NBER WORKING PAPER SERIES

DISINFLATION AND THE NAIRU

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Working Paper 5520

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
March 1996

This paper was prepared for the NBER Conference on Monetary Policy and Low Inflation, January 1996. I am grateful to Jorgen Elmeskov and Marco Doudeyns of the OECD for providing data, and to Christopher Ruebeck and Tao Wang for research assistance. Helpful suggestions were provided by Olivier Blanchard, Jorgen Elmeskov, the editors, conference participants, and seminar participants at Columbia and MIT. This paper is part of NBER's research programs in Economic Fluctuations and Monetary Economics. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

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ABSTRACT

This paper asks why the NAIRU rose in most OECD countries in the 1980s. I find that a central cause was the tight monetary policy used to reduce inflation. The evidence comes from a cross-country comparison: countries with larger decreases in inflation and longer disinflationary periods have larger rises in the NAIRU. Imperfections in the labor market have little direct relation to changes in the NAIRU, but long-term unemployment benefits magnify the effects of disinflation. These results support "hysteresis" theories of unemployment.

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I. INTRODUCTION

Average unemployment in the OECD stood at 3.1% in 1970. It rose to 5.7% in 1980 and 8.1% in 1994. The rise in unemployment was especially severe in the European Community, where 1994 unemployment averaged 11.5%. Although these movements had a cyclical component, there was also a large rise in the long-run trend, as captured by the non-accelerating-inflation rate of unemployment -- the NAIRU. OECD estimates of the NAIRU rose for most countries in both the 1970s and 1980s (OECD, 1994).

A large literature has sought to explain the rise in unemployment. In recent years, most explanations have focused on imperfections in the labor market arising from labor unions and from government interventions such as unemployment insurance and firing restrictions. Often, economists argue that these imperfections have interacted negatively with changing economic conditions. On the back cover of its 1994 Jobs Study, the OECD summarizes its views as follows:

> [M]uch unemployment is the unfortunate result of societies' failure to adapt to a world of rapid change and intensified global competition. Rules and regulations, practices and policies, and institutions designed for an earlier era have resulted in labour markets that are too inflexible for today's world.

Krugman (1994) is more specific about the key economic changes. Summarizing "the conventional wisdom," he focuses on the decline in the equilibrium relative wages of low-skill workers (arising, perhaps, from skill-biased technical change). In Krugman's view, labor-market distortions create a floor on real wages, and unemployment rises when

equilibrium wages fall below the floor.

This paper argues that the conventional wisdom misses a central cause of the rise in unemployment: macroeconomic policy. In particular, I focus on the decade of the 1980s and argue that the main cause of rising unemployment was the tight monetary policy that most OECD countries pursued to reduce inflation. My evidence comes from a cross-country comparison: countries with larger decreases in inflation and longer disinflationary periods had larger increases in the NAIRU. My principal measure of the NAIRU is the one constructed by Elmeskov (1993) and used in the OECD Jobs Study.

In the "natural rate" theories of Friedman (1968) and Phelps (1968), the NAIRU is determined by labor-market imperfections and is independent of monetary policy. My argument is inconsistent with traditional natural-rate models. My findings fit easily, however, with "hysteresis" theories (Blanchard and Summers, 1986). In these theories, a disinflation causes a cyclical rise in unemployment, which in turn causes a rise in the NAIRU. My results suggest that hysteresis is highly relevant for explaining recent experience.

This paper also examines the role of labor-market imperfections in the rise of the NAIRU. I consider various measures of these distortions, and find that their cross-country correlations with the change in the NAIRU are low. However, one labor-market variable -- the duration of unemployment benefits -- has a large effect on the size of the NAIRU increase resulting from disinflation. That is, much of the rise in unemployment is explained by the interaction between benefit duration and changes in inflation. Once again, my results support hysteresis theories, which attribute the persistence of

unemployment changes to labor-market distortions. More specifically, the finding that unemployment benefits are the key distortion points toward hysteresis models based on decreasing job search by the unemployed.

The remainder of this paper contains six sections. Section II describes how I measure changes in the NAIRU. Sections III-V investigate the cross-country relations among changes in the NAIRU, the size and speed of disinflation, and labor-market distortions. Section VI considers robustness, and Section VII discusses the results.

II. THE NAIRU IN THE 1980s

A. Measuring the NAIRU

The concept of the NAIRU is based on an accelerationist Phillips curve:

$$(1) \qquad \pi - \pi_{-1} = a(U - U^*) ,$$

where U is unemployment, π and π_{-1} are current and lagged inflation, a is a negative constant, and I ignore supply shocks. U* is the NAIRU -- the level of unemployment consistent with stable inflation. In the Friedman-Phelps model, U* is determined by microeconomic features of labor markets. In hysteresis models, U* is also influenced by the path of actual unemployment, and hence by macroeconomic policy.

In calculating the NAIRU, I follow Elmeskov (1993), whose approach is also used in the OECD Jobs Study. Elmeskov estimates the unemployment rate consistent with stable wage inflation (he calls his variable the NAWRU rather than the NAIRU). There is no clear reason for focusing on wage inflation or on price inflation, and so I follow

Elmeskov for simplicity. To estimate the NAIRU in a given year, Elmeskov compares unemployment and the change in wage inflation in that year and the previous one. Assuming a Phillips curve, equation (1), the two observations determine the NAIRU, U*. For some countries, Elmeskov makes ad hoc adjustments to the NAIRU series to eliminate outliers. Finally, he smooths the series mildly: he applies the Hodrick-Prescott filter with a parameter of 25. This smoothing reduces the influence of supply shocks and other transitory shifts in the Phillips curve.[1]

Elmeskov's NAIRU series for several countries are plotted in Figure 1, along with actual unemployment. Generally, the series appear close to what one would draw by hand if attempting to capture the long-term trend in unemployment. Elmeskov finds that his NAIRU series are similar to two other "natural rate" series he calculates, one based on the relation between unemployment and vacancies and the other based on capacity utilization.

Elmeskov's procedure is not perfect, of course. The appropriate approach to estimating the NAIRU is controversial. In Section VI, I consider biases that might arise if Elmeskov's procedure does not completely eliminate the cyclical component of unemployment. I also consider an alternative measure of the NAIRU based on a univariate smoothing of the unemployment series.

B. The Sample

I seek to explain the change in the NAIRU from 1980 to 1990. I

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[1]To understand Elmeskov's procedure, note that equation (1) implies $\pi_{-1} - \pi_{-2} = a(U_{-1} - U^*)$. Given two years' data on inflation changes and unemployment, this equation and (1) are two equations in two unknowns, a and U*. The solution for U* is Elmeskov's initial estimate of the NAIRU.

choose this period because the most important macroeconomic shocks were shifts in demand, especially monetary tightenings aimed at reducing inflation and supporting currencies. One can find reasonable proxies for the tightness of policy in different countries, such as the total fall in inflation. Accounting for unemployment movements during the 1970s is more difficult: one has to measure the severity of supply shocks in different countries.

