark	1.25	0.87	1.62	1.48
Netherlands	0.99	0.73	1.83	1.81
Ireland	2.33	1.10	1.19	1.85
France	1.43	1.06	1.74	1.80
Germany	1.22	0.66	1.71	1.42
Italy	2.09	0.92	1.57	1.40
	F-tests on the Columns[c]			
	(1) – (2)	(3) – (4)	(1) – (3)	(2) – (4)
Belgium	1.10	1.21	3.64*	3.97*
Denmark	2.08*	1.20	1.69*	2.93*
Netherlands	1.82*	1.02	3.42*	6.11*
Ireland	4.50*	2.41*	3.80*	2.86*
France	1.80*	1.07	1.48	2.87*
Germany	3.38*	1.45	1.98*	4.60*
Italy	5.13*	1.24	1.79*	2.31*

Source: International Monetary Fund, International Financial Statistics.

[a]The Extra-EMS group of countries consists of Austria, Canada, Japan, Norway, Sweden, Switzerland, the United States, and the United Kingdom.

[b]The first subperiod goes from January 1973 to February 1979, and the second from March 1979 to October 1986.

[c]The *F*-statistics reported test for the significance of the variances between the two columns indicated.

*$p < .05$.

however. The decline in intra-EMS variability of the French franc and the Danish krone after 1979 seems to be insignificant on a quarterly basis.

When looking at the standard deviation of yearly changes of the real effective exchange rates in table 3.3, we even observe an increase in the intra-EMS variability after 1979 for the Belgian franc, the Danish krone and the deutsche mark (DM). The limited degrees of freedom however, prevent formal *F*-tests on the significance of these increases.

A comparison of the monthly, quarterly, and yearly changes in the real effective rates suggests that the decline in intra-EMS variability has been somewhat more significant at the short end. It is nevertheless fair to conclude that the EMS has succeeded in creating a zone of relative exchange rate stability in Europe.[1]

Table 3.2 **Standard Deviation of the Quarterly Changes of the Real Effective Exchange Rates (%)**

	Intra-EMS		Extra-EMS[a]	
	1973–78[b] (1)	1979–86[b] (2)	1973–78 (3)	1979–86 (4)
Belgium	1.25	1.24	2.87	3.11
Denmark	1.61	1.28	2.27	2.60
Netherlands	1.68	1.20	3.02	3.48
Ireland	4.21	1.84	2.40	3.63
France	2.40	2.03	2.63	3.04
Germany	2.20	1.17	3.06	2.73
Italy	3.51	1.47	2.61	2.56
	F-tests on the Columns[c]			
	(1) – (2)	(3) – (4)	(1) – (3)	(2) – (4)
Belgium	0.99	1.17	5.29*	6.25*
Denmark	1.58	1.31	1.99	4.12*
Netherlands	1.96*	1.32	3.25*	8.41*
Ireland	5.23*	2.29*	3.08*	3.89*
France	1.40	1.34	1.20	2.25*
Germany	3.51*	1.25	1.94	5.44*
Italy	5.73*	1.04	1.81	3.06*

Source: International Monetary Fund, International Financial Statistics.

[a]See note *a* of table 3.1.

[b]The first subperiod goes from 1973:II to 1978:IV, and the second from 1979:I to 1986:III.

[c]See note *c* of table 3.1.

3.3 The EMS and Misalignment

Another way to evaluate the performance of the EMS in stabilizing exchange rates is to compare measures of misalignment within and outside the EMS. This is done in this section. At first, however, the equilibrium rate that will be used as a reference for the calculations of misalignment needs to be defined. There are several possible ways to calculate an equilibrium exchange rate. One has been made popular in recent years by Williamson.[2] In this view the "fundamental equilibrium exchange rate" is the real exchange rate leading (over the cycle) to a current account balance which is sustainable given the long-run equilibrium capital movements. An alternative and computationally easier way is to calculate purchasing power parity (PPP) rates and correct them for productivity differences between countries.[3] Here we used the latter approach. As derived more formally in appendix A, we can write the measure of misalignment M as:

Table 3.3 **Standard Deviation of the Yearly Changes of the Real Effective Exchange Rates (%)**

	Intra-EMS		Extra-EMS[a]	
	1974–78[b] (1)[c]	1980–86[b] (2)[c]	1974–78 (3)[c]	1980–86 (4)[c]
Belgium	2.58	3.66	5.24	7.61
Denmark	2.77	3.47	3.25	4.80
Netherlands	3.63	2.84	4.91	8.88
Ireland	7.63	3.28	4.34	7.09
France	5.02	4.78	5.06	6.52
Germany	3.01	3.46	4.31	7.70
Italy	5.14	2.84	5.02	6.53

Source: International Monetary Fund, International Financial Statistics.

[a]See note *a* of table 3.1.

[b]The first subperiod goes from January 1974 to February 1979, and the second from March 1980 to October 1986. These subperiods were chosen since monthly observations of 12-month changes are considered and we didn't want to mix periods with different exchange rate regimes.

[c]The limited number of independent observations did not allow us to perform the same kind of *F*-tests as in tables 3.1 and 3.2.

$$M = S + P_c^* - P_c + (1 - a)(q - q^*)$$

where M = misalignment of the exchange rate (%)
S = log of the nominal exchange rate
P_c = log of the general price index
q = log of the productivity level in the tradables sector
a = share of traded goods in the consumption basket
* refers to a variable of the foreign country.

A common problem with PPP-based calculations like these is the proper choice of the base period. To minimize distortions from choosing a particular year, we have taken the average over 1974–85 as constituting the equilibrium value.

In figures 3.1 to 3.7 we present the misalignment of a number of currencies against non-EMS currencies and against EMS currencies. These misalignments are calculated using measures of effective exchange rates. To take an example: figure 3.1 indicates that in 1985 the DM was overvalued (on average) against the other EMS currencies and undervalued against the group of non-EMS currencies.

On the whole, the evidence indicates that although misalignments were also present among the EMS currencies, they seem to have been smaller than those between currencies which were not explicitly linked through an exchange-rate agreement. More evidence is shown in table 3.4. This table concentrates on the period in which the EMS was in

Table 3.4 **Maximum Misalignment (in Either Direction) during the Period 1979–85 (%)**

	vs. EMS Currencies	vs. Non-EMS Currencies
Belgian franc	19.00	30.20
Danish krone	8.17	13.98
Guilder	11.38	16.74
French franc	8.64	21.51
Deutsche mark	8.91	12.77
Italian lira	11.47	15.83
Pound sterling	27.21	24.50
U.S. dollar	39.37	18.06
Yen	18.69	23.39

effect. It presents the maximum misalignment of the effective rates during 1979–85. We observe that the EMS currencies always recorded the highest misalignment with respect to the group of non-EMS currencies.

