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ATTITUDES TOWARDS INFLATION AND THE VIABILITY OF FIXED EXCHANGE RATES: EVIDENCE FROM THE EMS

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ABSTRACT

History provides us with many examples of multiple country fixed exchange rate regimes that have eventually fallen apart. In light of these failures, why has the EMS been so successful in stabilizing exchange rates among members, and in expanding its membership? This paper argues that one key aspect of the explanation lies in a convergence in attitudes toward inflation and unemployment among EMS members since the late 1970s.

This paper presents new empirical evidence for this convergence using household survey data for eight European countries during 1974-90. We find evidence that initially high inflation countries -- France and Italy -- have experienced a decrease in tolerance for inflation relative to unemployment. Germany and other low inflation countries, in contrast, appear to have experienced a decrease in tolerance for unemployment. The paper also contains a theoretical section that illustrates why shifts in attitudes of voters within a given country might lead that country to join a fixed exchange rate regime.

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1. INTRODUCTION

An influential view of why the Bretton Woods system eventually collapsed points to the widening gap between European and American views on the desirable rate of inflation during the late 1960s. Reflecting on the tensions that characterized the economic relations between Europeans--Germans in particular-- and Americans at that time, Harry Johnson (1973) wrote: "So long as the United States maintained reasonable price stability, it suited the other major countries to live with the international financial dominance of the dollar, ... [but] once the United States became a potent source of world inflation, the question naturally arose of establishing a basis for common action to resist imported inflation." At the same time, Bundesbank president Otmar Emminger's (1973) description of the necessary conditions for the viability of a fixed exchange rate system vividly illustrated the thinking that led to the end of the Bretton Woods era: "A system of fixed rates can only function so long as the key-currency country, by its domestic stability--that is monetary stability and economic stability in general--enables the other member countries to maintain fixed exchange rates without imposing undue strains on their own domestic stability."

Similarly, behind the failure of the European attempts to create an area of exchange rate stability in the mid-1970s[1] lie divergent views on the role of inflation in helping the European economies steer through the rough waters of that decade. Commenting on the Italian exchange rate policy of 1976-78--that would eventually lead to an inflation rate twice as high as the European average--the governor of the Bank of Italy wrote: "Though aware of its role in shaping the dynamics of prices, we guided the external value of the lira so as to permit a growth of

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[1] These initiatives never managed to extend the area of exchange rate stability beyond the group of small countries whose economies are closely linked to the German economy. For a recollection of that experience see Triffin (1979) and European Economy, no. 12, July 1982.

exports setting the premises for a recovery of accumulation and of employment less conditioned by the external constraint". (Banca d'Italia, Annual Report, 1979)--a view that even a German central banker during the time of the "locomotive experiment" would hardly have subscribed.

These experiences confirm that common attitudes towards inflation are a necessary condition for the viability of a fixed exchange rate system. Throughout the 1960s Germany faced the choice between achieving its domestic inflation targets, and behaving according to the rules of Bretton Woods. Eventually the cost of an inflation rate that was constantly "too high" convinced Germans that a regime of flexible exchange rates was "the only one able to guarantee domestic price stability."[2]

These experiences also suggest that the success of the European Monetary System in creating an area of exchange rate stability in Europe--made possible by the convergence of inflation rates toward the German level--may be the result of an unprecedented convergence of attitudes toward inflation throughout the continent. (Figure 1 shows that countries which had remained in the Snake[3] maintained low inflation differentials relative to Germany from the end of the 1970s while Figure 2 shows that inflation rates in other European countries did not begin to converge toward German levels until the mid 1980s.) From this viewpoint, the various phases of the EMS experience could reflect the timing of such a shift in attitudes. The system

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[2] Quote from a 1964 statement of the German Council of Economic Experts, reported in Giavazzi and Giovannini (1989), p. 23.

[3] When the Snake was set up in Spring 1972, ten countries participated: Germany, the Netherlands, Belgium, Luxembourg, Denmark, Norway, France, Italy, Great Britain and Ireland. Denmark, Ireland and Great Britain pulled out in June 1972, but Denmark rejoined in December. Italy pulled out, and Sweden joined in February 1973. France and Sweden left in January 1974 and August 1977 respectively. The EMS began operation in March 1979.

Figure 1

Annual Inflation Rate, relative to Germany

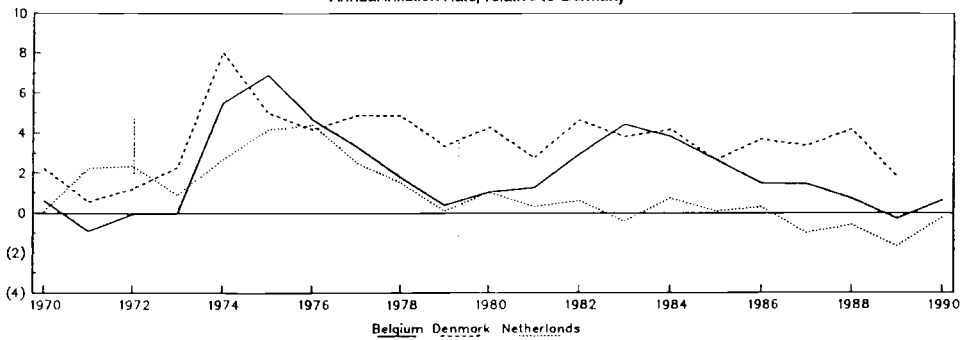
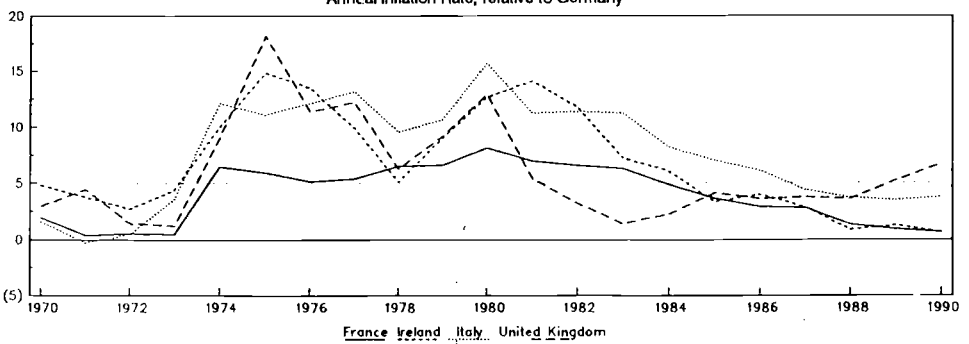


Figure 2

Annual Inflation Rate, relative to Germany



was originally set up in March 1979 by seven countries, and it is commonly recognized that until 1982-83 it effectively functioned like a crawling peg: each member maintained its own inflation rate, and realignments were the mechanism to correct the large swings in real exchange rates that the system generated regularly. But then, one after the other, the high-inflation members of the group changed policies, often going through dramatic U-turns: Denmark, in the fall of 1982; France in March 1983; Italy at the time of the 1984 referendum on the "scala mobile". With the gradual convergence of inflation, realignments became less necessary and less frequent, until they were de-facto abandoned in 1987.[4] In the meantime, two more countries (Spain and the United Kingdom) joined the system, while Austria and Sweden--which are prevented from formal membership because they are not part of the European Community--follow an exchange rate policy consistent with full membership. By 1991 European monetary authorities--even the same central bank that in 1979 seemed to justify an inflation rate that was rising above 20 percent--are unanimously ready to sign on to a European System of Central Banks whose Statutes declare price stability as the main objective of monetary policy.

The aim of this paper is to provide new evidence about the hypothesis that the recent popularity of fixed exchange rates in Europe results from a convergence in attitudes towards inflation. So far, research on the European disinflation of the 1980s has concentrated on the extent to which membership in the EMS affected expectations, and thus the unemployment cost of stabilizing prices.[5] There has been less discussion of the reasons that led first to the

[4] For discussions of the EMS experience prior to 1987, see Collins (1988) and Rogoff (1985a).

[5] See for example Giavazzi and Giovannini (1989) and Weber (1991).

decision to join the EMS, and later (in most countries) to a change in policies that made the new exchange rate regime viable. Most existing work assumes that the turnaround was induced by "enlightened" policy makers whose unyielding commitment to price and exchange rate stability eventually produced a shift in private sector expectations. An alternative view, explored in this paper, is that consumers' perception of the tradeoff between price and output stabilization changed first. This second view raises an additional issue: why did some countries pursue disinflation independently, while others, by joining the EMS, seem to have attempted de facto to replace their domestic monetary authorities with the Bundesbank? This issue is also discussed briefly.

The paper is organized as follows. Section 2 compares the Bretton Woods and the EMS experiences with inflation differentials and exchange rate adjustments. Section 3 discusses both the empirical methodology and the survey data of consumer expectations about future economic performance on which the analysis is based. Section 4 presents empirical evidence for the hypothesis that attitudes toward inflation and unemployment have shifted within Europe. Section 5 develops a theoretical framework that illustrates how changes in private sector attitudes across countries might lead to a convergence in inflation rates. The model, which follows recent work by Alesina and Grilli (1991) provides a useful context for thinking about our empirical findings. Finally, Section 6 contains our concluding discussion.

