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The High-Pressure U.S. Labor Market of the 1990s

THE RECENT PERFORMANCE of the U.S. economy has been nothing short of extraordinary. In 1998 inflation and unemployment reached their lowest levels since 1965 and 1969, respectively. Although estimates of the NAIRU (the nonaccelerating-inflation rate of unemployment, or the rate consistent with stable inflation) are imprecise, the actual unemployment rate has been below 5 percent—the lower bound of Staiger, Stock, and Watson’s 95 percent confidence interval for the NAIRU—for more than twenty consecutive months.¹ Moreover, the rate of price inflation *declined* in 1997 and 1998.

What accounts for this unexpectedly strong performance? It is unclear whether the unusual combination of low unemployment and low inflation in the 1990s is due to fortuitous developments originating in the labor market or to changes in product and financial markets. If labor market developments are responsible, they may represent lasting structural changes that could permanently lower the NAIRU. If instead they are due to developments outside the labor market, they are more likely to represent favorable transitory shocks that will only temporarily allow low inflation and unemployment. Robert Gordon, for example, attributes the shift in the Phillips curve, which relates price inflation to unemployment, largely to favorable price shocks (for example, in computer and energy prices),

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1. See Staiger, Stock, and Watson (1997a, table 1).

changes in the measurement of inflation, and reduced growth in employer health care costs.² Others, including James Stock, point to the fact that the relationship between price inflation on the one hand and capacity utilization, industrial production, and other measures of the business cycle on the other has remained stable in the 1990s. This suggests that something in the labor market has changed to accommodate low unemployment and low inflation.³

Understanding the forces that have created the fortunate combination of low inflation and low unemployment is critical for predicting whether these conditions will continue and for devising policies, if any can be devised, that could help keep unemployment low. Moreover, the circumstances that have produced the lowest unemployment and inflation in a generation might also have altered the consequences of a tight labor market. In this paper we investigate the labor market causes and consequences of low U.S. unemployment in the 1990s. The goal of the paper can be thought of as twofold. First, we seek to explain why the unemployment rate eight years into the ongoing expansion is 0.8 percentage point lower than at the peak of the last expansion, and 1.4 percentage points lower than at the peak of the expansion before that. Second, we seek to explain why the NAIRU has fallen by an estimated 1.2 percentage points since the mid-1980s. Even economists who question the utility of the NAIRU and the Phillips curve should still find the first goal of interest.

We begin by reviewing recent trends in employment, unemployment, wage growth, and price inflation. We first explore the stability of textbook macroeconomic relations among price inflation, wage inflation, and unemployment. A contribution of our analysis is that we use data from the Current Population Survey (CPS) of the Bureau of Labor Statistics (BLS) to examine the sensitivity of wage growth to unemployment for workers with different levels of education and in different deciles of the wage distribution. Our overview of the macroeconomic evidence suggests that certain features of the labor market may have changed to allow for low unemployment and low inflation in recent years. The wage Phillips curve, which relates wage inflation to unemployment, appears to have shifted since 1988. Additional evidence suggests that the Beveridge curve, which relates job vacancies to unemployment, has also shifted favorably.

2. Gordon (1998).

3. Stock (1998).

At a minimum, our review of the macroeconomic evidence suggests there is value in exploring labor market changes at a more disaggregate level.

Our approach is to explore the plausibility of various contending explanations for the decline in unemployment and the restraint in wage growth. We evaluate four main hypotheses concerning labor market changes that might partially or fully account for the decline in unemployment and in wage pressure. The first is that demographic trends have led to a more mature and more stable work force. The second is that the surge in the prison population in the 1990s may have reduced the measured unemployment rate, because the institutional population is not counted in the labor force in official statistics, and individuals in prison historically have had low rates of employment when they were not in prison. The third is that labor market matching has become more efficient, possibly because of the rise of the temporary help industry and the provision of job search assistance (JSA) by the unemployment insurance system. Finally, we examine the “weak backbone hypothesis,” which holds that workers have been reluctant to press for wage gains in this recovery because they are anxious about their job prospects or because unions are weak. This type of exercise does not always lead to hypotheses that can be cleanly or directly tested. As a consequence, we cast a broad net and try to gather strands of evidence where we can find them.

In our evaluation of the role of changing demographics, we focus on changes in the age and education structure of the work force. Changes in the age composition of the labor force, driven by the maturing of the baby-boom generation, can account for an estimated 0.4-percentage-point decline in the overall unemployment rate since the mid-1980s.⁴ But naive compositional adjustments for increases in the educational attainment of the work force should have persistently reduced the NAIRU over the past several decades, not just since the early 1990s. We argue that adjustments to the unemployment rate for changes in the age structure of the work force are more plausible than adjustments for changes in its educational composition.

Our examination of the role of the explosion of the prison population begins with the observation that nearly 2 percent of the adult male population is currently incarcerated. The prison population has almost doubled in the last decade. Since convicted criminals typically had weak

4. See also Horn and Heap (1999) and Shimer (1998).

attachment to jobs before their arrest, it is possible that the labor market is not as tight as the low unemployment rate suggests. This explanation suggests that the low measured unemployment of the 1990s is partly illusory: some of the unemployed have simply been relabeled as the prison population. Our calculations suggest that the increase in the incarcerated population can account for roughly a 0.3-percentage-point decline in the *male* unemployment rate, and a 0.17-percentage-point decline in the overall rate, since 1985.

We explore changes in labor market matching from two perspectives. First, we evaluate the effect of the new Worker Profiling and Reemployment Services (WPRS) program of the U.S. Department of Labor, a major initiative to improve the efficiency of the unemployment insurance system in the 1990s. The most important feature of the WPRS program for our purposes is the much wider use of JSA. Our analysis indicates, however, that JSA, and worker profiling more generally, are unlikely to affect sufficiently large numbers of workers to significantly influence the aggregate unemployment rate.

Second, and of more consequence, we examine the impact of the temporary help industry on unemployment and wage growth. Although the temporary help industry (called help supply services in the official statistics) employs only 2.2 percent of the work force, the industry has grown rapidly in recent years: its employment level doubled from 1992 to 1998.⁵ Also, a significant share of workers flow through the temporary help industry. Estimates for the state of Washington indicate that 3.7 percent of workers held temporary help jobs at some point during 1994, and 5 percent did so between the first quarter of 1993 and the fourth quarter of 1994.⁶ The availability of temporary help jobs may provide an alternative to short-term unemployment and job search for job seekers. We present some preliminary (and quite speculative) cross-state panel regressions suggesting that the availability of temporary help workers to firms may lessen the wage pressures that ordinarily accompany tight labor markets, possibly by enabling firms to fill vacancies quickly without having to adjust their overall wage structure. Our results suggest that the growth of the tempo-

5. Payroll employment in the help supply services industry (Standard Industrial Classification 7363) increased from 1.41 million in 1992 to 2.82 million in 1998, according to establishment survey data from the Current Employment Statistics program of the BLS.

6. Segal and Sullivan (1997a). The employment share of the temporary help industry in Washington state in 1994 of 2.24 percent is quite similar to the national share in 1998.

rary help sector may account for as much of the decline in unemployment as do demographic shifts.

Our examination of the weak backbone hypothesis focuses first on the role of unions. Union membership has declined steadily within private sector industries for the last thirty years. And the 1981 strike by the Professional Air Traffic Controllers Organization (PATCO) appears to have been a major watershed in terms of union organizing and strike activity. It is possible that the threat of unionization is now so low in many industries that the labor market has crossed a tipping point, beyond which unions and the threat of unionization have very little influence on wage setting. We also explore more sociologically based explanations for wage moderation. For example, Federal Reserve Board Chairman Alan Greenspan testified to the Congress in February 1997 that “atypical restraint on compensation increases has been evident for a few years now and appears to be mainly the consequences of greater worker insecurity.”⁷ And in a February 1999 speech he elaborated: “The rapidity of change in our capital assets, the infrastructure with which all workers must interface day-by-day, has clearly raised the level of anxiety and insecurity in the workforce.”⁸ Paul Krugman has emphasized a related argument to explain timid wage demands on the part of workers: “These days competition among firms is more intense (why? good question), and nobody wants to let costs get out of line.”⁹

We find the evidence for worker anxiety causing wage restraint murkier but less compelling. The most important evidence against such a hypothesis is that worker surveys do not reveal widespread insecurity, and the link between insecurity and wage growth across regions is tenuous at best. Wage growth in recent years has been weaker for sectors of the economy that have been exposed to more intense competition, such as goods-producing industries and unionized firms. However, wage growth in these sectors has only been slightly below overall wage growth, especially once historical cyclical patterns are taken into account.

Finally, we briefly explore some of the social and distributional consequences of tight U.S. labor markets since the mid-1990s. The prolonged

7. Greenspan (1997).

8. Quoted in Bureau of National Affairs, *Daily Labor Report*, February 17, 1999, p. AA-1.

9. Krugman (1999, p. 38).

macroeconomic expansion of the 1990s finally appears to be paying off in terms of real and relative wage growth for low-wage workers and improvements in family incomes for the disadvantaged, even in the face of major social policy changes such as welfare reform. The concluding section summarizes our main findings and considers whether the factors we have identified are likely to be temporary or permanent.

Unemployment, Wage, and Inflation Trends

The first three data columns of table 1 report measures of the unemployment rate by sex for each of the last thirty-one years. Although the unemployment rate historically has been higher for women than for men, since the early 1980s the unemployment rate for men has exceeded or roughly equaled that for women. Last year the female unemployment rate reached its lowest level since 1953. The next three columns show the percentages of the labor force unemployed for various durations. Interestingly, the short-term unemployment rate (the rate including only persons unemployed less than five weeks in the numerator) is near an all-time low, whereas the long-term unemployment rate (which includes only those unemployed twenty-six weeks or longer) is slightly higher than it was in 1989, at the peak of the last recovery. Because the composition of unemployment has shifted toward longer spells, the average length of an ongoing unemployment spell was 22 percent higher in 1998 than in 1989, and 34 percent higher than in 1979. These statistics suggest that factors that caused the decline in short-term joblessness hold the key to understanding why unemployment is lower now than it was at the peak of previous business cycles.

The seventh data column in table 1 reports a different measure of the unemployment rate: the “work experience unemployment rate.” This variable measures the proportion of individuals in the labor force who at some time during the calendar year experienced at least one week of unemployment. Notably, in 1997 (the last year for which data are available) the work experience unemployment rate reached its lowest level since the BLS began this series in 1958. The low incidence of unemployment in this recovery is probably closely connected to the decline in short spells of unemployment. Thus, at a given unemployment rate, a smaller fraction of

the work force appears to be flowing through unemployment in the late 1990s than in the past.

Less than a decade ago, Chinhui Juhn, Kevin Murphy, and Robert Topel argued that the natural rate of unemployment had increased in the 1980s because the demand for less skilled male workers had declined, causing a rise in permanent joblessness.¹⁰ The ninth data column of table 1 indicates a steady decline during the 1970s and early 1980s in the percentage of men who are employed. Since 1984, however, the male employment-population ratio has held relatively steady, oscillating between 70 and 72 percent. This pattern is not only due to changes in the age structure: Joseph Quinn finds that the decline in this ratio came to a halt in the 1980s for older males as well.¹¹ By contrast, the female employment-population ratio has grown throughout this period, although slightly more slowly in the 1990s than in earlier decades. The combination of a persistently rising female employment ratio and a stable male employment ratio has caused the overall ratio for the civilian noninstitutional population to reach an all-time high in each of the last three years.

Recent U.S. unemployment performance is even more impressive when compared with that of other major industrialized economies. As table 2 shows, the unemployment experiences of the seven major industrialized countries and of the members of the Organization for Economic Cooperation and Development (OECD) as a whole shared a common pattern of rising unemployment from the 1960s to the 1980s, although the magnitudes of the increases vary widely. But after having consistently higher unemployment than the OECD as a whole in the 1960s, 1970s, and 1980s, the United States has had a substantially lower average rate in the 1990s. The United States is also the only major OECD economy to have a lower average unemployment rate in the 1990s (5.8 percent) than in the 1970s (6.1 percent). Furthermore, the United States and the United Kingdom are the only major countries with lower unemployment today than in the early 1990s.

Although many major economies have recorded decelerations in price inflation, only the United States has combined lower inflation with lower

10. Juhn, Murphy, and Topel (1991).

11. Quinn (1999).

Table 1. Unemployment Rates and Employment-Population Ratios, 1968–98^a

Year	Unemployment rate						Work experience unemployment rate ^b	Employment-population ratio		
	All workers	Men	Women	Duration				All persons	Men	Women
				<5 wks	5–25 wks	≥26 wks				
1968	3.6	2.9	4.8	2.0	1.4	0.2	12.4	57.5	77.8	39.6
1969	3.5	2.8	4.7	2.0	1.3	0.2	12.5	58.0	77.6	40.7
1970	4.9	4.4	5.9	2.6	2.1	0.3	15.3	57.4	76.2	40.8
1971	5.9	5.3	6.9	2.7	2.7	0.6	16.3	56.6	74.9	40.4
1972	5.6	5.0	6.6	2.6	2.4	0.7	15.5	57.0	75.0	41.0
1973	4.9	4.2	6.0	2.5	2.0	0.4	14.3	57.8	75.5	42.0
1974	5.6	4.9	6.7	2.8	2.4	0.4	17.9	57.8	74.9	42.6
1975	8.5	7.9	9.3	3.1	4.0	1.3	20.2	56.1	71.7	42.0
1976	7.7	7.1	8.6	3.0	3.3	1.4	19.1	56.8	72.0	43.2
1977	7.1	6.3	8.2	2.9	3.1	1.0	17.9	57.9	72.8	44.5
1978	6.1	5.3	7.2	2.8	2.6	0.6	15.9	59.3	73.8	46.4
1979	5.8	5.1	6.8	2.8	2.5	0.5	15.8	59.9	73.8	47.5
1980	7.1	6.9	7.4	3.1	3.3	0.8	18.1	59.2	72.0	47.7

1981	7.6	7.4	7.9	3.2	3.4	1.1	19.5	59.0	71.3	48.0
1982	9.7	9.9	9.4	3.5	4.6	1.6	22.0	57.8	69.0	47.7
1983	9.6	9.9	9.2	3.2	4.1	2.3	19.6	57.9	68.8	48.0
1984	7.5	7.4	7.6	3.0	3.1	1.4	17.4	59.5	70.7	49.5
1985	7.2	7.0	7.4	3.0	3.1	1.1	16.7	60.1	70.9	50.4
1986	7.0	6.9	7.1	2.9	3.1	1.0	16.2	60.7	71.0	51.4
1987	6.2	6.2	6.2	2.7	2.6	0.9	14.3	61.5	71.5	52.5
1988	5.5	5.5	5.6	2.5	2.3	0.7	12.9	62.3	72.0	53.4
1989	5.3	5.2	5.4	2.6	2.2	0.5	12.9	63.0	72.5	54.3
1990	5.6	5.7	5.5	2.6	2.4	0.6	14.7	62.8	72.0	54.3
1991	6.8	7.2	6.4	2.8	3.2	0.9	15.7	61.7	70.4	53.7
1992	7.5	7.9	7.0	2.6	3.3	1.5	15.8	61.5	69.8	53.8
1993	6.9	7.2	6.6	2.5	3.0	1.4	14.8	61.7	70.0	54.1
1994	6.1	6.2	6.0	2.1	2.8	1.2	13.5	62.5	70.4	55.3
1995	5.6	5.6	5.6	2.0	2.6	1.0	12.8	62.9	70.8	55.6
1996	5.4	5.4	5.4	2.0	2.5	0.9	11.7	63.2	70.9	56.0
1997	4.9	4.9	5.0	1.9	2.3	0.8	10.8	63.8	71.3	56.8
1998	4.5	4.4	4.6	1.9	2.0	0.6	...	64.1	71.6	57.1

Source: Bureau of Labor Statistics World Wide Web site.

a. Data are for the civilian noninstitutional population aged 16 and older. Years in which the unemployment rate reached a cyclical trough are italicized.

b. Percent of the labor force unemployed for at least one week during the year.

Table 2. Unemployment Rates in Industrial Countries, 1950–98^a

Country	1950s	1960s	1970s	1980s	1990s ^b	1992	1998 ^c
United States	4.4	4.7	6.1	7.2	5.8	7.3	4.6
Canada	3.8	4.7	6.6	9.3	9.7	7.7	8.5
Japan	2.1	1.3	1.7	2.5	2.9	2.2	4.0
France	1.5	1.7	3.8	9.0	11.2	10.4	12.0
Germany ^d	4.9	0.6	1.9	5.7	6.6	4.6	7.5
Italy	7.2	3.8	4.7	7.5	10.5	8.3	12.2
United Kingdom	1.7	2.0	4.4	10.1	8.4	10.0	6.3
All OECD ^e	3.5	2.8	4.3	7.0	7.3	7.3	7.0

Source: Martin (1994, table 1), Katz (1998, table 1), and Organization for Economic Cooperation and Development (1999); *Economic Report of the President*, 1999, table B-109.

a. OECD standardized unemployment rates, measured as a percentage of the total labor force.

b. Average for 1990–98.

c. Average for the first three quarters of 1998.

d. Data are for West Germany only.

e. Total unemployment in all OECD countries divided by total labor force in all OECD countries.

unemployment in the 1990s.¹² Table 3 displays recent price and wage inflation developments in the United States. The first three data columns present the main indicators of price inflation: the consumer price index (CPI-U-X1, the index for all urban consumers, with rental equivalence), the personal consumption expenditure (PCE) deflator, and the GDP implicit price deflator. As many commentators have pointed out, these measures of inflation have recently reached their lowest levels in decades.

Because labor compensation comprises more than two-thirds of the cost of producing GDP, wage growth that is unmatched by productivity growth (or by a decline in profits) tends to generate price inflation. The last three columns of table 3 present three measures of nominal labor compensation growth. Additionally, figure 1 displays five different wage series, each deflated by the CPI-U-X1. Before analyzing their trends, we briefly describe the various wage series.

The compensation per hour measure for the nonfarm business sector, derived by the BLS from the national income and product accounts (NIPA), is perhaps the measure of labor costs most widely used by macroeconomists and Wall Street economists. This series has the advantage of defining com-

12. We restrict our analysis in this study to recent changes in U.S. labor market performance. Comparative studies of the role of macroeconomic shocks and labor market institutions in explaining differences in the evolution of unemployment among OECD countries include Ball (1997) and Blanchard and Wolfers (forthcoming).

pensation broadly—perhaps too broadly, since it includes some compensation of corporate owners and payments to retired workers. The employment cost index (ECI) was designed by the BLS to provide a gauge of inflationary pressure coming from the labor market.¹³ The ECI measures wage increases within a fixed set of establishments and jobs, much as the CPI measures price inflation. Table 3 and figure 1 display trends in the ECI measure of total compensation for private sector workers. The figure also displays an experimental compensation per hour measure that was derived by BLS researchers from the ECI data; this measure uses current hours weights (as opposed to fixed job weights) to calculate total compensation costs per hour in the private sector.¹⁴ Labor economists tend to focus on the CPS wage data, which have the advantage of providing microdata on individual workers but lack information on fringe benefit costs. The CPS data used here are from the May CPS for 1973–78 and the Outgoing Rotation Group (ORG) files for 1979–98.¹⁵ Finally, the average wage of production and nonsupervisory workers, estimated from the BLS's monthly Current Employment Statistics (CES) survey of establishments, is closely watched by the financial markets and covers some 80 percent of the work force.¹⁶

Nominal hourly compensation growth as measured by the NIPA or ECI compensation data has averaged about 1.0 percentage point less from 1992 to 1998 than from 1983 to 1989. The wage and salary component of the ECI has grown about 0.75 percentage point less in this recovery than in the previous one. Nonetheless, table 3 indicates that, unlike price inflation, nominal wage growth clearly has increased in the last few years.