3.4 The EMS and Trade

One of the striking phenomena concerning the growth of trade within the EMS is its sluggishness since 1979. The evidence is summarized in figure 3.8. It shows the average yearly growth of intra-EMS trade during 1973–78 and 1979–85 and compares this with the growth of trade (export + import) of the EMS countries with the non-EMS industrialized countries during the same two periods.

Two observations can be made from the evidence of figure 3.8. First, the yearly growth of the intra-EMS trade declined on average from 4.44% in 1973–78 to 2.74% in 1979–85. The trade of the EMS countries with the non-EMS industrial countries does not seem to have been subjected to the same deceleration. As this trade might have been affected by the large movements of the dollar, we also show the growth rates of the trade of the EMS with the non-EMS group, excluding the United States. Although we observe a somewhat larger deceleration, it is nevertheless a less pronounced slowdown than the one observed within the EMS.[4]

Second, during both the pre-EMS and the post-EMS periods, the average growth of the intra-EMS trade was substantially lower than the average growth of the trade of the EMS countries with the non-EMS industrialized countries. Thus, the intra-EMS trade flows continued to grow at about half the rate of the trade between EMS and non-EMS countries, despite a significantly greater exchange rate stability

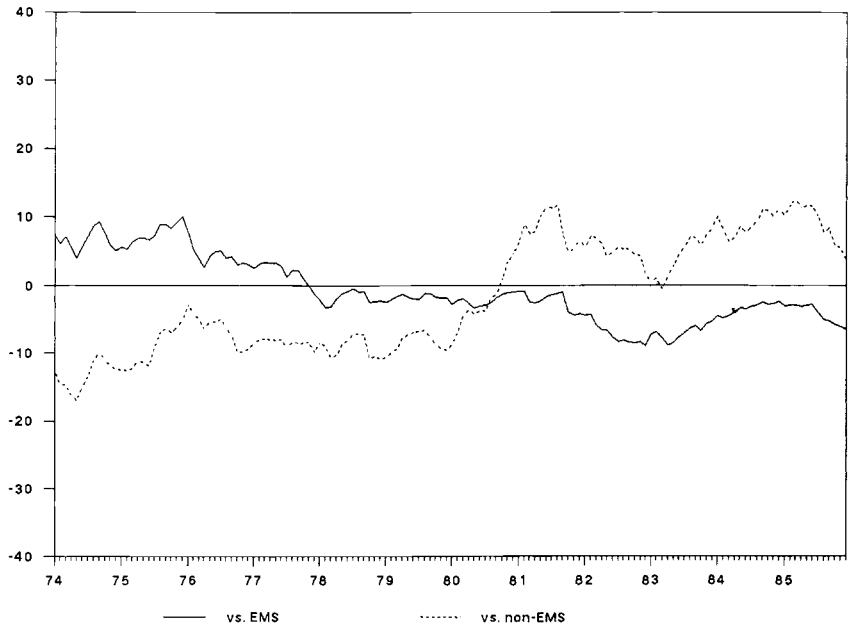

Fig. 3.1 Misalignment of the DM versus EMS and non-EMS currencies (+ = undervaluation of the DM).

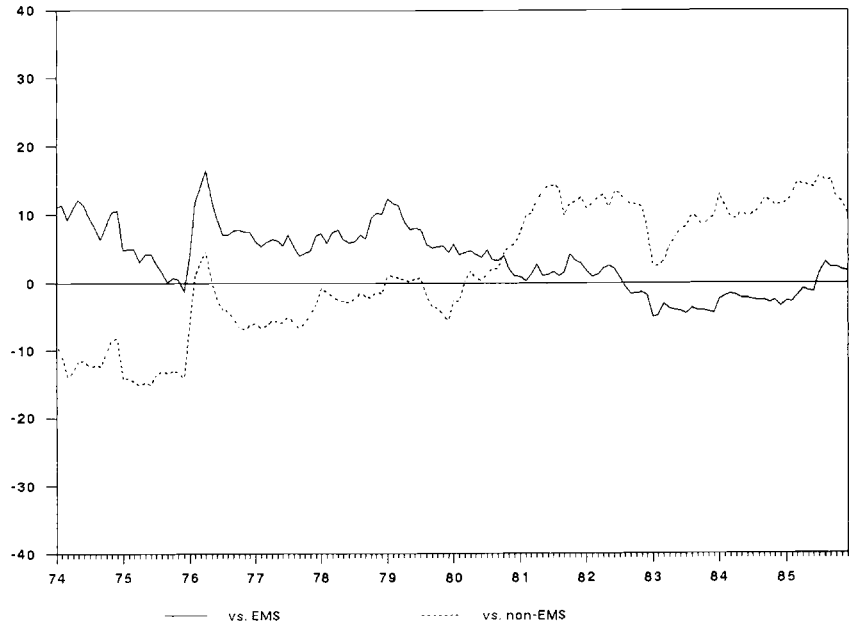

Fig. 3.2 Misalignment of the lira versus EMS and non-EMS currencies (+ = undervaluation of the lira).

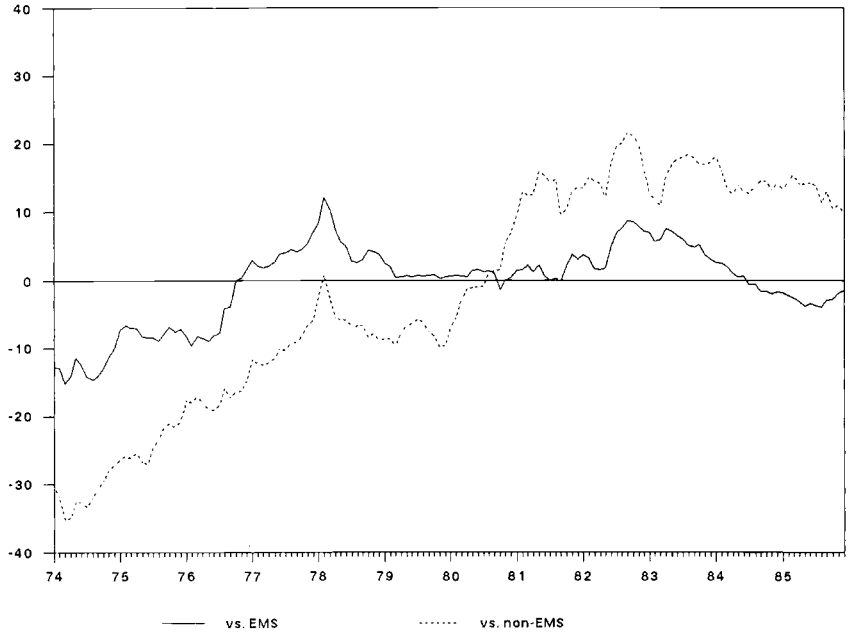

Fig. 3.3 Misalignment of the French franc versus EMS and non-EMS currencies (+ = undervaluation of the French franc).

