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**Disinflation in Spain: The Recent Experience**

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**Abstract**

This paper investigates the causes of the recent disinflation in Spain. A standard Phillips curve model is used to disentangle the contributions of three possible shocks: an adverse demand shock that raises unemployment, a positive supply shock resulting from relative price adjustments or structural improvements in the labor market, and a credibility shock that lowers inflationary expectations. The main element underlying Spain's recent disinflation appears to be a fall in inflation expectations, thanks to the country's commitment to participate in Economic and Monetary Union from the start, and policy actions geared to that end.

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## SUMMARY

This paper investigates the causes of the recent disinflation in Spain. In a standard Phillips curve model, three major aggregate shocks could explain the fall in inflation: an adverse demand shock that raises unemployment, a positive supply shock resulting from relative price adjustments or structural improvements in the labor market, or a credibility shock that lowers inflationary expectations.

The methodology consists of several building blocks: (1) the estimation of a Phillips curve to assess the roles played by demand and relative price shocks; (2) the estimation of a vector autoregressive system to determine the possible contribution of the labor market and expectation shocks to disinflation; (3) the examination of disaggregated price data to detect the influence of relative price shocks on inflation; (4) the analysis of proxies of inflationary expectations to gauge the credibility effect of a new monetary policy framework; and (5) the comparison of Spain's disinflationary episode with Italy's and Portugal's, so as to ascertain the common disinflationary effect of Spain's commitment to participate from the start in Economic and Monetary Union (EMU).

Spain's recent disinflation cannot be fully explained either by the recession of 1992-93 or by a positive supply shock. In particular, wage moderation seems to have accompanied, rather than induced, the fall in inflation. As in Portugal and Italy, Spain's fall in inflation is more likely to have resulted from a credibility shock associated with a strong commitment to take part in EMU from the start and the implementation of fiscal policy consistent with that goal.

## I. INTRODUCTION

Until recently, Spain was regarded as a country of moderate but persistent inflation. Indeed, after the long and sustained disinflation experienced from 1977 to 1987, Spain's inflation rate seemed to stabilize on a plateau between 4 percent and 6 percent (Figure 1), increasing with the overheating period in the end of the 1980s and decreasing with the slowdown of the early 1990s. Even in the wake of the severe recession of 1992–93, while unemployment increased by about 5 percentage points to exceed 24 percent of the labor force, inflation did not decline below 4 percent. As a consequence, inflation differentials between Spain and other countries of the European Monetary System remained significantly positive, contributing to the successive devaluations of the peseta until 1995, and to lingering doubts about Spain's qualification as a founding member of the European Monetary Union.

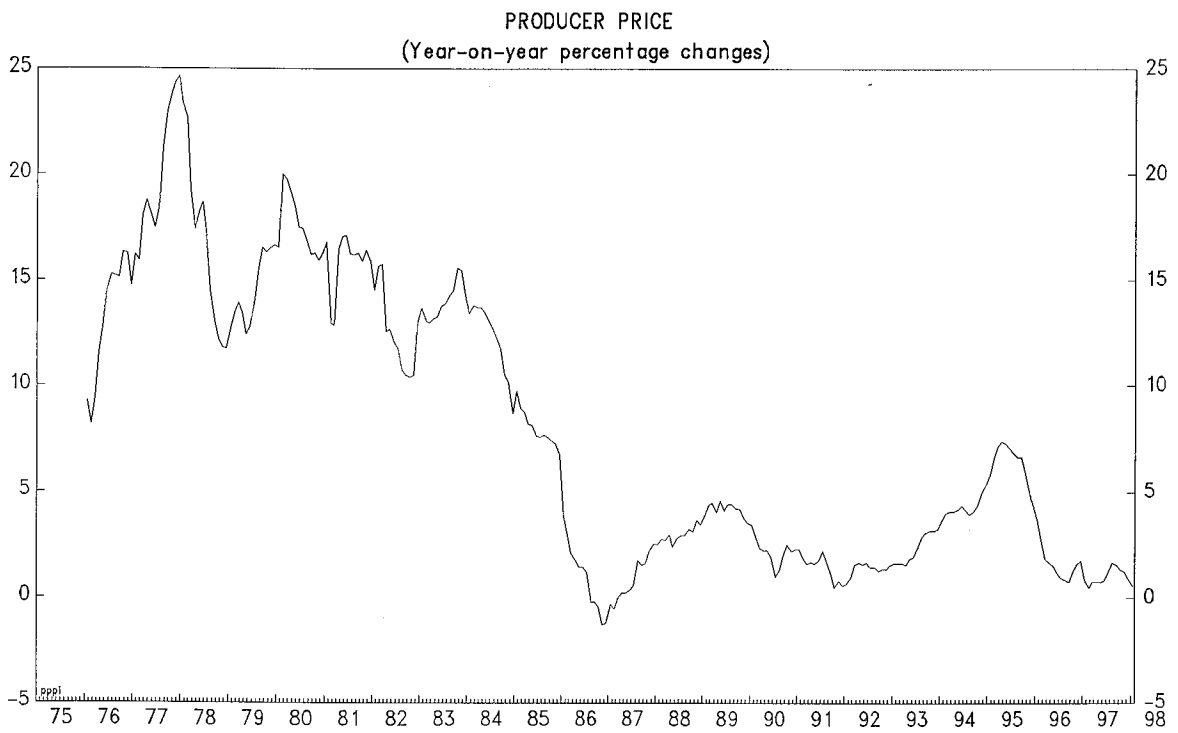
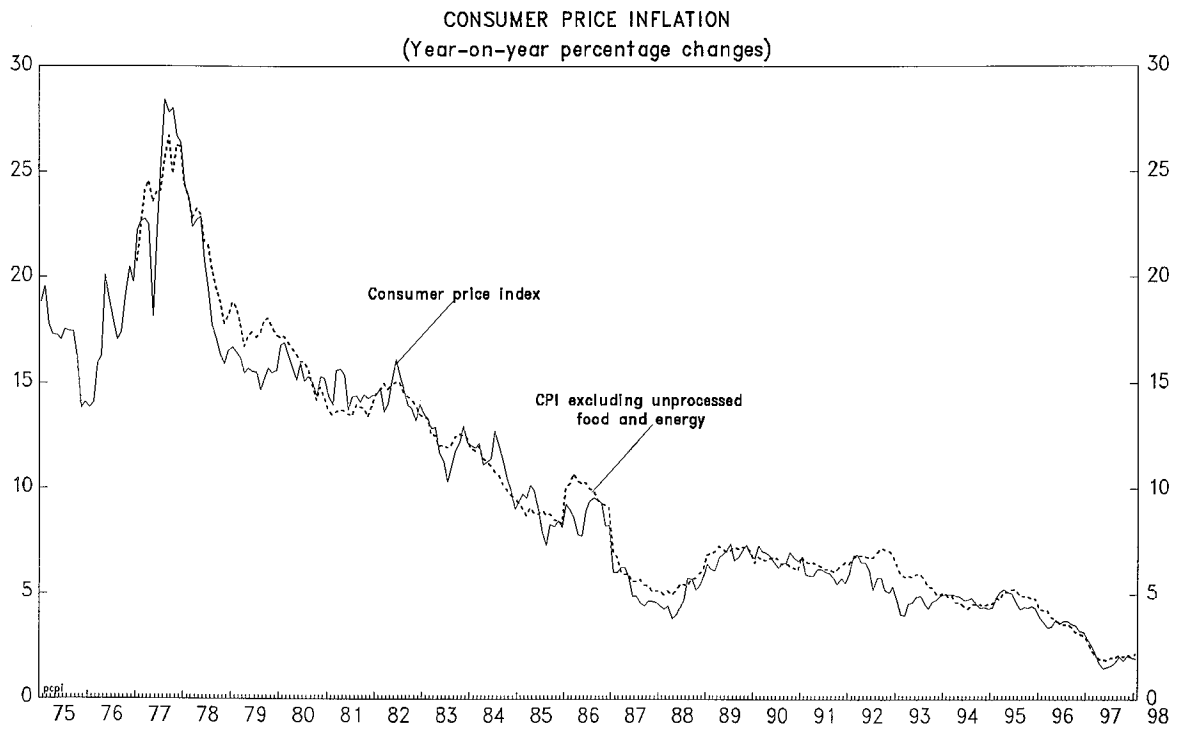
In contrast, Spain's inflation declined substantially in the last few years, from 5.0 percent in 1995 to 2.0 percent in 1997, well below the Maastricht reference value. The growth in industrial prices also decreased sharply, from 6.4 percent in 1995 to 1.3 percent in 1997 (Figure 1). Finally, nominal wage growth fell significantly, from 4.5 percent in 1995 to 3.3 percent in 1997 (Figure 2). Contrary to the traditional view that maintained that lower productivity gains and less competition in the nontradable sector were sources of inflation persistence, disinflation was observed in all sectors of the economy, in almost exactly the same proportion, with a decline of about 3.5 percentage points between the average of 1987–95 and 1997. Food prices, services prices, and industry prices contributed by about a 1.1 percentage point to the fall in inflation (Table 1 below).

Table 1. Spain: Components of Total CPI

(In percent)

