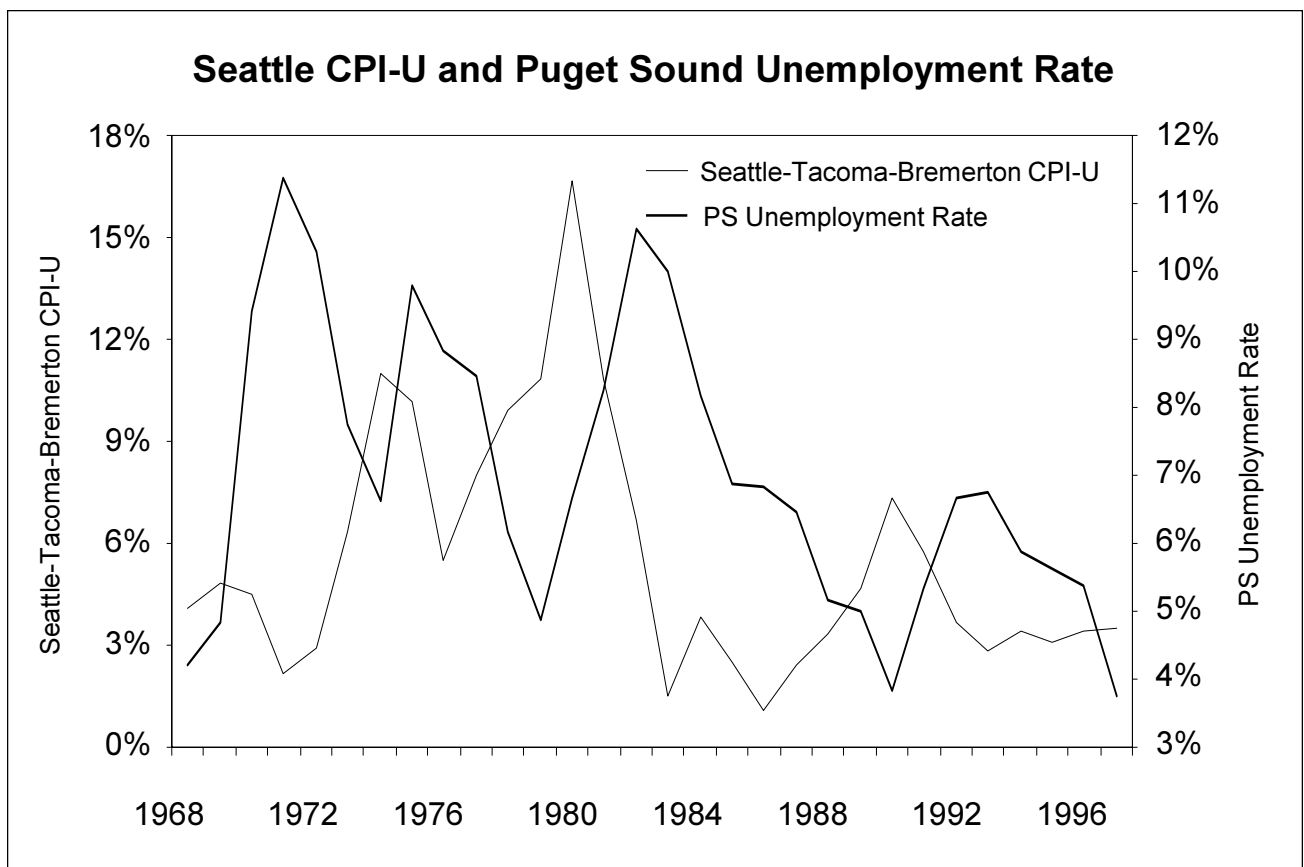

Studies in Industry and Employment

The Unemployment-Inflation Relationship



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Executive Summary

- The non-accelerating inflation rate of unemployment (NAIRU) is an economic concept describing the unemployment rate that produces a stable rate of inflation. As such, it theoretically represents a means of predicting inflation by tracking unemployment rates.
- The NAIRU is measured or tracked by means of two readily available data series—the Consumer Price Index (CPI) and unemployment rates. The ready availability of the data is considered one of the driving factors for using the NAIRU as a policy tool.
- The CPI is available for the Seattle-Tacoma-Bremerton area and for small metropolitan and non-metropolitan areas in the western U.S.—as are unemployment rates—which means that a NAIRU can technically be generated for sub-state areas in Washington.
- The Employment Cost Index (ECI) measures the change over time in the cost of labor and may be an alternative to the CPI since the Phillips curve actually reflects the relationship between wage (not price) inflation and unemployment rates. Established in 1982, the ECI did not exist when the NAIRU theory was established.
- Because of its solid performance in years past, the NAIRU has been used by the Federal Reserve Board, including Chairman Alan Greenspan, to guide monetary policy and inflation forecasts.
- The reliability and effectiveness of the NAIRU as a policy tool was seriously questioned in the 1970s, first when it failed to account for the supply shock caused by the OPEC oil embargo and then after it failed to predict the high unemployment, high inflation environment known as *stagflation*. Though the NAIRU has its fair share of skeptics, even they acknowledge the scarcity of reliable alternatives.
- More recently, inflation has remained in check despite historically low unemployment rates even though the NAIRU would have predicted an increase in the former after the latter fell to 6 percent and certainly after it fell below 5 percent.
- Among the numerous variables thought to affect the NAIRU—and which may account for its recent poor tracking—are labor force changes, job insecurity and restructuring, economic growth, changes in productivity, global competition, changes in educational attainment, government programs, duration of unemployment, and regional economic integration.
- Researchers are developing more sophisticated NAIRU models that incorporate a wide range of variables rather than simply unemployment and inflation. That these variables also affect unemployment and inflation may explain why the latter was able to track well for as long as it did.
- A reliable and predictable NAIRU at the regional level would have application for the local financial community and borrowers, labor and management in contract negotiations, business and consumers in purchasing decisions and for labor market policy including WorkFirst.
- The simplicity with which the NAIRU depicts the unemployment-inflation relationship, while critical to its appeal, may have also caused its demise as economies became increasingly complex.

Introduction

With the national economy (and most state and regional economies) experiencing a relatively unusual combination of low unemployment *and* low inflation, economy watchers have been refocusing their attention on a concept known as the *non-accelerating inflation rate of unemployment* or *NAIRU*. The interest, to be sure, is not purely academic (though there is a significant body of academic literature on the subject). From a public policy perspective, the NAIRU has long served as an important indicator for monetary policymakers to determine whether or not inflation was imminent to a degree that would warrant raising interest rates. From the mid-1950s through the late 1960s, the NAIRU proved equal to the task. Since the 1970s, however, the NAIRU, in the words of economist Arthur Okun, “has been an unidentified flying object and has eluded all econometric efforts to nail it down.” (Espinoza-Vega 1997) It was commonly held, for example, that the NAIRU was in the 6.0 percent to 6.5 percent range. However, the absence of inflation as unemployment rates descended through that range has researchers speculating that the NAIRU may actually be in the 5.0 percent to 5.5 percent range—if not lower. Given this uncertainty, the debate once again rages over whether or not it should be used as a guideline in setting national monetary policy.

