Explaining Unemployment: Sectoral vs. Aggregate Shocks

Prakash Loungani
and Bharat Trehan

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We include a stock market-based measure of sectoral shocks in a small VAR to examine the role played by these shocks in explaining the behavior of the unemployment rate. Sectoral shocks explain a significant proportion of the variation in the unemployment rate—especially the long-duration unemployment rate—even though other kinds of shocks (such as shocks to monetary policy, defense expenditures, and oil prices) are allowed to affect the unemployment rate. A historical decomposition reveals that sectoral shocks were most important during the 1974–75 recession, and they explain only a modest part of the rise in unemployment over the 1990 recession.

"A leading question—perhaps *the* leading question—in macroeconomics since the publication in 1982 of David Lilien's paper, 'Sectoral Shifts and Cyclical Unemployment,' is whether sectoral, rather than aggregate, shocks are the key factor responsible for fluctuations in the unemployment rate."

Yellen (1989)

"In an average week, between 350,000 and 400,000 jobs are destroyed. On average, a bit more than that are created. The flow of workers out of the old jobs and into the new ones is not seamless. The period of transition between jobs depends on many factors, including . . . the match between skills possessed and those needed . . . A large pool of unemployed workers might exist in a particular region even if most labor markets are viewed as 'tight.'"

Lindsey (1996)

In a controversial paper, Lilien (1982) suggested that frictions associated with the reallocation of labor across sectors of the economy accounted for as much as half of all fluctuations in unemployment. Though Lilien's paper inspired a significant amount of follow-up work,[1] the debate over the relative importance of sectoral shifts and aggregate shocks in unemployment fluctuations remains unresolved. We revisit Lilien's hypothesis in this paper. We are motivated in part by the lack of agreement on what causes business cycles that has been highlighted in some recent work. For instance, after an exhaustive review of the evidence, Cochrane (1996) concludes that "we haven't found large identifiable exogenous shocks to account for the bulk of output fluctuations" (though he suggests that "oil plus reallocation" may be a promising avenue). It is also telling that at the 1993 American Economics Association session entitled "What caused the recession of 1990–91?" Hall (1993) considered the relative importance of eight possible causes of the recession suggested by contemporary macro theories, but concluded that "established models are unhelpful in understanding this recession, and probably most of its predecessors." The failure of traditional models suggests that the sectoral shifts hypothesis may deserve another look.

1. Two examples are Davis (1987) and Campbell and Kuttner (1996).

Another recent development that helps motivate our study is the fact that the average duration of unemployment has been surprisingly high recently; for instance, in 1994 the average duration was nearly 20 weeks, roughly the same level as in the 1981–82 recession. This increase in duration appears to be related to the growing importance of permanent job loss relative to temporary layoffs, a phenomenon which was highlighted by Perry and Schultze (1993) and Hall (1995).[2] As we discuss below, sectoral shocks are a plausible candidate for explaining these changes.

To conduct our investigation we follow a suggestion by Black (1987), who conjectured that periods of greater dispersion in stock returns should be followed by increases in unemployment. The reason is that the stock market dispersion measure gives an "early signal of shocks that affect sectors differently, and puts more weight on shocks that investors expect to be permanent" (Black 1995). This latter point is important because it is presumably permanent shocks that motivate reallocation of labor across industries, thus significantly raising unemployment.

Two previous studies, Loungani, Rush, and Tave (1990) and Brainard and Cutler (1993), have provided evidence in favor of Black's conjecture. This paper extends their work in a number of ways; in particular, we are more careful about the measurement of aggregate shocks in our model as well as the kinds of shocks we include. For instance, since many observers, such as Romer and Romer (1989), consider shifts in monetary policy as the dominant source of recessions, it is important to control adequately for such shocks when trying to judge the importance of sectoral shifts. Both studies mentioned above used unanticipated money growth as a measure of monetary policy; Brainard and Cutler used M2 growth, for example. However, it is not obvious that the broad monetary aggregates provide a good measure of policy. For example, over the period 1979 to 1982, M2 growth was relatively robust, even though this period is generally thought of as one of restrictive monetary policy. Using money growth may therefore give a misleading picture of the relative importance of monetary policy and sectoral shifts over this period. Our solution is to employ the funds rate, since a lot of recent work (such as Bernanke and Blinder 1992) suggests that innovations in the federal funds rate are a better indicator of the stance of monetary policy.

Second, in contrast to earlier studies, the system we estimate also includes real output. We believe that including real output is important for at least two reasons. For instance, "Okun's Law," which is a key component of Keynesian models, explains changes in unemployment in terms of the growth of output. More generally, inclusion of real output helps control for other shocks hitting the economy. Thus, in trying to determine how important sectoral shifts are likely to be in explaining unemployment, it seems desirable to account for the effects of changes in output.

Finally, our sample period extends to 1995, which allows us to attempt to explain the 1990–91 recession as well as the high duration of unemployment over the last few years.

The basic model we employ to estimate the relative importance of sectoral shifts and aggregate shocks is a Vector Autoregression (VAR) that contains the civilian unemployment rate[3] (plus other variables described below). We find that our measure of sectoral shifts accounts for roughly 30% of the fluctuations in the civilian unemployment rate at a horizon of three to five years. While this is not a small number, the funds rate appears to be even more important, accounting for roughly 40% to 50% of the fluctuations in the unemployment rate over this period.[4] To address issues concerning the average duration of unemployment, we also estimate VAR models for the long-duration unemployment rate (which is constructed using unemployment spells that are 27 weeks or more in length). The dispersion index plays a larger role in explaining long-duration unemployment than the funds rate does. At a three to five year horizon, for example, it accounts for something like 30% to 45% of the fluctuations in the long-duration unemployment rate, while the contribution of the funds rate is about 10% to 15% smaller.

The remainder of this paper is organized as follows. In Section I we motivate the empirical measure of sectoral shifts we use and present some evidence on how it performs relative to the measure introduced by Lilien (1982). In Section II, we add this measure to a standard macro VAR and examine how well we can explain movements in the aggregate unemployment rate, while in Section III we use our VAR to try to explain movements in long-duration unemployment. Section IV uses the VARs to examine the role played by various factors in the evolution of the unemployment rate over the 1971–1995 period, and Section V concludes.

