

## ACCOUNTING FOR THE RECENT DECLINE IN THE NAIRU\*

Robert G. Murphy  
Department of Economics  
Boston College  
Chestnut Hill, MA 02467  
[robert.murphy.1@bc.edu](mailto:robert.murphy.1@bc.edu)

November 4, 1998

### Abstract

This paper confirms that the unemployment rate associated with stable inflation, the so-called “NAIRU,” probably has declined in recent years, after having risen sharply during the late 1970s and early 1980s. Although a demographic shift toward a less experienced workforce and an unexpected slowdown in trend productivity growth are able to explain the earlier rise in the NAIRU, a reversal of these effects does not adequately explain the timing of the apparent decline in the NAIRU during the 1990s. I propose that an additional element needs to be incorporated into the assessment. I argue that the degree of integration of regional labor markets across the United States has accelerated over the recent past, leading to a greater degree of synchronization in the pattern of regional labor market conditions and regional business-cycle conditions. I provide evidence of this greater synchronization, and suggest that it may have led to a drift downward in the NAIRU.

\*An earlier version of this paper was presented at the 40<sup>th</sup> Annual Meeting of the National Association for Business Economics, Washington, D.C., October 4-7, 1998.

## 1. Introduction

The stubborn persistence of high inflation during the 1970s despite high average unemployment led economists and policymakers nearly twenty years ago to a reappraisal of the inflation-unemployment tradeoff popularly known as the Phillips Curve. This reappraisal, partly documented in a volume edited by Martin Baily (1982), focused on the question of whether the unemployment rate appropriately captured the degree of tightness (or slack) in the labor market. As Baily notes in his introduction to that volume, although “there was some hope that it might be possible to break away from the Phillips curve framework...many of the papers did end up analyzing...the tradeoff between economic slack and inflation.” A conclusion of many of the volume’s papers was that the unemployment rate by itself was probably not very useful as a measure of economic slack.

One response to this dilemma was to search for alternatives to the unemployment rate as potential measures of labor market tightness, such as job vacancy rates and quit rates. Some attempts to use these alternative measures to explain wage growth met with moderate success (e.g., Medoff and Abraham, 1982).

Another response was to continue focusing on the unemployment rate as a measure of slack but to assume that structural changes in labor markets had caused a shift upward in the rate of unemployment at which inflation was stable—the so-called natural rate of unemployment or “NAIRU.”<sup>1</sup> This response, best exemplified by Robert Gordon in a series of papers (1982a, 1982b), involved showing how the NAIRU implied by estimates of the standard Phillips curve had drifted upward during the 1970s. After incorporating supply shocks, temporary effects from the productivity slowdown, and the demographic

shift toward a less experienced workforce, Gordon was able to explain virtually all of the apparent upward shift in the natural rate.

We have now come full circle, with the puzzle of today being the quiescence of inflation in the face of rock-bottom unemployment rates not seen in over 25 years. Of course, the obvious answer is that the NAIRU has fallen—that a reversal of the 1970s’ rise has occurred. But the answer is not quite as simple as it might appear. First, we need to highlight the statistical evidence concerning the NAIRU to determine the extent of any decline. Indeed, the recent experience of declining inflation despite a low unemployment rate is consistent with no change in the NAIRU provided the dollar is rising or energy prices are falling quickly enough. Second, if a decline is identified, a convincing case needs to be made for why this decline might have occurred. Because estimates of the NAIRU are computed as a “residual,” we need to have a clear story to support any shift, particularly if we are to rely on this shift in formulating policy. Otherwise we risk merely fitting the data in a statistical sense without economic content.

This paper assesses whether the NAIRU recently has declined. I do so within the traditional model of the Phillips curve. After concluding from the statistical evidence that the NAIRU has declined recently, I then consider the usual suspects from past discussions. I propose that a new element needs to be incorporated into the assessment. I argue that the degree of integration of regional labor markets across the United States has accelerated over the recent past, leading to a greater degree of synchronization in the pattern of regional labor market conditions and regional business-cycle conditions. I provide evidence of this greater synchronization, and suggest that it may have led to a drift downward in the NAIRU.

