Wage Determination and Monetary Policy: 1987-88

by

John B. Taylor

Stanford University

June 1988

During 1987 and early 1988, real output growth in the United States accelerated above the more moderate pace of 1985 and 1986. Over the four quarters of 1987, real GNP grew by 4.0 percent and this pace was nearly maintained at 3.9 percent in the first quarter of 1988. In comparison, real growth averaged 2.7 percent during 1985 and 1986. Few forecasters predicted the more rapid growth in 1987 and 1988.

Accompanying this relatively high growth rate was a sharp decline in the unemployment rate, from a steady average of 7.0 percent during 1986 to 5.7 percent during the first quarter of 1988 (and 5.4 percent in April 1988). The unemployment rate has not been this low since the business cycle peak immediately prior to the 1974-75 recession. Even during the boom period of the late 1970s the unemployment rate never fell below 5.6 percent in the United States.

Surprisingly, wage inflation has remained modest and has shown no signs of accelerating during this period of high output growth and falling unemployment. Average hourly earnings increased by 2.8 percent during 1987. Average hourly compensation increased by 2.7 percent, and negotiated first year settlements in major labor unions averaged 2.7 percent during the four quarters of 1987. The increases during 1986 were about the same. The wage increases in 1987 were also small compared to price inflation. The fixed-weight price index for personal consumption expenditures increased by 4.7 percent during 1987; the consumer price index increased by 4.4 percent.

The low wage inflation coupled with high output growth and relatively low unemployment raises questions about the wage determination process in the United States and about the appropriate

2

monetary policy for 1988 and 1989. Is the conventional expectations-augmented Phillips curve equation which is used to relate wage inflation to unemployment in many econometric models, including the Federal Reserve Board staff's MPS model, still useful? Or are there other things going on in the labor market, such as changes in collective bargaining relationships, that are causing moderate wage growth? Is the crucial expectations term in the Phillips curve equation correctly capturing expectations? Is the natural rate of unemployment in the equation still a useful concept, or is the natural rate of unemployment shifting yet again? The purpose of this paper is to discuss some evidence pertaining to these and related questions. Clearly, prospects for wage inflation, and inflation generally, at current levels of economic activity, are key issues in the choice of monetary policy now and in the near future.

The discussion is organized as follows. First, I examine recent developments in the union sector for signs that there are other factors influencing wages that are not normally incorporated in conventional econometric relationships. Despite the declining relative size of the union sector and the comparative industrial peace of the 1980s, I argue that changes in industrial relations are not likely to have played a big role in keeping overall wage inflation down. However, modest settlements in longer term union contracts and the elimination of indexing in many contracts will probably have a damping effect on overall wage inflation in 1988 and 1989.

Second, I consider possible changes in the natural rate of employment; that is, in the rate of unemployment usually associated

with stable wage inflation. I argue that demographic changes which have begun to lower the natural rate can explain part but not of all of the low wage inflation in the face of the low unemployment in recent years.

Third, I consider an alternative to the conventional Phillips curve equations. This alternative provides for a more explicit forward looking behavior on the part of workers and firms. I argue that such an alternative, in which expectations of the future play an important role, can provide further insight into why the rate of wage inflation has remained low during the recent high growth period.

Finally, I conclude with a brief discussion of the implications of the analysis for current monetary policy.

1. Developments in the Union Sector.

There have been a number of important changes in the process of wage determination in the union sector during the 1980s which might have bearing on the question of wage inflation. The fraction of U.S. workers in labor unions has continued to decline during the 1980s to about 17 percent in 1988. This decline has been due both to reductions in employment in manufacturing industries typically heavily unionized and to a slower growth of unions in other industries. Competition from foreign imports has probably been an underlying factor behind both developments. The number of workers in major union settlements (1,000 or more workers) has also declined rapidly (see Table 1 and Table 5) from about 9 or 10 million workers in the 1970s and early 1980s to only 6.3 million in 1988. It has been suggested that these declines have

4

made union leaders relatively more concerned about job security issues in recent years than about wage gains (see Ruben (1988)).

As Table 1 shows, a large majority of these workers negotiate contracts of about three years in length. The distribution of workers by contract length has not changed very much for this group of workers, as a comparison of Table 1 with a similar tabulation for the 1970s in Taylor (1983) shows.

Indexing

Indexing through cost of living (COLA) clauses has become much less prevalent in the major union contracts, especially during the last two years when several settlements dropped COLA provisions entirely (see Table 5). In the late 1970s about 60 percent of major settlements had COLA clauses; in 1988 the percentage was 38 percent. Under the assumption that this percentage is representative of all union workers and that indexing clauses are absent in the non-union sector, this implies that only about 7 percent of U.S. workers are employed under indexing arrangements. Explicit COLA provisions are potentially important for wage inflation because they automatically raise wages when inflation rises. For example, the 1987 automobile workers contract calls for 1 cent per hour increase in the wage for each .26 point increase in the CPI. The elimination of COLA clauses thus moderates the sensitivity of wage inflation to price inflation. Table 3 shows how contracts with COLA clauses generally have smaller deferred wage increases, however, so that a certain amount of inflation is built into the wage settlements even without indexing. In effect, COLA

5

clauses permit unanticipated increases in inflation to be passed through to wages relatively quickly.