2. BRETTON WOODS IN LIGHT OF THE EMS

As documented in Figure 2, there have been two distinct phases in the EMS in terms of the inflation experience of its members. For the first few years, membership in the exchange rate mechanism did not seem to have any effect on the high inflation countries. The year after the system was inaugurated, the inflation differential relative to Germany increased in France, Ireland and Italy. Convergence only began after 1982. This visual evidence is confirmed by empirical research on the effects of EMS membership. One common finding is that, to the extent that membership did affect expectations, the shift in expectations occurred with a lag: around 1983 in France, 1982 in Ireland and Denmark and late 1984 in Italy.[6]

During its first 4-5 years, the EMS had to accommodate countries with apparently very different attitudes toward inflation: in Italy, for example, the inflation differential with Germany remained above 10 percent until 1984. Thus, the success of the system in its early years must be attributed in large part to its flexibility: ie. to the smooth working of realignments. Revisions of central parities happened frequently, and were never delayed long enough to allow the build-up of large misalignments. However, they also required the agreement of all parties in the system, thus avoiding the risk of competitive devaluations.[7] Moreover, capital controls allowed

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[6] See Giavazzi and Giovannini (1989, chapter 5) and Weber (1991).

[7] A clear example is France in March 1983. Jacques Delors, then Finance Minister, went to the realignment meeting asking for a devaluation of the franc that was viewed as "excessive" by his colleagues. The meeting was suspended, Delors returned to Paris, and the French government, facing exclusion from the exchange rate mechanism of the EMS, had to withdraw its request and change domestic policies accordingly. In the end, the devaluation of the franc was much smaller than the French had originally requested, and was accompanied by devaluations of the Italians lira, the Belgian franc and the Danish krone.

devaluations to occur without financial disruptions and allowed central banks to choose the timing of realignments, instead of being forced to realign by speculative attacks on reserves.

In the latter half of the 1980s, when European inflation rates and --more importantly, as we shall argue in this paper -- European attitudes toward inflation converged, frequent realignments became unnecessary. Eventually, intra-EMS exchange rates became fixed. (As of the day of writing, there has been no change in central parities since January 1987.) As financial markets came to understand that realignments were no longer necessary, the need for capital controls also vanished. It therefore became possible to lift all administrative controls on intra-European financial transactions.

Despite some similarities, the EMS experience contrasts sharply with the experience during the Bretton Woods period. As for Germany -- the "center" in the EMS -- U.S. inflation was lower than inflation in Europe, at least until the mid 1960s. On average, between 1960 and 1966, inflation (GDP deflators) was 2 percent per year lower in the U.S. than in France, 1.6 percent per year lower than in the U.K., and 3 percent per year lower than in Italy. Even in Germany, inflation was higher than in the U.S. during this period, notwithstanding the German attempt to put downward pressure on domestic prices by revaluing the Deutsche mark (DM) in 1961. Except for the DM episode, however, exchange rates remained fixed. Realignments, when they happened, were dramatic events, forced by the unsustainable external position of a member country. The U.K. experience provides a clear example of the resultant difficulties. By 1966, the U.K had accumulated a loss of competitiveness vis-à-vis the U.S. of almost 20 percent (measured using unit labor costs). Sterling was devalued in November 1967, forced by

a speculative attack large enough to burst the dam provided by British exchange controls. (See the account by Bordo in this volume.)

Table 1 compares the inflation performance and the role of exchange rate changes during Bretton Woods and the EMS. The first column of the table confirms that, until the mid-1960s, Bretton Woods central parities were rarely changed: our sample of countries reports only the 1961 DM revaluation. In the late 1960s, realignments became more frequent. However, there was no convergence of inflation rates. Instead, as U.S. inflation accelerated, the relative trend the trend of unit labor costs, which in the early 1960s had been rising faster at the periphery than at the center, reversed.

The third and fourth columns of Table 1 offer a comparison with the EMS. During the early 1980s, when inflation differentials relative to Germany were large, realignments avoided the build-up of large misalignments. Denmark provides a clear example of the difference between Bretton Woods and the EMS in this period. Between 1961 and 1966, the krone appreciated by 35.7 percent relative to the dollar, in real terms. Eventually, this was corrected in part when Denmark joined the sterling devaluation of 1967. A similar inflation divergence relative to Germany between 1979 and 1987, however, was accommodated by frequent devaluations, thus avoiding a significant real appreciation. Finally, the last column of Table 1 shows that in the late 1980s the move toward more fixed exchange rates was accompanied by a sharp convergence in inflation.

Thus, as seen from the perspective of the EMS experience, Bretton Woods failed on two accounts. First, the system lacked the necessary flexibility to accommodate countries with different inflation rates. Second, although this is not a fault that can be ascribed to the design

Table 1

	BRETTON WOODS		EMS	
	Cumulative Position Relative to the US		Cumulative Position Relative to Germany	
	1960-66	1967-71	1979-87	1988-91
DENMARK				
Unit Labor Cost	35.7	2.1	39.5	7.5
Exchange Rate	0.2	6.0	22.7	1.5
ITALY				
Unit Labor Cost	8.1	-12.0	81.2	10.4
Exchange Rate	0.6	-0.9	53.2	-0.9
IRELAND				
Unit Labor Cost	26.7	-6.2	49.2	1.1
Exchange Rate	0.6	12.1	39.5	0.8
FRANCE				
Unit Labor Cost	-3.4	-10.6	33.5	2.5
Exchange Rate	0.2	12.0	43.7	0.0
BELGIUM				
Unit Labor Cost	10.0	-14.3	12.3	2.7
Exchange Rate	-0.1	-2.2	29.1	0.3
SPAIN				
Unit Labor Cost	13.4	-14.2	44.1	19.2
Exchange Rate	-0.1	13.6	74.0	-4.2
GERMANY				
Unit Labor Cost	12.4	-10.2		
Exchange Rate	-4.1	-12.7		
UK				
Unit Labor Cost	19.8	-8.5		
Exchange Rate	0.6	12.1		
SWEDEN				
Unit Labor Cost	19.2	-11.0		
Exchange Rate	0.4	-1.0		
JAPAN				
Unit Labor Cost	0.5	-23.4		
Exchange Rate	0.7	-3.6		

Footnote to Table 1. The data for Unit Labor Cost show the total change in the index of relative labor cost per unit of output between each country and either the US or Germany, over the period indicated. Exchange Rate is the total change in each country's exchange rate relative to the dollar or the DM over the period indicated--a positive sign indicates a cumulated depreciation.

Source: OECD, National Income Accounts. Unit labour costs are constructed using the index of labour cost per employee and the index of productivity. Both refer the the whole economy.

of the system, the Bretton Woods years did not see the convergence of attitudes toward inflation that characterized Europe in the late 1980s, and that we believe is a necessary condition for the survival of a fixed rate regime.

In the remainder of this paper, we first examine some new evidence that supports our view about the convergence of attitudes toward inflation. We then offer a theoretical framework that highlights the links between attitudes and the choice of an exchange rate regime.

3. EXTRACTING INFORMATION ABOUT CONSUMERS' ATTITUDES TOWARD INFLATION FROM HOUSEHOLDS' SURVEYS

The empirical analysis examines two issues. First, is there any evidence of shifts in attitudes towards inflation versus unemployment within EMS member countries? Second, if so, when did any such shifts occur? In particular, we ask if there is any evidence of increased concern about inflation among countries that gave up some monetary sovereignty in following Germany's leadership of the multiple peg system. (Note that simply joining the EMS in 1979 need not have entailed any such change.) We would also like to know when any such shifts occurred. For example, if attitudes did change, did this occur before or after the EMS was instituted? Did it occur before or after the changes in actual inflationary policy and performance that some countries experienced?

We assume that residents in each country have an expected loss function that depends on expectations about future inflation and unemployment. We use survey data from European households to provide information about how inflation and unemployment affect their assessments of general economic conditions, where the latter is interpreted as a measure of their

"expected loss". We then use regression analysis to infer the implied weights on inflation and unemployment in this loss function and to look for changes in these weights over time. Following a description of the data and methodology in this section, the empirical results are presented and discussed in Section 4.

3.a. The Data

To examine these issues, we use survey data on expectations about future economic performance from the European Community's survey of consumer opinion, reported in European Economy, Supplements B and C.[8] Surveys of households are taken three times a year (January, May and October) in each of eight countries. The complete sample is available since 1974.[9] These data can be interpreted as information about the average household in each country.

Three of the survey questions are relevant for our purposes. The first asks respondents their perceptions of prospects for the general economic situation in their country over the next 12 months, relative to the current situation in their own country. The second asks their expectations about the changes in the trend of the price level (inflation) over the next 12 months, and the third asks their expectations about changes in the unemployment rate over the next 12

[8] We look at the nine countries that were members of the European Community during the 1970s, with the exception of Luxembourg, for which these data are not available. In some cases, the reported figures average across months, in which case, we obtained the actual figure for the relevant months from the European Commission. However, these data were in each case identical to the published figures.

[9] The survey is given to a random sample of 2500 adults, most of whom are household heads, in each country in January and May, and to 5000 adults in October. (Note that we do not treat the October observations differently in the empirical analysis.) For additional discussion of the survey, see Papadia and Basano (1981).

months.[10] Responses for these two question are also relative to the current situation in the respondent's country. The published indicators are weighted sums of these responses. Each series ranges between -100 and +100, but the scale differs across questions. In particular, if respondents, on average, expected the inflation rate, the unemployment rate and general economic conditions all to be the same over the next twelve months as they had been recently, then the indicators would be 50, 0 and 0 respectively.

Table 2 shows the means and standard deviations of each variable for the eight members of the European Community. Looking first at general economic prospects (EP), the table shows that, on average, respondents were pessimistic. The average response is less than zero for all eight countries, implying that, on average, economic conditions were expected to deteriorate. France, Belgium and Ireland appear to be the most pessimistic, with Germany and the U.K. the least pessimistic. But recall that respondents in each country are asked about their expectations relative to recent performance in their own country. Therefore, responses for different countries are not on comparable scales. Cross country comparisons must be interpreted with caution.