13. Although the ECI is widely considered the best measure of wage pressure, it has a few potential limitations. First, the ECI is a fixed-weight Laspeyres index, which may overstate compensation pressures as a result of substitution bias as relative wages change, just as the CPI may overstate increases in the cost of living because of substitution bias. Second, and parallel to the issues raised by the CPI, there may be unmeasured changes in the quality of workers within industries and occupations. The secular increase in the education of the work force that has occurred within occupations and jobs, for example, would be expected to cause the ECI to overstate the growth in labor costs. During expansions, however, upgrading of less qualified workers could cause the ECI to understate wage pressures. And third, if technological change is skill biased, the ECI will provide a misleading measure of cost pressures because job categories that are in high demand will receive too little weight. An analogous problem arises with the CPI if preferences change.

14. The measure was derived along the lines described in Barkume and Lettau (1997). We thank Michael Lettau for providing these data.

15. These data were supplied by Jared Bernstein of the Economic Policy Institute.

16. Abraham, Spletzer, and Stewart (1999).

Table 3. Price Inflation and Nominal Compensation Growth, 1968–98^a

Percent

Year	Price inflation			Compensation growth		
	CPI-U-XI	PCE deflator	GDP deflator	NIPA ^b	EI—total compensation ^c	EI—wages and salaries ^c
1968	3.9	4.0	4.4	9.3	...	...
1969	4.5	4.1	4.7	7.5	...	...
1970	4.8	4.7	5.3	6.7	...	...
1971	4.4	4.5	5.2	5.7	...	...
1972	3.0	3.5	4.3	7.1	...	...
1973	6.3	5.4	5.6	8.9	...	...
1974	10.0	10.1	9.0	11.0	...	...
1975	8.3	8.1	9.4	8.9	...	...
1976	5.7	5.7	5.8	9.2	...	7.2
1977	6.4	6.6	6.4	7.6	...	6.9
1978	6.8	7.3	7.3	9.4	...	7.6
1979	9.6	9.0	8.5	9.8	...	8.7
1980	11.2	10.9	9.3	11.0	9.6	9.1
1981	9.5	9.0	9.4	8.5	9.9	8.8

1982	6.1	5.8	6.3	6.8	6.5	6.3
1983	4.2	4.5	4.2	3.5	5.7	4.9
1984	4.3	3.8	3.8	4.6	4.9	4.2
1985	3.6	3.7	3.4	5.6	3.9	4.1
1986	1.9	2.8	2.6	4.7	3.2	3.2
1987	3.6	3.8	3.1	4.1	3.3	3.3
1988	4.1	4.2	3.7	4.2	4.8	4.1
1989	4.8	4.9	4.2	2.9	4.8	4.1
1990	5.4	5.1	4.4	6.0	4.6	4.0
1991	4.2	4.2	3.9	4.7	4.4	3.7
1992	3.0	3.3	2.8	4.5	3.5	2.6
1993	3.0	2.7	2.6	1.9	3.6	3.1
1994	2.6	2.4	2.4	1.9	3.1	2.8
1995	2.8	2.3	2.3	2.9	2.6	2.8
1996	3.0	2.0	1.9	3.8	3.1	3.4
1997	2.3	1.9	1.9	3.8	3.4	3.9
1998	1.6	0.8	1.0	4.2	3.5	3.9

Source: Bureau of Labor Statistics and Bureau of Economic Analysis World Wide Web sites.

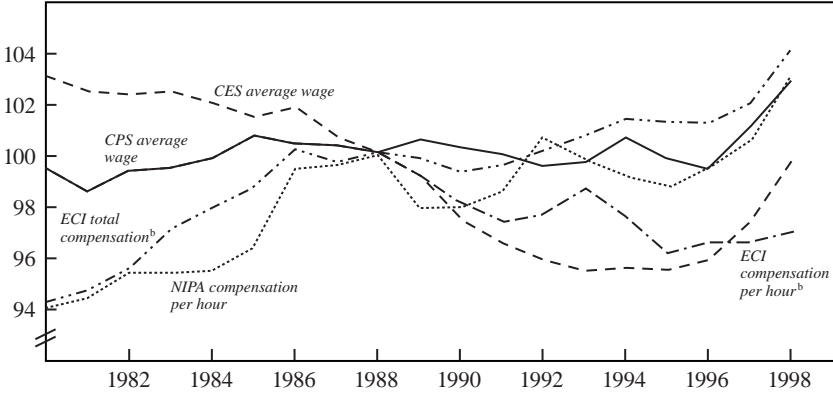
a. Years in which the unemployment rate reached a cyclical trough are italicized.

b. Compensation per hour for the nonfarm business sector only.

c. Private industry only.

Figure 1. Alternative Measures of Real Wages and Compensation, 1980–98^a

Index, 1988 = 100



Source: Bureau of Labor Statistics, Bureau of Economic Analysis, Economic Policy Institute, and Bureau of the Census World Wide Web sites.

a. All series are deflated by the CPI-U-X1 and described in the text.

b. Private industry only.

Worker well-being depends more on real than on nominal compensation. Hence, we deflate the wage series by the CPI-U-X1 in figure 1. Two features of figure 1 stand out. First, the wage series display divergent trends prior to 1996. Second, since 1996 all of the real wage series have grown by 1 to 3 percent. From 1980 to 1996, the ECI total compensation and NIPA measures of compensation per hour showed a steady upward trend, while the average wage from the CPS, the average wage of production and nonsupervisory workers, and compensation per hour derived from the ECI data showed flat or declining trends. Katharine Abraham, James Spletzer, and Jay Stewart have explored the disparate trends in the NIPA, CPS, and CES wage series.¹⁷ They conclude that different trends in hours account for half of the faster growth of the NIPA compensation measure than of the CPS wage measure between 1973 and 1997, and that different trends in payroll account for the remaining discrepancy.

Part of the divergence in the wage series can be ascribed to fringe benefits, since the CPS and CES data exclude these benefits. The wage component of the ECI has grown faster than the nonwage component in each

17. Abraham, Spletzer, and Stewart (1999).

of the last four years; only once in the preceding fifteen years did the non-wage component grow by less than the wage component. Employer health insurance costs have grown particularly slowly, actually declining by 14 cents per hour between 1994 and 1998, but other fringe benefits have also grown slowly or declined. For example, the hourly cost of providing workers' compensation insurance declined by 5 cents between 1994 and 1998.¹⁸ Because wages and nonwage benefits are fungible, it is difficult to view the deceleration in benefit costs as a separate phenomenon from the wage trends; it is likely that wages would have grown more slowly had health insurance and other benefit costs not decelerated. Available evidence suggests that the slowdown in health insurance costs was not simply a result of a one-time switch to managed care. Krueger and Levy find that the slowdown in employer health care costs occurred because of a general slowdown in the growth of health insurance premiums and because of a steady decline in employer-provided health care coverage.¹⁹ It is unclear whether the quality of health care and the extent of covered services declined as well.

Aggregate Price and Wage Phillips Curves

The coincidence of rather low and declining measured unemployment and price inflation in the United States from 1992 to 1998 is suggestive of a decline in the NAIRU relative to the 1970s and 1980s, as well as of some favorable supply shocks over the past few years. Several recent econometric studies have found that the NAIRU declined by 0.7 to 1.5 percentage points between the mid-1980s and the mid-1990s.²⁰ Much uncertainty remains, however, concerning the magnitude, sources, and persistence of the decline in the NAIRU. And much debate continues concerning the extent to which the recent declines in price inflation and unemployment reflect transitory factors as opposed to structural changes in the labor market.²¹ We first summarize, through the estimation of textbook (naive) price and wage Phillips curves, the macroeconomic patterns motivating a search for structural labor market changes. We then provide a more

18. Unpublished tables from the BLS. These figures are from the Employers Cost for Employee Compensation survey and pertain to March of each year.

19. Krueger and Levy (1997).

20. See Stiglitz (1997), Staiger, Stock, and Watson (1997a, 1997b), and Gordon (1998).

21. Gordon (1998) and Stock (1998).

detailed analysis of the relationship between wage growth and unemployment for subgroups of the labor force.

We start with the simplest macroeconomic model of the determination of the NAIRU. We specify a two-equation system for price and wage determination of the following form:

$$\begin{aligned} (1) \quad & \Delta p_t = \alpha_p + \Delta w_t + \varepsilon_{pt} \\ (2) \quad & \Delta w_t = \alpha_w + \Delta p_{t-1} - \beta u_t + \varepsilon_{wt}, \end{aligned}$$

where Δp_t is the change in the logarithm of the price index in year t , Δw_t is the change in the logarithm of the nominal wage, and u_t is the unemployment rate. The first equation can be thought of as the first difference of a “price setting” or “demand wage” relation, and the second as a “wage setting” or “supply wage” relation.²² Textbook macroeconomic models imply that the intercept in the price equation (α_p) will be $-q$, where q is expected productivity growth. In equation 2 lagged inflation is assumed to provide an adequate proxy for expected inflation. Supply shocks are not explicitly accounted for and are subsumed in the error terms. Substituting equation 2 into equation 1 yields the “expectations-augmented” Phillips curve:

$$(3) \quad \Delta p_t = \alpha + \Delta p_{t-1} - \beta u_t + \varepsilon_t,$$

where $\alpha = \alpha_p + \alpha_w$ and $\varepsilon_t = \varepsilon_{pt} + \varepsilon_{wt}$. Notice that Δp_{t-1} could be subtracted from each side of equation 3, yielding the “accelerationist” Phillips curve.

The NAIRU (u^*) is the unemployment rate at which inflation is stable in the absence of shocks: $u^* = \alpha/\beta$. Thus the wage and price Phillips curves in equations 2 and 3 can be rewritten as

$$\begin{aligned} (4) \quad & \Delta p_t = \Delta p_{t-1} - \beta(u_t - u^*) + \varepsilon_t \\ (5) \quad & \Delta w_t = -\alpha_p + \Delta p_{t-1} - \beta(u_t - u^*) + \varepsilon_{wt}. \end{aligned}$$

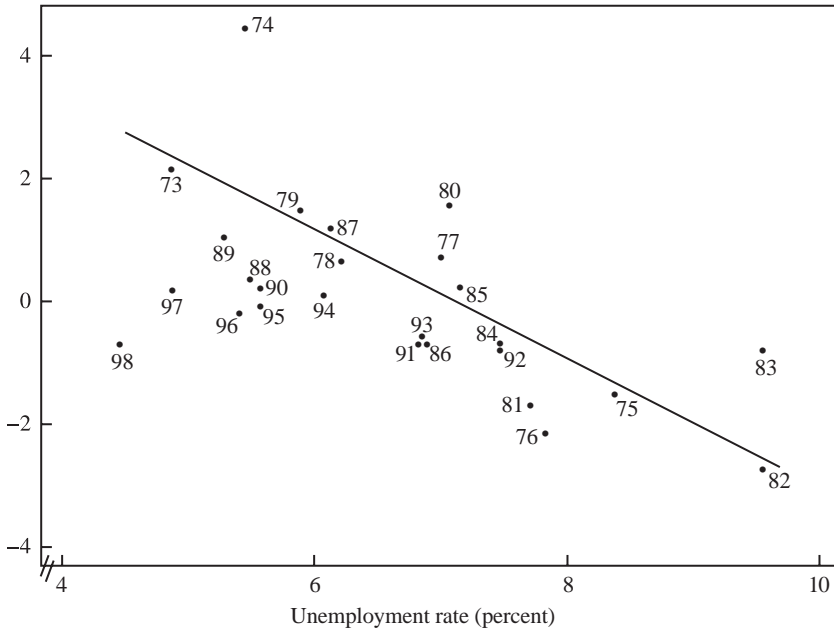
Equations 4 and 5 imply that price inflation tends to accelerate and expected real wages tend to grow faster than productivity when unemployment is below u^* .

Figure 2 is a scatter diagram of the accelerationist price Phillips curve, with the change in the PCE inflation rate on the vertical axis and the overall unemployment rate on the horizontal axis. The figure also shows the

22. This presentation follows Blanchard and Katz (1997), which contains a more elaborate discussion of these two equations.

Figure 2. Phillips Curve Using PCE Deflator, 1973–98^a

Change in inflation (percentage points)



Source: Bureau of Economic Analysis and Bureau of Labor Statistics World Wide Web sites.
 a. Line is fitted to data from 1973 to 1988.

ordinary least-squares (OLS) line fit through the observations using the years 1973–88. As Gordon and others have concluded from more sophisticated analyses, the large negative outliers in 1996–98 suggest a change in the Phillips curve relationship.²³

To (slightly) more formally test for a shift in the Phillips curve in the last decade, table 4 presents regressions of year-over-year changes in price inflation on a lagged dependent variable, the overall unemployment rate, and a dummy variable that equals one in years after 1988. The lagged dependent variable is constrained to have a coefficient of one, but if it is unconstrained, the coefficient is still very close to one. Additionally, some specifications include an interaction between the post-1988 dummy and the unemployment rate. The first three data columns of the table present

23. Gordon (1998).

Table 4. Estimated Equations for Price Phillips Curves

<i>Independent variable</i>	<i>Dependent variable^a</i>					
	<i>CPP-U-XI</i>			<i>PCE deflator</i>		
	4-1	4-2	4-3	4-4	4-5	4-6
Constant	7.15 (1.31)	8.63 (1.34)	3.37 (1.83)	6.12 (1.32)	7.44 (1.39)	2.97 (0.78)
Dependent variable lagged one year ^b	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*
Unemployment rate	-1.00 (0.18)	-1.21 (0.19)	-0.53 (0.13)	-0.86 (0.18)	-1.05 (0.19)	-0.47 (0.12)
Post-1988 dummy	-1.53 (0.49)	-7.35 (2.48)	-0.50 (0.44)	-1.71 (0.50)	-6.62 (2.57)	-0.56 (0.41)
Post-1988 dummy × unemployment rate		0.95 ^c (0.40)			0.85 ^c (0.41)	
Root-mean-squared error	1.10	1.00	1.18	1.11	1.04	1.11
Durbin-Watson statistic	1.70	2.23	1.62	2.07	2.52	1.80
Time period	1973-98	1973-98	1962-98	1973-98	1973-98	1962-98
No. of observations	26	26	37	26	26	37

Source: Authors' calculations based on data from Bureau of Labor Statistics (CPI) and Bureau of Economic Analysis (PCE) World Wide Web sites.

a. Dependent variable is the annual percentage change in the indicator. The mean (standard deviation) of the dependent variable is 5.00 (2.54) in columns 4-1 and 4-2, 4.36 (2.45) in column 4-3, 4.85 (2.54) in columns 4-4 and 4-5, and 4.24 (2.43) in column 4-6. Standard errors are in parentheses. Equations estimated by the ordinary least-squares method.

b. An asterisk indicates that the coefficient was constrained to equal 1.

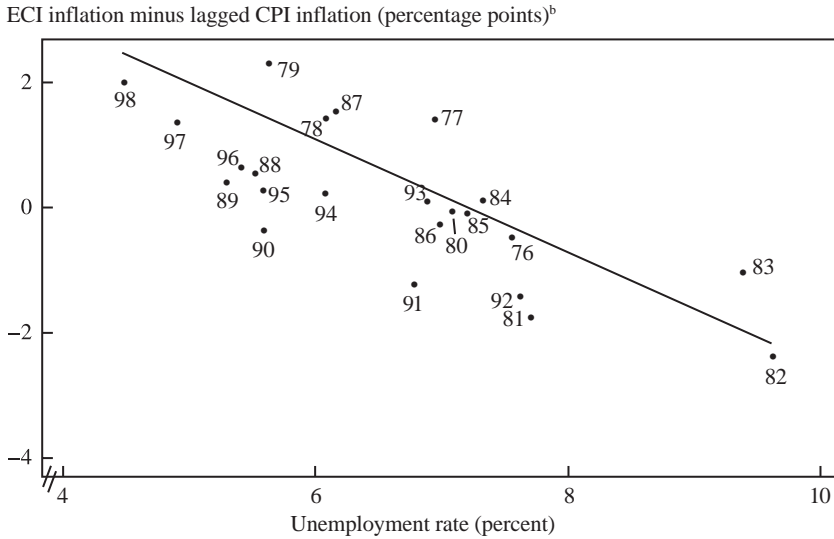
c. The *p* value for the joint *F* test of the post-1988 dummy and its interaction with the unemployment rate is 0.002 for column 4-2 and 0.006 for column 4-5.

estimates using the CPI-U-X1 to measure price inflation, and the last three columns use the PCE deflator. The equations reported in the first two columns are estimated for the period 1973–98, whereas that in the third column is estimated for 1962–98. The results are quite similar whether inflation is measured by the CPI or by the PCE. When the shorter period is used, the intercept of the Phillips curve is found to have shifted inward during the past decade, and the sensitivity of inflation to the unemployment rate is found to have become much weaker. The results for the third column, however, which include years prior to the productivity slowdown, show less evidence of a shift in the Phillips curve.²⁴

Figure 3 is a scatter diagram of a wage Phillips curve, using the percentage change in the wage and salary component of the ECI minus the lagged CPI inflation rate as the measure of wage growth, plotted against the overall unemployment rate. The figure also displays the OLS line fit through the points in the 1976–88 period. All of the observations for 1989–98 are below the predicted line, although the observation for 1998 is close to the line. By fitting a time-varying Phillips curve to quarterly ECI data, Gordon finds that the latest observations (for wage and salary) for the first half of 1998 fall right on the line, which he interprets as evidence that the wage Phillips curve has been stable. Such a conclusion appears, however, to be somewhat sensitive to the precise specification of the wage Phillips curve and the period examined.

To examine whether the relationships among wage growth, inflation, and unemployment have changed in the last decade, we performed the series of OLS regressions reported in table 5. In these regressions, which are based on equation 2, the dependent variable is the year-over-year change in the natural logarithm of nominal hourly compensation, and the independent variables include the lagged growth rate of the CPI, the unemployment rate, and a dummy variable indicating years after 1988. We measure compensation by NIPA compensation per hour, the ECI total compensation measure, the wage and salary component of the ECI, or the average hourly wage from the CPS. Because the interaction between unemployment and the post-1988 dummy is significant only for the NIPA data, we omit this variable from the other models. The regressions are esti-

24. If we include an interaction between the post-1988 dummy and the unemployment rate in the model reported in the third column, it is statistically insignificant, and the post-1988 dummy and the interaction are jointly insignificant in both the CPI and the PCE models.

Figure 3. Phillips Curve Using ECI for Wages and Salaries, 1976–98^a

Source: Bureau of Labor Statistics World Wide Web site.

a. Line is fitted to data from 1976 to 1988.

b. Inflation is lagged one year.

dated over various periods for which data are available. The coefficient on lagged (CPI) inflation is constrained to equal one, as in equation 2.

As with the price Phillips curve, results for all of the wage series in table 5 indicate a shift in the wage growth–unemployment relationship. In the last decade, wage growth has been slower than one would predict based on the historical relationship between unemployment and wage growth. Moreover, the equation for the wage and salary component of the ECI appears to have shifted inward at least as much as that for the total ECI. This suggests that special factors due to slower growth in fringe benefits are not responsible for the post-1988 inward shift of the wage Phillips curve (compare the fourth and sixth columns). Evidently the pickup in wage growth over the last few years is not sufficient to overturn the intercept shift in the wage growth equation over the last decade as a whole. We do not want to push these regressions too far, however. We readily acknowledge that the 1989–98 period for the shift was chosen arbitrarily, and the results are sensitive to the time period chosen and are not very pre-

Table 5. Estimated Equations for Wage Phillips Curves

Independent variable	Dependent variable ^a							
	NIPA compensation per hour			ECI—total compensation		ECI—wages and salaries		CPS average hourly wage
	5-1	5-2	5-3	5-4	5-5	5-6	5-7	
Constant	10.46 (1.47)	11.82 (1.57)	9.06 (0.93)	4.49 (1.02)	6.41 (1.04)	5.38 (1.10)	6.46 (1.32)	
CPI-U-X1 inflation lagged one year ^b	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*	
Unemployment rate	-1.30 (0.20)	-1.49 (0.22)	-1.13 (0.15)	-0.60 (0.13)	-0.88 (0.14)	-0.78 (0.14)	-0.93 (0.18)	
Post-1988 dummy	-2.67 (0.56)	-8.02 (2.90)	-5.26 (2.77)	-0.75 (0.37)	-1.25 (0.37)	-0.84 (0.40)	-0.96 (0.48)	
Post-1988 dummy × unemployment rate		0.87 ^c (0.42)	0.52 ^c (0.46)					
Root-mean-squared error	1.24	1.17	1.26	.65	.74	70	1.02	
Durbin-Watson statistic	1.37	1.55	1.89	1.96	1.61	1.57	2.34	
Time period	1973–98	1973–98	1962–98	1980–98	1976–98	1980–98	1974–98	
No. of observations	26	26	37	19	23	19	25	

Source: Authors' calculations based on data from Bureau of Labor Statistics (ECI and CPI), Bureau of the Census (CPS), and Bureau of Economic Analysis (NIPA) WorldWide Web sites.
a. Dependent variable is the annual percentage change in the indicator. ECI data are for private industry only. The mean (standard deviation) of the dependent variable is .594 (2.82) in columns 5-1 and 5-2, 5.95 (2.54) in column 5-3, 4.65 (2.05) in column 5-4, 4.90 (2.11) in column 5-5, 4.33 (1.83) in column 5-6, and 5.01 (2.28) in column 5-7. Standard errors are in parentheses.
b. An asterisk indicates that the coefficient was constrained to equal 1.
c. The *p* value for the joint *F* test of the post-1988 dummy and its interaction with the unemployment rate is 0.000.

cisely estimated.²⁵ But these results suggest that something may have caused a change in the wage-setting relationship in the last decade, facilitating less wage-push inflation despite low unemployment. If nothing else, these results suggest that it is worth probing what might have caused the wage growth–unemployment relationship to shift.

