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Wage Bargaining Coordination and the Phillips Curve in Italy

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Abstract
Was there a textbook-like Phillips curve in post-WWII Italy? We estimate a consensus model of the relationship between inflation and the level of economic activity over 1949-1998, finding no evidence of a significant and positive feedback from output to prices. We also estimate similar models for the UK and the US. We discuss the role of wage coordination and indexation mechanisms in generating what amounts to a significant departure of Italian data from what holds true for the US and UK. Likely, the rigid indexation mechanism that aimed at protecting wages from inflation ended up contributing to the persistent inflation bias that Italy experienced almost until its entry into EMU.

Keywords: Wage bargaining, inflation, Phillips curve.

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1. Introduction

Inflation dominated the policy agenda for most of the 1970s and the 1980s. Over the next two decades, apparent price stability has confined the issue to the outer limits of the macroeconomic debate. In the light of recent developments, this was shortsighted. Between 2005 and the current downturn, inflation rates and expectations rose across most advanced economies, suggesting that inflation is not dead and that we should study it within a long-run perspective. It is therefore appropriate to reconsider the inflation phenomenon, chiefly for its policy relevance and its impact on long-term macroeconomic performance. Shedding some light on the unsettled aspects of past inflation processes could also guide us in interpreting the current state of affairs, and help identifying the forces that trigger major inflation shocks. This paper contributes to this debate by investigating the evolving nature of the trade-off between inflation and output in Italy.

We study Italian inflation and the Phillips curve with a long-run perspective, from the end of World War II to the entry of Italy in the European Monetary Union at the end of 1998. At least two attractive features motivate the choice of Italy as a case study. The first is that this country has experienced higher than average and more volatile inflation rates than most industrialized countries, and across a variety of monetary regimes. The second is that Italy differs markedly from Anglo-Saxon market structures and institutions, which the bulk of the literature on the Phillips curve has focused on. The long reach of our study appears to be particularly suitable to draw novel inferences.

We first examine the volatility, persistence and stationarity of the Italian inflation rate across the various exchange-rate regimes that have shaped Italian monetary history post WWII. We next estimate alternative Phillips equations, and study the effects of structural changes and asymmetries on the estimated parameters of the inflation-output trade-off. We partly rely on sub-sample estimates and partly on time-varying parameter models estimated via the Kalman filter. Finally, we contrast the evidence on Italy with what we obtain by applying a similar approach to the US and UK. We frame a quantitative study of Italian inflation within a description of the wage bargaining mechanisms—and their changes over time—that affected the Italian labour
market, because in our view such mechanisms were fundamental determinants of the observed inflation outcome.

Our key results are as follows. The statistical properties of inflation display significant fluctuations over the post WWII sample. Periods of fixed exchange rates and looser wage bargaining mechanisms typically experienced lower and more stable inflation rates than those characterised by more rigid labour market regulation and flexible exchange rates. The 1972-84 period stands out as the only major non-war inflation episode. After the demise of the Bretton Woods agreement, stiff indexation of wages to consumer prices linked Italian wages also to increases in the price of imported goods, de facto importing foreign inflation. Recurrent exchange-rate crises made monetary policy less effective and socially very expensive, as inflation shocks and uncertainty hit hardest the groups whose incomes were less sheltered by indexation. These effects lasted in Italy much longer than in comparable economies, at least until 1985, which marked the starting point of a long and uncertain process of retrenchment, which eventually led to the Single Market in Europe and Italy among the founding members of EMU.

The additional evidence we provide comes from estimates of the inflation-output trade-off, using a consensus model that blends the original expectation-augmented Phillips curve with the most recent stylizations on persistence and price/wage rigidity. Over the 1949-1998 sample, we are not able to detect for Italy a statistically significant feedback from cyclical conditions to inflation, i.e., we find no Phillips curve. The formal and anecdotal evidence that we offer in this paper suggests that supply-side factors, such as the large degree of goods and labour markets regulation, were major drivers of Italian inflation. At the end of the sixties, most industrial countries faced union unrest, and Italian conflict was the highest among OECD countries. Unions managed to impose a unique (for Europe) industrial relation system: a national level category, plus company-level bargaining backed by a strong egalitarian claim that converged in the Scala Mobile (SM) indexation mechanism. This mechanism held firmly at the centre of the bargaining stage until the early 1990s. Over time, these factors had a significant impact on the behaviour of inflation, with institutional changes in the wage bargaining structure and in the indexation mechanism contributing to the
fall of inflation in the 1990s\textsuperscript{1}.