The goal of this study is fourfold. It will describe (1) the relationship between unemployment and inflation—namely in the context of the NAIRU, (2) the NAIRU’s use and effectiveness as a monetary policy and forecasting tool, (3) reasons why the NAIRU may be shifting, and (4) the NAIRU’s usefulness at the sub-state level at tracking inflation, and possibly its usefulness as a forecasting tool, using the Puget Sound region as an example.

An Applicable Theory

For years, the great attraction of the NAIRU was the translatability of the theory into practice. Nationally, for example, economy watchers, notably the Federal Reserve, could anticipate an increase in inflation if there was steady decline in the national unemployment rate or vice versa. Regionally, economy watchers witnessing progressively lower unemployment rates in

the Seattle-Tacoma-Bremerton CMSA could anticipate a subsequent rise in the region’s rate of inflation or vice versa. The connection between theory and application was a claim few theories could make, at least not without adding the perfunctory *ceteris parabis*. Indeed, the theory became a kind of mantra that even non-economists accepted—tight labor markets lead to wage and price pressures—though few could cite the NAIRU as the theoretical basis of the phenomenon. That was then. Today, the NAIRU is widely believed to be askew. Though clearly the case nationally, it is perhaps even more obvious in high-flying regions like the Seattle-Tacoma-Bremerton CMSA. This is important because the NAIRU was once the principal tool used in setting federal monetary policy. Few, if any, of the other tools available to policymakers inspired much confidence. As such, it is important to understand why the NAIRU has come unhinged. First, however, it is necessary to establish the framework for this discussion by providing some key definitions.

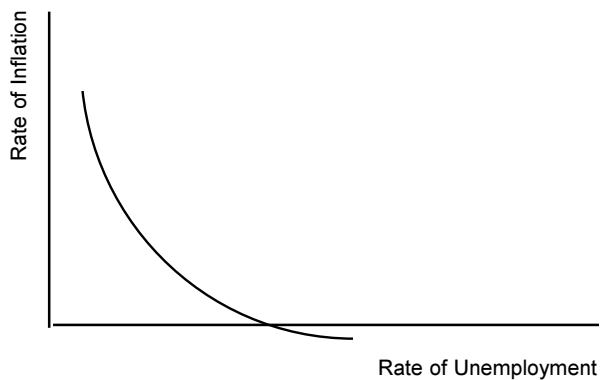
What is NAIRU?

Simply stated, the non-accelerating inflation rate of unemployment (NAIRU) is an economic concept describing the unemployment rate that produces a stable rate of inflation. By definition, any jobless rate above the NAIRU will cause inflation to fall while any jobless rate below the NAIRU will cause inflation to rise.

To understand the NAIRU, one must first understand an economic concept known as the *Phillips curve*. The Phillips curve depicts an inverse relationship between unemployment rates and inflation as a downward sloping curve with aggregate demand and aggregate supply determining unemployment rate levels (*see Figure 1*). If either or both increase, unemployment rates will decrease, causing inflation to increase as tight labor markets exert wage pressure (a concept known as *cost push*). If either or both decrease, unemployment rates will increase, causing inflation to decrease. The Phillips curve is the foundation upon which the NAIRU was built.

The NAIRU arose from attempts to reconcile the differences between the Keynesian and monetarist schools over what caused price changes and how those changes were related to unemployment and inflation. It

Figure 1
Phillips Curve



got a big boost in 1960 when American economists Paul Samuelson and Robert Solow showed that changes in wages were related to inflation. This reshaped the wage-unemployment relationship discovered by British economist A.W. Phillips into an inverse relationship between inflation and unemployment that became known as the Phillips curve.

Critical to the NAIRU concept is the assumption that the Phillips Curve is downward sloping. In reality, no one truly knows in what direction it slopes. Indeed, there is considerable debate as to whether that is actually the case. Keynesians, for example, believe the slope is downward while monetarists believe the “curve” is vertical. The prevailing school of thought, however, posits that since inflation and unemployment are driven primarily by aggregate demand, their relationship would in all likelihood be negatively correlated and, therefore, represented by a downward sloping curve.

How is NAIRU Measured?

The NAIRU is measured using two readily available data series—the Consumer Price Index (CPI) and unemployment rates. In addition to being generated on a regular basis, a further plus is that both are recognized as key economic indicators.

Consumer Price Index. The CPI is produced monthly by the U.S. Department of Labor, Bureau of Labor Statistics (BLS). It represents changes in prices of all goods and services purchased for consumption by urban households (also known as a *market basket*).

User fees (such as water and sewer service) and sales and excise taxes paid by the consumer are also included. Income taxes and investment items (like stocks, bonds, and life insurance) are not included. The CPI-U (all urban consumers) includes expenditures by urban wage earners and clerical workers, professional, managerial, and technical workers, the self-employed, short-term workers, the unemployed, retirees, and others not in the labor force. The CPI-W (Urban Wage Earners and Clerical Workers) includes only expenditures by those in hourly wage earning or clerical jobs. Prices for the goods and services used to calculate the CPI are collected in 87 urban areas across the nation and from about 23,000 retail and service establishments. Data on rents are collected from about 50,000 landlords or tenants. The weight for an item is derived from reported expenditures on that item as estimated by the Consumer Expenditure Survey.

At the regional level, it gets a little trickier since not all areas have their own CPI. There is no state CPI, for example. As such, there is no statewide measure of inflation despite the fact that there is a state unemployment rate. At the sub-state level, the *Seattle-Tacoma-Bremerton CPI* (more commonly referred to as the *Seattle CPI*) is the only region in Washington that is specifically assigned a CPI and it is generated bimonthly by BLS (though Clark County is part of the Portland-Salem OR-WA CPI). The Seattle CPI encompasses a number of Washington counties—Island, King, Kitsap, Pierce, Snohomish, and Thurston. This is effectively the CPI for the Puget Sound region. While the state’s smaller regions or counties are not specifically assigned CPIs, the series does have an index for western areas delineated by population size. The categories are as follows: Size A = 1,500,000 or more, Size B/C = 50,000-1,499,999, Size D = Non-metropolitan (less than 50,000). One-fourth of Washington’s 39 counties currently meet Class A requirements, another fourth fall within Class B/C, and about half fall within Class D.