A final word on statistical measurement changes is required. It is well known that the BLS made several adjustments to the CPI in the mid-1990s that likely reduced the inflation rate. Gordon, for example, estimates that an approximately 0.2-percentage-point decline in estimates of the NAIRU from 1988 to 1998 may be due to changes in the measurement of the CPI.²⁶ It is also the case, however, that the BLS redesigned the CPS questionnaire in 1994, which may have affected the measured unemployment rate. Polivka and Miller find that the redesign of the CPS may have raised the aggregate unemployment rate by 0.2 percentage point, with the effect being larger for women.²⁷ If the CPS revision increased measured unemployment compared with what it would have been with the old questionnaire, the NAIRU would have fallen by even more than 0.7 to 1.5 percentage points since the mid-1980s.

Wage Trends and Phillips Curves for Subgroups of Workers

Wage growth has not been uniform for all groups in the labor market. It is well known, for example, that average wages grew more in the 1980s and early 1990s for workers with a college education than for those with a high school education or less.²⁸ Similarly, real wages have declined for the lower deciles of the wage distribution since the 1970s but have increased for those in the higher-wage deciles. Figure 4 illustrates the

25. A grid search over possible years for the intercept shift typically finds that a post-1987 dummy maximizes the *R*-square of the wage growth equations.

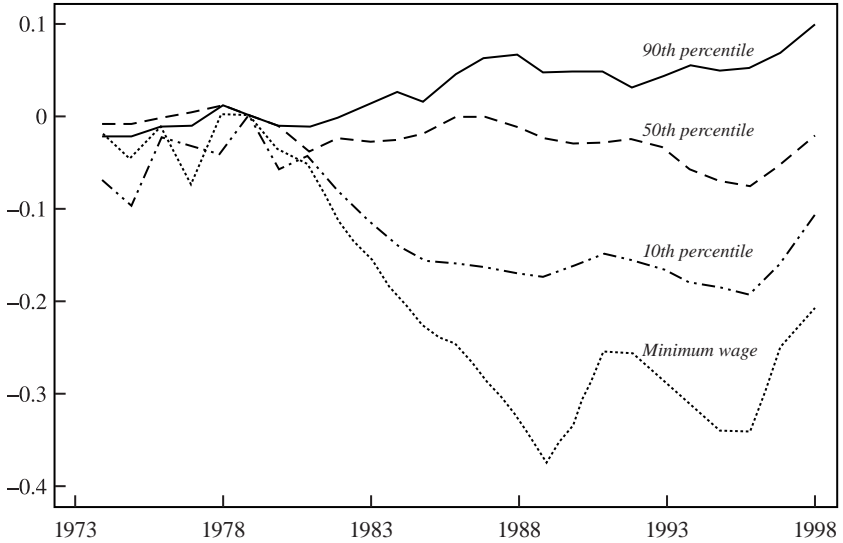
26. Gordon (1998, table 6). The BLS is currently devising a consistent CPI series that adjusts the historical data to be comparable with the current data. This series will be useful for future analyses.

27. Polivka and Miller (1995).

28. See, for example, Levy and Murnane (1992) and Katz and Autor (1999). One difficulty in comparing wages across education groups is that the average “quality” of the groups may change over time; for example, the quality of education could change. Scores on the National Assessment of Educational Progress examination for 17-year-olds have remained relatively stable or increased since the early 1970s; see National Center for Education Statistics (1997).

Figure 4. Real Wages by Percentile and the Real Minimum Wage, 1973–98^a

Log scale, 1979 = 0



Source: Authors' calculations using data from the Bureau of Labor Statistics and the Economic Policy Institute.
 a. Wages deflated by the CPI-U-X1.

cumulative growth of the logarithm of real wages relative to 1979 for workers at the 10th, 50th, and 90th percentiles for each year from 1973 to 1998, as well as the value of the minimum wage.²⁹ The minimum wage fell by 31 percent in real terms between 1979 and 1989. The wage at the 10th percentile of the distribution fell by 16 percent in this period but has rebounded by 6.6 percent since 1989, with most of the increase occurring in 1997–98. From an analysis of regional variation in wages, David Lee attributes much of the 1980s decline in the relative earnings of workers at the bottom of the wage distribution to the declining relative (and real) value of the minimum wage.³⁰ The median worker saw a real decline of 2 percent in his or her earnings between 1979 and 1989 and a steeper decline in the mid-1990s, until real wages recovered during 1997–98.

29. The CPI-U-X1 is used to deflate the wage series. The wage data are from the May 1973–78 CPS and the ORG files for 1979–98. The data were provided by Jared Bernstein.

30. Lee (1999).

Finally, the worker at the 90th percentile of the distribution experienced a 4 percent gain in real earnings from 1979 to 1989 and another 5 percent gain between 1989 and 1998. One way in which the 1990s recovery differs from the 1980s recovery is that real wage growth has been more widespread throughout the distribution seven to eight years into the 1990s recovery.

Tables 6 and 7 present estimates of wage Phillips curves using the average hourly wages of workers with different levels of education; the wage measures are derived from CPS data from 1973 to 1997. Table 6 uses the overall unemployment rate to predict wage growth, whereas table 7 uses the unemployment rate specific to each education group. That is, in table 7 the unemployment rate of high school dropouts is used to predict high school dropouts' wage growth, the unemployment rate of high school graduates is used to predict high school graduates' wage growth, and so on.³¹

The results in table 6 indicate that wage growth is more responsive to the overall unemployment rate for workers with a lower level than for those with a higher level of education. This finding is in keeping with a large literature that finds that skill upgrading is more common during periods of low unemployment and that wage differentials tend to be compressed during such periods.³² Interestingly, when the education group-specific unemployment rate is used in the regression in table 7, the pattern is reversed: more-educated groups experience stronger wage growth when *their* unemployment rate declines by a percentage point compared with less educated groups. Because the unemployment rate is much more variable over the business cycle for less educated workers, this finding is not surprising: a tight labor market is especially tight for low-skill workers. Furthermore, the much higher average unemployment rate for dropouts implies a lower wage growth elasticity with respect to the group's unemployment rate for dropouts than for other education groups.

The results in table 6 further suggest that the post-1988 intercept shift of the wage Phillips curve was primarily brought about by a shift for less

31. We experimented with including a variable that measures the change in the logarithm of the minimum wage in the regressions in tables 6 and 7, but this variable had an insignificant and small effect. In addition, the other coefficients were unaffected by the inclusion of this variable.

32. Okun (1973).

Table 6. Estimated Equations for Wage Phillips Curves by Education Level Using the Overall Unemployment Rate

<i>Independent variable</i>	<i>Educational attainment of wage earner^m</i>			
	<i>Less than high school</i>	<i>High school</i>	<i>Some college</i>	<i>College graduate or higher^b</i>
	<i>6-1</i>	<i>6-2</i>	<i>6-3</i>	<i>6-4</i>
Constant	8.90 (2.26)	6.39 (1.40)	7.38 (1.88)	4.91 (2.21)
CPI-U-X1 inflation lagged one year ^c	1.00*	1.00*	1.00*	1.00*
Overall unemployment rate	-1.39 (0.31)	-1.00 (0.19)	-1.12 (0.26)	-0.75 (0.30)
Post-1988 dummy	-2.48 (0.80)	-1.14 (0.50)	-1.44 (0.66)	0.11 (0.78)
Root-mean-squared error	1.68	1.04	1.40	1.65
Durbin-Watson statistic	2.19	1.96	2.35	2.30

Source: Authors' calculations based on data from the Economic Policy Institute (EPI; calculated from CPS data) and the Bureau of the Census World Wide Web sites.

a. The dependent variable is the annual change in the logarithm of the average wage of the indicated group. The mean (standard deviation) of the dependent variable is 3.81 (2.98) in column 6-1, 4.47 (2.24) in column 6-2, 4.56 (2.66) in column 6-3, and 5.16 (2.30) in column 6-4. Data are annual and span the period 1974-97 for all estimates; sample size is twenty-four observations. Wage data are for workers aged 18-64. Standard errors are in parentheses.

b. EPI reports average wages for college graduates separately for two groups: those with a college (baccalaureate) degree but no further education, and those with education beyond college. Estimates are based on weighted averages of the two groups using weights of 0.7 and 0.3, respectively.

c. An asterisk indicates that the coefficient was constrained to equal 1.

Table 7. Estimated Equations for Wage Phillips Curves by Education Level Using Education-Specific Unemployment Rates^a

<i>Independent variable</i>	<i>Educational attainment of wage earner^a</i>			
	<i>Less than high school</i>	<i>High school</i>	<i>Some college</i>	<i>College graduate or higher^b</i>
	7-1	7-2	7-3	7-4
Constant	4.64 (1.88)	2.94 (1.21)	5.29 (1.45)	2.08 (1.97)
CPI-U-X1 inflation lagged one year ^c	1.00*	1.00*	1.00*	1.00*
Education-specific unemployment rate ^d	-0.58 (0.18)	-0.60 (0.19)	-1.25 (0.29)	-1.07 (0.80)
Post-1988 dummy	-0.13 (0.84)	-0.08 (0.55)	-0.35 (0.60)	1.16 (0.77)
Root-mean-squared error	1.94	1.30	1.41	1.80
Durbin-Watson statistic	2.10	1.75	2.10	2.25

Source: Authors' calculations based on data from the Economic Policy Institute (calculated from CPS data) and the Bureau of Labor Statistics World Wide Web site.

a. The dependent variable in all equations is the annual change in the logarithm of the average wage of the indicated group. Data are annual and span the period 1974-97 for all estimates. Means and standard deviations of the dependent variable for each column are the same as in table 6. Wage data are for workers aged 18-64. Sample size is twenty-four observations. Standard errors are in parentheses.

b. Average wage calculated as in table 6.

c. An asterisk indicates that the coefficient was constrained to equal 1.

d. Rates pertain to March of each year. Data for 1997 are from the BLS website and are for wage earners 25 and over, whereas data for 1973-96 are from U.S. Department of Labor (1997, table 56) and are for ages 25-64 only. To make the 1997 data comparable, the difference between the unemployment rates in the two sources (when data from both are available) is added for each education level.

educated workers.³³ The Phillips curve for college graduates indicates no such shift. We can calculate, using the estimates in table 6, the unemployment rate required to generate positive expected real wage growth for each education group. Interestingly, the point estimates in the top panel imply that real wage growth arrived when unemployment was below 6.4 to 6.6 percent for all education groups prior to 1989. In the 1989–98 period, the unemployment rate associated with zero expected wage growth is estimated to have declined to 4.6 percent for the group with less than a high school education, and to 5.3 percent for both those with exactly high school and those with some college education. The estimates in table 7 suggest that the group-specific unemployment rates at which one would expect positive real wage growth are rather stable over time for all of the education groups.

Table 8 presents several additional estimates of wage Phillips curves, using wage growth among workers occupying the 10th, 30th, 50th, 70th, or the 90th percentile of the wage distribution as the dependent variable. In addition to the unemployment rate, these models include the change in the logarithm of the nominal minimum wage as an explanatory variable.³⁴ Again, lagged CPI inflation is constrained to have a unit coefficient. These results also indicate that wage growth is more responsive to the overall unemployment rate for the least-paid groups of workers. According to the model with the unconstrained inflation rate (not shown), a 1-percentage-point increase in the unemployment rate is associated with an increase in wages at the 10th percentile of 1.5 percent, and at the 90th percentile of 0.4 percent. The last two rows of the table report the point estimates for the implied unemployment rate associated with zero expected real compensation growth (URZERCG) for each decile. Interestingly, in the pre-1989 period, the URZERCG tends to rise with the wage level, as expected in a period of rising wage inequality and sharp labor shifts against less skilled

33. The results in table 7, however, indicate little shift in the Phillips curve for any of the education groups when group-specific unemployment rates are used and when lagged inflation is constrained to have a coefficient of 1.0. But because the earlier, aggregate results in table 5 are based on the overall unemployment rate, the results in table 6 are probably most relevant for understanding the underlying trends that influenced the aggregate Phillips curve.

34. If the minimum wage increased in the middle of a year, we calculated the average wage in place during the course of the year. That is, we weighted the minimum wage by the number of months that it was in effect during the year. The results were qualitatively similar if we excluded this variable.

Table 8. Estimated Equations for Wage Phillips Curves by Percentile of the Wage Distribution

<i>Independent variable</i>	<i>Place of wage earner in wage distribution^a</i>				
	<i>10th percentile</i>	<i>30th percentile</i>	<i>Median</i>	<i>70th percentile</i>	<i>90th percentile</i>
	8-1	8-2	8-3	8-4	8-5
Constant	9.74 (3.27)	9.44 (1.70)	5.89 (1.79)	7.74 (1.92)	7.19 (1.82)
CPI-U-X1 inflation lagged one year ^b	1.00*	1.00*	1.00*	1.00*	1.00*
Unemployment rate	-1.57 (0.42)	-1.40 (0.22)	-0.86 (0.23)	-1.02 (0.25)	-0.95 (0.24)
Percentage change in the log minimum wage	0.14 (0.08)	(0.02) (0.04)	0.00 (0.05)	-0.04 (0.05)	0.00 (0.05)
Post-1988 dummy	-0.81 (1.09)	-1.66 (0.57)	-1.25 (0.60)	-1.65 (0.64)	-1.63 (0.61)
Root-mean-squared error	2.24	1.16	1.22	1.31	1.25
Durbin-Watson statistic	2.68	2.06	2.08	2.24	2.08
Implied URZERG, ^c 1974-88	6.2	6.7	6.8	7.4	7.6
Implied URZERG, ^c 1989-98	5.7	5.6	5.4	5.7	5.8

Source: Authors' calculations based on data from the Bureau of Labor Statistics World Wide Web site and the Economic Policy Institute.

a. Dependent variable is the annual change in the logarithm of the wage for the worker at the indicated percentile times 100. Wage data calculated from May CPS (1973-78) and ORG CPS (1979-98) by the Economic Policy Institute. Sample size is twenty-five observations. The mean (standard deviation) of the dependent variable is 4.74 (3.47) for column 8-1, 4.74 (2.38) for column 8-2, 4.78 (2.32) for column 8-3, 4.98 (2.43) for column 8-4, and 5.36 (2.32) for column 8-5.

b. An asterisk indicates that the coefficient was constrained to equal 1.

c. Unemployment rate associated with zero expected real compensation growth.

workers. In the 1989–98 period, however, the implied URZERCG is roughly constant for each of the wage deciles, indicating a much more egalitarian impact of tight labor markets across the wage distribution in the 1990s. But a lower unemployment rate appears to have been necessary to generate positive real wage growth in the past decade relative to the 1974–88 period.

Beveridge Curves

The Beveridge curve, or the relationship between job vacancies and unemployment, can provide additional clues about the nature of possible structural changes in the labor market.³⁵ Labor market innovations that reduce the equilibrium unemployment rate by improving the efficiency of matching in the labor market or by increasing job search effort by the unemployed are likely to generate an inward shift in the Beveridge curve. Demographic shifts reducing the share of younger workers in the labor force should also be associated with an inward movement in the Beveridge curve, because these workers have a higher rate of job turnover (a higher rate of inflow into unemployment). In contrast, wage restraint driven by pure reductions in worker bargaining power arising from a decline in union membership, increased worker psychological “insecurity,” or increased international competition should shift the wage Phillips curve inward but should not systematically shift the Beveridge curve. Increased rates of economic turbulence from rising globalization and more rapid technological change (the “new economy”) could probably be reinterpreted as an increased rate of job reallocation and be expected to shift the Beveridge curve outward. Thus the major alternative hypotheses for wage restraint and low unemployment result in different predictions about changes in the unemployment-vacancy relationship in the 1990s.

The lack of a consistent national job vacancy series for the United States creates difficulties for assessing shifts in the U.S. Beveridge curve. Researchers are forced to rely on the Conference Board’s help wanted index, which is based on newspaper help wanted advertising, as a proxy

35. See Blanchard and Diamond (1989) for a derivation of the theoretical underpinnings of the Beveridge curve and an assessment of its usefulness in identifying the sources of changes in unemployment.

for the job vacancy rate. Katharine Abraham has shown that cyclical movements in the normalized help wanted index (the ratio of the help wanted index to total nonfarm payroll employment) tend to closely track cyclical movements in direct job vacancy measures in those periods and locations for which both series are available.³⁶ But Abraham also finds that secular movements in the normalized help wanted index are likely to have deviated from those in the “true” underlying job vacancy rate because of changes in the newspaper industry and changes in employer recruiting practices. (In particular, pressures to provide equal employment opportunity to women and minority workers increased the use of help wanted advertising for a given level of job vacancies in the 1970s.) We use a proxy for the job vacancy rate that is based on the normalized help wanted index, and we incorporate Abraham’s adjustments through 1985. Because there has been little systematic analysis of changes in the use of help wanted advertising since 1985, we naively assume no change in the relationship between the normalized help wanted index and the vacancy rate since 1985.³⁷

Figure 5 is a scatter diagram of the U.S. unemployment-vacancy relationship from 1960 to 1998. The figure demonstrates an outward shift in the Beveridge curve in the 1970s. Abraham’s analysis of the period through 1985 suggests that both demographic changes (an increased share of younger workers in the labor market) and increased regional dispersion in labor market performance played a role in this outward shift.³⁸

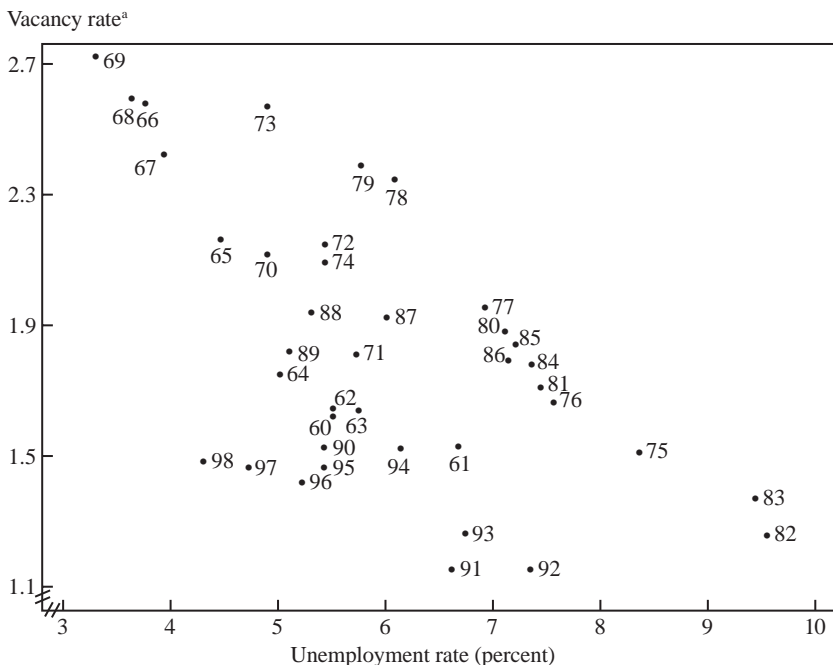
Figure 5 also suggests a large inward shift in the Beveridge curve from the mid-1980s to the 1990s that has more than reversed the earlier outward shift of the 1970s. This recent movement in the Beveridge curve is poten-

36. Abraham (1987).

37. We are grateful to Hoyt Bleakley for providing us with the data on job vacancy proxies and on the Conference Board help wanted index. Bleakley and Fuhrer (1997) provide documentation for this job vacancy proxy and provide a more detailed analysis of recent changes in the U.S. Beveridge curve and the efficiency of job matching. Our job vacancy measure is a rescaled version of the normalized help wanted index including Abraham’s adjustments through 1985. The variable is scaled to match earlier estimates of actual job vacancy rates following Blanchard and Diamond (1989). Our post-1985 vacancy proxy differs from the measure used by Bleakley and Fuhrer, since we do not assume a continued trend inward shift in the job vacancy rate relative to the normalized help wanted index after 1985.

