

**INSTITUTIONAL COMMITMENTS AND POLICY CREDIBILITY:  
A CRITICAL SURVEY AND EMPIRICAL EVIDENCE FROM THE ERM**

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## INTRODUCTION

Since its inception the Exchange Rate Mechanism (ERM) of the European Monetary System has evolved beyond its initial role of reducing nominal exchange rate variability to symbolise the commitment to stable and low inflation rates. In this second role, it is sometimes conjectured that the exchange rate constraint serves to lower inflation by directly influencing inflation expectations in the private sector, thereby accelerating and reducing the output cost of disinflation, as well as by limiting the scope for inflationary monetary and fiscal policies. This paper tries to assess the extent to which inflation expectations have been affected by the increasing commitment to the ERM.

The initial members of the ERM experienced sharp declines in inflation during the **1980s** that were especially pronounced in those countries which entered the ERM with high inflation rates (Table 1, Chart 1). At the same time, however, significant increases in unemployment also occurred that were only partially reversed during the upturn from **1987 to 1990**. The simultaneous rise in unemployment and decline in inflation makes it difficult to assess whether the benefits of ERM membership came primarily in the form of enforcing disinflationary policies via an exchange rate constraint, or whether such a constraint itself contributed to improving the credibility of the commitment to lowering inflation rates and served to directly reduce inflation expectations.

The distinction is important because policies that directly lower inflation expectations will also reduce the costs of disinflation to the extent that actual inflation rates fall with expectations. Thus, the remaining high-inflation countries of the ERM, as well as countries currently outside the ERM, would be able to significantly lower their costs of disinflation if the private sector viewed their commitment to disinflation as being sufficiently credible. In the context of the ERM, the main candidate policy is adherence to a fixed (and preferably, narrow) band of allowable exchange rate fluctuation. In a more general context, a variety of candidate policy rules have been proposed.

This article both examines the analytical foundations of the credibility hypothesis and reviews the econometric evidence on whether or not credibility contributed to low-cost disinflation in ERM countries. The article goes on to provide some independent estimates of possible credibility effects since **1987**, when nominal exchange rates became largely fixed among ERM countries. The greater stability of nominal exchange rates within the ERM since **1987** allows a relatively clear-cut test of the proposition that adherence to a verifiable policy rule based on a nominal anchor will produce a rapid shift in inflation expectations, although the precise degree to which policies are credible is always difficult to access.

After considering both the analytical underpinnings of the credibility model and the empirical evidence, this article concludes that policy credibility in ERM countries has

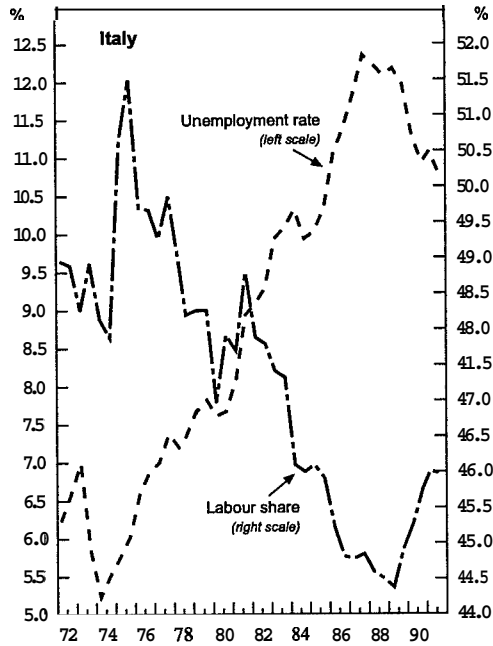
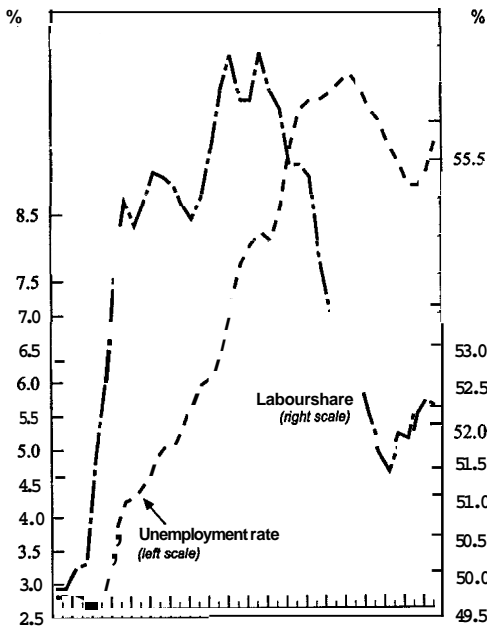
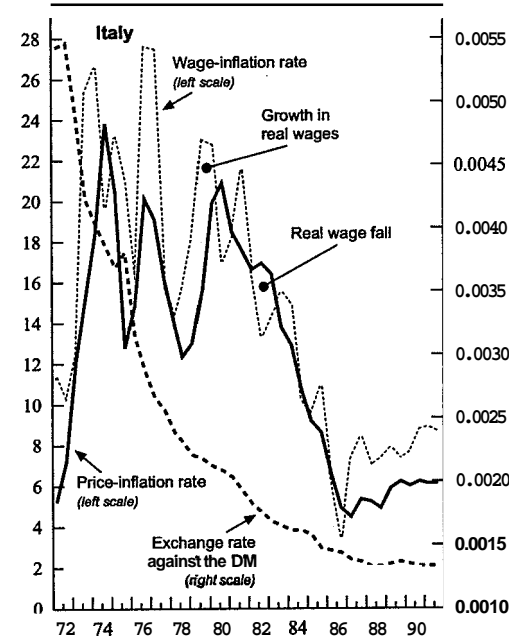
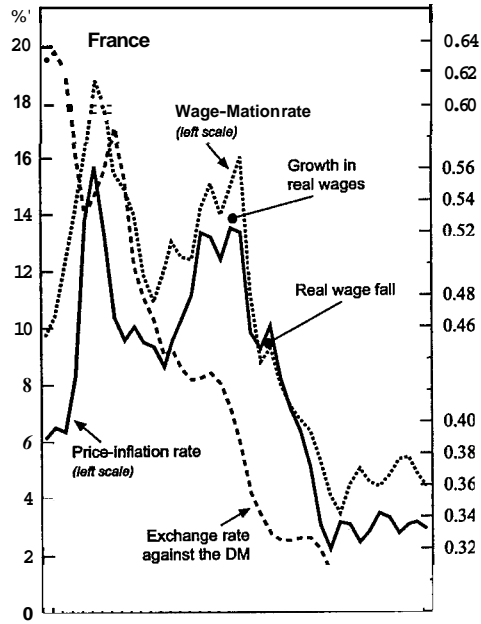
**Table 1. Comparison of inflation rates in ERM and non-ERM countries**

Percentage changes in private consumption deflators at annual rates

	Weights	1978-80	1981-83	1984-86	1987-89	1990	91/90	Rank (Lowest inflation country = 1)		
								1978-80	1987-89	1990
Original ERM countries										
Germany		4.3	5.0	1.4	1.7	2.5	3.8	2	3	2
France	42.0	11.0	11.4	5.4	3.1	2.9	2.8	13	7	5
Italy	35.5	16.0	16.7	8.8	5.5	6.2	6.1	18	14	17
Netherlands	10.1	5.3	4.8	1.6	0.9	2.5	2.7	6	2	2
Belgium	6.5	4.8	7.9	4.2	2.2	3.5	3.2	3	5	9
Denmark	4.7	10.1	9.7	4.5	4.8	2.5	2.7	12	12	2
Ireland	1.2	13.7	14.5	5.5	3.2	3.2	3.0	16	8	7
Weighted average, excl. Germany		11.8	12.3	6.1	3.7	4.1	4.0			
Unweighted average, excl. Germany		10.2	10.8	5.0	3.3	3.5	3.4	11	8	7
New ERM countries										
United Kingdom		12.9	8.2	4.9	5.0	5.0	6.0	15	13	11
Spain		17.4	13.7	9.3	5.7	6.7	2.4	19	15	18
Non-ERM countries										
United States	54.9	9.1	6.3	3.2	4.3	5.0	3.4	9	10	11
Japan	29.5	5.2	3.1	1.7	0.6	2.4	2.4	5	1	1
Canada	5.0	8.7	9.2	3.8	4.2	4.2	5.3	8	9	10
Australia	2.4	9.5	9.6	7.4	7.2	6.1	2.8	11	18	15
Austria	1.4	5.0	5.7	3.6	1.8	3.1	3.1	4	4	6
Finland	1.1	9.2	10.0	5.4	4.5	5.8	3.9	10	11	14
New Zealand	0.5	14.7	12.3	11.7	9.3	6.1	2.3	17	19	15
Norway	1.1	7.8	10.9	6.6	6.1	3.2	3.1	7	16	7
Sweden	2.0	11.3	11.4	6.4	6.1	9.3	9.3	14	16	19
Switzerland	2.1	3.2	4.9	2.4	2.5	5.4	5.5	1	6	13
Weighted average		7.8	5.8	3.0	3.3	4.3	3.3			
Unweighted average		8.4	8.4	5.2	4.7	5.1	4.1	9	11	11

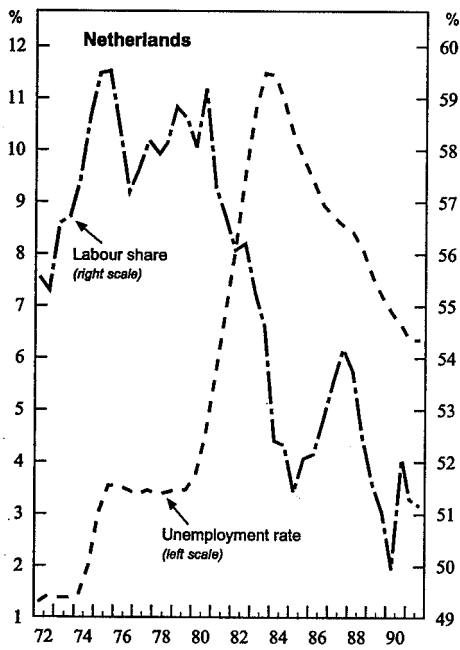
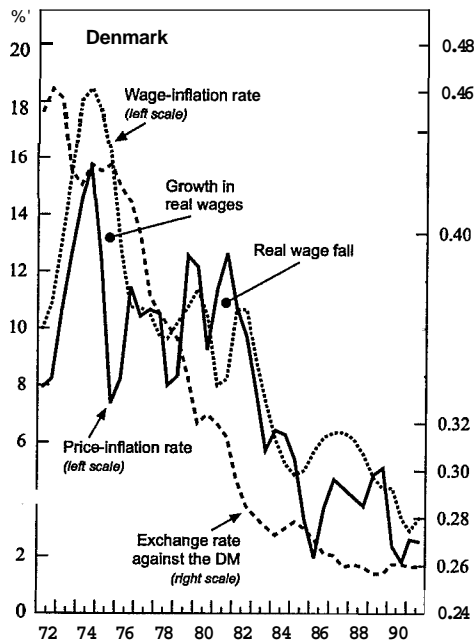
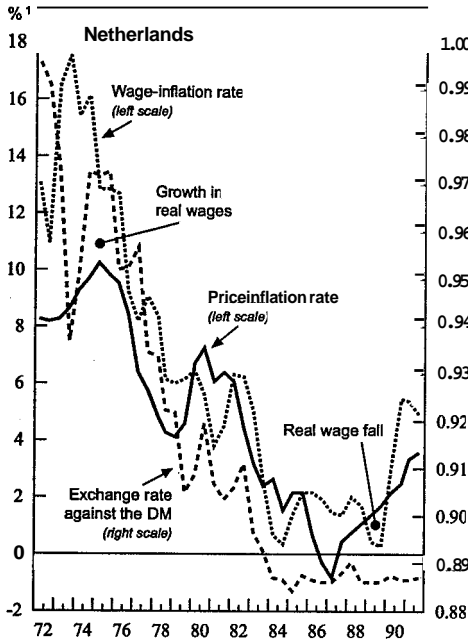
Note: The table excludes four OECD economies; Iceland, Greece, Portugal and Turkey. These countries experienced the highest rates of price increases among the OECD economies in all the periods reported. The recent ranking is based on 1990 inflation rates in order to abstract from the effects of German unification.