To be sure, the CPI is not the only way to measure inflation. There is the *Producer Price Index* (PPI), a BLS product that measures the average change in selling prices received by domestic producers of goods and services. The PPI shortcoming, however, is that unlike the CPI it reflects price changes from the perspective of

the seller rather than the buyer. It is considerably more difficult to gauge possible wage inflation from the seller's perspective. The *Employment Cost Index* (ECI) is perhaps a more appropriate alternative. Also generated by BLS, the ECI measures the change over time in the cost of labor. The cost of labor includes wages and salaries and employer costs for employee benefits. Interestingly, the Phillips curve is actually supposed to reflect the relationship between wage (not price) inflation and unemployment rates and, ironically, the CPI was used as a proxy for wage inflation on the assumption that price pressure leads to wage pressure. Why wasn't the ECI used in the first place? The principal reason is that it is a relatively new indicator (started in 1982) which did not exist when the NAIRU theory was being established. It is also only available at the national and regional (e.g., western region) levels, though that is a minor shortcoming. The ECI will establish a solid historical series over time, which will enable researchers to determine if it is a more effective alternative than the CPI in tracking the NAIRU. For the time being, however, it might be best used as a control for the broader inflation measure like the CPI.

Two additional surveys worth noting are the *Consumer Expenditure Survey* (also from BLS), which provides information on the buying habits of American consumers, including their expenditures, income, and demographic characteristics, and the American Chamber of Commerce Research Association's *Cost of Living* survey which tracks price information for an established basket of goods on a quarterly basis.

Unemployment Rates. The unemployment rate is also measured by the U.S. Department of Labor, Bureau of Labor Statistics. Each month, statistics on the employment and unemployment status of the population and related data are compiled by BLS using data from the Current Population Survey (CPS). This monthly survey of households is conducted for BLS by the Bureau of the Census through a scientifically selected sample designed to represent the civilian noninstitutional population. Respondents are interviewed to obtain information about the employment status of each member of the household 16 years of age and older. There are about

60,000 households in the survey sample, which is meant to be representative of the entire population of the U.S. (the 60,000 households represent about 1 bin every 1,600 households in the U.S.). Unemployment rates are available at the national, state, and county levels.

According to BLS, *unemployed persons* are all persons who had no employment during the reference week, were available for work, except for temporary illness, and had made specific efforts to find employment some time during the 4-week period ending with the reference week. Persons who were waiting to be recalled to a job from which they had been laid off need not have been looking for work to be classified as unemployed. Actively looking for work includes: having a job interview or contacting an employer directly; having a job interview; contacting a public or private employment agency; contacting friends or relatives; contacting a school or university employment center; sending out resumes or filling out applications; placing or answering advertisements; checking union or professional registers; or some other means of active job search.

At the regional level, an unemployment rate is calculated for the five counties constituting the Puget Sound region using employment and unemployment data from the state Employment Security Department.

The measurement variables for the NAIRU having been discussed, here is how the unemployment-inflation relationships look on paper for both the U.S. and Puget Sound region (*see Figures 2 and 3*).

It is clear from *Figure 3* that there is indeed an inverse relationship between the change in inflation and the change in unemployment rates in the Puget Sound region. In fact, the relationship is arguably more visible at the regional level than it is at the national level. The national level relationship displays a clear lag—something that is not as evident at the regional level. This is probably due to the fact that price changes surface more immediately at the regional level, while at the national level they are an aggregation of price changes across many regions.

Figure 2
 Unemployment Rate and CPI-U
 United States, 1947-1997
 Source: Bureau of Labor Statistics

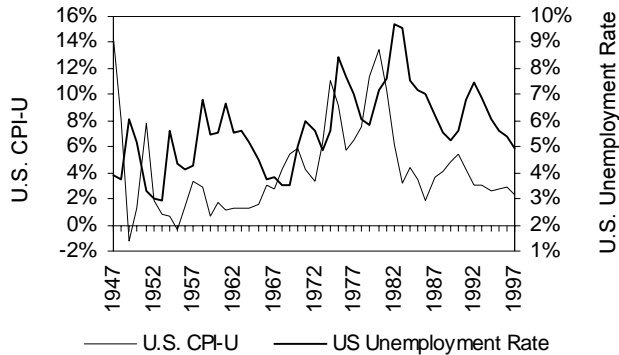
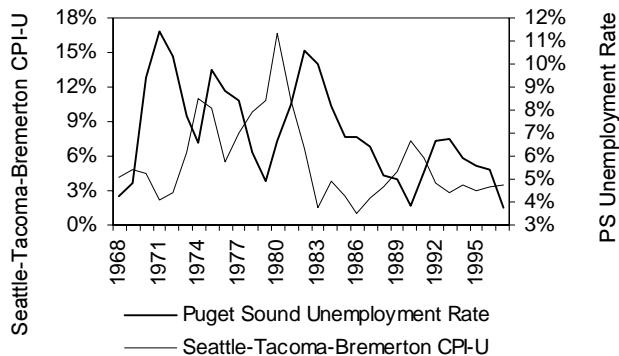


Figure 3
 Seattle/Tacoma/Bremerton CPI/Puget Sound Unemp. Rate
 Washington State, 1968-1997
 Source: Bureau of Labor Statistics & Employment Security



Why is NAIRU Important?

The NAIRU is important chiefly because it may be able to forecast inflation. Inflation is regarded as a “hidden” tax on the public because of the way it erodes purchasing power. Put another way, in an inflationary environment, the dollar one has today will not purchase the same amount of goods or services as it did yesterday. The Federal Reserve Board figures prominently in this discussion because it sets monetary policy (controls the nation’s money supply) with the aim of either stimulating or dampening the economy’s aggregate demand (the total demand for all goods and services). These Fed actions ultimately influence both employment/unemployment and inflation. To the extent that the Phillips

curve displays an inverse relationship between unemployment and inflation, proponents argue that (pinpointing) the NAIRU enables one to pursue a trade-off between the unemployment rate and inflation. (Espinoza-Vega and Russell 1997)

Inflation does not operate in real time. By the time inflation actually begins to rise, inflationary pressures may have been building for a year or two. Compounding the situation, lags in monetary policy are problematic because a policy action taken today may not affect inflation for a year or two. Viewed against this backdrop, it would appear futile to base policy actions on current rates of inflation. It is for this reason that the NAIRU has received so much attention. Any tool that can generate accurate inflation forecasts would be crucial in formulating monetary policy. Inasmuch as the Phillips curve implies that demand-induced changes in inflation tend to lag behind movements in the unemployment rate, a tool that enables policymakers to compare the actual unemployment rate to the NAIRU may be helpful in forecasting inflation.

Adding to the appeal of the NAIRU as a policy tool is the fact that traditional monetary models and variable regression analysis models currently used in policymaking have not shown themselves to be clearly superior alternatives to NAIRU models. This explains the continued use of NAIRU models by many policymakers, despite its recognized shortcomings.

At a more theoretical level, Samuelson and Solow believed that the Phillips curve was a useful tool for understanding and analyzing the behavior of wages vis-a-vis the level of employment. They believed that under certain conditions, movements along the Phillips curve resembled standard demand-pull forces while shifts of the Phillips curve represented the cost-push forces. (Espinoza-Vega and Russell 1997)

Additionally, the NAIRU is more broadly felt to represent a natural “speed limit” for economic activity (in the sense that it might measure sustainable production capacity). Why? As economists David Altig and Paul Gomme (1998) explain, the NAIRU’s point of equilibrium identifies that point at which the labor supply is maximized. Any attempt to wring additional capacity carries inflationary consequences, which is very ineffi-

cient. At that point, additional economic growth needs to come from the supply side changes as opposed to demand side changes.