The paper proceeds as follows. Next Section sets the stage of our study by presenting the main stylized facts about inflation and the indexation mechanism in post-WWII Italy. Section 3 analyses the statistical properties of inflation data, while Section 4 presents estimates of the Phillips curve, using conventional and time-varying tools. Section 5 compares our estimates for Italy with similar ones extracted for the US and UK. Section 6 discusses the main findings of our work.

2. Inflation in Italy, 1949-1998

2.1 Stylized facts

There are several ways to measure the Italian price level over the time span considered in this paper. Spinelli and Trecroci (2008) gather time series of the implicit price deflator of national income, cost of living and wholesale prices, dating back to 1861, the year of Italy’s unification. In this paper we pick up the former, but experiments with the other indices show that most of our findings are qualitatively unaffected by our choice. The sample period spans 1949-1998 and the data are at annual frequency.

This paper focuses on the 1949-1998 period, because indexation arrangements were established in the post war years. However, we start by plotting the price level over 1861-1998, to put our analysis into an historical perspective. Figure 1 shows that for a long, 50-year spell, inflation displayed some limited variability.

\textsuperscript{1} Obviously, additional factors should be taken into account to explain the remarkable fall of inflation in the early 1990s. Amongst them, a central role likely was played by the adoption of a tighter monetary stance by the Bank of Italy.
With WWI, the price level underwent a sharp increase, which levelled off only in the mid-20s, and subsequently experienced the single deflationary episode of Italian history. That episode ended with a second and more acute inflation outburst, which characterised WWII and the post-war years. Between 1947-48 and the early 1970s, the price level kept growing but at a more moderate pace than during the wars. In the 1970s-90s Italy witnessed the third major inflation outbreak, the only and most significant occurring during peacetime.

Figure 2 below plots the log differences of the price level, for the years 1949-1998. Three sizeable developments stand out:

1) Wide variations in the 1950s and 1960s. During that period, unions experienced the transition from post-war strength to a significant weakening later in the fifties. The employment growth in the sixties considerably increased union membership, which extended to unskilled workers. By the end of the sixties, the weight of the latter had remarkably grown relative to the unions’ traditional base of old-skilled workers.

2) The first oil shock, which triggered a sharp acceleration of inflation and its persistence on unprecedented high levels. That episode also accompanied a surge in the unions’ strength, massive strikes in the following years and an egalitarian wage policy. In 1975, monetary authorities reacted with restrictive
measures to rising wage pressures and the risk of a balance of payments crisis. However, wage moderation lasted only a couple of years, as the graph shows. The wages of Italian workers started to be automatically revised in the face of inflation, via the Scala Mobile indexation system.

3) The gradual reversion to moderate rates in the latter part of the sample, which started in 1983 but was completed only with Italy’s entry into EMU. The early eighties saw the decline of unions’ grip on the bargaining process and a gradual loosening of the indexation mechanism. The full effects on inflation, however, did not materialise until the early 1990s, when the country’s macroeconomic framework underwent substantial changes in preparation for its admission into EMU.

![Graph showing inflation rates from 1950 to 2000](image)

**Figure 2, Italy, 1949-1998: implicit price deflator of the national income, change in the natural log of index.**

Before evaluating the statistical properties of inflation, we next provide some background analysis of wage bargaining conditions in Italy, whose developments, as we will see, closely tracked the dynamics of inflation.

### 2.2 Wage indexation in post-war Italy

What will be later known as Scala Mobile was established for the province of
Milan in 1944 and extended in 1945 to protect wages from high inflation. The Employers’ Association was willing to accept it to prevent social conflict and the consequences of poverty. This indexation system had no exact counterpart in other industrialized countries and resulted from the favourable bargaining positions of workers and left-wing parties in 1945. In the fifties, a weakened union with a declining membership was progressively marginalised by institutional and government action (Accornero, 1992). Collective bargaining was neither widespread nor respected. Still, the SM made some progress, but the degree of indexation was still much differentiated.

The occupational growth of the sixties in the industrial and services sectors increased considerably union membership. Unions extended their control on unskilled workers, whose percentage was growing relative to their old skilled workers’ traditional base (Cella and Treu, 1982). By the end of the decade, a new collective identity emerged: the unskilled manual workers who migrated from the South and agriculture were then employed in the production chains of the North. At the beginning of the seventies, the “working class” reached its peak: blue collars were 84% of manufacturing employees. This explains the explosion of massive strikes in the following years as well as an egalitarian wage policy. All wage levels were automatically adjusted by the SM, which was the most representative phenomenon of those years, at the top of the economic and political agenda for the years ’75 -’85.