My findings should be of interest to policymakers and business analysts who need to assess the extent of and reasons for any recent decline in the NAIRU, particularly as regards the formulation of monetary policy. The results also suggest the potential usefulness of measures of labor market integration in forecasting inflation.

## 2. Some Stylized Facts and the Case for a Shifting NAIRU

Estimates of Phillips curves for the United States typically show an unambiguous negative relationship between the unemployment rate and the change in price inflation. Although the steepness of the curve varies depending on the particular specification of the equation and its sample period, the statistical significance of the relationship is very high.

Figure 1 presents a simple scatterplot of the relationship between the change in inflation and the unemployment rate using annual data from 1960 to 1997. The slope of this line is clearly negative and standard hypothesis tests show that it is strongly statistically significant. The point where this line intersects the unemployment axis is an estimate of the unemployment rate for which inflation is constant, in other words the natural rate of unemployment or the “NAIRU.” As can be seen in Figure 1, however, the relatively large errors about the regression line imply that pinning down a precise estimate of the NAIRU is difficult. Although the estimate of the NAIRU from this simple scatterplot is 6.2 percent, unemployment rates ranging from roughly 4 to 7 percent over the years have been associated with periods of stable inflation. Of course, Figure 1 does not account for important features such as supply shocks, lags in adjustment to past inflation, and price controls, among others, that are usually included in models of the

inflation process. But even when such features are included, estimates of the NAIRU continue to be rather imprecise.

One interpretation of the apparent imprecision in estimates of the NAIRU is that the Phillips curve has shifted over time, implying different values of the NAIRU for different time periods. A possible way to assess such shifts is to estimate the NAIRU using time-varying parameter methods. Recent papers by Staiger, Stock, and Watson (1997) and Gordon (1997) have used these methods to estimate a time-varying NAIRU. Broadly speaking, both studies find that the NAIRU rises in the 1970s, stays relatively high in the 1980s and then declines in the 1990s. A problem with these time-varying parameter methods, however, is that they require ad hoc assumptions about either the deterministic process (Staiger et al) or the stochastic process (Gordon) driving the NAIRU that ensure the estimates evolve “smoothly” over time. A second problem, emphasized by Staiger et al, is that statistical confidence bands for a time-varying NAIRU are quite wide, often on the order of two to three percentage points of unemployment, raising questions about how to interpret movements in point estimates of the NAIRU that are much smaller.

This paper assesses shifts in the NAIRU by harking back to an earlier methodology that compares values of the NAIRU for sample periods of several years (e.g. Gordon 1982b). By using this approach, I avoid having to specify the ad hoc features of time-varying parameter models. Furthermore, by limiting the shifts in the NAIRU to a small number, I am able to statistically identify these shifts with a reasonable degree of confidence. A drawback of my approach is that the NAIRU has discrete “jumps” between these periods. While my statistical approach relies on these breakpoints to delineate shifts in the NAIRU, I believe that such shifts in fact probably do occur more

gradually. Nevertheless, I find it instructive to compare periods where, on average, the NAIRU clearly differs and to then explore economic reasons why such differences may have occurred.

Table 1 provides estimates of the NAIRU for several periods since 1960. These periods were chosen in part by looking for statistically significant shifts in the underlying Phillips curve used in computing the NAIRU estimates. The Phillips curve is a standard textbook version that controls for the effects of lagged inflation and supply shocks measured as changes in the relative price of food and energy.<sup>2</sup> Confirming conventional wisdom, the first line of Table 1 shows that the NAIRU, on average, was lower before 1973 than after, with an overall shift between these periods of about 1 percentage point. Breaking the 1973-97 period into roughly equal subsamples of 1973-85 and 1986-97, the second line shows relatively little change from the full-period results, with the NAIRU hovering in the 6.5 percent range. When the NAIRU is estimated specifically for the 1993-97 period, however, its value drops to 5.7 percent, and importantly, this period is not statistically different from the pre-1973 period.<sup>3</sup> The last line in Table 1 incorporates this statistical equivalence and yields an estimate of the NAIRU equal to 5.4 percent for the pre-1973 and post-1992 periods.<sup>4</sup>