Clearly, a predictable and reliable NAIRU would be critical in national monetary policymaking and long range economic forecasting and planning. At the regional level, a predictable and reliable NAIRU would have a number of applications. It could provide the financial community with a regional indicator to assist the decision making process for long-term loans. It could provide labor and management with a reliable gauge of regional wage and price trends in contract negotiations. It could provide businesses and consumers alike with an inflation-related early warning system to help in making purchasing decisions. Retrospectively, it could provide valuable insight into unemployment-inflation relationships that might be used in forecasting.

NAIRU is Not the Natural Rate

While the natural rate of unemployment and the NAIRU are often viewed as one and the same, they are, in fact, two separate and distinct concepts. The natural rate theory was developed by American economists Milton Friedman and Edmund Phelps in 1968 as a response to the NAIRU. Friedman and Phelps conceded that the NAIRU offered an unemployment-inflation trade off in the short run. They did not, however, believe that the trade off held over the long run. Over the long run, they argued, unemployment would respond to fundamental shifts in labor market demand and supply, constantly seeking an equilibrium value or natural rate of unemployment. This would ultimately reflect the economy's sustainable unemployment rate when wages and prices had time to adjust to demand and supply factors. Those factors would be reflected in the dynamic process of job creation and destruction, job market search, and a suitable matching of employers and employees. What's more, the natural rate is an equilibrium value whereas the NAIRU is a fixed empirical value. Furthermore, the NAIRU posits that low unemployment causes inflation to increase regardless of what caused that low unemployment and regardless of monetary policy, a position counter to that of the natural rate theory. (Chang 1997, Walsh 1998, Altig and Gomme 1998)

Having outlined the difference between the NAIRU and the natural rate, it should be noted that there is in fact a point at which the two are synonymous. That is where the NAIRU-based unemployment rate mirrors the sustainable unemployment rate that defines the natural rate's equilibrium value. However, since the NAIRU is so difficult to estimate, it is almost impossible to know at which point it matches the natural rate's equilibrium value.

Is NAIRU an Effective and Reliable Policy Tool?

If based solely on the body of NAIRU-related research, the answer is *no*. Nevertheless, in exploring this question, it is important to note that the NAIRU has, in fact, been used by economic policymakers (including members of the Federal Reserve Board of Governors and its chairman, Alan Greenspan) to debate and craft monetary policy. This is because in the not too distant past, the answer was *yes*. Back then, the reason was clear. For the better part of 15 years ending in the late 1960s, U.S. inflation and unemployment lined up predictably along a stable Phillips curve. In the 1970s, however, major supply shocks—most notably the OPEC oil embargo and resulting oil price increases—were injected into the economic mix. Against this backdrop, the NAIRU performed terribly. In fact, the resulting high unemployment, high inflation environment (generally referred to as *stagflation*) stood the NAIRU on its head and caused Keynesian-based forecasts to produce huge errors. This event, more than any other, caused the NAIRU to be discredited in the minds of many economists.

The NAIRU's shortcomings became readily clear. It had been developed during a time when demand shocks were believed to be responsible for virtually every economic shift. Supply shocks were simply not taken into account. The reality, it turned out, was that the economy could also be affected by supply shocks or unexpected changes in the aggregate supply of goods and services. Needless to say, these events changed the way most macroeconomists viewed supply shocks and their importance in explaining economic fluctuations. Ultimately, it was relatively easy to find examples of aggregate supply shocks that helped explain why unemployment remained low without causing acceleration in inflation.

With the NAIRU's poor performance during the 1970s and early 1980s still fresh in the minds of advocates and critics alike, a gap once again has emerged in defiance of widely published NAIRU estimates. Over the past several years, for example, the U.S. unemployment rate has been quite low—lower than many widely publicized NAIRU estimates—and yet the inflation rate has shown no signs of increasing or accelerating in the way the NAIRU theory predicts. This trail of events has led some observers to suggest that a supply shock is once again affecting the U.S. economy. Chief among the factors being singled out for causing the current NAIRU gap is a presumed surge in productivity due to information technology. There is wide-ranging debate as to whether information technology has in fact translated into significant productivity gains and, by extension, driven supply side forces. However, the possibility of a supply shock, whatever its form, cannot be dismissed.

Monetarist Response. Monetarist critics of the NAIRU argue that it cannot serve as an effective policy tool because the trade-off between inflation and unemployment is only temporary and cannot be permanently achieved through monetary policies. This was a direct challenge to the effectiveness of (Keynesian) demand management. Within the framework of monetarist theory, the Phillips curve is quite steep over the long term, meaning that demand management would likely produce significant inflation without lowering unemployment. This is essentially a reassertion of the Friedman-Phelps theory on the natural rate of unemployment. As such, monetarists dismiss the NAIRU outright, arguing that inflation is determined by monetary policy and that it is not affected by unemployment rates.

Does this mean that the concept of the NAIRU is invalid and that it should be discarded? No, not necessarily. Numerous analyses confirmed that the NAIRU was statistically significant—that it is a valid concept. The supply shocks of the 1970s revealed that shifts in the NAIRU were too narrowly ascribed to aggregate demand. Additional research is currently ongoing to develop more sophisticated NAIRU models that incorporate an ever-increasing array of variables, particularly those reflecting aggregate supply.

Keynesian Response. Keynesians believe that the Phillips curve is relatively flat, particularly at high unemployment rates. Given this slope of the curve within the framework of Keynesian theory, it follows that when unemployment is high, the unemployment rate can be lowered with little risk of increasing inflation.

Of course, given the recent track record, even Keynesian economists concede that no matter how statistically significant it may be, the NAIRU's range of error (estimated at one to two percentage points) is equally significant. Moreover, that range of uncertainty appears to be widening. As such, the range of uncertainty about the actual location of the NAIRU is too large for the concept to be effectively applied in monetary policy decisions where quarter-point and half-point increments are trigger points for moving the economy. Furthermore, the estimated NAIRU seems to move around, increasing uncertainty about its location and raising questions about the statistical assumptions that have to hold to estimate it.

Even if supply side variables were fully incorporated into a NAIRU model, there may still be a compelling argument for not using NAIRU estimates to predict inflation. According to economist Roberto Chang (1997), most econometric models treat inflation and unemployment as endogenous outcomes that are triggered by responses to a constant barrage of more basic and random forces or shocks. In this environment, inflation and unemployment will move in opposite directions in response to some shocks and in the same direction in response to others. As such, declines in unemployment will trigger increasing inflation in some cases but decreasing inflation in others. This uncertainty would seem to preclude the use of the NAIRU as a predictable and stable forecast tool.