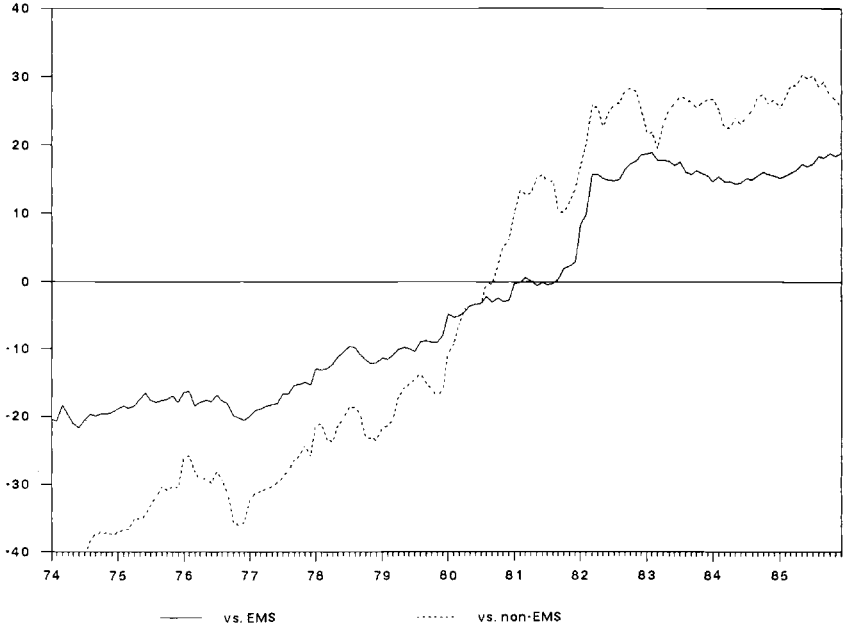

Fig. 3.4 Misalignment of the Belgian franc versus EMS and non-EMS currencies (+ = undervaluation of the Belgian franc).

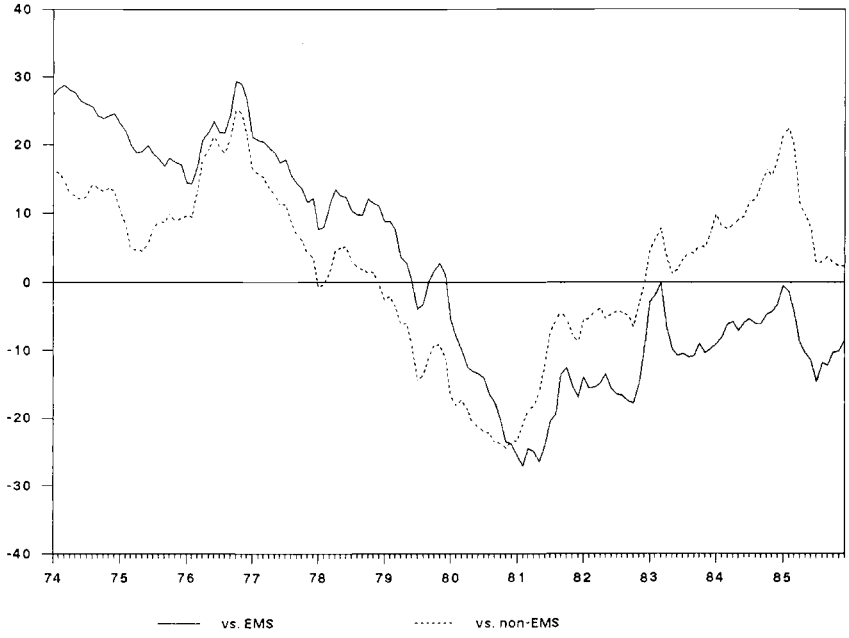

Fig. 3.5 Misalignment of the pound sterling versus EMS and non-EMS currencies (+ = undervaluation of the pound).

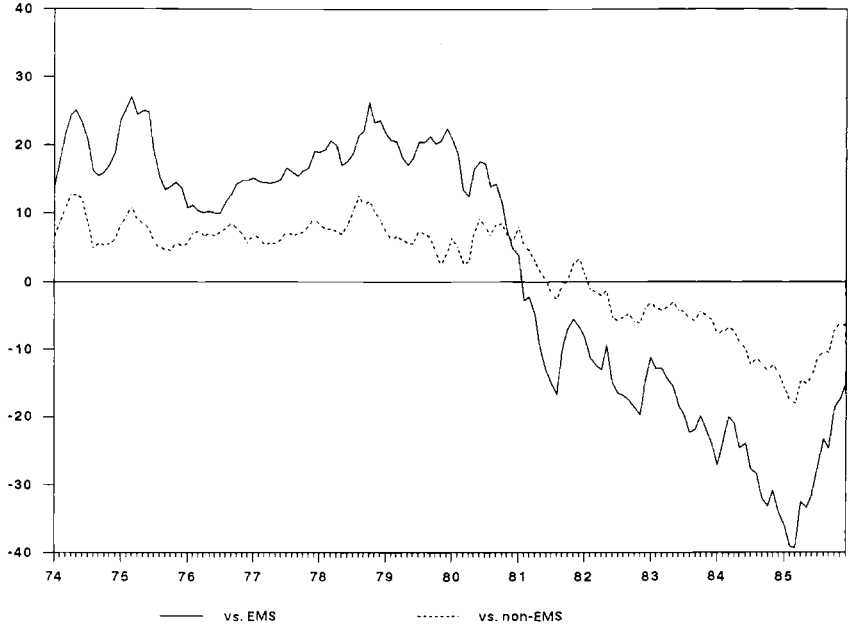

Fig. 3.6 Misalignment of the U.S. dollar versus EMS and non-EMS currencies (+ = undervaluation of the dollar).

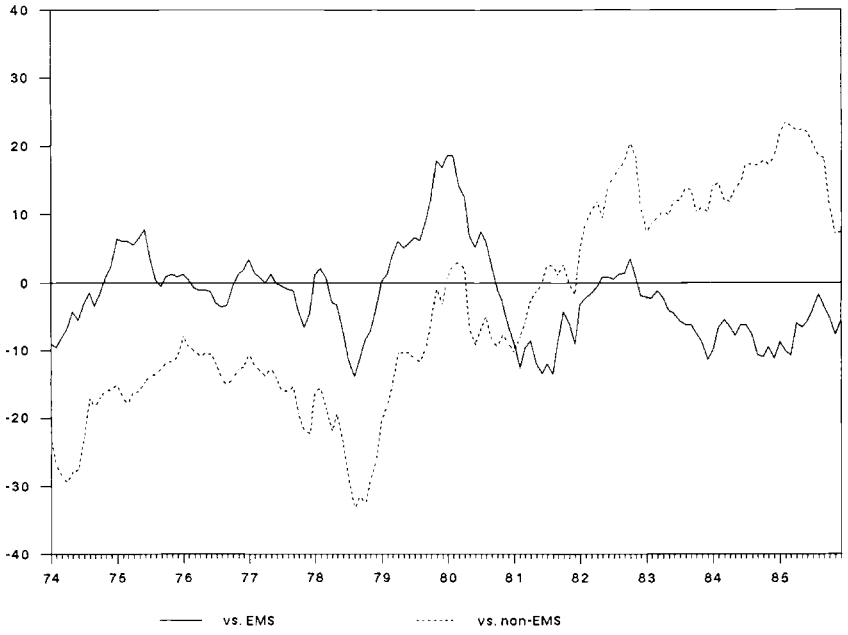

Fig. 3.7 Misalignment of the yen versus EMS and non-EMS currencies (+ = undervaluation of the yen).