2. Duration data are derived from the CPS survey, which was revised in 1994. According to Polivka and Miller (1995) ". . . the new methodology significantly increased the proportion of unemployed who had long spells of unemployment and significantly decreased the proportion of unemployed with spells of unemployment less than 5 weeks."

3. Figure 3 plots the behavior of the unemployment rate over the last 25 years, while the long-duration unemployment rate is shown in Figure 4.

4. These numbers are taken from the variance decompositions of the unemployment rate in a 5-variable VAR where the dispersion index is ordered last and the funds rate is placed in the middle.

I. MEASURING SECTORAL SHIFTS

Lilien (1982) and Black (1987) suggested that the amount of labor reallocation that an economy has to carry out can change significantly over time. Some periods may be marked by relatively homogeneous growth in labor demand across sectors, whereas others may be characterized by shifts in the composition of labor demand. While beneficial in the long run, the reallocation of labor in response to sectoral shifts imposes short-run costs in the form of increases in unemployment. The greater the divergence in the fortunes of different industries, the more resources must be moved, and the larger will be the resulting increase in unemployment.

While these ideas are fairly intuitive, constructing a satisfactory measure of sectoral shifts poses an empirical challenge for a couple of reasons. First, as stated by Barro (1986), shocks to the expected profitability of an industry can arrive from "many—mostly unobservable—disturbances to technology and preferences [that] motivate reallocations of resources across sectors." Second, Davis (1985) points out that "allocative disturbances *from any particular source* are likely to occur rather infrequently over available sample sizes," [italics ours] which makes it difficult to incorporate variables explicitly that capture the effects of sectoral shifts into an aggregate unemployment equation.

These considerations motivated Lilien's construction of a cross-industry *employment* dispersion index to proxy for the intersectoral flow of labor in response to allocative shocks. Many researchers, most notably Abraham and Katz (1986), have questioned Lilien's use of employment dispersion as a measure of labor reallocation. Their basic point is that movements in employment dispersion may simply be reflecting the well-known fact that the business cycle has non-neutral effects across industries. The increase in the dispersion of employment growth rates could reflect not increased labor reallocation, but simply the uneven impact of aggregate demand shocks on temporary layoffs in different industries. Under certain conditions—for instance, if cyclically responsive industries have low trend growth rates of employment—aggregate demand shocks also can lead to a positive correlation between the dispersion index and aggregate unemployment. Hence there is an observational equivalence between the predictions of the sectoral shifts hypothesis and the more traditional "aggregate demand hypothesis."

Loungani, Rush, and Tave (1990) and Brainard and Cutler (1993) attempt to circumvent these problems by constructing an index based on stock prices. Assuming that stock markets are efficient, so that shocks to the expected profitability of an industry are reflected in its stock market return, and assuming that these shocks are followed by changes in that industry's use of inputs such as labor, their hypothesis is that the *dispersion* of stock returns across industries can be used as a proxy for shocks to the desired allocation of labor, i.e., as a measure of sectoral shifts. For instance, the arrival of news regarding the relative profitability of industries is likely to be followed by an increase in stock price dispersion. It is likely that this news also will lead to a change in the output mix of the economy in the long run. This will necessitate a reallocation of resources, and the unemployment rate will rise as part of this process of reallocation of labor across sectors. Thus, an increase in stock price dispersion will be followed by an increase in the unemployment rate.

For this paper, we updated the index used in Loungani, Rush, and Tave. The basic data consist of indexes of industry stock prices, as reported in Standard and Poor's Compustat PDE file. There are 121 industries in all, and they provide comprehensive coverage of manufacturing as well as nonmanufacturing sectors of the economy.[5] The sectoral shifts index is defined as

$$Mismatch_t = \left[\sum_{i=1}^{n} W_i (R_{it} - R_t)^2 \right]^{1/2} .$$

In the equation above, R_{it} is the growth rate of industry I's stock price index, R_t is the growth rate of the S&P500 (a composite index), and W_i is a weight based on the industry's share in total employment in 1978.[6] Hence, the sectoral shifts index can be interpreted as the weighted standard deviation of industry stock returns.

An advantage of the stock price dispersion measure relative to Lilien's measure is that unlike employment changes, stock prices respond more strongly to disturbances that are perceived to be permanent (or structural in nature) than to temporary disturbances (such as those caused by business cycle fluctuations). The industry stock price represents the present value of expected profits over a long horizon. The impact of innovations in industry profits on its stock price therefore will depend on how long the shocks are expected to persist. If the shocks are purely temporary, the innovations will have little impact on the present value of expected profits and, hence, will have little impact on industries' stock prices. On the other hand, if the shocks are fairly persistent, the innovations will have a significant impact on expected future profits and will lead to large changes in industries' stock prices. Furthermore, it is these

5. The Appendix provides details on the construction of the index.

6. As a check on the robustness of these results we also reestimated some of the VARs presented below using employment shares in 1995 as weights for the dispersion index. This did not lead to a noticeable change in our results.

sorts of persistent shocks that will cause productive resources, such as capital and labor, to be displaced from the adversely affected industries. Thus, a dispersion index constructed from industries' *stock prices* automatically assigns greater weight to permanent structural changes than to temporary cyclical shocks.[7] As a consequence, a dispersion measure based on stock prices is less likely than a measure based on employment to reflect aggregate demand disturbances that result in large swings in temporary layoffs.

It is not difficult to demonstrate this difference between the two measures. In Table 1, we present the results from two three-variable VARs. The first contains a dispersion measure based on the growth rate of employment across sectors, and the second contains a dispersion measure based on stock prices; both also contain the unemployment rate and the growth rate of real GDP. Eight lags of each variable are included in both systems. Note from Panel A that the employment-based dispersion measure is significant only at the 20% level in explaining unemployment and does not help predict output at all. Instead, output growth predicts employment dispersion. By contrast, the stock market-based dispersion measure helps predict unemployment and output (the latter at a 6% level of significance), but is not explained by either of these variables.

