

**The CPS After the Redesign: Refocusing the Economic Lens**

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December, 1994

Revised March, 1995

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## **The CPS After the Redesign: Refocusing the Economic Lens**

The Current Population Survey (CPS) is a major source of information about the American labor market. In addition to providing monthly estimates of unemployment and employment, economists, sociologists and policy analysts use data from the CPS to examine broad societal and cyclical changes in economic activity over time. For example, data from the CPS have been used to investigate the declining rate of employment among men, especially older men (e.g., Peracchi and Welch, 1994); the rising labor force participation rate of women since the 1960's (Ward and Smith, 1984; Michael, 1985); the changing demographic composition and number of the self employed (Devine, 1994a, Devine 1994b, Aronson, 1991); the fluctuations in the number of involuntary part-time workers over the business cycle (Blank, 1990); the increase in wage inequality over time (Levy and Murnane, 1992; Bound and Johnson, 1992); and the relationship between unemployment and inflation (Tobin 1972; Murphy and Topel, 1987).

In January 1994, the CPS underwent a major redesign both in the wording of the questionnaire and the methodology used to collect the data. The objective of the redesign was to improve the quality and expand the quantity of available data. However, the redesign also caused changes in the measurement of many of the estimates derived from the CPS. The major purpose of this paper is to estimate adjustment factors for various aggregate measures derived from the CPS in order to permit comparisons of estimates before and after the redesign. In addition, these adjustment factors will be analyzed to assess the impact of the redesign on some of the key conclusions drawn from the CPS.<sup>1</sup>

The remainder of the paper is structured as follows. The first section briefly summarizes the reasons for the CPS redesign. The second section contains a description of the data and a discussion of the motivation for the methodology used in the empirical analysis. The third section presents the empirical model. The estimated adjustment factors, along with a discussion of possible causes and implications of the estimated changes, are presented in the fourth section. The paper concludes with a brief summary of the results and implications of the redesign.

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<sup>1</sup> The estimates presented in this paper are being provided only to aid individuals who use the CPS historically. The Bureau of Labor Statistics will not revise previously published official estimates.

## **Reasons for Redesigning the CPS**

The redesigned CPS was the culmination of a massive 8 year collaborative effort between the Bureau of Labor Statistics (BLS) and the Bureau of the Census (BC). The impetus for changing the CPS was fourfold. First, there were indications that some of the concepts and wording in the CPS were becoming dated. The last major revision to the wording of the CPS occurred in 1967. Since that time there have been many changes in the United States labor market. Women's labor force activity has increased dramatically. Service sector employment has grown. The proportion of the employed working in factory jobs has declined. Two-income households have become the norm in husband-wife households. Single-parent households have become more prevalent. The population has grown older, and minorities constitute a larger proportion of the labor force than previously. Given these societal changes, some of the wording of the CPS questions were dated and new situations had arisen that were not adequately covered by the survey.

For example, in the unrevised CPS, interviewers were instructed to tailor the wording of the first labor force question based on the gender and age of the respondent. Specifically, if the respondent "appears to be a homemaker," the manual instructed interviewers to ask, "What were you doing most of last week -- keeping house or something else?" If the respondent appeared to be relatively young, interviewers were supposed to ask, "What were you doing most of last week -- going to school or something else?" For all other respondents, interviewers were instructed to ask, "What were you doing most of last week -- working or something else?" The next question about work activities in the unrevised questionnaire included the phrase "not counting work around the house." Given the increased labor market activity of women and the rising prevalence of home offices or other work arrangements that involve individuals working from their homes, the wording of these questions could be both offensive and confusing (Polivka and Rothgeb, 1993; Rothgeb, 1994; and Polivka, 1994).

Other examples of the datedness of the CPS occurred with respect to the recording of the reasons why individuals were working part time or were absent from work. The unrevised CPS did not include the response categories of "child care problems" or "maternity/paternity leave." In the mid 1960's, when the last redesign was implemented, dual income households and women working outside of the home were not as prevalent. However, with the tremendous increase over the last quarter century of women in the labor market, the lack of these response categories raised the probability of answers being inaccurately classified and reduced the usefulness of the data (Fracasso, 1989).

Investigation also revealed that the meaning of several phrases and words in the CPS have changed over time. An important example of shifting meanings involves the measurement of individuals "on layoff." In the past, most people defined a layoff as a temporary spell of unemployment from which an individual expected to be recalled as soon as business conditions improved or retooling was completed. Research showed, however, that in the late 1980's and early 1990's, the majority of individuals used the word layoff to refer to permanent separations from which they did not expect to be recalled ( Rothgeb, 1982; Palmisano, 1989).