Overall, I interpret these results as suggesting (as have many others) that the NAIRU has declined in the 1990s. Although a value of 5.4 percent might seem high given that the unemployment rate has remained below 5 percent for more than a year without sparking a rise in inflation, it is important to remember that these estimates account for the effects of cost shocks. In recent years, an appreciating dollar and declining real

energy prices have without a doubt helped maintain stable inflation despite historically low unemployment rates.

### 3. Accounting for Shifts in NAIRU

This section assesses potential explanations for changes in the value of the NAIRU. First, I consider the importance of two factors often identified as giving rise to shifts in the NAIRU: changes in the demographic composition of the workforce that may be associated with changes in experience levels and the role of unexpected shifts in productivity growth. I conclude that demographic shifts can not account for the timing of the recent decline in the NAIRU, but that the pickup in productivity growth over the past few years may have had the effect of temporarily depressing the NAIRU. Then, I propose a role for increased integration of regional labor markets as an important consideration in assessing shifts in the NAIRU. I argue that evidence of greater regional integration during the 1990s is consistent with a recent decline in the NAIRU.

#### The Shifting Demographics of the Labor Force

The U.S. labor force has undergone dramatic shifts in age structure over the past three decades. Between the early 1960s and the late 1970s, the labor-force share of young workers rose dramatically while the share of middle-aged workers dropped sharply. This shift reflected the entry of the “babyboom” generation into the workforce. Younger workers tend to be less experienced than older workers and generally have less attachment to the workforce. Because workers with less experience have higher average rates of unemployment, this shift toward a more youthful workforce probably raised the

NAIRU during the 1970s and early 1980s. Over the past 15 years, this shift has reversed, with the share of middle-aged workers climbing back to earlier levels and share of young workers falling. This shift toward an older, more experienced workforce probably has contributed to a lower NAIRU in recent years, but can not explain the timing of a sharp drop in during the 1990s because the shift in age structure was well underway by the late 1980s.

Another demographic factor often cited to explain an increase in the NAIRU during the 1970s is the rise in labor force participation by during the late 1960s and early 1970s. Because women on average had less work experience than men, they on average had higher rates of unemployment. Accordingly, during the 1970s the rising proportion of women in the workforce likely led to an upward movement in the NAIRU. Beginning in the early-1980s, however, the unemployment rate for women had converged to the rate for men, so that any effects from women's increased labor force participation on the NAIRU should have been reversed during the 1980s. Thus, the timing of a decline in the NAIRU during the 1990s can not be explained by a reversal of these effects.

### Productivity Gains and the NAIRU

A common refrain heard in recent years is that the economy has entered an “new era” in which a step-up in the rate of productivity growth is underway, leading to a faster potential rate of growth for the economy. Faster productivity growth by itself, however, need not alter the value of the NAIRU, which is determined in labor markets by the demand for and supply of labor. An increase in productivity allows firms to pay higher real wages (at least eventually), but workers probably will increase their “reservation

wage,” i.e. the wage they consider to be appropriate. Provided that the “aspirations” of workers concerning appropriate wages eventually match the productivity gain, the NAIRU will be unaffected. Only if productivity growth somehow changes the structure of labor markets, altering the rates of transition into and out of unemployment can it ultimately affect the NAIRU. For example, improvements in the speed and quality of matching unemployed workers with jobs will lead to a lower level of “frictional” unemployment and thus a lower NAIRU.