A comparison of the variance decompositions from these two systems, reported in Panel B, also sheds light on the properties of the two indexes. When ordered first, the employment-based dispersion measure explains 20% of the variance of unemployment at the 20-quarter horizon; this falls to 3% when it is ordered last. On the other hand, even when it is placed last, the stock market-based dispersion measure still explains 30% of the variance of the error in predicting the unemployment rate at a 20-quarter horizon. Thus, the stock market index does not appear to be subject to the Abraham and Katz criticism of Lilien's

7. Presumably, similar reasoning lies behind Toledo and Marquis's (1993) use of the dispersion in capital stock changes across industries as a proxy for allocative disturbances.

TABLE 1

A Comparison of Dispersion Indexes

A. Marginal Significance Levels

	Based on employment				Based on stock prices		
	Y	U	ED		Y	U	SD
Y	.49	.01	.04	Y	.60	.01	.30
U	.02	.01	.73	U	.01	.01	.34
ED	.87	.20	.03	SD	.06	.01	.01
Adj. R^2	.13	.98	.30	Adj. R^2	.21	.98	.31

B. Variance Decompositions: Unemployment Rate

Ordering:	ED, Y, U			Y, U, ED			Ordering:	SD, Y, U			Y, U, SD		
Qtrs	ED	Y	U	ED	Y	U	Qtrs	SD	Y	U	SD	Y	U
0	13	36	51	0	44	56	0	14	27	59	0	34	66
4	17	57	26	1	68	32	4	6	49	45	2	53	45
8	14	65	21	0	75	25	8	23	43	34	8	52	40
12	17	62	22	1	72	27	12	42	31	27	22	39	39
20	20	58	22	3	69	29	20	53	25	22	30	33	36
40	21	57	22	4	68	29	40	54	24	22	34	30	36

Note: Y denotes output, U denotes unemployment, ED denotes employment dispersion, and SD is stock market dispersion. The variance decompositions may not add to 100 due to rounding errors.

measure. Accordingly, we now turn to a detailed analysis of the performance of the stock market index in a larger VAR.

II. SECTORAL SHIFTS AND THE AGGREGATE UNEMPLOYMENT RATE

The Basic Model

The basic model we use will be a five-variable VAR. In addition to the stock market price dispersion index and unemployment, we include three other variables—real GDP, the federal funds rate, and the S&P500 index. As mentioned above, our intent is to look at the effect of changes in the dispersion index on unemployment after we control for variables that are commonly thought to affect unemployment. Thus, the funds rate is included as a measure of monetary policy (as in Bernanke and Blinder 1992, for instance). The inclusion of real GDP controls for the stage of the business cycle; it also means that our model allows for a version of "Okun's Law." The S&P500 index is included to rule out the possibility that the dispersion index explains unemployment because it is mimicking the behavior of the stock market.[8] Both the unemployment rate and the federal funds rate are entered in levels (the latter following Bernanke and Blinder), while GDP and the S&P500 index are entered in growth rates. In addition to the basic system, we will also discuss some results from VARs that contain a somewhat different set of variables; we have refrained from including those variables in our basic system in order to keep it to a reasonable size.

Panel A of Table 2 presents marginal significance levels for our estimated equations. It shows that the dispersion index helps predict unemployment even after we account

8. Brainard and Cutler (1993) present results from different systems that contain different combinations of money growth, the price of oil, and the stock market return, in addition to a stock market-based measure of dispersion. However, their measure of dispersion is not significant at even the 20% level, once the market return variable and lagged unemployment are included in the unemployment equation.

TABLE 2

RESULTS FROM A 5-VARIABLE VAR

A. MARGINAL SIGNIFICANCE LEVELS

	UNEMPLOYMENT	OUTPUT	FUNDS RATE	S&P500	DISPERSION
UNEMPLOYMENT	.01	.16	.01	.65	.42
OUTPUT	.01	.38	.30	.92	.49
FUNDS RATE	.01	.06	.01	.45	.56
S&P500	.01	.54	.30	.84	.28
DISPERSION	.01	.38	.02	.57	.06
ADJ. R^2	.99	.30	.92	–.01	.35

B. VARIANCE DECOMPOSITIONS[a]

	UNEMPLOYMENT					OUTPUT				
QRTRS	S&P500	OUTPUT	FUNDS	UNEMP.	DISPERSION	S&P500	OUTPUT	FUNDS	UNEMP.	DISPERSION
0	3	27	9	61	0	0	100	0	0	0
4	14	33	4	46	4	5	75	14	4	2
8	12	16	24	29	19	7	57	15	4	18
12	5	8	38	18	31	8	56	15	4	18
20	3	5	52	11	28	8	54	15	5	18
40	4	6	53	11	27	8	53	16	5	19