Wage Settlements During the Disinflation

The disinflation of the early 1980s is quite marked in the union sector, as new settlements in the 1982-83 period had remarkably small increases compared to only one year before (see Table 2 and Figure 1 for a summary; a detailed discussion of this period is found in Kosters (1984)). Cuts in nominal wages were common enough in this period to show up as negative inflation rates in the averages of settlements in Figure 1 and Table 2. To be sure, some of the small increases and declines in 1983 and 1984 are part of the transition to lower wage growth as contracts expiring in these periods had to offset the large built-in increases in previous contracts. (This aspect of union wage developments during a disinflation is illustrated in Taylor (1983).)

Note that the sharp break in wage inflation shown in the new union settlements data in Figure 1 does not result in as sharp a break in average wage inflation. The average inflation rate represents the behavior of previous wage increases and indexing clauses as well as new settlements. Figure 2 shows that average union wage inflation declined more gradually, and the slowdown is no more marked than for non-union wages during the disinflation period.

To summarize, part of the apparently remarkable change in the union sector wage settlements during the disinflation period shown in Table 2 and Figure 1 is due to the fact that the observations are on individual wage contracts rather than averages, and part is due to the

6

need to offset previous high increases in three year contracts. Adjusting for these two factors results in wage behavior in the union sector which looks very similar to the non-union sector.

Changes in the Bargaining Environment

There are other signs of change in the union wage bargaining environment which might explain low wage inflation in recent years. Table 6 shows the sharp decline in the number of major work stoppages (strikes and lockouts) in the 1980s. There were only 46 major work stoppages involving 1000 or more workers in 1987, a new low for the postwar period. The decline in the 1980s, however, appears to be part of a more gradual downward trend during the last twenty years. Focussing on the three previous expansion periods prior to the previous three recessions in order to control for cyclical influences, the average number of work stoppages fell from 395 in 1967-69, to 330 in 1972-74, to 250 in 1977-78, and to 56 in 1985-87. While the decline in the number of stoppages in the 1980s is large, it appears to be related to more secular influences than to a completely new industrial relations environment that began in the 1980s.

Some analysts place great emphasis on the demise of the professional air traffic controllers organization (PATCO) following the unsuccessful strike in August 1981, as a watershed in industrial relations that has resulted in less aggressive wage demands on the part of unions. As Northrup (1984) has argued, however, the particulars of the PATCO strike make it a watershed for public sector unions, and, in particular, for public sector unions where strikes are illegal, rather

than for the private sector unions. The main lesson from the PATCO case was that public sector unions at any level of government would not be able to go any further in adopting private sector bargaining rules, and that illegal strikes, or even disruptive slowdowns in key public service jobs, would no longer be tolerated by public officials. Except for the possibility that private employers learned from the Reagan Administration's effective strategy for dealing with the PATCO strike, it is difficult to see why the private sector bargaining environment was affected by the successful stand of the Reagan Administration against the PATCO strike. Recall that the wage settlements described in Table 2 which showed the large wage decline in wage inflation in 1982 and 1983 refer to private sector employees only.

According to the employment cost index for union and non-union workers shown in Figure 2, the rate of wage gain has been slightly less in the union sector than in the non-union sector during the 1983-87 period. However, the difference has not been large enough to affect significantly the average rate of wage inflation across both sectors. The rate of wage inflation for both sectors combined is not shown in Figure 2, but in the 1983-87 period, and, especially, in the more recent 1985-87 period, there is almost no difference between the total and the non-union index. During the 1985.1-1987.4 period, the employment cost index for non-union workers increased at an average annual rate of 3.8 percent; for the total labor force including unions the increase was 3.5 percent. Moreover, the small difference that exists between the union and non-union sectors could just as likely be

8

due to sectoral shifts in demand as to changes in the collective

bargaining environment in the union sector.

Near Term Effects of Recent Settlements

Finally, note that because of the continual importance of three

year contracts in the union sector, the moderate deferred wage

increases in 1986, 1987, and early 1988 will have a slight damping

effect on average wage growth through 1990 even if there is an increase

in inflation in new settlements. (To be sure, if there is an

extraordinary inflation, the long term contracts would probably be re-

opened as in 1982.) The reduction of the importance of COLA clauses in

the three year contracts will tend to lock in these increases more than

in the past, but it should be emphasized that the importance of these

contracts in the overall economy is now probably too small to have a

very large effect. Deferred wage increases in recent settlements,

exclusive of fringe benefits, which will apply in the rest of 1988,

1989, and 1990 are about 2 percent (see the last eight rows of Table

2).

2. Demographic Effects on the Natural Rate of Unemployment.

Demographic factors have been a well understood and widely-

accepted reason for part of the gradual upward trend in the full-

employment, or "natural", unemployment rate in the late 1960s and 1970s

in the United States. As the post-war baby boom entered the labor

force in the 1960s and 1970s, the labor force percentage of young

workers with typically higher unemployment rates increased. As a

9

result, the level of unemployment associated with a given level of labor market slack increased. (See Summers (1986) for a recent detailed discussion of the demographic factors.) However, demographic factors could not explain all of the upward trend in the cyclically-adjusted unemployment rate during the 1960s and 1970s. There was also a secular rise in the unemployment rate of young workers relative to adults. The 1977 Annual Report of the Council of Economic Advisers, one of the first public documents to revise upward the natural rate, took both factors into account: the demographics and the relatively higher unemployment rate for young workers. At that time, the upward revision in the natural rate was approximately 1 percentage point. The 1977 report noted that this revision "corresponds with the widening in the difference between the overall unemployment rate and the unemployment rate for adults..." (that is, 25 to 54 year olds).