In the short-term, however, worker aspirations regarding wages may rise either faster or slower than the actual rate of productivity growth. If aspirations rise faster than productivity, then the NAIRU will tend to increase, and vice versa. As is well known, annual trend growth in output per hour for the U.S. business sector decelerated sharply in the early 1970s, dropping from a rate of 3.2 percent during 1960-73 to a rate of 1.2 percent during 1974-94. To the extent that workers during the 1970s expected productivity to continue growing at its earlier pace, aspirations for real wage gains would have exceeded productivity, leading to a temporary shift upward in the NAIRU. But once workers adjusted their aspirations downward into line with actual productivity growth, the NAIRU would have fallen back. Evidence from several recent studies suggests that this adjustment process is relatively slow, so the effects on the NAIRU could persist for some time (Blanchard and Katz, 1997; Card and Hyslop, 1996; Bell, 1996). An unwinding of this aspiration effect has probably contributed to the drop in the NAIRU, although again the timing suggests this would have been happening at least by the late 1980s.

The apparent pickup in productivity growth over the past few years, of course, would tend to reduce the NAIRU to the extent that workers aspirations continue to be conditioned by the sluggish productivity growth of the 1970s and 1980s. Here, the timing fits the Phillips-curve evidence of a drop in the NAIRU during the mid-1990s. But regardless of whether or not the trend rate of productivity growth has risen, the gap between wage aspirations and productivity growth eventually will close (either through increased wage aspirations or by productivity reverting to its previous trend), so that the NAIRU is only temporarily lower.<sup>5</sup>

#### Increased Integration of Labor Markets

Discussions about why the NAIRU might recently have declined recently sometimes highlight the effects of increased production efficiency and competition in restraining price increases (Stiglitz, 1997). This potential explanation, however, is usually offered as a catchall to explain the timing of the recent decline in the NAIRU that other factors cannot fully account for. And the evidence provided is typically anecdotal, e.g., appeals to the increased use of computers for just-in-time inventory management, the increased openness of the U.S. economy to competitive pressures of international trade, or the reduced importance of unions.

One way to quantify the effects of increased economic integration and efficiency is to consider the pattern of labor market conditions and economic activity across regions of the United States. Figure 2 shows the variance of state unemployment rates about the national unemployment rate for periods of both recession and expansion since 1980.<sup>6</sup> As seen in Figure 2, the dispersion of unemployment rates across states clearly has declined

in the 1990s compared to the 1980s, regardless of whether one considers expansions or recessions. A similar decline over time in the dispersion of unemployment rates is also apparent if one looks across census regions rather than states. This pattern of a decline may have resulted from greater mobility of workers across regions and better matching of unemployed workers to available jobs, and accordingly would reflect a national labor market that has become more integrated and efficient. Greater labor market efficiency likely would lead to lower wage pressures for any national rate of unemployment than in the past.<sup>7</sup>

The decline in dispersion of unemployment rates could also signal an increase in the diversification of regional economies, so that expansions and recessions are now more uniform in their effects on unemployment across states or regions than in the past. Indeed, the dispersion of economic growth rates across states and regions has fallen during the 1990s compared to the 1980s, as Figure 3 illustrates.

To the extent that this decline in growth-rate dispersion reflects an increased synchronization of regional business cycles, then price pressures are less likely to emerge first in one region and spill over into inflation expectations in other regions. Instead, price pressures would tend to emerge uniformly across regions, limiting the tendency for expectations about inflation to shift up in response to market pressures in some other region. Accordingly, the change in the national rate of inflation associated with any given national unemployment rate likely would be lower.

#### 4. Summary

This paper confirms that the NAIRU probably has declined in recent years, after having risen sharply during the late 1970s and early 1980s. Although a demographic shift toward a less experienced workforce and an unexpected slowdown in trend productivity growth are able to explain the earlier rise in the NAIRU, a reversal of these effects does not adequately explain the timing of the apparent decline in the NAIRU during the 1990s. I propose that an additional element needs to be incorporated into the assessment. I argue that the degree of integration of regional labor markets across the United States has accelerated over the recent past, leading to a greater degree of synchronization in the pattern of regional labor market conditions and regional business-cycle conditions. I provide evidence of this greater synchronization, and suggest that it may have led to a drift downward in the NAIRU.