I end the analysis in 1990 because it is difficult to estimate the NAIRU in more recent years. It is not yet clear, for example, whether the large increases in unemployment in Sweden and Finland are changes in the NAIRU or deviations from the NAIRU. At a technical level, Elmeskov's procedure relies on the Hodrick-Prescott filter, which is imprecise near the endpoints of series.

Elmeskov calculates NAIRU series for 21 OECD countries. Of these countries, I examine the 20 with moderate inflation; I exclude Turkey, where inflation was 110% in 1980. My sample of countries is identical to the main sample that Layard et al. examine in their 1991 book on unemployment. For each country, I use an updated NAIRU series that Elmeskov has calculated using data in the December 1994 Economic Outlook of the OECD. For two countries, Netherlands and Ireland, I adjust the series based on revisions in unemployment data in the June 1995 Economic Outlook.[2]

In Table I, the first column reports the change in the NAIRU from

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[2]For Netherlands and Ireland, I compute an initial NAIRU series for both the December 1994 data and the June 1995 data, using the approach in footnote 1. I add the difference between the two series to Elmeskov's final NAIRU series. This procedure assumes that the data revision does not affect the difference between the initial NAIRU and the final (smoothed) NAIRU.

1980 to 1990. The NAIRU rose in all countries except the United States, Portugal and Belgium; Ireland and Spain have the largest increases by a wide margin. The unweighted average increase across countries is 2.1 percentage points.

III. THE EFFECTS OF DISINFLATION

Sections III-V look for variables to explain cross-country differences in the change in the NAIRU. This section examines the role of disinflation.

A. The Policy Variables

I examine two variables concerning disinflation. The first is the total fall in inflation from 1980 to 1990. This variable measures the overall tightness of monetary policy during the decade. In hysteresis models, a larger disinflation produces a larger cyclical rise in unemployment, which in turn produces a larger rise in the NAIRU. I measure inflation with the year-over-year change in consumer prices, as reported in the June 1995 Economic Outlook. The fall in inflation from 1980 to 1990 is reported in the second column of Table I.

The other variable measures the length of disinflation. For each country, I determine the longest disinflation during the 1980s, defined as the greatest number of consecutive years in which inflation fell or was constant. This variable shows whether a given fall in inflation occurred quickly or slowly.

There are two reasons that the speed of disinflation may affect the change in the NAIRU. First, it may affect the size of the cyclical downturn caused by disinflation. Ball (1994) finds that

slower disinflations produce larger cyclical output losses. Second, a given amount of cyclical unemployment may have a larger effect on the NAIRU if it is spread over time. This is true in some hysteresis models. It is true, for example, if the unemployed take more than one period to become "outsiders" in wage bargaining (Lindbeck and Snower, 1989), or if only long-term unemployment reduces workers' job search (Pissarides, 1994). All these effects suggest that a longer disinflation produces a larger rise in the NAIRU.

The third column of Table I reports the length of disinflation in each country. After experimentation with functional forms, I use the square of this variable in the regressions below.[3]

B. Results

Table II reports regressions of the change in the NAIRU on the fall in inflation, on the square of disinflation length, and on both of these variables. Figure 2 plots the two bivariate relations.[4]

In each of the simple regressions, the independent variable explains a substantial fraction of the variation in the change in the NAIRU. For the fall in inflation, the t-statistic is 3.5 and the $\bar{R}^2$ is 0.37. For length squared, the t-statistic is 4.7 and the $\bar{R}^2$ is

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[3]Inflation in Spain was 8.8% in both 1985 and 1986. The Spanish disinflation would be three years shorter if I required inflation to fall in all years rather than fall or stay constant. On the other hand, I count only years of disinflation after 1980. If I measured the longest disinflation that overlaps with the 80s, the Spanish disinflation would be three years longer. This adjustment would not affect any other country.

[4]In the reported regressions, I assume that errors are uncorrelated across countries, and use OLS. I have also considered a specification in which errors are correlated for countries in the same region. Regions are defined as North America, the EC, non-EC Europe, the Antipodes, and Japan. The estimated within-region correlation is close to zero. Consequently, two-step GLS estimates accounting for this correlation are close to OLS estimates.

0.53. The scatterplots confirm the positive relationships between the change in the NAIRU and the right-side variables.[5]

The correlation between the fall in inflation and length squared is 0.63. It is difficult to separate the effects of these variables with twenty observations, but the data suggest that length squared has greater explanatory power. In the multiple regression, the t-statistic is 2.9 for length squared and only 1.4 for the fall in inflation, although standard confidence intervals include large effects for both variables. The $\bar{R}^2$ for the multiple regression is 0.55, only slightly higher than the $\bar{R}^2$ with length squared alone.

The size and speed of disinflation explain an important part of changes in the NAIRU during the 1980s. Yet large residuals remain. As one example, Ireland and Italy had inflation changes of 15.0 and 15.1 percent respectively, and both had longest disinflations of eight years. These figures put Ireland and Italy near the high end for both variables. Despite these similar disinflation experiences, the NAIRU rose 9.3% in Ireland and only 3.6% in Italy. Something besides macro policy must explain such differences.

IV. THE EFFECTS OF LABOR-MARKET VARIABLES

Most discussions of unemployment focus on imperfections in labor markets. Observers blame unemployment on the power of labor unions and on government policies such as unemployment insurance and firing restrictions. Layard et al. (1991) show that measures of labor-market distortions explain much of the cross-country variation in

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[5]When the change in the NAIRU is regressed on the length of disinflation rather than length squared, the t-statistic is 3.8 and the $\bar{R}^2$ is 0.42.

unemployment levels in the mid-1980s. It is harder, however, to explain changes in unemployment during the 80s. Most labor-market distortions remained constant during the decade or decreased, as some countries weakened firing restrictions and reduced unemployment benefits (OECD, 1990; Blank, 1994). These changes go in the wrong direction for explaining why unemployment rose.

Nonetheless, authors such as Krugman and the OECD emphasize labor-market distortions in explaining the 80s. They argue that pre-existing distortions contributed to rising unemployment through interactions with market forces such as greater wage dispersion. If OECD countries experienced similar economic changes, this view suggests that unemployment rose more in countries with more distorted labor markets. Many authors use this idea to explain why unemployment has risen in Europe but not the United States, where markets are more flexible. Motivated by this view, I explore the relation between the change in the NAIRU and labor-market distortions in my twenty countries.