At the end of 1974, the coverage of real wages was lower than the full real indexation awarded by the SM agreement signed in 1957, and the gap between manual and clerical workers had widened. To overcome this disparity, the value of contingenza was revised in 1975 with a historical agreement. Unions and employers, after a long

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2 Consumption goods prices were up by 775.2% between 1943 and 1945.
3 In 1946, the indexation mechanism was extended to Northern Italy, and soon after to the whole country, following a national agreement signed by the unions and the Italian employers confederation. Initially calculated on a province basis, scala mobile was the same for all sectors, only differenced by age and sex. Blocked in 1946, was re-established in 1951, with a unified index for the whole country for all workers but with a “contingenza point” of 1% of wage levels differenced by qualification, age and sex and company size. The compensation varied according to a “union” cost of living, which recorded the increase in the cost of living for a manual worker family based on price changes of primary consumption goods.
4 In 1957, the contingenza points for the manual worker were 396 lire (1% of a pay of 39600 a month), and for a white collar was 948 lire.
5 When the cost of living increased by 1%, a manual worker earning 160,000 lire a month should received 1,600 lire to fully protect his wage. But the index had reached 252 points, the manual worker received 2,52 contingenza points, that is to say, 998 lire (396x 2.52) the point being at 396 lire for the manual and 948 lire for a clerical worker.
debate, agreed to fix a unique *contingenza* point for all workers equivalent to the highest: 948 lire of a 1st level clerical worker. The Lama-Agnelli agreement represented for Italian unions the most rewarding victory. At the same time, it marked the beginning of their decline: an automatic mechanism SM deprived them of any room for manoeuvre in their wage policy and reduced the scope and range of action of economic policy. The indexation connected with consumer prices protected wages also from increases in imported goods, *de facto* importing foreign inflation. Exchange rate policy became less effective and socially very expensive as it was borne out by the most vulnerable groups who were less covered by indexation. This paradox held out for most of the sample, as shown in Figure 3 below.

![Figure 3. Inflation and average gross earnings. Source: Tronti, 2008.](image)

The percentage share of earning increases due to 1975 indexation grew much faster than the one due to contractual increases. SM was rapidly eroding union’s power as a wage regulator (Somaini, 1989): the percentage share of wage increases due to *contingenza* grew from 13.5% in 1970 to 79.7% in 1979.

The degree of coverage of real wages, inversely proportional to its level (the higher the income, the lower the coverage), inevitably flattened wage differentials. By

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6 Plus a “heavy point”, of 2.52 times the predetermined point of 2.389 lire for all industrial workers to face inflation accelerating due to the oil crisis. The index was again set to the new base 100.

7 To give a quantitative idea, Manacorda (2004), considers two individuals at the top and bottom deciles of the earnings distribution in the first quarter of 1978. Their monthly wages in December 1977 were, respectively, 461,000 lire and 192,000 lire, and therefore the relative wage was 2.40. The SM point was
granting the same absolute wage increase to all employees as prices rose, $SM$ had a considerable equalizing effect and was largely responsible for: i) the fall in inequality between the late 1970s and the mid-1980s (Manacorda, 2004); ii) more transitions to self-employment at the top of the productivity distribution (Pellizzari, 2009). This significant wage compression intensified, as the most productive and rewarded employees were transferring wealth to the low wage and productivity workers. Growing frustration later led to a historical upheaval. In 1980, an estimated 40,000 white-collar workers ($quadri$) manifested their dissent against the equalizing effect of the $SM$ in front of FIAT headquarters in Turin ($Marcia dei quarantamila$). The growing dissatisfaction induced the government to lower the value of the $SM$ points. This pushed the IR system towards dispersion and decentralization. The most significant steps to fight inflation were the agreements of the following years. In 1983, Accordo Scotti was the first important breach in the unions’ unity, the last agreement signed by the three major unions together and the first to be signed by three actors: unions, employers and government. It reduced $SM$ by 18% while the final demise of $SM$ was achieved by the Craxi government on April 14, 1984. 1985 was a second milestone in the history of the $SM$: the proposition ($referendum$) called by the communist wing of the unions ($CGIL$) to recoup lost increments was defeated (Manacorda, 2004). The idea of predetermination of contingenza points was due to Ezio Tarantelli, who was killed by the Red Brigades in 1985. From then until 1986, $SM$ increments were based on some approximation of the $SM$ point and the increments were gradually lost. The 1986 reform was partial and ineffective: a more definite settlement was necessary in the early ’90s, after Italy entered SME’s narrow band and joined the Maastricht Treaty.