## Footnotes

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<sup>1</sup> The acronym “NAIRU” stands for “non-accelerating inflation rate of unemployment,” although a more accurate description is the “non-increasing inflation rate of unemployment.”

<sup>2</sup> To compute the NAIRU, the Phillips curve equations estimated in this paper maintain the assumption that lagged inflation eventually feeds one-for-one into current inflation. In my basic specification, I allow for only one lag of inflation. The estimates in Table 1 use an equation that expresses the CPI inflation rate as a function of lagged inflation, the civilian unemployment rate, and the relative rate of food and energy inflation (measured by the rate of change in the price index for personal consumption expenditures minus the price index for personal consumption expenditures less food and energy).

<sup>3</sup> Results are similar when the rate of change in relative import prices (measured by the rate of change in the price index for imports minus the price index for GDP) is included as an additional supply shock variable. Other measures of inflation, such as the rate of change in the GDP price index also provide comparable estimates of shifts in the NAIRU over time.

<sup>4</sup> Gordon (1997) likewise estimates that the NAIRU has declined during the 1990s to levels that prevailed during the 1960s. He also finds an upward drift during the late 1980s, similar to the results shown in line 3 of Table 1.

<sup>5</sup> In line with the qualitative evidence presented in the text, econometric tests showed that neither demographic shifts nor unexpected changes in productivity growth can account for the apparent recent decline in the NAIRU, although both factors together account quite well for the shift upward in the NAIRU during the 1970s and early 1980s. Details available from the author upon request.

<sup>6</sup> The periods were chosen depending on whether unemployment was rising or falling on an annual basis.

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<sup>7</sup> Econometric tests indicate that the dispersion of state unemployment rates is a statistically significant variable in Phillips curve regressions, with a lower degree of dispersion associated with lower inflation at any given unemployment rate. The significance of the dispersion of unemployment as a variable in Phillips curve regressions was identified by Archibald (1969), but seems to have been ignored during the subsequent three decades.