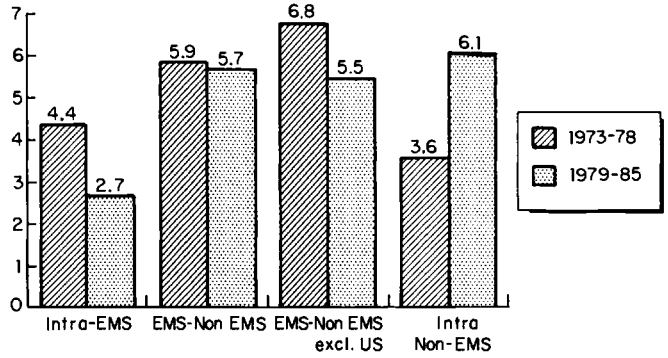

Fig. 3.8 Average yearly growth of trade (export + import) in constant prices (in percentages). *Source:* IMF, Direction of Trade; IMF, International Financial Statistics. *Notes:* 1. The group of non-EMS industrialized countries consists of Austria, Canada, Japan, Norway, Sweden, Switzerland, the U.K., and the U.S. 2. The export figures of each country were deflated by the index of export unit values of the same country; in order to obtain import figures in constant prices we used export unit values of the different countries of origin of these imports and weighted these indices using the share of each exporting country in the total imports. The trade figures are the sum of exports and imports.

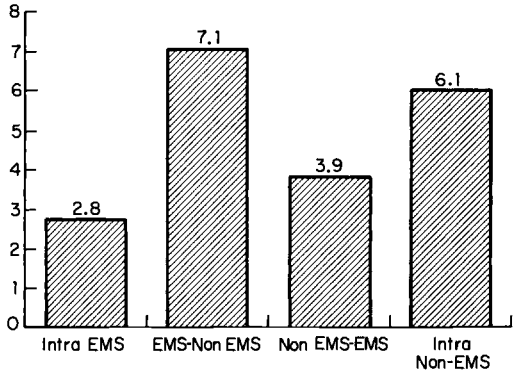

Fig. 3.9 Average yearly growth of exports in constant prices (in percentages) 1979–85. *Source:* IMF, Direction of Trade; IMF, International Financial Statistics. *Notes:* 1. The group of non-EMS countries consists of Austria, Canada, Japan, Norway, Sweden, Switzerland, the U.S., and the U.K. 2. The export figures of each country were deflated by the index of export unit values of the same country.

inside the EMS. Figure 3.9 presents some additional evidence about these trade flows in the post-1979 period. Whereas the intra-EMS exports grew at an annual rate of 2.79%, the exports from the EMS to the rest of the industrial countries and the exports between the non-EMS countries grew at more than twice this rate. Even the exports from the non-EMS to the EMS grew substantially faster than the intra-EMS exports. This is surprising, since these export flows also include the exports of the United States to the EMS, which were hampered by the significant appreciation of the dollar during the period.

It is clear that there is a puzzle to explain. On the one hand, the EMS has been successful in avoiding the high variability of exchange rates observed outside the system. On the other hand, it has not only experienced a slowdown of its internal trade, but the intra-EMS trade now grows at a substantially slower pace than that in the rest of the industrialized world. These phenomena raise a number of issues. First, there is the question of how exchange rate variability affects international trade flows. Second, if it can be established that exchange rate stability fosters trade, how important is this effect? The evidence of the EMS indicates that if exchange rate stability has a positive effect, it must have been swamped by other variables which negatively affected intra-EMS trade. What are these variables? And how important have they been? These are some of the questions we intend to answer in the following sections. As we are primarily interested in the possible effects of the EMS arrangement on trade among its members, we limit the empirical work to the period 1979–85. This of course prevents us from analyzing why intra-EMS trade has decelerated after 1979, but

allows us to focus on the difference in trade growth during the period in which the EMS was in effect.[5]

3.5 Exchange Rate Variability and International Trade

Exchange rate variability can affect the growth rate of international trade in several ways. One has to do with the effects of exchange risk on international trade. The other could be labeled the political economy of misaligned exchange rates.

According to the traditional analysis of behavior under risk, an increase in risk will lead risk-averse individuals to reduce their efforts in the risky activity and to concentrate their energies in less risky endeavors (given an unchanged return). This theory has led many to conclude that by increasing the risk of international trade activities, the exchange rate volatility must in principle have a negative effect on trade. In this view, exchange rate volatility leads economic agents to a retrenchment into domestic activities.[6] The empirical evidence of the models based on this theory has up until now not been very convincing about the significance of the negative effects of exchange rate risk on international trade.

There is another strand of literature which analyzes the effects of exchange rate variability on international trade and which appears to come to more clear-cut results about this relationship. One can call this literature the "political economy of exchange rate variability."

Although this literature is far removed from the level of formalization which is found in the pure theory of risk, it is important to look at the problem from the political economy perspective. We can summarize the main ideas as follows. Exchange rate changes which wander away from purchasing power parities (or more generally from their equilibrium values) lead to adjustment problems and "real" effects on the economy. These misalignments lead to a boom in the traded goods sectors of the countries whose currency has become undervalued. In the countries with overvalued currencies as a result of these swings in the real exchange rate, the traded goods sector is squeezed. This leads to a loss of output and employment which is not easily absorbed in the short run by the other sectors in the economy.

The political economy part of this story is set in motion when, as a result of output and employment losses, individuals hurt by these developments organize themselves to pass protectionist legislation. These protectionist measures can take a variety of forms; from import tariffs and quantitative restrictions to very subtle ways of subsidizing exporting and import-competing industries.[7] As a result, markets become more protected, such that international trade is negatively affected.

This hypothesis only makes sense if there is some asymmetry in the protectionist tendencies. It must be that the protectionist legislation passed when the currency tended to be overvalued is not easily scrapped when the currency is in the undervaluation cycle. If such asymmetries are present, then the swings in the real exchange rates will lead to a trendlike increase in protectionism and will negatively affect international trade. Thus, this theory predicts that the volatility of real exchange rates over periods exceeding a few months or quarters is likely to lead to a reduction in the growth of international trade.