38. Abraham (1987).

Figure 5. Job Vacancies and Unemployment, 1960–98



Source: Conference Board and Bureau of Labor Statistics World Wide Web site.

a. Defined as 100 times the ratio of vacancies to the sum of vacancies and employment, based on a normalized help wanted index as adjusted by Abraham (1987).

tially supportive of hypotheses emphasizing structural labor market changes that have increased the efficiency of job matching, demographic shifts toward older and more stable workers, and (perhaps less plausibly) reductions in job reallocation intensity. An important caveat in drawing such a conclusion is the possibility of changing hiring practices that have led to less reliance on help wanted advertising for a given level of true job vacancies. For example, the growth of the temporary help industry and of Internet job listings could both improve the efficiency of job matching and reduce the number of newspaper help wanted ads placed for a given level of job vacancies. To the extent the latter effect is present, the use of data from the help wanted index as a proxy for job vacancies will tend to overstate the true inward shift in the Beveridge curve.

Demographic Change and the NAIRU

A venerable macroeconomic tradition examines the extent to which changes in the age and sex composition of the labor force can explain secular movements in the unemployment rate. The much higher unemployment rates for teenagers and young adults than for adults of prime working age make it plausible that changes in the age structure of the work force can substantially affect the unemployment rate. Seminal studies by George Perry and by Robert Gordon provide strong evidence that changes in the age and sex composition of the work force (the labor market entry of the baby-boom cohorts and a rapid expansion of female labor force participation) contributed to an increase in the NAIRU in the 1960s and 1970s.³⁹ The convergence in male and female unemployment rates since the early 1980s indicates that the direct effect of sex-composition changes on the unemployment rate is unlikely to have been important over the past two decades. But recent studies by Robert Shimer and by Robert Horn and Phillip Heap suggest that age-structure changes driven by the maturing of the baby-boom cohorts can account for a substantial part of the lower unemployment in the 1990s than in the 1970s and 1980s.⁴⁰ In this section we reassess the role of age-structure changes and explore the possible consequences for the NAIRU of continuing secular increases in the educational attainment of the adult work force.

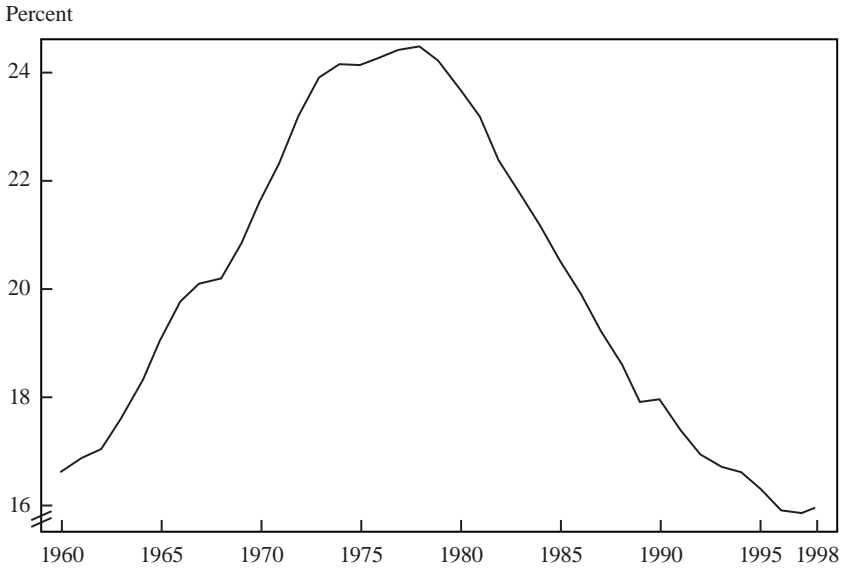
The potential importance of age-structure changes for the trend in the aggregate unemployment rate is highlighted by the large differences in unemployment rates across age groups and by the dramatic rise and then fall in the labor force share of young workers over the past four decades. Figure 6 shows that the share of 16- to 24-year-olds in the labor force increased from 16.6 percent in 1960 to 24.5 percent in 1978 and then declined to 15.8 percent in 1997.⁴¹

Table 9 summarizes trends in unemployment rates for seven discrete age groups from the 1960s to the 1990s. The average unemployment rates for teenagers (those aged 16–19) and young adults (20–24) for the entire

39. Perry (1970); Gordon (1982).

40. Shimer (1998); Horn and Heap (1999). In contrast, Gordon (1997) argues that increases in the labor force share of young workers help explain the rise in the NAIRU in the 1970s, but that declines in the youth share failed to lower the NAIRU in the 1980s.

41. The BLS forecasts that the current low share of young workers in the labor force will persist over the next decade, rising only from 15.9 percent in 1998 to 16.4 percent in 2006. See Fullerton (1997, table 7).

Figure 6. Labor Force Share of Young Workers, 1960–98^a

Source: Bureau of Labor Statistics World Wide Web site and Robert Shimer of Princeton University.
a. Workers aged 16–24.

1960–98 period were 16.8 and 9.6 percent, respectively, compared with 4.2 percent and 3.7 percent for persons aged 35–44 and 45–54, respectively. The higher unemployment rates of young workers largely reflect higher rates of inflow into unemployment (that is, greater employment instability), not longer durations of unemployment. Thus the aging of the work force is consistent with the substantial decline in inflow rates into unemployment in the 1990s compared with the 1980s and 1970s.⁴²

Table 9 also indicates the potential role of age-composition changes in accounting for differences in unemployment experiences across recent decades. Although the average overall unemployment rate was higher in the 1970s than it has been in the 1990s (6.2 percent versus 5.9 percent), the average unemployment rates for five of the six age groups of the working-age population (those aged 16–64) were lower in the 1970s. But age group–specific unemployment rates were higher for all six age groups on average in the 1980s than in the 1990s, and higher in 1989 than in 1998.

42. See, for example, Bleakley and Fuhrer (1997).

Table 9. Unemployment Rates by Age Group, 1960–98

Percent

<i>Age group</i>	<i>1960s</i>	<i>1970s</i>	<i>1980s</i>	<i>1990s^a</i>	<i>1989</i>	<i>1998</i>	<i>1960–98</i>
16–19	14.5	16.8	18.6	17.3	15.0	14.6	16.8
20–24	7.4	10.0	11.4	9.6	8.6	7.9	9.6
25–34	4.2	5.5	7.1	5.8	5.2	4.3	5.7
35–44	3.4	3.9	5.1	4.5	3.8	3.4	4.2
45–54	3.2	3.5	4.5	3.8	3.2	2.7	3.7
55–64	3.4	3.3	4.1	3.8	3.2	2.6	3.6
65 and over	3.5	3.9	3.1	3.5	2.6	3.2	3.5
All ages	4.8	6.2	7.3	5.9	5.3	4.5	6.0

Source: Bureau of Labor Statistics World Wide Web site.

a. Average for 1990–98.

Thus the stronger unemployment performance in the expansion of the 1990s than in that of the 1980s does not appear to be attributable only to age-composition effects.

We use a simple shift-share decomposition analysis to assess the mechanical effect of age-structure changes on trends in unemployment from 1960 to 1998.⁴³ We again divide the labor force into seven age groups and ask the following question: What would have happened to unemployment if the age structure of the labor force had remained constant over the 1960–98 period? Our initial assumption is that if the age shares had remained fixed from 1960 to 1998, the disaggregate, age-specific unemployment rates would have evolved no differently than did the actual observed paths. The actual overall unemployment rate at time t (U_t) equals the weighted average of the age group-specific rates (u_{jt} 's, where j indexes age groups) using the actual time t labor force shares (ω_{jt} 's) as weights:

$$(6) \quad U_t = \sum_j \omega_{jt} u_{jt}.$$

The hypothetical age-constant unemployment rate at time t (UFW_t) is simply given by the weighted average of the group-specific unemployment rates in period t using a fixed set of age-group weights for some baseline time period (ω_j 's):

$$(7) \quad UFW_t = \sum_j \omega_j u_{jt}.$$

43. Our approach closely follows that of Summers (1986) and Shimer (1998).

The age adjustment to the unemployment rate in period t is then simply given by the difference between the actual and the age-constant unemployment rates ($U_t - UFW_t$).

The time pattern of the implied age adjustments to the unemployment rate is relatively insensitive to the choice of base year. Table 10 illustrates the potential mechanical effects of age-structure changes on the unemployment rate using fixed age-group labor force weights for two alternative base periods: the average shares for the 1960–98 period and the age-group share in 1979, the midpoint of the period.⁴⁴ The estimates using the full-period average age-group shares imply that age-structure changes can account for a rise in the unemployment rate of 0.63 percentage point from 1960 to 1979 and then a decline of 0.69 percentage point from 1979 to 1998.

An alternative approach, following Robert Shimer, to examining the impact of changes in the age structure on the unemployment rate is to directly calculate a measure of “age-driven” unemployment.⁴⁵ We define the age-driven unemployment rate in year t , UA_t , as

$$(8) \quad UA_t = \sum_j \omega_j u_{j0},$$

where u_{j0} is the group-specific unemployment rate for group j in a base period. Changes in UA_t are entirely driven by changes in the age structure (the ω_j 's). The last column of table 10 summarizes the trend in the age-driven unemployment rate, with u_{j0} set equal to the average unemployment rate for age group j over the entire 1960–98 period. The age-driven unemployment rate increased by 0.71 percentage point from 1960 to 1979 and has since declined by 0.73 percentage point.

Thus alternative age adjustments lead to similar results: likely significant reductions in unemployment from an aging population over the past two decades. Furthermore, BLS projections of changes in labor force composition over the next decade predict little change in age-driven unemployment through 2006, as shown in the last row of table 10.

How far do the mechanical effects of age-structure changes go toward explaining the lower unemployment of the 1990s? The age adjustments in table 10 can account for essentially all of the 0.5-percentage-point decline in the unemployment rate from the trough of 1979 to that of 1989.

44. We normalize the age adjustments to equal zero in 1979 for both choices of base period.

45. Shimer (1998).

Table 10. Age Composition of the Labor Force and Unemployment, 1960–2006

Year	Unemployment rate	Age adjustment ^a		Age-driven unemployment rate ^b
		Using 1960–98 labor force shares	Using 1979 labor force shares	
1960	5.5	-0.63	-0.55	5.69
1963	5.7	-0.60	-0.58	5.74
1966	3.8	-0.35	-0.21	5.96
1969	3.5	-0.33	-0.21	6.04
1973	4.9	-0.29	-0.06	6.32
1976	7.7	0.06	-0.02	6.38
1979	5.8	0.00	0.00	6.40
1982	9.7	-0.02	-0.19	6.22
1984	7.5	-0.25	-0.29	6.12
1985	7.2	-0.30	-0.33	6.08
1989	5.3	-0.49	-0.44	5.90
1992	7.5	-0.65	-0.69	5.76
1995	5.6	-0.68	-0.67	5.72
1998	4.5	-0.69	-0.63	5.67
2006 ^c	...	...	...	5.62

Source: Authors' calculations based on data from the Bureau of Labor Statistics World Wide Web site, Fullerton (1997, p. 7), and Robert Shimer of Princeton University.

a. Calculated for each year by first creating an age-constant unemployment rate for that year as a fixed-weighted average of the age group-specific unemployment rates for the seven age groups in table 9, using the average labor force shares in one of two base periods (1960–98 and 1979) as weights. The adjustment for labor force composition is then the difference between the actual overall unemployment rate and the age-constant unemployment rate. See equations 6 and 7 in the text. The age adjustments using 1960–98 weights are normalized to zero in 1979.

b. The age-driven unemployment rate (UA) does not include cyclical variations in unemployment; rather, it simply tracks changes in unemployment predicted by changes in the age composition of the labor force among the seven age groups: $UA_t = \sum_j \omega_j \mu_{jt}$, where ω_j is the age group-specific unemployment rate for group j over the 1960–98 period and ω_j is the labor force share of group j in year t .

c. Age group-specific labor force shares for 2006 are based on BLS labor force projections.

But age-composition effects account for only around a 0.2-percentage-point decline in unemployment from 1989 to 1998, or about one-quarter of the 0.8-percentage-point actual change.

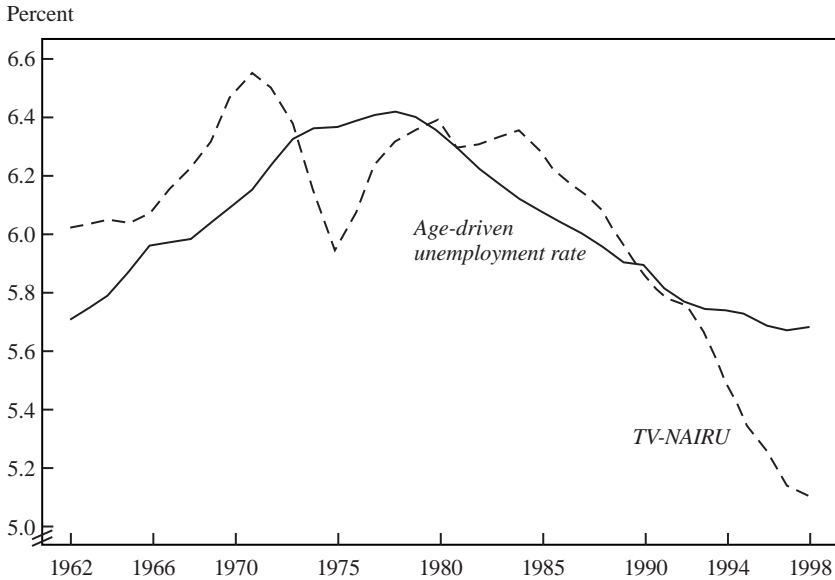
Age-structure changes also do not appear large enough to fully explain existing estimates of the decline in the NAIRU since the mid-1980s. Staiger, Stock, and Watson, using the core PCE from 1984 to 1994, provide a point estimate (with much uncertainty) of a 1.4-percentage-point decline in the time-varying NAIRU (TV-NAIRU), whereas age adjustments explain a decline in unemployment of approximately 0.3 to 0.4 percentage point over the same period.⁴⁶ Mark Watson's updated estimates using the GDP deflator as the price measure indicate a decline in the TV-NAIRU from 1985 to 1998 of 1.2 percentage points, compared with a decline in age-driven unemployment of 0.4 percentage point over the same period.⁴⁷ Figure 7 plots Watson's point estimates of the TV-NAIRU and our own measure of age-driven unemployment from 1962 to 1998. The figure indicates that age-driven unemployment tracks the TV-NAIRU reasonably well through the end of the 1980s, but that the TV-NAIRU has diverged downward relative to the age-driven unemployment rate in the 1990s.

We conclude that age-structure changes can explain a significant fraction—perhaps one-third—of the decline in the NAIRU since the mid-1980s. The consideration of further demographic adjustments for changes in the sex (or age and sex) composition of the work force does not alter these quantitative conclusions for the past two decades.⁴⁸ Thus existing

46. Staiger, Stock, and Watson (1997a, table 1).

47. We are grateful to Mark Watson for providing us with estimates of the TV-NAIRU from 1962 to 1998. These estimates follow the methodology of Staiger, Stock, and Watson (1997a, 1997b) but use quarterly data, use the GDP deflator as the price measure, and include controls for standard supply shock measures (food and energy price shocks, exchange rate movements, and indicators for the price controls of the Nixon administration).

48. Military personnel trends are another factor that may influence the demographic composition of the civilian labor force. Since military personnel are disproportionately young adults and are not included in measures of the civilian labor force, the substantial reduction in military personnel on active duty since the end of the Vietnam War in the mid-1970s has tended to increase the share of young workers in the civilian labor force. Military personnel on active duty declined from 3.7 percent of the civilian labor force in 1970 to 1.9 percent in 1980, 1.6 percent in 1990, and 1.1 percent in 1997 (*Statistical Abstract of the United States*, 1998 table 582; U.S. Department of Labor, 1999, table A-1; Kosters, 1999, table 3). To the extent that military personnel have civilian labor market prospects typical of others in their age group, our age-structure adjustments incorporate the impacts of changes in military requirements on the measured civilian unemployment rate. Military downsizing in the 1990s has probably modestly attenuated the reduction in age-driven unemployment.

Figure 7. Age-Driven Unemployment Rate and the Time-Varying NAIRU, 1962–98

Source: Authors' calculations as described in table 10. TV-NAIRU data were provided by Mark Watson of Princeton University.

estimates of the TV-NAIRU suggest a further decline in the NAIRU since the mid-1980s of at least 0.3 to 1 percentage point that cannot be accounted for by mechanical demographic composition effects.

A key assumption behind the age adjustments to unemployment in table 10 is that changes in the age composition of the labor force do not affect age group-specific unemployment rates. The labor economics literature on the effects of relative cohort size on the labor market outcomes of young workers has generated a somewhat mixed set of conclusions.⁴⁹ Robert Shimer has recently explored the effect of relative cohort size on differences in unemployment across age groups in the United States. He finds that the unemployment rate for a given age group tends to rise relative to those of other groups when that age group's share of the labor force

49. Important early work on cohort size and earnings includes Freeman (1979) and Welch (1979). Recent studies have tended to find somewhat ambiguous results concerning the effects of relative cohort size on the employment and earnings of young workers. See, for example, Blanchflower and Freeman (1996).

increases.⁵⁰ This pattern suggests that shift-share age adjustments may understate the effects of changes in the age structure on the unemployment rate, as the composition effects of age-structure changes are magnified by impacts of relative cohort size on the unemployment rates of young workers. Shimer finds much larger age-structure effects under the assumption that changes in age structure do not affect the unemployment of prime-age workers. Shimer's modified age adjustments can completely explain almost all of the decline in estimates of the NAIRU from the late 1970s to the early 1990s, but the phenomenon of lower unemployment in the late 1990s than in the late 1980s still remains unexplained after his preferred demographic adjustment.