A second motivation for the revisions is that changes previously recommended in the 1970's -- most notably those from the National Commission on Employment and Unemployment Statistics -- had not been fully implemented. Several recommendations were tested in the 1980's through the Methods Development Survey jointly developed by BLS and the Bureau of the Census, but the lack of funding for a large overlap sample to assess the effect of the changes precluded the implementation of these recommendations.

The changes that were occurring in survey methodology provided a third impetus for redesigning the CPS. In the early 1980's, the introduction of cognitive psychological theory and research methods provided a means for understanding and reducing measurement error in the survey process (Jabine, Straf, Tanur, and Tourangeau, 1984). Two important aspects of the application of cognitive methodology were used in the redesign of the CPS. One was the development of a psychological model to relate psychological theory to how the questionnaire affects responses, and the other was the incorporation of laboratory techniques into the questionnaire design and testing process (Dippo, Polivka, Creighton, Kostanich, and Rothgeb, 1994).

A fourth reason for the revision was the advent of the ability to conduct surveys using laptop computers. The use of laptop computers made it possible to develop a completely computerized survey instrument. In turn, a computerized instrument permitted the methods and procedures used to conduct interviews to be altered. For example, use of a computer allows information from a previous interview to be inserted into the current interview and permits internal data consistency checks to be built into the survey.<sup>2</sup>

Given these reasons, an effort to redesign the CPS was begun in 1986. From 1988 through 1991, a series of research projects were conducted to guide the development of the revised

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<sup>2</sup> For a more complete description of the general motivation for the CPS revision see Bregger and Dippo (1993). For a discussion of the motivation of specific questionnaire changes see Polivka and Rothgeb (1993) For a description of the use of computers in redesigning and administering of the CPS see Dippo, Polivka, Creighton, Kostanich, and Rothgeb (1994).

CPS. Included in this research were two large-scale tests of alternative versions of the questionnaire collected using centralized computer-assisted telephone interviewing with samples of households selected through random digit dialing. The result of these tests was a completely revised questionnaire designed to be collected with an entirely automated survey instrument.

## **The Data**

As mentioned in the introduction, the major goal of this paper is to provide a set of adjustment factors which account for the redesign for application to aggregate estimates derived from the CPS. Initially, to assess the effect of the redesign a parallel survey was conducted using the new automated collection procedure from July 1992 through December 1993. This parallel survey provided BLS its first estimates of the expected effect of the redesign. For example, based on the parallel survey it was estimated that the redesign would increase the overall unemployment rate 0.5 percentage point and that the increase would be relatively larger for women than for men. The initial parallel survey estimates also indicated that the employment-to-population ratio would be 0.7 percentage point higher for women and 0.6 percentage points lower for men after implementation of the redesign.<sup>3</sup>

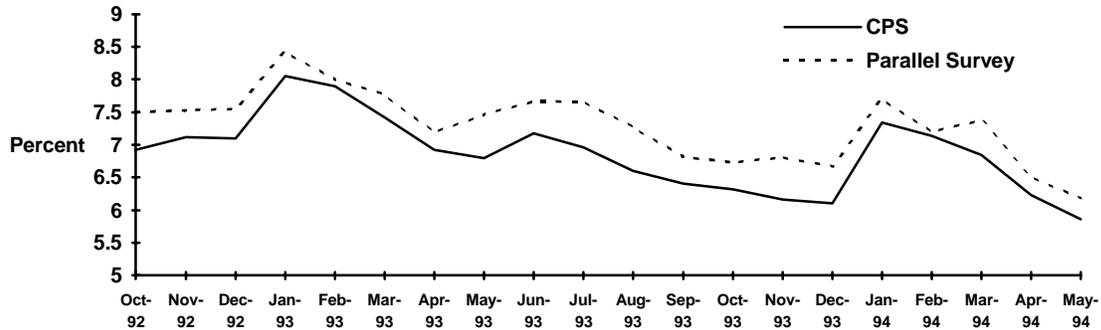
As an additional tool to assess the impact of the redesign, households in the sample used for the parallel survey were interviewed with the unrevised procedures from January 1994 through May 1994. The primary purpose of extending the parallel survey, while switching households to the old procedures, was to obtain an estimate of what the unemployment rate would have been under the old procedures. However, examination of the data from the extended parallel survey called into question the interpretation of some of the results of the initial parallel survey. Specifically, rather than the unemployment rate being lower than in the CPS when the parallel survey was conducted with the old methodology, the unemployment rate continued to remain higher in the extended parallel survey. As can be seen in graph 1, plots of the parallel survey and CPS estimates of the monthly unemployment rates did not cross as would be expected if the new methodology were increasing the rate.

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<sup>3</sup> More detailed estimates of the effect of the redesign from the initial parallel survey can be found in Cohany, Polivka and Rothgeb (1994).