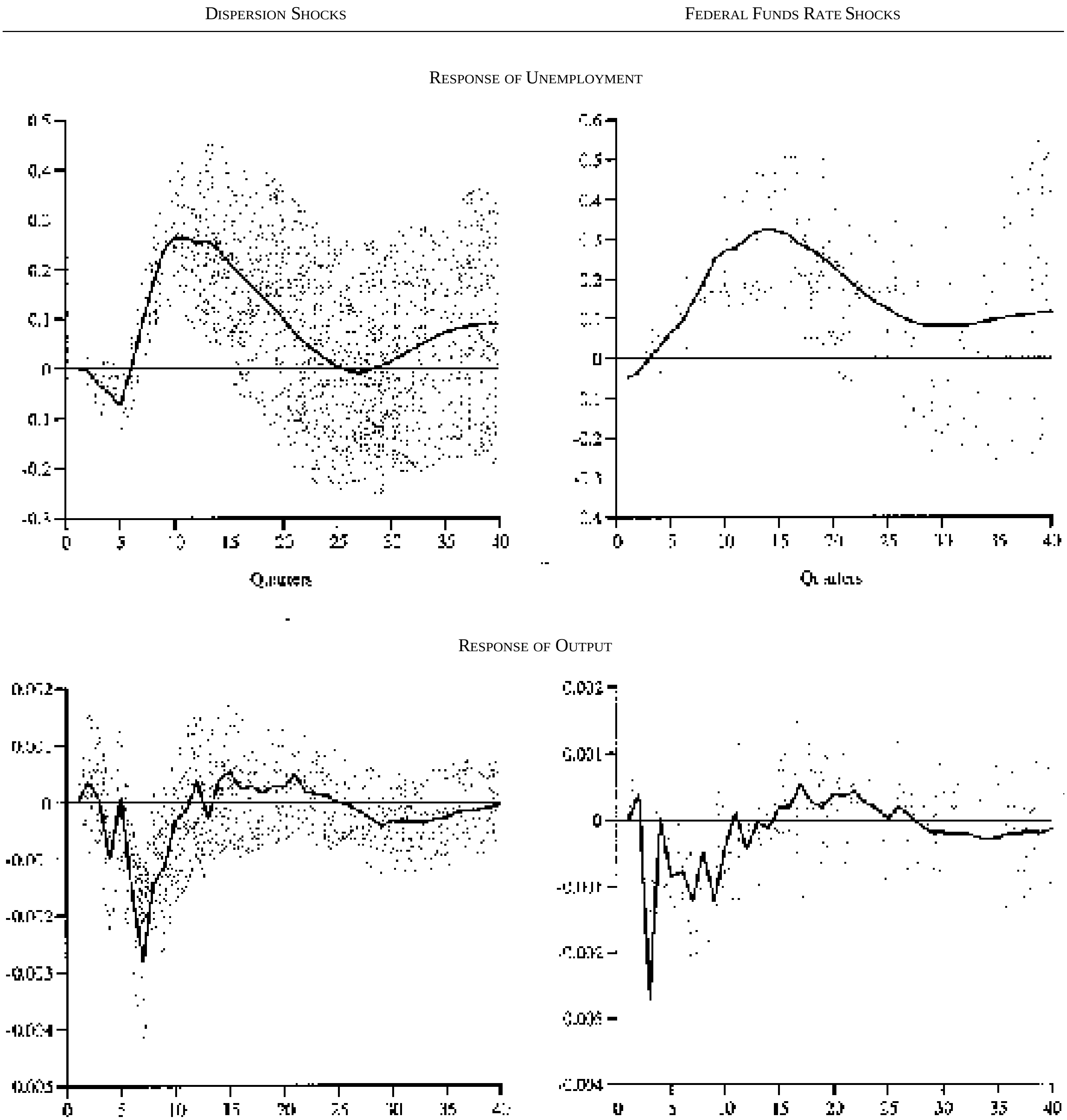
[a] Ordering is: S&P500, output, funds, unemployment, and dispersion.

for the stage of the business cycle, as measured by real GDP growth, and the stance of monetary policy, as measured by the federal funds rate. However, the dispersion index does not help predict output.

Figure 1 shows the responses of unemployment and output to shocks to the dispersion index, along with the associated standard error bands. For comparison purposes we also show the effect of shocks to the funds rate. To avoid

FIGURE 1

Dynamic Responses of Unemployment and Output



exaggerating the role of the dispersion index, we placed it last in the ordering. Specifically, the S&P500 index is placed first, followed by output, the funds rate and unemployment rate, and the dispersion index is placed last. The figure shows that the unemployment rate begins to increase about four to five quarters after a shock to the dispersion index and continues to go up for about two more years before beginning a gradual decline. This response resembles the response of the unemployment rate to funds rate shocks. Output responds to a shock to the dispersion index with a lag as well, but the response is relatively short-lived.

The associated variance decompositions are shown in the lower panel of Table 2. They show that dispersion accounts for roughly 25% to 30% of the variance of unemployment beginning about three years after the shock. The funds rate accounts for about half. In the case of output, both dispersion and the funds rate account for about 15% to 20% of the variance after the first two years.

Alternative Models

We also estimated some alternative versions of our basic VAR. We began by estimating a model that included the relative price of oil instead of the total stock market return. Our motivation here is twofold. First, we intended this to be a check on the robustness of our specification, following Loungani (1986) who showed that including this variable in the unemployment equation led to Lilien's measure of dispersion becoming insignificant. Second, even if inclusion of the oil price variable does not cause our dispersion index to become insignificant, we would like to see how much our dispersion index explains after an explicit source of sectoral reallocation is taken into account. It turns out that the dispersion variable is still significant at the 1% level in the unemployment equation, while the oil price variable has a marginal significance level of about 90%. However, including the oil price variable does lead to a reduction in the proportion of the forecast error variance of unemployment explained by the dispersion index; it falls from 31% to 22% at the 12-quarter horizon and from 27% to 20% at the 40-quarter horizon. The oil price variable accounts for roughly 5% to 6% of the error decomposition. (The dispersion index is placed last in all cases.)

The second system we estimated substituted federal defense expenditures instead of the stock market return in the original VAR. Once again, the idea was to include a variable that has been associated with a change in the sectoral allocation of labor over our sample period. The defense expenditure variable is significant at the 11% level in the unemployment equation, while the dispersion index remains significant at 1%. There is a slightly larger decline in the proportion of forecast error variance explained by the dispersion index, which now explains 21% of the variance at a 12-quarter horizon and 17% 40 quarters ahead. The defense expenditures variable explains about 15%.

Overall, we believe these results are consistent with Davis's observation (cited above) that allocative disturbances are unlikely to be associated with one particular variable.

III. Sectoral Shifts and the Duration of Unemployment

Intuitively, it seems that sectoral shocks should lead to permanent reallocations of labor, and thus imply longer spells of unemployment than those caused by aggregate shocks. For instance, an increase in interest rates is likely to cause automobile manufacturers to respond to the temporary reduction in demand by laying off workers, who will then be hired back when demand rebounds. By contrast, a shock to the automobile sector, such as an increase in the supply of Japanese cars, is likely to lead to permanent changes in employment in the sector. As a consequence, displaced workers will have to move to other sectors. Workers who have to find jobs in other sectors will tend to stay unemployed for longer periods than those who can stay within the same sector (or even be rehired by the same firm).