A further issue, raised by Lawrence Summers in an analysis of high unemployment in the mid-1980s, is the extent to which one should also attempt to adjust the unemployment rate for changes in the educational attainment of the work force.⁵¹ Summers found that the implied compositional effects of an increasing overall level of educational attainment offset the "adverse" effects of changes in age and sex composition in the 1960s and 1970s, and that the combined effects of an aging work force and rising education levels should have greatly reduced the NAIRU in the 1980s. Shimer finds that educational upgrading can "explain" a 1-percentage-point decline in the unemployment rate from 1979 to 1997.⁵²

The case for adjustments in the unemployment rate for changes in the education composition of the work force appears much weaker than the case for adjustments for changes in age composition. It is clear in a cross section that more-educated workers have substantially lower unemployment rates than do less educated workers. But to the extent that increases in education improve the productivity of the work force, most models of the equilibrium unemployment rate predict equal proportional increases in actual wages and in workers' reservation wages, thereby leaving the equilibrium unemployment rate unchanged.⁵³ This pattern implies that we should not necessarily expect changes in educational attainment to affect the unemployment rate. This view can be reconciled with the cross-

50. Shimer (1998).

51. Summers (1986).

52. Shimer (1998).

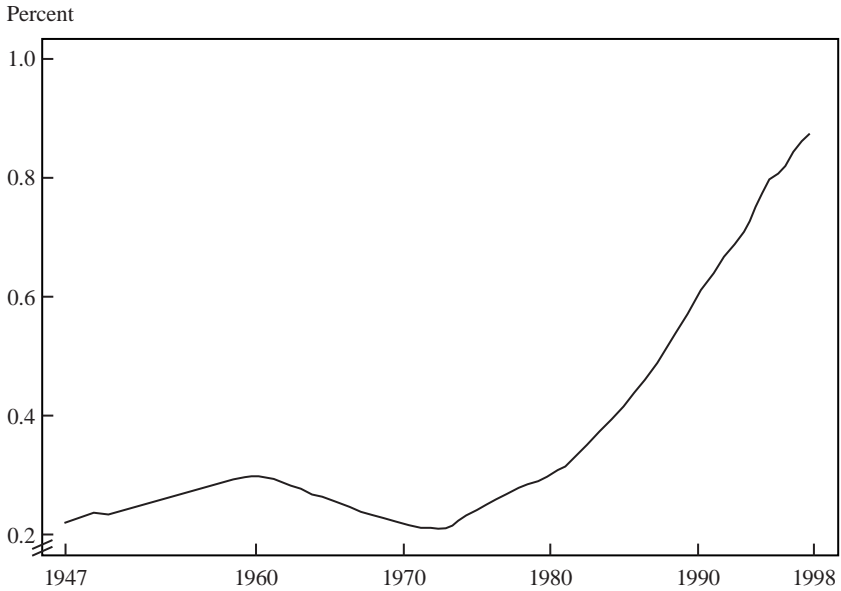
53. See, for example, Blanchard and Katz (1997). Topel (1998) makes a similar point. Shimer (1998) argues against adjusting for education levels both on empirical grounds and on the basis of a signaling model of education.

sectional differences in unemployment by education level by recognizing that reservation wages (which depend on the generosity of government transfers, black market and illegal earnings opportunities, and home production) are likely to be higher relative to market wages for less educated workers. Thus, even as productivity improvements associated with rising education levels increase wages, unemployment benefits and other determinants of reservation wages tend to rise by a similar proportion, and the smaller gap between the value of unemployment benefits and legitimate labor market opportunities for the less educated tends to be preserved. In fact, unemployment rates have not perennially trended downward in response to rising productivity and increasing education levels.

We conclude that changes in the age structure of the labor force associated with the labor market entry and then maturation of the baby-boom cohorts contributed significantly to increases in unemployment from the late 1950s to the late 1970s and to a decline in the NAIRU from the late 1970s to the early 1990s. But the estimated decline in the NAIRU since the early 1990s and most of the decline in actual unemployment from 1989 to 1998 remain unexplained even after accounting for both the mechanical and the broader effects of age-structure changes. If one adds mechanical adjustments for increases in educational attainment, then the fall in unemployment is no longer a mystery—rather the mystery is why unemployment has not declined throughout the twentieth century in all advanced economies. But, again, we are somewhat skeptical of the legitimacy of such adjustments for changes in education composition.

Rising Incarceration Rates and Measured Unemployment

Another major demographic shift that could influence the unemployment rate involves the movement of a portion of the population into prisons and jails. Figure 8 displays the adult prison and jail population relative to the adult civilian noninstitutional population. In 1970, 2 in 1,000 adults were in prison or jail; by 1998 the number had increased to 9 in 1,000. The proportion of the population in prison or jail has doubled since 1985. About 90 percent of those in prison or jail are men. To put the magnitude of this social problem in perspective, in June 1998 the number of adult men in prison or jail equaled 2.3 percent of the male labor force. The

Figure 8. Share of Population in Prison or Jail, 1947–98^a

Source: Authors' calculations based on Freeman (1995), Bureau of Justice Statistics (1999), and Bureau of Labor Statistics population data.

a. Ratio of the prison and jail population to the total civilian noninstitutional population.

United States has a much higher incarceration rate than any other developed country, and that rate has grown exponentially since the early 1970s.

Whereas most of the economics literature on crime has focused on the effect of economic conditions on criminal activity, or on the effect of having an arrest record on subsequent labor market activity, little attention has been devoted to the direct effect of the high rate of incarceration on unemployment.⁵⁴ Incarcerated persons are not counted in either the numerator or the denominator of the official BLS unemployment rate, and those in jail and prison tend to have been unemployed prior to being arrested. Hence the surge in the prison population in recent years could account for some of the decline in measured unemployment. To the extent the decline in

54. Freeman (1995) provides an excellent overview of the literature on the economics of criminal activity and on the effect of criminal activity on subsequent labor market activity.

the official unemployment rate for any group simply reflects the removal from the civilian noninstitutional population through incarceration of individuals with high unemployment propensities, the decline should be interpreted as a compositional change rather than a “true” improvement in labor market performance.

We provide in table 11 an illustrative set of calculations to explore the likely magnitude of the impact of the surge in the prison and jail population since 1985 on the official male employment and unemployment rates. Jeffrey Kling finds that only about 35 percent of convicted criminals serving one- to two-year sentences in California for federal crimes were employed prior to being arrested.⁵⁵ This figure is similar to the employment rate he finds for a “control” group of persons who were convicted but not sentenced to prison, two years after their cases were filed. Consequently, we assume that 35 percent of those in prison or jail would be employed were they not incarcerated. The fourth data column of table 11 provides an estimate of the male employment-population ratio for a hypothetical situation in which all incarcerated individuals are added to the civilian noninstitutional population, and 35 percent of them are employed.⁵⁶ The 1998 employment-population ratio is predicted to be 71.9 percent under our hypothetical situation, compared with the actual BLS estimate of 72.6 percent for the noninstitutional population. Notice also that the male employment-population ratio is still estimated to rise from 1985 to 1998 with the adjusted data, but by 0.4 percentage point less than in the official, unadjusted data.

The fifth column of table 11 reports the actual male unemployment rate in 1985 and 1998. One additional assumption is needed to calculate the effect the incarcerated population has on the unemployment rate, namely, the percentage of incarcerated persons who would be participating in the labor force were they not incarcerated. In the last four columns we recompute the unemployment rate under various assumed values of the labor force participation rate that incarcerated individuals would have if they were not incarcerated, again assuming that 35 percent of the incarcerated population would be gainfully employed. We believe that the labor force participation rate for this population would likely exceed 40 percent

55. Kling (1999).

56. An interesting study by Western and Pettit (1998) calculates expanded employment-population ratios by race and age that include the incarcerated under the assumption that the prison population does not work.

Table 11. Estimated Effects of Growth in the Prison and Jail Population on the Male Employment-Population Ratio and Unemployment Rate, 1985 and 1998
Percent

Year	Incarcerated male population		Male employment-population ratio		Male civilian noninstitutional unemployment rate				
	Number	As percent of labor force	Male employment-population ratio		Adjusted assuming the indicated labor force participation rate among incarcerated males ^a				
			Actual	Adjusted ^b	Actual	40 percent	50 percent	60 percent	70 percent
1985	683,173	1.1	70.9	70.6	7.0	7.0	7.1	7.2	7.3
1998 ^b	1,716,237	2.3	72.6	71.9	4.4	4.5	4.7	4.9	5.2
Change	1,033,064	1.2	1.7	1.3	-2.6	-2.5	-2.4	-2.3	-2.1

Source: Authors' calculations based on data from the Bureau of Labor Statistics World Wide Web site and Bureau of Justice Statistics (1997, 1999).

a. Assumes that 35 percent of incarcerated men would be employed if they were not incarcerated.

b. Data are for June.

and would most likely be less than 70 percent.⁵⁷ One way to estimate this rate is to examine the labor force participation rates for noninstitutional populations with characteristics similar to those of the incarcerated population. Using the 1989 CPS ORG file, we find that about one-third of high school dropouts who are not employed are nonetheless in the labor force and counted as unemployed. The same is true of all workers aged 18–34. If we continue to assume an employment rate of 35 percent, this assumption about the labor force participation rate of the nonemployed implies that the labor force participation rate would be 57 percent and the unemployment rate would be 38 percent for the incarcerated population if they were not in jail or prison.

What if the labor force participation rate of the incarcerated population would be only 40 percent were they not in prison or jail? Then only 0.1 percentage point of the 2.6-percentage-point fall in the male unemployment rate from 1985 to 1998 could be accounted for by the removal of a growing incarcerated population from the labor force statistics. If the labor force participation rate of this group were 60 percent, which we consider a more plausible value, then a 0.3-percentage-point contribution to the decline in the male unemployment rate since 1985 is possible. The low rate of incarceration for women suggests a 0.1- to 0.2-percentage-point contribution of rising incarceration to the decline in the overall unemployment rate since the mid-1980s from this source. The effect is much larger, on the other hand, for subgroups of less educated and minority men.⁵⁸ Of course, these calculations ignore the possible lasting negative effects of incarceration on the labor market prospects of individuals after their imprisonment. Such persistent effects would tend to raise measured unemployment and offset the mechanical reduction in measured unemployment from the increased incarceration of more high-unemployment individuals.⁵⁹

57. The labor force participation rate for the entire male civilian, noninstitutional population in February 1999 was 74 percent.

58. See Western and Pettit (1998) for an analysis of the impacts of incarceration on measured changes in employment rates for both black and white males.

59. The possible increasing magnitude of criminal records on aggregate labor market measures can be partially gauged by the rise in the number of adults on probation or parole from 2.3 million (1.3 percent of the adult civilian noninstitutional population) in 1985 to 3.9 million (1.9 percent) in 1998 (U.S. Department of Justice, Bureau of Justice Statistics website, <http://www.ojp.usdoj.gov/bjs>).

Worker Profiling, Contingent Jobs, Frictional Unemployment, and Wage Pressure

On November 24, 1993, the Congress passed legislation requiring each state to implement a Worker Profile and Reemployment Services (WPRS) program for unemployed workers through its unemployment insurance system.⁶⁰ Worker profiling involves using a statistical model (which varies across states) to identify individuals, upon their first receipt of unemployment benefits, who are likely to exhaust their benefits and to have difficulty finding a job. Those workers are then channeled into reemployment services, including job search workshops, counseling, job clubs, and referrals to employers. The program focuses on serving those workers who are predicted to suffer long-term unemployment, based on such characteristics as their recall status, amount of first unemployment benefit payment, industry or occupation, employment history, job tenure, education, and the local unemployment rate. Claimants referred to employment services are required to participate in those services as a condition of eligibility for benefits. The WPRS initiative represents a break from the traditional approach of the unemployment insurance program in the United States, which primarily has been concerned with providing temporary cash compensation to eligible unemployed workers while they search for a job. By implementing WPRS and the related one-stop career centers, the unemployment system has begun to play a more active role in reducing unemployment.

All fifty states and the District of Columbia phased in WPRS systems between 1994 and 1996. States that phased the program in early (that is, by the end of 1994) included Delaware, Hawaii, Maryland, Missouri, New Jersey, New Mexico, Oregon, and West Virginia. Late adopters included Arkansas, North Dakota, and South Dakota. In 1997 essentially all unemployment insurance recipients nationwide were profiled, 30 percent were placed in the selection pool for services because they were deemed likely to exhaust their benefits, and 35 percent of those in the selection pool were

60. The November 1993 legislation was preceded by legislation passed on March 4, 1993, that encouraged states to voluntarily establish a worker profiling system. Wandner, Messenger, and Schwartz (1999) provide an overview and evaluation of the WPRS system, from which this section draws heavily.

referred to some type of service.⁶¹ The intensity of assistance varies considerably across states. Wandner, Messenger, and Schwartz estimate that one-third of the states provide only minimal reemployment services—five hours or less, on average—to WPRS participants.

A major part of the motivation for enacting WPRS was that several studies have found that job search assistance programs are effective at reducing unemployment spells. Bruce Meyer summarizes the effects of JSA in five states (Nevada, New Jersey, South Carolina, Washington, and Wisconsin) that have randomly selected eligible claimants to receive various forms of JSA and compares their performance with that of a randomly selected control group.⁶² He finds that JSA participants found a new job more quickly: their average duration of unemployment benefits was reduced by about 0.5 to 4 weeks compared with the control group, with most estimates falling near the low end of this range. Meyer also found that the reduction in benefits paid and the increased tax revenue resulting from faster reemployment made the JSA programs cost-effective for the government. A third finding was that, on average, the jobs that JSA participants found paid about the same as the jobs found by the control group.

A recent study by Orley Ashenfelter, David Ashmore, and Olivier Deschenes suggests that the instructional component of JSA is essential for it to be effective; stricter enforcement and verification of worker search behavior alone do not appear to reduce unemployment spells.⁶³ The main activity of WPRS has been to provide various forms of JSA to dislocated workers. In 1994 only 10,773 workers reported for at least one type of reemployment service under WPRS, and 9,990 completed at least one service. In 1998 fully 999,208 workers reported for at least one type of service, and 747,904 completed a service.⁶⁴ Evidence in Wandner, Messenger, and Schwartz suggests that most of the JSA services provided under

61. Wandner, Messenger, and Schwartz (1999, figure 2) and authors' calculations from Employment and Training Administration (ETA 9048) data.

62. Meyer (1995).

63. Ashenfelter, Ashmore, and Deschenes (1999).

64. These figures were calculated by the authors for the fifty U.S. states and the District of Columbia from ETA 9048 data. The reemployment services include orientation, assessment, counseling, job placement services and referrals to employers, job search workshops, job clubs, education and testing, and a small self-employment program. In principle, these figures are based on unduplicated counts of claimants, although it is likely that some states double-counted claimants who received multiple services.

WPRS are a net addition to the total amount of JSA that claimants receive.⁶⁵

The following back-of-the-envelope calculation suggests that, even at its 1998 scale, WPRS is unlikely to significantly influence the aggregate unemployment rate. Suppose that 1 million additional dislocated workers received some type of reemployment assistance in 1998 because of WPRS. Using Meyer's range of estimates of the effect of JSA on unemployment spells, this would be expected to reduce the total number of weeks of unemployment in the U.S. economy by 0.5 million to 4.0 million weeks. In 1998, 6.21 million workers were unemployed during the average CPS survey week, producing a total of 322.9 million weeks of unemployment. Thus WPRS would have reduced the total number of weeks of unemployment by only about 0.15 to 1.24 percent. These estimates imply that the absence of WPRS would have increased the unemployment rate from its actual level of 4.5 percent in 1998 up to a range from 4.51 to 4.56 percent—increments so small as to be quite difficult to tell from sampling error in the unemployment rate. Moreover, these calculations probably overstate the effect of WPRS on aggregate unemployment, for several reasons. First, the average service provided under WPRS is probably less intensive than the average JSA treatment studied in the literature. Second, the literature may overstate the effect of JSA participation on unemployment duration because nonparticipants may incur longer unemployment spells if participants find jobs sooner. Third, WPRS may have increased the net number of claimants receiving reemployment services by less than 1 million. On the other hand, if WPRS leads to more-stable job matches, it could have a larger effect than this back-of-the-envelope calculation suggests.

As a final check on the effect of the WPRS system on unemployment, we exploit the interstate variability in the timing of the implementation of the state programs. Using state-level data for the years 1994–98, we estimate the following equation:

$$(9) \quad u_{jt} = \beta_0 + \beta_1 \text{PROFILE}_{jt} + v_j + \gamma_t + \varepsilon_{jt},$$

where u_{jt} is the unemployment rate in state j and year t as estimated by the BLS, PROFILE_{jt} is a dummy variable that equals one if WPRS was in effect in state j during year t , v_j is an unrestricted state effect, and γ_t is an

65. Wandner, Messenger, and Schwartz (1999, p. 9).

unrestricted year effect. The results are shown in the last column of table 12. Consistent with the back-of-the-envelope calculation described above, the regression estimate indicates a trivial effect of WPRS on the aggregate unemployment rate once year and state fixed effects are held constant.⁶⁶ For comparison, we report results without year effects (the first column) and without state effects (the second column). These models highlight the importance of controlling for these two effects. First, because profiling was implemented gradually in the second half of the 1990s, when unemployment was falling, failure to control for time effects induces a spurious negative correlation between the profiling dummy variable and unemployment. Second, because the states that implemented WPRS early tended to be states with high unemployment, failure to control for state fixed effects induces a positive bias between unemployment and profiling.

Although much research suggests that JSA helps reduce the duration of unemployment spells and is cost-effective for the government, our results suggest that programs to provide JSA more broadly, such as WPRS, are unlikely to have much effect on the aggregate unemployment rate. This does not imply that improving the reemployment system is not a worthy goal, but it does highlight the fact that even cost-effective micropolicy interventions of modest scale are unlikely to have much effect on aggregate outcomes such as unemployment.⁶⁷

*Temporary Help Agency Workers, Wage Pressure,
and Frictional Unemployment*

A more promising explanation for the possible improvements in the efficiency of job matching and increased labor market competition in the 1990s is the rapid growth of private sector employment intermediaries (especially temporary help agencies). Payroll employment in the temporary help services industry increased from under 0.5 percent of U.S. employment in the early 1980s to 1.1 percent in 1989 and to just over 2.2 percent in 1998. Employment growth in this industry accounted for 8.2 percent of net nonfarm payroll employment growth from 1992 to 1998,

66. This conclusion is quite robust to extending the sample period back to 1990 to use a longer time series in each state to estimate the underlying state fixed effects.

67. Heckman (1994) makes this point in the context of job training programs.

Table 12. Estimated Equations for the Effect of Worker Profiling on the Unemployment Rate, State-Level Analysis^a

<i>Independent variable</i>	<i>Equation</i>		
	<i>12-1</i>	<i>12-2</i>	<i>12-3</i>
Constant	5.676 (0.086)	5.545 (0.181)	5.683 (0.069)
Profiling dummy variable ^b	-0.751 (0.097)	1.015 (0.380)	0.008 (0.163)
Year dummies	No	Yes	Yes
State dummies	Yes	No	Yes
Adjusted R^2	0.80	0.12	0.87

Source: Authors' calculations based on data from the Bureau of Labor Statistics World Wide Web site.

a. The dependent variable is the BLS estimate of the state unemployment rate; its mean is 5.07. Sample size is 255 state-by-year observations (1994–98). Standard errors are in parentheses.

b. The profiling dummy has a value of 1 when profiling is in effect. It is derived from ETA 9048 data provided by Cindy Ambler of the U.S. Department of Labor and has a mean of 0.81.

as opposed to 4.1 percent in the comparable 1983–89 period.⁶⁸ Recent work by David Autor indicates that temporary help agencies are playing an increasingly important role in screening employees and providing some forms of computer training.⁶⁹ The possibly greater ease with which firms can locate qualified and screened employees through intermediaries may lower hiring costs, reduce labor market bottlenecks, improve employment matches, and exert greater restraint on wage increases for incumbent workers.

The scale of operations of temporary help agencies, employee leasing firms, and private sector employment intermediaries appears to have increased to a level that may be significant for the operation of the labor market as a whole. For example, approximately 3.1 percent of employed workers in the February 1997 CPS supplement on contingent work indicated that they were on-call workers or employees of a temporary help agency or contract firm. Sharon Cohany reports that 60 percent of the 1.3 million self-reported employees of temporary help agencies in the February 1997 CPS were temporary workers for economic reasons.⁷⁰ If half of these “involuntary” temporary workers had been unemployed and search-

68. These tabulations use data from the BLS Current Employment Statistics program. Household survey data from the CPS indicate a smaller share of the work force employed in the personnel services industry. See Polivka (1996) for a discussion of these discrepancies.

69. Autor (1999a). See also Segal and Sullivan (1997b) and Autor (1999b) for useful analyses of the growth of the temporary services work force.

70. Cohany (1998, exhibits 1 and 9).

ing for work in the absence of the expanded temporary help industry, the official unemployment rate in 1997 would have been about 0.2 to 0.3 percentage point higher than it was.