## GRAPH 1

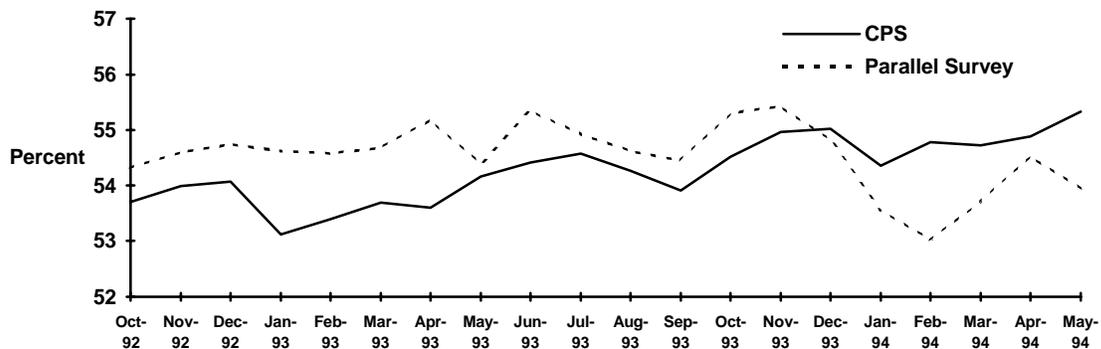
**Total National Unemployment Rates  
Not Seasonally Adjusted**



The failure of the two plots to cross suggests that there may have been something specific to or distinct about the parallel survey. In other words, there may have been a "parallel survey effect." This parallel survey effect could exist even for estimates that appeared to perform as predicted by the initial parallel survey. For example, graph 2 indicates that the monthly estimated employment-to-population ratios for women were, by and large, higher in the parallel survey than in the CPS prior to January 1994 and were lower in the parallel survey than in the CPS after January 1994. This crossing of the plots is consistent with there being a new method effect on women's estimated employment-to-population ratio. However, if there is a parallel survey effect in addition to a new methodology effect, the effect of the redesign on women's employment-to-population ratio would be different from what was observed prior to January 1994, since prior to January 1994 the two effects would be confounded.

## GRAPH 2

**Employment-to-Population Ratios for Women  
Not Seasonally Adjusted**



A parallel survey effect could occur for a variety of reasons. For example, a parallel survey effect could exist due to differences in the CPS sample versus the sample used for the parallel surveys, differences in supervision of the interviewer staff between the CPS and the parallel surveys, or differences that arise just because respondents and interviewers know that they were part of an experiment. The latter effect is sometimes referred to as a "Hawthorn effect."

Given the graphical results and the possibility of a parallel survey effect existing, it is important to construct adjustment factors that control for a parallel survey effect. Consequently, data collected with the parallel surveys using the new procedures prior to January 1994 and the unrevised procedures from January through May, along with data collected from the unrevised CPS prior to January 1994 and revised CPS beginning in January 1994, will all be used in the estimation of adjustment factors. Throughout the remainder of this paper, estimates and data pertaining to the portion of the parallel survey test conducted prior to January 1994 will be referred to as "Parallel Survey prior to January" estimates or data (PSPj). Estimates or data pertaining to the portion of the parallel survey conducted since January 1994 using the unrevised procedures will be referred to as "Parallel Survey since January " estimates or data (PSSj). Estimates or data derived from the unrevised CPS will be referred to as "unrevised CPS, " "old method" or "unrevised methodology" estimates or data. Estimates or data derived from the revised CPS after January 1994 will be referred to as "revised CPS" or "revised methodology estimates or data."

To aid in subsequent discussion of the statistical modeling and to provide additional insight into why a "parallel survey effect" may exist, the sample design and procedures used in each of the surveys are described below.

#### *The Unrevised CPS (Old Method before January 1994)*

The Current Population Survey includes 60,000 households monthly that are selected to represent the population in the Nation and each state. The probability sample of housing units is drawn using a multistage stratification procedure. The largest metropolitan areas within each state are always included; the remaining areas of a state are sampled on a probability basis, with the probability of selection being proportionate to the population of the area. In an effort to balance respondent burden with improved estimates of change, households are interviewed for 4 consecutive months, not interviewed for the next 8

consecutive months, and then interviewed for another 4 consecutive months. Each month, a new household panel of approximately one-eighth of the total monthly sample size is initiated and the panel which received its eighth interview the previous month is dropped. Given this rotating panel structure, in any month one-eighth of the households will be receiving their first interview, one-eighth will be receiving their second interview, one-eighth will be receiving their third interview, etc. This rotating panel structure means that three-quarters of the sample in a given month is retained in the sample the next month. This improves estimates of month-to-month change, but it also means that there is a great deal of correlation in the data month to month. The first interview in each of the four consecutive interview months is conducted through a personal visit. In subsequent months, the majority of interviews are conducted over the phone, either from interviewers' homes or from one of two centralized computer-assisted telephone interviewing (CATI) facilities. The majority of the unrevised CPS data were collected with a paper survey instrument, although approximately nine percent of the data were collected by interviewers working in the two centralized (CATI) facilities.