Neoclassical Response. There is another compelling argument against using the NAIRU for forecast purposes. Again, despite the questionable reliability of the NAIRU as a monetary policy tool, some argue that even if the NAIRU were accurate and predictable, it should not be used for such ends. For example, American economist Robert Lucas, whose theory of rational expectations is the foundation of the *neoclassical* school of economics, argued that changes in monetary policy had no effect on employment and that the labor market did not factor

into the means by which a monetary expansion produced inflation. Therefore, he saw no reason for the government to focus on unemployment rates or wage changes as guides for monetary policy. His *policy ineffectiveness* position remains a fundamental tenet of the neoclassical school.

Nevertheless, many economists continue to believe that monetary policy has real effects on employment patterns. Moreover, there is a significant amount of empirical evidence to support that position. In fact, it is Lucas' own theory of rational expectations that these economists cite as the driving force behind the impacts of monetary policy. Their counter-argument to Lucas is this: if people knew that every time the unemployment rate moved above or below an established NAIRU, economic policymakers would increase or decrease the money supply, respectively, such predictable actions would induce changes in people's expectations and behavior, a point made forcefully by Lucas. In other words, even if a short-term NAIRU existed, it would be impossible for the government to exploit it because people would respond to its demand-management policy in ways that would undercut the objectives of that policy and possibly interfere with the proper functioning of the price system. Alternatively, it would be possible that by its pronouncements, the Fed might manage to "talk" the economy down an equilibrium path of disinflation, which would lower the NAIRU but not the natural rate of unemployment. Simply put, any reasonable set of monetary policy guidelines must be multidimensional in nature so as not to create the situation described above. (Espinoza-Vega and Russell 1997, Walsh 1998, Chang 1997, Phelps and Zoega 1997)

For these and other reasons, while the concept of a NAIRU is cited regularly in the press and media and among economic policymakers, it no longer carries much weight with academic economists. These same reservations predictably carry over into discussions regarding the NAIRU's effectiveness as a forecast tool.

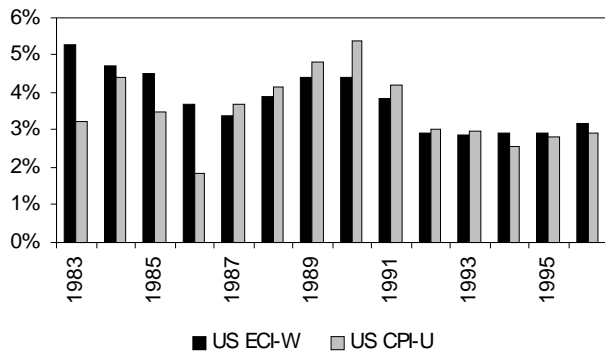
And yet... Despite its rejection by academic economists, the NAIRU, as pointed out, retains a certain cachet among economic policymakers. Why? As Murphy (1998) points out, a scatterplot of the relationship between the unemployment rate and the change in inflation using data from 1960-97 clearly show a negatively sloped line that emerges as statisti-

cally significant under the burden of standard hypothesis testing. As can be seen, however, the relatively large errors about the regression line imply that pinning down a precise estimate of the NAIRU is difficult. As a result, while not discarded, its application is regarded as limited.

While there has yet to be proven an undisputed relationship between unemployment and inflation, many policymakers continue to believe that the NAIRU can play a role in the conduct of short-term monetary policy. Indeed, until a clearly superior model for forecasting future inflation comes along, the NAIRU is likely to continue to figure prominently in discussions of monetary policy based, if for no other reason, on its past track record. That is why Fed Chairman Alan Greenspan and others remain reluctant to abandon it (though certainly none have relied on it exclusively). Said respected econometrician and Fed Governor Laurence Meyers, "I am a strong and unapologetic proponent of the Phillips curve and the NAIRU concept." (Cooper 1997) Economic policymakers reason that by applying the NAIRU exclusively to short term actions, they can avoid the long-term trap of rational expectations.

Yet another issue with respect to the Phillips curve—one identified by Espinoza-Vega and Russell (1997)—is that it is technically suppose to measure *wage* inflation, though it has been used to explain *price* inflation. Because wages represent the largest component of a business' costs, however, most economists are willing to assume that wage increases will eventually force businesses to begin increasing prices, thus producing price inflation. Toward that end, what has been the relationship between wage inflation and price inflation? To answer this question, the annual change in the *U.S. Consumer Price Index-All Urban Consumers* was compared to that for the *U.S. Employment Cost Index-Wages* over the 1983-96 period. The data show a mixed pattern: wage inflation outpacing price inflation from the early to mid-1980s followed by the reverse during the late 1980s and early 1990s, and wage inflation has been slightly higher than price inflation in the past several years (see *Figure 4 on the next page*). This would seem to suggest that wage inflation is not necessarily a predictor of price inflation. Could the application of this long-held theory which is not supported by the data have

Figure 4
 CPI-U and ECI-W
 United States, 1983-1996
 Source: Bureau of Labor Statistics



led researchers to believe that the NAIRU would be higher than it currently is? No. If anything, the current situation would have to be reversed; that is, price inflation would have to be higher than wage inflation for researchers to be “misled” into thinking the NAIRU was higher than it is.

Variables Affecting the NAIRU

As noted, if there was an indisputable relationship between unemployment and inflation, the latter could be predicted accurately. In reality, however, numerous variables affect the NAIRU. Indeed, there is a growing body of evidence that it is not unemployment and inflation that determine the NAIRU; but, rather, an aggregation of variables that also happen to affect unemployment and inflation. According to this newer school of thought, assessing inflation solely by the movement of the unemployment rate above or below the NAIRU ignores the degree to which it can be influenced by other variables (shocks) that can and have been identified, isolated, and measured. It stands to reason, then, that inflation predictions should be based, if possible, on an assessment of these variables rather than on unemployment alone. There is a precedent for this. Economist Robert Gordon was reportedly able to explain virtually all of the upward shift in the NAIRU during the 1970s after accounting for supply shocks, productivity slowdowns, and shifts toward a less experienced work force. (Murphy 1998, Chang 1997)

A number of research economists have studied the wayward drift of the NAIRU since the 1970s and suggest that it may be attributed to a combination of the following variables:

Labor Force Shifts. Since the NAIRU is principally driven by the supply and demand for labor, it stands to reason that changes in the labor force would be a key variable given their direct link to unemployment (to which the NAIRU is pegged). Changes in the labor force, which have a positive statistically significant relationship to the NAIRU, represent supply shocks. The effect of labor force changes on the NAIRU first emerged during the late 1960s and early 1970s when the baby boom generation and an increasing number of women entered the work force and caused the NAIRU to rise. As the boomers aged, however, the NAIRU started to fall, reflecting the fact that older workers tend to have more work experience and, by extension, lower rates of unemployment. However, as the pre-war generation began retiring and was replaced by younger, less experienced workers, the NAIRU subsequently rose.

Robert Murphy (1998) argued that the shift toward a less experienced work force was able to explain the earlier rise in the NAIRU. An ongoing reversal of that trend with the share of middle-aged workers climbing again while that of younger workers falls, however, does not adequately explain the timing of the apparent decline in the NAIRU during the 1990s because the shift in age structure was well underway by the late 1980s.