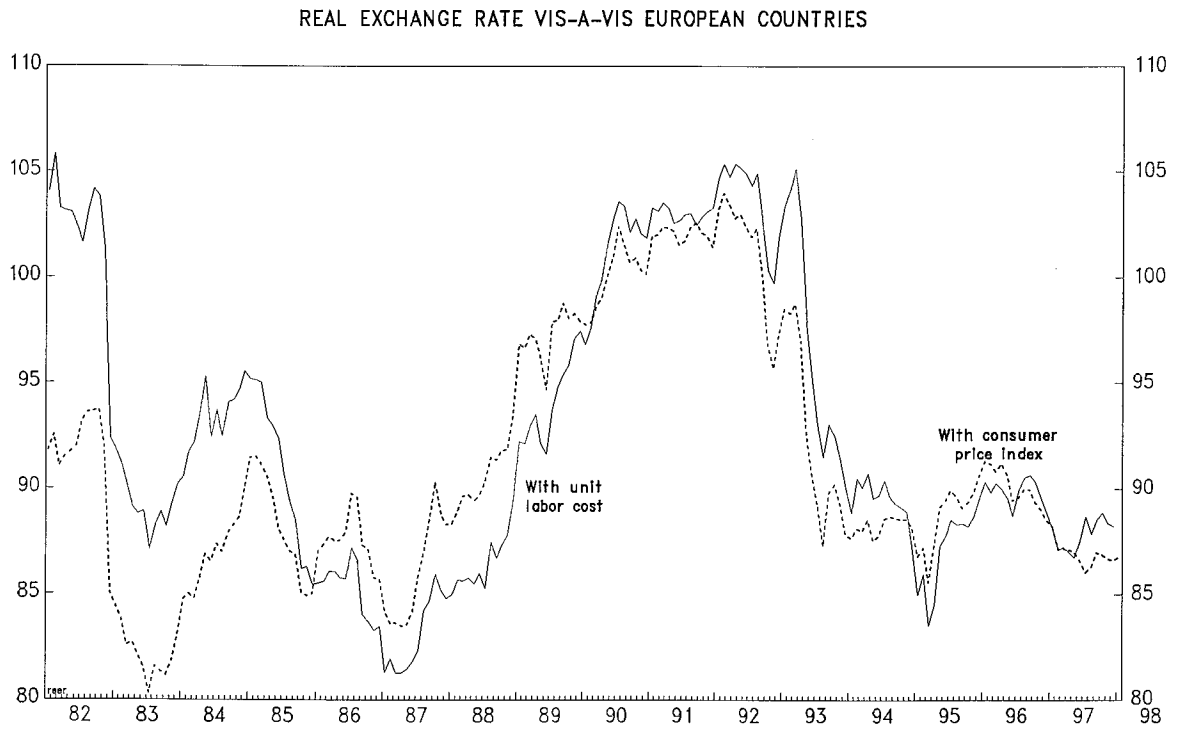
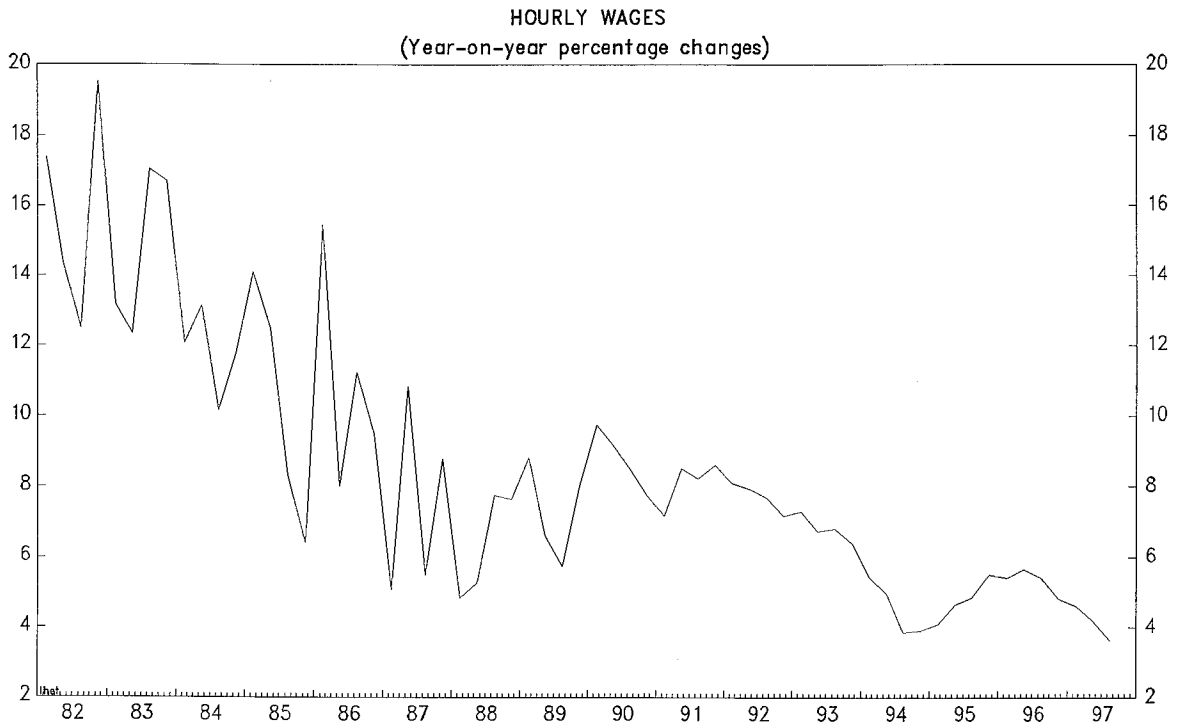
	Inflation (weight in the index)	Energy 7.1	Food 29.4	Industry 32.9	Services 30.6
Dec-97	2.0	0.6	1.5	1.4	3.5
Average 87–95	5.5	4.0	4.7	4.5	7.3
Disinflation	-3.5	-3.3	-3.2	-3.2	-3.8
Contribution to the decline in total inflation		-0.2	-0.9	-1.0	-1.2

Figure 1. Inflation, 1975-98



Source: Bank of Spain.

Figure 2. Wages and Exchange Rate, 1982-98



Source: Bank of Spain.

This paper investigates the causes of this rapid disinflation. In a standard Phillips curve model, three major aggregate shocks could explain the fall in inflation: an adverse demand shock that raises unemployment, a positive supply shock resulting from relative price adjustments or structural improvements in the labor market, or a credibility shock that lowers inflationary expectations.

Lacking a full structural model capable of disentangling the individual contribution of shocks to inflation in Spain, the methodology followed here consists of several building blocks: (i) the estimation of a Phillips curve to assess the roles played by demand and relative price shocks; (ii) the estimation of a VAR system to determine the possible contribution of the labor market and expectation shocks to disinflation; (iii) the examination of disaggregated price data to detect influence of relative price shocks on inflation; (iv) the analysis of proxies of inflationary expectations to gauge the credibility effect of a new monetary policy framework; and (v) the comparison of Spain's disinflationary episode with Italy's and Portugal's, so as to ascertain the common disinflationary effect of the commitment to EMU participation from the start.

The main findings of this study are as follows:

(1) The severe recession of 1992–93 and its lingering effects on the output gap are unlikely to have been behind the sharp fall in inflation in 1996–97. A simple Phillips curve relationship between inflation and the output gap that seems stable prior to 1995, breaks down afterwards.

(2) Supply side shocks do not seem to have played a determinant role in Spain's latest disinflationary episode. Although food prices fell importantly in early 1997 and temporarily lowered inflation, total inflation fell by more than food prices can account for. Simple disaggregated price indicators do not reveal the existence of supply side shocks. Most important, wage moderation, while evidently present in the last few years, does not seem to have played a leading role in lowering inflation.

(3) It appears that the main factor underlying Spain's recent disinflation is a fall in inflation expectations. The common experience of Spain, Italy, and Portugal would suggest that inflation expectations were reduced thanks to the commitment—and policy actions geared to—the participation in EMU from the start. Gains in credibility by the Bank of Spain are also likely to have contributed to the decline in inflation expectations.

An important feature of the disinflationary episode under review is that all the contributing factors, regardless of their specific contribution, affected inflation with some complementarity effects. Each factor induced lower inflation, reinforcing the influence of other factors. This complicates the task of disentangling their effects, but must have been crucial for the positive outcome.

## II. A SIMPLE FRAMEWORK OF ANALYSIS

This chapter presents a simple inflation model that will be tested subsequently. Inflation is determined by aggregate demand and supply and it results in a traditional augmented Phillips curve. It is derived from the process of wages and prices formation, with imperfect competition in products market, wage bargaining, and equilibrium unemployment. In the long run, the Phillips curve is vertical: actual unemployment equals structural unemployment, which is only affected by supply side factors, and actual inflation equals inflation expectations. In the short term, there is a negative relationship between inflation and activity: if there is an adverse demand shock (a cyclical trough for example) inflation declines below expected inflation.

With imperfect competition, prices are determined as a markup over labor costs:

$$p = w - \alpha + z_{ps}$$

Where  $p$  stands for the level of prices,  $w$  for the level of nominal labor cost,  $\alpha$  for the level of labor productivity, and  $z_{ps}$  for all factors that might affect the markup<sup>2</sup> over wages, as for example the degree of competition in products market or the costs of other factors of production (oil prices, non-oil commodity prices, real interest rate).

The wage-setting curve results from the bargaining framework between unions and employers, as for example in Layard, Nickel and Jackman (1991). Unions target the expected real wages to be a markup on labor productivity. This desired markup depends on several features of the labor market that define the relative power of negotiation of unions and employers and determine cost-push-factors. These features include the level and duration of unemployment benefits, the presence of a tax wedge, firing costs, and other labor regulations. In addition, when unemployment increases, unions' bargaining power declines because the probability to be unemployed increases in case of failure in the negotiation. In its log-linearized version, the relation can be written in the following way:

$$w = p^e + \alpha - \gamma \cdot U + z_{ws}$$

where  $U$  is the unemployment rate,  $p^e$  is the expected level of prices, and  $z_{ws}$  represents all the "labor-cost push" factors.

Combining the two relations, prices can be expressed as follows:

$$p = p^e - \gamma \cdot U + z_{ws} + z_{ps}$$

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<sup>2</sup>All variables are in logarithm, except for unemployment and the output gap.



subtracting the level of prices in the previous period on both sides, one gets the traditional form of the augmented Phillips curve:

$$\pi = \pi^e - \gamma \cdot U + z_S$$

where  $\pi^e$  is expected inflation and  $z_S$  summarizes the influence of all supply side factors included in  $z_{ws}$  and  $z_{ps}$ .

In the long run, actual and expected inflation coincide, and the unemployment rate is equal to the equilibrium unemployment rate (to which we will refer as the NAIRU).

$$\pi = \pi^e \qquad U^* = \frac{Z_S}{\gamma} = \frac{Z_{ws} + Z_{ps}}{\gamma}$$

where  $Z$  stands for the long run value of  $z$ . In this model, the NAIRU depends only on the long-term values of the various supply side factors described before. It increases for example with cost-push factors and with the markup of prices over labor cost. This means that an adverse shock on relative commodity prices (e.g., oil prices) will push the NAIRU up, as a low degree of competition in products market will spur higher equilibrium unemployment.

In the short run, the equation can be rewritten as follows:

$$\pi = \pi^e - \gamma \cdot (U - U^*) + \zeta_S$$

where  $\zeta$  represents the transitory component of supply shocks in the short term ( $z = Z + \zeta$ ). Using a simple Okun relation between output and unemployment, the output gap can also be substituted for the unemployment gap:

$$\pi = \pi^e + \beta \cdot OGAP + \zeta_S$$

As argued in Chadha, Masson and Meredith (1991), inflation expectations are a weighted average of forward-looking and backward-looking elements, which implies some inertia in inflation. Inertia may be imparted by partially nonrational expectations, or by the existence of overlapping wage contracts.

$$\pi^e = A(L) \cdot \pi_{-1} + (1 - A(1)) \cdot \pi^*$$

where  $A(L)$  is a polynomial in the lag operator  $L$ , and  $\pi^*$  is the long-run forward looking component of expectations, independent from past inflation (the innovation). The latter component moves essentially with the credibility of monetary policy, and foreign inflation. Allowing for short-run dynamic effect of the output gap, the equation may be written as follows:

$$\pi = A(L).\pi_{-1} + (1 - A(1)).\pi^* + B(L).OGAP + \zeta_s$$

According to this specification, the main factors behind the decline in inflation are (a) a demand shock that increases unemployment above its equilibrium level, (b) a positive supply shock, or (c) a decline in the forward-looking component of inflation expectations. This simple model captures the main factors that may underlie the decline in inflation in Spain in recent years. It will be used to investigate the possible impact of each factor, beginning with a standard Phillips curve with demand effects, and then incorporating supply side and credibility factors.