Chart 1. Labour market conditions and inflation reduction in ERM countries



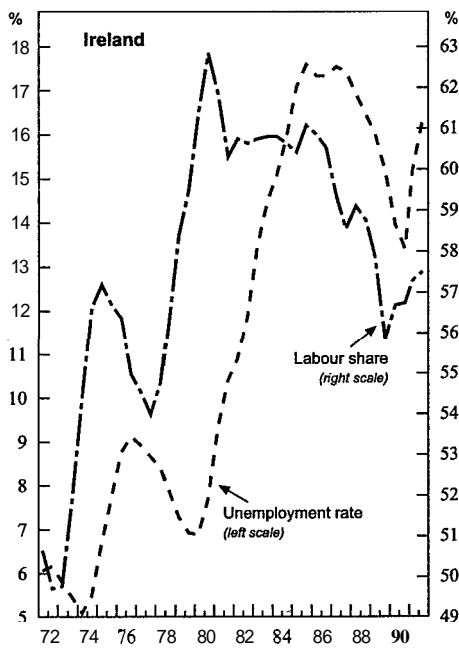
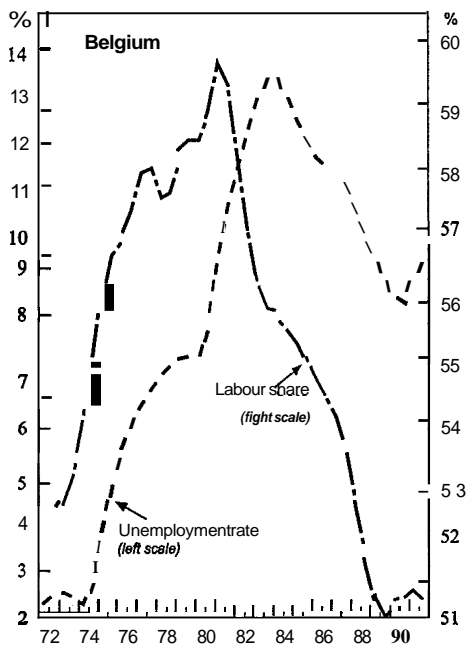
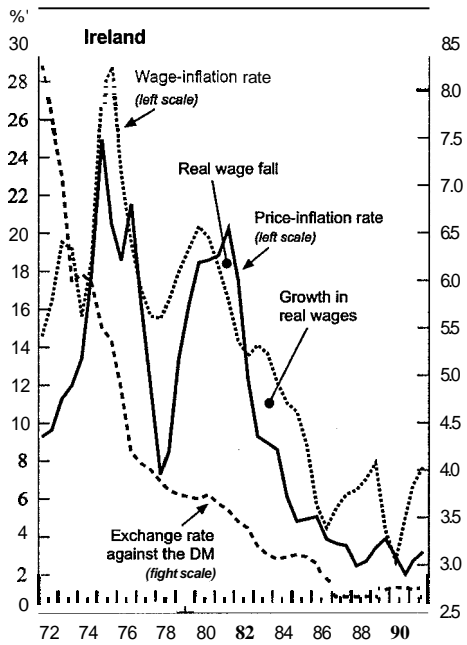
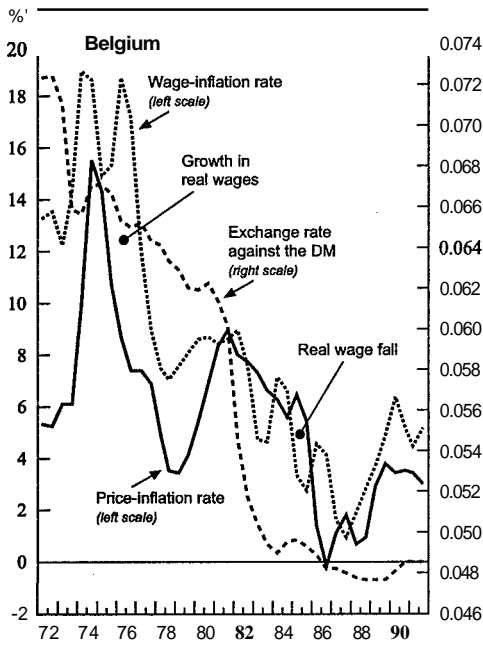
1. Change from two semesters earlier.

Chart 1. (cont.) Labour market conditions and inflation reduction in ERM countries



1. Change from two semesters earlier.

Chart 1. (cont.) Labour market conditions and inflation reduction in ERM countries



1. Change from two semesters earlier.  
Source: OECD Secretariat

not significantly reduced the costs of disinflation. The paper finds some policy credibility effects in financial markets in the second half of the 1980s, but there is little evidence of a downward shift in inflation expectations in labour or product markets after 1987. This conclusion is similar to the generally negative results found in the literature for the pre-1987 period. In particular the evidence presented below, as well as the review of earlier work, finds little basis for concluding that adhering to the **ERM** bands alters the trade-off between inflation and unemployment. Hence, either inflation expectations have not responded to the greater credibility of inflation policy, or labour market institutions and rigidities have prevented lowered expectations from translating into lower inflation.

A second contribution of this paper has methodological as well as policy interest. A common view is that increases in the **NAIRU** (non-accelerating inflation rate of unemployment) account for much of the unemployment increases in **ERM** countries during the 1980s, casting doubt on traditional tests for improved credibility which rely on detecting structural changes in standard expectations augmented Phillips curves that incorporate constant **NAIRUs**. To avoid such problems, this paper uses several different methods to decompose the unemployment rate into cyclical and trend, i.e. **NAIRU**, components. If such decompositions could successfully distinguish the cyclical component of unemployment from its **NAIRU** component, the cyclical unemployment rate term should bear a stable relationship to wages, and the **NAIRU** would be found to be irrelevant for wage formation. Thus, controlling for changes in the **NAIRU** would allow credibility effects to be detected even in periods of rising **NAIRUs**. However, the use of such a decomposition does not reverse the conclusions based on Phillips curves that there is little evidence of a downward shift in inflation expectations due to credibility in the late 1980s. Second, the constructed trend components often have more effect on wage behaviour than do the constructed cyclical components, contradicting the notion that the upward drift in the average level of unemployment rates in the 1980s had little effect on inflation. Hence, these results both justify the traditional tests for detecting credibility, and suggest that less of the 1980s unemployment increase may have been related to a rising **NAIRU** than is generally perceived. As a general procedure, it seems useful to test whether estimates of the **NAIRU**, obtained either from structural modelling or through time series methods, are in fact uncorrelated with wage increases.

Section I below reviews the analytical underpinnings of the credibility literature, arguing that some of the underlying foundations have modest empirical backing at best. Moreover the academic literature appears to focus too heavily on commitment and credibility in monetary policy alone, largely ignoring the potential for structural and fiscal policies to undermine the credibility of even a determined monetary policy. Section II reviews the empirical literature on credibility in the **ERM**. Section III presents additional empirical evidence, based on the more recent period of stable exchange rates, that largely confirms the earlier results, concluding that there is little evidence that credibility effects have played a role in labour market behaviour.

## I. CREDIBILITY AND INFLATION EXPECTATIONS

### A. Analytical underpinnings

A review of the linkages between credibility, inflation expectations and inflation may make it easier to assess the extent to which a credible commitment to exchange-rate stability has lowered the costs of disinflation in the ERM<sup>1</sup>. These costs of disinflation can be reduced either by increasing the responsiveness of wages and prices to excess supply or by shifting inflation expectations downwards. Where labour and product market prices do not respond quickly to excess supply (as is the case in many ERM countries), a fast adjustment of inflation expectations may be an attractive disinflation option as compared with structural measures to increase labour market flexibility that may be more difficult to implement. The rigidities that characterise inflexible labour markets may, however, themselves prevent lowered inflation expectations from affecting the actual path of inflation. The possibility of a downward shift in inflation expectations requires that expectations be at least somewhat forward-looking, as well as responsive to policy commitments that are viewed as credible. As compared to situations in which inflation expectations reflect only past wage and price developments, a credible disinflation would be faster and require less unemployment and output **loss**.

Much of the credibility literature is motivated by the observation that most, if not all, OECD countries experienced higher than desired levels of inflation in the post-war period, especially after around 1970, without any apparent offsetting benefit from the inflation in terms of higher levels or growth rates of output. The persistence of inflation has led analysts to attempt to model it as an equilibrium phenomenon that can result from private and public sector optimisation, despite the lack of benefits from anticipated inflation. The basic credibility model is well-described in Barro and Gordon (1983), Barro (1985) and Blanchard and Fischer (1989).

In the credibility model, inflation expectations are high because wage and price setters recognise that policy-makers have conflicting, and irreconcilable, objectives – low and stable inflation and output levels that exceed the natural rate. Given these objectives, the authorities are assumed willing to exploit a short-run inflation output trade-off, even when they recognise that no long-run trade-off exists. Private sector agents understand these incentives and, accordingly, adjust their inflation expectations upwards. Beyond a certain point, however, the additional inflation required to maintain higher output is no longer acceptable to policy-makers and inflation stabilises, but output is no higher than it would have been at zero inflation. With expectations of inflation quickly ratcheting up to the threshold, policy-makers are left with little room to actually implement further expansionary policy without raising inflation to beyond the acceptable level. Any subsequent disinflation will entail a **loss** of output, unless policy-makers can convince the public that they will not re-inflate in the future. If they can not credibly make such a commitment, policy-makers may choose to allow inflation and inflation expectations to permanently remain at the threshold level.



## **B. Policies to achieve credibility**

At its simplest, credibility means that policy-makers can convince the public to accept and act upon the commitments that they make. Because policy-makers may have incentives to renege on such policy commitments, the public may believe them only when adherence is verifiable or a sufficiently large penalty is attached to reneging. The need to back up commitments argues for rules for policy-making rather than discretion, which may be abused. Various methods have been proposed to make low inflation commitments credible, such as removing the discretion to inflate from policy-makers, legislating commitment to disinflation, and ensuring policy is placed in the hands of individuals or institutions that are known to be unwilling to inflate opportunistically.

In practice, programmes to obtain credibility often contain elements of all three approaches. For example, analysts who view the ERM as a vehicle by which less-credible policy-makers have obtained credibility often emphasise the direct disinflationary aspects of tying the exchange rates to a “hard” currency, such as the Deutsche-mark, the implicit insulation of monetary policy-making from short-term political considerations by shifting to the exchange rate as the primary short-term target of monetary policy and the confidence of the public and investors in the Bundesbank’s commitment to low inflation. Much of the discussion surrounding the nature, independence, targets and even the location of the central bank of the future European monetary union aims at endowing that institution with features that will enhance its credibility from the start.

### ***Removing discretion***

Tying policy to a rule may prove helpful in allaying the fears that policy-making discretion will lead to inflation. As long as policy-makers adhere to the rule, the public would recognise that commitments were being met and inflation expectations would remain consistent with the long-run goal. Policy-makers would recognise that violating the rule in order to take advantage of lower inflation expectations would quickly ratchet inflation expectations back up, permitting neither lower inflation nor additional output.

Given that there is often a long lag between policy actions and their effects on final goals, such as the inflation rate, the public’s need to verify adherence to the rule on a timely basis suggests a role for intermediate policy targets. In the past various monetary aggregates have been proposed. An extensive review of monetary aggregates and other intermediate targets is presented in Federal Reserve Bank of New York (1990). The limited fluctuation of currencies adhering to the exchange rate mechanism (ERM) of the European monetary system has been cited as an example of a credible intermediate target that should work to lower inflation expectations. The evidence on this proposition is the main object of this article.

### ***Legislating commitment***

By mandating a specific inflation goal or intermediate target, legislation has the appearance of eliminating discretion and substituting prescribed behaviour. In practice, the legislation may take the form of guaranteeing the independence of the central bank and specifying low inflation as the pre-eminent goal of monetary policy. This has been the long-standing mandate of the German Bundesbank, and a number of other countries, including Canada and New Zealand, have adopted similar approaches in recent

years. To the extent that the legislation is viewed as imposing a binding constraint on monetary policy, inflation expectations may adjust downward to reflect the targets embedded in the legislation.

### ***Selecting non-inflationary policy-makers***

The essence of the credibility problem is that the policy-maker is viewed as susceptible to the temptation of inflating opportunistically. Choosing an individual or institution well known for anti-inflationary views is another way of reassuring the public that a non-inflationary course will be followed. Detailed analyses of the implications of selecting policy-makers with high aversion to inflation are presented in Rogoff (1985, 1987).

### **C. Limitations of the credibility model**

The view that credible disinflationary policies will succeed in lowering inflation expectations requires that the economy have a specific underlying structure. In particular, the assumptions that wage and price setters are forward-looking in their behaviour and that changes in inflation expectations will necessarily translate into lower inflation may limit the applicability of the credibility model. **Also**, as a practical matter, many of the intermediate targets that are suggested as means of demonstrating commitment may not themselves be linked tightly enough to final objectives or may conflict with other policy goals. Even if strictly adhered to, such intermediate targets may therefore not greatly improve credibility.

### ***Forward-looking expectations and labour market rigidities***

In order for credibility to matter, households and businesses must formulate expectations that incorporate future policies, and act upon these expectations in setting wages and prices. However, inflation expectations in both labour and product markets often appear more backward-looking than forward-looking, and inflation "surprises" appear to last for a long time. Even where wage and price setters are forward-looking in principle, a wide variety of circumstances may make it optimal for expectations to be decided on the basis of realised past performance. For example, uncertainty as to the structure of the economy, the relationship of the policy rule to the final targets, or about the underlying goals of the policy-maker may generally make past inflation the best guide to future inflation. Since such uncertainties generally exist, any downward shift in inflation expectations may be very gradual. Under these circumstances credibility may help reduce the costs of keeping inflation low, without greatly altering the cost of disinflating. In general, it may be risky to count on economic agents acting in anticipation of lower inflation as a component of a disinflation programme.

Labour market rigidities may also reduce the extent to which credible policies can translate directly into lower inflation. For example, insider-outsider problems, downward rigidity in real and nominal wages or a focus by workers on relative wage levels may prevent the ratcheting down of wages that is needed to initiate a disinflationary cycle. Hence, credibility may be secondary to such factors in determining the costs of disinflation.

### **Credibility of intermediate targets**

Credibility in inflation reduction is often linked to adherence to a short-term intermediate target, such as the exchange rate or a monetary aggregate. By focusing the public's attention on such a target, which is regarded as a timely indicator of the stance of monetary policy, it is hoped that inflation expectations can be reduced faster than by an emphasis on the actual inflation rate, which may respond to policy only with a lag.

An intermediate targeting strategy carries two risks which may greatly diminish its effectiveness. First, intermediate targets are often very imperfectly linked to final targets. Instability in the relationship of many potential intermediate targets – monetary aggregates, credit and debt aggregates, commodity prices, and exchange rates – to final targets is well documented. “Goodhart’s law”, that the link between an indicator variable and a final target is weakened after the indicator is designated as an intermediate target, is widely accepted, and the weakness of links between exchange rates and purchasing power parities is also well documented. Both output and inflation control will be lost to the extent that the intermediate target is imperfectly linked to the final targets. Moreover, the unreliability of such a link may itself prevent the intermediate target from being viewed as credible, since the public is likely to be aware that rigid adherence to it is inconsistent with achieving final goals.

The **ERM** has demonstrated both the advantages and disadvantages of an intermediate targeting strategy. As discussed in Section II below, monetary discipline has clearly led to a decline in inflation in previously high inflation countries. However, the persistence of relatively high inflation rates in some countries that have adhered to the **ERM** bands suggests that exchange rate stability does not guarantee convergence of inflation, let alone price-levels, over the short to medium term.