*The Revised CPS (New Method since January 1994)*

Starting in January 1994, the 60,000 household CPS sample was switched to the revised questionnaire and computerized collection procedure. The rotation pattern established prior to January 1994 was maintained; therefore, 88 percent of the households that received the revised CPS questionnaire and procedures in January 1994 had previously received the CPS using the unrevised questionnaire and procedures, with 75 percent of the households having experienced the unrevised CPS in December 1993. Except for staff turnover, all of the CPS interviewers in January 1994 had previous experience with the unrevised CPS. The revised CPS data were collected entirely with the new computerized instrument. Again, the majority of the households were interviewed in a decentralized manner, either through personal visits or by telephone from interviewers' homes. In January 1994, a little less than 13 percent of the data were collected from the centralized CATI facilities. By May 1994, the percentage of interviews conducted by CATI in the revised CPS had increased to 14.5 percent.

*The Parallel Survey Prior to January (Parallel Survey Using the New Method before January 1994, PSpj)*

The Parallel Survey prior to January included 12,000 households that were interviewed monthly starting in July 1992. The sample design for the Parallel Survey prior to January was that used by the National Crime Victimization Survey which is conducted by the Bureau of the Census for the Bureau of Justice Statistics. Like the CPS, the PSpj sample

was drawn using a multistage stratified design. Unlike the CPS's state based design, geographic areas for the PSpj were selected only to be nationally representative. The Parallel Survey prior to January had the same 4-8-4 interview rotation pattern as the CPS. However, since the PSpj was initiated in 1992, and it takes 16 months to phase in this type of rotation scheme, September 1993 was the first month in which the rotation scheme was fully in place.<sup>4</sup> As in the CPS, the first and fifth month-in-sample households in the PSpj were interviewed through personal visits. In subsequent months, the majority of interviews were conducted by telephone. In the Parallel Survey prior to January, 82 percent of the data were collected by field representatives using laptop computers, either during personal visits or by telephone from their own homes. The remaining 18 percent of the data were collected using CATI by a separate staff of interviewers working in the same two centralized facilities used for the CPS. The interviewer staff for the PSpj was drawn to reflect the experience of CPS interviewers in a given year. Fifty percent had experience on the unrevised CPS, 25 percent had experience on other Census surveys, and 25 percent were new hires. While the PSpj was being conducted, none of the PSpj interviewers conducted the unrevised CPS. The PSpj had a supervisory staff which was separate and independent from the unrevised CPS. For each supplement conducted in the CPS from July 1992 through December 1993, a computerized version was also administered in the PSpj. Due to factors related to the initialization of the new procedures and implementation of the revised questionnaire, only data from October 1992 to December 1993 will be used for analysis.

*The Parallel Survey Since January (Parallel Survey Using the Old Method since January 1994, PSsj)*

Starting in January 1994, the sample used for the Parallel Survey prior to January was switched to the unrevised CPS paper questionnaire. Given the rotation structure of the Parallel Survey sample, this meant that in January 1994, 88 percent of the respondents had

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<sup>4</sup> The rotation scheme was such that from October 1992 forward all of the households in month in sample one through four actually were interviewed for their first through fourth time. In October 1992, the month in sample one through four households constituted 50 percent of the sample, At the same time half of the survey households were designated as month in sample five through eight. The majority of these households actually were having their first through fourth monthly interviews, where households designated as month in sample five were really month in sample one, households designated as month in sample six were really month in sample two etc. Historically, changes in estimates from month in sample five through eight have shown the same pattern as changes in estimates for month in sample one through four. A small percentage of the MIS 5 households in October 1992 had been previously interviewed in January 1992 as part of a large scale operations test of the new instrument and collection procedures. Starting in January 1993, 30 percent of the households designated as MIS 5 actually were being interviewed for the fifth time after having not been interviewed for eight months. The percentage of "true" MIS 5 households increased to 63 percent in April 1993 and 100 percent in May 1993. The percentage of true MIS 6 through MIS 8 households followed a similar pattern as the MIS 5 households lagged by one calendar month.