### III. DEMAND EFFECTS

In the short run, a decline in inflation tends to be associated with a contraction of output and a rise in unemployment. A tightening of monetary policy tends to reduce domestic demand through higher interest rates and depresses external demand through an appreciation of the exchange rate. This negative demand shock leads to an excess of supply in domestic product markets and allows prices to decline, while the subsequent fall in employment moderates wage increases. This section investigates whether a negative demand shock was the main factor underlying the recent fall of inflation in Spain. The question is addressed by examining the data, computing a simple ratio of the output costs of disinflation, and estimating a Phillips curve.

A close look at the data on inflation in Spain reveals that there were two episodes of disinflation since the early 1990s. Inflation declined from a peak of 6½ percent in early 1990 to 4½ percent in 1993. Subsequently, the rate of inflation remained stable until mid-1995, when a second disinflationary period ensued with inflation falling to 2 percent in late 1997. The first disinflationary episode was associated with a severe recession and a strong rise in the unemployment rate, from about 16 percent at the end of 1990 to 24½ percent in the beginning of 1994. In contrast, the second episode was marked by accelerating activity and falling unemployment, to 20½ percent at end-1997. On the surface, it would appear that the output-inflation relationship differed between the two episodes.

### A. The Sacrifice Ratio

To compare the two episodes discussed above, this section computes, in a very simple manner, the output cost of disinflation, i.e., the sacrifice ratio. Using quarterly data, the sacrifice ratio relates the change in the output gap<sup>3</sup> relative to the change in year-on-year inflation. Allowing for some dynamic and lags in the interaction between inflation and the output gap, the ratio computes the difference between the highest and lowest output gap to the highest and the lowest inflation rate, even if the numerator and denominator dates do not coincide exactly. If the output-inflation tradeoff was stable, then the sacrifice ratios in the two disinflation episodes should be similar.<sup>4</sup>

The sacrifice ratio of the first disinflation episode (1990–93) stands at 2.7 percent of GDP, which falls in the range of 0.6–1.0 percent of GDP per year estimated by Dolado, Gonzalez-Páramo and Viñals (1997) for Spain (in case of a demand shock). In contrast, the sacrifice ratio for the second disinflation episode is ten times lower, at 0.28 percent of GDP (Table 2). This dissimilar behavior of the output costs of disinflation between the two episodes suggests that the factors associated with the decline in inflation during these episodes differed.

Table 2. Spain: Sacrifice Ratios

(In percent)

	First episode (1990–1993)	Second episode (1995–1997)
Decline in inflation	2.7	3.3
Decline in the output	7.3	0.9
Increase in the unemployment rate	8.7	-2.2
“Sacrifice ratio”		
in terms of: output	2.7	0.3
unemployment	3.2	-0.7

<sup>3</sup>Potential growth is here estimated by a log-linear trend since 1975, with a break in 1984. The trend is 2.7 percent since 1984. This method gives fairly the same result than more elaborate filtering like the Hodrick-Prescott filter, and the output gap is close to the values proposed by the OECD and the WEO for Spain.

<sup>4</sup>The sacrifice ratio computed here differs from the standard ratio that relates the *accumulated* output loss to the decline in inflation (see, for example, Ball (1994)). The standard ratio assumes backward looking price expectations, and this may not be an adequate representation of price formation in Spain.

## B. A Simple Phillips Curve

To assess the role of demand shocks, this section estimates a simple Phillips curve. The year-on-year inflation rate is regressed on its past values, past values of the output gap, and foreign inflation (in pesetas). To avoid simultaneity problems, the contemporaneous value of the output gap is not included in the regression. The equation is estimated with quarterly data for two periods: a long period covering 1977–97, and a shorter period spanning 1987–95.

To distill information on the output-inflation tradeoff over the course of several business cycles, the estimation should cover a long period. However, several econometric problems impede obtaining a meaningful estimation of the Phillips curve in Spain. The equation below provides estimated coefficients (students' statistics are indicated in parenthesis below the coefficients):

$$\pi = 0.20\% + 0.92 \pi_{-1} + 0.05 \pi_{-2} + 0.001 \pi_f + 0.24 gap_{-1} - 0.15 gap_{-2} + 0.000 (\pi_{energy} - \pi) + 0.03 (\pi_{commodities} - \pi)$$

$R^2 = 0.97$                        $\sigma = 0.98\%$

These results include a coefficient on lagged inflation that is not significantly different from one, and a coefficient on the output gap that is not significantly different from zero. This is the case even after controlling for the relative price of non-oil commodities and the relative price of energy, which helps capture the effects of the oil price shocks of the 1970s. The equation was also checked for residual autocorrelation, as the use of the year-on-year inflation rate may introduce a statistic correlation between contemporaneous and lagged inflation due to the existence of overlapping quarters.

The difficulty in fitting a simple Phillips curve with data for the last 20 years stems from the fact that inflation has not been stationary in Spain. Non stationarity results in a coefficient on lagged inflation that is close to one. Therefore, it may be impossible or even spurious to relate the inflation rate to the output gap or any other stationary variable. In this context, any estimation that includes lagged values of inflation is likely to describe the moving-average process followed by inflation rather than provide accurate estimates of the Phillips curve.

The problems posed by nonstationarity could be solved by estimating a cointegrating relationship between inflation and expected inflation, as implied by the simple theoretical model developed above. The Phillips curve would then result from a short-run relationship between two cointegration residuals, which are, by definition, stationary: the first one relates inflation to expected inflation; and the second one relates unemployment to structural unemployment (or output to potential output). Most researchers use past inflation as a proxy

for expected inflation, but this approach rules out testing for shocks to expectations, a possibility that should not be discarded a priori.

Turning to a more modest task, that of estimating the output-inflation relationship during the more recent period when expected inflation is likely to have remained stable, the issue is which estimation period should be chosen. As noted earlier, with the end of a long disinflation process and the absence of major supply disturbances, inflation stabilized after 1987, following Spain's entry in the European Community. In effect, during the period from 1987 to 1997, the estimation of the Phillips curve did not exhibit unit root, while all the estimations performed on periods beginning before 1987 and ending in 1997 exhibited a unit root. Thus, the shorter period of estimation, chosen due to the seeming stability of the Phillips curve, is 1987 through 1995.

Given the smaller number of observations, the estimation does not allow for a rich dynamic specification, and simply regresses inflation on its lagged value, foreign inflation in pesetas, and the lagged value of the output gap and of the change in the output gap. The estimation produced the following results (students' statistics are shown in parenthesis below the estimated coefficients):

$$\pi = 2.5\% + 0.42 \pi_{-1} + 0.03 \pi_f + 0.18 gap_{-1} + 0.40 \Delta gap_{-1}$$

(5.7)      (4.9)      (1.8)      (5.2)      (2.4)

$$R^2 = 0.81 \qquad \sigma = 0.41\%$$

Parameter constancy forecast tests:

using \Omega	Chi <sup>2</sup> (8)=	53.337	[0.0000]**	F(8,31)=	6.6671	[0.0000]**
using V[e]	Chi <sup>2</sup> (8)=	39.549	[0.0000]**	F(8,31)=	4.9436	[0.0005]**
using V[E]	Chi <sup>2</sup> (8)=	24.719	[0.0017]**	F(8,31)=	3.0899	[0.0111]*

The coefficient on lagged inflation is significantly different than one, which illustrates the absence of unit root. The static long-run solution is as follows:

$$\pi = 4.5\% + 0.06 \pi_f + 0.32 gap$$

(17.1)      (1.8)      (6.1)

which gives an estimate of the sacrifice ratio equal to 3.2, close to the simple ratio computed above.

As shown in Figures 3 and 4, this equation tracks quite satisfactorily the observed inflation rate, both in a static and a dynamic simulation from 1987 to 1995. It advances the view that inflation responded closely to the domestic cycle during the period.<sup>5</sup> Such fit would also rule out major supply side influences on inflation (shocks to commodity prices, deregulation in product markets, changes in the NAIRU). Long-term inflation expectations were stable

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<sup>5</sup>Similar results are obtained when the unemployment rate (which can be considered as stationary during this period) is substituted for the output gap.

