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BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM  
DIVISION OF RESEARCH AND STATISTICS

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**Date:** March 18, 1994  
**To:** Federal Open Market Committee  
**From:** William Wascher and Joyce Zickler  
**Subject:** Factors Affecting the Measurement of the Unemployment Rate

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This memo discusses a number of technical factors affecting the measurement of the unemployment rate that are associated with the switch from the old to the new version of the Current Population Survey (CPS). The research underlying the estimates presented here has been done largely by staff of the Bureau of Labor Statistics (BLS) and the Bureau of the Census. The findings are not final and, indeed, may change as we and our colleagues at those statistical agencies gain more experience with the new survey. In providing us with this detailed information, the BLS emphasized the great uncertainty surrounding it and asked that we preserve its confidentiality.

The four principal technical issues are: the use of seasonal adjustment factors that are estimated using historical data from the old CPS; the increase in the proportion of households interviewed from centralized computer-assisted telephone interviewing (CATI) facilities; the delay in implementing composite estimation procedures; and the possibility that respondents who entered the sample last year and remained in the sample this year would be conditioned to answer as they did last year. Only the absence of compositing has boosted the measured level of the unemployment rate early this year; the remaining factors, to date, have artificially depressed it.

Estimates of the effects of these factors on the reported unemployment rate are summarized in columns 2 through 5 of the attached table. As we noted in Part 1 of the Greenbook, these factors combined to understate the level of the official unemployment rate in

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February by 1/4 percentage point. They will continue to hold down the jobless rate in March and April and then will boost it from June through September.

**Seasonal Adjustment**

At present, the seasonal adjustment factors applied to data from the new CPS are based on data from the old CPS. Following its recent practice, the BLS reestimated the seasonality of the employment, unemployment, and other labor force series at the end of 1993 by applying an X-11 procedure to data from 1984 through 1993. Based on those estimates, it projected seasonal factors for the first six months of 1994.

Comparing the data available from the parallel survey that was conducted between September 1992 and December 1993 and the data from the old CPS for the same period indicates that the seasonal patterns in the two surveys may have been different (chart 1). Because the initial experience with the new survey suggests a seasonal pattern early this year similar to the pattern observed for early 1993 in the parallel survey, the BLS suggested in its report to the Congress in February that the use of seasonal factors based on the old CPS may have biased the reported unemployment rate.

In the aggregate, the seasonal bias would tend to lower the average unemployment rate roughly 0.2 percentage point in the first quarter and to raise it a similar amount in the third quarter. On a monthly basis relative to an unchanged jobless rate, the seasonal problem would produce a slight decline in reported unemployment between December and March, a rise each month between May and July, and another decline in September and October (table, column 2).

As can be seen in chart 2, the sources of the seasonal bias vary throughout the year. During the first quarter of 1993, the parallel survey showed a lower level of unemployment among adult men (aged 20 and older) than was apparent in the old CPS; this gap was reversed over the remainder of the year, with the parallel survey showing a higher level of unemployment. If this pattern held in early 1994 as well, the overall rate in recent months may

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have been biased down because the jobless rate for adult men has been artificially lowered by using factors based on old seasonal patterns. In the spring and summer, larger flows of teenagers and adult women in and out of the labor force are anticipated to be the source of the seasonal problem: The parallel survey suggested a larger inflow of young workers in June and of women in July; these flows were reversed for young workers in September and for women in September and October.

Typically, we have been able to track shifts in seasonal patterns during the year by comparing the official unemployment rate with one calculated using concurrent seasonal adjustment. However, the BLS has not yet developed a method of applying concurrent adjustment to the new series. More generally, the issue is how to “splice” the old and new series. The BLS feels that it needs to consider carefully how much weight to give the new data and how much information could be gleaned from data in the smoothed version of the parallel survey, which had a much smaller sample and much greater variance than the full CPS. These issues will need to be resolved before the BLS reestimates seasonality in the data at midyear and projects seasonal factors for the last six months of the year.