In 1991, the $SM$ was repealed by the employers’ association. The definitive solution putting an end to the $SM$ was 1003’s trilateral pact, with whom concertazione and the income policy model took the stage and became institutional. Since its full operation in 1994, this historical pact has linked contingent wage changes to expected inflation, and performed beyond expectations for well over a decade. Nominal wage growth has been very moderate with a reduction of the average real earnings. The 1993 approximately equal to 2,400 lire. From January to April, the price index increased by 5 points, triggering a rise in everybody’s wages of approximately 12,000 lire ($5 \times 2,400$) and reducing the gap to 2.32. Because of the $SM$, the relative wage would have decreased by 3% in only 3 months.
pact did not boost productivity and growth because it was never completed, but also because it laid on imbalanced ground: at the macro level, the asymmetry between product and labour market deregulation had perverse effects on income distribution and growth (Tronti, 2008). Since the mid 1980s, Europe had gradually put forward relatively stern labour market deregulation, producing a decrease in the bargaining power of workers. The effects of labour market deregulations dominated those of product market deregulation, which took place mostly at the end of the 1990s, after a major decline in the labour share (Blanchard and Giavazzi, 2003). Without competitive pressures on prices and profit margins, labour share declined, allowing companies to postpone investments and strategies to improve productivity. High price dynamics reduced wage bargaining power and consequently domestic demand and growth.

3. Statistical analysis of Italian post-war inflation

Having described the evolution of wage bargaining and indexation institutions, we now focus on the inflation data for 1949-1998, but also split the sample in half in 1973 and study the resulting two sub samples, which were characterised by different monetary and exchange-rate regimes. We recall that during 1949-1973 exchange rates were fixed within the Bretton Woods system, whereas during 1974-1998 the Italian lira followed a “fixed but adjustable” peg.

Table 1 displays average inflation rates ($\mu$), their standard deviations ($\sigma$) and variation coefficients ($cv = \sigma / \mu$) for the whole sample and the two sub periods.

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>$\mu$</th>
<th>$\sigma$</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1949-1998</td>
<td>7.00</td>
<td>5.12</td>
<td>0.731</td>
</tr>
<tr>
<td>1949-1973</td>
<td>4.269</td>
<td>2.423</td>
<td>0.568</td>
</tr>
<tr>
<td>1974-1998</td>
<td>9.902</td>
<td>5.334</td>
<td>0.539</td>
</tr>
</tbody>
</table>

Table 1, Italy. Implicit price deflator of the national income, change in the natural log of index. Mean ($\mu$), standard deviation ($\sigma$), coefficient of variation ($cv$), normality tests ($e_1$ and $e_2$). ‘*’ and ‘**’ indicate rejection of the null at the 5% and 1% significance level, respectively.
The 1974-1998 sub sample saw the highest and more volatile inflation. Our narrative account described it as the period during which social conflict and union bargaining power were most intense. Table 1 also contains the results of Jarque and Bera (1987) \( (e_1) \) and Doornik and Hansen (1994) \( (e_2) \) tests for normality. Essentially, these tests evaluate whether asymmetry and kurtosis of the series correspond to those of a normal distribution\(^8\). Table 1 shows results for the whole sample: there is clear evidence against the null of normality. As to stationarity, we employ the Augmented Dickey-Fuller (ADF) test, which we remind is implicit in the evaluation of the \( t \) statistic of the \( \hat{\beta} \) coefficient in:

\[
\Delta \pi_t = \alpha + \mu \tau + \beta \pi_{t-1} + \sum_{i=1}^{n} \gamma_i \Delta \pi_{t-i} + u_t,
\]

where \( \tau \) is a deterministic trend. A significant statistic would imply rejection of the null hypothesis of unit root \( (H_0 : \beta = 0) \) and therefore stationarity of the inflation rate.

Table 2 presents results for the whole sample and the four main sub periods. We included \( t \)-values for the \( \beta \) coefficient for both the model with a constant and that with constant and trend, each estimated with \( n = 3 \)\(^9\).

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>Constant</th>
<th>Constant and trend</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( i=0 )</td>
<td>( i=1 )</td>
</tr>
<tr>
<td>1949-1998</td>
<td>-1.731</td>
<td>-2.100</td>
</tr>
<tr>
<td>1974-1998</td>
<td>-0.4841</td>
<td>-0.9693</td>
</tr>
</tbody>
</table>

Table 2, Italy, various sub samples. Implicit price deflator of the national income, change in the natural log of index. Augmented Dickey-Fuller test Augmented Dickey-Fuller. ‘*’ and ‘**’ indicate rejection of the null with a 95 and 99% confidence interval, respectively.