Not all researchers agree. Though the entry of the baby boom generation into the labor force and a changing share of teens among the unemployed are believed to have caused the NAIRU to rise in the 1970s and fall in the 1990s, Phelps and Zoega (1997) argue that the boomers never raise the unemployment rate by more than 27 basis points and teenagers never lower it by more than 20 basis points. They argue, in other words, that there must be some additional variable at work.

A similar conundrum has research economists baffled here in the 1990s as the rate of decline in the NAIRU appears to be accelerating. The pattern of slower labor force growth that has characterized the 1990s and which is expected to continue into the new

millennium was expected to push the NAIRU down, but not to this extent.

Again, slower labor force growth as Baby Boom generation exits and is followed by the Baby Bust generation may account for some of the decline in the NAIRU, though that is widely debated. More importantly, few believe that this demographic trend qualifies as a significant labor supply shock. However, if the aforementioned demographic shift is compounded by inadequate replacement due to the tremendous net number of jobs created by the Baby Boom generation, a significant labor supply shock might indeed be the result. At the state and regional levels, the same situation would apply with the addition of a net migration factor (as opposed to an immigration factor nationally).

Take, for example, the demographic situation in Washington in 1999 to illustrate the previous point (see *Figure 5*). As it currently stands, the Baby Boom generation (35-53 year olds) is in its prime earning years and numbers nearly 1.73 million. Add to that the just over half a million Pre-War generation (54+ years old) and you have 2.3 million individuals. By contrast, the Baby Bust generation (23-34 year olds) that follows it numbers less than 923,000. There is some longer term relief in the form of the Baby Boomlet generation (4-22 year olds), the front end of whose 1.6 million members represent current new entrants into the labor force. Coupled with the Baby Busters, this group is 2.5 million strong. However, there were more than 2.6 million nonfarm jobs in Washington in 1998 alone and the number is rising. These data already take into account migration. Therefore, without additional sources of labor, the current labor supply shortage will only intensify.

Restructuring/Job Insecurity. Industry restructuring that has resulted in mass layoffs and worker dislocation is believed to be another variable contributing to the lowering of the NAIRU according to Walsh (1998). The impact reveals itself in at least a couple of ways. First, increased worker perceptions of job insecurity—fueled by a combination of global and domestic mergers and acquisitions, corporate outsourcing, and rapid changes in technology—can dampen or moderate demands for wage increases. The practical effect is that wage inflation remains low in the face of declining unemployment

Figure 5
Population by Age
Washington State, 1999 and 2020
Source: Office of Financial Management

Category	Age	1999	Age	2020
Baby Boomlet	4-22	1,599,006	25-43	1,908,217
Baby Bust	23-34	922,545	44-55	1,035,732
Baby Boom	35-53	1,725,399	56-74	2,109,274
Pre-Boom	54+	540,295	75+	---

rates. Second, employee downsizing can lower the NAIRU by reducing workers' propensity to quit and, by extension, the wage pressures employers might otherwise have to accommodate in order to stem employee turnover. The anticipated gain from having a preferred job declines because jobs as a whole are not expected to last as long.

Phelp and Zoega (1997) agree. They argue that the relative absence of wage inflation is no guarantee that unemployment is at the NAIRU. Rather, it may be that the persistent reporting of corporate downsizing and wage concessions to either keep or regain work has spurred those who remain employed to overestimate how much their wage has risen compared to those who have lost their jobs, while inducing those who have lost jobs to underestimate their relative wage loss.

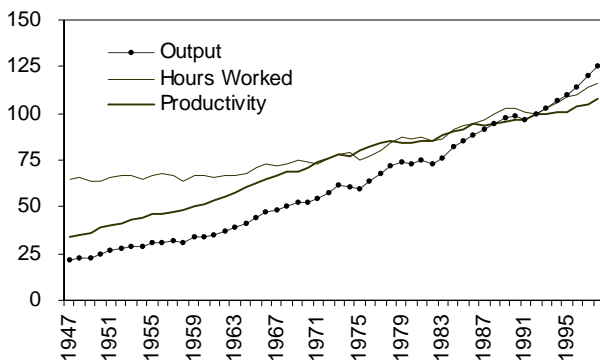
Here in Washington, the record economic expansion of the past decade has not been without its share of foreboding news. Despite record job growth, worker dislocation in the state's aircraft and parts, computer equipment, forest products, shipbuilding, finance, insurance, and nuclear industries has been reported prominently. The extent to which these events have helped to dampen wage pressures in the midst of an otherwise robust economy is difficult to measure. However, the Puget Sound region's exceptionally low unemployment rate and low inflation suggest that its NAIRU may be much lower than expected—possibly in response to the pockets of job insecurity caused by restructuring.

Productivity Shift. Of all the variables presented to explain the observed decline in the NAIRU, perhaps the most common and popular has been *productivity*. As mentioned earlier, economist Robert Gordon was able to identify productivity as a factor in the movement of the

NAIRU and, for the most part, economists agree with his findings. The more controversial issue is whether or not productivity has played a major role in the current NAIRU debate. Proponents of this theory argue that the U.S. economy has entered a new era of technology that has accelerated the rate of productivity growth, which translates into faster growth for the economy as a whole. By their reasoning, this new age has accelerated the substitution of capital for labor and has markedly increased the efficiency of remaining workers—both of which increase productivity. Whether this has, in fact, occurred is the key question. This is also, without question, one of the more controversial debates.

Economist Paul Krugman (1997) is one critic of the new era theory. While he agrees that productivity increases are critical to long-run economic growth, he also points out that U.S. productivity growth has waned at an annual rate of around 1 percent since the early 1970s, well below the nearly 3 percent annual rate of the 1950s and 1960s (see Figures 6 and 7). As for the presumed productivity gains from technology, he argues that however impressive they may *appear* to be, technology has done less for worker productivity than many less “glamorous” innovations of the past and that it carries large hidden costs as well. Altig and Gomme (1998) agree, adding that *new era* proponents’ claims that technical measurement problems are distorting productivity data and obscuring technology gains misses the point altogether. The real point is that technology’s claim to having lifted productivity is debatable.

Figure 6
U.S. Business Productivity (Indexed 1992=100)
1947-1998
Source: Bureau of Labor Statistics

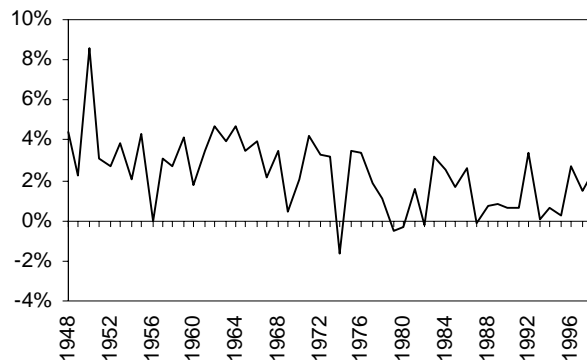


Besides, Krugman argues, most business restructuring does not eliminate jobs anyway. It simply outsources them from larger corporations that pay high wages to smaller subcontractors who often pay less. To the corporation, it may seem as if the same work is being done with far fewer people, but in terms of the economy as a whole, productivity has not increased much, if at all, and current productivity data—when juxtaposed against the long-term historic trend—would appear to support his argument.