Under the best of circumstances there appears to be a balance between the **loss** of control over final targets and the gains to credibility from an intermediate target. One generalisation is that the benefits from an intermediate targeting strategy are likely to be greatest when the desired disinflation is large compared to the shocks in the relationship between intermediate and final targets. Thus, countries disinflating from very high levels of inflation may find the signalling value of an intermediate target to be higher than countries starting from moderate inflation levels.

Moreover, adherence to an intermediate target is not by itself sufficient to engender credibility, if other policies are not consistent with the low inflation outcome. For example, the presence of a large budget deficit may imply either an ultimate monetisation of government debt or high real interest rates that may impose an unacceptably steep cost on real activity. Thus, adherence to a nominal intermediate target over the short-run may not provide credibility if there is doubt as to its long-run sustainability. Similarly, if the domestic economy is rigid in its structures either because of labour market institutions or government policies, the public may be uncertain how to weigh the commitments of policy-makers against the potential high costs of disinflation, should these commitments not succeed in lowering inflation expectations. Where the costs of a non-credible disinflation are high, the public may perceive a higher risk that the authorities will ultimately back off from their commitments.

## II. CREDIBILITY GAINS FROM ERM MEMBERSHIP: A REVIEW OF THE LITERATURE

### A. Introduction

Although not envisaged at its creation, the prospect of acquiring credibility for a disinflation has come to be seen as a major incentive for high-inflation countries to participate in the ERM<sup>2</sup>. Such credibility, it is argued, arises because membership is a powerful external discipline on domestic economic policies. Thus, if the ERM forces monetary authorities to adopt a policy that will reduce inflation (the discipline effect), it could as a consequence also directly lower the inflation expectations of wage and price-setters (the credibility effect). It is commonly considered that policy discipline has been enforced by the asymmetry of the ERM, with Germany in a leading role managing its monetary policy to ensure low domestic inflation, and other ERM countries gearing monetary policy to the exchange-rate objective. Such discipline would indeed cause disinflation outside Germany, but need not lower its costs. However, if the monetary authorities in countries with less good inflation records come to be viewed as firmly anchoring their policies to the low inflation objective of monetary policy in Germany, they may "borrow" the anti-inflationary reputation of the German Bundesbank and thereby gain credibility. By directly lowering inflation expectations, ERM membership would then reduce the costs of disinflation.

It is often argued that a commitment to ERM should be viewed as more credible than a domestic money target or interest rate rule because the ERM is an international agreement and is therefore seen as more constraining than purely national targets. In particular, as noted by Giavazzi and Giovannini (1988a), the ERM is part of a broader agreement that includes the common market and other Community institutions. Under these circumstances, the contractionary consequences of maintaining a fixed parity may be more palatable than when domestic considerations alone are involved. Also, there is often thought to be a prestige value to having a "hard" currency. The validity of such explanations is very difficult to test, although they are widely accepted.

The inflation performance of ERM countries during the 1980s lends support to the view that, at least, the monetary policies of countries were disciplined. While the inflation rate has come down throughout the OECD area, the fall has been more pronounced among ERM countries; from more than 10 per cent in 1978-80 to 3½ per cent in 1990 in the six original ERM members excluding Germany, as compared with a fall from 8½ per cent to 5 per cent in non-ERM OECD countries (Table 1). Moreover, France, Denmark and Ireland, which ranked among the high-inflation countries in 1978-80, are now among those where inflation is lowest. Italy has reduced its inflation rate by some 10 percentage points, but is still one of the OECD economies where inflation is high, whereas Germany and the Netherlands were consistently in the group of low-inflation countries until the post-unification boom in Germany. The only ERM country which has slipped in terms of inflation performance is Belgium, although inflation there remains just 1 percentage point above the lowest inflation rates in ERM countries. In sum, there has been a noticeable convergence of inflation among the original ERM members at an average inflation rate which fell by some 3 percentage points more during the 1980s than it did in non-ERM countries.

The improvement in the inflation performance of ERM countries does not necessarily reflect the working of credibility effects, however, as ERM membership might have enforced disinflation without reducing its costs. This could be the case if the discipline of tight economic policies pushed unemployment to heights at which wage growth would have started to fall in any event. This issue is discussed in the following sections. First, the role played by Germany in the ERM is analysed together with evidence of credibility effects from financial-market data. Second, the available evidence of ERM-related credibility effects in labour markets is presented in the context of analysing whether ERM membership has reduced the costs of disinflation.

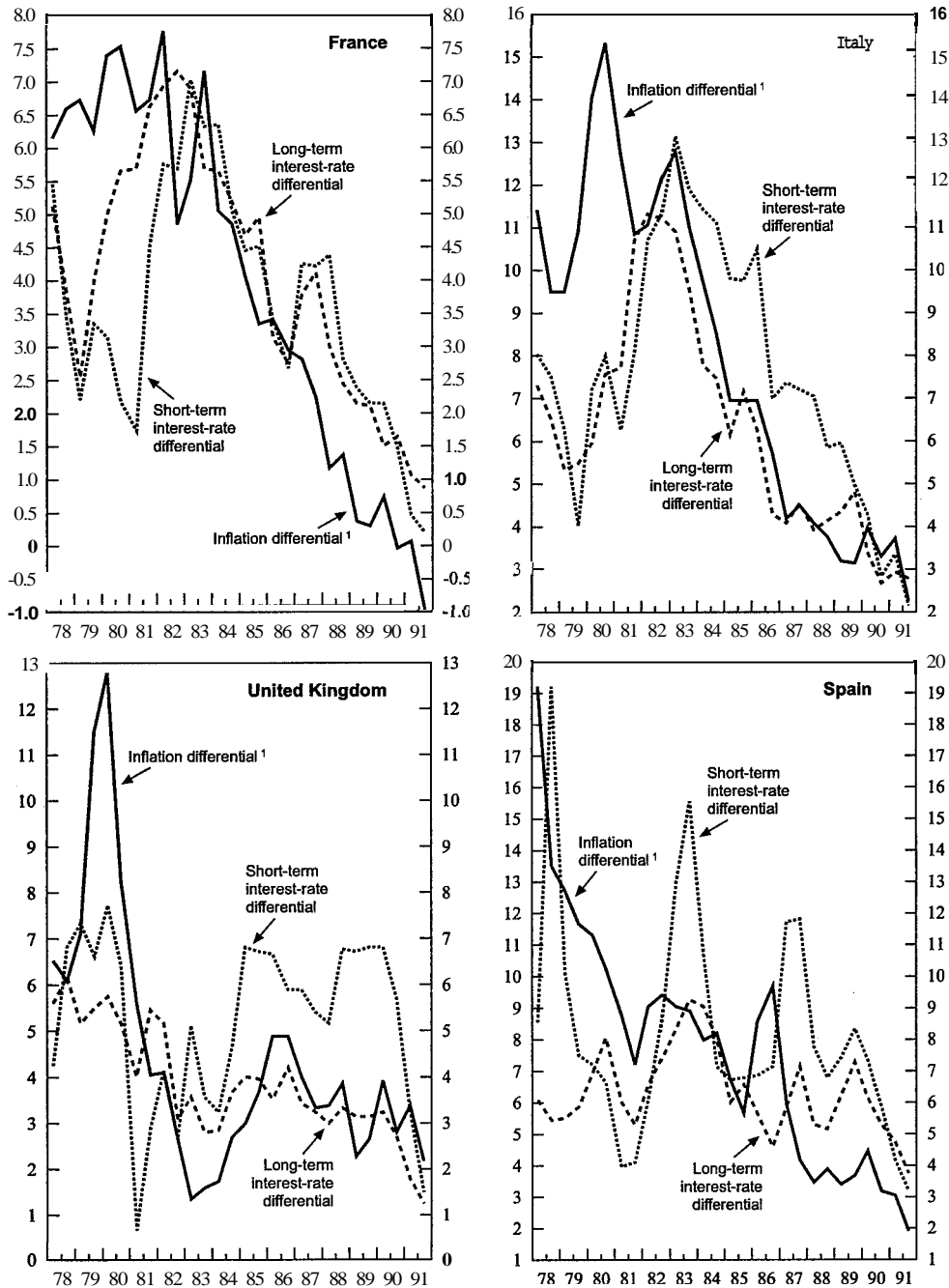
## **B. German dominance and credibility gains in financial markets**

German dominance implies that Germany managed to maintain its monetary policy independence after entering the ERM, whereas other members, in attempting to hold their exchange rates *vis-a-vis* the Deutschemerk, were forced to gear their monetary policies to the German standard. The role of Germany in providing a nominal anchor to the system is widely seen as a prerequisite for credibility effects, but is not a sufficient condition for such effects to occur.

Initially, the central operating mechanisms of the EMS, such as the indicator of divergence and the Very Short Term Financing facility, were explicitly designed to render the system symmetric. But evidence of its short-run management and behaviour around realignments suggests that, in fact, it developed asymmetrically, with Germany in a leading position. First, Giavazzi and Giovannini (1986 and 1989), Mastropasqua *et al.* (1988) and Bini Smaghi and Micossi (1989) note that the bulk of intra-ERM currency interventions have been carried out by other central banks than the Bundesbank, especially in the earlier years. Furthermore, when it has intervened, the Bundesbank has most often done so in U.S. dollars, whereas other central banks have tended to intervene in ERM currencies and increasingly in Deutschemarks. This suggests that the Bundesbank's preoccupation was with the exchange rate of ERM currencies *vis-à-vis* the U.S. dollar, whereas other central banks focused on stabilising the position of their currencies *vis-a-vis* the Deutschemerk. Mastropasqua *et al.* (1988) and Russo and Tullio (1988) find that the Bundesbank has persistently sterilised changes in the foreign component of the money stock arising from its own and others' interventions. Likewise, Giovannini (1988) shows that lagged values of reserve flows are uncorrelated with deviations from domestic interest-rate targets in the case of Germany, but not for France and Italy. Lastly, Deutschemerk interest rates have remained relatively stable in periods of speculative pressure, whereas Euromarket interest rates of other ERM currencies fluctuated widely in the period of capital controls and relatively frequent exchange-rate adjustment (Giavazzi and Giovannini, 1989, Giovannini, 1988, and DeGrauwe, 1989a). These findings indicate that German monetary policy was largely unaffected by events in exchange markets and that other members took most of the adjustment pressure.

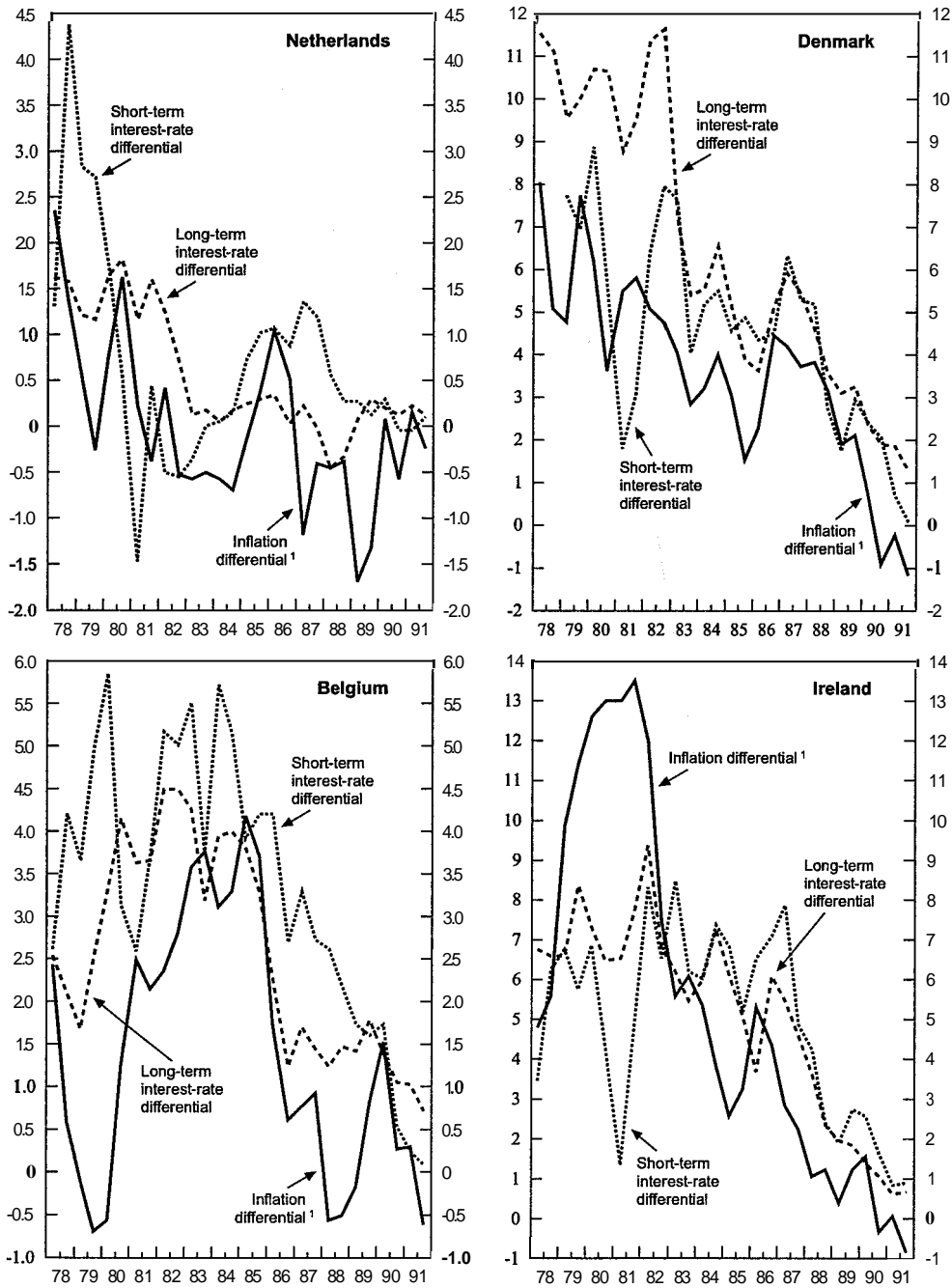
Causality tests based on interest-rate and money reaction functions show that Germany has been able to maintain more monetary independence than other ERM members. It has not been completely autonomous, however, and innovations in German monetary variables appear to have been affected by innovations in monetary variables in other ERM countries. The extent to which other ERM countries are found to

**Chart 2. Inflation and financial markets: comparison with Germany**



1. As measured by the private consumption deflator

Chart 2. (cont.) Inflation and financial markets: comparison with Germany



1. As measured by the private consumption deflator.  
Source: OECD Secretariat.

have surrendered monetary policy autonomy to German leadership also varies. Two-way or inverse links between money supply in Germany and other ERM countries are reported by Cohen and Wyplosz (1989), Fratianni and von Hagen (1990a,b), Mastropasqua et al. (1988), von Hagen and Fratianni (1990) and DeGrauwe (1989a). MacDonald and Taylor (1990), on the other hand, find that German money Granger-causes French and Italian money, whereas no inverse link is present. Weber (1990), using interest-rates, also finds causality running only from German variables.