Turning next to expected price changes (PT), Table 2 shows that Italians on average expected inflation rates to be about the same as in the past. (The mean response is close to 50.)

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[10] The three questions and possible responses are as follows: (1) "General economic situation in your country, prospects over the next 12 months?" The possible responses are: a lot better (coded as +1), a little better (+1/2), the same (0), a little worse (-1/2), a lot worse (-1) or don't know. (2) "Price trends over the next 12 months?" The possible answers are: more rapid increase (+1), same increase (+1/2), slower increase (0), stability (-1/2), fall slightly (-1), or don't know. (3) "Unemployment level in your country in the next 12 months?" The possible responses are: increase sharply (+1), increase slightly (+1/2), remain the same (0), fall slightly (-1/2), fall sharply (-1), or don't know. For each variable, the "don't know" responses are redistributed between the other answer categories according to the latter's percentage distribution.

Table 2

Means and Standard Deviations: Household Expectations

	General Economic Prospects	Expected Price Trends	Expected Unemployment Trends
Germany	-9.08	32.06	16.90
	(12.45)	(13.17)	(16.52)
France	-23.78	30.39	35.63
	(11.59)	(14.07)	(14.73)
Italy	-16.10	48.37	45.98
	(13.07)	(8.27)	(10.10)
Belgium	-25.14	33.10	40.47
	(16.64)	(8.86)	(18.70)
Denmark	-14.90	19.39	19.78
	(15.10)	(14.82)	(17.56)
Netherlands	-15.82	34.73	35.02
	(10.14)	(18.97)	(28.39)
U.K.	-11.45	37.14	28.63
	(14.18)	(12.56)	(18.54)
Ireland[1]	-25.09	40.19	35.68
	(16.59)	(15.50)	(19.10)

Standard deviations in parentheses.

Source:

European Economy, Supplements B and C, various issues, May 1974-May 1990.

[1] Jan 1975-May 1990

Respondents in other countries expected inflation to slow somewhat (responses between zero and 50), with the greatest slowdown in inflation expected in Denmark. Italy and Belgium -- not Germany -- are the countries with the least variation in expectations about price trends. Finally, the last column shows that all countries, on average, expected unemployment to rise. Italians expected the largest increase in unemployment, on average, and Germans the smallest.

3.b. Empirical Methodology

We interpret expected economic prospects as a measure of (minus) the expected loss function for residents in each country. We also assume that economic prospects are a function of expected inflation and expected unemployment: the greater the expected price increases and the expected unemployment, the worse anticipated general economic conditions.[11]

$$-\mathcal{L}^i = EP^i = F(PT^i, UT^i) \qquad (1)$$

where EP is expected general economic situation in country i

PT is expected price trends in country i

UT is expected unemployment in country i

Our next step is to take a linear approximation to the loss function F(.). This equation is used in the estimation. (Future work will consider other specifications, such as a quadratic function that fits the standard theoretical specification of objective functions more closely.) The weights on PT and UT in determining EP provide indicators about attitudes toward inflation and

[11] Ideally, we would analyze survey responses to questions about whether inflation or unemployment is considered a more serious problem. Such data is available for the U.S., and has been studied by Fischer and Huizinga (1982). However, these data are not available, in a time series, for European countries.

unemployment. As discussed above, these survey responses are not directly comparable across countries. However, a decrease in a given country's tolerance for unemployment relative to inflation should imply a fall in the weight (a smaller negative weight) on UT relative to PT in determining general economic prospects. Thus, changes in attitudes should imply structural shifts in equation (1).[12] Note that we will estimate the actual weights respondents placed on expected unemployment and expected price trends, and not just the relative weight they placed on unemployment in the loss function ("b" in the model presented in Section 5). This relative weight can be constructed from a ratio of parameters.

Suppose we wished to examine whether a shift in attitudes occurred at a given date s. We could simply construct a dummy variable that was zero before s and unity afterwards, enter it interactively with PT and UT and test whether the coefficients on these interacted variables differ from zero, in the appropriate directions. However, we do not simply wish to test for a prespecified breakpoint, we wish to look at when any shifts in attitudes occurred. These breakpoints need not occur in all countries, and need not occur at the same time for each country which experienced shifts. To look for the timing of any structural shifts, we estimated a series of equations for each country, allowing the breakpoint to range from January 1976 to May 1989.[13] Thus, we estimated the following equation for each country:

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[12] It is important to point out that there are alternative interpretations for changes in the coefficients in equation (1). One other possibility is that "general economic prospects" is really an indicator of expectations about future economic growth, instead of an indicator of expected welfare. If so, changes in respondents perceptions about the structural relationships between inflation, unemployment and growth would cause the coefficients to change. In general, it is very difficult to distinguish between these two interpretations.

[13] This formulation assumes that any possible change in attitudes occurred all at once. It would also be interesting to look for gradual changes in attitudes, for example using a specification that allows for time varying parameters.

$$EP = C_0 + C_1*UT + C_2*PT + D*(C3 + C4*UT + C5*PT) + e \quad (2)$$

where D = 1 after the breakpoint, 0 otherwise.

In most cases, there was evidence of serial correlation. Our estimations correct for first order autoregressive error terms.[14]

We compare the values of the likelihood function across specifications with different dates for a breakpoint to see which specification best fit the data. A convenient indicator for these comparisons is the posterior odds ratio, PR(s), for each possible breakpoint s. This ratio can be interpreted as the likelihood that the breakpoint occurred at time s relative to the likelihood that it occurred at s*, where s* is the breakpoint at which the value of the likelihood function is maximized.[15] PR(s) is equal to 1.0 for $s=s^*$ and is bounded between zero and one for all other dates, s. The ratio is useful for two reasons. First, it provides some information about how well the data can distinguish between alternative dates for the breakpoint. (For example, values close to one for many dates would suggest that it is difficult to pinpoint when

[14] The strong serial correlation suggests that there may be omitted variables in our equations to explain expectations about next year's economic conditions. We tried including actual levels of inflation and unemployment for each country, and an index of real oil prices. However, this did not significantly reduce the serial correlation problem. Note that including these variables did not qualitatively change the results discussed in the text.

[15] The posterior odds ratio for a breakpoint at date s is defined as :
PR(s) = exp(LF(s)-LF(s*)), where LF(s) is the value of the log of the likelihood function, given a breakpoint at date s and LF(s*) is the value of the likelihood function at the breakpoint s* where it is maximized. Thus, PR(s*)=1. Our procedure is similar to the one followed by Mankiw, Miron and Weil (1987).

the break occurred. Values close to zero at most dates, with a spike at one date, would suggest a clearly identifiable breakpoint. Multiple spikes would suggest more than one shift in attitudes within the sample period.) Second, since the ratio always ranges from zero to one, it facilitates cross country comparison of the degree of confidence about the timing of shifts in attitudes about inflation and unemployment. For each country, we show a plot of the values of the posterior odds ratio across breakpoints, and report the maximum likelihood parameter estimates and diagnostic statistics at breakpoint(s) corresponding to peaks in the value of the likelihood function.

Estimates for C3, C4 and C5 provide information about shifts in attitudes. A negative (positive) estimate for C3 can be interpreted as increased pessimism about overall economic prospects, given expectations about inflation and unemployment. Negative estimates for C4 and C5 can be interpreted as increases in the weights respondents placed on expected unemployment and on expected inflation, respectively. And $(C1+C4)/(C2+C5) > C1/C2$ can be interpreted as a decrease in the relative weight placed on unemployment expectations, or as an indication that respondents have become willing to tolerate more unemployment in return for lower inflation.[16]

[16] While we discuss changes in the estimated weight on unemployment relative to inflation, the estimated change in this ratio was only statistically significant in the cases of Belgium and Ireland.

4. ESTIMATION RESULTS

Is there any evidence of a shift in attitudes toward inflation among the residents of EMS member countries? If so, when did it occur, and in which direction was the change? This section discusses the results from our empirical analysis for each country. A summary and interpretation of these results is given at the end of the section.

4.a. France

Figure 3 shows the values of the posterior odds ratios for alternative breakpoints for France. It shows that the likelihood function reaches a maximum when the breakpoint is October 1979. This suggests that there was a change in attitudes during the first year the EMS was in operation--not before it was instituted. There are also smaller peaks in the early 1980s. (The value of PR(s=May 1983)=0.43, which can be interpreted as the likelihood that a shift occurred in May 1983 relative to the likelihood that it occurred in October 1979 is 43%. Similarly, PR(s=October 1986)=0.53) This suggests that there were additional shifts in attitudes during the early years of the exchange rate system. This result is quite interesting, in light of the fact that it was not until after 1983 that French monetary policy and inflation performance began to converge to policy and performance in Germany.