Beyond such possible direct effects of shifting workers from job search through unemployment to job tryouts through temporary jobs, the growth of labor market intermediaries may facilitate wage restraint by increasing the ability of firms to locate substitute workers. The increased ability to establish contingent work arrangements may also allow employers to raise wages only for the additional workers employed through temporary help agencies or other intermediaries, and not for their entire payroll. This avoids creating the internal equity comparisons that in the past may have necessitated increasing the wages of incumbent employees as well as new hires, to prevent morale problems.

We next present a preliminary and highly speculative initial attempt to examine whether increased access to contingent employment options, as proxied by the size of the temporary help industry, plays a role in wage restraint (and thereby possibly affects the NAIRU). We take advantage of differences across U.S. states in the relative scale of operations of the temporary help industry. In particular, we ask whether states with a better-developed temporary help industry at the start of the 1990s—as measured by the average share of the temporary help industry in total state employment from 1985 to 1989—experienced greater wage restraint in the 1990s. Nationwide, the share of total employment in the temporary help industry, according to data from the County Business Patterns database of the Bureau of the Census, averaged 0.9 percent from 1985 to 1989. This share ranged from less than 0.3 percent in states such as North Dakota and Idaho to more than 1.2 percent in California, Florida, and Delaware.⁷¹ There appears to be substantial persistence over the past two decades in the relative importance of the temporary help industry across states.

Our approach is to estimate wage Phillips curves using state panel data on (composition-adjusted) wages from the ORG files of the CPS and state

71. We are grateful to David Autor for providing us with state data on employment in the temporary help industry from both County Business Patterns and the CPS. The correlation of state measures of the share of employment in the temporary help industry in County Business Patterns and the personnel supply services industry in the CPS ORG files, averaged over the 1985–89 period, is 0.85. We focus on the more precisely estimated measures from County Business Patterns.

unemployment rates from the BLS for the 1980–98 period.⁷² We examine whether states with a greater initial presence of temporary help at the start of the decade—as measured by the average temporary help industry employment share (THSP) over 1985–89—experienced lower than expected wage growth at given measured unemployment rates in the 1990s. We control for preexisting state differences in NAIRUs through state fixed effects and for common macroeconomic factors through a full set of year dummies. Our basic estimating equation is of the form

$$(10) \quad \Delta w_{jt} = \alpha_j - \beta u_{jt} + \delta(\text{THSP}_j^* d90) + d_t + \varepsilon_{jt},$$

where Δw_{jt} is the change in the (composition-adjusted) mean log wage for state j from period $t - 1$ to t ; u_{jt} is the state unemployment rate; $d90$ is an indicator variable equal to one after 1989 and zero in 1989 and before; and α_j and d_t represent full sets of state and year fixed effects.⁷³ The hypothesis of greater wage restraint in the 1990s from a larger initial presence of the temporary help industry at the start of the decade implies δ less than zero.

Table 13 presents some simple regressions in the form of equation 10 to examine the possible effects of greater temporary help and contingent work options on overall wage growth. We include specifications with both the level and the logarithm of the state unemployment rate as a cyclical indicator, and allowing or not allowing the effect of unemployment on wage growth to change in the 1990s. We consistently find modestly lower wage growth in the 1990s, conditional on unemployment and preexisting state wage growth patterns (state fixed effects), for states with a greater share of temporary help employment at the start of the decade. The estimates imply that a 1-standard-deviation increase (a 0.25-

72. We adjusted the wage data by first estimating microregressions for each year of the log wage on education, experience, sex, and race and then calculated the average residuals for each state using the fitted regressions.

73. We create composition-adjusted wages by running a cross-sectional log hourly wage regression using the CPS ORG samples in each year with a standard set of control variables (education, age, race, and sex indicator variables and interactions). The adjusted wage for each individual is the sum of the mean national log hourly wage and the individual's residual from the composition adjustment regression. The state adjusted wage is the mean adjusted wage in the state using the CPS sampling weights. The wage samples are limited to wage and salary employees. Our findings are quite similar for unadjusted (raw) mean state log hourly wages. We are grateful to David Autor for assistance in preparing the adjusted wage data.

Table 13. Estimated Equations on Wage Inflation, Unemployment, and the Temporary Help Industry, State-Level Analysis^a

<i>Independent variable</i>	<i>Equation</i>			
	<i>13-1</i>	<i>13-2</i>	<i>13-3</i>	<i>13-4</i>
State unemployment rate	-0.529 (0.038)	-0.544 (0.041)		
State unemployment rate × post-1989 dummy		0.072 (0.069)		
Log of state unemployment rate			-0.0379 (0.0026)	-0.0423 (0.0029)
Log of state unemployment rate × post-1989 dummy				0.0131 (0.0041)
Temporary help share ^b × post-1989 dummy	-0.656 (0.334)	-0.724 (0.339)	-0.579 (0.331)	-0.742 (0.333)
Adjusted <i>R</i> ²	0.69	0.69	0.69	0.69

Source: Authors' calculations based on data from the Bureau of the Census and Bureau of Labor Statistics World Wide Web sites and from David Autor, Kennedy School of Government, Harvard University.

a. The dependent variable is the change in the state (composition-adjusted) mean log hourly wage. All regressions are weighted by state shares of total employment in each year. See equation 10 in the text. Hourly wages are for wage and salary workers from the CPS ORG and are adjusted each year to account for differences in education, age, sex, and race. All regressions include full sets of state and year dummies (1980–98). Sample size is 950 observations. The (weighted) mean of the dependent variable is 0.043 with a standard deviation of 0.021. The (weighted) mean state unemployment rate is 0.0658 with a standard deviation of 0.020. Standard errors are in parentheses.

b. Mean share of temporary help industry employees in total employment from 1985 to 1989, based on establishment employment counts from the County Business Patterns database of the Bureau of the Census (see equation 10 in the text). The variable has a (weighted) mean of 0.0089 with a standard deviation of 0.0024.

percentage-point increase) in the share of the temporary help industry in the late 1980s has been associated with slower wage growth of almost 0.2 percent a year.

The regressions in table 13 suggest some potential role for increased labor market competition from the growth of labor market intermediaries in preventing bottlenecks and restraining wage growth in tight labor markets in the 1990s. The rapid expansion of the temporary help industry also coincides with the inward shift in the Beveridge curve since the late 1980s (figure 5), suggesting a possible favorable impact on labor market matching.

To derive a rough estimate of the effect of the growth in the temporary help sector in the 1990s on the NAIRU, we first calculated the intercept shift in the wage Phillips curve implied by the regression in table 13 and the expanded presence of the temporary help industry in the 1990s. We then converted this intercept shift into a decline in the NAIRU based on the estimated slope of the wage Phillips curve. Specifically, we multiplied the estimated effect of temporary help employment on wages (–0.656) in

the regression reported in the first data column of table 13 by the growth in this sector from 1989 to 1998 (1.1 percentage points). We then multiplied this figure by the inverse of the slope of the aggregate wage Phillips curve ($1/0.93 = 1.075$) based on the CPS wage data in table 5. However, because we measure the 1990s presence of the temporary help industry in the regressions in table 13 using the industry employment share from the period 1985–89, and the scale of this variable doubled in the 1990s, we divided the resulting estimate by 2. This approach yields an estimate of a decline in the NAIRU over the past decade due to the impact of the temporary help industry (and other improvements in labor market intermediation correlated with the prevalence of this sector) of 0.39 percentage point. Thus the impact of the improvement in labor market matching and competition from labor market intermediaries may be as large as the impact of demographic changes on the NAIRU since the 1980s.

Union Power, Worker Insecurity, and the Wage Structure

Private sector union membership has declined steadily since its peak in the mid-1950s, with the sharpest decline occurring in the 1970s and 1980s. In 1973, 24.6 percent of private sector nonagricultural workers in the United States belonged to a labor union or to an employee association similar to a union; by 1998 the private sector union rate had fallen to 9.6 percent.⁷⁴ Farber and Krueger find that only one-quarter of the decline in union membership between 1977 and 1991 occurred because of the combined effects of shifts in employment from highly unionized industries and occupations to less unionized industries and occupations, and from demographic changes in this period.⁷⁵

Much evidence suggests that unions raise wages for their members above what they would be in the absence of unions.⁷⁶ The union wage gap is larger for workers with relatively low earnings potential (based on education and experience) than for workers with higher earnings poten-

74. In contrast, union membership levels in the public sector increased from 23 percent in 1973 to 37.5 percent in 1998. See Hirsch and Macpherson (1999, tables 1c and 1f).

75. Farber and Krueger (1993). Linneman, Wachter, and Carter (1990) also find that industry shifts account for very little of the decline in union membership in the 1973–86 period.

76. See, for example, Lewis (1986).

tial.⁷⁷ Unions are also likely to raise wages for non-union members, as employers raise compensation to discourage workers from unionizing.⁷⁸ Yet Farber and Krueger find that only one-third of non-union members desired union representation in the mid-1980s and early 1990s. The steady and persistent long-run decline in union membership makes it seem unlikely that changes in union strength in the 1990s could have a further discrete effect on wage-setting practices. Indeed, it is possible that the union movement has passed a tipping point, where its support has fallen so low that employers feel virtually no threat effect from unions. Because a majority of workers in a bargaining unit must vote for a union in order for the unit to be unionized, passing the 50 percent threshold of support is key. It should also be noted that the frequency of union recognition elections fell discretely following the failed PATCO strike in August 1981.⁷⁹ Figure 9 displays the fraction of working time lost due to strike activity in the United States each year since 1948. Strike activity fell sharply in the 1970s and early 1980s and has not recovered. In 1998 only thirty-four strikes occurred involving 1,000 or more workers. The 0.2 percent of work time lost to strikes in 1998 was only slightly more than 1997's record low.

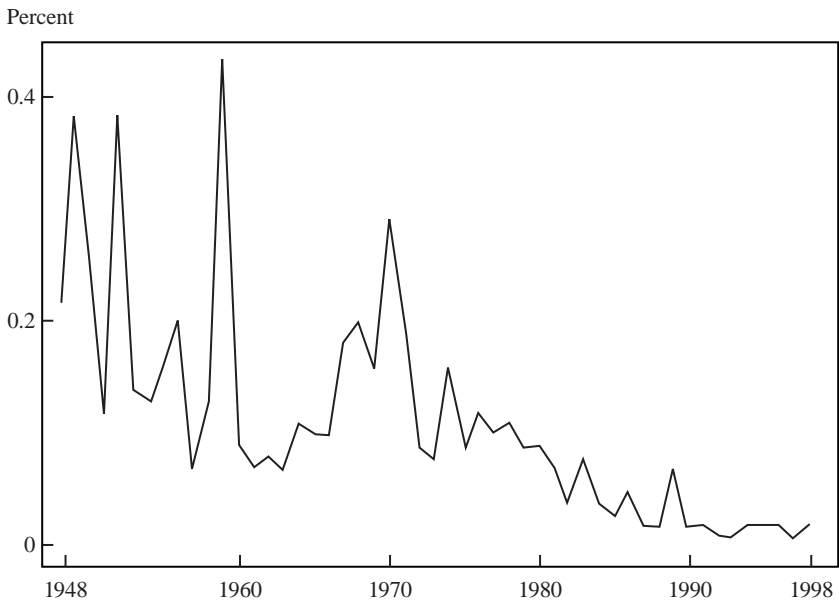
David Card attributes about 10 to 20 percent of the rise in wage inequality among men between the mid-1970s and the early 1990s to the decline of unions, because union membership fell most for groups of low-wage men, and because the union wage premium is largest for these groups.⁸⁰ If workers have become more timid in their wage demands in the 1980s and 1990s, the low level of private sector unionization is a prime suspect for why this might be so: many workers today lack the representation to press aggressively for wage gains through collective action. Some evidence suggests that the rents workers receive in the union sector may be eroding. Table 14 reports the percentage growth in the ECI for private sector non-union and union workers in selected periods. According to these data, compensation growth was slower for union members in the

77. Card (1998).

78. See Dickens (1986) for a model of wage setting in response to the threat of collective action.

79. Unpublished tabulations of National Labor Relations Board elections by Henry Farber.

80. Card (1998). Card also finds that the decline in union membership has had relatively little effect on wage dispersion among women.

Figure 9. Estimated Working Time Lost to Strikes, 1948–98^a

Source: Bureau of National Affairs, Inc., *Daily Labor Report*, February 11, 1999, p. D-2.
 a. Data limited to strikes involving 1,000 or more workers.

1980s and 1990s than for non-union members.⁸¹ It is likely that the faster growth of wages in the nonunion sector in this period is at least partially related to the rise in skill premiums more generally, since private sector non-union members tend to have more education on average. Interestingly, in the current recovery and in the previous one, wage growth was notably slower for union members in the later stages of the recovery than it was for non-union members. Compensation growth appears to have been particularly sluggish in the unionized manufacturing sector in 1994–98 (third data column of table 14); this probably reflects trade pressures resulting from the Mexican currency crisis and, more recently, the Asian currency crisis.

81. For a detailed study of the union wage premium in the 1973–86 period see Linne-
 man, Wachter, and Carter (1990). Using CPS data, they find that the conventionally estimated union premium was relatively stable in this period. Hirsch and Macpherson (1999, table 2a) find that the private sector union wage gap fell by 4 percentage points between 1989 and 1998, after controlling for education, experience, demographics, industry, and occupation.

Table 14. Nominal Growth in the Employment Cost Index for Selected Groups, Sectors, and Time Periods^a

Percent

<i>Period</i>	<i>Non-union workers</i>	<i>Union workers</i>	<i>Unionized manufacturing sector</i>	<i>Services- producing sector</i>	<i>Goods- producing sector</i>
1979–89	74.1	68.5	...	...	...
1985–89	18.7	13.0	14.9	18.2	15.7
1989–98	36.8	35.1	34.2	37.2	34.8
1994–98	13.7	10.7	8.8	14.4	10.9

Source: Bureau of Labor Statistics World Wide Web site.

a. Data are changes in the ECI—total compensation index from fourth quarter to fourth quarter, for private industry only.

But these large trade shocks have not coincided with a rise in overall wage inequality (figure 4). Indeed, the wage structure narrowed at a time when the U.S. exchange rate and trade balance shifted most dramatically.

Evidence on Worker Insecurity

Such diverse observers as Alan Greenspan and former Secretary of Labor Robert Reich have argued that wage growth has been sluggish recently because of worker insecurity. Although evidence on worker insecurity as a cause of subdued wage growth is likely to be as inconclusive as evidence on the sociological causes of downward wage rigidity and unemployment, it is worth considering whether worker anxiety about job prospects has caused wage demands to moderate. The labor market has visibly changed. The proportion of workers who use a computer increased from 25 percent in 1984 to 50 percent in the mid-1990s.⁸² Workers are also concerned about international trade, and such concerns could influence their wage demands regardless of whether the concerns are justified. In a 1996 survey, over two-thirds of the public reported that an important reason why the U.S. economy is not doing better is that “companies are sending jobs overseas.”⁸³ But technology is always evolving. And the economy has flourished in the last few years despite the boom in imports. What is the evidence that high levels of worker insecurity are influencing labor market behavior?

82. Autor, Katz, and Krueger (1998, table IV).

83. Blendon and others (1997). By contrast, only 6 percent of members of the American Economic Association agreed that companies sending jobs overseas is a reason the U.S. economy is not doing better.

First, national data do show a slight decline in job tenure and an increase in displacement rates in the mid-1990s.⁸⁴ Farber, for example, finds that “after controlling for demographic characteristics, the fraction of workers reporting more than ten and more than twenty years of tenure fell substantially after 1993 to its lowest level since 1979.”⁸⁵ In other work he finds that the rate of worker displacement, especially among midlevel occupations, was higher in 1993–97 than in 1983–87. But it is probably the case that the magnitude of the rise in job instability in the 1990s is modest compared with the public attention the issue received in the mid-1990s.

Second, worker surveys display some tendency for job insecurity to be higher than expected in the mid-1990s, although the post-1996 data suggest that worker self-reported job insecurity has returned to the relatively low levels characteristic of earlier business cycle peaks. For example, Schmidt and Thompson analyze three surveys—the Gallup poll, the General Social Survey (GSS) of the National Opinion Research Center, and the U.S. Department of Labor survey—and find “evidence of a growth in workers’ concerns about job security since 1977; however, the most recent data (from 1996 and 1997) indicate that workers are no more worried about job security than they were during earlier economic recoveries.”⁸⁶ For example, in the June 1997 Gallup poll, 10 percent of workers said they were very likely or fairly likely to lose their job or be laid off in the next twelve months, compared with 12 percent in October 1979.⁸⁷

Also, recent survey data from the Institute for Social Research (ISR), which tracks families’ financial security as part of its consumer confidence measure, find a sharp increase in 1997 and 1998 in the net fraction of families who think they are better off financially than a year earlier.⁸⁸ Indeed, the latest data for 1998 reached the highest level since 1965. In the 1992–96 period, the net fraction that felt better off financially was below the corresponding figures for the first four years of the 1980s business cycle upswing. In view of the low inflation of the past two years, these data suggest that workers are not suffering from money illusion, which would

84. See Aaronson and Sullivan (1998) for a comprehensive review of the literature.

85. Farber (1997).

86. Schmidt and Thompson (1997). See also Aaronson and Sullivan (1998).

87. Schmidt and Thompson (1997).

88. See the University of Michigan Surveys of Consumers website. Krueger and Siskind (1998) find that the net fraction of families that have actually experienced a rise in real income is a good predictor of the ISR variable.

be the mechanism causing workers to reduce their labor supply in the original Phillips curve model. On the whole, trends in self-reported worker security suggest that insecurity may have contributed to wage restraint in the mid-1990s, but the return of these survey measures to their levels at previous business cycle peaks suggests that worker insecurity was not abnormally high in 1996–98. Perhaps coincidentally, nominal wage growth also rebounded in those years (see table 3).

A final issue concerns the link between worker job insecurity and wage growth. Aaronson and Sullivan evaluate the effect on wage growth of self-reported worker insecurity from the GSS and job displacement rates by estimating regional wage Phillips curves, augmented to include these additional explanatory variables. Their results are rather mixed. When they use annual earnings as the dependent variable, they find that these two measures are negatively related to earnings growth, although only the displacement rate has a statistically significant coefficient. However, this relationship may only stem from hours worked. A more relevant outcome measure for understanding wage pressure, which they also examine, is the hourly wage rate. Their results for hourly wage growth are less supportive of the view that measured job insecurity has an important effect on wage demands: both the GSS insecurity index and the displacement rate have statistically insignificant, although negative, effects.

Competitive Pressure and Rent Erosion

A related explanation for modest wage growth in the 1990s—and one that might cause feelings of job insecurity—is that the inability of businesses to raise prices in the face of heightened competition (for example, resulting from the steady deregulation of U.S. industries, shareholder pressure, increased international trade, and exchange rate shocks) has caused employers to seek ways to restrain factor costs.⁸⁹ If wages were above competitive market levels in some sectors, reducing the economic rents accruing to workers would be one way to cut factor costs. Competitive pressure to reduce costs may have slowed wage growth and contributed to the remarkably slow growth of intermediate goods prices in recent years. The search for more efficient production practices, spurred by

89. This point was recently emphasized by Krugman (1999). Gordon (1996) argues that a reallocation of rents from workers to managers accounts for the rising inequality of the 1980s.

heightened competition, may also explain why productivity growth has been stronger over the last few years than during the final years of the previous recovery.

Although profit-maximizing employers always have an incentive to minimize their costs, this explanation presumes that firms do not always act on that incentive. Indeed, a growing literature suggests that firms share some of their product-market rents with workers, perhaps because managers have a preference for sharing profits with workers.⁹⁰ When profits are squeezed, pay tends to be squeezed as well. A number of recent studies have found that employee pay tends to fall prior to a plant closing, tends to fall when a firm's profits declines, tends to fall and become more dispersed following deregulation, and is related to "exogenous" changes in industry import and export prices.⁹¹ These findings suggest that, in many sectors, workers are paid a premium over their best alternative wage, which provides some scope for competitive pressures to induce firms to reduce wages.