Overall, we cannot reject the null of a unit root in both models: inflation appears to be non-stationary. While this result is clear-cut, the nature and frequency of the structural changes that lead to non-stationarity cannot be determined with simple unit root tests. Moreover, the ADF tests have low power in small samples, and with

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\(^8\) We remind that Jarque and Bera’s test has low power in small samples. Doornik and Hansen’s test adjusts for this bias.

\(^9\) The critical values for this procedure depend on the inclusion of the constant or of the constant and a trend term. The critical values we employ are those of MacKinnon (1991). A statistic significant at the 5% is marked by *, at the 1% by **.
variables containing MA components (see Maddala and Kim, 1998). This suggests focusing on the possible structural breaks rather than on the unit root properties of the series. However, we believe it more appropriate to study the structural changes of the inflationary process jointly with output dynamics, within the context of the Phillips curve.

4. A Phillips Curve for Italy?

To investigate what drove the change in the properties of Italian inflation, we think it is crucial to disentangle its short-run variation from long-term trend. Various methods are available, like the application of Hodrick-Prescott (HP), linear or band-pass filters. Unfortunately, the results from market surveys or measures extracted from inflation swaps or bond-based break-even inflation rates are available only for relatively short and recent samples of data. We therefore base our inferences on two filtered measures. First, we employ the *Structural Time Series* (STS) approach, proposed by Harvey (1989). The procedure amounts to decomposing the original series into trend, recursive stochastic cycles, and irregular components that vary over time, via the application of the Kalman filter. This generates a time-varying trend based on low-frequency autoregressive and cyclical components of inflation’s DGP. Moreover, we contrast all our results with those obtained using the more conventional HP filter.

Figure 4 plots actual inflation along with both the estimated Kalman-filter-based trend (STSINF) and the HP one (HPINF). One can easily notice that the sizeable acceleration of inflation originates already in the late 1960s. Inflation then peaks in 1980-82, and gets back to moderate levels only towards the end of the sample.

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10 For more details, see Hamilton (1994).
11 This way, we extract time-varying measures of expected inflation that for each observation rely only on information available up to the point of estimation. This modelling approach applies a Kalman-filter estimation procedure, in line with a plausible learning process for both the central bank and private agents.
12 We are aware that these are not “ideal” measures of expected inflation. The two-sided nature of the HP filter, for instance, makes the inflation trend based on it depend on a perfect-foresight hypothesis. More in general, agents’ expectations of inflation will be the combination of some trend measure and a random component, which, according to rational expectations, should be unpredictable. Both the HP filter and the Kalman-filter-based trends, as well as almost all other alternative methodologies, violate this orthogonality condition, which on the other hand appears to clash with the empirical evidence in favour of adaptive inflation expectations.
The starting point of our econometric analysis is a consensus model of inflation and output, which blends the original expectation-augmented Phillips curve (Phelps, 1967; Friedman, 1968) with more recent proposals featuring persistence and price/wage rigidity (Woodford, 2003). Let us start from the following reduced-form representation of the relationship between inflation and output:

$$\pi_t = \gamma(y_t - y_t^*) + E_{t-1} \pi_t$$

(1)

where $y_t - y_t^*$ denotes the output gap, that is, the difference between the current level of output and its NAIRU or equilibrium level, and $E_{t-1} \pi_t$ the expected inflation rate, conditional on last period’s information. The dependence of current inflation on last period’s expectations reflects the rational expectations hypothesis within a structural model with some price rigidity. In turn, this implies that:
(i) unexpected changes in aggregate demand affect both inflation and output;  
(ii) the stickier the prices, the lower $\gamma$, Phillips curve’s slope.

The literature often adopts the following model:

$$\pi_t = \gamma (y_t - y_t^*) + \beta E_t \pi_{t+1}$$  \hspace{1cm} (2)

This differs from (1), as it makes the curve shift in response to revisions of current expectations of future inflation. However, from an observational point of view, the difference between (1) and (2) is quite hard to grasp, as expected inflation displays quite high serial correlation. Finally, given the small-open nature of the Italian economy, we believe it appropriate to add the log change in the index of import prices ($\pi_t^*$). This way we account for the impact of foreign inflation pressures on the behaviour of domestic prices. Therefore, our estimates are based on the following model:

$$\pi_t = \beta E_t \pi_{t+1} + \omega \pi_{t-1} + \gamma (y_t - y_t^*) + \delta \pi_t^*,$$  \hspace{1cm} (3)

To measure the output gap too we employ the STS approach. We fit a univariate model for real GDP, and extract a time-varying measure of potential output that for each observation relies only on information available up to the point of estimation. As a robustness check, we also tried with a measure of output gap provided by the OECD, and with HP- and band-pass filters, but we found very little qualitatively differences in the resulting estimates of the Phillips curve.