My principal measures of labor-market distortions are the six variables that Layard et al. emphasize. Two of the variables concern unemployment insurance: the replacement ratio and the duration of benefits. Three concern wage bargaining: the percentage of workers covered by collective agreements, and the coordination among workers and among employers. The final variable is government spending to help the unemployed find jobs. Layard et al. report these variables as of the mid-1980s. To check robustness, I also examine a set of six variables drawn from the OECD Jobs Study. These include four variables similar to Layard's, and two others: an index of legal

employment protection, and the tax wedge between labor costs and workers' incomes.

I run simple regressions of the change in the NAIRU on each of the six Layard variables, and a regression on all six at once. Most of the results are negative. In the multiple regression, the p-value for the hypothesis that all coefficients are zero is 0.36. In five of the six simple regressions, the t-statistic is less than 1.5; the $\bar{R}^2$'s, reported in Table III, range from -0.05 to 0.05. The only variable close to significant is the duration of unemployment benefits: it yields a t-statistic of 1.9 and an $\bar{R}^2$ of 0.12. Figure 3 plots the change in the NAIRU against the duration of benefits; it suggests a mild positive relationship, but a number of countries have long durations and small changes in the NAIRU. (Following Layard, I count indefinite unemployment benefits as a duration of four years.)

Regressions using the six Jobs Study variables yield even more negative results. No variable approaches significance, and the $\bar{R}^2$'s are all below 0.01. (The Jobs Study variables do not include the duration of unemployment benefits.)

As discussed above, changes in labor-market distortions are not a promising explanation for the overall rise in OECD unemployment, because most changes go in the wrong direction. Nonetheless, changes in distortions could help explain cross-country differences in unemployment changes; for example, some authors argue that Thatcher's reforms dampened the rise in British unemployment. There is less cross-country data on changes in distortions than on levels, but the OECD has constructed three variables for both 1980 and 1990, or for nearby years. The variables are union density, the benefit

replacement rate, and the tax wedge. (As stressed by Phelps [1994], the tax wedge is one distortion that worsened for most countries during the 80s.) I regress the change in the NAIRU on the change in each labor-market variable over the 80s. Once again, the results are negative: all coefficients are insignificant.

Thus an extensive search has failed to find any labor-market variable that explains nearly as much of the rise in the NAIRU as the size and length of disinflation.

V. INTERACTIONS BETWEEN DISINFLATION AND LABOR-MARKET VARIABLES

In hysteresis models, increases in unemployment are triggered by cyclical factors such as demand contractions. But labor-market imperfections are the reason that cyclical unemployment leads to a rise in the NAIRU. Thus the models suggest an interaction between disinflation and labor-market variables. A given disinflation has a larger effect on the NAIRU in countries with more distorted labor markets.

In exploring this idea, I mainly consider the interaction between disinflation and the duration of unemployment benefits. Recall that the duration of benefits is the only labor-market variable with any direct relation to the change in the NAIRU. It also proves to be the variable that interacts most strongly with disinflation.

Figure 4 plots the change in the NAIRU against two interaction variables: the fall in inflation times benefit duration ($(\Delta\pi)x(ben)$), and length squared times benefit duration ($(L^2)x(ben)$). Table IV reports regressions of the change in the NAIRU on various combinations of the interactions and the individual variables from which they are

constructed. The interactions are very important. Simple regressions yield $\bar{R}^2$'s of 0.55 for $(\Delta\pi)$x(ben) and 0.59 for (L^2)x(ben). When both interactions are included, the $\bar{R}^2$ is 0.67. When $(\Delta\pi)$x(ben) is included in the regression, the separate $(\Delta\pi)$ and (ben) coefficients are insignificant. The data do, however, suggest a direct effect of L^2: it helps explain the change in the NAIRU even controlling for (L^2)x(ben).

The last column of Table IV presents a particularly successful combination of variables: L^2 and $(\Delta\pi)$x(ben). The t-statistics for these variables are 4.0 and 4.2, and the $\bar{R}^2$ is 0.75. Figure 5 shows the close relationship between the fitted and actual values of the change in the NAIRU. With twenty observations, we cannot draw firm conclusions about which specification is best. (A priori, there is no obvious reason that L^2 affects unemployment directly while $(\Delta\pi)$ interacts with (ben).) Nonetheless, a broad conclusion is robust: the explanatory power of macro-policy variables increases greatly when we account for interactions with benefit duration.

I have also explored the interactions between disinflation and the other labor-market variables that Layard et al. measure. In most cases, these interactions do not help explain changes in the NAIRU once we control for the direct effects of disinflation. One exception is the interaction between the fall in inflation and the coverage of collective bargaining. However, even this variable adds little once we control for the interaction between disinflation and benefit duration.[6]

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[6]A simple regression of the change in the NAIRU on the inflation change / union coverage interaction yields an $\bar{R}^2$ of 0.46. However, adding this variable to the last column in Table IV reduces the $\bar{R}^2$.

It makes sense that the duration of unemployment benefits is the variable that interacts most strongly with disinflation. In some hysteresis theories, workers who lose their jobs become accustomed to an unemployed lifestyle, stop searching for work, and become detached from the labor force. This effect is likely to be strongest where unemployment benefits are long-lived, making it easier to become satisfied with unemployment. My results support hysteresis theories based on these ideas.

Recall that another of the Layard variables is the replacement rate for unemployment insurance. This is one of the variables that does not magnify the long-run effects of disinflation. As long as benefits are cut off quickly, they can be generous while they last without promoting hysteresis.

VI. ROBUSTNESS

This section extends the analysis in several directions to check the robustness of my results.

A. An Alternative Unemployment Variable

The results so far depend on a particular approach to measuring the NAIRU, the one devised by Elmeskov. Do the results hinge on this choice, or do they hold for other reasonable approaches? Elmeskov estimates the NAIRU with data on unemployment and inflation. An alternative approach (e.g. Mankiw, 1994) is simply to smooth the univariate unemployment series. Following this approach, I use the Hodrick-Prescott filter to derive a trend-unemployment series for each country. (I set the HP parameter to its usual value of 1600). I then redo my regressions with the change in the HP-filtered variable from

1980 to 1990 as the dependent variable.[7]

Table V presents a sample of the results. They are qualitatively the same as when Elmeskov's procedure is used to measure the NAIRU. The coefficients and $\bar{R}^2$'s are smaller than before, but only moderately; for example, the $\bar{R}^2$ drops from 0.75 to 0.62 in the equation with L^2 and $(\Delta\pi)x(ben)$. The lower $\bar{R}^2$'s may reflect greater measurement error, since the HP-filter uses less information to estimate the NAIRU than does Elmeskov. In any case, my basic message does not depend on Elmeskov's procedure.