Some evidence from micro data supports these intuitive ideas. Using the Michigan Panel Study of Income Dynamics, Loungani, Rogerson, and Sonn (1989) find that workers who moved across industries have longer unemployment spells than those who stayed within the same industry. Based on data from the Canadian Labor Market Activity Survey, Thomas (1996) concludes that industry movers have longer spells of unemployment than stayers, though the difference is significant only for workers who do not receive unemployment insurance.

Further evidence is provided by Brainard and Cutler (1993), who showed that (in a system that contained lagged unemployment and a measure of stock market dispersion, as well as labor market dispersion) the stock market dispersion variable entered significantly into equations that explained unemployment spells exceeding five weeks but was not significant in explaining spells up to five weeks. We extend their work by looking at variance decompositions in a five-variable VAR; it seems to us that the variance decompositions provide a more useful way of trying to judge the relative importance of sectoral shocks than *F* tests do.[9] Since our system also contains the funds rate, we are in a position to compare the effects of policy shocks and sectoral shocks as well.

9. In any case, the dispersion index is significant at 5% in all the unemployment equations we estimated, so that the *F* test cannot be used to distinguish between equations.

We have data on four different durations of unemployment: 0 to 4 weeks, 5 to 14 weeks, 15 to 26 weeks, and spells that are 27 weeks or longer. We present detailed results for spells lasting 27 weeks or more, and abbreviated results for the other three categories.

Results for a system where we have substituted the long-duration unemployment rate (that is, the rate based on unemployment that exceeds 26 weeks) for the aggregate unemployment rate are shown in Table 3.[10] The important result in Panel (A) of the Table is that lagged values of the dispersion index play a very significant role in the determination of long-duration unemployment. Furthermore, note that lags of long-duration unemployment do not influence the level of dispersion. Figure 2 shows that long-duration unemployment responds to changes in dispersion with a lag as well, although its response is somewhat more drawn out than that of overall unemployment shown in Figure 1. The variance decompositions are in Panel B. Note that dispersion accounts for a very high proportion of unemployment variation at the longer horizons: at the 20-quarter horizon, for instance, the proportion accounted for by dispersion is close to 45%.

Table 4 compares the role of the dispersion variable (Panel A) and the funds rate (Panel B) in explaining the forecast error variance of different durations of unemployment. Each column in Panel A comes from a VAR that contains the unemployment rate of the relevant duration plus the four variables in our basic system (output, the funds rate, dispersion and the stock market return). The ordering is the same as before, as well. The table shows that beyond the first two years the contribution of sectoral shifts to unemployment fluctuations rises fairly steadily with duration. For instance, comparing the 20-quarter ahead decomposition, the contribution of dispersion rises from 9% for the shortest duration to 43% for the longest duration.

10. The rate is obtained by dividing the number of unemployed workers at each duration by the total labor force.

TABLE 3

Explaining Long-Duration Unemployment

A. Marginal Significance Levels

	Lr-unemp.	Output	Funds Rate	S&P500	Dispersion
Lr-unemp.	.01	.30	.85	.30	.44
Output	.10	.35	.09	.61	.39
Funds rate	.21	.03	.01	.50	.50
S&P500	.29	.35	.65	.88	.44
Dispersion	.01	.36	.06	.40	.03
Adj. R^2	.99	.29	.91	.03	.30

B. Variance Decompositions[a]

	Long-Duration Unemployment					Output				
Qrtrs	S&P500	Output	Funds	Lr-unemp	Dispersion	S&P500	Output	Funds	Lr-unemp	Dispersion
0	1	3	3	93	0	0	100	0	0	0
4	3	29	5	63	1	8	75	14	1	2
8	7	33	8	45	7	10	59	15	1	15
12	5	17	20	25	33	11	58	15	2	15
20	5	11	28	14	43	11	56	15	2	16
40	5	11	29	14	41	11	55	15	2	17

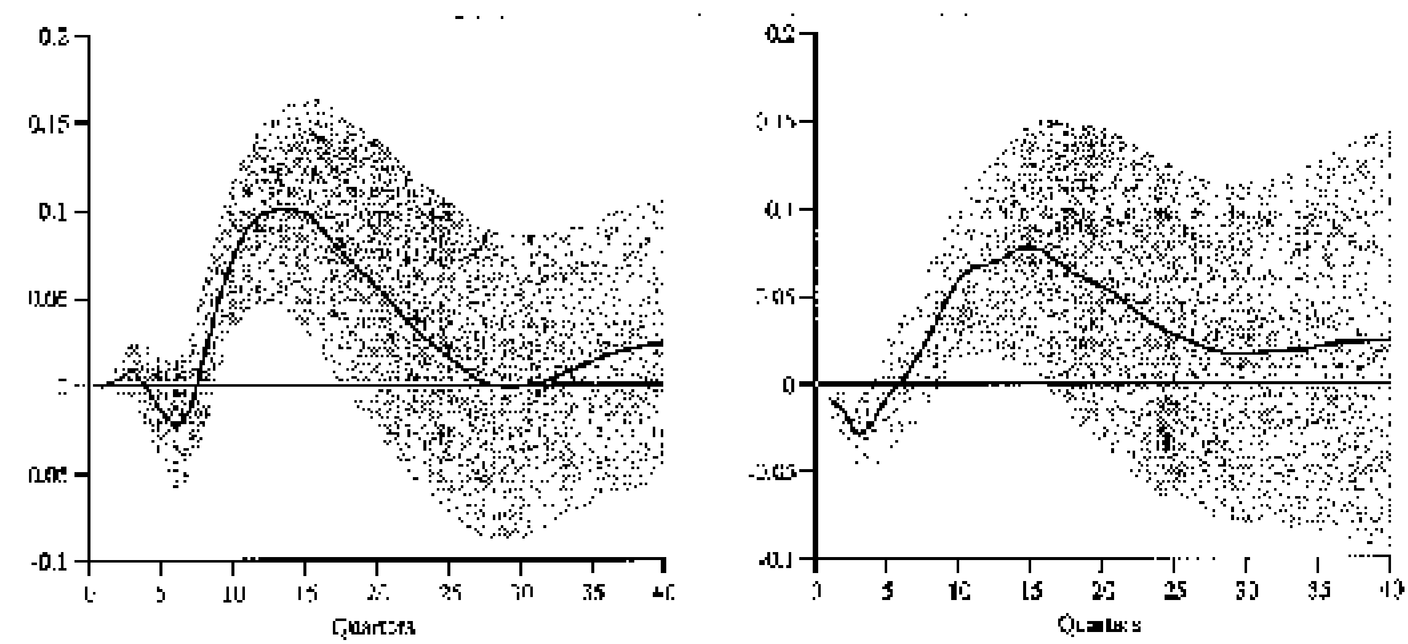
[a]See note to Table 1.