previous experience with the revised computerized questionnaire, and, for 75 percent of the sample, this experience had been in December 1993. By May 1994, the percentage of respondents who had previous experience with the revised CPS had decreased to 50 percent, with none of this experience having occurred in a contiguous month. In January 1994, approximately 16 percent of the PSsj households were eligible to be interviewed through CATI. By May 1994, the percentage of interviews eligible to be conducted by CATI had been reduced to 9 percent. Twenty-six percent of the field interviewers for the Parallel Survey since January had conducted interviews with the unrevised CPS using the paper instrument. The majority of the remaining field interviewers were newly hired to work on the PSsj. Approximately 6 percent of these new hires had received training on the new questionnaire and methodology. None of the CATI interviewers for the PSsj had experience with the old questionnaire. The Parallel Survey since January had the same supervisory staff as did the Parallel Survey prior to January . The PSsj did not have any of the supplements that were administered with the revised CPS in 1994. It is important to note that the switching of the same households from the Parallel Survey prior to January to the Parallel Survey since January permitted an estimate of the parallel survey effect.

## **Description of Statistical Modeling**

### *Introduction*

Let  $Y_{it}$  be a non seasonally adjusted estimate for a particular labor force measure (e.g., Total National Unemployment Rate) for the  $i$ -th survey in month  $t$ . Here  $i = 1$  refers to the CPS while  $i = 2$  refers to the Parallel Survey. In addition,  $t$  ranges from 1 to 20, denoting the months October 1992 to May 1994 respectively.

We will consider two models, an *additive factor* model and a *multiplicative factor* model.

The additive factor model is given by

$$(1) \quad Y_{it} = \mu_t + \lambda_i + \sum_{j=1}^4 \delta_{ij} m_j + e_{it}$$

where

- $\mu_t$  = True mean for month  $t$
- $\lambda_1$  = Effect due to Current Population Survey
- $\lambda_2$  = Effect due to Parallel Survey
- $\delta_{ij} = 1$  if  $m_j$  occurs in Month  $t$  and Survey  $i$  (zero otherwise)
- $m_1$  = Effect due to Old Method before January 1994
- $m_2$  = Effect due to New Method before January 1994
- $m_3$  = Effect due to Old Method since January 1994
- $m_4$  = Effect due to New Method since January 1994
- $e_{it}$  = Sampling error for Survey  $i$  and Month  $t$

We make the assumption that the sampling errors are Normally distributed with mean zero. In addition, the sampling errors are uncorrelated between the two surveys, but are correlated within survey. This within survey correlation is mainly caused by the rotating panel structure of the CPS, and mimicked in the parallel survey, which creates a 75 percent overlap between sampled units one month apart and 50 percent overlap between units twelve months apart.

The multiplicative model is given by

$$(2) \quad \log Y_{it} = \log \mu_t^* + \log \lambda_i^* + \sum_{j=1}^4 \delta_{ij} \log m_j^* + u_{it}$$

where the parameters are defined analogously to those in (1), and the sampling error  $u_{it}$  is Normally distributed with mean zero.

Our goal with the additive model is to estimate the effect of the new methodology,  $\hat{m}_4$  say, in order to create a revised estimate  $\hat{Y}_t^{(A)} = Y_{1t} + \hat{m}_4$  for months before January 1994, which are comparable to the data from the CPS since January 1994. Under the multiplicative model we estimate a new methodology effect  $\hat{m}_4^*$ , in order to create the revised estimate  $\hat{Y}_{1t}^{(M)} = Y_{1t} \hat{m}_4^*$ . Unfortunately, the parameters of the models in (1) and (2) are not fully identified, even though some linear combinations are identified. For example, if we look at months prior to January 1994 for the additive factor model we get:

$$(3) \quad E\{Y_{2t} - Y_{1t}\} = \lambda_2 - \lambda_1 + m_2 - m_1$$

while since January 1994 for the additive factor model we get:

$$(4) \quad E\{Y_{2t} - Y_{1t}\} = \lambda_2 - \lambda_1 + m_3 - m_4.$$

The linear combinations in (3) and (4) are estimable, even though the individual parameters are not estimable. In order to make progress with respect to individual parameters, additional restrictions need to be imposed.

### *Basic Assumption*

The basic assumption we used is to make everything relative to the CPS prior to January 1994.

$$(5) \quad \begin{array}{l} \text{Additive Factor : } \quad \lambda_1 = 0, m_1 = 0 \\ \text{Multiplicative Factor : } \lambda_1^* = 1, m_1^* = 1 \end{array}$$

This brings us down to 4 free parameters plus 20 monthly mean parameters. Unfortunately all of the parameters of the model still are not identified. There are several ways to further restrict the parameters, and we list three reasonable ones next.

### *Restriction 1*

In addition to the basic restriction, we could assume that the new method had the same effect before January 1994 as from January 1994 on and that there was no parallel survey effect

$$(6) \quad \begin{array}{l} \text{Additive Factor : } \quad \lambda_2 = 0, m_2 = m_4 \\ \text{Multiplicative Factor : } \lambda_2^* = 1, m_2^* = m_4^* \end{array}$$

This would allow us to estimate a new method effect and an effect due to the way in which the old methodology was applied from January 1994 forward.