B. A Change in Timing

Any measure of the NAIRU is imperfect. In general, measurement error in the dependent variable does not cause bias in my regressions. Problems may arise, however, if the error is correlated with cyclical unemployment -- if cyclical fluctuations are not completely filtered out of the NAIRU. Since disinflation causes cyclical unemployment, a cyclical component in the error could bias my estimates of the effects of disinflation. This problem might arise with either Elmeskov's NAIRU variable or the Hodrick-Prescott variable.[8]

To address this problem, I perform versions of my basic regressions with a change in the timing. In these regressions, the

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[7]I use OECD standardized unemployment series for countries where they exist, and local unemployment series for other countries. Unemployment data from 1975 to 1994 are used to construct the filtered series.

[8]There is, however, no clear reason that the bias goes in a particular direction. If the measured NAIRU contains a cyclical component, the errors in the regressions are correlated with the difference in cyclical unemployment between 1980 and 1990. This causes an upward bias in the disinflation coefficient if countries with larger disinflations had greater cyclical unemployment in 1990 than in 1980. It is not obvious whether this condition holds.

dependent variable is the change in the NAIRU from 1976 to 1994, not the change from 1980 to 1990. The independent variables are unchanged: they still measure the size and speed of disinflation during the 1980s. If disinflation raises unemployment permanently, disinflation during the 80s should affect the change in the NAIRU from 1976 to 1994. And with this dependent variable, cyclical unemployment causes less of a problem. If the measured NAIRU contains a cyclical component, the errors in the regressions are correlated with cyclical unemployment in 1976 and in 1994. The errors are uncorrelated with disinflation during the 1980s as long as cyclical fluctuations die out within four years. Under this assumption, there is no bias.[9]

Table VI presents regressions with the 1976-94 change in Elmeskov's NAIRU as the dependent variable. The coefficients are similar to those when the dependent variable covers 1980-90. The fall in inflation contributes less to $\bar{R}^2$, but length squared contributes just as much. Indeed, a simple regression on $(L^2)x(ben)$ produces an $\bar{R}^2$ of 0.72. A likely explanation is that, for most countries, the longest disinflation between 1976 and 1994 is the same as the longest disinflation between 1980 and 1990. Consequently, the difference in timing between the left- and right-side variables makes little difference when the latter is length squared. Changes in inflation differ considerably across the two periods, and so the difference in timing adds noise to the regression.

In any case, the results again suggest that my findings are

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[9]Elmeskov's NAIRU series does not extend back to 1976 for Belgium, Finland, or Ireland. For these countries, I use another of Elmeskov's natural-rate series, the one based on capacity utilization, to proxy for the NAIRU in 1976.

robust.

C. Reverse Causality?

Does the correlation between disinflation and changes in the NAIRU reflect a causal relationship? Several readers have suggested a non-causal explanation. In their story, shocks or unwise policies produced both NAIRU increases during the 1980s and high inflation at the start of the 80s. Countries with the largest NAIRU increases also experienced the highest inflation. And high initial inflation led to large disinflations, since most countries sought low inflation during the 80s.

My discussant, Olivier Blanchard, has suggested a test of this idea. The size of disinflation is the difference between initial and final inflation -- the levels of inflation in 1980 and 1990. Shocks that cause rises in the NAIRU might also cause high initial inflation, but they do not cause low final inflation. That is, there is no apparent reason that countries with large NAIRU increases would push inflation down to especially low levels. We can therefore learn about causality by including initial and final inflation separately in the regressions, relaxing the assumption that only their difference matters. A significant coefficient on final inflation suggests that causality runs from disinflation to the NAIRU.

Table VII presents the results of this test. Both initial and final inflation have significant effects on the change in the NAIRU. One cannot reject the hypothesis that these variables have coefficients of the same absolute size, as assumed before. The point estimate is larger for the final-inflation coefficient, which goes in the wrong direction for the reverse-causality story. Similar results

arise when I separate the (inflation change) x (benefit duration) interaction into (initial inflation) x (benefit duration) and (final inflation) x (benefit duration). Thus the data support a causal effect of disinflation on the NAIRU.[10]

VII. DISCUSSION

This paper argues that disinflations were a major cause of the rise in OECD unemployment during the 1980s. I show that measures of the NAIRU rose more in countries with larger and longer disinflations. I also find that disinflation had a greater effect on the NAIRU in countries with long-lived unemployment benefits. These results support hysteresis theories based on decreasing job search by the unemployed.

To conclude the paper, I examine several well-known country experiences in light of my results. I then discuss policy implications.

A. Country Experiences

The United States vs. Europe: Many discussions of OECD

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[10]Blanchard has suggested a specific version of the reverse-causality story that goes as follows. Problems in labor markets caused a rise in the NAIRU that was spread over the 1970s and 1980s. The rise in the 70s caused inflation to rise, because policymakers resisted rising unemployment with expansionary policy. In the 80s, policymakers reversed course and disinflated. Countries with more severe labor-market problems experienced larger rises in the NAIRU in both the 70s and 80s, and larger disinflations.

In this story, the ultimate cause of disinflation was the rise in the NAIRU between 1970 and 1980. Therefore, following a suggestion by John Shea, I have added this variable to the regressions. Once again, my basic results are robust: the new variable is never significant, and there is little change in the other coefficients. These results reflect the weak relationship between changes in the NAIRU across decades: a simple regression of the change in the 80s on the change in the 70s yields an $\bar{R}^2$ of 0.05.

unemployment emphasize differences between the United States and Europe. During the 1980s, inflation fell as much in the U.S. as in many European countries, but the NAIRU did not rise in the U.S. My results suggest two explanations for the U.S. case. First, unemployment benefits last only half a year, a much shorter period than in most European countries. Consequently, there is little hysteresis in the U.S., and the cyclical downturn caused by disinflation did not raise the NAIRU. Second, the U.S. disinflation was short. The Volcker disinflation was accomplished in three years, from 1980 to 1983; many European disinflations started at the same time but lasted several years longer.

Portugal vs. Spain: A number of authors, notably Blanchard and Jimeno (1994), have puzzled over the different experiences of Portugal and Spain. Their economies are similar in many ways, yet Spain experienced a large rise in the NAIRU during the 1980s while Portugal's NAIRU fell. Here, my results point to three explanations. First, Portugal's fall in inflation during the 80s was much smaller than Spain's. (This partly reflects an increase in Portugal's inflation in the late 80s after an earlier disinflation.) Second, in 1985 the duration of unemployment benefits was half a year in Portugal and 3.75 years in Spain. And finally, Portugal's disinflation lasted three years, while Spain's lasted eight years. (If one extends the data before 1980, Spain's disinflation lasted eleven years, from 1977 to 1988. No other country experienced a disinflation longer than seven years.)[11]

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[11]A confusing feature of the Portugese experience is that unemployment benefits have become more generous over time. Currently, most parameters of benefits, including duration, are similar in

Ireland vs. Italy: As discussed earlier, these two countries had almost identical disinflations, but the NAIRU rose much more in Ireland. My results suggest a simple explanation: the difference in unemployment benefits. Benefits last indefinitely in Ireland, but only six months in Italy.