FIGURE 2

DYNAMIC RESPONSES OF LONG-DURATION UNEMPLOYMENT AND OUTPUT

DISPERSION SHOCKS	FEDERAL FUNDS RATE SHOCKS

RESPONSE OF LONG-DURATION UNEMPLOYMENT



RESPONSE OF OUTPUT

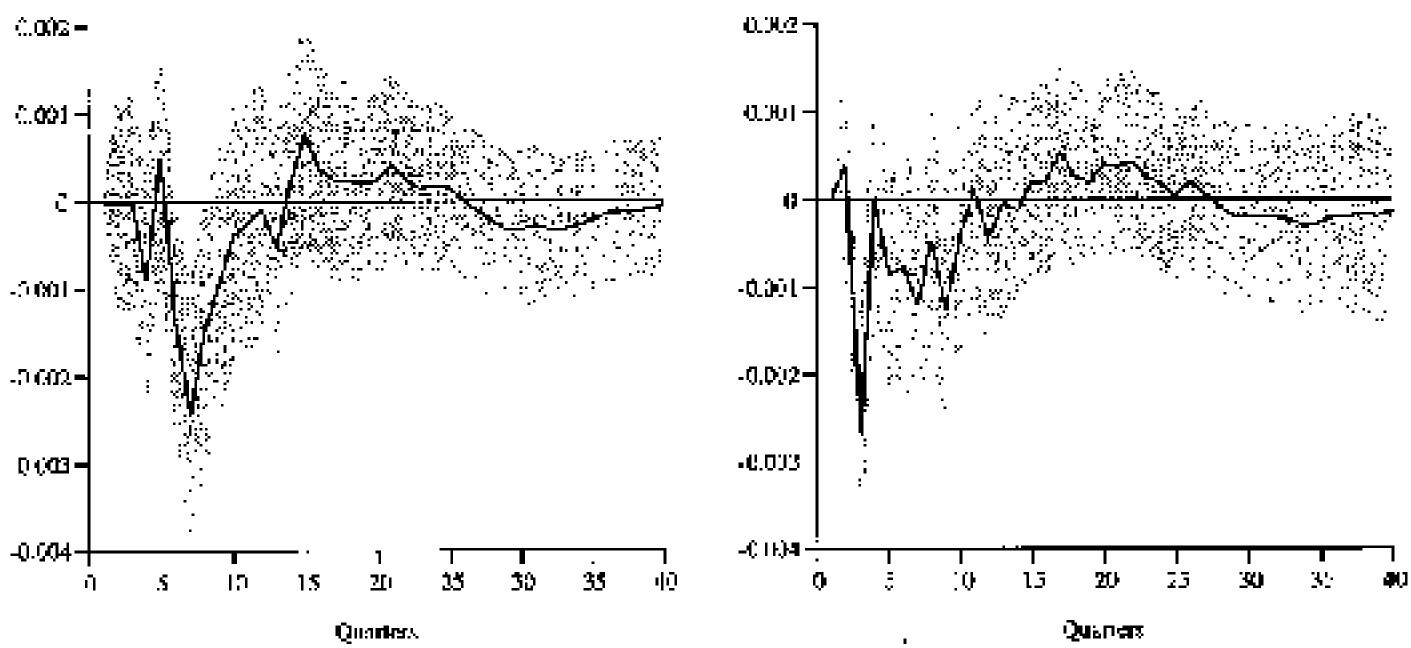


TABLE 4

EXPLAINING UNEMPLOYMENT BY DURATION

A. PROPORTION OF FORECAST ERROR VARIANCE OF THE UNEMPLOYMENT RATE EXPLAINED BYDISPERSION

	UNEMPLOYMENT			
QUARTERS AHEAD	Up to 5 weeks	5 to 14 weeks	14 to 26 weeks	26+ weeks
0	0	0	0	0
4	1	4	2	1
8	9	20	19	7
12	10	28	33	33
20	9	26	35	43
40	9	24	35	41

B. PROPORTION OF FORECAST ERROR VARIANCE OF THE UNEMPLOYMENT RATE EXPLAINED BYTHE FUNDS RATE

	UNEMPLOYMENT			
QUARTERS AHEAD	Up to 5 weeks	5 to 14 weeks	14 to 26 weeks	26+ weeks
0	3	14	4	3
4	17	6	6	5
8	37	22	18	8
12	52	35	28	20
20	60	47	35	28
40	59	49	36	29

Panel B shows that the contribution of the funds rate declines as the duration of the unemployment rate rises. At a 20-quarter horizon, for instance, it falls from 60% to 28%. It is worth pointing out that the relative shares of the other variables in the system do not change as dramatically as the duration of unemployment changes.