## References

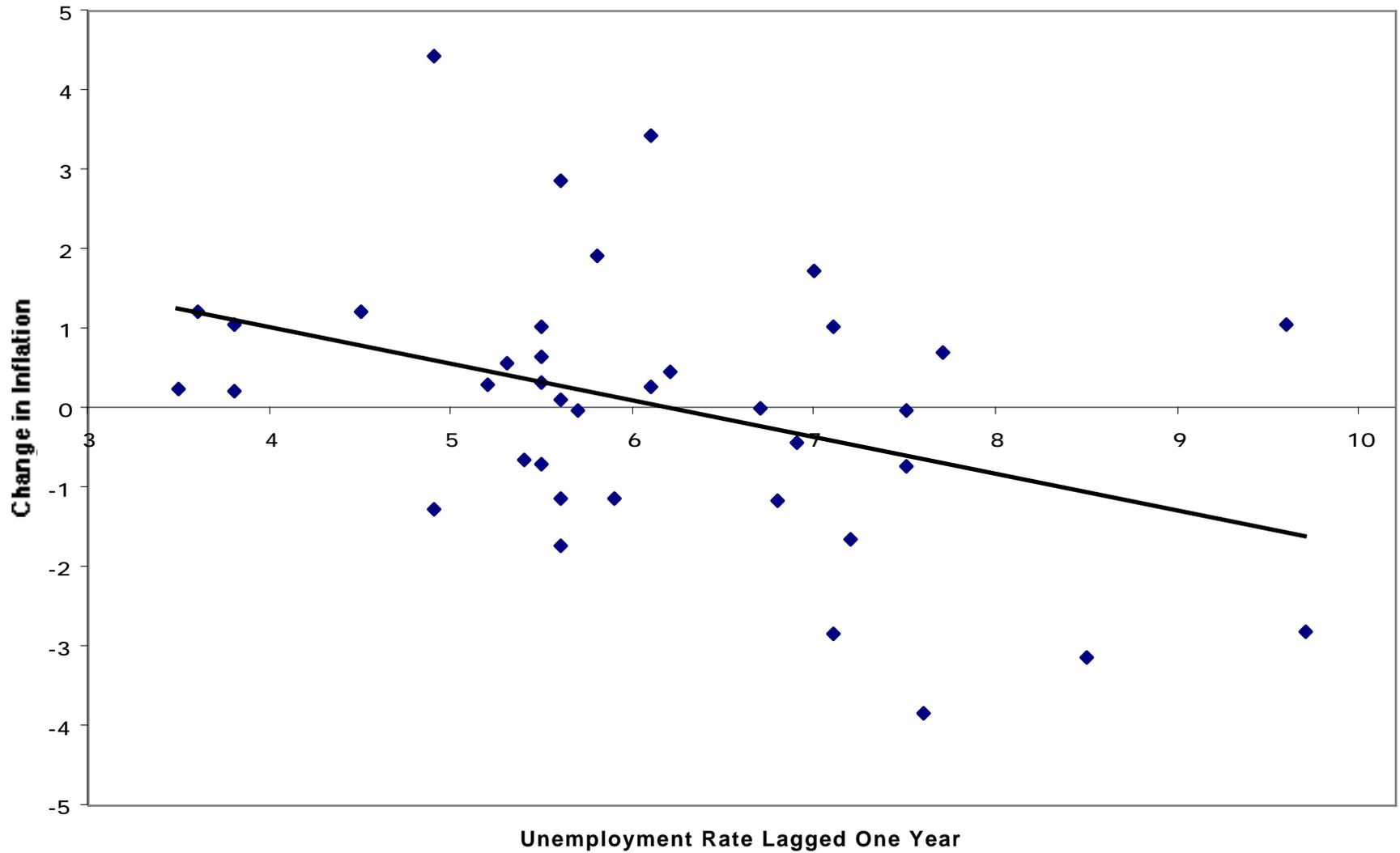
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**Table 1**  
**Estimates of the NAIRU**  
**Various Time Periods, 1960-1997**

<b>1.</b>	<b>Time Period:</b>	<u>1960-72</u>	<u>1973-97*</u>		
	<b>NAIRU:</b>	5.3	6.4		
<b>2.</b>	<b>Time Period:</b>	<u>1960-72</u>	<u>1973-85*</u>	<u>1986-97*</u>	
	<b>NAIRU:</b>	5.3	6.5	6.4	
<b>3.</b>	<b>Time Period:</b>	<u>1960-72</u>	<u>1973-85*</u>	<u>1986-92*</u>	<u>1993-97</u>
	<b>NAIRU:</b>	5.3	6.5	6.9	5.7
<b>4.</b>	<b>Time Period:</b>	<u>1960-72</u>	<u>1973-92*</u>	<u>1993-97</u>	
	<b>NAIRU:</b>	5.3	6.7	5.7	
<b>5.</b>	<b>Time Period:</b>	<u>1960-72 &amp; 1993-97</u>	<u>1973-92*</u>		
	<b>NAIRU:</b>	5.4	6.8		