**Use of Centralized Computer-Assisted Telephone Interviews (CATI)**

With the introduction of the new CPS, Census interviewers began collecting their data via computers that are programmed to use information as it is being collected from the respondents to automatically tailor subsequent questions and direct interviewers to appropriate followup questions. Although most interviews continue to be conducted by field interviewers, either via telephone or in-person using laptop computers (CAPI), the proportion that are conducted from a central telephone facility (so-called CATI) is scheduled to be increased from the 9 percent rate in the old survey to about 17 percent. In the parallel survey, 18 percent of the interviews were conducted by CATI.

The relevant issue for the current estimates of the unemployment rate is that the additional sample in CATI is being gradually phased into the new survey this year: It will cover

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12 percent of households in the reports from January through April and will then move up to about 15 percent in the May report and 17 percent in June. In their analysis of the parallel survey, the BLS determined that the use of CATI appeared to be associated with higher reported rates of unemployment than with non-centralized CAPI, even though both survey approaches used the same form. Thus, the lower use of CATI (relative to the parallel survey) in the early months of 1994 could be holding down the overall unemployment rate. As indicated in column 3 of the table, the BLS estimates that the effect is roughly 0.08 percentage point from January through April. The estimates shown in the table for later months assume that one-half of that difference will be eliminated in May and the remainder in June when CATI usage is fully phased in.

**Composite Estimation**

The sample design of the CPS divides participants into eight rotation groups, designated by the number of months they have participated in the survey. Each selected household is in the sample for four consecutive months, out of the sample for the next eight months, and then in the sample again for a final four-month period. To estimate the monthly unemployment rate (and other labor force statistics) from this sample, the BLS traditionally uses a procedure called composite estimation. In order to reduce the variance in the month-to-month changes in the estimates, the procedure takes advantage of the fact that three-fourths of each month's sample were participants in the survey in the prior month.<sup>1</sup>

The procedure also includes a correction for "rotation group" or "month-in-sample" bias; in the old survey, the BLS and Census found that new participants tended to report a higher unemployment rate than the average unemployment rate for the entire sample (similarly, those reentering the survey showed a higher unemployment rate than

1. Technically, compositing involves using a weighted average of (1) the sample ratio estimate from the current month and (2) the sum of the composite estimate from the previous month and the over-the-month change for the six rotation groups who participated in the survey in both months.

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subsequent respondents). Thus, an adjustment term is added to the estimate that gives additional weight to the ratio estimates from the first and fifth rotation groups.

Two issues related to compositing might be affecting the current estimates of the unemployment rate. The first is that BLS did not use a composite estimator to compute the January and February unemployment rate estimates and does not plan to begin using a composite estimator with the new survey until April or May.<sup>2</sup> Of course, in January, composite estimation was not possible because none of the respondents had participated in the redesigned survey in both December and January. However, BLS decided against using a composite estimator in February and March as well because of operational constraints.

Second, the rotation group bias evident in the old CPS may not carry over to the redesigned survey. The BLS notes that in the past small changes in the questionnaire have resulted in striking changes in rotation group patterns, and given the large changes in the survey introduced with this redesign, we would not be surprised if the rotation group bias changed as well.<sup>3</sup> Thus, even when composite estimation is introduced, the procedure may not fully yield appropriate estimates. As with the seasonal factors, a few years of experience will be required to determine the pattern of rotation group biases for the new CPS.

The BLS believes that the small sample size in the parallel survey and the incomplete rotation group phase-in severely limit their ability to estimate possible changes in rotation group bias. However, as a way of approximating the possible effects of omitting the composite estimation stage of their existing procedures early this year, the BLS recomputed unemployment rates from the parallel survey using composite estimation to the extent possible. The results showed that the composited monthly estimates of the unemployment rate from the parallel survey averaged 0.06 percentage point lower than the comparable uncomposited

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2. BLS will compute composited estimates beginning in February to "seed" the procedure so that fully composited estimates can be produced in April or May. While BLS will not revise the uncomposited estimates for February and March, it plans to use the composited estimates in calculating annual averages and in reestimating seasonal factors.