The political economy theory of the effects of misalignment also suggests a way in which in the empirical work a distinction can be made between the effect of changes in competitiveness and the effects of misalignment. The influence of misalignment can be introduced into the model through the inclusion of an indicator of "protectionist pressure stemming from misalignment."

In section 3.6 we present an econometric model which aims at quantifying the effects of exchange risk and misalignment. In addition, the model will allow us to separate these effects from the effects of other variables like the growth of income and relative price changes. The empirical results will enable us to shed some light on the puzzle of why intra-EMS trade was growing more slowly than other trade flows after 1979.

3.6 The Econometric Model

In order to specify the empirical model, we rely on what standard trade theory tells us about the determinants of international trade flows. Let us start from the following general equation:

$$X_{ij} = f(Y_j, Y_i, R_{ij}, T_{ij}, S_{ij}, M_{ij}). \tag{1}$$

The growth of exports of country i to country j (X_{ij}) is a positive function of the growth of demand in country j as measured by the real income of that country (Y_j). It is a positive function of the growth of the supply possibilities of the exporting country. This is measured by the growth rate of output of country i (Y_i). The growth of the exports of country i to country j is a positive function of the change in the bilateral real exchange rate (R_{ij}). A real depreciation of the currency of the exporting country i will increase its exports to country j.

The growth of trade between countries i and j is also influenced by the nature of the trade arrangements between the two countries (T_{ij}). In particular, if countries i and j form a customs union, this should increase their bilateral trade flows relative to the trade with third countries. We will use this variable to measure the effect of the trade arrangements between the EEC countries in the sample. In the empirical

analysis we will further isolate the trade flows among the original EEC members (Belgium, France, Germany, Italy, and the Netherlands) from the other intra-EEC flows. In this way we can catch differences in the phases of the integration process.

In equation (1) we also include a measure of exchange rate variability (S_{ij}). We expect that this variable negatively affects trade flows between countries i and j. In contrast to most of the empirical literature on the effect of exchange rate volatility on international trade, we will use a measure of long-term (yearly) variability of the real exchange rate.

Finally, we add the variable M_{ij}. This is our indicator of protectionist pressure in country j (induced by a sustained overvaluation of the currency of country j) against imports from country i. Thus this variable measures the negative effect of past and current misalignments on bilateral exports. It is calculated as the cumulative percentage overvaluation of the currency of the importing country relative to the productivity-adjusted bilateral real exchange rate (for more details see appendix A). One way to interpret this variable is as follows: misalignments (overvaluations of the currency) which have occurred in the past affect today's trade flows by the protectionist measures they have set in motion.

3.7 The Empirical Results

A cross-section analysis was performed on the average yearly change of the volume of exports during the period 1979–85. The sample included the bilateral exports of 15 industrial countries which together constitute more than 90% of trade among industrial countries.[8] In total we thus have a sample of 210 bilateral export flows. A detailed description of the data can be found in appendix B. Two further remarks should be made here. The first concerns the way the variable M_{ij} is calculated. It is calculated over the whole floating-rate period 1974–85 and not over the period 1979–85 as the other variables are. The reason is that we assume that protectionist pressure built up before 1979 will still influence trade flows during 1979–85. The second remark deals with the way the effects of trade arrangements between countries (T_{ij}) are introduced. Integration effects are assumed to work through higher income elasticities on the import side. The same increase in the income of the importing country belonging to a trade arrangement such as the EEC is expected to have a greater effect on the exports of the partners than those of other countries.[9] The results of the estimation of equation (1) are shown in table 3.5.

These empirical results suggest the following interpretation. First, the demand and supply variables as measured by the changes in the income of the importing and the exporting country have the expected

Table 3.5 **Estimation Results, with Average Real Change in Exports, 1979–85, as Dependent Variable (in Millions of 1980 Dollars)**

	Eq. (1a)	Eq. (1b)	Eq. (1c)
c	94.71**	39.21	124.68**
	(2.22)	(0.86)	(2.55)
Y_i	0.008**	0.005**	0.008**
	(4.62)	(2.65)	(4.28)
Y_j	0.012**	0.010**	0.013**
	(6.80)	(5.59)	(6.91)
Y_j*OLD	0.013	0.023**	0.012
	(1.23)	(2.17)	(1.17)
Y_j*NEW	0.022**	0.027**	0.024**
	(2.10)	(2.54)	(2.30)
R_{ij}	1413.43*	807.35	1066.45
	(1.70)	(0.89)	(1.22)
S_{ij}	−3.010**		−2.829**
	(4.33)		(3.99)
M_{ij}		−0.081**	−0.049
		(2.03)	(1.24)
SER	322.97	334.16	322.54
F	13.10**	10.01**	11.48**
Adj. R^2	.26	.21	.26
$F_{S,M}$	18.82**	4.14**	10.21**

Note: Y_i = average yearly change in income exporting country; Y_j = average yearly change in income importing country; OLD = dummy which takes the value of 1 for flows among the 5 original members of the EEC in the sample; NEW = dummy which takes the value of 1 for intra-EEC flows involving the U.K., Ireland, and Denmark; R_{ij} = average annual rate of real depreciation of the exporting country's currency; S_{ij} = real exchange rate variability, measured as the variance of the annual changes of the real exchange rate; M_{ij} = indicator of protectionist pressure created by exchange rate misalignment. t-statistics in parentheses. *$p < .05$. **$p < .01$.

positive and significant effect on bilateral export flows. Second, integration effects are positive and significant. They are more pronounced for the EMS trade with the new members of the EEC. The variable measuring the integration effects among the old EEC countries is less pronounced and often insignificant. This suggests that for the trade among these old EEC members some saturation effect is present. Third, changes in relative prices have the expected positive effect, that is, a real depreciation of currency i leads to an increase of the exports of country i. This effect, however, is usually not significant (except in equation 1a in table 3.5).

When the exchange rate variability (S_{ij}) and the indicator of protectionist pressure created by misalignment (M_{ij}) are entered separately into the equation (eqs. 1a and 1b in table 3.5), they show up with a significant negative coefficient. When entered simultaneously into the equation, the misalignment variable looses its significance (eq. 1c in

table 3.5). The *F*-statistics reported at the bottom of table 3.5 indicate that variability and/or misalignment contribute significantly to the explanation of the change in bilateral exports.