This comparison puts the Italian case in a different light than usual. The NAIRU rose 3.6% in Italy, less than in Ireland but more than in most other countries. The rise in Italian unemployment is often blamed on rigid labor markets; in particular, Italy tops the OECD in most measures of legal employment protection (OECD, 1994). My results suggest that the rise in Italian unemployment was low considering the large, slow disinflation. And this is explained by labor-market flexibility along the key dimension of unemployment benefits. Firing restrictions do not appear important for explaining unemployment changes.

Belgium: This example shows that long-lived unemployment benefits are not sufficient for a rise in the NAIRU. Belgium has indefinite benefits, but its NAIRU fell during the 1980s. The main explanation is that disinflation was mild: inflation fell only 3.3% (compared, for example, to 10% in France and 15% in Italy). Disinflation was also moderately quick (four years). Disinflation was mild in Belgium because inflation was low to start with: it was only 6.7% in 1980.

B. Policy

My results imply that disinflation is very costly, especially in

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Portugal and Spain. This similarity leads Blanchard and Jimeno to deemphasize benefits as a source of unemployment differences. But Portugese benefits were much less generous during the mid-80s, when disinflation occurred. Stingy benefits during disinflation prevented the cyclical rise in unemployment from affecting the NAIRU.

countries with long-lived unemployment benefits. Disinflation raises unemployment not only in the short run, but also in the long run. Authors such as Ball (1994) underestimate the costs of disinflation because they assume only transitory losses. Unless we know that living with inflation is very costly, it may be unwise to reduce inflation.

On the other hand, if policymakers choose to disinflate, they should do so aggressively. Both this paper and Ball (1994) find that disinflation is less costly if it is quick. This paper also finds that the costs are smaller if workers are denied long-term unemployment benefits. Efforts to soften the impact of disinflation -- whether through gradualism or through support for the unemployed -- are counterproductive.

In many countries, policymakers disinflated during the 1980s and left a legacy of high unemployment. Can we now reduce unemployment? My findings do not answer this question. Limits on unemployment benefits prevent increases in the NAIRU if adopted before disinflation, but it is not clear that cutting benefits would be helpful today. Such a policy might force the unemployed back to work, but it might not. If the unemployed are detached from the labor market and their human capital is gone, cutting benefits might only increase poverty. So far, no country has reduced benefits enough to test these ideas.

My results suggest another idea for fighting unemployment: expansion of aggregate demand. If tight monetary policy has raised the NAIRU, perhaps loose policy can reduce it -- and perhaps a risk of higher inflation is an acceptable price. On the other hand, it is

not clear that the effects of tight and loose policy are symmetric. A demand expansion would cause a cyclical fall in unemployment, but would this reverse the hysteresis process, with workers becoming reattached to the labor force? We do not know the answer, because countries have not tried demand expansions to reduce the NAIRU.

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Table I

THE SAMPLE

	Change in NAIRU, 1980-1990 (%)	*Decrease in Inflation, 1980-1990 (%)*	*Longest Disinflation (years)*	*Duration of Unemployment Benefit (years)**
Australia	1.1	2.9	2	4
Austria	1.4	3.0	3	4
Belgium	-0.5	3.3	4	4
Canada	0.6	5.4	4	0.5
Denmark	2.5	9.7	6	2.5
Finland	0.5	5.5	5	4
France	3.7	10.2	6	3.75
Germany	2.3	2.8	5	4
Ireland	9.3	15.0	7	4
Italy	3.6	15.1	7	0.5
Japan	0.3	4.7	3	0.5
Netherlands	2.7	4.0	3	4
New Zealand	4.6	11.0	2	4
Norway	2.3	6.8	4	1.5
Portugal	-1.4	3.2	3	0.5
Spain	8.7	8.9	8	3.5
Sweden	0.4	3.2	4	1.2
Switzerland	0.9	-1.4	3	1
United Kingdom	1.1	8.5	3	4
U.S.A.	-1.4	8.1	3	0.5

* Indefinite benefits are coded as four years.

Table II

DISINFLATION AND THE CHANGE IN THE NAIRU

Dependent Variable: Change in NAIRU from 1980 to 1990			
Constant	-0.593 (0.935)	-0.444 (0.700)	-1.033 (0.801)
Inflation Decrease	0.420 (0.121)		0.183 (0.131)
Length Squared		0.123 (0.026)	0.095 (0.033)
$\overline{R}^2$	0.367	0.528	0.552

(Standard errors are in parentheses.)

Table III

LABOR-MARKET VARIABLES AND THE CHANGE IN THE NAIRU

Dependent Variable: Change in NAIRU from 1980 to 1990				
Variable:	Benefit Duration	Replacement Ratio	Coverage of Collective Bargaining	Employer Coordination
$\overline{R}^2$:	0.125	-0.053	0.039	0.050
Variable:	Union Coordination	Expenditure on Labor-Market Programs	All Six Variables	
$\overline{R}^2$:	-0.048	-0.017	0.064	

Table IV

INTERACTIONS BETWEEN DISINFLATION AND LABOR-MARKET VARIABLES

Dependent Variable: Change in NAIRU from 1980 to 1990						
Constant	-0.142 (0.627)	0.165 (0.550)	-0.493 (1.428)	-1.451 (1.258)	-0.367 (0.545)	-1.217 (0.537)
(Inflation Decrease) × (Benefit Duration)	0.131 (0.026)		0.112 (0.065)		0.072 (0.031)	0.092 (0.022)
(Length Squared) × (Benefit Duration)		0.034 (0.006)		0.008 (0.018)	0.022 (0.008)	
Inflation Decrease			0.131 (0.188)			
Length Squared				0.093 (0.057)		0.084 (0.021)
Benefit Duration			-0.069 (0.506)	0.450 (0.410)		
$\overline{R}^2$	0.552	0.590	0.529	0.605	0.669	0.754

(Standard errors are in parentheses.)