Next, we estimated equation (3) via OLS over the sample 1949-1998. The estimates we obtained, based on either the HP or STS definitions of the output gap, are as follows ($t$-values in parentheses):

$$\pi_t = 0.014 \ E_t \pi_{t+1} + 0.731 \pi_{t-1} - 0.602 \left(y_t - y_t^*\right)_{HP} + 0.174 \pi_t^* + \hat{\epsilon}_t,$$  \hspace{1cm} (0.132) \hspace{0.5cm} (5.58) \hspace{0.5cm} (-2.31) \hspace{0.5cm} (2.85)

$$\pi_t = 0.048 \ E_t \pi_{t+1} + 0.691 \pi_{t-1} - 0.227 \left(y_t - y_t^*\right)_{STS} + 0.173 \pi_t^* + \hat{\epsilon}_t,$$  \hspace{1cm} (0.33) \hspace{0.5cm} (3.75) \hspace{0.5cm} (-1.19) \hspace{0.5cm} (2.40)
Lagged inflation and import prices seem to be current inflation’s main drivers. The output gap coefficient is statistically significant only when the model includes its HP-filter based measure, but in both cases, the inflation response is surprisingly negative. These results likely are the product of periods dominated by ample and positively correlated output and inflation shocks, which lower the covariance between the variables over the sample. Given such heterogeneity in the sample, estimation should take into account the occurrence of shifts over time in the relationship between inflation and real activity. Furthermore, by allowing for time variation in the inflation-output trade-off, estimates could shed further light on the links between observed institutional changes and the structural shifts in the curve’s coefficients and residual variance.

We therefore computed additional estimates that explicitly allow for time variation in the parameters of the Phillips curve and in its residual variance. We obtained estimates of the state vector for each observation in our sample. These estimates can then describe the evolution of the Phillips curve’s coefficients over time.

Let us represent the model in a general state-space form (see Harvey, 1989; Kim and Nelson, 1999):

\[
\begin{align*}
\pi_t &= c_t + x_t \beta_t + e_t \\
\beta_{t+1} &= d + T \beta_t + z_{t+1}
\end{align*}
\]

where

\[e_t \approx N(0, \sigma^2), z_t \approx N(0, Q), b_0 \approx N(a_0, \Sigma_0),\]

and \(x_t\) contains the explanatory variables.

The first equation in (4) is the measurement or observation equation. It is the classical linear regression model except that the parameter vector \(\beta_t\) (representing the state variables) is posited to change stochastically according to the transition described in the second equation in (4)\(^{13}\). Summing up, this time-varying formulation involves

\(^{13}\) We follow the prior distribution proposed by Doan et al. (1984), which assumes that changes in the endogenous variable modelled are so difficult to forecast that in the AR(1) process of the unobserved state vector the coefficient on its lagged value is likely to be near unity, while all other coefficients are assumed to be near zero. The prior distribution is independent across coefficients, so that the MSE of the
forecasting the optimal state vector in each period, based on information available up to the previous period\textsuperscript{14}. This way we compute filtered estimates of the parameters and the residuals for each observation in the sample, thus accounting for the potential variation over time of the underlying parameters.

Figure 5 plots the times series of the estimated coefficient $\gamma_t$ in equation (3), that is, the coefficient measuring the sensitivity of current inflation to changes in the output gap\textsuperscript{15}. We computed the displayed estimates by using a HP-based measure of inflation expectations and both STS and HP definitions of the output gap.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure5.png}
\caption{Italy, 1949-1998. Phillips curve, output gap TVP coefficients obtained using Hodrick-Prescott and STS-based measures of the output gap.}
\end{figure}

\textsuperscript{14} Under the normality and independence assumptions about the disturbances, the computation of the state vector is obtained via application of the Kalman filter.

\textsuperscript{15} For brevity, we do not show here the full results of our TVP estimation, which are available from the authors upon request.
The dynamics of $\gamma_t$ broadly confirms that inflation and output were negatively linked. If instead we measured the inflation impact of output changes via standard constant-coefficient techniques, we would find an insignificant response, as the result of a significant but negative feedback for the early part of the sample, and an essentially mute correlation for the latter part. The vigorous output dynamics of the 1950s and early 1960s was largely non-inflationary, as rapid productivity gains pushed the Italian economy’s production possibilities, while Bretton Woods’ fixed exchange rates shielded the economy from nominal shocks. This effect faded out over time. Stronger labour unions ended out imposing heavy constraints on employers. The government and the unions were at the origin of an upward shift of the Phillips curve, as already recorded by various estimates of the time (Modigliani and Tarantelli, 1976). Tarantelli (1978), for instance, argued that stagflation did not necessarily hamper the theoretical validity of a textbook-like Phillips curve, especially if the reaction of monetary policy to the resulting cost-push inflation was a successful deflation. However, Modigliani and Tarantelli (1976) showed that starting from 1968, as a result of the changes in industrial relations that we have described above, the Phillips curve shifted upward and became steeper with every round of labour contract negotiations.