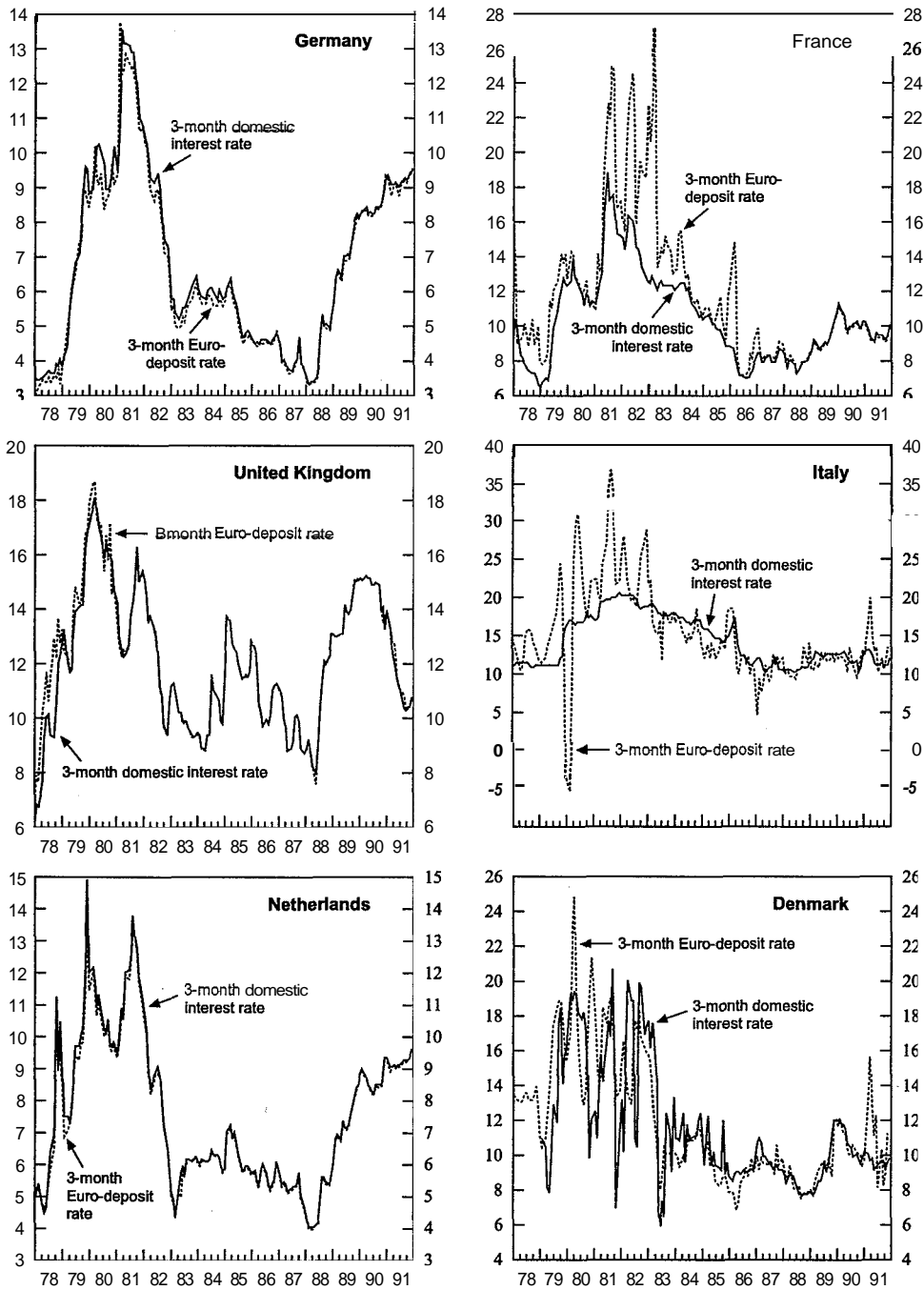
Whereas occasional realignments and exchange controls can account for the observed degree of policy leeway in the early and mid-1980s, some of the results found in the literature might be biased against the German dominance hypothesis. First, instability of money demand equations and difficulties in detecting causality when interest rates move more or less simultaneously may explain counter-intuitive findings, such as money in small countries Granger-causing German money. Second, if sterilisation of foreign exchange reserve flows by the Bundesbank is spread over time, this might show up as reversed causality links between money supply in Germany and elsewhere. Finally, during the period of disinflation, the main task for high-inflation members was to converge to German monetary standards, not to reproduce every move in German monetary policy settings.

The record of ERM countries, based on financial markets data, suggests that the anti-inflationary reputation of monetary authorities has improved, but only gradually as policy consistently remained tight. The gaps between short-term interest rates in Germany and those in other ERM countries, acting as proxies for financial markets' evaluations of the probabilities of near-term exchange rate realignments, have closed gradually in line with actual inflation performance (Chart 2). There is little indication that rate differentials came down in anticipation of reduced inflation differentials, however. Until around 1983, interest rate differentials actually diverged, except for the Netherlands, where they have been low since 1980. In the cases of France, Italy and Belgium, interest rate differentials have come down gradually since 1983, whereas, for Denmark and Ireland, they remained at high levels until 1987, when they started to narrow rapidly. Furthermore, following the stronger commitment to the exchange-rate objective after 1983 and, especially, 1987 (Table 2), bouts of speculative capital flows became less frequent. Thus, the role of exchange controls (as evidenced by shrinking gaps between interest rates in domestic and Euromarkets) gradually vanished as controls were relaxed and eventually abolished (Chart 3). Liberalisations of capital movements, by being seen as raising the pressure to align policies, may also have contributed to increased confidence that central banks were pursuing low inflation. Even during the early period of the ERM, which was marked by numerous realignments, the disinflationary bias introduced by not allowing parity changes to entirely offset the real appreciation of some of the high-inflation currencies (the Italian Lira and the Irish Punt) (Chart 4) may have contributed to the strengthening of authorities' anti-inflation reputations.

Evidence from econometric estimates of financial markets behaviour, although somewhat inconclusive, also tends to support the impression that the reputations of monetary authorities have improved, if only gradually. A first set of studies examine the stability of interest rate equations over the ERM period. With few exceptions, these equations seem to be stable. Christensen (1987b) finds evidence of a structural break around late 1982 in an interest rate equation for Denmark. His result is supported by Andersen and Risager (1988) analysing the interest rate differential vis-a-vis Germany.

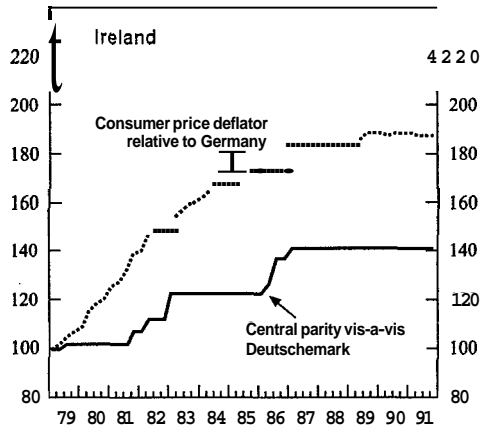
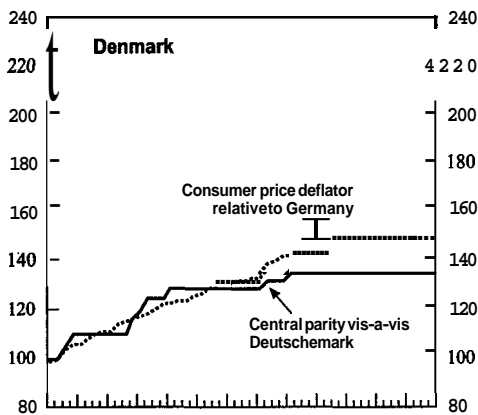
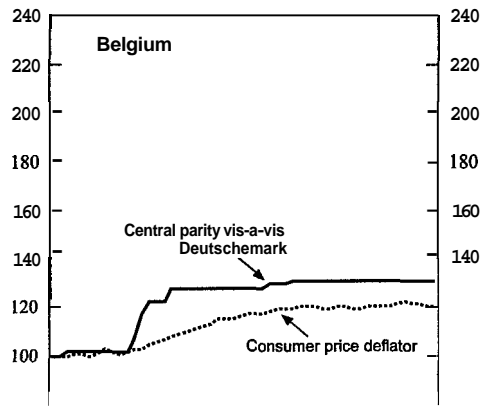
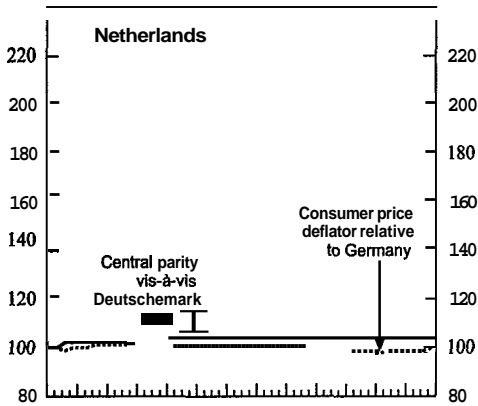
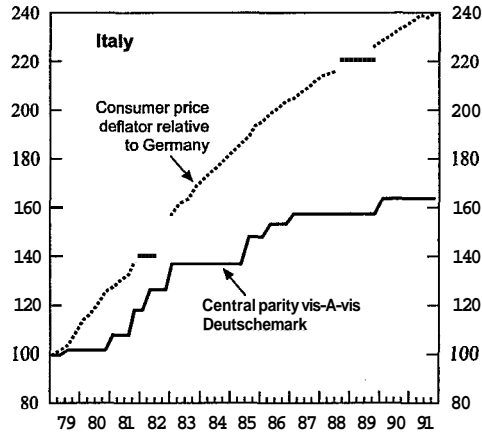
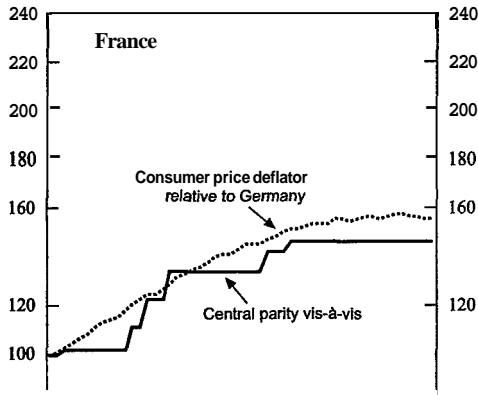


**Chart 3. Interest rates in domestic markets and Euro-markets**



Source: OECD, Financial Statistics.

**Chart 4. Exchange rates and inflation: comparison with Germany**  
 First quarter 1979 = 100



**Table 2. Changes in ERM central rates**  
Per cent change in central rates

	Dates of realignments											
	24/9 1979	31/11 1979	2/3 1981	5/10 1981	22/2 1982	14/6 1982	21/3 1983	21/7 1985	7/4 1986	4/8 1986	12/1 1987	1/1 1990
Belgian franc					-8.5	+1.5	+2.0	+1.0			+2.0	
Danish krone	-2.9	-4.8			-3.0	+2.5	+2.0	+1.0				
Dutch guilder				+5.5		+4.25	+3.5	+2.0	+3.0		+3.0	
French franc				-3.0		-5.75	-2.5	+2.0	-3.0			
German mark	+2.0			+5.5		+4.25	+5.5	+2.0	+3.0		+3.0	
Irish punt							3.5	+2.0		-8.0		
Italian lira			-6.0	-3.0		-2.75	-2.5	-6.0				-3.7

But Giavazzi and Giovannini (1988a), looking at data for France, Italy and Denmark, conclude that interest rate differentials do not provide evidence of improved reputation. Likewise, Meen (1991) estimates short-term interest rate equations for France, Italy, Spain, the Netherlands and Belgium that are stable over the ERM period. Cohen and Wyplosz (1989) find, however, that whereas the interest premium of French rates above German rates fell only marginally between France's entry into the ERM and the mid-1980s, it became related to fiscal policy innovations whereas earlier it was related to inflation innovations. This is taken as evidence of improved reputation of French monetary authorities.

A second set of studies estimates the credibility of exchange rate targets directly using Bayesian filtering techniques. These show that targets may have become more credible during the latter half of the 1980s. Thus, Weber (1991b) finds that since 1983 to 1987, depending on the country considered, the probability of realignments and interventions (at the margin) has declined to almost zero, indicating that the ERM has become a credible target zone. Weber (1989 and 1990) also estimates reputation from price data. He finds that Belgium, Denmark and Ireland have gained reputation during the ERM period, whereas France and Italy have lost some. Germany and the Netherlands have had high reputation throughout. However, Weber (1991a) finds that targets have become more credible, but only for Ireland since June 1986 and France since September 1987.