3. In the parallel survey, the average monthly unemployment rate estimate for the first rotation group was 4 percent higher than for all rotation groups combined (as the phase-in period for the parallel survey was short, this figure is an approximation). The equivalent difference in the old CPS was 6 percent.

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estimates. This stands in contrast to the results of compositing the old CPS, which raised the unemployment rate by 0.02 percentage point.

The BLS has determined that the 0.06 percentage point effect of compositing evident in the parallel survey held true in February as well. Thus, in column 4 of the table, we have assumed that omitting the composite estimation procedure raises the unemployment rate by about 0.06 percentage point in the early part of this year. This effect is assumed to disappear when composite estimation is introduced with the April or May data.

**Respondent Conditioning**

In addition to the statistical issues discussed above, the BLS has expressed concern that respondents who answered questions from the old survey in December may be interpreting the redesigned questions as if they were from the old survey, simply because of their familiarity with the old questionnaire. These households represented three-fourths of the sample in January and half of the sample in February; they will be only one-fourth of the sample in March.

This respondent conditioning could impart a downward bias to the unemployment rate estimates until these respondents are replaced with individuals who did not participate in the old survey. The BLS believes that only respondents who participated in the survey in December are likely to be affected and, thus, that this bias will gradually be eliminated by April. The BLS doubts that respondents who participated earlier in 1993 and who are reentering the sample after an eight-month lag will be influenced by their familiarity with the old CPS; if they were, the bias might not completely disappear until April 1995.

We have no way of arriving at a firm estimate of the magnitude of this effect. However, as evidence that this might be going on, BLS notes that the unemployment rate for individuals new to the CPS in January and February was higher than for individuals who had also participated in the old survey, even after accounting for the rotation group bias evident in

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the parallel survey. We estimate that if all of this difference reflects respondent conditioning (rather than, say, different rotation group patterns), the average unemployment rate in January might have been held down by as much as 0.15 percentage point. Of course, this is a very tenuous assumption, and our estimates for this effect (shown in column 5) are probably less reliable than for the other technical factors. (Indeed, BLS is unwilling even to make such a guess.)

**Summary of Results**

Column 6 of the table shows our best guess at present for the combined effect of these technical factors on the January and February unemployment figures. Column 1 shows the pattern of the official unemployment rate that would be reported over the remainder of the year, assuming that the “underlying” jobless rate is unchanged at 6.6 percent from March to December—the March Greenbook projection. These estimates suggest that the decline in joblessness between December 1993 and February 1994 was overstated by about 0.2 percentage point.<sup>4</sup> The unemployment rate then could be reported as edging down further in March and April, rising about 0.4 percentage point during the May to July period, and retracing part of that increase during September and October.

**A Note on the NAIRU**

In preparing the January Greenbook, the staff had assumed that the NAIRU consistent with measured unemployment rates in the new CPS would be between 0.5 and 0.6 percentage point higher than the NAIRU estimated from data in the old CPS. That difference was calculated from the average gap between measured rates in the old CPS and last year’s parallel survey. Part of the difference occurred because the parallel survey was uncomposited. As discussed above, composite estimation will be introduced shortly in the new survey. Thus,

4. This calculation assumes the December 1993 reading from BLS’ smoothed version of the parallel survey, adjusted for 1990 Census weights, is an accurate measure of the unemployment rate at year-end 1993.

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our current estimate of the upward adjustment to the old NAIRU is 0.06 percentage point less than previously thought, and the underlying unemployment rates calculated in column 6 of the table should be evaluated relative to an updated NAIRU that is on the low side rather than the high side of 6-1/2 percent.