The first two columns of Table 3 show parameter estimates for France, assuming an October 1979 breakpoint. The equations fit quite well. They show that, on average in the 1970s, French respondents put about three times the weight on expected unemployment that they placed on expected inflation in forming their assessments of general economic prospects. (C1/C2 is about three.) The first column shows that, after October 1979, there is weak evidence that respondents became more pessimistic about general economic prospects ($C3 < 0$) and that

Figure 3

Posterior Odds Ratio

France

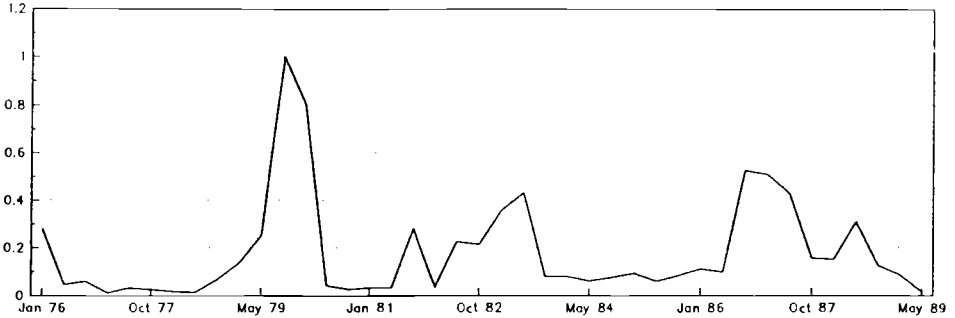

Figure 4

Posterior Odds Ratio

Italy

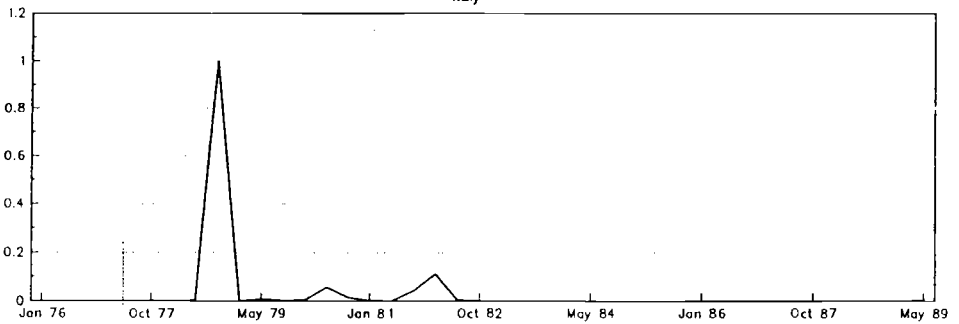

Table 3

Estimation Results
France and Italy

$$EP = C_0 + C_1 \cdot UT + C_2 \cdot PT + D\ \{C_3 + C_4 \cdot UT + C_5 \cdot PT\}$$

Breakpoint	France Oct. 1979	France Oct. 1979	France May. 1983	Italy Oct. 1978
C_0	6.334	3.255	8.406	25.678
	(1.376)	(1.388)	(2.132)	(3.345)
C_1	-0.563	-0.532	-0.600	-0.434
	(7.256)	(-7.759)	(-8.738)	(-4.731)
C_2	-0.196	-0.148	-0.270	-0.656
	(-2.015)	(-1.969)	(-3.324)	(-4.333)
C_3	-4.213	--	-9.680	35.208
	(-0.781)		(-1.795)	(3.791)
C_4	0.041	-0.010	0.146	-0.083
	(0.404)	(-0.124)	(1.379)	(-0.621)
C5	-0.118	-0.172	-0.049	-0.364
	(-1.040)	(-1.955)	(-0.421)	(-1.922)
Rho	0.511	0.485	0.623	0.449
	(4.015)	(3.765)	(5.403)	(3.325)
ln L	-129.90	-130.23	-130.736	-129.027
$\bar{R}^{2*}$	0.814	-0.800	0.765	0.856
Nobs	49	49	49	49
C_1/C_2	2.9	3.6	2.2	0.7
$(C_1+C_4)/(C_2+C_5)$	1.9	2.6	1.4	0.5

Maximum Likelihood estimates, correcting for first order autocorrelation.
Rho: first order autocorrelation coefficient. Sample: May 1974 to May 1990.
t-statistics in parentheses. D is a dummy equal to zero before the breakpoint and one from then on.
* Based on transformed data, using autocorrelation coefficient, Rho.

the weight they placed on price expectations increased ($C5 < 0$). However, neither of these estimates is statistically significant.

It is possible that there is not enough data to distinguish between a change in attitudes toward inflation and an increase in pessimism more generally. In the second column, the latter change is ruled out (C3 is constrained to equal zero). These estimates do show a statistically significant increase in the weight on inflation. They suggest that the weight on unemployment relative to the weight on inflation fell somewhat, from 2.9 before October 1979 to 1.9 afterwards. Of course, this result raises the question why French voters elected Francois Mitterand, and his very expansionary platform, in 1981.

The third column of Table 3 provide estimates, assuming a breakpoint in May 1983. Here, C3 is significantly negative, suggesting that French respondents did anticipate less positive economic conditions in general as French macroeconomic policies under Mitterand became more restrictive. These results suggest that, before May 1983, the relative weight on unemployment was 3.6 and provide weak evidence of a decrease after May 1983 to 2.6. These findings are consistent with the view that French households' concerns about inflation increased gradually during 1982-83.

4.b. Italy

Figure 4 shows the values of the posterior odds ratios for Italy across alternative breakpoints. Here, there is a clear, single spike of the likelihood function in October 1978. Interestingly, this is only a few months before the EMS began operation. There is little evidence of additional shifts later on.

The last column of Table 3 shows parameter estimates, assuming an October 1978 breakpoint. Again, the overall fit of the equation is quite good. In contrast to France, Italian respondents became more optimistic on average about general economic performance during the EMS period. Like French respondents, Italians appear to have become less willing to tolerate inflation after October 1978. The weight on price trends rises and the shift is statistically significant--even allowing for a change in the constant term. The weight on unemployment relative to inflation declined from 0.7 to 0.5 after the breakpoint.

4.c. Germany

Figure 5 plots the posterior odds ratio across alternative breakpoints for Germany. It shows that the likelihood function peaks for breakpoints during October 1988-89. It also gives some evidence that attitudes were shifting in 1984-86. However, there are only 6 observations from October 1988 to the end of our sample, providing little information about such a recent shift in attitudes. We also wished to allow for a possible shift in attitudes following the collapse of the Berlin Wall in late 1989. Thus, in addition to looking at parameter estimates for breakpoints in October 1988 and January 1986, we also allow the coefficient on price trends to shift in October 1989, together with a general shift in attitudes in January 1986.

Table 4 presents the three sets of estimates. Results for an October 1988 breakpoint are in column 1. They point to results that we did not expect. German respondents' tolerance for inflation relative to unemployment appears to have increased sharply. They also appear to have become more pessimistic about general economic prospects at the end of the 1980s. However, these results are somewhat strange in two respects. First, they suggest that Germany did not care at all about price trends after October 1988 ($C_2 + C_5$ is close to zero). Second they suggest

Figure 5

Posterior Odds Ratio

Germany

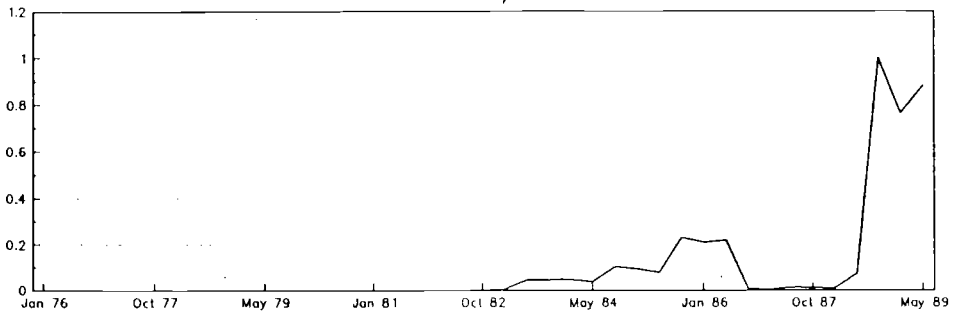

Figure 6

Posterior Odds Ratio

Belgium

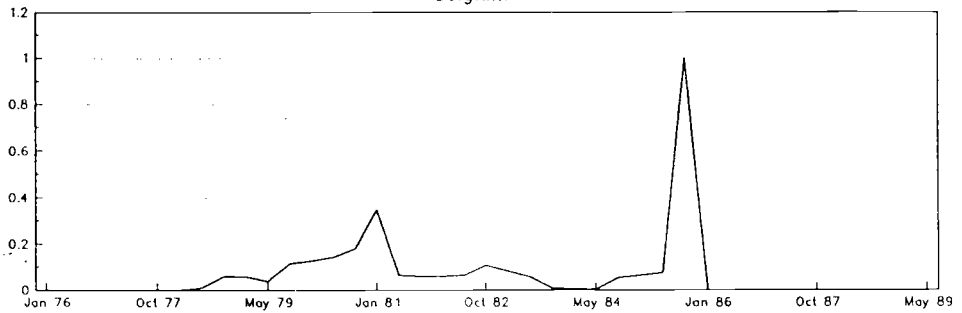

Table 4

Estimation Results
Germany

$$EP = C_0 + C_1 \cdot UT + C_2 \cdot PT + D\{C_3 + C_4 \cdot UT + C_5 \cdot PT\} + D_2 \cdot C_6 \cdot PT$$

Breakpoint	Oct. 1988	Jan. 1986	Jan. 1986 Oct 1989 .(PT only)
C_0	7.049 (3.153)	12.440 (3.121)	12.528 (3.921)
C_1	-0.576 (-11.760)	-0.553 (-9.505)	-0.583 (-12.551)
C_2	-0.229 (-3.267)	-0.378 (-3.268)	-0.367 (-4.023)
C_3	-12.058 (-1.374)	-10.612 (-2.155)	-9.448 (-2.360)
C_4	0.750 (2.632)	0.082).517)	0.052 (0.375)
C_5	0.237 (0.851)	0.491 (2.636)	0.334 (2.046)
C_6	--	--	0.309 (3.061)
Rho	0.381 (2.741)	0.444 (3.211)	0.239 (1.604)
ln L	-133.375	-134.933	-130.848
$\bar{R}^{2*}$	0.834	0.811	0.872
Nobs	49	49	49
C_1/C_2	2.52	1.46	1.59
$(C_1+C_4)/(C_2+C_5)$	21.75	-4.17	16.1

Maximum likelihood estimates, correcting for first order autocorrelation. Rho: first order autocorrelation coefficient. Sample: May 1974 to May 1990. t-statistics in parentheses. D is a dummy equal to zero before the breakpoint and one from then on. D_2 is a dummy equal to zero before October 1989, and one from then on.