IV. ROLE OF SECTORAL SHIFTS DURING NBER RECESSIONS

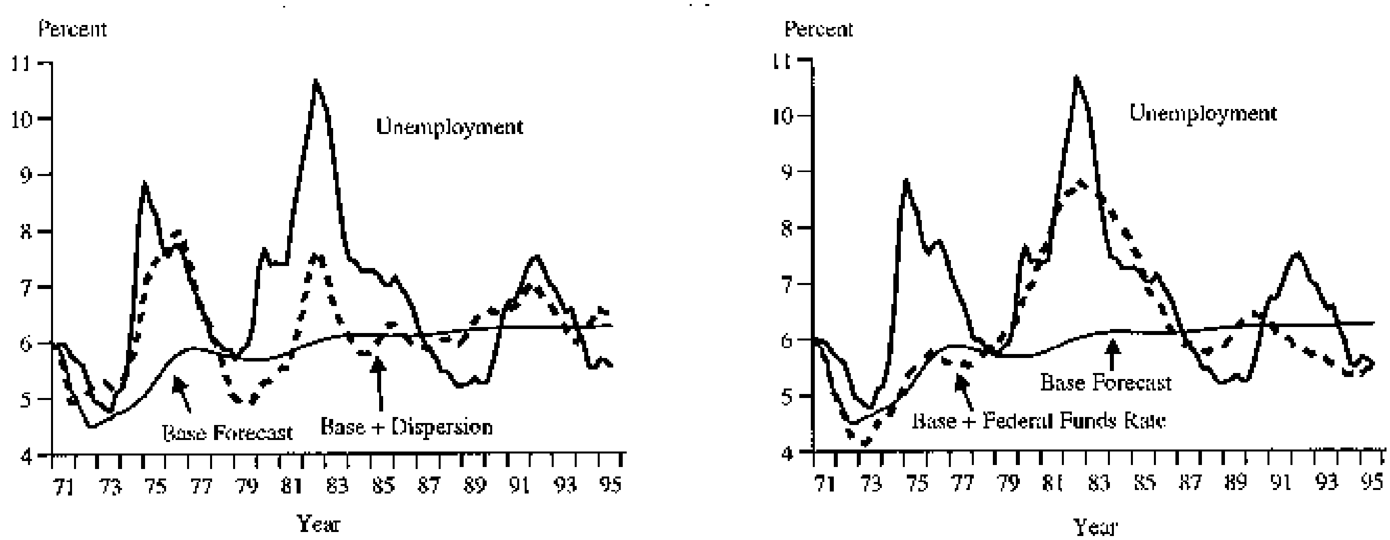
In this section we use the models we have estimated to carry out a historical decomposition of the unemployment rate. Our purpose is to examine what role, if any, sectoral shifts may have played during recessions. We also look at the role played by changes in the funds rate; this is of interest in its own right and also provides us with a benchmark for assessing the relative importance of sectoral shifts.

Figure 3 provides our results for the aggregate unemployment rate. The top panel shows the actual unemployment rate over the 1971.Q1–1995.Q4 period together with two sets of forecasts. The line labeled "Base Forecast" is the VAR's forecast for this entire period based on data up to the end of 1970 only (though the coefficients used are obtained by estimating the model over the entire period). The line labeled "Base + Dispersion" is the forecast from the VAR after it has been provided with all the innovations to the dispersion variable over this period. These innovations are the orthogonalized innovations obtained from the same ordering that was used in Table 2 and the associated Figures. The top panel shows that dispersion accounts for most of the rise in unemployment during the 1973–75 recession. Its contribution is more modest during the 1982 recession, though it does help explain part of the sharp increase in the middle of the recession. The dispersion index

FIGURE 3

HISTORICAL DECOMPOSITION OF UNEMPLOYMENT RATE

CONTRIBUTION OF DISPERSION | CONTRIBUTION OF FEDERAL FUNDS RATE



also appears to explain part of the rise in unemployment during the 1991 recession, though it does not explain the decline during the last two years or so. While we have not shown the results here, it is worth pointing out that the dispersion index accounts for somewhat less of the rise in unemployment during the 1973–75 recession in the systems where we include either defense expenditures or oil (though it still accounts for most of the increase). Its role during the 1982 recession is roughly unchanged. And in both alternative systems it helps explain some of the rise in unemployment during the 1990–91 recession, though its role is noticeably smaller than in the base system (shown in Figure 3).[11]

The lower panel of the Figure shows the contribution of the funds rate. The funds rate does not account for the rise in unemployment during the 1973–75 recession, and its contribution actually goes the wrong way during the most recent recession. However, the funds rate does an extremely good job of tracing the rise and fall of unemployment around the recessions of 1980 and 1982; this is consistent with the widespread belief that the tightening of monetary policy around this period played a big part in these recessions.

Figure 4 presents the same results for the long-duration unemployment rate. The top panel shows that dispersion accounts for the entire increase in long-duration unemployment in the 1973–75 recession (in fact, it more than accounts for the increase) and also accounts for some of the increase in unemployment during the early 1980s. However, dispersion explains only a small part of the rise in long-duration unemployment during the last recession.[12] This result is in contrast to the result in Figure 3. Since our priors are that sectoral shifts should be more closely related to long-duration unemployment, we interpret these two conflicting pieces of evidence as suggesting that sectoral shocks probably did not have a very large role to play in the 1990–91 recession.

Finally, the lower panel of the Figure shows the contribution of the funds rate to changes in unemployment over this period. Once again, the funds rate explains only what happened around the early 1980s. However, even during this period its contribution to movements in the long-duration unemployment rate is smaller than to movements in the overall unemployment rate.