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**Estimates of Technical Factors Affecting the Unemployment Rate  
(percent)**

	Adjustment for:					
	Official Rate	Seasonal Adjustment	CATI Usage	Compositing	Respondent Conditioning	Underlying Rate
	(1)	(2)	(3)	(4)	(5)	(6)
(actual)						
<u>1993:</u>						
December <sup>1</sup>	7.0	.0	.0	-0.06	.0	6.94
<u>1994:</u>						
January	6.66	.0 to .1	.08	-0.06	.0 to .15	6.81
February	6.51	.1 to .2	.08	-0.06	.0 to .10	6.76
(projected)						
March	6.36	.2	.08	-0.06	.0 to .05	6.6
April	6.37	.1 to .2	.08	.0	.0	6.6
May	6.56	.0	.04	.0	.0	6.6
June	6.7	-.1	.0	.0	.0	6.6
July	6.8	-.2	.0	.0	.0	6.6
August	6.8	-.2	.0	.0	.0	6.6
September	6.7	-.1	.0	.0	.0	6.6
October	6.55	.0 to .1	.0	.0	.0	6.6
November	6.7	-.1	.0	.0	.0	6.6
December	6.6	.0	.0	.0	.0	6.6

1. Estimate from BLS' smoothed version of the parallel survey (1990 Census weights).

Chart 1

### Civilian Unemployment Rate

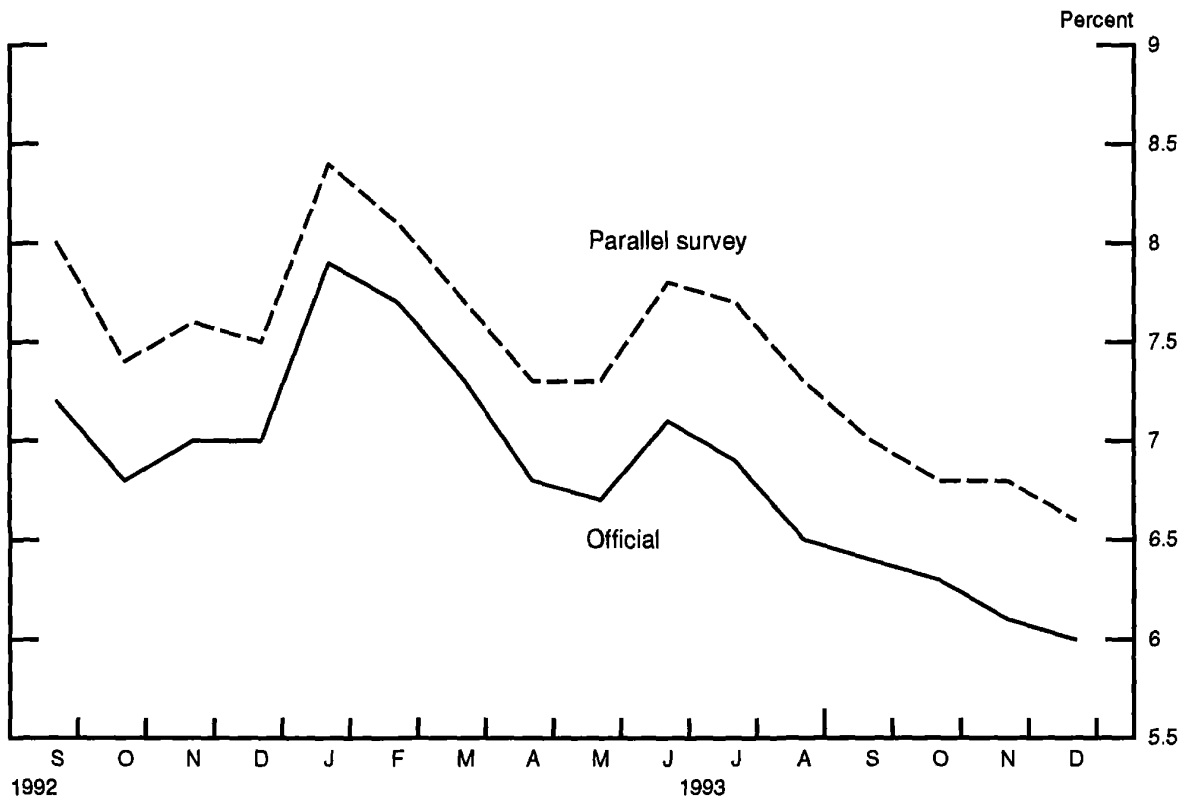
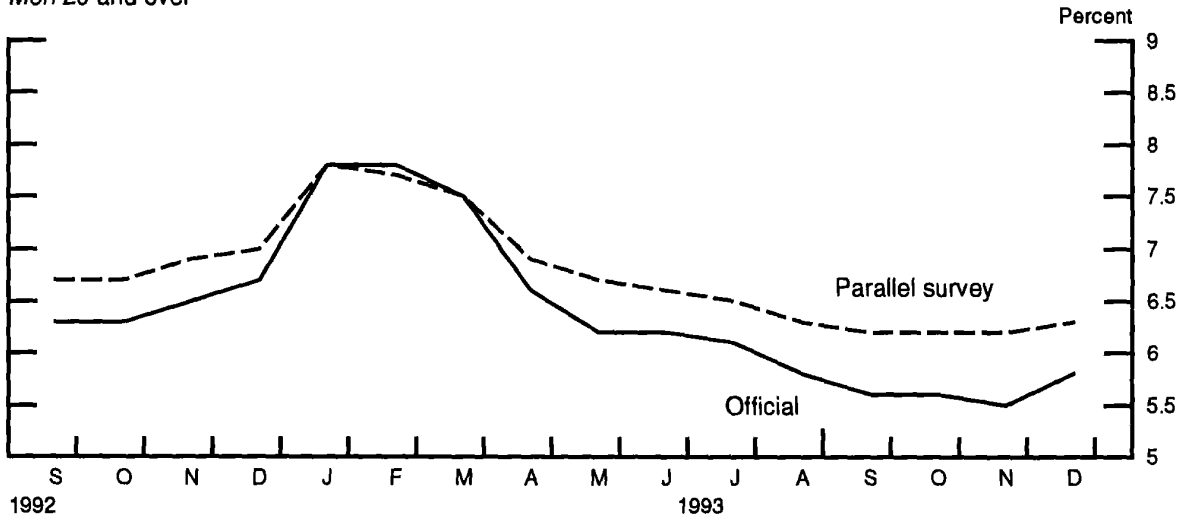