Figure 3. Static simulation of the Phillips curve

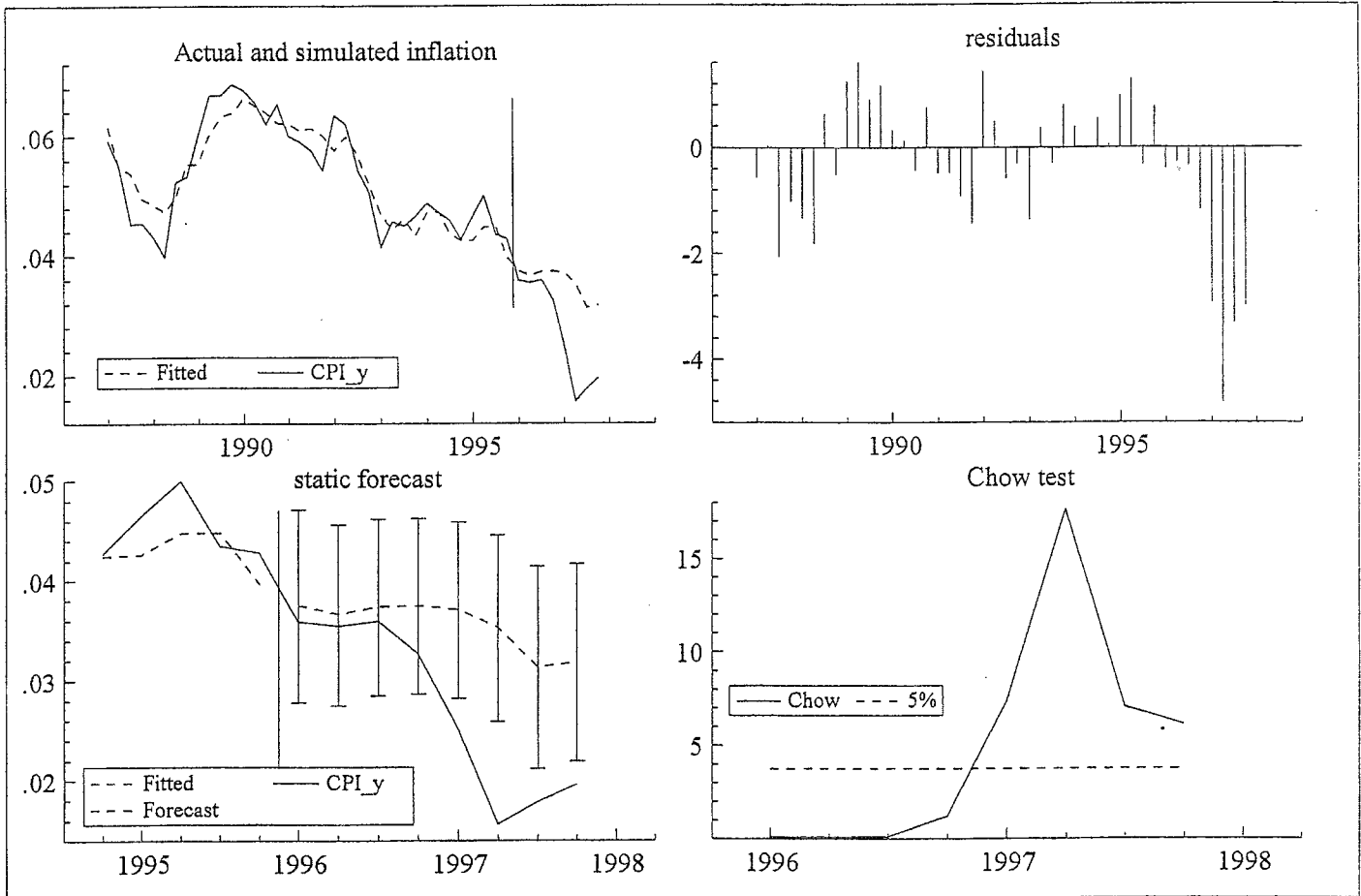
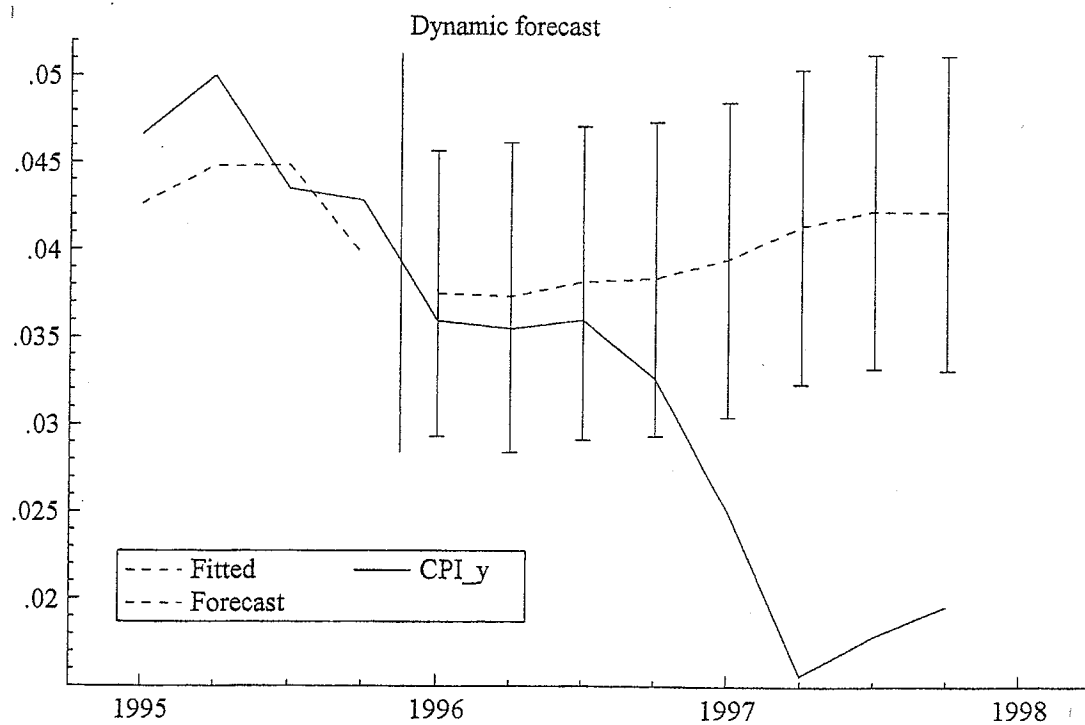
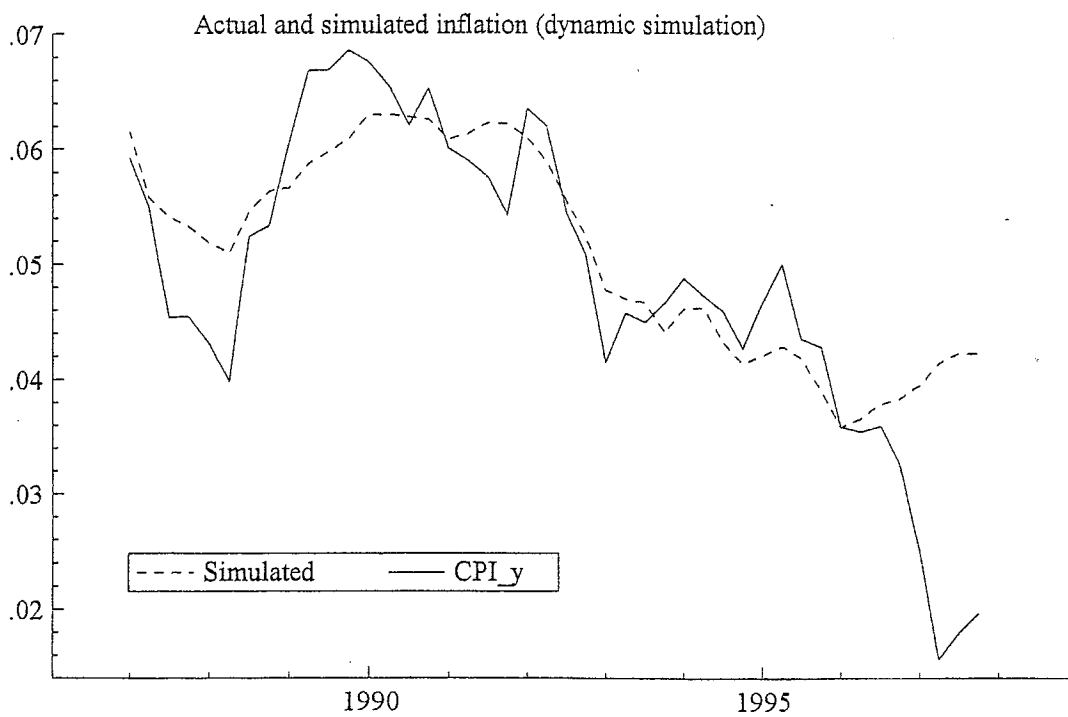


Figure 4. Dynamic simulation of the Phillips curve



around 5 percent, even though in the short term their adaptive component made them follow partially past inflation, and foreign inflation seems to have hardly influenced the behavior of domestic inflation.

After 1995,<sup>6</sup> all tests of parameter stability show a structural break. Neither the dynamic simulation, nor the static one, are able to reproduce the considerable decline in inflation from 1995 to 1997. The residuals turn significantly negative, and a Chow test rejects the absence of a break in the equation.

In sum, the evidence presented in this section lends support to the hypotheses that (a) inflation in Spain was mainly determined by demand-side factors in 1987–95, and (b) the simple relationship between inflation and unemployment broke down after 1995. This would tend to rule out a demand shock as the main factor behind Spain's disinflation after 1995. It is possible, however, that demand factors indeed contributed to the latest disinflationary episode, but that the methodology used here is not capable of capturing them. Such would be the case if long-lasting effects of the 1992–93 recession had exerted a disinflationary influence in 1996–97. The following sections turn to the question of what factors other than demand shocks may have induced the recent fall in inflation.

#### **IV. SUPPLY SIDE FACTORS**

Several developments in the supply side of the economy could have contributed to the decline in inflation of the recent years. Specifically, commodity prices were subdued in international markets, and food prices declined strongly in Mediterranean countries. Furthermore, structural reforms aimed at increasing competition in product markets may have also facilitated a decrease in inflation. Most important, reforms in the labor market or the effects of the recession in 1992–93 might have increased the sensitiveness of wages to unemployment and induced wage moderation. This section investigates the influence of supply side factors in reducing inflation after 1995, through two main channels: relative price adjustments, and changes in the labor market.

##### **A. Relative Prices Adjustments**

It could be argued that relative price shocks had an important impact on the fall in inflation after 1995. In particular, (i) non-oil commodity prices in U.S. dollars deaccelerated sharply in 1995–97, although the pattern is not as clear when prices are measured in domestic currency;

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<sup>6</sup>The figure actually shows a failure of the equation from the beginning of 1996 rather than from 1995. Yet, a one-point increase in the VAT rates along with a rise in excise duties, pushed transitorily the inflation rate up during 1995, with a maximum impact close to 0.7 percent in a year.



(ii) energy price inflation also declined and fell significantly more rapidly than total inflation in the beginning of 1997; and (iii) food price inflation dropped from an annual rate at about 5 percent in 1995 to 0.5 percent in 1997. To assess the contribution of relative price shocks to falling inflation, this section presents two alternative ways of evaluating the question. The first is to expand the Phillips curve estimation to include relative price inflation and the second is to examine the statistical characteristics of price changes.

When the Phillips curve includes the relative inflation of non-oil commodities, energy, and food, only the relative price of food is significant, with a long-run elasticity close to the weight of food prices in the CPI index. However, the inclusion of this variable does not improve the performance of the simulation during 1996 and 1997. Out of sample forecasts continue to be significantly different from actual values, which would argue against considering relative shock as the main determinant of the fall in inflation in 1996–97.

A second method used to assess the possible effect of relative price adjustments on inflation is to examine general indicators of supply-side shocks, such as the variance of price changes across sectors or the skewness of the distribution of inflation across sectors. An increase in the variance of inflation would indicate relative prices adjustments, and point to supply side shocks as a source of change in total inflation (see, for example, Fischer (1981)). Similarly, a skewed (i.e., asymmetric) distribution of relative prices may be correlated with inflation (see Ball and Mankiw, 1995). In a model with menu-cost for price adjustment, firms adjust prices in face of large shocks but not small shocks. This means that only firms in the upper and the lower tail of the distribution of desired price changes actually change their price. If the distribution of relative prices is symmetric, the net effect of relative price adjustments is zero on total inflation. But if the distribution is skewed to the right, the upper tail weighs more than the lower one and thus total inflation increases. In this context, a larger variance of price changes will also entail higher inflation as it magnifies the asymmetry in the tails. Loungani and Swagel (1996) confirm these correlations in a VAR estimated for industrial countries.