### C. Credibility gains in labour markets

Econometric studies provide only weak evidence for ERM-related credibility effects in labour markets. Most studies examine whether econometrically estimated equations overpredict wage or price growth in the ERM period. With some exceptions, clear evidence of structural breaks that can be related to ERM membership is hard to find.

Thus, as concerns wage equations, Christensen (1987a) finds no evidence of structural breaks for Denmark. Barrell et al. (1990) and Barrell (1991) find stability for France, but increased sensitivity to changes in unemployment for Italy, which they relate to the dismantling of "scala mobile". Poret (1990) reaches the opposite conclusion that credibility effects may have been present for France but not for Italy. Dhar (1991) finds an almost significant ERM dummy in a pooled European wage equation. In price equations, Giavazzi and Giovannini (1988a,b) for France, Italy, Denmark and Ireland (only in the first study) and Meen (1991) for France, Italy and the Netherlands find no evidence of structural shifts. Giavazzi and Giovannini note, however, that equations tend to overpredict inflation starting some time after ERM entry. Collins (1988) fails to estimate a significant ERM dummy in pooled OECD inflation equations. Kremers (1990), on the other hand, finds evidence of credibility effects in the case of Ireland.

German inflation is found in some studies (e.g. Artis and Nachane, 1990, Artis and Ormerod, 1991 and Kremers, 1990) to be a good predictor of partner countries' inflation rates in the ERM period, suggesting the presence of credibility effects. However, the German inflation variable may also proxy the anti-inflation policies that these countries were following: in the case of the Netherlands, German inflation is generally found to be significant even before ERM entry.

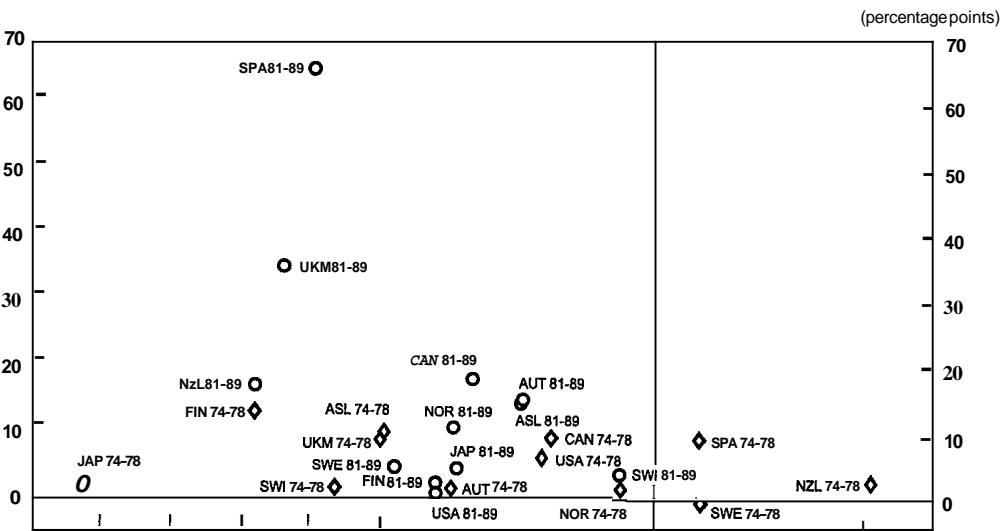
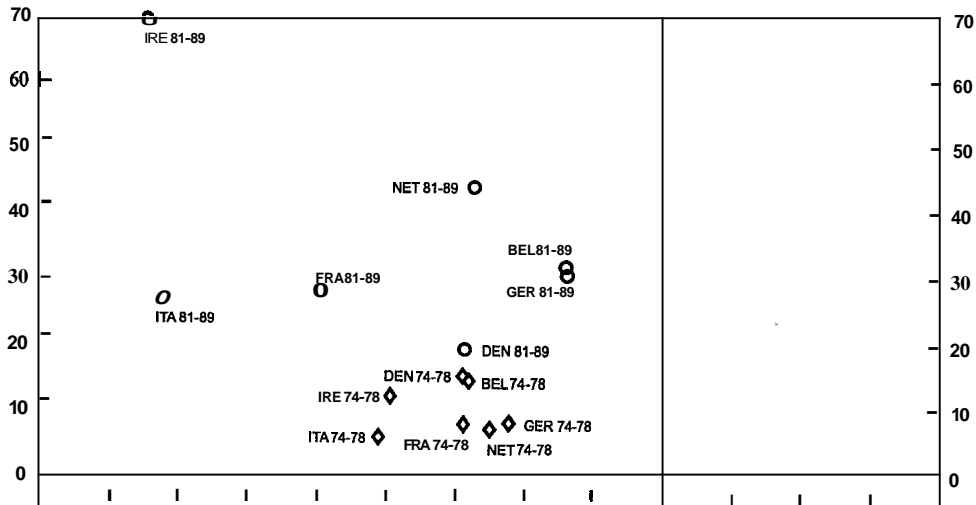
### III. HAS ERM MEMBERSHIP REDUCED THE COSTS OF DISINFLATION?

Exchange rates within the ERM have been very stable since 1987, as Chart 1 shows. This provides a ready opportunity to examine the data for evidence of credibility effects. Two approaches are followed. First, crude sacrifice ratios are calculated to see whether there is a *prima facie* case for reduced costs of disinflation in the 1980s. Second, Phillips curves are used to test whether there is any break in wage behaviour after 1987, reflecting the increased stability of exchange rates. Third, vector auto regressions (VARs) are used to test in an atheoretic fashion whether labour and product markets have extracted signals of future inflation trends from financial markets or from wage/price differentials with Germany.

#### A. Sacrifice ratios

The apparent costs of disinflation can be assessed in a crude way by means of sacrifice ratios. These attempt to measure the costs of reducing inflation over a given period in terms of foregone output or employment over that same period. Such ratios show that disinflation in ERM countries has not been achieved at less cost in the 1980s than in earlier periods. In fact, the disinflation that ERM countries underwent from 1981, when inflation peaked, to 1989, seems to have been rather more costly than the 1974 to 1978 disinflation, except in Denmark where the trade-off worsened only slightly (Chart 5). This is notably the case for Germany, Belgium and the Netherlands who

Chart 5. Sacrifice ratios In two periods of disinflation



Change in the inflation rate (per cent)

Source: OECD Secretariat.

entered the ERM in 1979 with relatively low inflation rates, and experienced the smallest subsequent disinflation. But even for high-inflation ERM countries, the substantial rise in unemployment rates during the 1981 to 1989 disinflation tends to outweigh the more pronounced improvement in inflation performance. A clear worsening of the sacrifice ratio between the two disinflations is observed in only about half the non-ERM OECD countries (Chart 5). (The comparison group includes 12 countries but excludes high-inflation Portugal, Greece, Iceland and Turkey.) In the United States and Finland, it actually improved, whereas it remained roughly unchanged in Canada, Sweden and Norway. For Spain and New Zealand it is difficult to calculate disinflation costs, as these two countries experienced simultaneously rising inflation and unemployment from 1974 to 1978<sup>3</sup>.

The sacrifice ratios suggest that ERM-related credibility effects may not have been felt in labour markets to any great extent. However, unemployment has been affected by both cyclical and structural disturbances, and it is difficult to disentangle the two influences. Moreover, in the 1980s, unemployment rates did not return to earlier levels although the process of disinflation came to a halt as early as 1984 in non-ERM countries and 1986 in ERM countries. This indicates that the natural rate of unemployment may have increased in both groups of countries. Thus, the true sacrifice ratios in ERM countries may be smaller than Chart 5 suggests if other factors were pushing up the natural rate during the ERM period. An attempt is made below to correct for this possible source of bias by allowing for shifts in the natural rate.

## **B. Phillips curves**

### ***Specifications***

Wage equations were estimated for France, Italy, Netherlands, Belgium, Denmark and Ireland, the core ERM countries that could be viewed as having borrowed credibility from the Bundesbank. With modest variations, the equation specifications were similar across countries. The wage variable was the growth in business-sector wages and salaries per worker, except in the case of Ireland and the Netherlands, where data instability or lack of availability led to the use of compensation per business-sector worker. (In other countries substitution of one wage variable for the other did not change the basic results.)

Homogeneity in the response of wage to price inflation was imposed by defining the dependent variable as the growth in real wages (the ratio of nominal business-sector wages and salaries to the consumption deflator, DRW in Table 3). Contemporaneous and lagged changes in consumer price inflation (DPCP1) were entered as independent variables, allowing lags in the response of wage to price inflation to emerge, while insuring homogeneity. Lagged effects proved significant in all countries, except France and Italy. Insofar as lagged price inflation terms were insignificant in these latter countries, the estimated real wage equations can be viewed as nominal wage equations with coefficients of unity on contemporaneous price inflation. No significant effect resulted from adding terms related to the business sector output deflator.

Error-correction terms (EC), derived from the first-order conditions for cost minimisation, were entered into the wage equations for the Netherlands and Denmark, the only countries for which they were found to be significant<sup>4</sup>. Their derivation from

**Table 3. Post-1987 performance of estimated structural wage equations**

Dependent variable: Change in real wage (except for the Netherlands and Ireland where dependent variable is change in real Compensation)

	France	Italy <sup>1</sup>	Italy <sup>2</sup>	Netherlands	Belgium	Denmark	Ireland
Regression coefficients							
UNR	-0.33			-0.54	<b>-0.82</b>	-0.27	-0.18
LOG (UNR)	..	-6.67	-5.38				..
DUNR	-1.13	..	..		-1.183		
DPCPI	-0.24	..	..	-0.45	-0.36	-0.91	-0.60
DPCPI (-1)	..			<b>-0.24<sup>3</sup></b>	-0.77	..	-0.13
DPCPI (-2)	..	-0.30	-0.31	<b>-0.52</b>			
DRW (-1)	..			<b>0.29</b>		0.64	0.65
DRW (-2)	..	0.50	-0.51			<b>-0.18</b>	..
EC (-1)	..	..	..	-0.43		-0.16	..
Standard error	0.69	1.35	1.36	1.32	1.75	0.95	1.14
F tests for:							
Serial correlation	2.09 (2,21)	0.03 (2,19)	0.02 (2,19)	0.26 (2,19)	1.41 (2,20)	1.68 (2,22)	1.56 (2,18)
Functional form	1.41 (1,22)	0.01 (1,20)	0.01 (1,20)	0.01 (1,20)	0.76 (1,21)	0.86 (1,23)	0.34 (1,19)
Heteroscedasticity	0.38 (1,28)	0.27 (1,28)	0.21 (1,28)	0.42 (1,28)	0.02 (1,28)	0.09 (1,28)	1.08 (1,28)
Predictive failure	0.75 (10,23)	2.56 (10,21)	1.18 (10,21)	4.49 (10,21)	0.12 (10,22)	0.38 (10,24)	3.54 (10,20)
Mean prediction error 19871-1991II	0.25	3.47	1.23	0.14	0.33	0.10	0.41
Root-mean squared prediction error	0.63	3.59	1.69	3.01	<b>0.64</b>	0.62	2.23

1. Overall unemployment rate.

2. Composite rate based on northern Italian unemployment rates after 1978.

3. Not significant at 10 per cent

Note: The equations are estimated on semestrial data over the period 1972:1 to 1986:1. The variables included are discussed in the text and in Annex 1. For Ireland, the growth of UK real wages was also significant reflecting the linkages in the two labour market and was included in the equation shown. All coefficients are significant at the 5 per cent level, except where otherwise indicated. The degrees of freedom for the diagnostic tests are presented below the F-values. Among the diagnostic tests, only the predictive failure test for the Netherlands and Ireland are significant.

cost-minimising behaviour by producers suggested that the error-correction term be defined as the ratio of total compensation per worker to the output deflator. For Ireland, the growth of U.K. real wages was included as an additional explanatory variable to capture the tight linkages between the two labour markets. In all countries, except Denmark, additional variables were needed to eliminate problems indicated by diagnostic tests, primarily relating to outlying observations. These dummy variables and their estimated coefficients are listed in Annex I. Although these dummy variables improved the properties of the residuals with respect to normality, heteroscedasticity, and functional form as well as in-sample fit, they did not have a great effect on the coefficients of economic interest, nor on out-of-sample projections.

### Results

Coefficient estimates and equation diagnostics are reported in Table 3. The wage relationships estimated over 1972-86 either fit the post-1986 data reasonably well or underpredict actual real wage increases. The underpredictions were largest in Italy and smaller in France, the Netherlands, Belgium, Denmark and Ireland. In some countries, variants on the reported specifications produced smaller average underpredictions, but efforts to alter or augment the specifications did not change the basic contours of the post-1987 performance.

Standard F-tests for serial correlation, heteroscedasticity and functional form are reported and were never significant. Predictive-failure tests were significant for Ireland and the Netherlands, but the failures reflect large offsetting errors, as the mean out-of-sample projection errors are relatively small in both countries. Out-of-sample projections are presented in Table 4.

The Italian out-of-sample projection errors were very large, despite the insignificant F-statistic on the prediction error test. One possible reason for the large underprediction is that the average unemployment rate in the 1980s overstated the pressures on wages. One piece of evidence supporting this hypothesis is the greatly widened gap between unemployment in the north of Italy and the overall average rate. This gap had

Table 4. Out-of-sample projections errors of basic equations<sup>1</sup>

	France	Italy	Netherlands	Belgium	Denmark	Ireland <sup>2</sup>
87-I	-0.60	3.31	0.56	-0.39	0.96	2.51 (1.59)
87-II	0.87	2.10	0.02	0.69	-0.10	1.78 (0.61)
88-I	0.86	5.68	2.97	0.12	-0.22	1.90 (0.66)
88-II	-0.23	3.69	-0.55	-0.49	-0.34	-3.52 (4.84)
89-I	-0.28	2.77	-2.07	0.53	-0.49	1.03 (-0.62)
89-II	-0.20	3.21	-1.71	0.51	-0.02	1.36 (-0.23)
90-I	0.64	3.33	5.05	-0.28	-0.78	-4.10 (-5.95)
90-II	-0.20	2.90	-5.79	0.42	0.73	0.38 (-1.27)
91-I	1.02	3.20	4.05	0.84	1.05	1.76 (0.71)
91-II	0.61	4.45	-1.12	1.31	0.34	1.01 (0.28)

1. Actual wage increase less projected in per cent, annualised.

2. For Ireland out-of-sample projection errors based on cyclical unemployment (as estimated by a Hodrick-Prescott filler) are presented in parentheses.