* Based on transformed data, using autocorrelation coefficient, Rho.

that as German respondents expected unemployment to increase, they became more sanguine about general economic prospects ($C_1 + C_4 > 0$). Both may be an artifact of assuming that only one shift in attitudes occurred during the sample.

The second two columns of Table 4 assume an earlier breakpoint--January 1986. In the middle column, we allow for only one shift, while in the last column, we allow for an additional shift--attitudes towards inflation are allowed to shift again in October 1989 in response to developments in the former East Germany. We focus on the latter, which suggest three conclusions. First, German respondents do appear to have become more pessimistic, on average, about their economy in the mid 1980s. Second, the weight Germans placed on expected price trends declined significantly in the mid 1980s. In fact, C2+C5 is close to zero. (There was no change in their weight on unemployment.) Increased German tolerance of inflation may help to resolve the puzzle of why Germany has been willing to stay in an EMS that leads to higher German inflation. Finally, there appears to have been a further reduction in the weight German respondents placed on price movements after October 1989. This is consistent with West Germans expecting German unification to increase inflation, but at the same time, feeling more positive about the likely performance of their economy. Unfortunately, there are too few observations post October 1989 to distinguish between a general shift in optimism and a shift in attitudes toward inflation.

4.d. Belgium and the Netherlands

These two countries did not pull out of the Snake in the 1970s (see footnote 4), but chose to follow German leadership. They also resemble Germany here, in that parameter estimates in each imply a rise in relative tolerance for inflation. Looking first at Belgium, the plot of the

posterior odds ratio in Figure 6 shows an initial peak in January 1981, with some evidence that attitudes had been shifting during the previous two years, and then a much larger peak in October 1985. The parameter estimates presented in Table 5 show a significant increase in the weight on expected unemployment after January 1981. After October 1985, there is evidence that the weight on inflation declined (the point estimate is close to zero).

Turning next to the Netherlands, Figure 7 shows that there appear to be a number of candidates for a breakpoint. In fact, all show attitudes shifting in the same direction: increasing tolerance for inflation and/or decreasing tolerance for unemployment. Table 5 shows estimation results assuming breakpoints in October 1977 and in May 1986. For the earlier breakpoint, none of the changes in coefficients are statistically significant. (Constraining the constant term to be the same across sub-periods did not alter this result.) However, the estimates suggest that the weight Dutch respondents placed on unemployment relative to inflation rose from 0.5 to 1.9. The estimates for the later breakpoint show a further shift, to a relative weight on unemployment of 3.4 after May 1986.

4.e. Ireland

Ireland also seems to have experienced a decrease in tolerance for unemployment. The likelihood function exhibits a series of peaks from late 1982 through 1986. (Figure 8) The last column of Table 5 gives the parameter estimates, assuming the breakpoint was January 1986. These show that the weight on price trends declined in the second sub-period while the weight on unemployment rose. Both coefficient estimates differ significantly from their estimated values in the earlier sub-period. The weight Irish respondents placed on unemployment relative to inflation rose from slightly less than 1.0 before January 1986 to 2.8 afterwards.

Figure 7

Posterior Odds Ratio

Netherlands

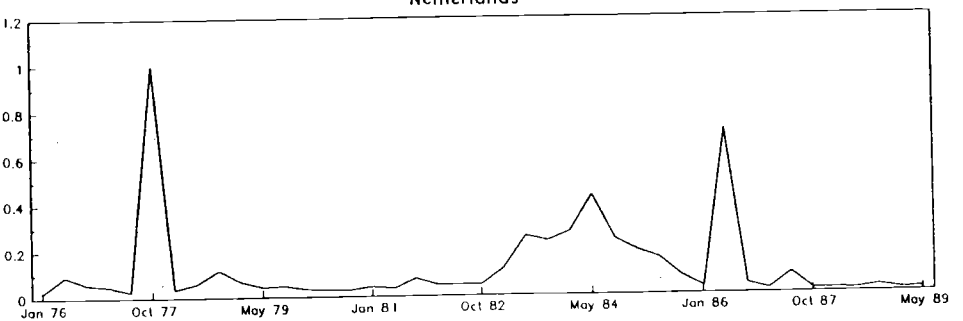

Figure 8

Posterior Odds Ratio

Ireland

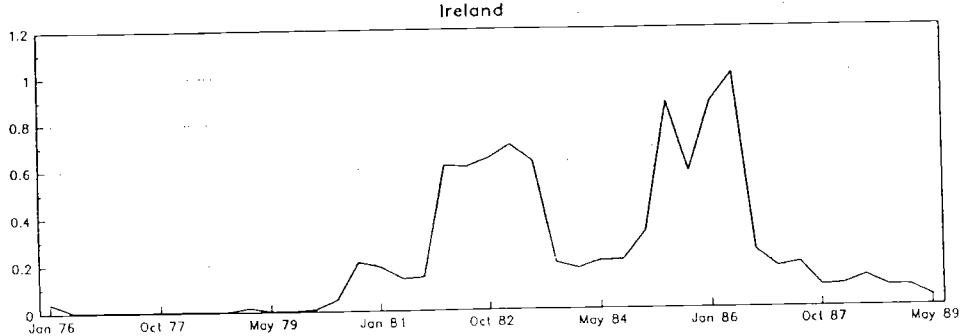

Table 5

Estimation Results
Belgium, Netherlands, Ireland

$$EP = C_0 + C_1 \cdot UT + C_2 \cdot PT + D\ \{C_3 + C_4 \cdot UT + C_5 \cdot PT\}$$

	Belgium		Netherlands		Ireland
Breakpoint	Jan. 1981	Oct. 1985	Oct. 1977	May 1986	Jan. 1986
C_0	4.531	6.441	39.284	21.381	21.613
	(1.182)	(1.992)	(1.943)	(3.855)	(6.694)
C_1	-0.489	-0.569	-0.378	-0.536	-0.608
	(-8.462)	(-10.976)	(-2.606)	(-8.181)	(-15.235)
C_2	-0.391	-0.349	-0.762	-0.417	-0.616
	(-3.733)	(-3.870)	(-1.663)	(-3.105)	(10.564)
C_3	13.612	0.016	-29.265	-16.931	0.656
	(2.398)	(0.002)	(1.426)	(-2.767)	(0.112)
C_4	-0.349	-0.058	-0.145	-0.071	-0.275
	(-4.212)	(0.415)	(-0.974)	(-0.460)	(-0.074)
C_5	0.138	0.315	0.482	0.274	0.296
	(0.811)	(1.427)	(1.022)	(1.224)	(1.680)
Rho	0.527	0.360	0.687	0.639	0.109
	(4.169)	(2.574)	(6.526)	(5.554)	(0.684)
ln L	-127.991	-126.936	-152.006	-152.352	-130.707
$\bar{R}^{2*}$	0.893	0.922	0.733	0.745	0.926
Nobs	49	49	49	49	49
C_1/C_2	1.25	1.63	0.50	1.29	.99
$(C_1+C_4)/(C_2+C_5)$	3.31	15.03	1.87	3.44	2.76

Maximum likelihood estimates, correcting for first order autocorrelation.
Rho: first order autocorrelation coefficient. Sample: May 1974 to May 1990.
t-statistics in parentheses. D is a dummy equal to zero before the breakpoint and one from then on.
* Based on transformed data, using autocorrelation coefficient, Rho.

4.f. Denmark

As shown in Figure 9, there appear to be two breakpoints for Denmark--an early one in 1976 and one a decade later. Table 6 presents parameter estimates for both. The early breakpoint suggests that, in the mid 1970s, Danish respondents placed little weight on inflation in their general economic assessments--the relative weight on unemployment was 11.1. This changed dramatically, as the relative weight on unemployment fell to just 0.5 after May 1976. (However, we have only a few observation in the earlier sub-period.) The second set of estimates, with a January 1986 breakpoint, is quite different. They point to a rise in Danish tolerance for inflation and a decline in tolerance for unemployment. (This shift resembles the ones discussed above for Germany, Belgium, the Netherlands and Ireland.) Perhaps the relatively low explanatory power of the regressions for Denmark is due to the assumption of a single shift in attitudes.

Without additional information about the early 1970s, it is difficult to test for multiple breakpoints. Instead, we allow only the coefficient on PT to change in January 1976, assuming a general breakpoint in January 1986. These results are reported in the third column of Table 6. They imply that, prior to 1976, Danish respondents placed about the same weight on inflation and unemployment. During 1976-86, their concern about inflation increased significantly ($C6<0$). After 1986, they became significantly more pessimistic about their economy overall. There is also weak evidence that the relative weight placed on unemployment rose somewhat.