Some, like Murphy (1998), maintain that faster productivity growth by itself cannot alter the NAIRU because the latter is determined by the demand for and supply of labor and not productivity changes. In other words, the NAIRU is not responsive to productivity changes. Murphy is correct in stating that productivity growth must somehow change the structure of labor markets and alter the rates of transition into and out of unemployment before it can 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. Altig and Gomme (1998) put it another way, arguing that productivity gains can lower the NAIRU only if those gains fundamentally change the cost-benefit assessment used by unemployed workers when they search for jobs.

Furthermore, according to Murphy (1998), even if productivity rises (causing the NAIRU to fall), the resulting gap between it and wage expectations is only

Figure 7
U.S. Business Productivity (Percent Change)
1947-1998
Source: Bureau of Labor Statistics



temporary and will eventually close. Why? Because workers will invariably perceive that productivity has risen and demand wages commensurate with that increase which, in turn, would close the gap. Alternatively, they may not receive a wage increase commensurate with their increased productivity, in which case they will invariably respond by dragging productivity down to its initial level. Either way, the NAIRU shift is only temporary.

Of course, it is also possible that some workers will fail to recognize that their productivity has risen and consequently understate the wage they can reasonably expect to receive. They will take jobs they really should reject, failing to realize that the cost of remaining unemployed and continuing a job search is less than the benefit of keeping their current job. Again, while possible, this scenario would, in the opinion of Altig and Gomme (1998), require persistent long-term confusion on the part of workers—a situation that is difficult to envision. One possibility, however, is that *fear* (due to restructuring-related job insecurity) rather than confusion is the driving factor and that the former is a lot more prevalent and entrenched than originally thought.

Economic Growth. There is evidence that high or low economic growth influences the NAIRU. The NAIRU's apparent failure to predict the pattern of inflation during the current economic expansion has prompted some prognosticators to proclaim the dawning of a new economic era, one in which "speed limits" have been revoked forever. Not all agree with this viewpoint, however, among them Krugman (1997). He posited that the highest possible growth rate of any economy, once any economic slack was taken up, was equal to the sum of productivity growth and labor force growth. He continued his argument by stating that globalization has not measurably changed the rules about how fast the U.S. economy can grow. Globalization or no globalization, he argued, if the Fed tries to expand the economy faster than the sum of labor force growth and productivity growth, inflation will follow. To tie this back to the NAIRU, it might be argued that the NAIRU has not risen and perhaps even declined in recent times because the Fed has not tried to push economic growth

beyond its limits, thus sustaining a low inflation economy. Inasmuch as forecasts are for even slower labor force and productivity growth—and by extension lower inflation—the NAIRU might be expected to fall even more. In an extension of this theory, Murphy (1998) posits that an appreciating dollar and declining real energy prices have helped maintain stable inflation despite historically low unemployment rates.

Global Competition. Increased global competition and excess global capacity have been held forth to explain the phenomenon that has allowed the U.S. to experience lower unemployment rates without rising inflation or a downward drift in the NAIRU. Moreover, the increasing level of that excess global capacity has led many to conclude that inflation will remain exceptionally low for some time (Walsh 1998, Tootell 1998). Like the productivity variable, this one is also controversial. Geoffrey Tootell (1998) argues that his research shows that global capacity has little if any influence on U.S. inflation beyond that which it would have in domestic capacity utilization. Such a relationship, if it existed, would be obvious in the data when viewed through a Phillips curve model. Tootell, however, found no such relationship. For such a relationship to exist, U.S. import prices would have to be dependent on global capacity, and U.S. import prices would have a strong relationship to U.S. consumer prices, neither of which bears out. What Tootell's research shows is that anyone who believes that global capacity has eclipsed domestic capacity as a determinant of U.S. inflation will find that the data suggest otherwise. This is more or less consistent with Krugman's arguments in the prior section.

Here in Washington, the Puget Sound region has long been synonymous with global trade which, if the theory on global competition and excess global capacity were established, would argue for a lower NAIRU in this region. However, since the evidence appears to be quite weak, any lower than average NAIRU in the Puget Sound region would likely be the result of some other variable(s).

Educational Status. According to Phelps and Zoega (1997), a strong downward trend in U.S. unemployment rates has resulted from a change in the educational

status of the American labor force as evidenced using annual data from 1965-1996 for workers between the ages of 25 and 64. Fewer and fewer individuals are dropping out of high school or stopping their formal education after obtaining a high school diploma. Moreover, educational attainment by one segment of society does not appear to be derived at the expense of another. Inasmuch as higher educational attainment is associated with lower unemployment, the net effect has been to reduce the general unemployment rate and, by extension, the NAIRU. It is further expected that continued exit from the lower rungs of the education ladder will translate into continued decline in the NAIRU. By this reasoning, it is no surprise that the NAIRU may be well below the 6.5 percent estimated during in the mid-1980s. At the opposite end of the spectrum, what little upward trend in unemployment can be discerned (between 1967 and 1989) can largely be attributed to a decline in the relative demand for unskilled labor. This is slowly but surely being offset as prospective workers adjust their skill and training regimens to meet employer demands. The better match between what workers can offer and what employers need has kept the unemployment rate low.

The aforementioned argument is based on Group of Seven (G7) educational statistics, which is available only for the U.S. (and other G7 nations). Comparable data do not exist for Washington and the Puget Sound region. As a result, an attempt was made to use census data as a proxy. Even here there was a problem. The survey questions regarding educational attainment were changed in the 1990 census, making them incompatible with those from prior periods. However, for what it is worth, Washington and the Puget Sound region reflected higher degrees of educational attainment than the U.S. in the 1990 Census (*see Figure 8*). If the U.S. experienced a lowering of the NAIRU due to educational attainment, it is possible that the NAIRU's for Washington and the Puget Sound region dipped even lower (assuming their past levels of educational attainment were either the same as that of the U.S. or lower).

Government Programs. Phelps and Zoega (1997) presented evidence suggesting that government programs like welfare and unemployment insurance, many added or expanded in the 1960s and 1970s, raised the

NAIRU after they were introduced. With respect to welfare, the tendency to quit or slack is tied directly to the ratio of the after-tax wage to non-wage income, regardless of whether that income is derived from private or public sources. Unemployment insurance (UI) is believed to induce similar responses; the tendency to slack after losing employment is enhanced by the availability of UI safety net. The bottom line is that both programs (as well as others like them) raise the NAIRU because (1) they lessen the downside risk to being unemployed and (2) they provide a form of income support in the midst of unemployment that sustains that wage floor. Researchers, however, found that only one form of non-wage income had a significant coefficient with respect to the NAIRU and that was transfer payments (the UI component was apparently too small to be statistically significant). That would specifically focus attention on public assistance since seniors receiving retirement-related transfer payments in the form of social security are generally not in the labor force and therefore do not affect the unemployment rate. The point being made is that social safety nets affect the time workers devote to job searches upon entering the labor force or after being laid off.