5. Comparing Italy with the USA and UK

It is interesting to contrast our findings for Italy with what we could obtain on similar data, sample spans and methodology for other countries. We therefore extended our analysis to the USA and UK. Figure 6 plots the annual inflation rates (all based on the price deflator of national income) for the three countries. Italian inflation easily emerges as having the highest mean and volatility. UK and Italy differ sharply from the US, as they had significantly higher inflation throughout the 1970s and 1980s. Nevertheless, after 1979 inflation was mopped up much faster in the UK, where it tracked closely US inflation, than in Italy, where it remained consistently high. Finally, Italian and UK inflation rates have similar persistence levels, both far higher than for the US.
Turning to a comparison of the inflation-output relationships across the three countries, Table 3 contains the estimates for the standard New Keynesian Phillips Curve specification.\footnote{For these estimates, we measured the output gap by generating a HP-based series for potential output. Results do not qualitatively differ with the STS approach. Models for the UK and Italy also contained import prices as a regressor.}

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<tr>
<th></th>
<th>$E_i\pi_{t+1}$</th>
<th>$\pi_{t-1}$</th>
<th>$(y_t - y_t^*)$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USA</strong></td>
<td>0.707</td>
<td>0.302</td>
<td>0.127</td>
</tr>
<tr>
<td></td>
<td>(6.02)</td>
<td>(2.67)</td>
<td>(2.16)</td>
</tr>
<tr>
<td><strong>UK</strong></td>
<td>0.649</td>
<td>0.369</td>
<td>0.179</td>
</tr>
<tr>
<td></td>
<td>(4.90)</td>
<td>(2.98)</td>
<td>(1.36)</td>
</tr>
<tr>
<td><strong>Italy</strong></td>
<td>0.014</td>
<td>0.731</td>
<td>-0.602</td>
</tr>
<tr>
<td></td>
<td>(0.132)</td>
<td>(5.58)</td>
<td>(-2.31)</td>
</tr>
</tbody>
</table>

Table 3. USA, UK and Italy, 1949-1998. New Keynesian Phillips Curve, coefficient estimates and t-values.

Only for the US, our constant-coefficient estimates portrait an inflation-output trade-off in line with the conventional NKPC. As for the UK, while the output elasticity
is not significant either, expected inflation has a sizeable and strongly significant coefficient. So, Italy stands out: the strong tendency of output and inflation to move in opposite directions during major shocks makes it also the only country in which inflation expectations do not appear to affect current inflation.

Finally, we study the evolution of the inflation-output relationship in the UK and US by estimating TVP models. Figure 7 shows the dynamics of the output gap coefficients. The dominant feature is that the UK and Italy had a negatively-signed relationship up until early 1970s, although in the UK in the long-run it seems to have held up. In the US, the sensitivity of inflation to output developments is more sizeable and stable, with only one major breakdown during the 1970s’ stagflation. These findings broadly confirm that the standard trade-off between inflation and output growth can emerge only during periods of low inflation and limited macroeconomic volatility.

![Figure 7, USA, UK and Italy, 1949-1998. Phillips curve, output gap TVP coefficients obtained using STS-based measures of the output gap.](image)

As we discuss below, institutions in the US, and to a lesser extent in the UK, favoured a reduction of inflation and output variability. In the seventies, Italy and UK occupied the most uncomfortable position in the Calmors-Driffils curve (see Figure 8 taken from Bordogna, 2003). The curve relates Okun misery index
(inflation+unemployment) to the degree of centralization of the wage setting system, highly decentralized to the left, highly centralized to the right. The two countries were at the top of the curve in the mid-seventies, but in the early 1980s they followed two opposite routes to defeat inflation: the UK moved to the bottom left by adopting labour market reforms towards decentralization, whereas Italy moved to the bottom right through political regulation and further centralization.