Table V

DISINFLATION AND THE CHANGE IN DETRENDED UNEMPLOYMENT

Dependent Variable: Change in HP-filtered Unemployment from 1980 to 1990

Constant	0.598 (0.845)	0.425 (0.614)	0.696 (0.567)	0.839 (0.475)	0.502 (0.503)	-0.132 (0.545)
Inflation Decrease	0.273 (0.109)					
Length Squared		0.093 (0.023)				0.064 (0.021)
(Inflation Decrease) × (Benefit Duration)			0.096 (0.024)		0.046 (0.029)	0.066 (0.022)
(Length Squared) × (Benefit Duration)				0.027 (0.006)	0.019 (0.007)	
$\overline{R}^2$	0.216	0.448	0.443	0.536	0.572	0.616

(Standard errors are in parentheses.)

Table VI

DISINFLATION 1980-1990 AND THE CHANGE IN THE NAIRU 1976-1994

Dependent Variable: Change in NAIRU from 1976 to 1994						
Constant	2.803 (1.506)	1.655 (0.969)	2.380 (0.973)	2.169 (0.620)	1.914 (0.689)	0.821 (0.882)
Inflation Decrease	0.352 (0.195)					
Length Squared		0.164 (0.036)				0.121 (0.035)
(Inflation Decrease) × (Benefit Duration)			0.155 (0.041)		0.035 (0.040)	0.099 (0.036)
(Length Squared) × (Benefit Duration)				0.051 (0.007)	0.045 (0.010)	
$\bar{R}^2$	0.106	0.507	0.413	0.716	0.712	0.640

(Standard errors are in parentheses.)

Table VII

THE EFFECTS OF INITIAL AND FINAL INFLATION

Dependent Variable: Change in NAIRU from 1980 to 1990			
Constant	0.566 (1.422)	0.373 (0.715)	-1.035 (0.689)
Inflation in 1980	0.404 (0.121)		
Inflation in 1990	-0.596 (0.203)		
(Inflation in 1980) × (Benefit Duration)		0.153 (0.030)	0.099 (0.028)
(Inflation in 1990) × (Benefit Duration)		-0.222 (0.071)	-0.118 (0.063)
Length Squared			0.080 (0.023)
$\overline{R}^2$	0.373	0.574	0.742

(Standard errors are in parentheses.)

Figure 1

The NAIRU, 1970 - 1990

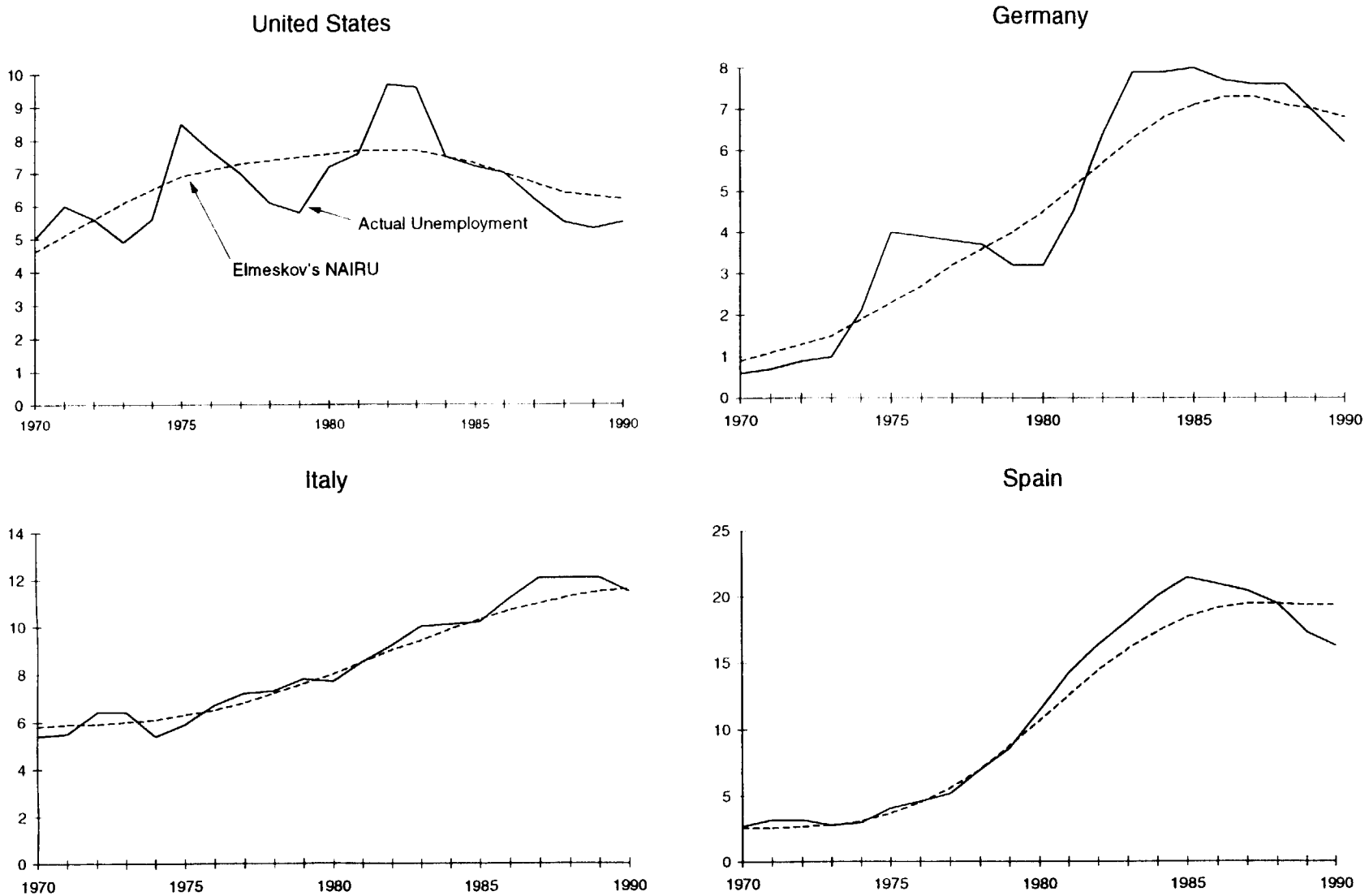
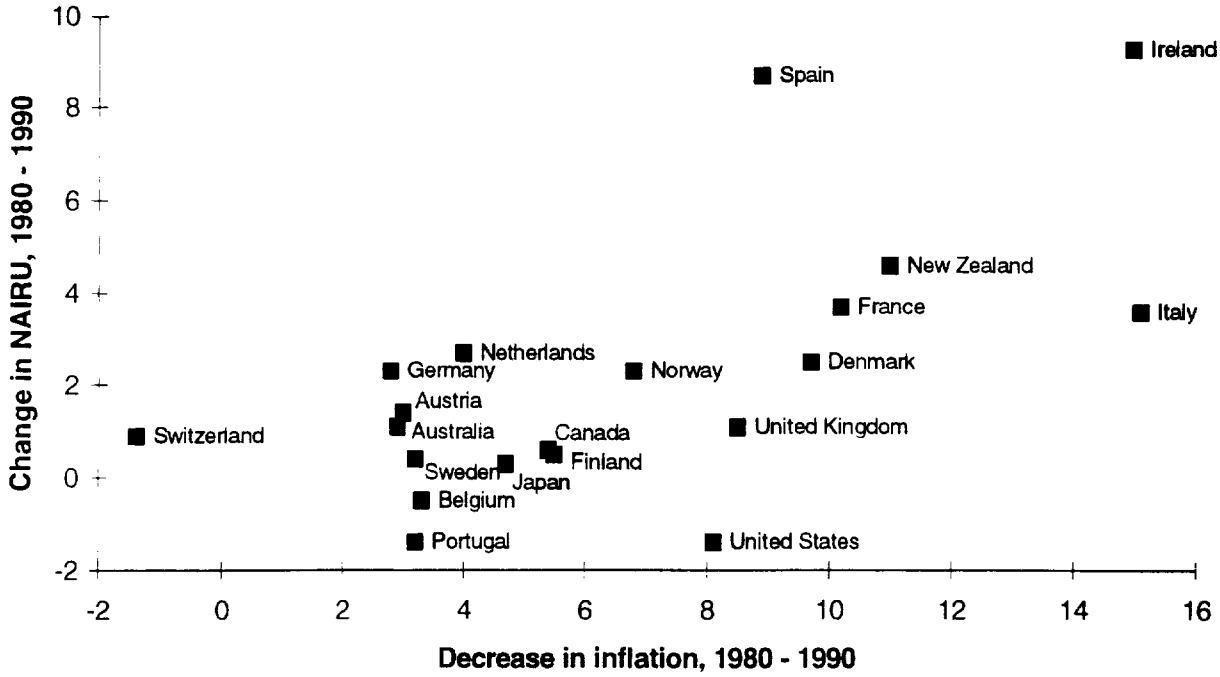