During the 1980s as the baby boom generation ages, these demographic factors have begun to have a reverse effect on the natural unemployment rate. For example, the Congressional Budget Office (CBO) broke the civilian labor force into 14 age-sex groups and calculated that shifts in the natural rate began to come down starting in 1981. According to the CBO, the natural rate was 6 percent in 1981, had fallen to 5.8 percent in 1986, to 5.7 percent in 1987, and will continue to fall to 5.5 percent in 1992. The levels of the CBO estimates are based on a NAIRU--nonaccelerating inflation rate of unemployment--concept. Hence, according to these demographically adjusted estimates, the actual unemployment rate has been slightly above the natural rate until early 1988. This estimate is, therefore,

10

consistent with the observation that there was no acceleration of wage inflation in 1987, but it suggests that there will be upward pressure on wages starting sometime in 1988.

Is there any evidence that the natural rate may be lower than the demographic estimates such as those of the CBO? The CBO estimates do not incorporate trends in secular unemployment rates within demographic groups. But these trends have also reversed in the 1980s. Figure 3 shows the overall civilian unemployment rate along with the unemployment rate for males 25 to 54 years old. As noted above, the gap between this adult unemployment rate and the overall unemployment rate widened in the 1960s and 1970s, but the gap has narrowed significantly in the 1980s. The gap between these two unemployment rates was 1.2 percentage points in 1956, 1.9 percentage points in 1973, 2.5 percentage points in 1979, and was back to 1.2 percentage points in 1987.

This reversal suggests that some further downward adjustment in the natural rate below the CBO estimate may be appropriate. Vroman and Abowd (1988), for example, have shown that using the male 25-54 unemployment rate works very well, and much better than the overall unemployment rate, in an expectations augmented Phillips curve regression for the entire 1964-1987 period. However, there is still considerable uncertainty about the appropriate size of such an adjustment because other factors may have directly raised the unemployment rate for adults. Summers (1987), for example, argues that sectoral shifts in demand away from certain highly unionized U.S. manufacturing industries may have had an abnormal increase in

11

unemployment for more senior workers. Until these sectoral effects fade away, it would not be appropriate to treat the adult male unemployment rate today as equivalent in terms of labor market pressure to the same level of the adult male unemployment rate in the 1960s. Other evidence also suggests caution. Abraham (1987) shows that vacancy rates in the labor market, as measured by an adjusted help-wanted index, have risen relative to the overall unemployment rate in the 1960s and 1970s, indicating greater labor market pressure for the same level of unemployment compared to the 1950s. However, there is no evidence that this trend has yet reversed.

3. Expectations and Alternative Models.

One of the questions raised by the recent occurrence of low wage inflation and high economic growth in the U.S., and which I was asked to explicitly address at this meeting, is the adequacy of conventional expectations-augmented Phillips curve equations which are embodied in many econometric models. There are many varieties of such equations. For example, in the Phillips curve equation in the Federal Reserve Board staff's MPS model, wage inflation is a function of the overall civilian unemployment rate, past price inflation, and a series of other variables. This equation overpredicts wage inflation in the four quarters of 1987 and the first quarter of 1988 taking as given the actual level of unemployment and the actual price inflation rate during these quarters. The reduction in unemployment and the increase in inflation are both factors in the recent overprediction. The average overprediction for the four quarters of 1987 is 1.4 percentage points.

12

While these errors are large enough to be significant economically, they are not significant statistically. The standard error of this equation is about 1.2 percentage points, so that the errors are well within the 95 percent confidence limits. A similar string of errors was made with this equation during 1985, but of the opposite sign: wage inflation was underpredicted by an average of 1 percent during this period. Another Phillips curve equation estimated by Vroman and Abowd (1988), which uses the adult male unemployment rate, has a smaller overprediction in 1987, and the prediction error is well within two standard deviations for that equation.

Empirical research in macroeconomics during the last few years has sought to improve on these conventional expectations-augmented Phillips curves in ways which might help explain some of the recent errors. There have been two directions of this research. First, efforts have been made to be more explicit about the reasons for wage rigidity focussing on labor union contracts as well as on implicit contracts in the non-union sector. For both union and non-union workers wages are adjusted relatively infrequently and the adjustments affect only a fraction of workers at any one time. Second, the adaptive expectations assumption that underlies the conventional expectations Phillips curve has been challenged. An alternative, which has attracted much attention from researchers, is the rational expectations assumption in which firms and workers make forecasts of the future that are similar to economists' forecasts.

Models that incorporate both of these features have the important property that temporary increases in demand or temporary increases in

13

inflation have a very small effect on current wage settlements. Forward-looking firms and workers will not adjust their wages much if they expect a boom to fade away quickly.