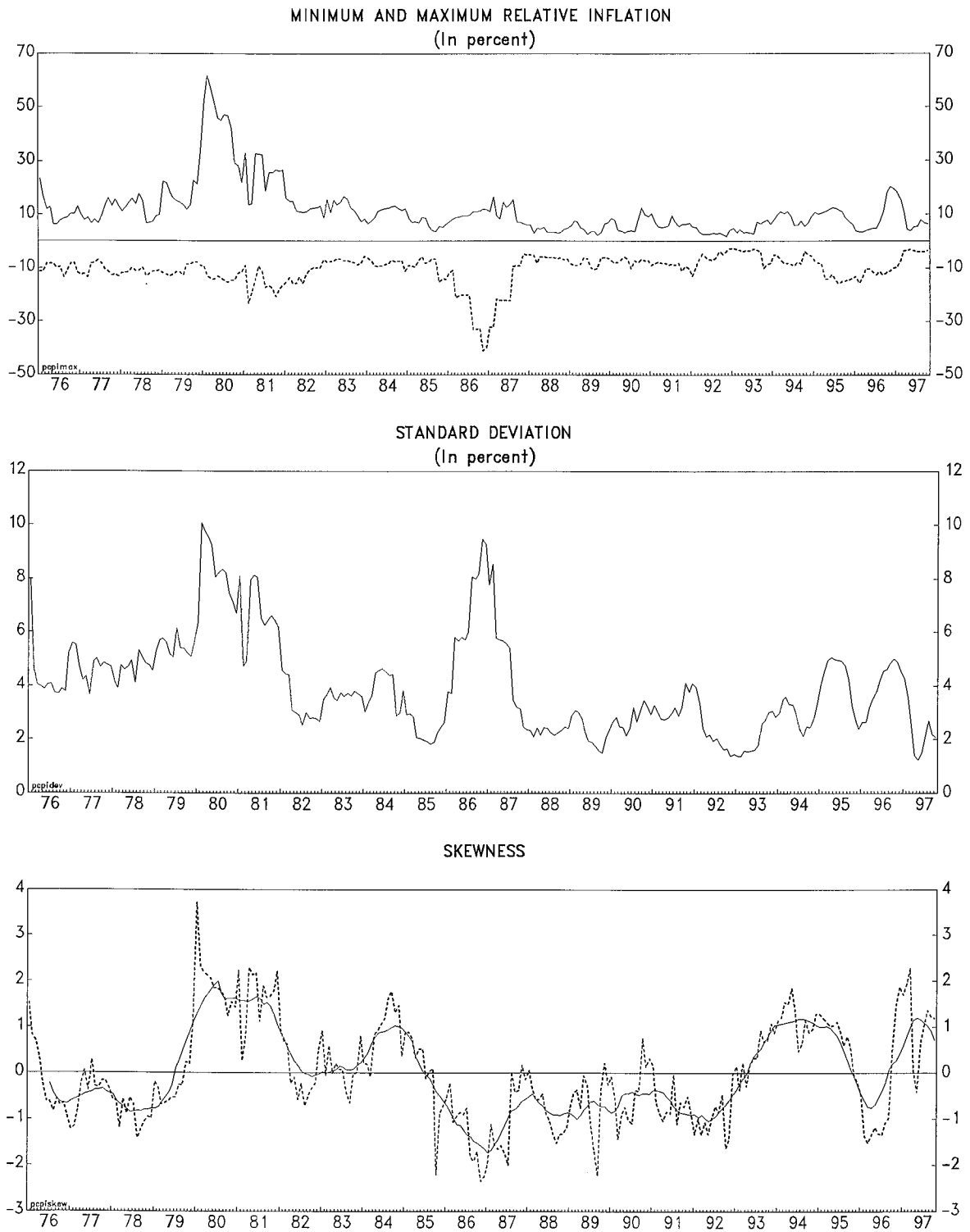
As in Ball and Mankiw (1995), we examine at each date the distribution of relative inflation for industrial prices (the difference between an industry inflation rate minus the total PPI inflation rate). We use monthly disaggregated Producer Price Index from 1975 to 1997. Our sample is less disaggregated because it contains 23 PPI components only.<sup>7</sup> The first panel in Figure 5 shows the range of values that relative inflation has taken: at each date, we keep the maximum and the minimum value of relative inflation, which provides two curves (the “envelope” of the distribution). The second panel plots the standard deviation of relative inflation at each date. The third panel plots the skewness.<sup>8</sup>

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<sup>7</sup>After initial computation with the 24 components of PPI, we eliminated an obvious outlier (industry of metal extraction). Its weight is only 0.2 percent in the total PPI.

<sup>8</sup>If the distribution is symmetric, then the skewness equals zero. If the distribution is skewed toward positive values, then the skewness increases, and vice versa. We also smoothed the initial series with a moving average filter.

Figure 5. Distribution of Sectoral Inflation in Industry, 1976-97



Sources: Producer price indices, Instituto Nacional de Estadística; and Fund staff estimates.

These proxies of the importance of supply shocks in the economy illustrate the importance of the two biggest supply shocks during the period examined: the second oil shock at the end of 1979 and the decline in oil prices in 1986. They also confirm the existence of a more stable inflation period after 1987, with no major supply shock. The standard deviation remained close to its lowest level at 2.0 percent, while it had reached almost 10.0 percent during the two oil shocks, and the skewness stood close to zero. For 1995–97, the data do not show a significant contribution of supply shocks to disinflation. Price dispersion slightly increased in 1995–97, but the skewness stood at a higher level at end-1997 than in 1987–95, which would indicate the absence of disinflationary pressures coming from supply shocks.

In sum, the evidence suggests that the impact of relative price adjustment on falling inflation in 1996–97 has not been substantial. This preliminary conclusion is based on (a) continued evidence of a break in the Phillips curve even after including supply side shocks, and (b) indicators that disinflation was common to all—and not only some—prices in the economy.

## **B. The Labor Market**

A second type of supply-side shock examined is a shock to wages. Specifically, wage moderation may have induced a decline in inflation. Such a moderation would be consistent with the evidence presented above that the distribution of inflation across sectors was not significantly altered during Spain's latest disinflation episode. The purpose of this section is to ascertain whether the decline in wage growth since 1995 was a major factor in pulling inflation down.

Wage growth has declined substantially. In industry and services, hourly wage growth fell from 8 percent in 1992 to less than 4 percent by end-1997 (see Figure 2). Compared to the average growth during 1987–95, nominal wages growth fell in parallel with total inflation. At 3.7 percent in the third quarter of 1997, wage growth was 3.5 percentage points below average growth in 1987–1995.

Wage moderation may be traced to two very distinct sources. First, it could be argued that the labor market reforms of 1994 and 1997 created a climate of improved industrial relations that yielded lower wage demands on the part of unions in exchange for the prospects of more employment creation, and higher stability of employment. In this case, wage moderation would have resulted from structural changes in the labor market. In contrast, a second hypothesis would sustain that wage moderation was the consequence of the hike in unemployment that accompanied the severe recession of 1992–93. This view would advance that labor market insiders consented more easily to wage moderation as employment conditions worsened while the public sector strongly contained public wages.

Independently of the sources of Spain's recent wage moderation, the most difficult issue to address is that of price and wage causality. Did wage moderation lead to a fall in inflation, or was it the result of falling inflation expectations in the economy? To attempt answering this

question, this section examines (a) the behavior of real wages and (b) trends in the share of labor income in GDP. Finally, it estimates a four-variable vector autoregression.

The behavior of real wages provides an inkling to the issue of price-wage causality. Simply put, if wage moderation induced a fall in inflation, then, *ceteris paribus*, the incomplete adjustment of prices to wages in the short-term would induce some reduction in real wage growth and rise in employment. In contrast, if wages simply followed prices, then real wages would have increased transitorily. Available evidence indicates that real wage growth increased in 1996–97, while labor productivity grew very slowly, which would run counter to the hypothesis that wage moderation induced a fall in inflation. A different behavior was observed in the earlier disinflation episode of 1992–95, when real wage growth declined, most likely because the deep recession induced wage moderation.

A second way to examine the link between prices and wages is to trace the share of wage income in GDP. This share rose in the latest disinflation episode, from 45.9 percent in 1995 to an estimated 46.3 percent in 1997. As with real wages, the behavior of the share of wage income in GDP during the latest disinflation episode differed from that of the earlier episode, when the labor share fell from 49.0 percent of GDP in 1992 to 45.9 percent in 1995. The similar patterns of real wages and labor income shares during the two disinflation episodes under review would suggest that wage moderation may not have played the leading role in the decline of inflation of 1996–97.<sup>9</sup> It is possible that a positive expectations shocks may have hit all agents in the economy, inducing a fall in price increases, and wage moderation. We turn now to this question.

A final and more complete method to investigate whether structural improvements in the labor market were behind the latest disinflation episode is the estimation of a four-variable VAR model covering 1987–95. The estimation includes inflation, real wage growth, productivity growth, and unemployment, and it performs a dynamic forecast for 1996–97 that is compared with the variables' observed trends.<sup>10</sup> The main advantage of the specification is that the model allows distinguishing between shocks to price expectations, and all other shocks, without identifying formally the underlying structural VAR. An expectation shock affects only the dynamics of inflation, without significantly altering the behavior of other variables. This is not the case for other shocks to the real economy, specifically demand and supply shocks. A negative demand shock would increase unemployment and reduce real wages and inflation through a Phillips curve effect. Similarly, a positive supply shock (such as a labor market

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<sup>9</sup>However, the share of wage income did not catch up with the levels observed earlier. This would point to some form of wage moderation.

<sup>10</sup>The estimation includes the relative price of foods as an exogenous variable as well. This is done because relative food prices were found to be significant in the estimation of Chapter III.

reform) would temporarily reduce inflation through real wage moderation and lower unemployment.

The estimated model traces the behavior of the four variables in a satisfactory manner, as shown by a comparison between the static simulation and observed values of the variables (Figure 6). A dynamic forecast for 1996–97, using available information at the beginning of the period, is able to replicate the observed trends in unemployment, productivity growth, and real wages, but fails to track inflation as well (Figure 7).<sup>11</sup> The evidence may thus be interpreted as representing stability in the behavior of real wages, productivity and unemployment. This might indicate the absence of significant innovations in the real economy. On the contrary, actual inflation differs importantly from the dynamic forecast implied by the model, which would suggest that there were innovations to inflation formation that were independent from the real economy. Such a finding would imply the presence of an expectation shock, such as that presented in the general model of inflation of Chapter II.

The tests conducted here to ascertain whether real shocks or expectation shocks were key to the fall in inflation seem to discard demand and supply shocks as having played a large role in Spain's latest disinflation episode. We now turn to a more in-depth analysis of the possible shock to price expectations.

## V. A CREDIBILITY EFFECT IN THE RUN-UP TO EMU

This chapter investigates the factors that might explain the credibility shock underlying the decline in inflation. Two mechanisms might have provided the basis for the reduction in inflation expectations: the implementation of an inflation targeting strategy by the newly independent Bank of Spain, and the convergence process to meet the EMU criteria.