Note: The basic equations are those presented in Table 3.



been stable at about 2 percentage points in the late 1970s and expanded to 6 or 7 percentage points in the mid- to late 1980s. To test the possibility that wage growth mainly reflected labour-market conditions in the North, a composite rate was constructed based on the northern Italian unemployment rate. This rate does not show the same persistent upward trend that the overall unemployment rate does, but its use did not eliminate the underprediction.

In France, Italy and Ireland, wage growth was weaker than could be explained by unemployment around 1982-84, as reflected by the negative coefficients on dummy variables entered for this period. One possible interpretation is that the slow wage growth reflects credibility effects from the initial period during which the ERM may have begun to constrain domestic policies. The arguments against such an interpretation are that the much tighter subsequent adherence had little apparent effect and that other analysts have generally focused on domestic reforms as accounting for slower wage growth in this period.

### *Alternative cyclical indicators*

Three indicators of cyclical unemployment were constructed to allow for the possibility that the apparent stability of wage behaviour reflects the offsetting effects of increasing NAIRUs and greater credibility. The cyclical unemployment variables were constructed as the deviations of current unemployment from a six semester lagged moving average of unemployment, a quadratic trend estimate fitted to actual unemployment, and trend unemployment estimated by a Hodrick-Prescott (HP) filter.

Each cyclical measure was added to the specification discussed above. However, they contributed little added explanatory power in general and the out-of-sample results were unaffected in most countries (Table 5). These results were fairly consistent across countries. Only in Denmark did such a filter add to the explanatory power of the wage equation, although the conventionally measured unemployment rate retained its significance, and the out-of-sample projections for Danish wages were hardly changed. In Ireland, the HP-based cyclical unemployment indicator was significant at the 10 per cent level and the conventional unemployment rate lost its significance when both were entered simultaneously. Moreover, the out-of-sample projections were very different – when only the conventional unemployment rate was entered, the Irish wage equation underpredicted wage growth over 1987-91, when the HP-based measure was included, an overprediction emerged. Taken by itself, this might lend support to the view that the recent evolution of Irish wages and unemployment reflected both a rising NAIRU and greater credibility. However, as discussed below, estimated over the entire sample (1972-91), the conventional measure was more significant than the HP-based measure.

In France and Belgium, the inclusion of a detrended unemployment variable changed the sign of the out-of-sample projection error from a modest underprediction to a modest, but insignificant, overprediction. The standard unemployment rate remained significant, however, with the detrended unemployment rate variable picking up some of the explanatory power of the change in unemployment rate term. In both countries the in-sample and out-of-sample fits were worse when these variables were included as the only unemployment terms or in conjunction only with levels of the unemployment rate (dropping the change in the unemployment rate). Hence, there

	France				Italy				Netherlands			
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]
UNR	-0.33	-0.32	-0.34	-0.28	..			..	-0.54	-0.53	-0.56	-0.65
DUNR	-1.13	-1.11	-1.12	-0.69'	..							
LUNR				..	-6.67	-6.51	-5.94	-4.71	8.39	..		
UNRCYCM			..	-0.59'	..		..	-0.83'	..		..	0.25'
UNRCYCTT		..	0.06'	..		..	-0.69'	..		..	0.03'	..
UNRCYCHP	..	-0.06'	..		..	-0.37'	..		..	-0.03'	..	
Average forecast error 871-9111	0.25	..	..	-0.54	3.47	..		..	0.14	..		

cyclical unemployment measures

Belgium				Denmark				Ireland			
[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]
-0.82	-0.70	-0.76	-0.82	-0.24	-0.18	-0.17	-0.30	-0.18	-0.19	-0.162	-0.07'
-1.18	-1.03'	-1.22'	-1.23'								
			0.04'				-0.18'				-0.362
	..	-0.34'			..	-0.402				-0.02'	
	-0.78'			..	-0.392	..			-0.04'		
0.33				0.10	-0.22	-0.21		0.41			-0.90

unemployment rate from the Hodrick-Prescott (smoothness parameter = 1 000) filtered unemployment rate. Its coefficient is entered in column [2] for each country. In column [3] is entered the coefficient of the deviation of actual unemployment from its quadratic trend (UNRCYCTT). In column [4] is entered the coefficient of the deviation of actual unemployment from its six-semester lagged moving average (UNRCYCM). ~~Where~~ the coefficients of the cyclical unemployment rates are correctly signed and significant at the 10 per cent level, the mean out-of-sample projection errors are calculated. Unless otherwise indicated all coefficients are significant at the 5 per cent level.

seems little basis for viewing their effect on the out-of-sample prediction forecast as economically important.

To examine further the possibility that there may have been an upward shift in the natural rate, the wage equations were extended to **1991**, including both the cyclical and trend unemployment rate terms, in order to allow for the upward natural rate drift, and an intercept dummy variable for the **1987-91** period to capture the effects of increased credibility. As compared to the predictive-failure tests, the dummy variable approach can capture relatively small improvements in credibility if their effects shift real wage demands down, given all the other explanatory variables (as might be expected if credibility was an omitted variable from the regression).

In addition to the three cyclical unemployment measures discussed earlier, an additional measure of cyclical unemployment was constructed, based on Layard, Nickell and Jackman's (henceforth LNJ **1991**) structural modelling of the natural rate. The LNJ natural rate series and derived cyclical unemployment measures are based on annual data and for some countries reflect different unemployment rate concepts<sup>5</sup>. Moreover, their series of natural rates ends at the end of **1988**; to allow comparisons over a longer sample period, the **1988** natural rate was extrapolated to **1991**, allowing the cyclical unemployment measure to be extended as well.

In no case did the **post-1987** dummy variable emerge negative and significant even at the 20 per cent level of significance (Table **6**). The absolute value was in most cases small, Italy being the exception and in any case wrongly signed. The cyclical unemployment terms that were constructed by various detrending methods were uniformly insignificant at the 20 per cent level, except for Denmark. In most cases the significance of the overall unemployment rate was unaffected. The cyclical unemployment series based on LNJ was correctly signed in the case of France and Italy.

These results reject the hypothesis that the increase in the credibility of fixed exchange rates in the late **1980s** led to more moderate wage increases over that period. The results also suggest that detrending the time series on unemployment using time-series, as opposed to structural methods, may produce a misleading indication of the degree of pressure on wages from unemployment. The results were also somewhat negative for the cyclical measures based on LNJ, but the heroic assumptions made in extrapolating the series into the **1990s** make this conclusion very tentative.

Although these wage equations were not designed to explain the changes in the natural rate in the **1980s**, the relative stability of the unemployment rate coefficients suggests that more of the increase in unemployment can be viewed as cyclical than is conventionally thought. However, in most countries, either the change in the unemployment rate or an error-correction term proved significant in addition to the level of unemployment, suggesting that the impact of higher unemployment is largely, although not entirely, transitory. The view that these equations imply a more stable natural rate must itself be qualified in **two** other respects as well. First, factors that affect the determination of prices, apart from the direct effect of wages, will also affect the natural rate, and these were not modelled. Second, the dummy variables that imply some unexplained weakness in real wages, particularly those for the early **1980s**, imply some temporary decline in the natural rate. Nevertheless, in forming a judgement on the relative importance of the increase in cyclical and structural unemployment, it is informative to look back at the evolution of real wages and the labour share in Chart 1. The

Table 6. Results over the entire sample

Unemployment Measures	Post-1987 dummy	Unemployment rate coefficients		Equation standard error
		Total	Cyclical	
France – total only	0.31 <sup>1</sup>	-0.34		0.66
UNCYCHP	0.211	-0.32	-0.112	0.67
UNCYCM <sup>3</sup>	-0.19 <sup>1</sup>	-0.30	-0.372	0.68
UNCYCTT	0.281	-0.34	-0.02 <sup>2</sup>	0.67
LNJ	-0.01 <sup>1</sup>	-0.23 <sup>1</sup>	-0.30 <sup>2</sup>	0.67
Italy – total only	3.40	-6.52 <sup>5</sup>		1.24
UNCYCHP	3.71	-0.79	-0.05 <sup>2</sup>	1.26
UNCYCM <sup>3</sup>	4.24	-0.95	0.36 <sup>2</sup>	1.17
UNCYCTT	3.64	-0.76	-0.16 <sup>2</sup>	1.25
LNJ – total only <sup>4</sup>	3.20	-1.18		1.25
LNJ <sup>4</sup>	3.45	0.13 <sup>2</sup>	1.51 <sup>2</sup>	1.25
Netherlands – total only	0.14 <sup>2</sup>	-0.66		1.96
UNCYCHP	0.382	-0.73	0.212	1.98
UNCYCM <sup>3</sup>	0.792	-0.86	0.36 <sup>2</sup>	1.86
UNCYCTT	0.61 <sup>2</sup>	-0.77	0.212	1.98
LNJ – total only	-0.112	-0.71		2.02
LNJ	0.37 <sup>2</sup>	-1.17	0.72 <sup>2</sup>	2.03
Belgium – total only	0.392	-0.82		1.51
UNCYCHP	-0.02 <sup>2</sup>	-1.29	0.57 <sup>2</sup>	1.49
UNCYCM <sup>3</sup>	0.452	-0.82	0.05 <sup>2</sup>	1.54
UNCYCTT	0.16 <sup>2</sup>	-0.77	-0.27 <sup>2</sup>	1.51
LNJ – total only <sup>4</sup>	-0.432	-0.83		1.76
LNJ <sup>4</sup>	1.14 <sup>2</sup>	-2.52	2.33	1.66
Denmark – total only	0.062	-0.24		0.87
UNCYCHP	-0.202	-0.17	-0.30 <sup>1</sup>	0.86
UNCYCM <sup>3</sup>	0.04 <sup>2</sup>	-0.26	-0.14 <sup>2</sup>	0.85
UNCYCTT	-0.14 <sup>2</sup>	-0.18	-0.222	0.87
LNJ	0.202	4.22	-0.06 <sup>2</sup>	0.88
Ireland – total only	0.262	-0.17		1.57
UNCYCHP	1.122	-0.28	0.42 <sup>2</sup>	1.54
UNCYCM <sup>3</sup>	0.42 <sup>2</sup>	-0.17	0.05 <sup>1</sup>	1.64
UNCYCTT	0.902	-0.25	0.23 <sup>2</sup>	1.57
LNJ	0.452	-0.35 <sup>1</sup>	0.30 <sup>2</sup>	1.58

1. Not significant at 10 per cent level.

2. Not significant at 20 per cent level.

3. Sample begins 1973L.

4. Sample ends 199011.

5. Coefficient on log of unemployment rate.

**Note:** The basic specification presented in Table 3 is augmented by a dummy variable that has a value of 0 before 1987 and a value of 1 over 1987-91 and by the constructed cyclical unemployment rates presented in Table 5. In addition the same specification is used with a decomposition of unemployment into cyclical and structural components based on LNJ's NAIRU estimates. The first line for each country presents the coefficients on the 1987-91 dummy variable and the total unemployment rate. The next three lines present the coefficients on these variables and on the three cyclical unemployment rate measures. Where LNJ use the same unemployment rate measure that is used in this paper (i.e. for France, Denmark and Ireland), cyclical unemployment based on the LNJ NAIRU is added to the basic specification, and the coefficient estimates are reported on the fourth line. Where the LNJ unemployment rate differs, the fourth line substitutes into the basic specification the LNJ unemployment rate for the unemployment rate used elsewhere in this paper, and the fifth line augments this specification with the LNJ cyclical unemployment rate.

change in the labour share is a good indicator of cyclical pressures in the labour market, indicating periods when real wages rose or fell relative to average labour productivity. In most countries, periods of low unemployment were associated with high real wage growth and an increasing labour share and periods of high unemployment rates with the reverse. The sharp decline in labour shares through the 1980s, reversed only partially in the cyclical upturn towards the end, suggests an extended period of downward cyclical pressure on wages.

### C. Vector auto regressions (VARs)

Although the basic conclusions from the wage equations reported above were robust to changes in specification, structural wage equations are generally subject to the criticism that they embody *a priori* identification restrictions that may not be well founded. In this section, the robustness of the above results are confirmed through VARs which impose fewer theoretical restrictions on specifications or dynamics, albeit at the cost of estimating many more parameters.

VARs are used because they provide a less restrictive, but nevertheless formalised, approach to assessing the degree to which various markets are forward-looking in their behaviour. Conventional adaptive expectations models would model wages as determined by past inflation, as an indicator of expected inflation or inflation catch-up, the unemployment rate, as a measure of labour market tightness, and possibly other variables reflecting structural factors. Similarly, prices would be determined by past increases in unit labour costs, a cyclical mark-up and other factors. Interest rates would not affect either, except to the extent that they captured cyclical effects of monetary policy. If financial markets were backward-looking in their expectations formation, then interest rates would be predicted by past inflation as well.

Credibility in financial markets would require that interest rates move in anticipation of future inflation. This is a necessary condition for credibility effects to lower inflation expectations. The absence of credibility effects in competitive, flexi-price asset markets would make it unlikely that such effects manifest themselves in more sluggishly adjusting markets. Moreover, it seems plausible that financial markets might be more forward-looking than labour and product markets, so that a decline in inflation expectations would be registered first in financial markets and only subsequently in labour and product markets. This will be used as a maintained hypothesis below. With financial markets more forward-looking than labour and product markets, interest rates should contribute to predicting future inflation.