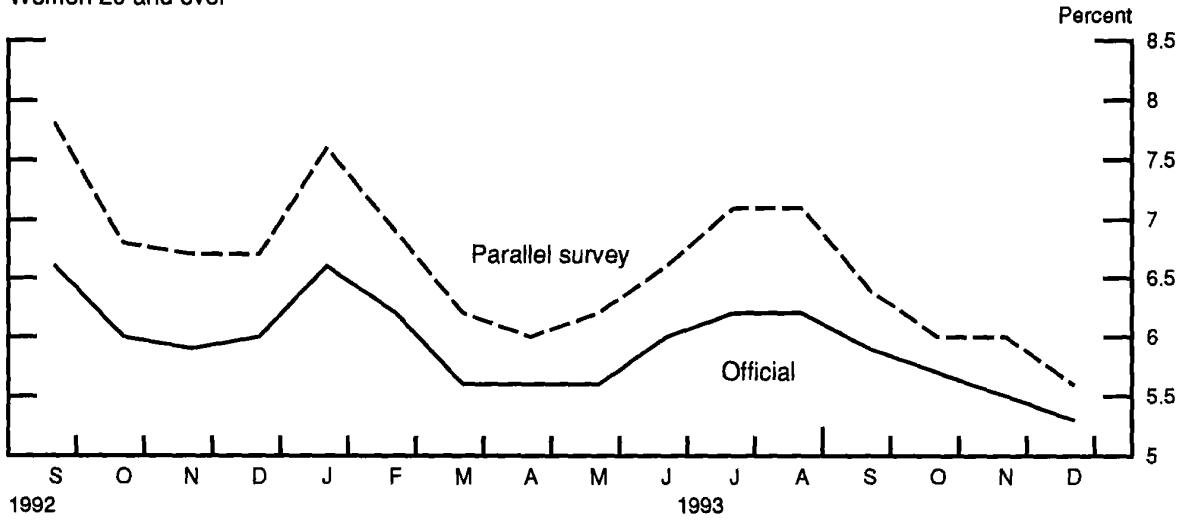
Chart 2

### Unemployment Rates by Age and Sex

Men 20 and over



Women 20 and over



Teenagers