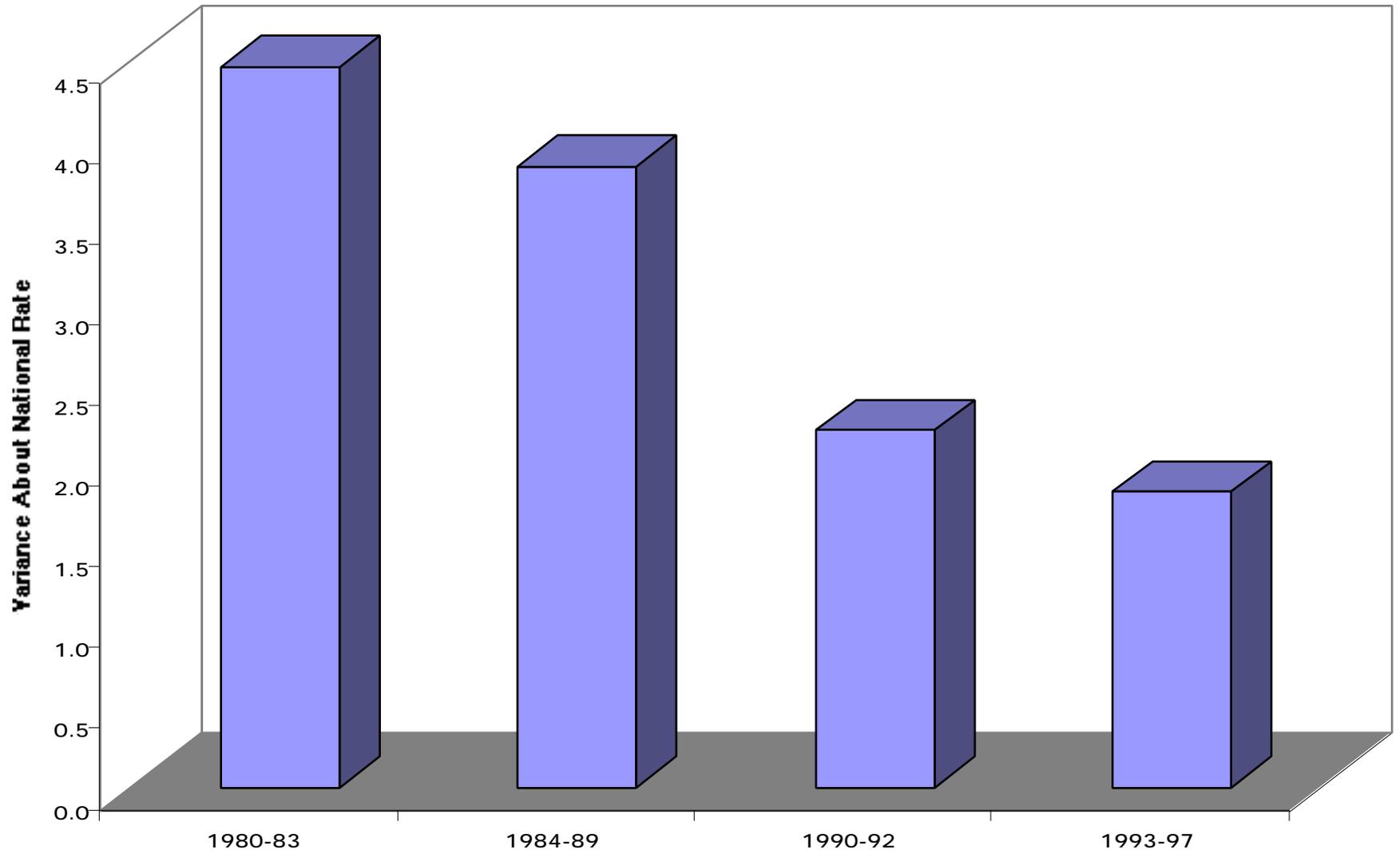
Note: The “\*” denotes time period is statistically different from time period reported in first column. All estimates are computed from a standard Phillips curve with controls for changes in the relative price of food and energy. Statistical significance is for the intercept term of the Phillips curve equation. Data are annual, from 1960 to 1997. See text for details.