Five credibility indicators were entered into the VARs to test whether credibility effects have lowered inflation expectation in labour and product markets. First, dummy variables were included in the wage-price system to see whether there was any systematic underprediction of wages and prices in the period of exchange rate stability. To the extent that pricing and wage behaviour had deviated from past practices, there should be a systematic tendency in either wage or pricing behaviour to overpredict inflation that the dummy variables should capture. Four dummy variables were constructed for the period from 1985 to 1991 taking values of 1, respectively, in 1985-86, 1987, 1988-89 and 1990-91 and 0 outside these periods. The first variable would potentially capture the initial hardening of exchange rate parities in the mid-1980s; the

second, the first year of unchanged parities; the last two, the periods of sustained, fixed parities.

ERM countries' inflation differentials with Germany were also tested as explanatory variables in the VAR equations, on the argument that wage and price behaviour may have been affected by the knowledge that fixed exchange rates ultimately implied convergence of inflation rates. Cumulative differences in inflation, adjusted for exchange rate changes, were also tested as a credibility indicator, on the argument that private sector agents would expect that fixed exchange rates would put downward pressure on the inflation rates of the countries whose relative price levels had moved out of line with their neighbours.

Two financial market indicators, the differential in long-term interest rates between Germany and other ERM countries, and individual countries' own interest rate term structure, were also entered in the wage-price system. Such financial market variables may represent proxies for the expectations in labour and product markets. To the extent that actual wage and pricing behaviour could be shown to be affected by such variables in the presence of other proximate determinants of inflation (such as lagged values of wages, prices and unemployment), the argument could be made that financial market expectations represented additional information that wage- and price-setters were acting on.

The general question asked was whether forward-looking indicators of inflation provided any information on the future evolution of wage or price inflation in the presence of lagged values of wage inflation, price inflation and unemployment. The lagged variables represent the conventional factors whose past history might be thought of as influencing wage and price formation. Hence, the significance of the forward-looking indicators would suggest that labour and product markets were not basing their decisions solely on past history.

The forward-looking indicators were entered as three separate variables covering, respectively, the pre-ERM period, the initial phase of the ERM and the period of exchange rate stability beginning in 1987. By allowing for separate coefficients over the three time periods, the possibility that forward-looking expectations became more important in the ERM period, notably in the period when credibility was being given greater weight in the statements of policy-makers, could be tested. This would be particularly true of indicators relating the German inflation rate or price level to those of other ERM countries. Intercept shift dummies were also included along with the indicators to assure that the coefficients on the indicators reflected the covariation of wage and price behaviour with the indicators, rather than a level shift in the pattern of errors.

The results for wage growth are reported in Table 7. The equations were run both with and without the imposition of homogeneity on lagged wages and prices. The top entry for each country/credibility indicator combination represents the joint significance levels of the coefficients on the post-1987 credibility indicators entered in each equation; dummy variables in columns 1 and 6, and continuous credibility indicators in the other columns. A value of 0.99 indicates significance at the 1 per cent level. The coefficients on the four forward-looking indicators (as opposed to the accompanying intercept shift dummies) are recorded below in parentheses.

For France, there is little indication that any significant change occurred after 1987. Only the post-1987 0,1 dummies show some sign of credibility effects, but are far from being significant. For Italy and the Netherlands, little evidence of post-1987 credibility

	A. No homogeneity					B. Homogeneity imposed				
	Post-1987 0,1 dummies	Interest differential with Germany	Inflation differential with Germany	Cumulated inflation differential with Germany	Domestic yield curve	Post-1987 0,1 dummies	Interest differential with Germany	Inflation differential with Germany	Cumulated inflation differential with Germany	Domestic yield curve
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
<b>FRANCE</b>	<b>0.53</b>	0.07	<b>0.55</b>	<b>0.18</b>	0.17	0.54	0.10	0.30	0.56	0.25
After Q187	(-0.22) <sup>1</sup>	(-0.02)	(0.14)	(-0.02)	(0.04)	(-0.20) <sup>1</sup>	(-0.02)	(0.07)	(-0.17)	(0.05)
Q279-Q486		(0.00)	(-0.37)	(0.10)	(-0.41)		(0.08)	(0.00)	(0.04)	(-0.48)
Before Q279		(-0.20)	(-0.21)	(0.02)	(-0.14)		(-0.15)	(-0.07)	(-0.10)	(-0.12)
<b>ITALY</b>	0.15	<b>0.05</b>	<b>0.05</b>	0.44	0.27	0.93	0.07	0.26	0.12	0.28
After Q187	(1.17) <sup>1</sup>	(0.32)	(-0.01)	(-0.09)	(0.26)	(3.46) <sup>1</sup>	(0.04)	(0.34)	(-0.01)	(0.27)
Q279-Q486		(0.26)	(0.26)	(0.01)	(0.10)		(0.01)	(-0.23)	(-0.06)	(0.02)
Before Q279		(0.14)	(0.20)	(-0.01)	(0.04)		(-0.14)	(0.01)	(-0.10)	(0.17)
<b>NETHERLANDS</b>	<b>0.09</b>	0.31	0.10	0.37	0.33	<b>0.08</b>	0.57	0.01	0.56	0.49
After Q187	(0.41) <sup>1</sup>	(0.33)	(-0.05)	(0.10)	(0.19)	(0.47) <sup>1</sup>	(-0.81)	(-0.01)	(-0.08)	(0.27)
Q279-Q486		(-0.73)	(0.41)	(-0.07)	(0.29)		(-0.95)	(0.49)	(-0.73)	(0.31)
Before Q279		(-1.70)	(-0.67)	(0.37)	(-0.30)		(-1.18)	(-0.47)	(-0.05)	(-0.30)
<b>BELGIUM</b>	0.67	0.75	0.37	0.99	0.84	0.59	0.69	0.41	0.48	0.81
After Q187	(-0.84) <sup>1</sup>	(1.31)	(0.27)	(-0.52)	(0.76)	(-0.69) <sup>1</sup>	(1.18)	(0.29)	(-0.12)	(0.78)
Q279-Q486		(-0.19)	(-0.02)	(0.23)	(0.63)		(-0.11)	(-0.06)	(0.08)	(0.48)
Before Q279		(-0.73)	(-0.15)	(-0.50)	(-0.02)		(-0.47)	(-0.17)	(-0.22)	(0.11)
<b>DENMARK</b>	<b>0.60</b>	<b>0.88</b>	<b>0.54</b>	0.70	0.23	0.95	<b>0.89</b>	<b>0.80</b>	0.09	0.25
After Q187	(-0.46) <sup>1</sup>	(0.35)	(0.12)	(-0.20)	(-0.08)	(0.85) <sup>1</sup>	(0.35)	(0.21)	(-0.01)	(-0.09)
Q279-Q486		(-0.02)	(-1.26)	(0.05)	(0.40)		(-0.01)	(-0.77)	(0.02)	(0.42)
Before Q279		(-0.59)	(-0.70)	(-0.20)	(n.a.)		(-0.59)	(-0.43)	(-0.07)	(n.a.)
<b>IRELAND</b>	0.43	0.96	0.82	0.71	0.58	0.45	0.67	0.66	0.39	0.34
After Q187	(-0.43) <sup>1</sup>	(0.64)	(0.64)	(-0.50)	(0.36)	(1.47) <sup>1</sup>	(0.32)	(0.46)	(-0.18)	(0.20)
Q279-Q486		(-0.91)	(-0.24)	(-0.32)	(0.38)		(-1.11)	(-0.81)	(0.01)	(0.40)
Before Q279		(0.84)	(0.47)	(-0.13)	(0.24)		(-0.04)	(-0.06)	(-0.15)	(-0.16)

1. Average value of dummy variables for 1989-90 and 1990-91. Other dummy variables incorrectly signed.



	A. No homogeneity					B. Homogeneity imposed				
	Post-1987 0,1 dummies	interest differential with Germany	Inflation differential with Germany	Cumulated inflation differential with Germany	Domestic yield curve	Post-1987 0,1 dummies	Interest differential with Germany	Inflation differential with Germany	Cumulated inflation differential with Germany	Domestic yield curve
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
<b>FRANCE</b>	<b>0.13</b>	<b>0.54</b>	<b>0.28</b>	<b>0.19</b>	<b>0.64</b>	<b>0.01</b>	<b>0.37</b>	<b>0.12</b>	<b>0.35</b>	<b>0.66</b>
After Q187	(-0.46) <sup>*</sup>	0.15	(-0.02)	(0.04)	(0.14)	(-0.04) <sup>*</sup>	(0.11)	(-0.03)	(-0.12)	(0.15)
Q279-Q486		(-0.09)	(0.16)	(0.09)	(0.07)		(-0.18)	(0.05)	(0.00)	(0.16)
Before Q279		(0.15)	(0.00)	(0.03)	(-0.09)		(0.07)	(-0.07)	(-0.06)	(-0.08)
<b>ITALY</b>	<b>0.13</b>	<b>0.20</b>	<b>0.37</b>	<b>0.44</b>	<b>0.25</b>	<b>0.06</b>	<b>0.27</b>	<b>0.24</b>	<b>0.01</b>	<b>0.24</b>
After Q187	(-0.64) <sup>*</sup>	(0.14)	(0.31)	(-0.09)	(-0.14)	(-0.16) <sup>*</sup>	(0.18)	(0.20)	(-0.00)	(-0.14)
Q279-Q486		(-0.14)	(-0.19)	(0.04)	(0.45)		(-0.11)	(0.06)	(-0.11)	(0.38)
Before Q279		(-0.10)	(-0.25)	(0.09)	(0.05)		(-0.07)	(-0.06)	(0.01)	(0.15)
<b>NETHERLANDS</b>	<b>0.40</b>	<b>0.77</b>	<b>0.89</b>	<b>0.63</b>	<b>0.76</b>	<b>0.46</b>	<b>0.46</b>	<b>0.89</b>	<b>0.21</b>	<b>0.22</b>
After Q187	(-0.34) <sup>*</sup>	(0.66)	(-0.29)	(0.18)	(-0.24)	(-0.05) <sup>*</sup>	(0.34)	(-0.28)	(-0.03)	(-0.05)
Q279-Q486		(-0.80)	(-0.65)	(-0.10)	(-0.07)		(-0.89)	(-0.65)	(-0.75)	(-0.02)
Before Q279		(-0.15)	(-0.20)	(-0.35)	(-0.11)		(0.05)	(-0.27)	(-0.03)	(-0.10)
<b>BELGIUM</b>	<b>0.87</b>	<b>0.30</b>	<b>0.46</b>	<b>0.99</b>	<b>0.36</b>	<b>0.90</b>	<b>0.21</b>	<b>0.65</b>	<b>0.46</b>	<b>0.25</b>
After Q187	(-0.82) <sup>*</sup>	(0.22)	(-0.17)	(-0.54)	(0.60)	(-0.74) <sup>*</sup>	(0.16)	(-0.25)	(-0.07)	(0.19)
Q279-Q486		(0.08)	(-0.21)	(0.26)	(-0.34)		(0.11)	(-0.05)	(0.10)	(0.02)
Before Q279		(-0.17)	(-0.28)	(-0.46)	(0.25)		(-0.01)	(-0.15)	(-0.20)	(-0.06)
<b>DENMARK</b>	<b>(0.99)</b>	<b>0.23</b>	<b>0.02</b>	<b>0.68</b>	<b>0.63</b>	<b>0.78</b>	<b>0.62</b>	<b>0.28</b>	<b>0.06</b>	<b>0.59</b>
After Q187	(-2.78) <sup>*</sup>	(-0.07)	(-0.01)	(-0.19)	0.27	(-0.73) <sup>*</sup>	(-0.20)	(-0.07)	(-0.06)	(0.25)
Q279-Q486		(0.36)	(0.23)	(0.10)	(0.20)		(0.04)	(-0.14)	(0.05)	(0.22)
Before Q279		(0.44)	(-0.20)	(-0.25)	(n.a.)		(0.19)	(-0.38)	(-0.09)	(n.a.)
<b>IRELAND</b>	<b>0.02</b>	<b>0.25</b>	<b>0.29</b>	<b>0.06</b>	<b>0.09</b>	<b>0.05</b>	<b>0.30</b>	<b>0.30</b>	<b>0.17</b>	<b>0.02</b>
After Q187	(0.02)	(0.08)	(-0.13)	(-0.04)	(0.03)	(0.81) <sup>*</sup>	(-0.09)	(-0.13)	(0.08)	(0.04)
Q279-Q486		(-0.19)	(-0.62)	(-0.24)	(0.15)		(-0.30)	(-0.26)	(0.04)	(0.16)
Before Q279		(-0.28)	(-0.26)	(0.07)	(-0.60)		(-0.09)	(-0.09)	(-0.03)	(-0.78)

1. Average value of dummy variables.

appears from the wage equations. For Belgium and Denmark, some evidence in favour of credibility emerges from dummy variables, interest rate differentials and cumulative inflation differentials; however, the significance levels are low by conventional standards and fall when homogeneity is imposed. For Ireland, the wage equations that incorporate interest rate differentials support credibility, but only when homogeneity is not imposed. On the whole, when homogeneity was imposed, the domestic yield curve and cumulative inflation differential coefficients are correctly signed, but of low significance and low absolute value.

A similar exercise was attempted with equations for price inflation (Table 8). For the Netherlands, the inflation differential *vis-a-vis* Germany enters in both ERM sub-periods, but it also does so for the pre-ERM period. For Belgium and Denmark, the dummy variable and cumulated inflation differentials *vis-a-vis* Germany indicated some shift after 1987 in pricing behaviour, but this shift was not confirmed by the other credibility indicators and again tended to disappear when homogeneity was imposed. Overall, the results do not suggest any marked tendency for credibility effects to be manifested.