Our finding that exchange rate variability has a significant negative effect on exports contradicts earlier findings by Hooper and Kohlhagen (1978), Gotur (1985), Bailey et al. (1986), and IMF (1984). It is, however, consistent with the results of Cushman (1983, 1986), Abrams (1980), and Thursby and Thursby (1985). The evidence on the effect of misalignment is not that clear-cut. Table 3.5 would suggest that the misalignment variable is overshadowed by the variable measuring yearly variability of exchange rates when entered simultaneously. This lack of precision of the misalignment variable may be due to the high correlation with the variable measuring exchange rate variability.

We have observed in this section that exchange rate variability and misalignment have a negative effect on international trade. The question remains, however, whether this effect is also economically important. We analyze this question in section 3.8.

3.8 Real Growth of Exports

In figures 3.8 and 3.9 it was illustrated that after 1979 trade flows among the EMS members were growing much more slowly compared with other trade flows. In this section we use the empirical results of section 3.7 to quantify the contribution of different variables in the explanation of this phenomenon.

The calculations were made using the estimated coefficients of equation (1c) in table 3.5. Using the average values of the independent variables for each group of countries, we calculated their contribution to the actual growth rate of exports. The results are presented in table 3.6.

Table 3.6 **Contribution to the Real Growth Rate of Exports (1979–85)**

	Exports			
	EMS to EMS	EMS to Non-EMS	Non-EMS to EMS	Non-EMS to Non-EMS
Income	2.28	10.60	10.67	11.83
Misalignment	−0.50	−2.21	−2.16	−1.53
Variability	−0.68	−8.05	−10.34	−9.18
Relative prices	0.0	1.11	−1.43	0.0
Other	1.69	5.61	7.20	5.02
Total	2.79	7.06	3.94	6.14

The totals of the columns of table 3.6 give the observed real growth rate of exports between the groups of countries during 1979–85. These figures correspond to the ones in figure 3.8. The entries in table 3.6 give the effects of the different explanatory variables on the growth rate of exports. They should be interpreted as follows. Changes in the income of the EMS countries were responsible for 2.28% of the 2.79% growth in intra-EMS exports. (Note that this includes the effect of the higher income sensitivity of intra-EMS trade, due to the higher level of trade integration.) Protectionist pressure as a result of misalignment slowed the growth of intra-EMS trade by 0.50%, while exchange rate variability reduced that growth rate by another 0.68%.

We can conclude from table 3.6 that income and exchange rate variability are certainly the most important factors in explaining the growth of exports. Misalignment and changes in relative prices seem to play a secondary role. The question remains now to what extent divergent evolutions of these variables can account for the difference in growth rate after 1979 between intra-EMS exports and other export flows. In order to answer this question, we performed some simulation experiments.

3.9 Some Simulation Results

In this section we report the results of three simulation experiments. The purpose is to write an "anti-histoire" of what would have happened to intra-EMS exports if conditions had been different. The results of the simulations are summarized in table 3.7. The base line is the actual real growth rate of exports between the groups of countries.

Case 1

In this simulation experiment we assumed that the average real growth rate of income in the EMS was the same as the one observed for the group of countries outside the EMS.[10] The growth of intra-EMS exports increases by 1.44% relative to the observed value. Thus if the EMS countries had managed to grow at the (higher) rate observed outside

Table 3.7 **Simulation Results: Real Growth of Exports (1979–85) (%)**

	Exports			
	EMS to EMS	EMS to Non-EMS	Non-EMS to EMS	Non-EMS to Non-EMS
Base	2.79	7.06	3.94	6.14
Case 1	4.23	8.10	9.00	6.14
Case 2	0.38	7.06	3.94	6.14
Case 3	2.02	7.83	4.79	6.19

the EMS, their trade would have grown on average by 4.23% per year instead of only 2.79%. In addition, the growth rate of their imports from the non-EMS area would have been more than twice as high as in the base value. Thus, it appears that the slow growth of GDP observed within the EMS is an important variable in the explanation of the low intra-EMS growth of trade. It is, however, insufficient to explain the full extent of the sluggish intra-EMS trade. Even when we assume, as we do in this simulation, that the EMS GDP would have grown at the higher (non-EMS) rate, the resulting growth of trade within the EMS falls short of the one we observe outside the EMS.

Case 2

In order to have an idea of the beneficial effects of the EMS as a stabilizer of the bilateral exchange rates, we performed the following experiment. We calculated the growth rate of exports assuming that inside the EMS we would have had the same degree of exchange rate variability and misalignment as among the non-EMS countries. The results in table 3.7 indicate that intra-EMS export growth would have dropped by 2.41%, from 2.79% to 0.38%. This 2.41% growth of exports can be interpreted as the beneficial effect of the exchange rate arrangement of the EMS on the trade flows among its members. This experiment suggests that through the exchange rate stability it provided, the EMS was successful in preventing an even more unfavorable evolution in its internal trade than the one we observed.

It should be stressed that these experiments are somewhat artificial. We cannot exclude, for example, that the low growth of GDP and the low variability of exchange rates are correlated. If this is the case, one could also argue that the EMS contributed to both low growth and low exchange rate variability. The present partial equilibrium exercise does not allow us to resolve this issue.

Case 3

In this third experiment we calculate what would have happened if the variability of the real exchange rates during the period 1979–85 had been the same as during the period 1974–78. The growth rate of intra-EMS exports would have been somewhat lower, while the other trade flows would have grown faster. The difference however, is not very large. These results reflect the fact that after 1979, long-term exchange rate variability has on average slightly decreased among EMS members, while it has increased somewhat outside the EMS when compared to the period 1974–78.

From the preceding experiments we can conclude that the low growth of GDP within the EMS explains a substantial part of the low growth of trade within the EMS since 1979. However, this negative growth effect was completely offset by a favorable effect resulting from the relative

exchange rate stability within the EMS. We are back at square one. Where does the observed decline in the growth rate of intra-EMS trade come from?

The answer must be sought in the slowdown of the trade integration process within the old EEC countries, which comprise the EMS countries. To illustrate this, we calculated the implied income elasticities of export demand (using the results of equation [1c] in table 3.5). For the trade among the original members of the EEC, this elasticity is 0.91. This is much lower than the one for the intra-EEC trade involving the United Kingdom, Denmark, and Ireland (4.10) and the one for all trade flows involving countries outside the EEC (2.31). These figures indicate that the trade integration process within the group of original EEC members has leveled off. Outside this old EEC zone, however, there is still a substantial trade integration momentum. The latter has been operating strongly enough to overcome the negative effects of exchange rate variability.

This evidence about new trade integration patterns has also been documented in the more disaggregated studies of Jacquemin and Sapir (1986, 1987).[11] In these studies it was found that the EEC countries' trade with non-EEC countries has been expanding much faster than the intra-EEC trade since the early eighties. These new trade integration processes are the result of the internationalization of European industries on a worldwide scale. They also explain a slowdown of the growth rates of traditional intra-EEC trade.