![Diagram](attachment:image.png)

**Fig. 7. Degree of centralization and misery index: Italy and UK (1975-85)**

Until the mid-1970s, Italian and UK industrial relations were strikingly similar, but, after Mrs. Thatcher’s victory in 1979 elections, they developed in opposite directions. In the early 1970s, the Conservative party had tried to regulate collective bargaining union representation and strike behaviour after the US model, but the reforms lost steam in a tug of war with Labour, which strongly endorsed collective bargaining and voluntary cooperation. Breaking with this consensus was Mrs. Thatcher’s early moves, which made monetary stability and low inflation a priority. After surviving through an unemployment rate of over 14% in 1982, her legislation gradually reduced the national role of unions, by promoting individual over collective bargaining (Visser and Ruysseveldt, 1996). Union density and strike participation all declined to well below the European average after having been well above. A number of institutional factors produced those changes. Employers had already abandoned collective bargaining before 1979, and the government made irreversible that shift. In
the British legal system, there were no positive rights of trade unions representations, collective bargaining or strikes. Union law had developed as an exemption to the common law - in itself a manifestation of *laissez faire* - and made British industrial relations sensitive to the prevailing balance of political and economic power.

In Italy too the system of industrial relations had evolved towards a spontaneous model, with market and political forces dictating the outcome. Centralised agreements had the force of law through government decrees. Moreover, such role for the state was the result of the co-existence of strong parties and weak governments (Visser, 1998). For instance, the employers’ association was not rooted in a “dense” institutional framework: heterogeneity between the political orientation of large and small firms, sectors and regions, prevented *Confindustria* from adopting a common policy or strategic design similar to what changed so deeply the UK in the early 1980s.

In Italy organizations representing employees and employers were (and still are) involved in multilateral dialogue at an intersectoral level. The US has little or no tradition of such dialogue at the national level. The structure of the UK trade unionism is similar to the US, with a single major national centre of member unions. Only few unions lie outside the umbrella of AFL-CIO or TUC, whereas in Italy significant union power is outside the “representative” multiple confederations, often divided along political, organizational and religious lines.

Unions affected wages both directly, through collective bargaining, and indirectly, via their general impact on the economy and the level and distribution of wages. In the US and the UK, despite declining membership, unions were able to raise members’ wages substantially above non-union wages. In Italy, where wage settlements spill over into the non-unionised sector, there was no significant union wage differential. Unions influence national wage setting by general extension of collectively bargained rates.

### 6. Discussion and concluding remarks

17 Still industrial relations are more complex in Britain than they are in the United States: in Britain many more non-members work in workplaces that are covered by union agreements and, conversely, more union members are employed in workplaces where unions are not engaged in pay bargaining than is true for the US.

18 Time-series evidence for the 1970s and 1980s from both the US and the UK suggests that the union differential in the US is 18 per cent, higher on average than the 10 per cent found in the UK. (Blanchflower and Bryson, 2008).
The evolution of the response of Italian inflation to the output gap confirms the existence of a broadly negative link between inflation and output. If we measure the inflation impact of output changes via standard constant-coefficient techniques, we find an insignificant response, a significant but negative feedback for the early part of the sample, and an essentially mute correlation for the latter part. Only for the US, constant-coefficient estimates portrait an inflation-output trade-off in line with the conventional NKPC. As for the UK, while the output elasticity is not significant, expected inflation has a sizeable and strongly significant coefficient. The tendency of Italian output and inflation to move in opposite directions during major shocks makes it the only country in which inflation expectations do not appear to affect current inflation. This happens with the exception of the 1950s and early 1960s. Back then, output dynamics was largely non-inflationary, as rapid productivity gains pushed the Italian economy’s production possibilities, while Bretton Woods’ fixed exchange rates shielded the economy from nominal shocks.

The dominant feature of our results is that both the UK and Italy had a negatively signed relationship between inflation and the level of economic activity up until early 1970s, although in the UK in the long-run it held up. In the US, the sensitivity of inflation to output developments is more sizeable and stable, with only one major breakdown during the 1970s’ stagflation. These findings broadly confirm that the standard trade-off between inflation and output growth can emerge only during periods of low inflation and limited macroeconomic volatility.

The comparison of Italy with US and UK sheds light on the institutional roots of inflation. Where market discipline is the regulating mechanism, like in the US, we find a textbook-like Phillips curve and inflation is defeated sooner. On the contrary, where institutions are weak and fractious, like in Italy, no clear and consistent policy rule emerges and bargained legislation dominates. The UK experience is likely to be midway between such examples, as strong institutions supported and cooperated with a government committed to fight inflation, and at some stage credibly so because it was unaffected by any persistent spending bias. The most likely explanation for the Italian “anomaly” lies in the presence of the rigid wage bargaining and indexation arrangements, on which the protection of real wages was based. Of course, there are other explanations for such anomaly, the most prominent of which suggests than in Italy
fiscal policy swamped the objectives of monetary policy and industrial relations (see for instance Fratianni and Spinelli, 2001). However, we feel those additional factors complemented the institutional rigidities we discussed in this paper.
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