How might such models explain some of the recent events? As mentioned in the introduction, the high real GNP growth in 1987 and early 1988 was forecast by very few economists. This is especially true of the high growth in the last quarter of 1987 and the first quarter of 1988. Even after the high growth in the last quarter of 1987, many forecasters were predicting a slowdown; the stock market crash and the inventory build-up in the last quarter were factors in this forecast.

Wage administrators, labor union leaders and others concerned with wages during 1987 were unlikely to be expecting large reductions in unemployment and tighter labor market conditions. Looking ahead to the period during which these wage rates would be in force, they probably did not foresee any need or any opportunity for an increase in wage growth over 1986. And even as the growth rate increased, if they were like many economic forecasters, they were probably predicting a decline in real output growth at least back to the more normal 2-1/2 to 3 percent per year.

Figure 4 shows the actual and predicted values for wage inflation for an econometric wage equation that has the two features described above: forward looking expectations and explicit contract wages set for up to four quarters in advance. (The equation is briefly described in the Appendix.) The natural rate of unemployment implicit in this equation is about 6-1/2 percent (the translation is rough because a

14

natural output concept is used rather than a natural unemployment rate in this equation). Hence, by this measure the equation has actual unemployment below the natural rate throughout 1987. Nevertheless, this equation seems to show less of a tendency to overpredict wage inflation in 1987 than the conventional type Phillips curve. Part of the reason for this is that real output growth was forecasted by the model (incorrectly, as with many forecasters) to decline throughout 1987 and into 1988.

It is important to note, however, that if greater output growth becomes widely expected in the future, then this same equation suggests that wage inflation will begin to accelerate sharply.

4. Concluding Remarks.

According to this analysis, two factors tend to stand out as explanations of the relatively low wage inflation during 1987 and 1988. One is demographic and the other is expectational.

First, recent declines in the natural rate of unemployment due to demographic changes mean that only very recently, early this year, has the actual unemployment rate fallen below the natural rate where labor market pressures start to build up. There is some possibility that the natural rate might even be lower than these demographic adjustments imply. For example, the unemployment rate for males 25-54 years old, which has in the past served as a guide to labor market tightness, is still relatively high. But because of sectoral shifts in the economy during the last few years, it would be unwise to estimate the degree of labor market tightness by the adult unemployment rate alone.

Second, the high real output growth and the reductions in unemployment during 1987 and early 1988 were probably unexpected by most people involved in wage determination. Expectations of more modest output growth and small changes in the unemployment rate probably led to the modest wage gains that have occurred. There does not seem to be a major change in industrial relations of the kind that would suggest that wage growth will remain low if boom conditions persist for long. In fact, the same quick wage change that occurred in 1982 and 1983 could occur in reverse if an inflationary boom came to expected.

Both these explanations for low wage inflation during the last year indicate that inflation will soon begin to accelerate if real growth continues for long in the 4 percent range. A monetary policy which takes low inflation, say 2 to 3 percent per year, and stable real growth as two primary goals should now be addressed to the task of avoiding an inflationary boom and maintaining a more moderate growth rate. Current evidence suggests that real output growth of around 2-1/2 to 3 percent will keep the unemployment rate fairly steady and thereby keep wage inflation around 3 to 4 percent and price inflation around 2 to 3 percent. This translates into nominal GNP growth of around 4-1/2 to 6 percent. Without substantial evidence of increases in productivity growth, real output growth above 3 percent for an extended period of time would lead to an increase in inflation and another boom-bust cycle.

Figure 5 shows on a dual scale U.S. real GNP growth and Japanese real GNP growth during the last 15 years. If a U.S. policy mistake can

be seen on this chart it is that the U.S. expanded too rapidly in the late 1970s; this led to the inflation and the subsequent recession and disinflation of the 1980s. By comparison, the Japanese avoided both the boom and the subsequent slump. Simply put, the key to avoiding a repeat of the 1981-82 recession in 1991-92, will be to avoid a repeat of the 1978-79 boom in 1988-89.

TABLE 1 - NUMBER OF WORKERS IN MAJOR UNION SETTLEMENTS
BY CONTRACT LENGTH, 1980.1-1987.4
(Thousands of workers)

| | Contract Length | | | |
QUARTER	1-YEAR	2-YEAR	3-YEAR	TOTAL
1980:1	10	60	299	369
2	80	167	693	940
3	99	203	1325	1627
4	25	177	652	854
1981:1	12	23	167	202
2	83	220	423	726
3	49	125	364	538
4	296	153	426	875
1982:1	34	79	530	643
2	94	651	491	1236
3	119	146	564	829
4	---	---	---	---
1983:1	16	54	477	547
2	152	120	407	679
3	90	143	438	671
4	30	72	1090	1192
1984:1	20	73	229	322
2	92	138	282	512
3	61	141	410	612
4	43	42	776	861
1985:1	35	6	132	173
2	110	93	473	676
3	99	93	574	766
4	93	78	408	579
1986:1	35	49	199	283
2	46	122	521	689
3	36	44	795	875
4	28	86	525	639
1987:1	14	37	180	231
2	61	78	361	500
3	10	59	456	525
4	42	29	722	793

Source: Current Wage Developments; Major Settlements are those
involving 1,000 or more workers. The numbers in the table are computed
from cumulative totals published quarterly for each year. Before
1983:1, 1-Year refers to contracts less than 18 months, 2-Year refers
to contracts between 18 and 30 months, and 3-Year refers to contracts
longer than 30 months. Starting in 1983:1, 1-Year contracts are less
than or equal to 12 months, 2-Year contracts are between 12 and 24
months and 3-Year contracts are greater than 24 months. This change
causes a break in the series in 1982:4.