Figure 2

Disinflation and the Change in the NAIRU



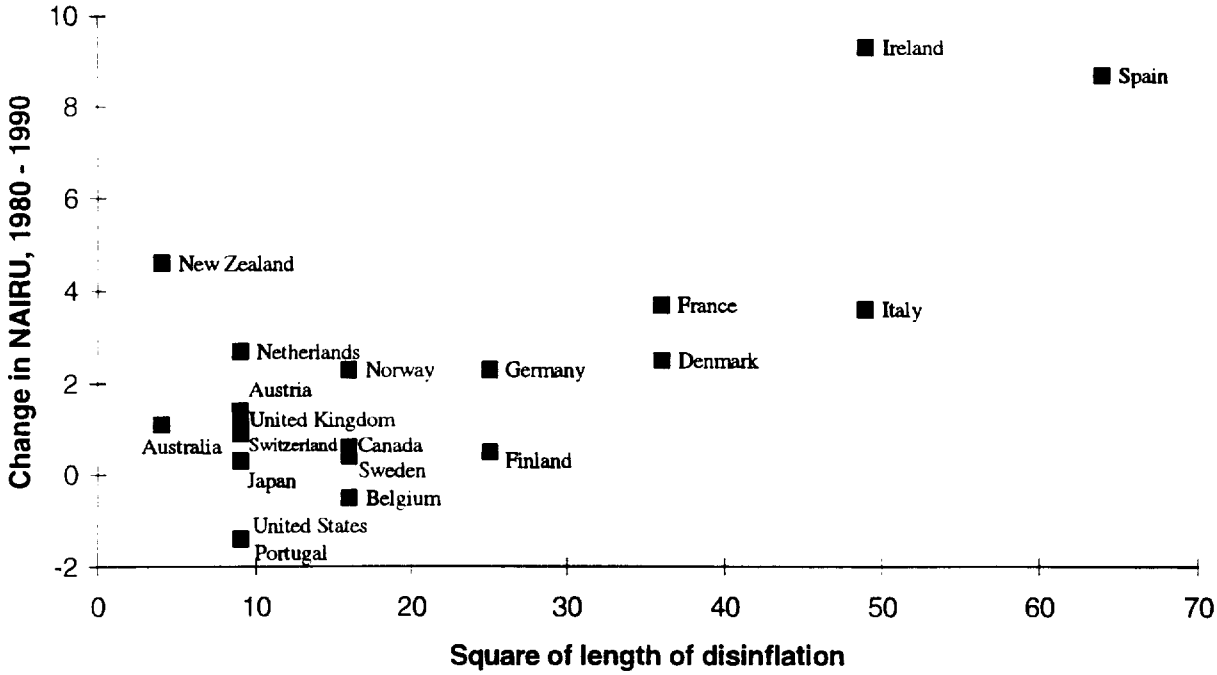


Figure 3

Disinflation and the Duration of Unemployment Benefits

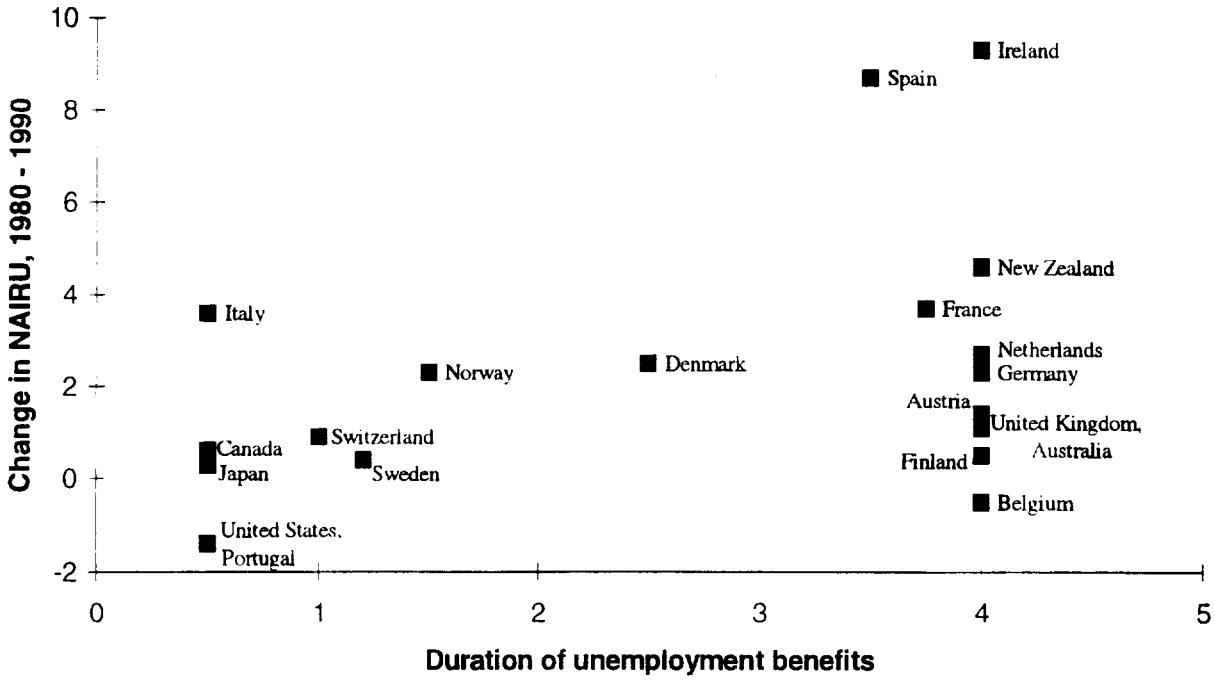
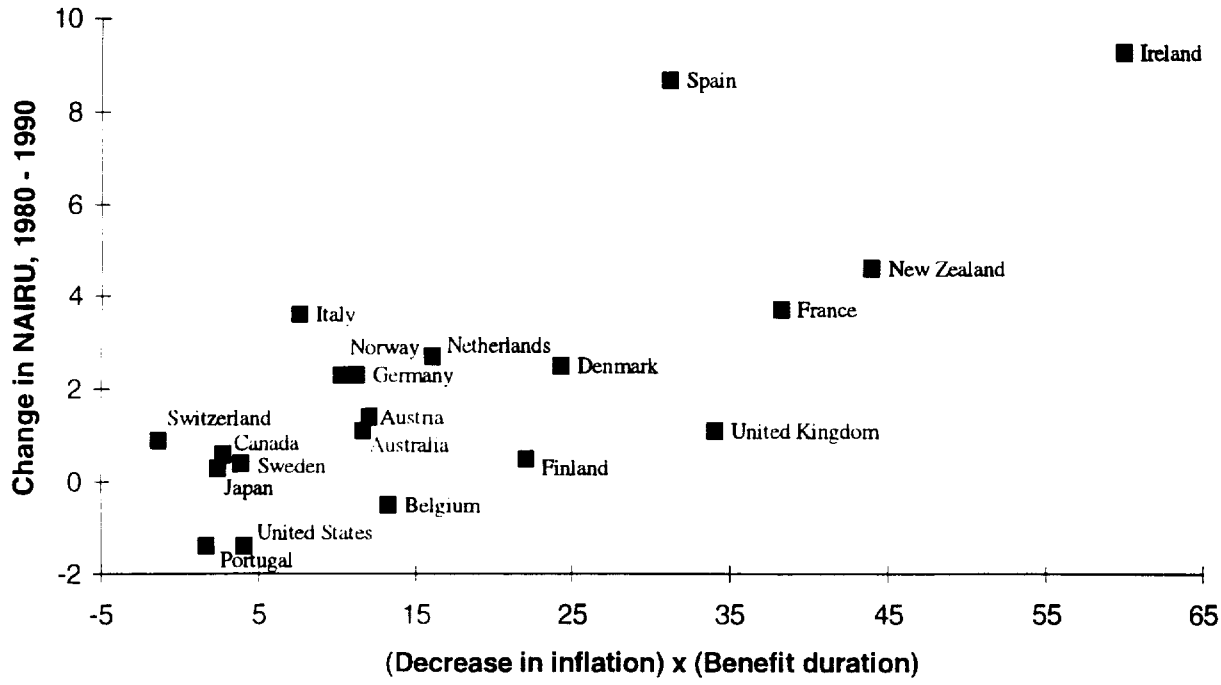