The story based on increased competition has three potential empirical shortcomings, however. First, we would expect competition to have intensified most in the goods-producing sector in the years since 1994, as a result of the Mexican and Asian currency collapses. In addition, the goods-producing sector is a high-wage sector that is widely thought to pay workers rents. Clearly, the traded goods sector has been more affected than the services sector by international competition over the last few years: the compensation growth figures in table 14 indicate that, since 1994, wage growth has been less in the goods-producing sector than in the services-producing sector, by 3.5 percentage points. However, during the corresponding years of the 1980s recovery, wage growth was 2.5 percentage points less in the goods sector than in the services sector. Thus the weaker growth of wages in the goods-producing sector does not seem particularly unusual.

Second, under some variants of the increased competition story one would expect labor's share of economic rents to fall. For example, if rents

90. See, for example, Katz and Summers (1989).

91. See Jacobson, LaLonde, and Sullivan (1993) on plant closings and wage growth; Blanchflower, Oswald, and Sanfey (1996) on wages and profitability; Rose (1987) and Card (1996) on the effects of deregulation on the labor market; and Revenga (1992) and Abowd and Lemieux (1993) on trade shocks and wage setting.

have simply been redistributed from workers to firms, labor's share would fall. Yet evidence on a drop in labor's share is mixed. Poterba finds that the modest fall in labor's share between 1992 and 1996 was in line with past cyclical relations.⁹² But alternative measures of labor's share, based on ECI data instead of NIPA compensation data, suggest a larger fall in labor's share.⁹³ In any event, it is unclear how persuasive the evidence on labor's share can be, since the erosion of wage rents due to increased competition would not lead to a fall in labor's share if firms are continually on their demand curve and if the production function is Cobb-Douglas.

A third strand of evidence concerns the consequences of job loss. If competition has eroded wages, one might expect workers who lose their jobs because of plant closings and mass layoffs to have suffered greater wage losses in recent years than in earlier periods. But work by Farber does not indicate that displacement carries with it a more severe loss of earnings now than in the past, and this suggests that labor market rents have not changed substantially.⁹⁴

Social and Distributional Consequences of Tight Labor Markets in the 1990s

The tight labor markets of the past several years have followed two decades of slow growth in family incomes, widening wage and income inequality, and perceptions of substantial crime problems. Although real wages were sluggish in the early 1990s, the prolonged macroeconomic expansion of the 1990s finally appears to be paying off in significant real and relative wage growth for low-wage workers since 1996 (as illustrated in figure 4). The 9 percent real hourly wage growth for workers at the 10th percentile from 1996 to 1998, in the face of substantial increases in competition in the low-wage labor market associated with welfare reform and large increases in the labor force participation of single women with children, is striking.⁹⁵ Improvements in earnings for low-wage workers

92. Poterba (1998).

93. See Krueger (1999). Because some of the salary drawn by incorporated business owners and corporate officers is counted in labor's share in the NIPA data, it is possible that computations of labor's share based on these data miss transfers between workers and owners.

94. Farber (1997).

95. See, for example, Bartik (1998).

with children are even more significant when one takes into account the large expansion in the generosity of the earned income tax credit (EITC) from 1993 to 1996.⁹⁶ Expanded employment opportunities and increased real wages have also meant a sizable rise in the mean real incomes of disadvantaged families (for example, those in the bottom quintile of the family income distribution) since 1993.⁹⁷ The current macroeconomic expansion has also been associated with a sharp decline in the crime rate.⁹⁸

Earlier work by David Cutler and Lawrence Katz showed that structural labor market shifts against less skilled workers in the 1980s prevented the macroeconomic expansion of that decade from improving the economic position of the disadvantaged by as much as would be predicted from the experience of previous postwar expansions.⁹⁹ We extend their analysis to examine whether the same pattern has persisted into the 1990s.

Figure 10 displays the actual official poverty rate for persons from 1959 to 1997 and two predicted poverty rate series using the historical relationship between poverty and median (or mean) income over the 1959–83 period. We calculate predicted poverty rates using the earlier regressions by Cutler and Katz of the poverty rate on contemporaneous macroeconomic indicators over the 1959–83 period.¹⁰⁰ The poverty rate has remained much higher since 1983 than would be predicted using historical macroeconomic relationships from 1959 to 1983. The actual poverty rate declined by 2.4 percentage points in the expansion of 1983 to 1989, compared with predicted declines of 3.9 and 5.0 percentage points using median and mean family income, respectively. Similarly, the actual decline in poverty from 1993 to 1997, also 1.8 percentage points, is below the predicted decline of 2.6 percentage points from either forecasting equation. But the income measure used in setting the official poverty rate fails to include the gains to low-income families from the large expansion in the EITC since 1993. Experimental poverty measures including income from

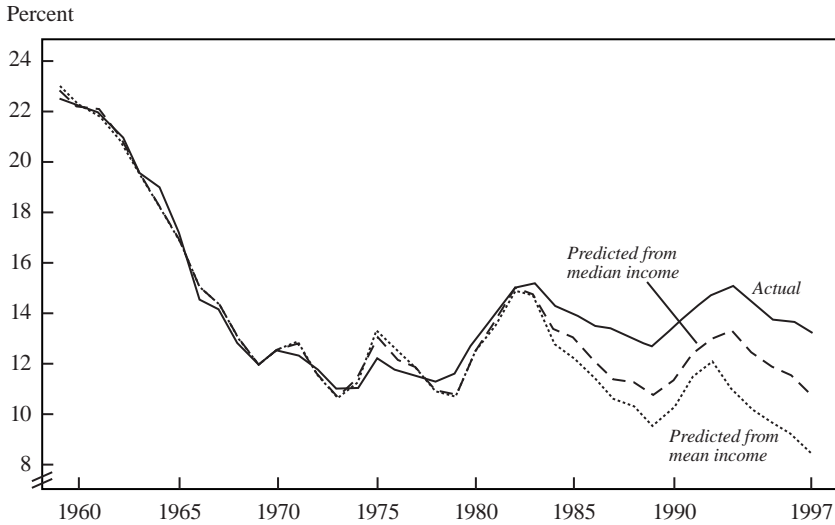
96. See Liebman (1998).

97. U.S. Bureau of the Census, *Historical Income Tables—Families*, accessed on the World Wide Web. See Okun (1973) for a seminal analysis of the social benefits of a high-pressure economy.

98. Recent work by Gould, Weinberg, and Mustard (1998) using panel data on U.S. counties finds strong negative effects of increases in wages for low-wage workers and reductions in unemployment on crime rates, especially property crime rates.

99. Cutler and Katz (1991).

100. We use the same regressions for the 1959–83 period used by Cutler and Katz (1991, table 1, first two rows).

Figure 10. Actual and Predicted Poverty Rates, 1959–97^a

Source: Bureau of the Census, *P-60 Current Population Report*; Cutler and Katz (1991).

a. Predicted rates are based on regressions by Cutler and Katz (1991) of the poverty rate on contemporaneous macroeconomic indicators—the ratio of the poverty line to median or mean income, the inflation rate, and the unemployment rate for men aged 25–54—over the 1959–83 period.

the EITC suggest a further 0.8-percentage-point decline in the poverty rate from 1993 to 1997.¹⁰¹ Adjusting for the impact of changes in the EITC, we therefore find that macroeconomic performance since 1993 appears to have reduced poverty by as much as would have been predicted from the pre-1983 relationship.

Thus, taking the EITC into account, the tight labor markets we have observed since 1993 appear to be generating more widespread benefits for the disadvantaged than was the case in the 1980s expansion. Recent research by Richard Freeman and William Rodgers also finds that metropolitan labor markets with sustained low unemployment in the 1990s have generated large improvements in employment and earnings for the group of workers who have fared the worst over the last couple of decades, namely, less educated young men, especially African American men.¹⁰²

101. U.S. Bureau of the Census (1998, table C4). Adjustments for the EITC expansion of the mid-1980s would have a much smaller effect on changes in poverty from 1983 to 1989.

102. Freeman and Rodgers (1999).

Tighter labor markets than in the 1980s may be necessary to partially offset the strong secular relative demand shifts against less skilled workers (documented in the wage inequality literature) and provide economic improvements for disadvantaged workers.¹⁰³ The structural labor market changes that we have examined (such as the improved efficiency of job matches) may allow labor markets to remain tight in the near future without creating major labor market bottlenecks in the absence of adverse supply shocks. But the very recent improvements in the economic situation of low-wage workers and low-income families certainly have not restored them to their levels of two decades ago. Another key issue is whether the recent strong labor market gains for new entrants (especially those moving off welfare) and other disadvantaged workers have improved labor market connections enough to cushion the effects of the next economy-wide slowdown in the face of major social policy changes that have reduced cash assistance for the nonemployed.

Conclusions

We conclude by summarizing the contributions of each of the major labor market changes we have examined here to the 0.8-percentage-point decline in the actual unemployment rate from 1989 to 1998, and to the estimated 0.7- to 1.5-percentage-point decline in the NAIRU since the mid-1980s. Table 15 presents our best estimates of the contribution to the decline in unemployment since the mid-1980s of each of the labor market factors we have investigated. In some cases we provide a range of estimates because we are particularly uncertain of the magnitude of the effect. These estimates are based on our subjective interpretation of the empirical evidence we have been able to garner in this paper. The evidence suggests to us that demographic shifts and the rise of labor market intermediaries are the main labor market changes that have contributed to the decline in unemployment. The emphasis we place on demographics and labor market intermediaries is also consistent with our finding that the incidence of short-term unemployment spells has declined markedly, whereas the incidence of long-term unemployment spells exceeds that achieved in past business cycle peaks.

103. See Katz and Autor (1999).

Table 15. Contribution of Selected Labor Market Factors to the Decline in the Unemployment Rate Since the Mid-1980s

<i>Factor</i>	<i>Best estimate of effect (percentage points)</i>	<i>Comments</i>
Demographic shifts toward older workers	0.4	Estimate assumes that age-specific unemployment rates are unaffected by cohort size and that changes in education composition have no effect.
Changes in labor market efficiency due to developments in the temporary help industry	0.0–0.4	Effect of changes in temporary help utilization on wage moderation is highly speculative.
Growth of the incarcerated population	0.17	Estimated effect is 0.3 percentage point for men. The overall estimate multiplies this figure by the percentage of the labor force that is male.
Weak backbone hypothesis, decline in unionization, increased competition	0.0–0.1	Difficult to assess.

It is interesting to speculate whether the labor market changes we have investigated are likely to have a transitory or a more lasting effect on the natural rate of unemployment. As noted earlier, population and labor force projections through 2006 imply that demographic shifts will exert very modest downward pressure on the unemployment rate, leading to perhaps a further 0.05-percentage-point decline. There is certainly no evidence in the labor force projections that unemployment will rise early in the next millennium because of demographic shifts. Likewise, labor market shifts brought about by innovations in the temporary help industry are likely to represent lasting structural changes in the efficiency of the labor market. On the other hand, the future role of the incarcerated population is difficult to predict, because it largely depends on the course of sentencing guidelines and practices.¹⁰⁴

There is one additional caveat to bear in mind in considering our relatively rosy forecast that the labor market shifts we have studied are unlikely to have only a transitory effect on unemployment. That is the

104. To appreciate the importance of sentence lengths, note that the prison population has continued to expand even as the crime rate has declined in recent years.

fact that we have ignored labor market shifts that may raise the equilibrium level of unemployment. To the extent that other structural shifts in the labor market have taken place that raise equilibrium unemployment, the factors we have identified may well be offset, and the likelihood that the unusually low unemployment rate of the late 1990s is only transitory, due to favorable price shocks or other factors, would increase. Future progress in lowering unemployment will likely require new approaches to reducing the incidence of long-term unemployment (and nonemployment) spells among the less skilled and the disadvantaged.

Comments and Discussion

Gary Burtless: American workers have now enjoyed the benefits of a low unemployment rate for several years. By the end of April 1999 the jobless rate had been 6 percent or less for fifty-seven consecutive months. The BLS has reported a monthly unemployment rate of 5 percent or less just twenty-six times since 1973. Twenty-five of those months occurred after March 1997.

This record would not have looked so amazing in the 1950s or 1960s. The jobless rate was 5 percent or less during two-thirds of the decade of the 1950s and in slightly more than half of all months in the 1960s. In the 1990s so far, it has been 5 percent or less in just one out of *five* months.

In one notable respect, however, the recent record looks impressive, even by the standards of the 1950s and 1960s. The long stretch of low and declining unemployment has not been accompanied by a jump in price inflation. In fact, as the authors' table 3 shows, annual inflation has subsided along with unemployment over the course of the 1990s, a combination that must have made central bankers and administration spokespersons pinch themselves in disbelief. When the jobless rate dipped in the second half of the 1950s, price inflation inched up to 3½ percent. When it fell below 5 percent in 1965, inflation rose above 3 percent and increased steadily thereafter. By contrast, in 1998 inflation fell for the seventh year in succession in spite of an unemployment rate that dipped to a quarter-century low.

Lawrence Katz and Alan Krueger try to explain the happy combination of declining joblessness and declining inflation—stagflation in reverse. Their interpretations of the data on the recent economic expansion are wide-ranging and sometimes ingenious. What changes in the labor market have permitted the expansion to last so long with so little evidence of accelerating inflation? The authors examine four explanations in detail. They explore the demographic changes that have reduced the measured unemployment rate in comparison with the rates observed in the 1970s and 1980s. They look at the increase in the population behind bars, which took a group of people with a high propensity for unemployment out of the jobless statistics. They review the improved performance of the labor market institutions that match unemployed workers with job vacancies. And they examine whether a general demoralization of the labor force has reduced its capacity or willingness to insist on better wages when labor markets tighten.

The crucial question about the recent good news is how long it will last. Is the happy combination of low unemployment and declining inflation temporary or permanent? Can the Federal Reserve allow the economy to operate indefinitely with unemployment below 4.5 percent? Or will policymakers soon face the need to rein in surging wages and prices? Some of the authors' explanations point to a permanent improvement in the unemployment-inflation trade-off, but others suggest only a temporary improvement.

Katz and Krueger's first explanation, which I find persuasive, is that the aging of the labor force has reduced the average propensity of workers to be unemployed. The young have always experienced more joblessness than the middle-aged and the elderly. Many young workers are seeking work for the first or second time, and they do not have much experience landing or keeping a job. Others shift quickly in and out of employment, leaving them with many weeks in which to seek their next job.

Figure 6 in the paper shows that less than 17 percent of the work force was in the most unemployment-prone age group, those aged 16–24, in 1960. That fraction climbed to almost one-quarter in 1978 and has since fallen back to its 1960 level. Some simple arithmetic suggests that the rise and fall of the proportion of young people in the labor market might account for two-thirds of a percentage point of the jump in unemployment between 1960 and 1979, and about the same amount of the decline in

unemployment since 1979. This is roughly half the improvement in the unemployment rate since 1979. Most of the demographic change occurred between 1979 and 1989, however. Only about one-quarter of the 0.8-percentage-point drop in joblessness since 1989 can be explained by the aging of the labor force since that year. Over the next decade or so we should see very little additional improvement in unemployment as a result of labor force aging. On the other hand, the improvement we have seen since the late 1970s will not disappear.

Another notable demographic trend is the slowing entry of women into the labor force. As the percentage of women in the work force increased during the 1970s and 1980s, many female job seekers were new entrants or reentrants without much recent experience in looking for a job. Comparatively few working women were securely attached to a job they had held for several years. Hence the unemployment rate for women was higher than that for men. But the percentage of women with lengthy job experience increased steadily in the 1980s, and the growth of female labor force participation has slowed dramatically in the 1990s (see table 1 below). As a result, women without recent job experience now represent a significantly smaller fraction of the female work force, contributing to a low measured jobless rate among women. Since the labor force status of women appears to have permanently changed, the presence of more steadily employed women in the job market should reduce the natural rate of unemployment of the whole population compared with its average during the 1955–89 period, when women’s participation was on the rise. This effect is permanent.

Table 1. Labor Force Participation of Women Aged 16 and Older, 1949–99

Percent		
<i>Year</i>	<i>Participation rate^a</i>	<i>Change from decade earlier</i>
1949	32.6	
1959	37.1	13.8
1969	41.9	12.9
1979	50.5	20.5
1989	57.5	13.9
1999	60.2	4.7

Source: Bureau of Labor Statistics World Wide Web site.

a. Data are for January, seasonally adjusted.

One source of improvement in recent inflation performance is changes in the way the BLS measures consumer price inflation. According to the Council of Economic Advisers, methodological changes since 1995 have reduced the annual change in the consumer price index (CPI) by a total of 0.7 percentage point relative to its trend before 1995 (*Economic Report of the President, 1998*, pp. 79–80). This implies that 0.7 percentage point of the apparent improvement in CPI performance is not a genuine improvement in inflation performance. It is simply a statistical restatement of how fast prices are changing. Assuming that the BLS retains its new methods of measuring price change, this apparent improvement in price inflation is permanent.

The authors point to a rise in the incarcerated population as another partial explanation for the fall in the jobless rate. According to this line of argument, a large percentage of the people whom we now lock up would otherwise be looking for gainful employment. By taking prisoners out of circulation, the judicial authorities have eliminated them from both the numerator and the denominator (the labor force) of the unemployment rate. Because putting the imprisoned population back on the streets would have a bigger proportional impact on the numerator than on the denominator, removing them from the labor force statistics reduces the jobless rate slightly. This reasoning seems convincing, but the authors find that it explains less than 0.2 percentage point of the decline in measured unemployment since the mid-1980s.

Offsetting some of the unemployment-reducing impact of a higher rate of incarceration is the effect of a shrinking military service. Although it is true that the imprisoned population has increased by a startling amount over the past quarter century, and especially in the past decade, the size of the armed forces has dropped sharply over the same period. Between 1985 and 1996, while the population behind bars increased by more than 900,000, the number of Americans in the uniformed armed services shrank by 500,000. When a half million people are pushed from military payrolls into the civilian economy, the probable consequence is to boost civilian unemployment, at least slightly. People in the armed services have much better job prospects in the civilian economy than do people sentenced to prison. But a large percentage of enlisted personnel are young men, who would have higher-than-average unemployment rates if they were not serving in the military. The dwindling size of the armed forces has thus probably pushed up the unemployment rate slightly compared

with the mid-1980s, possibly offsetting part of the effect of a larger prison population.

Katz and Krueger examine a couple of important labor market institutions to see if either might explain an improvement in the efficiency of job matching in the United States. First, they look at recent changes in targeting job search services in state employment security agencies. I agree with the authors that these reforms are unlikely to significantly reduce the average duration of an unemployment spell or job vacancy. State employment services do not have a very big effect on average unemployment duration. They do provide helpful services to a relatively small percentage of the unemployed, but that percentage is almost certainly smaller today than it was from the 1940s through the 1960s.

Improvement in temporary job matching is another possible contributor to lower unemployment. Katz and Krueger suggest that the rise of the temporary help industry has helped place some people in temporary jobs who would otherwise have been unemployed. This industry has certainly flourished: in 1998 it accounted for 2.2 percent of employment, compared with just 0.5 percent in the early 1980s. The critical question, of course, is what people in temporary jobs would have been doing in the absence of the industry's expansion. Some would have been seeking work and thus classified as unemployed. But others would have been directly employed in the companies that now contract for temporary workers, and the remainder would have been outside the labor force. In low-wage labor markets, the temporary help industry now offers a point of entry for workers with few skills. Many employers who contract for temporary workers would once have hired similar workers directly but now rely on intermediary firms to fill unskilled positions. Temporary contract workers who perform well are sometimes made permanent employees. Indeed, in some low-wage labor markets, the temporary help industry has replaced the institution of probationary employment, a period in which new hires could be dismissed under relaxed rules. Although the temporary help industry may shorten the duration of some job vacancies, I am skeptical that as many as half of "involuntary" temporary employees would have been classified as unemployed in the absence of the temporary services industry.