3.10 Conclusion

One of the objectives of the EMS was to create a zone of monetary stability in Europe. If we measure monetary stability by the variability of the exchange rates, it can certainly be said that the EMS was a success. In general, the intra-EMS exchange rates tended to be less variable and less prone to large misalignments than the exchange rates of currencies outside the system.

Despite the relative stability of intra-EMS exchange rates, the intra-EMS trade grew at a substantially lower pace than in the rest of the industrialized world. In addition, the EMS trade (both exports and imports) with the rest of the industrialized world increased significantly faster than the intra-EMS trade. This is certainly a puzzling phenomenon. The founding fathers of the EMS expected that a low exchange rate variability would boost internal EMS trade.

In this paper we have tried to explain this phenomenon. Our main findings are that the slowdown of the growth of GDP in the EMS, which was much larger than in the rest of the industrialized world, is an important explanatory variable. However, we also found that the low growth of GDP explains less than half of the slow intra-EMS trade.

The other unexplained part was interpreted as reflecting the slowdown in the trade integration process of the EMS countries, which all (except Ireland and Denmark) belong to the original EEC.

Our second main finding is that the low exchange rate variability contributed positively towards the intra-EMS trade. In other words, in a different (more variable) exchange rate regime, the EMS countries would probably have experienced an even larger slowdown of their internal trade than the one observed during the 1979–85 period. This positive effect of the relative stability of exchange rates within the EMS, however, has not been strong enough to overcome the combined negative growth effect and the negative effect coming from the slowdown of the trade integration process in the EEC countries.

One unresolved issue of this empirical analysis has to do with the question whether the EMS arrangement might have induced both low exchange rate variability and low growth of output. The latter may have occurred if the EMS arrangement forced the participating countries to follow a more deflationary demand policy than in a different exchange rate arrangement. If this is the case, the success of the EMS is less obvious.

Notes

1. It should be stressed here that we have looked only at measures of ex post (unconditional) variability. Better measures of risk involve the computation of ex ante (conditional) variability. The evidence using measures of unconditional variability, however, leads to conclusions similar to the ones arrived at here (see Rogoff 1985).
2. See Williamson (1985).
3. There is a large literature on this topic. See Balassa (1964), Kravis and Lipsey (1986), and Marston (1986).
4. It should be noted that the appreciation of the dollar during the first part of the eighties stimulated export flows from the EMS to the United States, but discouraged export flows from the United States to the EMS. The two effects tend to cancel out in the data presented in figure 3.8.
5. For an analysis of the factors which explain the slowdown of the intra-EMS trade since 1979, see P. De Grauwe (1987b).
6. A representative study is Hooper and Kohlhagen (1978). It should be stressed here, however, that the negative effect of exchange risk on trade is derived by making relatively restrictive assumptions about the utility function. In a more general setup with less restrictive assumptions about the shape of the utility function, it is generally not possible to derive such a clear-cut conclusion about the effect of risk on trade. See Newbery and Stiglitz (1981); see also De Grauwe (1987a).
7. These subsidies can take a more direct form of employment subsidies, cheap loans, or government participation or can be much more disguised as safety regulations, technical standards, and so on.

8. The group of 15 countries comprises the 7 members participating in the exchange rate mechanism of the EMS (Belgium, Denmark, France, Germany, Ireland, Italy, and the Netherlands) and the same group of 8 countries outside the exchange rate agreement as in section 3.2 (Austria, Canada, Japan, Norway, Sweden, Switzerland, the United Kingdom, and the United States).

9. In earlier experiments we also allowed for different income elasticities for trade among members of the EFTA in the sample (Austria, Norway, and Sweden). Since no significant difference was found, however, we dropped this complication.

10. The actual average growth rate of GDP in the EMS during that period was 1.51% as opposed to 2.50% in the group of non-EMS countries.

11. See also P. De Grauwe (1987b) and P. De Grauwe and B. de Bellefroid (1987).

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Appendix A

Measures of Misalignment

1. Calculating the Equilibrium Rate

The general price index P_c of the home country can be written (in logs) as :

$$P_c = aP_t + (1 - a)P_n \tag{1}$$

where P_t = price index of traded goods
P_n = price index of nontraded goods
a = share of traded goods in the consumption basket.

Analogously, we have for the foreign country:

$$P_c^* = a^*P_t^* + (1 - a^*)P_n^*. \tag{2}$$

Assuming we can write prices as a function of wages and productivity in the tradables and nontradables sector, we have:

$$\begin{aligned} P_t &= w - q \qquad P_n = w - v \\ P_t^* &= w^* - q^* \qquad P_n^* = w^* - v^* \end{aligned} \tag{3}$$

where w, w^* = the general wage index in the domestic and the foreign country, respectively
q, q^* = the (log of the) productivity levels in the tradables sector in the two countries
v, v^* = the (log of the) productivity levels in the nontradables sector in the two countries.

Substituting eq. (3) into (1) and (2) yields, after rearranging:

$$P_c = aP_t + (1 - a)(P_t + q - v)$$
$$P_c^* = a^*P_t^* + (1 - a^*)(P_t^* + q^* - v^*). \tag{4}$$

If PPP holds for the tradable goods, we have:

$$P_t = S^{PPP} + P_t^* \tag{5}$$

where S^{PPP} is the spot exchange rate when *PPP* holds.

If we furthermore assume that consumption patterns are the same in both countries ($a = a^*$) and productivity in the nontradables sector is the same ($v = v^*$), we can write

$$P_c - P_c^* = aS^{PPP} + (1 - a)(S^{PPP} + q - q^*). \tag{6}$$

Solving for S^{PPP}, the productivity-adjusted *PPP* rate can be written as:

$$S^{PPP} = (P_c - P_c^*) - (1 - a)(q - q^*). \tag{7}$$

2. Calculating Misalignment

Misalignment is equal to the difference between the log of the actual spot rate and S^{PPP}. The share of traded goods in the consumption basket a, was set equal to 0.7. Productivity in the traded goods sector q was proxied by the real value added per person employed in the manufacturing sector (Source: OECD). Wholesale prices are used as the general price index. All series are on the basis average 1974–85 = 100.

3. Comparison with Williamson (1985)

It is interesting to compare our estimates of misalignment for selected dollar exchange rates with the estimates of Williamson (1985).

	Authors' (%)			Williamson (%)	
	March 83	Dec. 84	Dec. 85	1983:I	1984:IV
DM	7.8	32.5	10.8	18	50
Yen	11.0	22.7	9.1	15	24
PS	13.7	31.4	7.4	3	25
FF	18.8	33.3	15.2	17	44

Though the estimates are not equal, they tend to go in the same direction.

4. Measure of Protectionist Pressure

Our measure of protectionist pressure M_{ij} used in the empirical analysis is equal to the cumulative sum of the monthly percentage overvaluation of the currency of the importing country with respect to that of the exporter. Because of the asymmetry referred to in the text, the

observations where the currency of the importer is undervalued were set to zero. The larger the overvaluation of the importer's currency and the longer the overvaluation lasts, the larger M_{ij} will be.