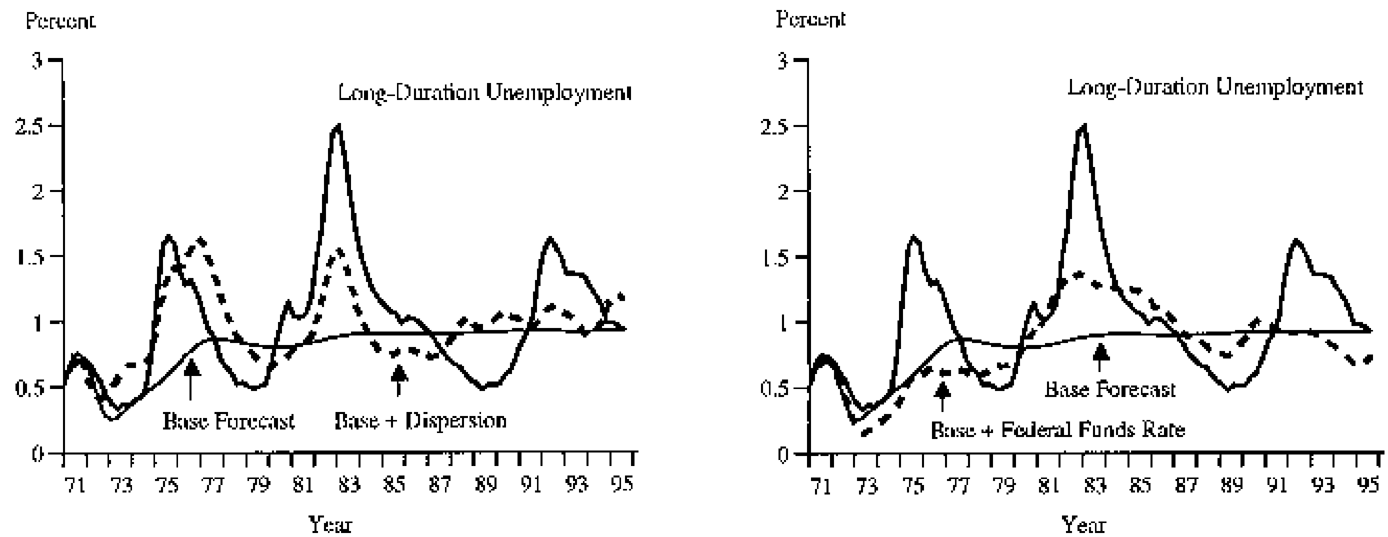
11. The defense expenditure variable helps explain some of the rise in unemployment during the 1973-75 recession, but is not very important elsewhere. The oil price variable does not contribute much to movements in unemployment over this period. Again, we see these results as illustrating how difficult it is to pinpoint any particular variable as the key source of sectoral shocks.

12. This last result may appear surprising in light of the results from the variance decompositions, which suggested that dispersion plays a larger role in explaining movements in long-duration unemployment than in short-duration unemployment. However, those results pertain to the sample period as a whole and need not hold true over the course of every recession.

FIGURE 4

HISTORICAL DECOMPOSITION OF LONG-DURATION UNEMPLOYMENT RATE

CONTRIBUTION OF DISPERSION | CONTRIBUTION OF FEDERAL FUNDS RATE



V. SUMMARY AND CONCLUSIONS

Overall, we conclude that sectoral shifts (as measured by the stock market index) explain a significant proportion of the variation in the unemployment rate. To assess the quantitative role played by sectoral shifts, it is useful to compare the contribution of the dispersion index to that of the federal funds rate, which is the leading alternate source of unemployment fluctuations considered here. Even though it is placed last in the ordering, dispersion accounts for 31% of the forecast error variance of unemployment at a 12-quarter-ahead horizon, whereas the funds rate accounts for 38%. Hence, dispersion is roughly as important as the funds rate in accounting for fluctuations in the unemployment rate over the medium term, though at longer horizons the funds rate is much more important.

The dispersion index is considerably more important when explaining movements in long-duration unemployment: except at the very short horizons, the dispersion index accounts for a larger percentage of the forecast error variance than the funds rate. At a 20-quarter horizon, for example, the respective contributions of the two variables are 43% and 28%.

It is worth emphasizing our finding that sectoral shocks play a relatively large role in explaining unemployment, even though our system includes both real GDP and the funds rate—variables that are commonly thought to have a significant effect on the unemployment rate but which have not been explicitly considered in previous analyses. In addition, we also have shown that our results are not due to the omission of other variables that could plausibly have caused sectoral shifts during particular episodes, namely, the oil price and defense expenditure variables.

The results from our exercise also provide a partial answer to an old question: Are business cycles all alike? Our historical decompositions say that recessions are not. Sectoral shifts appear to account for the 1973–75 recession, though we have not explored in detail which particular shocks may be driving the index over this period.[13] By contrast, monetary policy (as measured by the funds rate) appears to have been the key player in the 1982 recession. Neither sectoral shocks nor monetary policy appear to explain the 1990 recession, though the dispersion index does track the rise in unemployment over this period to a modest degree.

Finally, our results offer an interesting perspective on why the long-duration unemployment rate has remained high in the period since 1993. Our historical decompositions suggest that the path of the funds rate was consistent with long-duration unemployment returning to the level consistent with previous troughs in the data. However, increases in the dispersion index offset this effect, keeping long-duration unemployment higher than it would otherwise have been.[14]

13. While not the subject of our paper, the productivity slowdown that occurred around that time is consistent with the hypothesis that some kind of structural change took place over that period.

14. Valletta (1996) suggests a different explanation for the rise in long-duration unemployment. Specifically, he suggests that this increase could

APPENDIX

Construction of the Dispersion Index

Our dispersion index is constructed using the basic methodology of Loungani, Rush, and Tave (1990). Due to data constraints, our series covers 1962 to 1995. Over the lifetime of the S&P500 Composite Index, industry subgroups are added and deleted. We obtained a list of the dates of changes from S&P. The series includes only the industry indexes that were included in the composite for a given date. Three series have been omitted due to a lack of employment data: Miscellaneous, Miscellaneous (High Tech), and Conglomerates. They are not distinct industries and do not have SIC codes. Series that were deleted prior to 1973 were not in our database. There are 17 of these groups. In addition, we did not have Transport Misc. (Old). All composite indexes were dropped to avoid double counting. The index observations are the closing price of the quarter.

Weights are based on the BLS employment data by SIC industry. We determine the weight by two-digit SIC and divide that weight evenly among the component industries for that date. The weights sum to one. Two weights were constructed—one using data from 1978 (the sample midpoint) and one using data from 1995 (the sample endpoint.) The employment data for three two-digit SIC codes were available only starting in 1988. We estimated the 1978 weights for these industries using the 1988 data. For SIC 78 (Motion Pictures), we assumed that the share of the industry in the Services aggregate was the same in 1978 as in 1988. For SIC 60 and 61 (Depository and Nondepository Institutions, respectively), we found the employment for these sectors together by subtracting all other financial sectors from the Financial Sector aggregate. We assumed the share of each was the same as in 1988.

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be related to changes in job security, since many workers who lost jobs during this period were from groups that in the past did not have to think about job search.