### *Restriction 2*

In addition to the basic restriction, we could assume that the old methodology had the same effect from January 1994 on as it did previously and that there is no parallel survey effect.

$$(7) \quad \text{Additive Factor : } \quad \lambda_2 = 0, m_3 = 0$$

$$\text{Multiplicative Factor : } \lambda_2^* = 1, m_1^* = m_3^* = 1$$

This would allow us to estimate a new method effect before January 1994 and a new method effect from January 1994 forward.

*Restriction 3*

In addition to the basic restriction, we could assume that the new methodology had the same effect before January 1994 as it has had since January 1994, and that the old methodology has had the same effect since January 1994 as it had previously.

$$(8) \quad \begin{array}{l} \text{Additive Factor : } \quad m_2 = m_4, m_3 = 0 \\ \text{Multiplicative Factor : } m_2^* = m_4^*, m_1^* = m_3^* = 1 \end{array}$$

This would allow us to estimate a new methodology effect and an effect due to the parallel survey.

*Specification Used in Our Analysis*

For the purposes of our analysis we used the additive and multiplicative models in (1) and (2) along with the *Basic Assumption* (5) and *Restriction 3* (8). We chose this specification because it most closely fits our understanding of the data. Specifically, everything possible was done to ensure that the new methodology was applied in the same way in the Parallel Survey before January 1994 and in the CPS since January 1994. In addition, all possible measures were undertaken to ensure that the old method was implemented in the Parallel Survey since January 1994, in the same way it was in the CPS prior to January 1994. The measures taken to insure that the old and new methods were implemented in 1994 as they had been previously, means that we can estimate one parameter for the new method effect. The addition of a parallel survey effect parameter allows us to use data from 1994 to disentangle the confounding effects of the parallel survey and new method effect which are present if one analyzes only data prior to January 1994.

A variety of evidence both empirical and qualitative also supports the specification of a single new method and a parallel survey effect. Empirically, as will be discussed below, for the unemployment rate our additive model specification yields an insignificant point estimate of 0.079 for the new methodology and a significant point estimate of 0.41 for the parallel survey effect. Modeling done with employment data from the monthly Current Employment Statistics (CES) and Unemployment Insurance Claims data estimating what the national unemployment rate would have been with the unrevised CPS methodology during 1994 also indicates that there was approximately a 0.08 percentage point change in

the unemployment rate due to a change in methodology and weights (Tiller and Welch, 1994).

A qualitative explanation of why a parallel survey effect might exist, independent of sample design differences, was provided by CPS and Parallel Survey supervisors in focus groups where they discussed their recent experiences. In these focus groups, some supervisors volunteered that CPS interviewers had larger case loads than those working on the Parallel Surveys. The larger CPS case loads reduced the amount of time interviewers could follow-up on households that did not initially respond. Furthermore, members of the focus groups noted, the smaller case loads of the Parallel Survey supervisors provided them more time to monitor the survey process and pursue field problems (Tucker, 1994). Differences in following up on non responders and monitoring of potential problems between the CPS and the two Parallel Surveys might have contributed to a “parallel survey effect.”

There could be some concern that respondents who switched from the revised to the unrevised procedure and vice versa were contaminated by their previous experience. It should be noted, however, that on average the difference in the unemployment rates between surveys from January through May of 1994 did not diminish or change signs as would be expected if contamination were effecting the estimates. In addition, in order to maintain sample size and to capture any effect that was peculiar to the households actually selected for the Parallel Survey prior to January 1994, a decision was made to use the entire sample for January through May of 1994, rather than restricting the analysis to households with no previous experience with another methodology.

Finally, we would like to make two other points about the specification we chose. First, even though we are modeling non seasonally adjusted data, the parameter estimates for the parallel survey effect and new method effect can also be applied to seasonally adjusted data in the following sense. For those data series which are additively seasonally adjusted, we would get the same parameter estimates, with the additive model, for parallel survey effect and new method effect if we had used seasonally adjusted or non seasonally adjusted data (assuming the same variances and covariances were used in the general least squares estimation). This is because the true monthly mean in (1) for seasonally adjusted data is just the true mean for the non seasonally adjusted data plus a unique additive monthly seasonal adjustment factor which can be absorbed into the definition of the mean. A similar situation occurs for series which are multiplicatively seasonally adjusted, and we use the multiplicative model. Again, this occurs because the seasonal adjustment is additive on the scale in which we are modeling (that is, the seasonal adjustment is additive in the logarithmic scale). The second point we want to make about the selected specification has to do with why we did not model the underlying true monthly means with some method other than just monthly dummies. For example it would be possible to specify a polynomial