Figure 4

The Interaction Between Disinflation and Benefit Duration



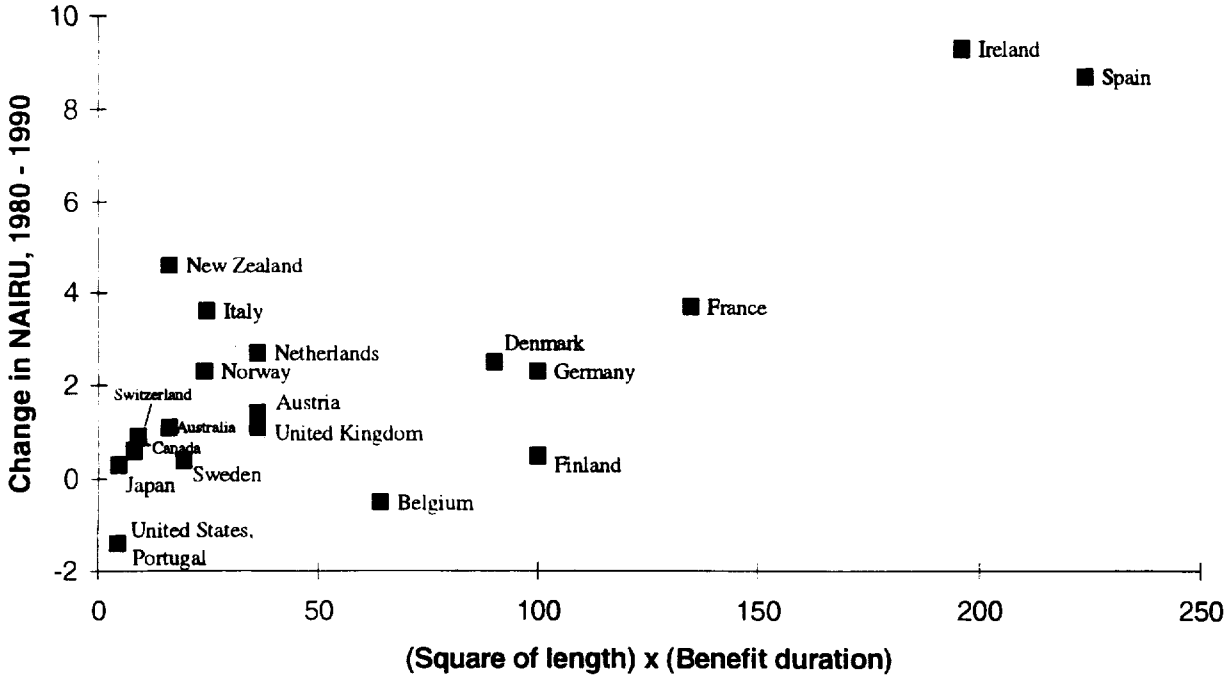


Figure 5

Fitted and Actual Values of Change in NAIRU

(Independent variables: (Decrease in inflation)x(Benefit duration) and Square of length)