4.g. United Kingdom

Finally, we look at the U.K., the only country in our sample that was not a member of the exchange rate mechanism of the EMS. Figure 10 shows that the value of the likelihood

Figure 9

Posterior Odds Ratio

Denmark

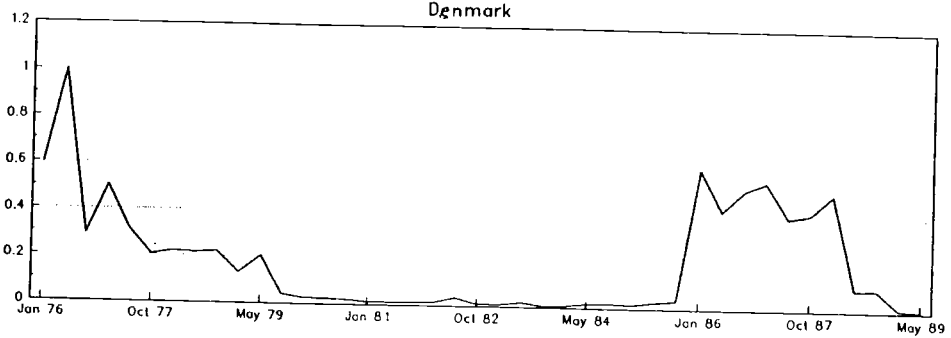

Figure 10

Posterior Odds Ratio

United Kingdom

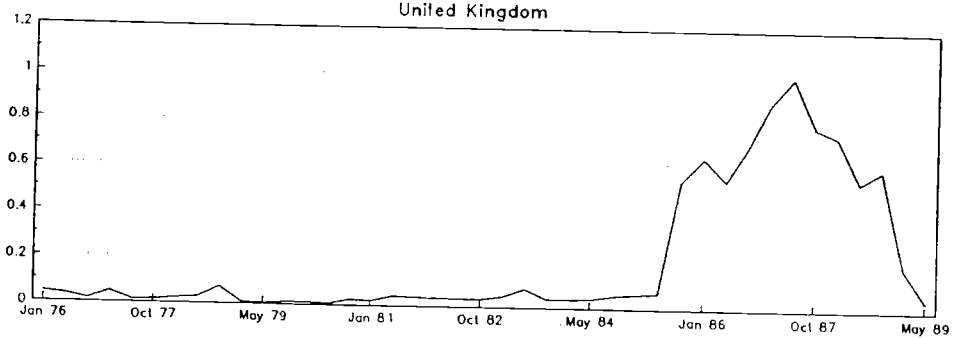

Table 6

Estimation Results
Denmark & the U.K.

$$EP = C_0 + C_1 \cdot UT + C_2 \cdot PT + D\{C_3 + C_4 \cdot UT + C_5 \cdot PT\} + D_2 \cdot C_6 \cdot PT$$

Breakpoint	Denmark May 1976	Denmark Jan. 1986	Denmark Jan. 1986 Jan 1976. (PT only)	U.K. May 1987
C_0	-5.977 (-0.679)	-10.883 (2.861)	11.157 (2.315	24.999 (6.631)
C_1	-0.522 (-3.532)	-0.351 (-4.349)	-0.379 (-5.110)	-0.585 (-6.576)
C_2	-0.047 (-0.229)	-0.733 (-6.572)	-0.361 (-2.692)	-0.480 (-4.753)
C_3	10.908 (1.313)	-11.228 (-2.121)	-13.360 (-2.537)	38.482 (2.257)
C_4	0.120 (0.722)	-0.225 -1.236)	-0.219 (-1.260)	0.141 (0.544)
C_5	-0.731 (-3.022)	0.191 (0.351)	0.287 (0.565)	_1.059 (-2.762)
C_6	--	--	-0.471 (-3.346)	--
Rho	0.843 (10.990)	0.629 (5.497)	0.812 (8.908)	0.134 (0.844)
ln L	-151.240	-151.750	-147.020	-160.492
$\bar{R}^{2*}$	0.644	0.665	0.695	0.741
Nobs	49	49	49	49
C_1/C_2	11.11	0.48	1.05	1.22
$(C_1+C_4)/(C_2+C_5)$	0.52	1.06	8.08	0.29

Maximum Likelihood estimates, correcting for first order autocorrelation. Rho: first order autocorrelation coefficient. Sample: May 1974 to May 1990. t-statistics in parentheses. D is a dummy equal to zero before the breakpoint and one from then on. D2 is a dummy variable equal to one before 1976 and zero from then on.

* Based on transformed data, using autocorrelation coefficient, Rho.

function peaks for a breakpoint in May 1987.[17] Estimates for this shift date are given in the last column of Table 6. These estimates suggest that British respondents became more optimistic about their economy overall after 1987, but that there was a large and significant increase in their tolerance for unemployment relative to inflation. (The relative weight on unemployment falls from 1.2 before 1987 to 0.3 more recently.)

4.h. Summary and Discussion

These empirical results provide surprisingly strong support for the hypotheses advanced at the beginning of this paper. Shifts in attitudes about unemployment relative to inflation can help to explain the "success" of the EMS--increased convergence of monetary policies and inflationary performance among members. To summarize, Italians became more tolerant of unemployment relative to inflation shortly before the EMS came into operation. Unemployment tolerance also increased in France, but the shift appears to have begun somewhat later, with most of the change occurring after the EMS was already in operation. (In both countries, the shift comes after the failure of the Snake.) In contrast--and surprisingly--Germany seems to have experienced a rise in relative tolerance for inflation in the mid 1980s, in the sense that expected inflation became a less important determinant of overall assessments of the future economic situation. This was reinforced at the end of the decade, perhaps by German unification. Belgium and the Netherlands--both members of the Snake, and perhaps "closer" to Germany--as well as Ireland seem to have had similar rise in their tolerance for inflation. However, their shifts appear to have occurred earlier than the shifts in Germany. Denmark experienced both

[17] Interestingly, the 1987 breakpoint coincides with the abandonment of the U.K.'s medium term financial strategy.

a decline in tolerance for inflation in the mid 1970s and a subsequent reversal in the mid 1980s. Last but not least, the U.K. has experienced a fall in tolerance for inflation at the end of the 1980s, consistent with its late entry into the exchange rate mechanism of the EMS.

5. ATTITUDES TOWARDS INFLATION AND THE CHOICE OF AN OPTIMAL CENTRAL BANKER

The previous section has presented evidence of shifts in attitudes toward inflation and unemployment in Europe since the late 1970s. In particular, there appears to have been some convergence in attitudes, in the sense that initially high inflation countries (such as France and Italy) have become less tolerant of inflation relative to unemployment, while attitudes in traditionally low inflation countries (such as Germany) have shifted in the opposite direction.

This section develops a theoretical framework to illustrate how such shifts in private sector attitudes might make fixed exchange rates more likely. The model is based on the new theories of economic policy which suggest how societies concerned about the stability of both prices and output may solve the dilemma between the lack of credibility of an "activist" central banker, and the cost of giving up monetary policy as a stabilization tool by delegating the conduct of monetary policy to an independent central banker whose preferences for output and price stability are slightly more "conservative" than society's.[18]

More specifically, we follow recent work by Alesina and Grilli (1991) that assumes citizens elect central bankers by majority rule. They have shown that if citizens were to vote

[18] For an early statement of this view see Rogoff (1985b). Empirical evidence can be found in Grilli, Masciandaro and Tabellini (1991).

upon which type of central banker to appoint, they would choose one who values price stability more than the median voter.[19] Next we study the consequences of a shift in consumers' attitudes towards inflation. We ask the following question: assume that after the shift in preferences the first-best outcome (the election of a new central banker) is ruled out. Then there are two options: (1) keep the current central banker--who is no longer optimal since tastes have changed or (2) force the domestic central banker to relinquish her monetary sovereignty -- for example, by signing an international agreement that commits the central bank to peg the exchange rate.

5.a Voters' preferences and the optimal central banker

The starting point is the time-consistency problem illustrated by Kydland and Prescott (1977), and Calvo (1978). Following Barro and Gordon (1983) we assume that the time-consistency problem arises from the central banker's attempt to steer the economy towards a higher output growth. The preferences of the central banker are described by the loss function:

$$L = E[p^2 + b(x-k)^2] \qquad (3)$$

where E(.) is the expectation operator, p the inflation rate, and (x - k) the deviation of the level of output from the central banker's target k. The parameter b measures the weight that the central banker attaches to output fluctuations, relative to fluctuations in the level of inflation. Output is determined by an expectational Phillips curve:

[19] The original work by Rogoff (1985b) was not cast in the framework of a voting equilibrium: he simply showed that society's welfare can be improved by appointing a central banker whose preferences differ from those of society.

$$x = (p - Ep) + e \tag{4}$$

where the "natural" rate of output has been assumed equal to zero, the elasticity of output with respect to unexpected inflation equal to 1, and e is an i.i.d. real shock with mean zero and variance σ^2_e. Expectations are formed--and wages are negotiated--before the central banker sets the inflation rate; the realization of the random shock e is known to the central banker at the time of setting monetary policy, but not to wage setters when contracts are signed. It is well-known that in this set-up the time-consistent levels of inflation and output are:

$$p = b \cdot k - \frac{b}{1+b} e \tag{5}$$

$$x = \frac{1}{1+b} e \tag{6}$$

Equations (5) and (6) illustrate the time-consistency problem. If the central banker attempts to steer output away from the natural rate ($k > 0$), the average rate of inflation rate is positive (its optimal level in (3) is zero). The tradeoff between average inflation and the variance of output, $\sigma^2_x = \sigma^2_e/(1+b)^2$, depends on the value of the parameter b. The lower is b in the central banker's objective function, the lower is inflation (on average), but the higher is the variance of output. If b were equal to zero, (average) inflation would be eliminated, but monetary policy would loose any ability to use private in formation about real shocks to stabilize output.