The authors suggest a more intriguing possibility. The temporary help industry may have reduced pressure on employers to boost hourly pay for all their workers when they need to fill stubborn job vacancies. The authors test this hypothesis with a careful comparison of wage inflation across U.S.

states that differ in the share of employment accounted for by temporary services firms. The analysis shows modestly slower wage growth in areas where the temporary help industry is relatively large. The statistical identification of this effect is not entirely convincing, however. States with the largest temporary help industries presumably share other characteristics that may have made them less prone to wage inflation, and it is hard to know whether these characteristics are adequately represented in the regressions. The findings are nonetheless suggestive.

The temporary help industry is one new institution that may permit employers to restrain overall wage growth while continuing to fill vacancies. Other institutional changes have pushed companies to hold down wage costs. Large U.S. firms have historically favored paternalistic pay scales; personnel managers were reluctant to accept big pay gaps between workers on company payrolls. Paternalistic pay scales often meant that firms paid wages for unskilled and semiskilled labor that were higher than the spot market price. Baggage handlers received high wages at major airlines, even though companies could easily have hired unskilled workers to perform the same tasks for low pay. Large service companies paid generous wages to their cafeteria and cleaning staffs, to maintain workplace harmony. As long as firms remained profitable and managers faced little prospect of job dismissal, this “overpayment” of unskilled and semiskilled workers was affordable and sustainable. But when companies face the imminent threat of bankruptcy, managers’ and workers’ calculations change. Managers become less reluctant to force overpaid workers to accept pay reductions—and new wage scales—that once would have seemed objectionable.

New institutional arrangements in company finance and in corporate ownership and control now allow aroused stockholders to fire managers who fail to minimize costs, even when companies do *not* face the imminent prospect of bankruptcy. As recently as the early 1970s, many observers believed that senior corporate managers could not be replaced by dissatisfied but hapless stockholders, who were too numerous and poorly organized to exert a decisive influence over management. As a consequence, lax, foolish, or unprofitable management could survive for as long as the company remained modestly profitable. By the middle of the 1980s, however, it was plain that this theory no longer described U.S. corporate practice. Innovations such as leveraged buyouts and junk bonds enabled a small number of well-organized stockholders and lenders to take

over a corporation's management and fundamentally change its direction—by modifying historical pay patterns, by selling off unprofitable operations, or by outsourcing the production of important inputs. These innovations have caused big increases in pay disparities, both within and between companies. From the point of view of recent wage inflation, these innovations have slowed the rate of overall wage advance needed to attract and retain a company work force.

Managers in large firms now face a difficult choice that few of their counterparts faced in the 1960s and 1970s. To minimize costs as shareholders demand, and thus avoid their own removal, either they must force overpaid unskilled and semiskilled employees to accept pay restraint, or they must find ways to buy more cheaply elsewhere the goods or services produced by these employees. Hiring workers through the temporary help industry is one way to address this dilemma, but not the only one. Managers can now go to the spot market for janitorial services, cafeteria services, protective services, computer services, and a variety of other tasks once performed by a company's own workers. Firms contract for the required services from specialized companies at the lowest market price consistent with acceptable quality. Unskilled workers become less numerous on big company payrolls, but they still find jobs. The jobs are in smaller companies and offer worse pay and fewer fringe benefits. This is good news for labor costs, but bad news for unskilled and semiskilled workers.

It is not obvious whether these new institutional arrangements have produced permanent change in the trade-off between higher unemployment and accelerating inflation. Once all workers' wages have been pushed down to spot-level prices, continued labor market tightness must eventually be associated with accelerating wage inflation. At very low levels of unemployment, the acceleration of spot-market wages may be faster than the acceleration of wages that are restrained by historical norms and social custom.

William T. Dickens: Katz and Krueger have provided a very useful analysis of a number of old and new explanations for an important puzzle. The consensus of the economics profession as recently as three years ago would have been that we could not sustain unemployment below 5 percent for as long as we have without an acceleration in the rate or at least an increase in the level of inflation. Yet we appear to have done exactly that.

What is the source of our good fortune? Can we expect it to last, or is accelerating inflation or higher unemployment just around the corner?

This is an important question. Besides its obvious relevance for how the Federal Reserve should interpret and react to the next uptick in the rate of wage or price inflation, a permanently lower natural rate of unemployment implies a permanently higher forecast for GDP and therefore for government revenue. Debates about how to provide for projected medicare and social security expenses hinge on revenue forecasts, as do other debates about the appropriateness of proposed tax cuts and new programs.

Katz and Krueger have added considerably to our knowledge of this problem, but I do not believe they have solved it. The explanations that they find most plausible can account for at least half of the shift in the NAIRU and possibly the entire shift. Those changes they see as responsible for the decline in the NAIRU are permanent or at least long lasting. However, I am skeptical of several of the explanations they propose. A closer look at some of the figures the authors present suggests that shifts in the NAIRU have occurred mainly in a few brief episodes. If that is right, the major explanations the authors propose for the miraculous performance of the U.S. economy in the last few years are inadequate, because the changes they involve have been gradual, not episodic. We would then have to reexamine the recent period for evidence of the real source of the decline in the NAIRU. However, before discussing whether or not we have a full explanation for the phenomena in question, I would like to briefly consider what it is that we are trying to explain.

The authors focus their analysis on two changes: the decline in the natural rate and the difference between the unemployment rate of today and that which prevailed at the last business cycle peak in the late 1980s. However, today's low unemployment is only surprising in light of the current inflation rate. An unemployment rate of 4.2 percent would be unremarkable if it were associated with high and rising inflation. It is impossible to sidestep the real issue here. Whether one believes in a natural rate model or in some long-run trade-off between inflation and unemployment, what is surprising about the performance of the last couple of years is the coincidence of low inflation and low unemployment.

Just how remarkable is the current period? Estimates vary. However, one important dimension of what causes estimates to vary is not considered by the authors when they present their analysis of the magnitude of the shift in the NAIRU. At least some of the difference in performance

between the 1990s and the rest of the postwar period is due to the supply shocks of the 1970s. As far as I can tell, the authors' estimates of the change in the NAIRU do not take these shocks into account. Evidence that they are important can be found by computing the change in the NAIRU implicit in the Phillips curve estimates in their table 4. Price Phillips curves that include the 1960s as well as the later period show a much smaller decline in the NAIRU. Wage Phillips curves estimated using only data from the 1980s and 1990s again show lower estimates of the decline in the NAIRU than all but one of the estimates that include the 1970s. (The one wage specification that includes the 1960s is problematic because the change in the trend rate of productivity growth between the 1960s and the rest of the sample period is not taken into account, making the calculation of a NAIRU for the pre-1988 period impossible.)

We could simply turn to other authors' estimates of the shift in the NAIRU that do take into account the supply shocks of the 1970s. However, there is something unique about Katz and Krueger's estimates that make it unfortunate that they ignore this problem. In some of their specifications of the Phillips curve they have estimated not just the change in the intercept, but also the change in the slope. When they do that, they get much larger estimates of the extent of the decline than previous researchers. For example, the implied NAIRU for PCE inflation declines from 7.1 percent to 4.1 percent. Even if a full percentage point of this estimated decline is due to failure to consider the effects of the supply shocks of the 1970s, the remainder is still equal to the largest estimate of NAIRU decline I have seen previously. Katz and Krueger's other estimates of the decline using this technique are smaller, but still larger than the typical estimate of the decline in the NAIRU. This finding deserves further exploration.

It is important to know how much of a decline we need to explain. When we reach the end of the paper and tally the contributions of all the possible causes the authors and others have suggested, we need to know if the proposed explanations account for too little, too much, or just enough. If all the explanations together are inadequate, we might worry that whatever explains the rest could be gone tomorrow, and our low inflation rate with it. If we explain too much, we may want to look again, either to figure out which explanations may not be as good as we originally thought or for additional problems that may be acting to increase the natural rate.

My reading of this paper and the rest of this literature is that we have an embarrassment of riches—that if we take the authors' estimates at face

value we can more than explain the estimated decline in the NAIRU. At least a half a percentage point of the decline can be attributed to changes in the measurement of inflation and to favorable supply shocks such as falling oil and import prices. Katz and Krueger's analysis makes it seem likely that another 0.1 to 0.2 percentage point of the drop can be attributed to the growth of the prison population. The authors argue that the aging of the population and the growth of the temporary help industry can explain another 0.4 to 0.8 percentage point of the decline. They note that elaborations of the demographic adjustment argument could alone account for the entire change of the NAIRU, but they question whether the timing of the change is consistent with that of demographic change.

Summing the various explanations proposed by Katz and Krueger, and assuming that favorable supply shocks and changes in the measurement of inflation can explain an additional half percentage point of the decline, we can account for a decline of at least 1.1 percentage points and possibly twice that amount. If I am right that we have more than enough in the way of explanations for the decline in the NAIRU, perhaps we should return to the proposed explanations with a critical eye.

To begin, I am very suspicious of arguments that changing demographics have shifted the NAIRU. According to the theories of the NAIRU that I prefer, that rate is more a consequence of the distribution of types of jobs than of the distribution of types of workers. The way different types of demographic adjustments fall in and out of favor depending on whether or not they are giving the right answer—and the fact that some types of demographic adjustments are never in favor—contributes to my skepticism. Chief among the demographic characteristics that never gets adjusted for is education. No adjustment is made because the average level of education has been steadily rising, but the natural rate has not been steadily falling. Katz and Krueger cite arguments that education is different from age. However, if earnings growth as workers age is due to increasing human capital, then all the same arguments that are made for why the NAIRU will not fall with a rising average level of education could be invoked to argue that it will not fall with population aging. To do otherwise smacks of post hoc rationalization.

Besides population aging, the other major explanation the authors propose for the declining NAIRU is the growth of temporary services. The larger estimate of that effect comes from extrapolating the results of their state panel regression, which may indeed underestimate the true effect if

wage competition between states causes the effects of an expanded temporary help industry on wages in one state to spill over to wages in others. On the face of it, there is a plausible story here. If temporary workers are counted as working even when they are not, that may mechanically reduce the unemployment rate. But the effects could go further than that. Temporary help firms may fill vacancies faster and allow a lower level of vacancies at the same unemployment rate without producing wage pressure.

However, the authors' analysis of the effect of temporary help services on wages is far from convincing. The share of temporary help services in employment in a state may be endogenous. The authors' identification strategy is to use lagged values of this variable, which they implicitly assume are uncorrelated with contemporaneous innovations in the wage change equation. However, the authors provide no discussion of what is producing the variation between states in the use of temporary help. There may be serial correlation in the innovations, which would bias the estimated effects. For example, states with growing service sectors may both use more temporary help and have wages that are growing slower than the average. States that had fast-growing service sectors before 1988 may still have fast-growing service sectors after 1988.

There is a further problem with not knowing what is causing the growth in the temporary help industry. Temporary help firms were not invented in 1988, and the usual stories about why there would be growth in employment in such firms would suggest that the natural rate should be rising, not falling. Reports in the popular media sometimes suggest that the growth of temporary help is a response to a general reduction in job permanency. More turnover would mean a higher natural rate of unemployment in most labor market models.

There is another problem with the arguments that the aging of the population and the growth of the temporary help industry account for a large fraction of the change in the NAIRU, namely, the timing of the changes. Katz and Krueger's figure 7 shows the age-driven NAIRU increasing steadily throughout the 1960s, reaching a relatively flat peak in the 1970s, and then falling fairly steadily through the 1980s and 1990s, with a hint that the decline may have recently come to an end. This figure compares the age-driven rate with Watson's time-varying NAIRU, making it clear that a lot of the decline in the NAIRU seems to have occurred since the mid-1990s. However, this is the period when the age-driven NAIRU is flattening out, not falling sharply. Moreover, the comparison the authors pre-

sent does not reveal the true extent of the problem. Watson's time-varying NAIRU is identified by the imposition of smoothness priors on changes in the NAIRU. This method of identification rules out rapid, discontinuous changes. Yet the Beveridge curve data the authors present suggest changes of exactly this nature.

From the authors' figure 5 it looks like the rate of unemployment consistent with a roughly 1.9 percent job vacancy rate became 1 to 2 percentage points lower between 1986 and 1989. In fact, it appears the Beveridge relation has returned to that which prevailed during the 1960s. The outward shift in the Beveridge curve in the early 1970s appears to be almost as abrupt: it took place between 1970 and 1975, with almost half the change occurring in the last year of that period. From 1990 to 1994 the Beveridge curve seems to have stayed in the same historic groove as in the 1960s, but since 1994 the unemployment rate has come down over 1.5 percentage points, with almost no increase in the vacancy rate. In fact, in 1998 we had nearly the same level of vacancies as in 1975, but the unemployment rate was 4 percentage points lower!

The abrupt and episodic nature of these shifts in the Beveridge curve makes it unlikely that they are due to problems with the vacancy proxy. The changes in the newspaper industry that might account for a changing relationship between the help wanted index and vacancies are not restricted to these periods. Further, it is arguable that the shifts in the Phillips curve (that is, in the NAIRU) took place during these same periods. The authors' figure 2 shows what appears to be a fairly stable relationship between unemployment and the rate of change of inflation between 1973 and 1987. After 1988, however, all the observations lie below the line, and in particular 1995 through 1998 stand out as years in which a further inward shift of the authors' accelerationist Phillips curve may be taking place. The similarity to the timing of the shifts in the Beveridge curve is eye catching. The authors do not show us what their Phillips curve relationship looked like before 1973, but points for the latter half of the 1960s would all lie below the plotted line. This suggests that there may have been an increase in the NAIRU during the same period as the initial outward shift in the Beveridge curve. The correspondence between these shifts in the Beveridge curve and shifts in the NAIRU make it seem even less likely that what we clearly see happening with the relation between the vacancy series and the unemployment series is due only to problems with the vacancy series. The same shifts are harder to see in

the ECI Phillips curve in the authors' figure 3, but because the authors do not take account of changes in productivity growth, this chart is difficult to interpret. In particular, there is no apparent shift in the authors' ECI Phillips curve after 1989. However, if there has been an increase in trend productivity growth in the last few years, the relatively subdued wage inflation in 1997 and 1998 is even more remarkable than it appears in figure 3 and could herald a further reduction in the NAIRU.

If I am right, the Beveridge curve data show that the great majority of the change in the NAIRU corresponds to developments in the labor market, but it is very unlikely that any of the factors that the authors identify can account for a substantial part of that shift. Clearly the demographic changes did not happen in two brief episodes. Nor could they have caused the abrupt deterioration in the Beveridge and Phillips trade-offs in the first few years of the 1970s. The same argument can be made about temporary help services. Employment in the temporary help industry has grown phenomenally since the early 1980s, but the rate of growth has been fairly constant. It was not noticeably greater during the years in which the Beveridge curve seems to have shifted inward. This is not to say that demographic shifts, the growth of the temporary help industry, and the growth of the prison population have had no effect on the NAIRU. However, they cannot explain the very large and abrupt shifts that seem to have taken place and seem to account for most of the decline in the NAIRU.

What could account for these abrupt changes in the Beveridge and Phillips relationships? In 1987 Katherine Abraham observed that the shift outward in the Beveridge curve in the 1970s was mainly evident at the national, not the local level. One interpretation of this finding is that there was an abrupt increase in the spatial mismatch of labor supply and labor demand. It would be interesting to see if the recent shifts in the Beveridge curve can be seen in local data as well.

There is another possible explanation. A favorable shift in the Beveridge curve may not indicate an improvement in the efficiency of the labor market but may be consistent with one version of the "new economy" explanation for the declining NAIRU. One commonly heard argument is that increased foreign competition has made it harder for domestic firms facing capacity constraints to raise their prices. Bottlenecks have not developed in the current expansion because foreign firms stand ready to supply any demand left unfilled by domestic firms. If this is true, per-

haps the expansion has proceeded further, and unemployment has fallen lower, than in previous recoveries because growth has not been stalled by the development of bottlenecks. In the past, firms in bottleneck industries may have attempted to expand production aggressively by raising prices and wages and by advertising extensively for the labor they needed. Today foreign competition may act as a brake on their ability to raise prices in response to excess demand and may therefore prevent the rise in wages and vacancies that characterized mature expansions in the past. The result may be that we are able to sustain lower rates of unemployment without increases in vacancies or inflation.

Of course, increases in foreign competition have been no more episodic than the changes that Katz and Krueger point to, but the argument just presented might explain a shift in the slope of the Phillips and Beveridge curves as well as a shift in the intercepts. If so, the entire period from 1988 to the present may represent just one episode of change rather than two separate episodes. The effects of increasing internationalization may have only become apparent in the performance of the economy during the last two periods of sustained expansion.

Whether or not this is the best explanation for the decline in the NAIRU, Katz and Krueger's finding of a change in the slope as well as in the intercept of the Phillips curve, and the shifts in the Beveridge curve to which they call attention, deserve more consideration.

General discussion: Christopher Sims questioned the value of examining Phillips-type relations as a way to understand labor market developments. He reported that he and others had found the relation between inflation and unemployment to be unstable across time periods, and no relation between the two stands out in multivariate time-series analysis of macroeconomic variables. Thus, although he found the authors' analysis of labor market developments useful in understanding why unemployment is as low as it is today, he saw no reason to think the inflation rate contributed to that understanding. Similarly, he thought it interesting to ask why inflation is low but saw no reason to focus on unemployment in answering that question.

Responding to Sims, William Dickens noted that, although the theoretical foundation for a Phillips-type relation was not well established, the relation between inflation and unemployment has been used in planning stabilization and budget policy for many years. This made it interesting to

examine whether the relation has changed. William Nordhaus added that, properly used, a two-equation system of wage and price equations is useful for understanding aggregate wage and price developments in a largely closed economy like the United States. He suggested that the two equations should be thought of as a system for capturing separate shocks, and he considered that the recent behavior of the U.S. economy could be understood by taking into account price shocks and how they were transmitted to wages. In this vein, Laurence Ball suggested viewing the recent favorable developments in the inflation-unemployment relation as a reverse of the stagflation of the 1970s. In that decade the productivity slowdown and oil price shock caused equilibrium real wages to grow more slowly than the real wages expected by workers. Recently, smaller but favorable price shocks, along with what may be a quickening of productivity growth, may have kept workers' real wage aspirations behind the growth of equilibrium real wages.

Robert Hall observed that the instability of inflation-unemployment relations to which Sims had referred was most apparent looking across countries. He recalled William Nordhaus's much earlier Brookings Paper that had asked why so many countries had experienced wage explosions around 1969. Nordhaus had found a different, coherent explanation in every country he examined. Hall noted a number of experiences since then that raise the same issue. Sweden had enjoyed near-zero unemployment for years and then discontinuously moved to a high level of unemployment. Similar discontinuous jumps in unemployment have occurred in Israel. In Canada, unemployment rates have diverged sharply from those in the United States, despite their strong economic ties. France has experienced large increases in unemployment over the past twenty years. Hall reasoned that the kinds of modest changes over time that Katz and Krueger were investigating would be useless in understanding these differences across countries. Carmen Reinhart added that, in many developing countries, the inflation-unemployment relation had the opposite sign from that in U.S. Phillips curves. Stabilization programs in those developing countries that use the exchange rate as a nominal anchor produced a positive correlation between unemployment and inflation.

Turning to the authors' analysis of changes in the labor market, Nordhaus observed that the expanded use of temporary workers could be interpreted as growth in the spot market for labor. The important questions are how this spot market would impact the larger market and how it would

impact overall unemployment and wages. He noted that the relation between spot and contract markets had been studied in other contexts, and he suggested that Katz and Krueger had not exploited the idea that a spot market would be more responsive to supply and demand, and so would presumably affect the coefficients in a Phillips relation.

Katharine Abraham questioned the reliability of the help wanted index as a proxy for the number of job vacancies. The help wanted index is subject to changes in employer advertising practices that would shift the relationship between the number of ads in major newspapers and the actual number of vacancies. In earlier work reported in the *Brookings Papers*, she had adjusted the help wanted data for this effect and others, but no adjustments have been made for years after 1985. She reported that the BLS has obtained funding to start a new job vacancy survey. Nordhaus believed it would be useful to supplement the paper's Beveridge curve analysis with data on job losers and job leavers, even though this would require merging data from before and after the redesign of the Current Population Survey.

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