Changes in the monetary framework could help explain a drop in the forward-looking component of inflation expectations through higher credibility. In June 1994, the Bank of Spain was granted autonomy and given the clear mandate of attaining price stability. In November 1994, the Bank of Spain abandoned the use of intermediate targets for monetary aggregates and shifted to targeting inflation directly. Since then, all medium-term targets for inflation have been met. Actual inflation stood at 2.0 percent by end-1997, while the target was 2.5 percent (Figure 8).

Spain's commitment to be a founding member of EMU entailed the pursuit of a stable peseta within the ERM bands. More specifically, after the devaluation of early 1995, any change in the central rate of the peseta would have ran counter to the Maastricht Treaty's requirement that there be no modification in the central parity in the two years prior to the decision on EMU membership. The credibility of nominal exchange rate stability is likely to have been

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<sup>11</sup> The apparent deviation between the dynamic forecast and observed values for real wages are not statistically significant. Observed values still fall within the confidence interval of the estimated values.

Figure 6. Static simulations of the VAR

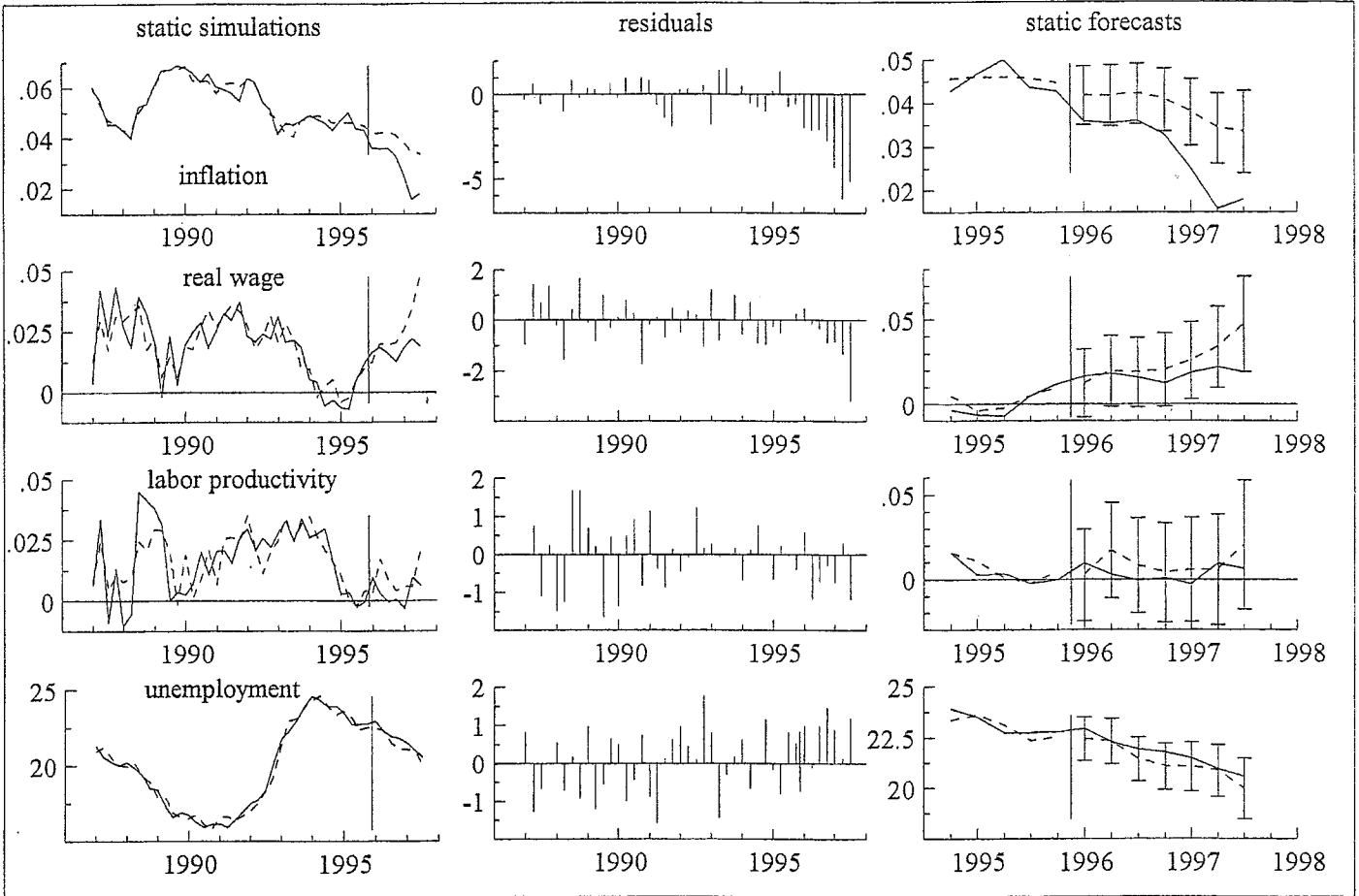


Figure 7. Dynamic forecasts of the VAR

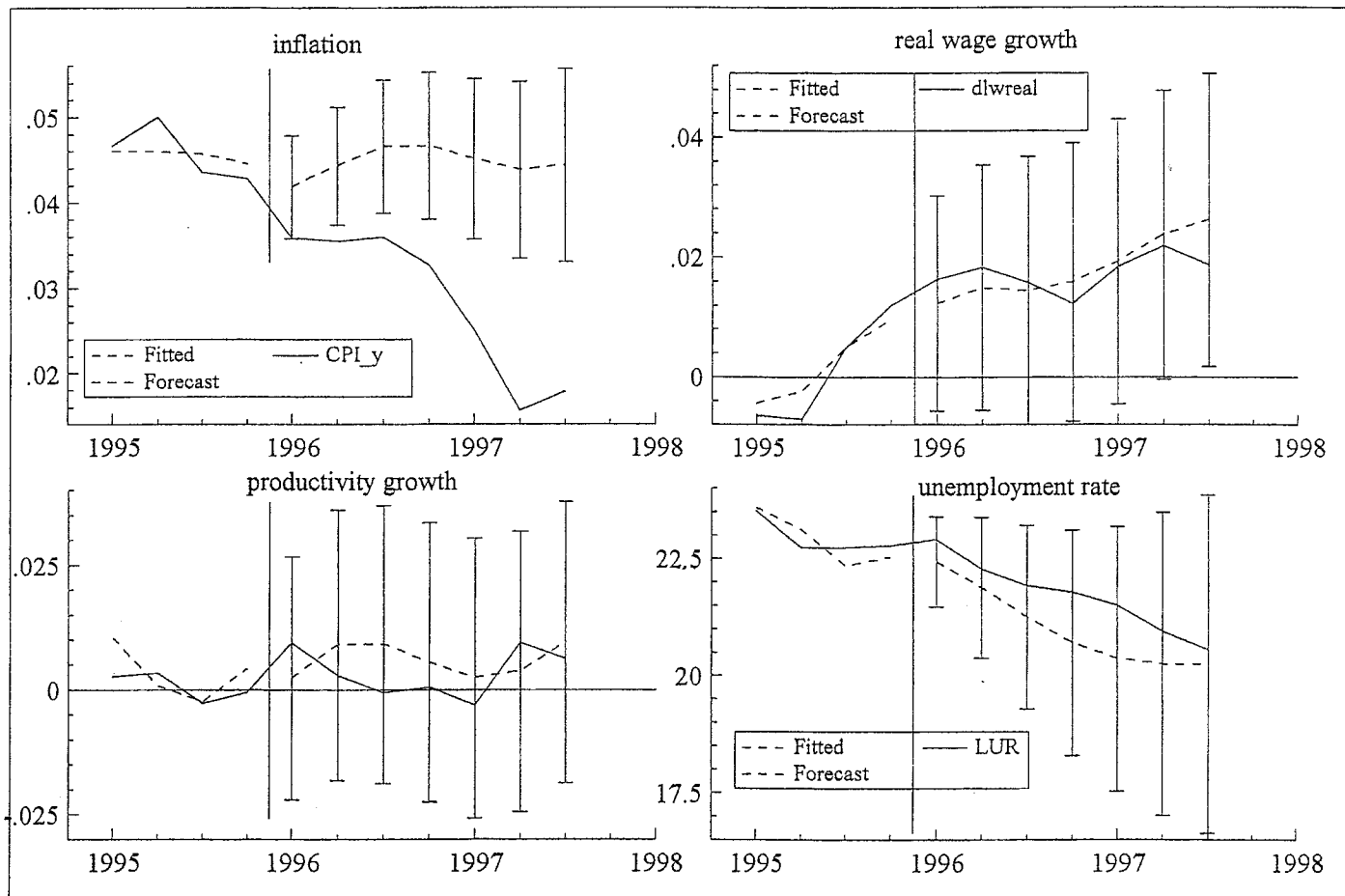
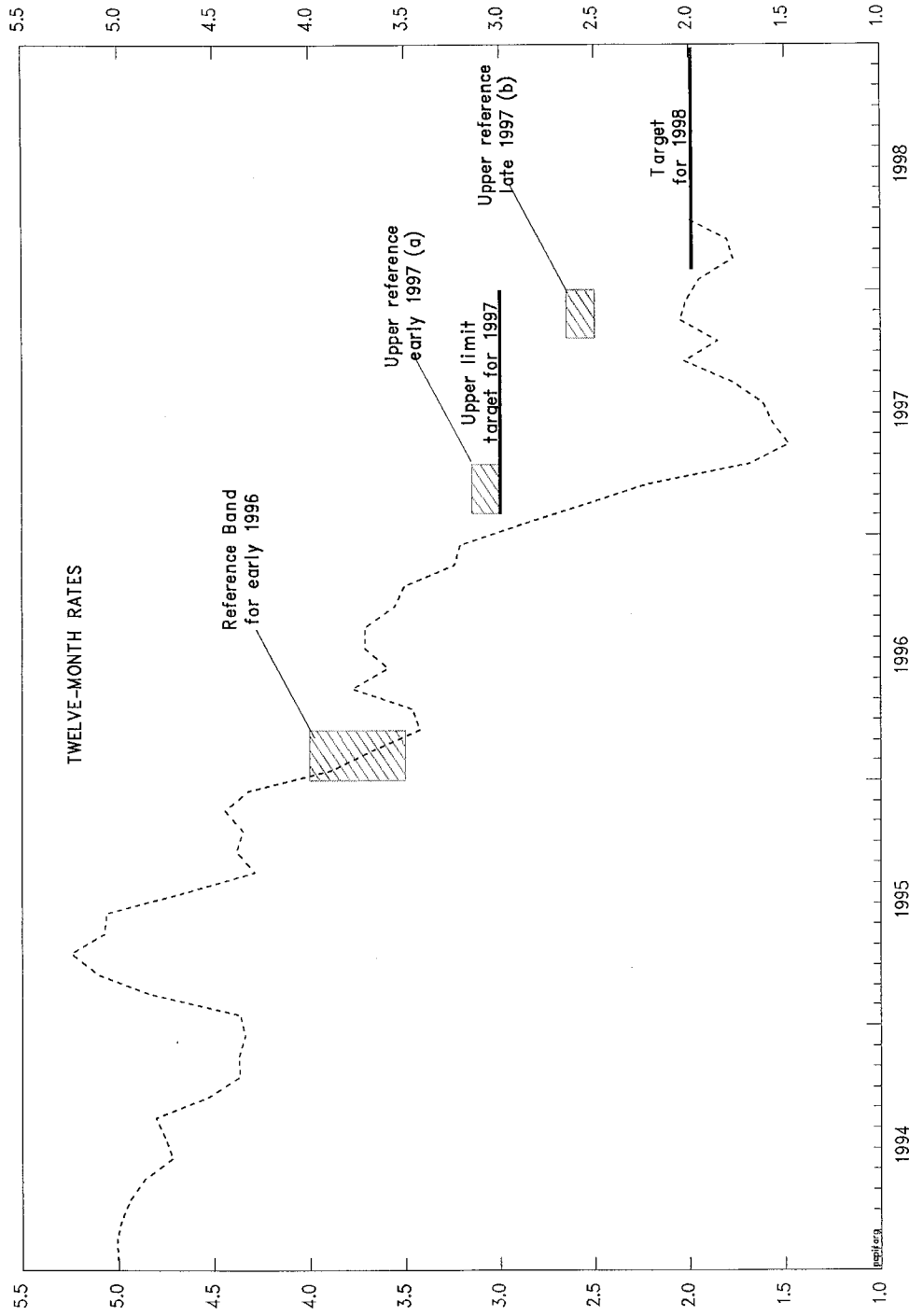