TABLE 2 - CURRENT AND DEFERRED WAGE CHANGE IN MAJOR UNION SETTLEMENTS
BY CONTRACT LENGTH, 1980.1-1987.4

QUARTER	ONE-YEAR CONTRACTS	TWO-YEAR CONTRACTS		THREE-YEAR CONTRACTS		
		YEAR 1	YEAR 2	YEAR 1	YEAR 2	YEAR 3
1980:1	10.1	10.7	9.9	6.7	4.6	4.6
2	10.9	11.8	8.8	7.7	4.7	4.3
3	13.5	10.7	9.3	10.5	5.6	4.9
4	9.6	9.7	5.4	8.3	5.2	4.2
1981:1	9.9	11.5	10.9	8.6	6.9	6.4
2	9.0	12.1	9.9	12.5	9.0	6.8
3	8.8	14.6	8.5	11.1	8.1	7.0
4	9.4	-2.1	4.7	9.0	4.7	4.2
1982:1	5.1	8.8	7.3	1.0	0.9	0.5
2	6.1	1.5	1.4	5.2	4.6	4.9
3	5.6	7.7	6.8	5.2	5.5	2.6
4	-	-	-	-	-	-
1983:1	2.5	5.2	7.1	-2.4	4.1	3.3
2	0.6	5.6	5.5	3.0	3.7	3.6
3	0.3	4.4	3.8	2.9	3.1	2.8
4	-3.9	-1.3	1.0	4.7	2.4	2.3
1984:1	-1.8	-1.4	3.7	4.8	4.9	3.7
2	-0.8	2.1	2.3	3.6	3.8	3.0
3	0.4	3.3	3.1	2.4	3.2	3.1
4	1.4	2.7	2.3	2.1	1.3	0.9
1985:1	3.1	4.0	1.1	2.7	3.3	2.7
2	1.4	2.3	2.9	3.2	3.8	3.4
3	4.0	2.0	2.3	1.4	3.3	3.8
4	2.7	0.6	0.7	2.6	2.8	1.6
1986:1	0.1	1.1	3.9	0.8	2.3	1.6
2	-0.1	3.7	2.8	0.9	2.1	1.9
3	2.3	2.7	2.6	1.4	2.1	1.9
4	2.0	-6.6	0.9	1.9	2.0	2.1
1987:1	0.4	1.7	2.4	0.8	2.4	1.7
2	1.4	3.3	2.9	2.8	3.1	3.0
3	1.2	4.4	3.7	1.8	1.6	1.8
4	0.4	3.1	0.9	2.5	1.2	1.6

Source: Current Wage Developments; Major Settlements are those involving 1,000 or more workers. The numbers in the table are computed from cumulative totals published quarterly for each year. Before 1983:1, 1-Year refers to contracts less than 18 months, 2-Year refers to contracts between 18 and 30 months, and 3-Year refers to contracts longer than 30 months. Starting in 1983:1, 1-Year contracts are less than or equal to 12 months, 2-Year contracts are between 12 and 24 months and 3-Year contracts are greater than 24 months. This change causes a break in the series in 1982:4.

TABLE 3 - CONTRACT SETTLEMENTS WITH OR WITHOUT COLA CLAUSES

Average Percentage Adjustment

	1980	1981	1982	1983	1984	1985	1986	1987
1st Year Adjustment	9.5	9.8	3.8	2.6	2.4	2.3	1.2	2.2
Contracts with COLA clauses	8.0	8.0	2.2	1.9	2.9	1.6	1.9	2.3
Contracts without COLA clauses	11.7	10.6	7.0	3.3	2.1	2.7	0.9	2.1
Adjustment over Life of contract	7.1	7.9	3.6	2.8	2.4	2.7	1.8	2.1
Contracts with COLA clauses	5.0	5.5	2.1	2.0	1.8	2.5	1.7	1.5
Contracts without COLA clauses	10.3	8.8	6.6	3.7	2.7	2.8	1.8	2.5

Source: Current Wage Developments

TABLE 4 - CONTRACT SETTLEMENTS WITH OR WITHOUT FRINGE BENEFITS

	Wage Change in Settlements with 1000 or more Workers		Compensation Change in Settlements with 5000 or more Workers	
	1986	1987	1986	1987
First Year Adjustment	1.2	2.2	1.1	3.0
Average Over Life of Contract	1.8	2.1	1.6	2.6