time trend model for the underlying monthly means with splines in time. The specification of such a model would allow us to, in general, identify an additional parameter such as freeing up the parameter  $m_3$  and  $m_3^*$  in Restriction 3. We actually attempted to estimate such models but found the models were still “close” to being not identified in the sense that while we were able to obtain parameter estimates, their standard errors were large, and multicollinearity inflated the variance estimates of the parallel survey and new method effects. Thus, we chose to continue modeling the monthly means as main effects in the linear model for all of our analyses, and gave up trying to identify an additional parameter. In addition, it was felt that using one specification for all of the analyses would help our analysis seem more objective, since we would not have to be engaged in fitting different models for the monthly means, which may have involved the use of additional explanatory variables apart from the CPS and the Parallel Surveys such as employment data from the monthly establishment survey (CES) to model nonagricultural employment.

### *Estimation*

For the model specified above we estimated the remaining parameters by generalized least squares. We illustrate in detail the estimation for the additive model. The estimation for the multiplicative model is analogous. Let  $\mathbf{Y}_{(1)}$  be the vector of size  $20 \times 1$  which contains the consecutive months of data from the CPS from October 1992 to May 1994, let  $\mathbf{Y}_{(2)}$  be the data from the Parallel Surveys, and let  $\mathbf{Y}' = (\mathbf{Y}'_{(1)}, \mathbf{Y}'_{(2)})$ . Let  $\mathbf{X}$  be the  $40 \times 22$  model matrix associated with the model specified model, and let  $\boldsymbol{\beta}$  be the  $22 \times 1$  vector of free parameters. The 22 free parameters consist of 20 monthly means, a parallel survey effect, and a new method effect. Then we can write

$$(9) \quad \mathbf{Y} = \mathbf{X}\boldsymbol{\beta} + \mathbf{e}$$

where  $\mathbf{e} \sim \mathbf{N}_{40}(\mathbf{0}, \mathbf{V})$ , and  $\mathbf{V} = \text{Block}(\mathbf{V}_1, \mathbf{V}_2)$  where  $\mathbf{V}_1$  is the  $20 \times 20$  covariance matrix of the CPS data, and  $\mathbf{V}_2$  is the  $20 \times 20$  covariance matrix of the Parallel Survey data. The matrices  $\mathbf{V}_1$  and  $\mathbf{V}_2$  are estimated by the method of generalized variances along with correlation estimates obtained from previous CPS research. We will condition on the covariance matrix  $\mathbf{V}$  and treat it as known.

The estimated parameters are given by

$$(10) \quad \hat{\boldsymbol{\beta}} = (\mathbf{X}'\mathbf{V}^{-1}\mathbf{X})^{-1} \mathbf{X}'\mathbf{V}^{-1}\mathbf{Y}$$

and the estimated covariance matrix of the estimates is given by

$$\hat{v} \{ \hat{\beta} \} = \hat{\alpha} v^{-1} x h$$

All of the estimations are done with uncomposited data using 1990 population weights. The 1990 population weights are used to obtain a pure estimate of a method effect.<sup>5</sup>

## The Results

### *General*

All of the adjustment factors presented in the tables below were estimated using the linear model specified above, which included a new method effect and a parallel survey effect. Standard errors are provided in parentheses below the adjustment factors. Adjustment factors that were significantly different from 1 for the multiplicative model or 0 for the additive model at the 5 percent level are indicated with asterisks. Point estimates for adjustment factors that were not significant are also provided, although when adjustment factors are not significant, depending on the sensitivity of the analysis, one could historically compare data before and after January 1994 without adjustment. 1993 annual averages are also included in the tables, when available, as a point of reference.

The effect of using the adjustment factors is illustrated for several of the characteristics graphically. The data in these graphs were adjusted multiplicatively. For comparisons over long time periods, multiplicative factors are recommended, since adjustments using multiplicative factors will account for differences in the level of the characteristic at different points in time. It should be noted, however, that, for multiplicatively adjusted data, changes over time will not be the same as the changes measured by the unadjusted series. In contrast, the additively adjusted series will change the level of the series, while leaving the estimates of change unaffected.

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<sup>5</sup> At the time of writing it was unclear whether BLS would adjust previously published data to gradually incorporate changes in the population as reflected by the difference in the 1980 and 1990 decennial weights. (The 1980 weights with modifications for projected growth were used from 1985 through 1993.) Appendix B presents the effects of using 1980 versus 1990 weights for selected 1993 annual average estimates.