Now, the argument made was that a welfare variable caused the NAIRU to rise during the 1960s and 1970s. How then does that account for the apparent decline of the NAIRU during the 1990s? Supporters of the welfare variable would argue that federal and state welfare reform initiatives—The Personal Responsibility Act nationally and WorkFirst in Washington State—have scaled back the welfare programs that caused the NAIRU

Figure 8
Educational Attainment
U.S., Washington, and Puget Sound Region, 1990
Source: Bureau of the Census

1990	US	WA	PS
Less than 9th Grade	10%	5%	4%
9th to 12th Grade, No Diploma	14%	11%	9%
High School Graduate	30%	28%	27%
Some College, No Degree	19%	25%	26%
Associate Degree	6%	8%	8%
Bachelor's Degree	13%	6%	18%
Graduate or Professional Degree	7%	7%	8%

to rise in the past. This has had the effect of putting significant numbers of welfare recipients to work and, in the process, reducing significantly the count of unemployed who had once represented a relatively constant presence in the unemployment formula. By this rationale, if some of the welfare-to-work dynamics turn out to be temporary (e.g., former welfare recipients are unable to hold onto their jobs during the next recession), some of the decline in the NAIRU should turn out to be temporary as well.

Duration of Unemployment. Walsh (1998) posited that an increased duration of unemployment can affect the short-run NAIRU as workers experiencing long spells of unemployment may have acted to moderate wage demands, lowering the rate of inflation associated with given unemployment rates. This variable, however, must be viewed in two ways. Workers who experience long duration of unemployment are not usually compelled to push wage demands; they are also able to weather longer stretches of unemployment due to programs like Unemployment Insurance (UI) which in Washington State represent 30 weeks of *regular benefits*. The 30 weeks is 4 weeks more than most states. Federal *extended benefits* are also available to workers as defined in a couple of ways. Without getting into the technical detail, Washington State applies extended benefits at a greater rate than many other states. In the Puget Sound region with its dominant aircraft and parts industry, extended benefits for aerospace workers have affected the region significantly. Specific to Washington, a proposed new category of *additional benefits* could provide 104 weeks (2 years) of training benefits to workers in industries such as aerospace, timber, and fisheries, among others, with 52 weeks (1 year) for all other dislocated workers so designated. Taken together, all of this could boost the impact of unemployment duration as a NAIRU variable in Washington as well as the Puget Sound region.

Regional Economic Shifts. Murphy (1998) has introduced what might be the most unique variable to explain recent shifts in the NAIRU. He argues that the observed downward shift in the NAIRU is due in part to acceleration in the degree of regional labor market integration across the U.S. He believes this integration has led to greater synchronization in regional labor

market conditions and regional business cycles. This integration and synchronization has revealed itself, he says, through emerging patterns in unemployment rates and economic growth rates.

Murphy argues that the disparity between unemployment rates across states and census regions has declined in the 1990s compared to the 1980s, regardless of whether the country is in the midst of an economic recession or expansion. He attributes this in large part to greater regional economic diversification. He notes that the disparity in economic growth rates across states and census regions has also narrowed during the 1990s compared to the 1980s.

If true, this increased synchronization of regional business cycles makes it less likely that inflationary price pressures would emerge in one region and then spill over into others. Stated another way, if price pressures emerge evenly across regions, it is less likely that inflation in one region will accelerate in response to price pressures in another. As such, the change in inflation associated with any unemployment rate would likely be lower.

There is evidence to suggest that Washington State is an example of what Murphy calls regional synchronization. Research conducted by the Employment Security Department (Kamimura 1997) shows that the state economy has become less seasonal and less cyclical over time. This is not to suggest that such swings have disappeared, only that they have abated to a level that suggests they do not play as big a role in employment swings as they had in the past.

What Does the Evidence Suggest?

Quite frankly, the "jury" is still out. However, as noted, researchers are constructing ever more sophisticated multivariate models in an effort to more precisely nail down the NAIRU. The findings that emerge with respect to regression coefficients will provide the best gauge as to the significance or insignificance of the incorporated variables. However, from the standpoint of the Puget Sound region, if variables such as education, labor force change, and duration of unemployment are found to be statistically significant, there will be a strong case for suggesting that the NAIRU for the region is lower than that for the nation.

Regional Application of NAIRU

Some of the points outlined above also underscore why the NAIRU, if made more reliable, would prospectively be an important tool for regional measurement and policymaking as well. There are, of course, shortcomings in applying the NAIRU to regions. Namely, labor is more mobile at the regional level than it is nationally. However, a sufficiently large labor market area—such as one encompassing the five-county Puget Sound region—would largely mitigate this concern. Non-wage inflation is also an issue. In the five-county Puget Sound region, housing cost inflation is a much greater factor than wage cost pressure, which undercuts the argument that the NAIRU may be at work in the Puget Sound region. Nevertheless, the idea that one might be able to determine whether regional inflation is just around the corner or whether a region was at its economic growth limits is intriguing and powerful. This would be an especially powerful tool for public and private sector policymaking and long-range planning.

As stated earlier, a predictable and reliable NAIRU at the regional level would have a number of applications. It could provide the financial community with a regional indicator to assist the decision making process for long-term loans. It could provide labor and management with a reliable gauge of regional wage and price trends in contract negotiations. It could provide businesses and consumers alike with an inflation-related early warning system to help in making purchasing decisions. Retrospectively, it could provide valuable insight into unemployment-inflation relationships, something the state could use in forecasting. Additionally, it might also serve to monitor the possible effect of WorkFirst on what might have been Washington's NAIRU. Broad-based economic models have shown that social welfare programs raise the natural rate as workers rely less on wage income and require higher wages to deter them from quitting, therefore creating inflation pressures and unemployment for those marginally attached to the work force. The latter examples suggest that a predictable and reliable NAIRU might also have significant public policy application.

Complex Times Require Complex Approaches

Unemployment rate falls, inflation rises. Unemployment rate rises, inflation falls. The sheer power of the NAIRU was implicit in its simplicity. It was relationship that everyone could understand. Moreover, it had a solid track record. It may be, however, that the NAIRU was ultimately a victim of its own simplicity—that the simplicity so admired ultimately led to its demise. Economies—whether international, national, or regional—are increasingly more complex. Previously isolated economies are now inter-connected. Labor markets, previously semi-permanent and localized, are now more flexible. Traditional wages have been supplanted by increasingly non-traditional compensation packages. The list goes on. As economies grow increasingly more complex, it stands to reason that the models being designed to track the unemployment-inflation relationship should become more complex as well. Whether or not these newer econometric models prove equal to the challenge, the NAIRU as we know it will likely be relegated to obsolescence as a key policy tool.

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