Figure 8. Consumer Price Inflation-Targets & References, 1994-98  
(Year-on-year inflation)



Sources: Instituto Nacional de Estadística; and Banco de España.

(a) The CPI growth rate should, in the opening months of 1997, be running at close to 3 percent.

(b) The twelve-month rate of inflation should, at the end of 1997, be close to 2.5 percent.



boosted by the government's effort to meet the 1997 fiscal deficit target of 3 percent of GDP. This, in turn, may have induced a fall in inflation expectations to levels prevailing in the rest of Europe.

The credibility effects of inflation targeting and commitment to EMU from the start are likely to have reinforced each other. In an effort to ascertain their relative importance, this section presents indicators of inflation expectations in Spain, which may be associated with country-specific credibility gains, and international comparisons of inflationary developments, which may have affected several countries seeking to join EMU.

We examine four proxies of inflation expectations in Spain (Figure 9), as proposed in Manzano and Campoy (1997): Business surveys and consumer confidence surveys, which include opinions about price expectations in the future; the consensus forecast for inflation, and interest rates differentials with Germany, which should reflect differences in inflation expectations between the two countries. Assuming as a first approximation that inflation expectations have been roughly constant in Germany during this period, then changes in spreads should reflect changes in Spain's inflationary expectations.

All these indicators show a rise in inflation expectations at the end of 1994, shortly after the autonomy of the Bank of Spain, no significant decline until end-1995, and a rapid fall thereafter. Thus, it would appear that credibility gains were not immediate after the central bank acquired an independent status and adopted an inflation targeting framework.<sup>12</sup> The evidence would instead point to a buildup of credibility gains as inflation targets were met, and as convergence to EMU criteria accelerated.

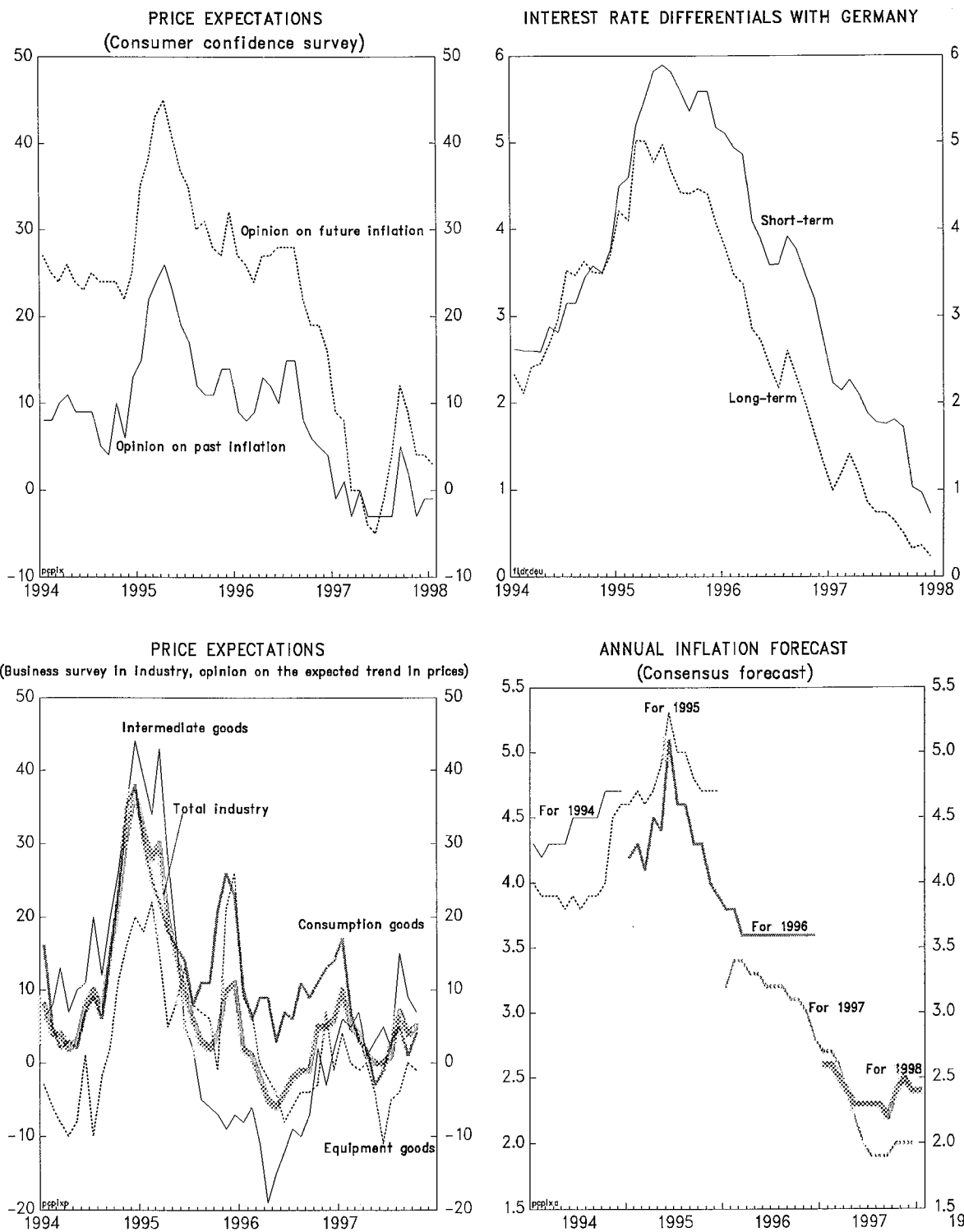
A simple comparison of the disinflationary experiences of Italy, Portugal, and Spain, all aspiring to joining EMU from the start, may provide some hints on the importance of the commitment to monetary union in reducing inflation. In the three countries, inflation declined sharply during the last few years to a rate close to 2.0 percent, while it previously fluctuated around 5.0 percent in Italy and Spain, and around 9 percent in Portugal (Figure 10, upper panel).

The strikingly similar disinflationary episodes in Spain, Italy, and Portugal suggest that a common factor may have been at play. In fact, there were three factors that these countries shared: fiscal policies geared to meeting the Maastricht deficit criteria; a favorable shock to food prices in early 1996; and similar movements of the output gap (Figure 10). This chapter has argued in previous sections that the shock to food prices and cyclical position are

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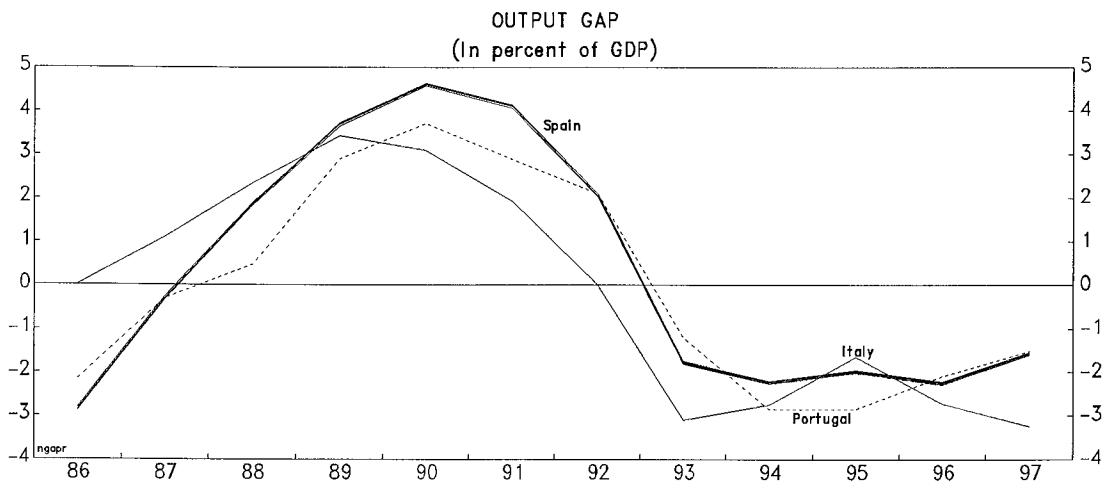
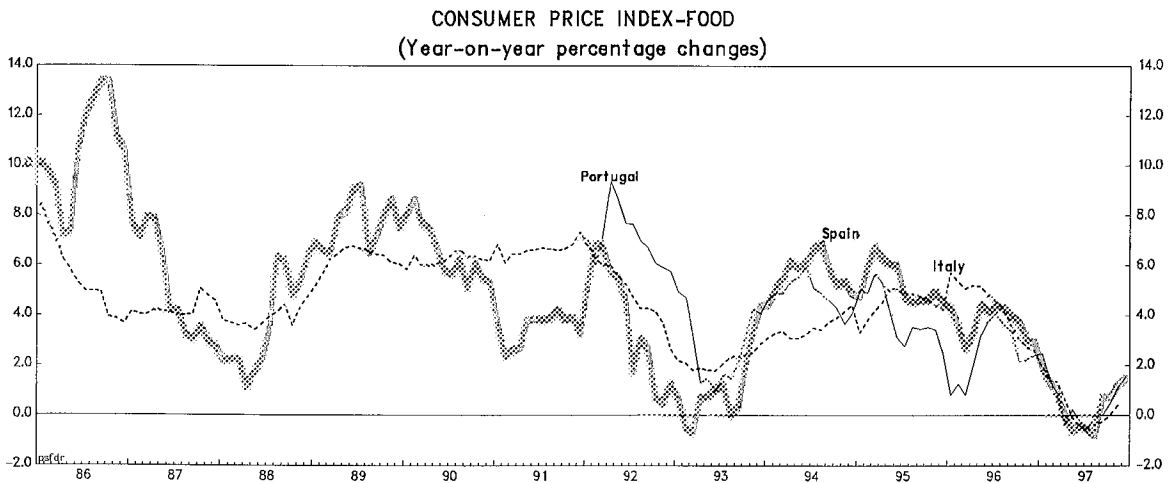
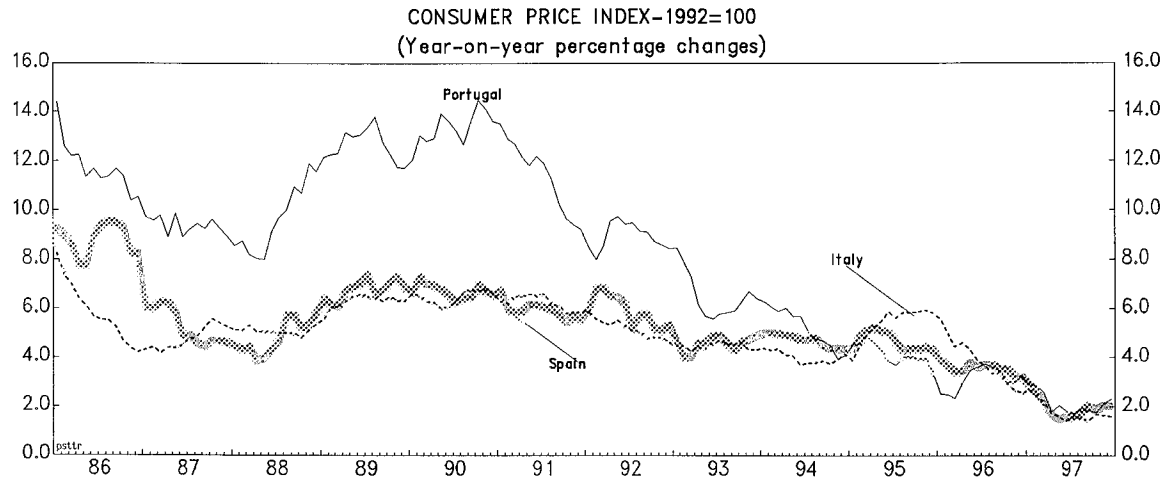
<sup>12</sup>Studies on the gains associated to changes in the status of the central bank or the adoption of a strategy of inflation targeting generally do not show immediate credibility effects. For example, Debelle (1996) finds no output gains comparing disinflation episodes in countries with varying degrees of central bank autonomy and inflation targeting, i.e., Australia, New Zealand, and Canada; Fischer (1996) finds that industrial countries with independent central banks have higher sacrifice ratio than those with less autonomous central banks.