Source: Current Wage Developments

TABLE 5 - WORKERS UNDER COLA ADJUSTMENT CLAUSES IN MAJOR
COLLECTIVE BARGAINING AGREEMENTS (private industry)

| Year	Percent with COLA coverage	Number of COLA workers (millions)	Total number of workers (millions)
1971	27.8	3.0	10.8
1972	40.6	4.3	10.6
1973	39.4	4.1	10.4
1974	39.2	4.0	10.2
1975	51.5	5.3	10.3
1976	59.4	6.0	10.1
1977	61.2	6.0	9.8
1978	60.4	5.8	9.6
1979	58.9	5.6	9.5
1980	58.1	5.4	9.3
1981	58.2	5.3	9.1
1982	56.7	5.1	9.0
1983	57.6	4.9	8.5
1984	57.3	4.5	7.9
1985	56.7	4.2	7.4
1986	50.0	3.5	7.0
1987	40.4	2.6	6.4
1988	38.4	2.4	6.3

Source: Borum et al (1988)

TABLE 6 - STOPPAGES INVOLVING 1,000 OR MORE WORKERS

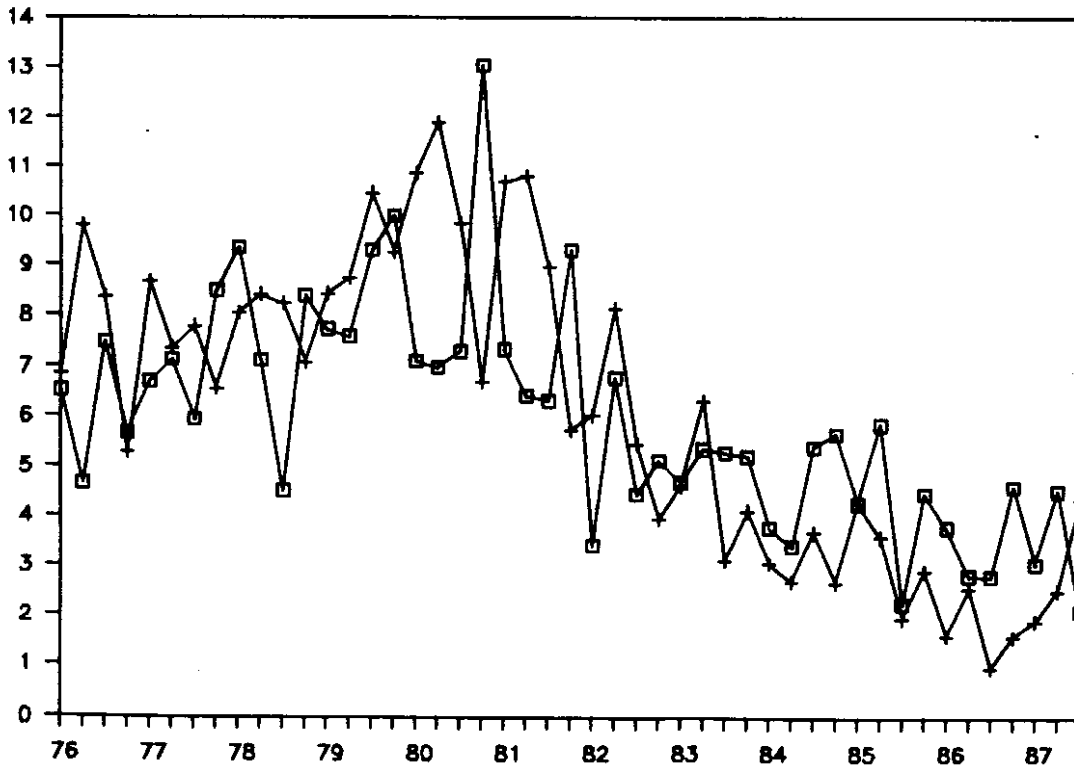| Year	Number of stoppages	Days idle as a percent of estimated working time
1947	270	
1948	245	.22
1949	262	.38
1950	424	.26
1951	415	.12
1952	470	.38
1953	437	.14
1954	265	.13
1955	363	.16
1956	287	.20
1957	279	.07
1958	332	.13
1959	245	.43
1960	222	.09
1961	195	.07
1962	211	.08
1963	181	.07
1964	246	.11
1965	268	.10
1966	321	.10
1967	381	.18
1968	392	.20
1969	412	.16
1970	381	.29
1971	298	.19
1972	250	.09
1973	317	.08
1974	424	.16
1975	235	.09
1976	231	.12
1977	298	.10
1978	219	.11
1979	235	.09
1980	187	.09
1981	145	.07
1982	96	.04
1983	81	.08
1984	62	.04
1985	54	.03
1986	69	.05
1987	46	.02