Appendix B

Data Sources

Y_i = Average yearly change in GDP of country i during the period 1979–85 (in millions of 1980 dollars).
Source: OECD Main Economic Indicators.

X_{ij} = Average yearly change in the exports of country i to country j. Deflated by export unit values (IFS, line 74d).
Source: IMF, Direction of Trade Statistics.

R_{ij} = Average yearly percentage change in the real exchange rate. R_{ij} is positive when the exporter's currency depreciates in real terms with respect to the currency of the importing country. It is calculated as $\log E_t - \log E_{t-12}$, where the real exchange rate E is calculated using monthly data on wholesale prices and nominal exchange rates from IFS, lines RF and 63.

S_{ij} = Variance of R_{ij} during the period 1979–85.

Comment Jacques Melitz

Much of the recent analysis of the European Monetary System (EMS) has concerned the strategic implications of the system in modifying the macroeconomic policy choices of the participating members. De Grauwe and Verfaille do us a service by reminding us that, quite apart from the latter sorts of considerations, the system was also intended to promote trade. From this last perspective, the performance of the system has been uneven, as the two point out. The EMS has indeed succeeded in stabilizing the terms of trade. But to all appearances, the system has not promoted trade. Growth of internal trade within the EMS in 1979–86 slipped significantly below 1974–78 levels. In addition, the growth of trade between the members was far lower than that of their trade with nonmembers in the OECD (Organization for Economic Cooperation and Development) in 1979–86. The authors offer some

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answers to this puzzle, though they do not pretend their answers are complete.

They indicate that the stability of the terms of trade has indeed promoted trade. However, slower economic growth of the EMS members as compared to the other major industrialized countries in the West worked toward a slowdown of the growth of trade. This lower growth has also seemingly damaged internal trade between the members more than external trade with the rest. Additionally, the authors suggest that the trade-integration effects of membership in the European Community (EC) diminished in 1979–85. This would also account for a reduction in the growth of trade between the members, since the only member who is also a newcomer to the EC is Ireland.

This general reconciliation of the evidence, it may be noted, would seem to place the EMS in a favorable light. This bears emphasis, since in the past De Grauwe has been one of the EMS's staunchest critics.[1] He may wish to remind us, though, that the EMS could be largely responsible for its own lower economic growth, as he also argues in the paper. This view would be based on the sort of strategic considerations to which I alluded at the beginning. That is, membership could have led to more anti-inflationary policies because of a tendency to follow the German example of a strong preoccupation with inflation. This would mean, naturally, that the EMS has not been as advantageous to the non-German members than it might otherwise seem, or more precisely, that the advantages to the others would depend on their sharing of the German anti-inflationary priorities.

However, as for the empirical work, I believe that three sorts of improvements could be made. First, the authors might abandon their measure of the annual volatility of the terms of trade in favor of either their monthly or their quarterly measure. Their annual measure is faulted by the use of overlapping observations. It is based on consecutive monthly observations of annual changes. Obviously this use of monthly data multiplies the data, but without adding any independent observations. Thus, it cannot serve to measure annual volatility properly. The authors recognize this implicitly when they acknowledge that the *F*-statistic can tell them nothing about the reliability of their annual volatility measure. But by the same token, they should have recognized that the measure should be scrapped as insignificant, whereas they use it to test in their econometric work. It is impossible to find the annual volatility of anything over two years simply by multiplying the number of annual observations within the same two-year stretch.

1. See Paul De Grauwe, Should the United Kingdom join the EMS? In House of Commons, Treasury and Civil Service Committee, *The financial and economic consequences of UK membership of the European Communities, Memoranda on the European Monetary System*. London: HMSO (1985), pp. 5–11.

The second problem is that the authors improperly limit their statistical analysis to the period 1979 to 1985, while they should have begun earlier, in 1974, since their empirical discussion calls for it. By limiting themselves to 1979–85, they cannot really explain the puzzling reduction in the growth of internal trade in the EMS from 1974–78 to 1979–85 to which they call our attention. This they recognize. But there is a similar problem hounding their efforts to explain the stronger reduction in the growth of internal than external trade in the EMS based on the diminution of the trade-integrating effects of the EC. How can we be sure that the trade-integrating effects of membership even fell off in 1979–85 if we do not look at the earlier period? De Grauwe and Verfaille attempt to answer this objection by referring to independent evidence from Jacquemin and Sapir that trade integration has fallen off since the beginning of the EC. But surely this will not do in the context of an effort to provide a quantitative assessment of the significance of different factors. The only indication of a drop in the trade-integrating effects of EC membership that emerges in their own work, as such, is the estimate that the output elasticity of the demand for EMS exports by the newer EC members—the United Kingdom, Ireland, and Denmark—was higher in 1979–85 than this elasticity of demand by the older members. This is admittedly suggestive, but it is quite consistent with the same elasticities of demand for EMS-country exports by the older members of the EC in 1979–85 as in the preceding years 1974–78.

The third problem concerns the issue of misalignment. De Grauwe and Verfaille sensibly argue that the benefits of stable terms of trade come partly from the avoidance of misalignment. But they focus exclusively on the benefits coming through political channels. Their measure of misalignment in their econometric work is even tailor-made to fit their political hypothesis. Whereas in their general discussion of misalignment in section 3.3 (and the accompanying figures 3.1 through 3.7), misalignment refers to productivity-adjusted movements away from PPP, in their econometric work they use the term to refer to the cumulative value of the previous sorts of movements in one particular direction—the one pointing toward a loss of competitivity. The idea is that periods of low competitiveness (relative to average) produce protectionist actions that are never canceled during times of higher-than-average competitiveness. I have some misgivings about the application of this political hypothesis to the trade relations between the members of the EC in the same way as to their trade relations with outsiders. This would seem to deny the importance of the free-trade rules in the EC and the trade-integrating effects of these rules, to which the authors otherwise give weight. But mostly I wish to emphasize the authors' neglect of the possibility of other effects of misalignment, such as those

suggested in some of the other contributions to this conference volume, like the Baldwin-Krugman argument about fixed costs of entry in a foreign market. These other effects would tend to say that a misalignment damages exports in one direction while encouraging them in the opposite one, contrary to De Grauwe and Verfaille's argument that misalignment hurts exports in every direction. This is important since it could mean that De Grauwe and Verfaille's neglect of other effects interfered with finding the ones they were looking for. In any event, the authors take too limited a view of the possible effects of misalignment.

The paper would gain considerable interest, in my opinion, if these problems were repaired or at least given proper attention. The simulations would benefit too—quite independently of the test significance of the estimated parameters, which could remain a problem. But even as the paper now stands, it provides a lot of food for thought about the effects of the EMS.

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