Figure 9. Indicators of Inflation Expectations, 1994-98



Sources: Bank of Spain; and consensus forecast.

Figure 10. Inflation and Output Gap, 1986-97



Source: Bank of Spain; and WEFA.

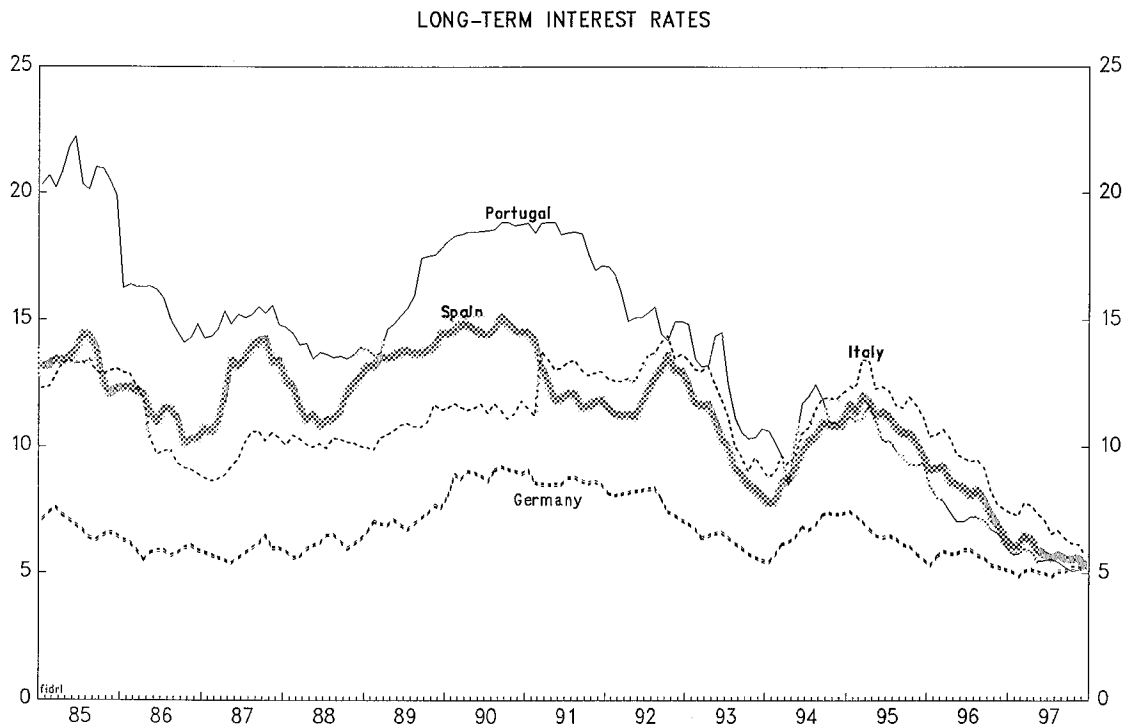
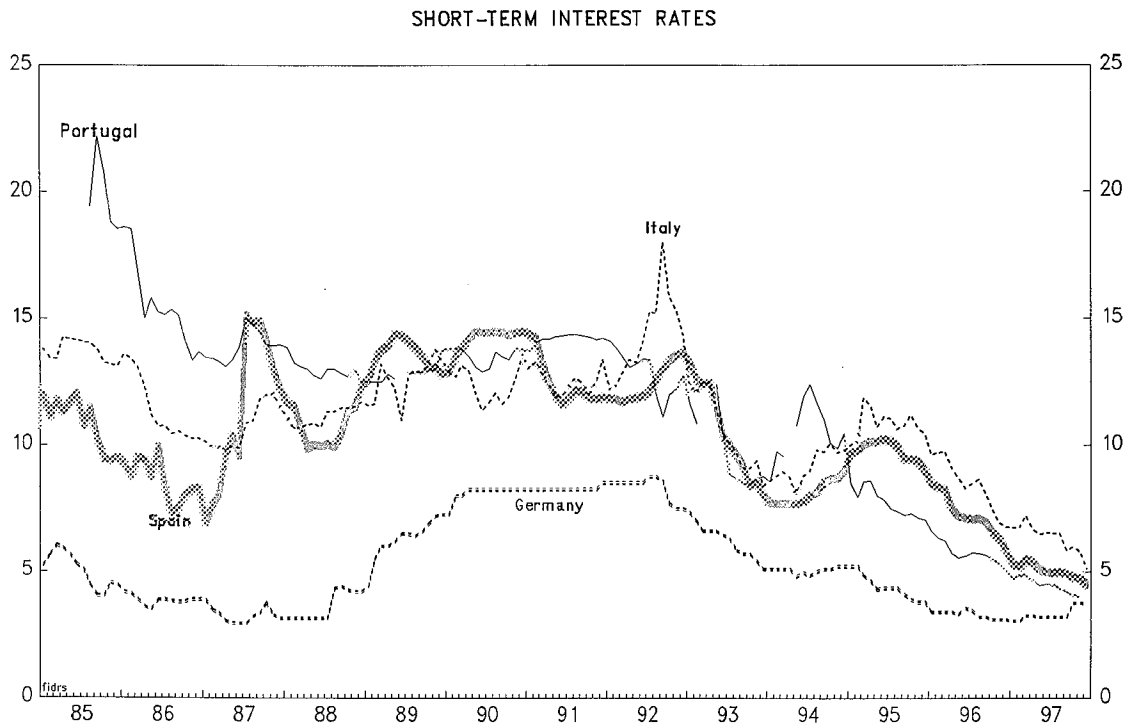
unlikely to have played a major role in the fall in inflation in Spain. If the same is true for Portugal and Italy, then it could be advanced that the commitment to EMU was key to inducing a positive credibility shock in the three countries (Figure 11). This conclusion is obviously tentative because it depends on inferences regarding inflation in Portugal and Italy that may not hold. If they did, however, it would mean that credibility in Spain ensued from the commitment to EMU and it was accompanied by the acquired gains in reputation by the Bank of Spain.

Although this chapter does not fully resolve the issue of why the EMU commitment may have been akin to a positive credibility shock, studies of the experience under the EMS may shed some light on the issue. For example, Giavazzi and Pagano (1988) sustained that the EMS was expected to allow member countries to “borrow counter-inflation reputation” from the Bundesbank, and therefore increase the credibility of their own monetary policy, simply by pegging their exchange rate to the German currency. Yet, few empirical studies confirmed this credibility effect as disinflation appeared no less costly in the EMS than outside. For example, Revenga (1993) concludes that there was no credibility effect in Spain during the EMS period. More recently, Bleaney and Mizen (1997) confirm the results obtained in previous studies that there is mixed evidence that price-setting in countries which participated in the EMS was influenced by the exchange rate mechanism. These studies lend support to the hypothesis that exchange rate pegging per se does not provide automatic credibility, especially when fiscal policy is not consistent with the target of monetary policy. It could be argued that, in contrast to the EMS experience, the commitment to EMU participation by Italy, Portugal, and Spain was accompanied by significant fiscal adjustment, which may have enhanced credibility and reduced inflation in 1996–97.

## VI. CONCLUDING REMARKS

Spain’s disinflation in 1996–97 cannot be explained fully by the recession experienced in 1992–93, nor by a positive supply shock, even if both factors contributed to abate inflationary pressures. In particular, wage moderation appears to have accompanied, rather than induced, the fall in inflation. As in Portugal and Italy, the fall in inflation is more likely to have resulted from a credibility shock associated with a strong commitment to be part of EMU from the start, and the implementation of fiscal policy consistent with that goal. The findings of this chapter bode well for medium-term prospects in Spain, even if cyclical conditions turn upward. As long as long-term price expectations remain stable, Spain’s inflation is unlikely to rise persistently. Risks, instead, emanate from possible unemployment costs associated with maintaining low inflation levels in the presence of continued product and labor market rigidities. With low inflation seemingly assured by EMU participation, the challenge for Spain is to allow price stability to coexist with flexible labor and product markets.

Figure 11. International Comparisons of Interest Rates, 1985-97



Source: IMF, International Financial Statistics.

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