#### IV. CONCLUSION

The success of ERM countries in reducing inflation has led to much analysis of whether the ERM as an institutional device has given rise to credibility effects in Member countries' disinflation processes. After considering both the analytical underpinnings of the credibility hypotheses and the empirical evidence, this article found little evidence that policy credibility in ERM countries reduced the costs of disinflation substantially. Some credibility effects have appeared in financial markets after exchange rate parities became more firmly adhered to in the second half of the 1980s. But there is only very weak evidence of a downward shift in inflation expectations that affected labour and product market behaviour. In particular, little basis is found from which to conclude that adhering to the ERM bands has altered the trade-off between inflation and unemployment.

Absence of credibility effects does not imply, however, that anti-inflationary reputation is unimportant, or that ERM countries have failed to improve the reputation of their central banks. On the contrary, convergence to the German standard has improved the reputation of monetary authorities, as is evident from the narrowing of interest rate differentials *vis-a-vis* Germany. But improved reputation appears to have come about gradually due to the policy discipline imposed by ERM membership. Although hard to gain, such anti-inflationary reputation may help to lock in low inflation. ERM members, in general, were able to maintain earlier disinflationary achievements better, during 1990 and 1991, than non-ERM countries.

Although it is difficult to assess whether the gradual occurrence of anti-inflationary reputation reflects the gradual evolution of the ERM itself, the slowness with which such reputation is established suggests that potential high-inflation newcomers to the ERM

should not base a decision to enter on expected short-term credibility effects, but on long-term gains. Countries seeking credibility must be prepared, and must prepare the public, to earn it by demonstrating success.

The lack of clear evidence of credibility effects and the poor trade-off between inflation and unemployment in ERM countries in the **1980s** also points to the need for countries seeking to reduce inflation and sustain price stability to pursue policies aimed at increasing labour market flexibility. Whereas financial asset prices adjust rapidly to changes in the expectations of forward-looking financial market participants, labour markets seem more often to be characterised by imperfections, sluggish adjustment, and generally more backward-looking behaviour. Such sluggishness implies that monetary regime changes impact on labour market behaviour with a considerable lag and only after unemployment has increased. If labour market imperfections and rigidities are important, then policy may become effective in lowering inflation only if unemployment is pushed to a level where workers begin to feel that their jobs are at risk, implying high unemployment even with a credible monetary policy. By contrast, greater flexibility in labour markets will reduce the direct unemployment cost of disinflationary policies and, by increasing the chances that the policies will be sustained over the medium term, may provide an additional credibility bonus that would otherwise be lacking.

## NOTES

1. This section draws in part on a more detailed survey of the credibility literature in Englander (1991). Other non-technical discussions can be found in Barro (1985), Blinder (1987) and Fischer (1987). Somewhat more technical are the surveys in Blackburn and Christensen (1989), Persson (1988), McCallum (1984), and Rogoff (1987). Of these discussions, Barro and McCallum are most sympathetic to the policy thrust of the literature, and Blinder the least.
2. Credibility in an ERM context is discussed in, among others, European Economy (1990). Giavazzi and Giovannini (1988a), Giavazzi and Pagano (1988), Goodhart (1990), Vinals (1990) and by several of the authors in Giavazzi et al. (1988).
3. Tradeoffs between disinflation and unemployment in the 1980s are discussed by Giavazzi and Giovannini (1988b), DeGrauwe (1989b,c), Fratianni and von Hagen (1990b), Dhar (1991) and Robertson and Symons (1991). Whereas the earlier studies conclude that tradeoffs have been less favourable in ERM countries than in other countries, the last two studies find contrary evidence. The results appear sensitive to the sample of non-ERM countries used.
4. Error-correction terms were constructed by taking the residual of a regression of the logarithm of real compensation per worker on the logarithms of labour productivity, total factor productivity (adjusted for the share of labour) and a constant term. The equations were estimated over 1971-1 to 1991-11. No restrictions were placed on the coefficients except that they be correctly signed.
5. See Layard et al. (1991). The data were kindly provided by Stephen Nickell.

### Annex I. Dummy variables included in the wage equations

	Variable	Description	Coefficient
France	D7377	Value of 1 in 19731 and 197511, -1 in 19741 and 197710 otherwise	2.39
	D7981	Value of 1 from 19791 to 19811, 0 otherwise	-1.44
	D8284	Value of 1 from 198211 to 19841, 0 otherwise	-2.21
Italy <sup>2</sup>	DDD	Value of 1 in 197911, 19721, 197311, 19751, 197611, 197911 and -0.5 in each of the two following semesters, 0 otherwise	7.18
	D73H1	Value of 1 in 19731, 0 otherwise	7.44
	D74H2	Value of 1 in 197411, 0 otherwise	-3.70
	D7778	Value of 1 in 197711, -1 in 1978, 0 otherwise	4.70
	D8183	Value of 1 from 198211 to 198311, 0 otherwise	-3.92
Belgium	D76H1	Value of 1 in 19761, 0 otherwise	-4.64
	D7778	Value of 1 from 19771 to 197811, 0 otherwise	-1.60
	D84H1	Value of 1 in 19841, 0 otherwise	-3.98
Ireland	D73	Value of 1 in 19731, -1 in 197311, 0 otherwise	2.59
	D76H1	Value of 1 in 19761, 0 otherwise	-7.57
	D8081	Value of 1 from 19801 to 198111, 0 otherwise	-2.85
	D8386	Value of -0.4 from 19831 to 19851, 1 from 198511 to 19861, 0 otherwise	-2.33
Netherlands	D7273	Value of 1 in 19731, -1 in 19721, 197211, 197311, 0 otherwise	4.12
	D75	Value of 1 in 19751, -1 in 197511, 0 otherwise	4.17

1. Not significant at 10 per cent.

2. Coefficients are from equation with overall unemployment rate.

**Note:** All coefficients are significant at 5 per cent level except where **Otherwise** indicated.

## BIBLIOGRAPHY

- Andersen, Torben M. and Ole Risager (1988), "Stabilisation policies, credibility, and interest rate determination in a small open economy", *European Economic Review*, No. 32.
- Artis, Michael J. and Dilip Nachane (1990), "Wages and prices in Europe: a test of the German leadership hypothesis", *Weltwirtschaftliches Archiv*, Bind 126, Hef! 1.
- Artis, Michael J. and Paul Ormerod (1991), "Is there an 'EMS effect' in European labour markets?", Paper presented at the L.S.E. workshop on the ERM in London (10 May 1991).
- Barrell, Ray (1991), "Structural change in European wage and price systems: a study of France and Italy", Paper presented at the L.S.E. workshop on the ERM in London (10 May 1991).
- Barrell, Ray, Julia Darby and Colin Donaldson (1990), "Structural stability in European wage and price systems", NIESR Discussion Paper No. 188.
- Barro, Robert J. (1985), "Recent developments in the theory of rules versus discretion", *The Economic Journal*, Vol. 95, Supplement, pp. 23-37.
- Barro, Robert and David B. Gordon (1983), "Rules, discretion and reputation in a model of monetary policy", *Journal of Monetary Economics*, Vol. 12, No. 1 (July), pp. 101-21.
- Bini Smaghi, L. and Stefano Micossi (1989), "Managing exchange rates in the EMS with free capital", *Banca Nazionale del Lavoro Quarterly Review*, No. 171 (December).
- Blackburn, Keith and Michael Christensen (1989), "Monetary policy and policy credibility: theories and evidence", *Journal of Economic Literature* Vol. XXVII (March).
- Blanchard, Olivier J. and Stanley Fischer (1989), *Lectures in Macroeconomics*, MIT Press, Cambridge.
- Blinder, Allan S. (1987), "The rules versus discretion debate in the light of recent experience", *Weltwirtschaftliches Archiv*, Band 123, Hef! 3, pp. 399-414.
- Christensen, Michael (1987a), "Disinflation, credibility and price inertia: a Danish exposition", *Applied Economics* No. 19.
- Christensen, Michael (1987b), "On interest rate determination, testing for policy credibility, and the relevance of the Lucas critique: some Danish experiences", *European Journal of Political Economy*, Vol. 3, No. 3.
- Cohen, Daniel and Charles Wyplosz (1989), "The European Monetary Union: an agnostic evaluation", CEPR Discussion Paper No. 306.
- Collins, Susan M. (1988), "Inflation and the European Monetary System", in F. Giavazzi et al. (eds), *The European Monetary System*, Cambridge University Press.
- DeGrauwe, Paul (1989a), "Is the European Monetary System a DM-zone?", CEPR Discussion Paper No. 297.
- DeGrauwe, Paul (1989b), "Disinflation in the EMS and non-EMS countries. What have we learned?", *Empirica - Austrian Economic Papers*, Vol. 16, No. 2.
- DeGrauwe, Paul (1989c), "The cost of disinflation in the European Monetary System", CEPR Discussion Paper No. 326.
- Dhar, S. (1991), "Wages, inflation and EMS membership", Paper presented at the L.S.E. workshop on the ERM in London (10 May 1991).
- Englander, A. Steven (1991), "Optimal monetary policy design: rules versus discretion yet again", *Federal Reserve Bank of New York Quarterly Review* (Winter).

- European Economy(1990), One Market, One Money, No. 44 (October).
- Federal Reserve Bank of New York (1990), *Intermediate Targets and Indicators for Monetary Policy: A Critical Survey*, New York.
- Fischer, Stanley (1987), "Rules versus discretion in monetary policy," NBER Working Paper No. 2518.
- Fratianni, Michele and Jurgen von Hagen(1990a), "German dominance in the EMS the empirical evidence", *Open Economics Review*, No. 1.
- Fratianni, Michele and Jurgen von Hagen (1990b), "The European Monetary System ten years after", in C. Plosser and A.H. Meltzer (eds.) *Carnegie-Rochester Conference Series on Public Policy*, Vol. 32 (Spring).
- Giavai, Francesco and Alberto Giovannini (1986), "The EMS and the dollar", *Economic Policy*, Vol. 2 (April).
- Giavai, Francesco and Alberto Giovannini (1988a), "Can the European Monetary System be copied outside Europe? Lessons from ten years of monetary policy coordination in Europe", NBER Working Paper No. 2786 (December).
- Giavai, Francesco and Alberto Giovannini(1988b), "The role of the exchange-rate regime in a disinflation: empirical evidence on the European Monetary System", in F. Giavazzi et al. (eds.), *The European Monetary System*.
- Giavazzi, Francesco and Alberto Giovannini (1989), *Limiting Exchange-Rate Flexibility*, MIT Press, Cambridge Mass.
- Giavazzi, Francesco; Stefano Micossi and Marcus Miller (eds.) (1988), *The European Monetary System*, Cambridge University Press.
- Giavai, Francesco and Marco Pagano (1988), 'The advantage of tying one's hands – EMS discipline and central bank credibility', *European Economic Review*, No. 32.
- Giovannini, Alberto (1988), "How do fixed-exchange-rate regimes work: the evidence from the gold standard, Bretton Woods and the EMS", NBER Working Paper No. 2766 (November).
- Goodhart, Charles (1990), "Economists' perspectives on the EMS – a review essay", *Journal of Monetary Economics*, No. 26.
- Kremers, Jeroen (1990), "Gaining credibility for a disinflation – Ireland's experience in the EMS", *IMF staff Papers*, Vol. 37, No. 1 (March).
- Layard, Richard, Stephen Nickell and Richard Jackman (1991), *Unemployment– Macroeconomic Performance and the Labour Market*, Oxford University Press.
- MacDonald, Ronald and Mark P. Taylor (1990), "Exchange rates, policy convergence and the European Monetary System", CEPR Discussion Paper, No. 444.
- Mastropasqua, Cristina, Stefano Micossi and Roberto Rinaldi (1988), "Intervention, sterilization and monetary policy in European Monetary System countries 1979-87", in F. Giavai et al. (eds.), *The European Monetary System*, Cambridge University Press.
- McCallum, Bennett T. (1984), "Credibility and monetary policy", in *Price Stability and Public Policy*, Federal Reserve Bank of Kansas City, pp. 105-128.
- Meen, Geoffrey P. (1991), "Convergence, divergence and stability in the European economies", Paper presented at the SPES Conference in Paris (June).
- Persson, Torsten (1988), "Credibility of macroeconomic policy: an introduction and a broad survey," *European Economic Review*, Vol. 32, pp. 519-532.
- Poret, Pierre (1990), "The 'puzzle' of wage moderation in the 1980s", *OECD ESD Working Papers*, No. 87 (November).
- Robertson, D. and J. Symons (1991), "Output, inflation and the ERM", *Centre for Economic Performance Discussion Paper No. 43* (July).
- Rogoff, Kenneth (1985), "The optimal degree of commitment to an intermediate monetary target", *Quarterly Journal of Economics*, Vol. 100, No. 4 (1985), pp. 1169-1190.
- Rogoff, Kenneth (1987), "Reputational constraints on monetary policy", in *Bubbles and Other Essays*, Karl Brunner and Allan Meltzer (eds.), *Carnegie-Rochester Conference Series*, Vol. 26.
- Russo, Massimo and Giuseppe Tullio (1988), "Monetary policy coordination within the European Monetary System: is there a rule?", *IMF Occasional Papers*, No. 61.

- Vinals, José (1990), "The EMS, Spain and macroeconomic policy", CEPR Discussion Paper No. 389.
- Von Hagen, Jurgen and Michele Fratianni (1990), "German dominance in the EMS: evidence from interest rates", *Journal of International Money and Finance*, No. 9.
- Weber, Axel A. (1989), "The role of policy-makers' reputation in the EMS disinflation: an empirical evaluation", revised version of Center of Economic Research Discussion Paper, No. 8803, Tilburg University.
- Weber, Axel A. (1990), "EMU and asymmetries and adjustment problems in the EMS: some empirical evidence", CEPR Discussion Paper No. 448.
- Weber, Axel A. (1991a), "EMS credibility", *Economic Policy*, No. 12 (April).
- Weber, Axel A. (1991b), "Stochastic process switching and intervention in exchange rate target zones: empirical evidence from the EMS", CEPR Discussion Paper, No. 554 (July).