Suppose now that voters were able to elect a central banker who, during her term of office, could freely pursue her preferred monetary policy--i.e., once elected the central banker cannot be recalled until the end of her term. Voters differ with respect to the relative weight they attach to inflation and to output stabilization. Voter i's preferences are described by a loss function identical to (3), but with a relative weight b_i on the two objectives. Under majority rule the central banker elected will be the one preferred by the median voter, that is by the voter characterized by the median value of b_i: b_m. As shown by Alesina and Grilli (1991), the first order condition that determines the type of central banker chosen by the median voter is:

$$b^* \cdot k^2 - \left(\frac{\sigma_e^2}{(1+b^*)^3} \right) \cdot (b_m - b^*) = 0 \qquad (7)$$

The parameter b^*, which characterizes the preferences of the "optimal" central banker from the viewpoint of the median voter (and thus of the central banker that will be elected by majority rule) is a function of the preferences of the median voter, b_m, and of the variance of real shocks. Equation (7) shows that, for $\sigma^2_e > 0$, b^* is always positive, but smaller than b_m: as originally shown by Rogoff (1985b) the median voter has an incentive to appoint a central

banker that is more "conservative" than herself--that is, a central banker who values fighting inflation more than the median voter.[20]

2.b The choice to relinquish monetary sovereignty

Consider now the effects of a change in voters' preferences. Let us assume that the distribution of preferences across voters shifts so as to result in a lower value of b_m: the median voter becomes relatively more concerned about inflation.[21] As b_m falls, so does b^* according to equation (7).[22]

The obvious outcome of a change in voters' preferences is that, at the end of the term of office, a new central banker is elected, whose preferences reflect the change in voters' concerns for output and price stability. For the purpose of our discussion, however, we are interested in studying the case when the first-best outcome (the election of a new central banker) is ruled out. We consider two options: (a) keep the current central banker--who is no longer optimal, but cannot be removed; or (b) short-circuit the independence of the domestic central banker by signing an international agreement that implies relinquishing domestic monetary

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[20] The "independence" of the central banker during her term of office is crucial to the result, as it amounts to a form of precommitment. If the central banker could be recalled before the end of her term, it would be impossible to improve upon the time-consistent equilibrium corresponding to $b = b_m$, which, by the first-order condition (5), is inferior to the equilibrium corresponding to $b = b^*$. The length of the central banker's term of office is clearly crucial because when a new one is elected b^* can change. What is relevant, in the framework of this model, is that the length of office be at least as long as that of wage contracts.

[21] In our empirical work we have tested for a change in consumers' preferences assuming that the median and the average voter--the only one we can observe--coincide. This obviously depends on the distribution of preferences.

[22] It is straightforward to show, from (5), that the derivative of b^* with respect to b_m is positive.

sovereignty--for example, a commitment to passively peg the exchange rate to a foreign currency, made credible by a sufficiently high political cost of abandoning the peg.

What are the costs and benefits of option (b)? If the shift in voters' preferences reflects an increased concern for inflation, then replacing the domestic monetary authority (elected at a time when inflation was not perceived as such a serious problem) with a foreign central banker more committed to price stability may be an attractive option. The cost is a higher variance of domestic output since the foreign central banker--to the extent that she cares--will stabilize output in her own country. The correlation between domestic and foreign real shocks will thus be an important factor in the decision to relinquish monetary sovereignty.

The choice between options (a) and (b) is illustrated in Figure 11. The parameter b, shown on the horizontal axis, characterizes the preferences of the relevant central banker. On the vertical axis is the value of the median voter's loss function: $L(b, b_m)$ is the loss function under the "old" voter's preferences (b_m): it is minimized at $b = b^*(b_m)$. A shift in preferences, from b_m to $b_m' < b_m$, implies that the "optimal" central banker will be relatively more concerned about inflation also (b^* falls along with b_m.) The relevant comparison is between $L(b^*(b_m), b_m')$ --point A--and the value of the loss function at some other point, say for $b=b_f$, which corresponds to the relative weight that the foreign central banker attaches to price and output fluctuations--point B in the figure.

We shall first study the simpler case where $b_f=0$: the foreign central banker is only concerned about price stability and gives no weight to fluctuations in output. This case is simpler because the covariance between domestic and foreign real shocks is obviously irrelevant. We shall then ask how the incentive to relinquish monetary sovereignty is affected by the

Figure 11

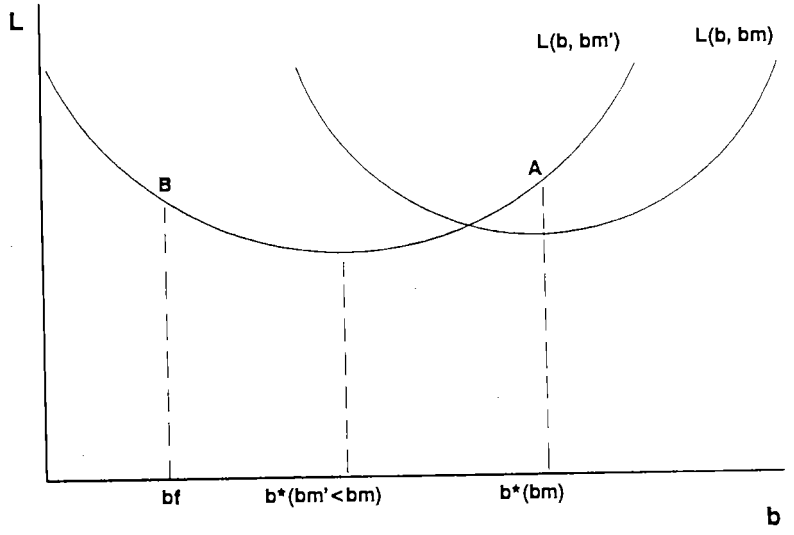
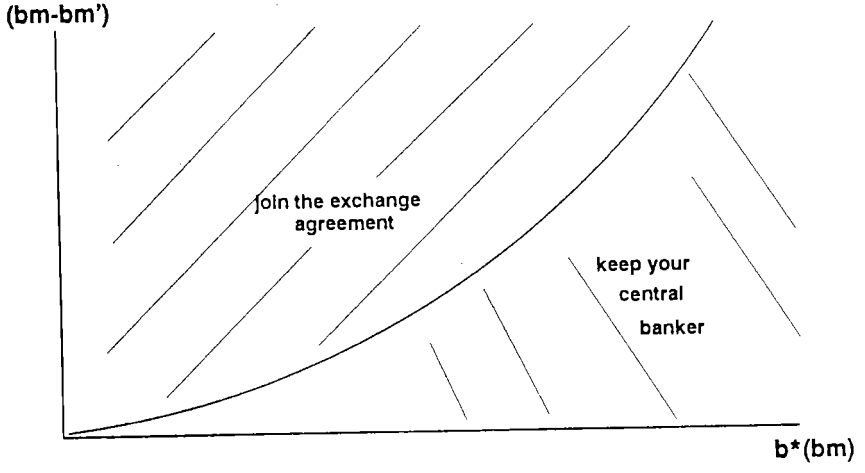


Figure 12



covariance of real shocks, when the foreign central banker is also trying to stabilize (her own) level of output.

2.b.i Pegging to a central banker solely committed to price stability

As we show in equation (A4) in the appendix, the choice between options (a) and (b) can be described by Figure 12. On the horizontal axis appears $b^*(b_m)$, which characterizes the preferences of the central banker that was optimal before the shift in preferences. This is shown on the vertical axis: $(b_m - b_m')$. The locus through the origin describes the points where the median voter, following the shift in preferences, is indifferent between keeping the domestic central banker, and deciding to short-circuit her independence by signing an international agreement that commits her to passively peg to her foreign counterpart. This will happen whenever the shift in preferences is sufficiently large, given how different the two central bankers available are: the domestic one, whose preferences are described by $b^*(b_m)$, and the foreign one, whose b equals zero. If the concern for inflation was relatively high to start with (thus resulting in a relatively high value of b^*) the shift must be large to convince the median voter to "adopt" a foreign central banker who only cares about price stability. An increase in the variance of domestic real shocks (that for given voters' preferences raises b^*) shifts the indifference locus upwards: the shift in preferences must be larger to justify abandoning the home central banker--even if she is no longer optimal.

2.b.ii The correlation between domestic and foreign real shocks

If the foreign central banker, like the domestic one, were chosen by majority rule, her concern for output stabilization would not be zero, as assumed above. We show in the appendix that if the correlation between domestic and foreign real shocks is small, the higher is b_f (the

parameter describing the preferences of the foreign central banker) the less likely is the median voter to decide to give up monetary sovereignty. This is true even if b_f happens to match the preferences of the new "optimal" central banker (from the viewpoint of the domestic voter), as long as the covariance of real shocks is small, because the home country imports a positive rate of inflation that abroad is justified by the gains in terms of output stabilization, but at home is just a source of inefficiency.

This has the following important implication: if the correlation between domestic and foreign real shocks is zero a foreign central banker stubbornly committed to price stability is preferable, even relative to one that happened to attach the "optimal" weight to price and output stabilization.

As the correlation between domestic and foreign real shocks rises, the home country starts benefitting from the stabilization independently carried out by the foreign central banker: for a given shift in preferences, the higher the correlation the more likely it is that the median voter will choose to relinquish monetary sovereignty. In terms of Figure 12, an increase in the correlation between domestic and foreign real shocks shifts the locus downward, increasing the chances that the domestic central banker will be short-circuited.