Source: Current Wage Developments, March 1988

Figure 1. Negotiated Wage and Benefit Decisions in Major Union Contracts,
1976.1 - 1987.4
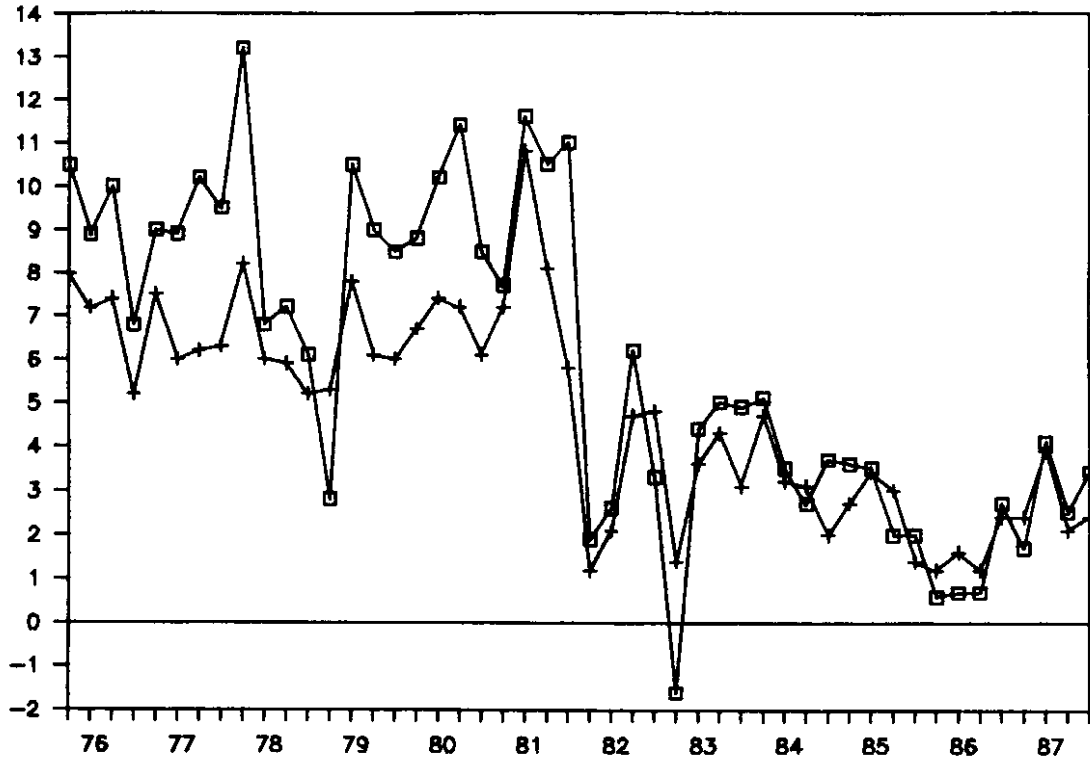
☐ Average First Year change   + Average change over length of contract

Figure 2. Employment Cost Index for Wages and Salaries, Union and Nonunion
Workers, 1976.2 - 1987.4

☐   Non-union   +   Union

Figure 3. Overall Civilian Unemployment Rate and Unemployment Rate for Males 25 to 54 years, 1950.1 - 1988.1

Figure 4. Predicted and Actual Wage Inflation (Average Hourly Earning), 1976.1 - 1988.1 (Based on one-quarter ahead predictions of wage equation shown in Appendix)

Figure 5. Comparison of Real Output Fluctuations in the United States and Japan (Ratio Scale), 1972.1 - 1987.4
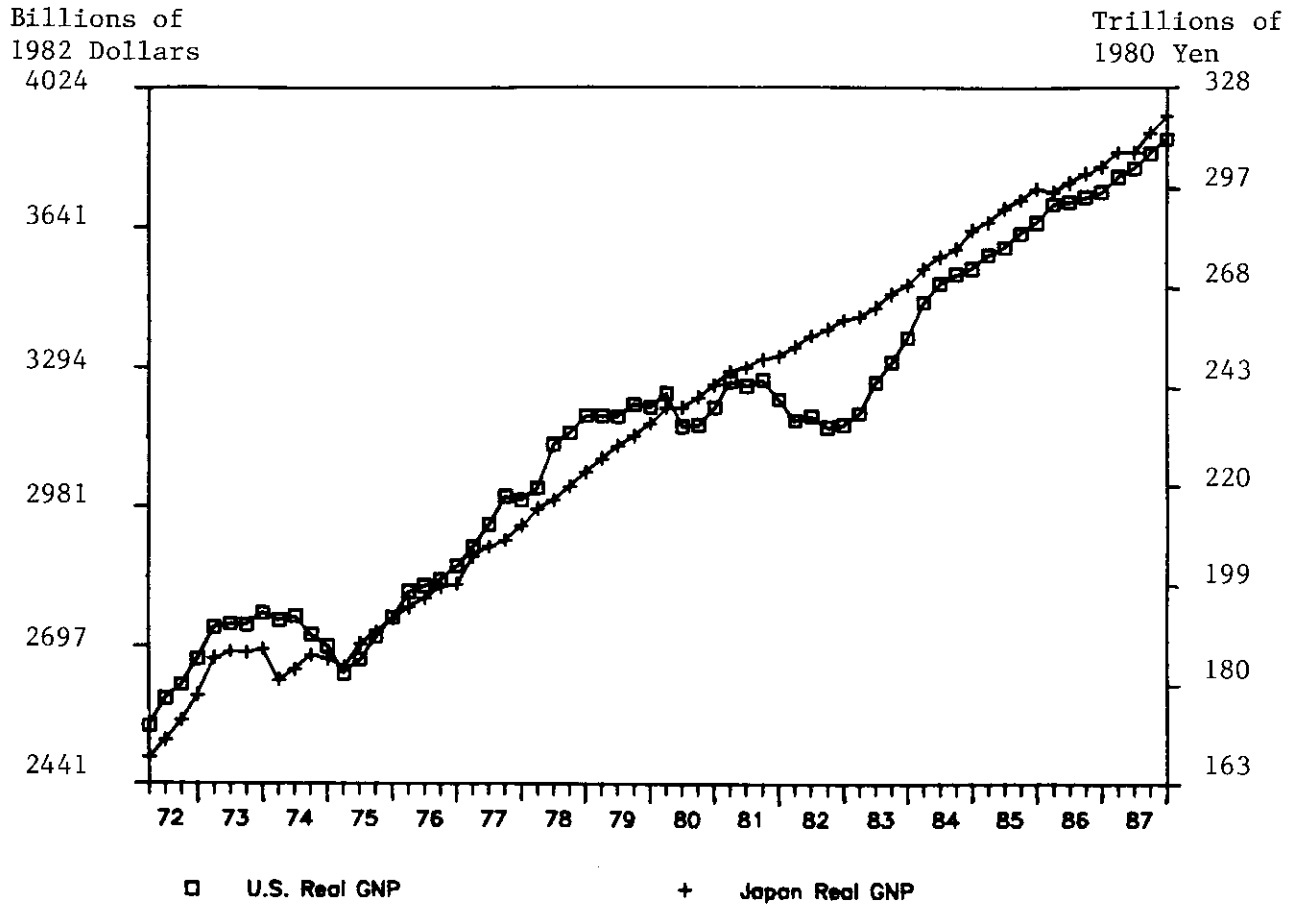
Appendix. The Wage Equation for Generating Predicted Values in Fig. 4.