### Annual Change in CPI Inflation versus Unemployment Rate, 1960-97



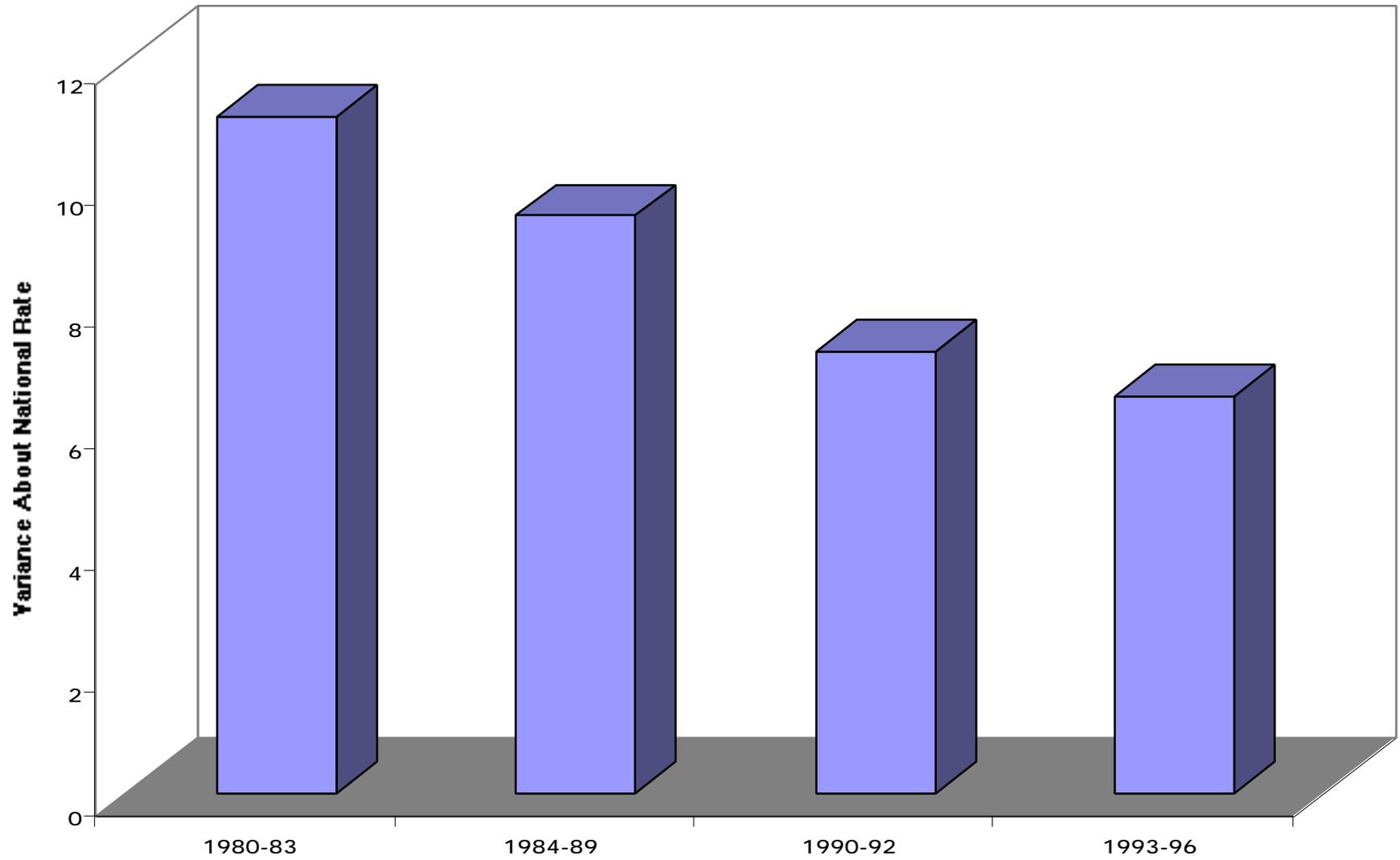
Source: Bureau of Economic Analysis and author's calculations.

## Dispersion of State Unemployment Rates



Source: Bureau of Economic Analysis and author's calculations.

## Dispersion of State Growth Rates



Source: Bureau of Economic Analysis and author's calculations.