(A formal proof is provided in the appendix.)

6. CONCLUDING REMARKS

History has provided us with a number of examples of multiple country fixed exchange rate regimes that have eventually fallen apart. At the top of the list is the Bretton Woods System, which collapsed in 1971. Early attempts at a European exchange rate system also failed--notably the Snake that was formed in 1972 with 10 members, but had dwindled to only five small countries pegging to Germany by 1979 when it was replaced by the EMS.

In light of these failures, why has the EMS been so successful in reducing inflation differentials and stabilizing exchange rates among members and indeed in expanding its membership? This paper has argued that a key factor in explaining these successes has been a convergence in attitudes toward inflation and unemployment in Europe since the late 1970s. In contrast, analysts of the Bretton Woods collapse point to a growing divergence in attitudes toward inflation, and in the resultant policy choices--from the late 1960s. However, the EMS was not initially viewed as a success. In its early years (1979-82) there is little evidence that membership in its exchange rate mechanism (ERM) forced countries to give up monetary sovereignty. France and Italy both followed quite expansionary monetary policies, in contrast to Germany. Both experienced rising inflation, and underwent a series of large exchange rate adjustments. Interestingly, other countries that did not participate in the ERM, such as the U.K. (and the U.S.) did significantly reduce their inflation rates during the early 1980s. However, since 1982, there has been widespread convergence of policy and performance among ERM members, and membership has expanded to include Spain and the U.K.

This paper had two tasks. First, it presented some new empirical evidence to support the view that one important reason for the success of fixed exchange rates in the EMS has been

a convergence of attitudes toward inflation and unemployment among EMS members. Second, it developed a theoretical framework to illustrate why shifts in attitudes of voters within a given country might lead that country to give up monetary sovereignty by pegging its exchange rate to a "leader."

The theoretical section of the paper can be summarized as follows. Consider a country that has inherited a central bank with a prespecified stance towards fighting inflation--ie. preferences that were optimal given voters' past preferences towards inflation and unemployment. Now suppose that the median voter becomes more concerned about inflation. There are two possible outcomes. First, the country might engineer a change in the anti-inflation stance of its own central bank. Whether this is possible depends on characteristics of the country in question, such as its political system, the timing of elections, and the independence of its central bank to political suasion. The second, less preferable option is to tie the hands of the domestic central bank by committing to follow the monetary policy of a central bank that is more dedicated to fighting inflation. The gain from giving up monetary sovereignty is lower inflation. The cost is a reduced ability to stabilize domestic output. The paper shows that whether the country will choose to become (and remain!) a follower depends on how much domestic preferences have shifted, on how different the domestic and the potential leader's central banks anti-inflationary stances are and on the covariance between domestic output and the leader's output.

The empirical section of the paper uses household survey data to look for shifts in attitudes toward inflation and unemployment in eight European countries during 1974-90. For each country, we regress expectations about the general economic situation on expectations about

the behavior of inflation and unemployment, and look for shifts in the structural coefficients. Our empirical results provide considerable evidence for such shifts.

There are three main findings. First, concern about inflation relative to unemployment appears to have increased significantly in both Italy and France during our sample period. Both of these countries had high inflation during the 1970s, and opted to pull out of the Snake. But both reduced their inflation rates and stabilized their exchange rates during the EMS period. Interestingly we find that much of the change in attitudes occurred after the EMS was already in operation--particularly for France. This could help to explain why these countries did not adopt more anti-inflationary policies until the mid 1980s. Exchange rate realignments were not "politicized" and thereby made costly until after 1982. Before this time, ERM membership arguably required little reduction in monetary sovereignty. Second, we also find that the U.K. experienced an increase in concern about inflation in the late 1980s. Perhaps this shift in attitudes was a factor in the recent decision to join the ERM.

The final result is a surprise that we find intriguing: a shift in the opposite direction for households in Germany. During the mid 1980s, they appear to have become less concerned about inflation. Interestingly, some of the small countries that stayed with Germany in the Snake--ie. Belgium, the Netherlands and Denmark--show a similar shift. (Such a shift is also evident in Ireland, which is somewhat more puzzling.) This finding provides a possible explanation for why Germany might be willing to stay in an exchange regime that requires it to accept an higher inflation rate.

Our analysis thus points to some key differences between Bretton Woods and the EMS that help to explain why one system of fixed exchange rates collapsed while the other has

expanded. Consider first the Bretton Woods experience. The early phase (1960-66) saw large inflation differentials, relative to the center (the U.S.) which had relatively low inflation. However, it was difficult to adjust exchange rates resulting in large real misalignments. In the second phase (1967-71), exchange rate adjustments did occur, but there was no convergence in inflation rates. In fact, the differential reversed as U.S. inflation rose relative to inflation in most other members.

The EMS experience is strikingly different. Although there were also large cumulative inflation differentials (with low inflation Germany at the center) in the first phase (1979-87), they were in large part offset by exchange rate realignments, and capital controls helped to avoid disruptive speculative attacks. In the second phase (1987-91), exchange rate adjustments stopped; however, this was sustainable because of the convergence in inflation rates.

Thus, there are two important differences between the two systems. First, the EMS exchange rate mechanism facilitated smooth adjustments of exchange rates in the period before inflation rates converged. Second, a convergence in attitudes toward inflation (and unemployment) appears to have occurred in Europe during the 1980s. This shift in attitudes facilitated -- a convergence in inflationary performance, and made the transition to a system of more rigid bilateral exchange rates sustainable.

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APPENDIX

1. Relinquishing monetary sovereignty to a foreign central banker solely committed to price stability.

We first consider the case where the foreign central banker is solely committed to price stability: that is, the relative weight he assignes to output stabilization is $b=b_f=0$. After a shift in the median voter's preferences, from b_m to b_m', the choice between pegging and keeping the domestic (suboptimal) central banker depends on the difference between the expected values of the loss function at $b=b^*(b_m)$, and $b=b_f 0$:

$$E\,[L(b^*(b_m),\, b_m')] - E\,[L(0,\, b_m')] \qquad (A1)$$

Noting that for any given value of central banker's preferences, b, the expected loss for a voter with preferences b_m is:

$$E\,[L(b,\, b_m)] = 0.5\,(b^2 + b_m)\,[k^2 + \sigma_e^2/(1+b)^2] \qquad (A2)$$

and using the median voter's first order condition, equation (7) in the text, it can be shown that (A1) is equal to:

$$\sigma_e^2 \frac{b^*}{1+b^*}\left[(b_m - b_m') - (b_m - b^*)\left(1 + \frac{b^*(2+b^*)}{(1+b^*)^2} - b^*\right)\right] \qquad (A3)$$

where $b^* \equiv b^*(b_m)$. (A3) is positive for:

$$(b_m - b_m') > b^* + \left[\frac{k}{\sigma_e^2} b^* (1 + b^*)^3\right] \left[1 + \frac{b^*(2 + b^*)}{(1 + b^*)^2}\right] = f(b^*, \sigma_e^2) \qquad (A4)$$

It can also be shown that both $\partial f/\partial b^*$, and $\partial^2 f/\partial(b^*)^2$ are positive, thus justifying the graph in figure 2. Moreover $df/d\sigma^2 = (\partial f/\partial b^*)(\partial b^*/\partial \sigma^2) + \partial f/\partial \sigma^2$ is also positive: an increase in the variance of domestic real shocks shifts the indifference locus upward.

2. The covariance between domestic and foreign real shocks.

We now assume that $b_f > 0$, the parameter that characterizes the preferences of the foreign central banker is positive and smaller than $b^*(b_m)$. In this case the choice whether to relinquish monetary sovereignty depends on the sign of:

$$E\,[L(b^*(b_m), b_m')] - E\,[L(b_f, b_m')] \qquad (A5)$$

Note that (A5) can be decomposed as follows:

$$E\,[L(b^*(b_m), b_m') - L(0, b_m')] + E\,[L(0, b_m') - L(b_f, b_m')]$$

The term in the first square brackets corresponds to expression (A1), whose sign depends on the sign of (A4); the second term is equal to:

$$- b_f^2 k_f^2 - (1 + b_m')\,[b_f/(1 + b_f)]^2\,\sigma_f^2 + 2\,b_m'[b_f/(1 + b_f)]\,\sigma_{df} \qquad (A6)$$

where k_f is the foreign output target, σ_f^2 is the variance of foreign output

shocks, and σ_{df} is the covariance between the shocks to foreign and domestic output. If shocks are uncorrelated, a positive value of b_f (motivated by the fact that the foreign central banker cares about output fluctuations in his own country) reduces the incentive to "adopt" the foreign central banker. As we noted in the text, if the covariance were zero a foreign central banker that happened to be the ideal one after the shift in preferences would be worse than one stubbornly committed to price stability. The intuition requires remembering (from the first order condition described in equation (7) in the text) why would the median voter choose a central banker with a positive b_f, thus resulting in a positive average inflation rate: only because a positive value of b_f dampens the variance of output. But if foreign output shocks are uncorrelated with domestic shocks, from the viewpoint of home residents a positive value of b_f is just a source of inefficiency: it keeps inflation positive with no effects on the variance of <u>domestic</u> ourput. The third term in the expression shows instead that the higher the covariance between foreign and domestic output shocks, the higher the likelihood that "adopting" the foreign central banker may be a superior option. This is because the correlation between domestic and foreign shocks allows the home country to benefit from the stabilization independently carried out abroad.