This appendix briefly describes the estimates of the wage equation used to generate the predicted values for average hourly earnings shown in Figure 4. The variables are defined as follows:

w = average hourly earnings, private nonfarm (logarithm)
y = percentage deviation of real GNP from potential GNP
x = unobserved "contract" hourly wage (logarithm)
E = expectation of a variable as of quarter t-1

The contract wage (x) is an index of wages set during a given for workers whose wages are changed during that quarter. This is an unobserved variable. The model assumes that a fixed wage is set for a maximum of one year, but some wages are adjusted more frequently, either every two quarters or every quarter. Wages are set according to estimates of expected future wages paid to other workers and according to expected future demand conditions as proxied by the output gap y. The estimated contract wage determination equation is thus:

$$x_t = .359Ew_t + .295Ew_{t+1} + .173Ew_{t+2} + .173Ew_{t+3}$$
$$+.022(.359Ey + .295Ey_{t+1} + .173Ey_{t+2} + .173Ey_{t+3})$$

The sample period is 1972.2 - 1986.4, the standard error is .0037, and the Durbin-Watson statistic is 1.40.

An equation for the average wage can be computed from the above estimates. The result is

$$w_t = .359x_t + .295x_{t-1} + .173x_{t-2} + .173x_{t-3}$$

The implied distribution of workers by contract length can also be computed from the estimates in the contract wage equation. The estimated percentage of workers who wages change every quarter, every

two quarters and every four quarters along with the standard error is shown below:

	Estimated percentage	Standard Error
one quarter:	6.4	2.6
two quarters:	24.3	8.5
four quarters:	69.3	8.9

The wage equation was estimated by the method of maximum likelihood jointly with an autoregression equation for the output gap (y) as a function of the lagged output gap and the lagged average wage, with a broken trend in 1982.4, implicitly allowing for a changed policy target for wage inflation. The estimated output gap equation ignoring the broken time trend was $y_t = 1.28y_{t-1} - .40y_{t-2} - .20w_{t-1}$. The implicit policy target for (wage) inflation was 7.4 through 1982.4 and 3.0 starting in 1983.1. The standard error for the coefficients in the contract wage equation are more easily interpreted from the standard error of the implied distribution of workers by contract length as shown in the above table. The standard error of the estimated coefficient .022 in the wage determination equation is .016.

REFERENCES

Abraham, Katherine G. (1987), "Help Wanted Advertising, Job Vacancies, and Unemployment," Brookings Papers on Economic Activity, No. 1, pp. 207-240.

Borum, Joan D., James Conley and Edward Wasilewski (1988), "The Outlook for Collective Bargaining in 1988," Monthly Labor Review, January, Vol. 111, No.1, pp. 10-23.

Congressional Budget Office, "The Economic and Budget Outlook: An Update," August 1987.

Kosters, Marvin H. (1984), Disinflation in the Labor Market," in William Fellner (Ed.), Essays in Contemporary Economic Problems: Disinflation, American Enterprise Institute, Washington, D.C.

Northrup, Herbert R. (1984), "The Rise and Demise of PATCO," Industrial and Labor Relations Review, Vol 37, No. 2 (January), pp. 167-183.

Ruben, George (1988), "A Review of Collective Bargaining in 1987," Monthly Labor Review, Vol. 111, No. 1, (January), pp. 24-37.

Summers, Lawrence H. (1986), "Why is the Unemployment Rate So Very High near Full Employment," Brookings Papers on Economic Activity, No. 2, pp. 339-384.

Taylor, John B. (1983), "Union Wage Settlements During a Disinflation," American Economic Review, December, Vol 73, No. 5, pp. 981-993.

Vroman, Wayne and John Abowd, (1988), "Disaggregated Wage Developments," Brookings Papers on Economic Activity, forthcoming.

28