## **Unemployment and Related Unemployment Estimates**

### *Unemployment Rate*

Table 1 presents adjustment factors for the unemployment rates for detailed demographic groups. Examination of the adjustment factors in table 1 indicate that, unlike what was expected from the Parallel Survey conducted prior to January 1994, the new methodology did not have a significant effect on the overall unemployment rate, although the point estimate for the additive factor was 0.079 and the point estimate for the multiplicative factor was 1.009 which would be equivalent to an approximately 1 percent increase in the unemployment rate. As could be anticipated by graph 1, the parallel survey effect in the linear model for the overall unemployment rate was estimated to be .41 which was statistically significant at the 1 percent level.

**TABLE 1**

**UNEMPLOYMENT RATE  
ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**

	<b>Multiplicative Factor</b>	<b>Additive Factor</b>	<b>'93 Annual Average</b>
Total 16+	1.009 (0.011)	0.079 (0.076)	6.8
Men 16+	1.012 (0.015)	0.10 (0.11)	7.1
Women 16+	1.007 (0.016)	0.07 (0.11)	6.5
White Men 16+	1.029 (0.018)	0.19 (0.11)	6.2
White Women 16+	1.025 (0.021)	0.15 (0.11)	5.7
Black Men 16+	0.971 (0.032)	-0.38 (0.49)	13.8
Black Women 16+	0.965 (0.031)	-0.48 (0.43)	12.0
Teenagers (16-19)	1.035 (0.027)	0.65 (0.51)	19.0
20-24 Year Olds	1.007 (0.026)	0.03 (0.28)	10.5
25-54 Year Olds	0.985 (0.014)	-0.075 (0.084)	5.8
55-64 Year Olds	1.121* (0.053)	0.50* (0.21)	4.7
65 Years and Older	1.52* (0.16)	1.52* (0.31)	3.2
Men 16 -19 Years Old	1.029 (0.033)	0.71 (0.66)	20.4
Men 20-24 Years Old	1.024 (0.035)	0.16 (0.40)	11.3
Men 25-54 Years Old	0.985 (0.019)	-0.07 (0.12)	5.9
Men 55-64 Years Old	1.06 (0.06)	0.29 (0.30)	5.2
Men 65 Years and Older	1.69* (0.25)	1.93* (0.42)	3.2
Women 16-19 Years Old	1.029 (0.040)	0.58 (0.69)	17.4
Women 20-24 Years Old	0.980 (0.036)	-0.23 (0.38)	9.6
Women 25-54 Years Old	0.990 (0.020)	-0.05 (0.12)	5.6
Women 55-64 Years Old	1.232* (0.096)	0.76* (0.26)	4.0
Women 65 Years and Older	1.33* (0.19)	0.85* (0.44)	3.1
Adult Men (20+)	1.005 (0.016)	0.04 (0.11)	6.4
Adult Women (20+)	1.001 (0.017)	0.016 (0.10)	5.9

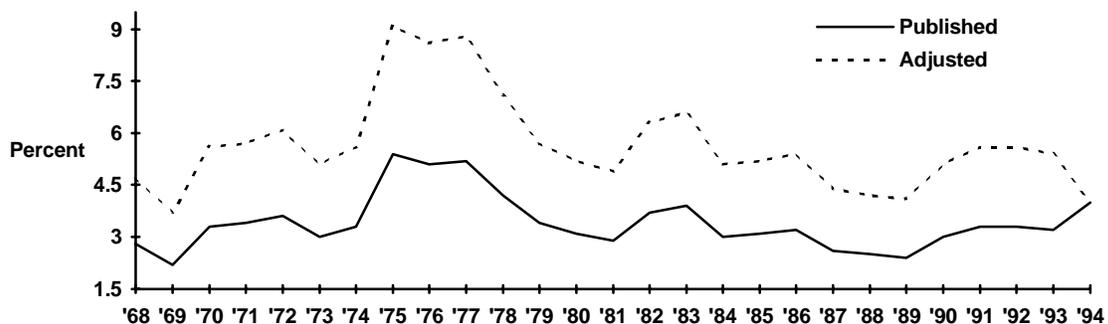
Further examination of the adjustment factors for the unemployment rates for various demographic groups reveals that the new methodology did not cause a significantly higher unemployment rate for any demographic group except older Americans. Specifically, the adjustment factors for all individuals age 55 to 64, all individuals age 65 and older, men age 65 and older, women age 55-64 and women age 65 and older are each statistically significant.

The higher unemployment rates for older Americans are probably due to a combination of the automation and rewording of the questionnaire. One of the most frequently heard complaints from respondents about the unrevised CPS was that it was burdensome and irritating for retired workers who had no attachment to the labor force. To alleviate this burden, the response category of "retired" was added to each question about labor force activity. If individuals 50 years of age or older volunteer that they are retired in answer to any of these questions, they are skipped directly to a specific question asking whether they currently want a job, either full or part time. Individuals who indicate that they want a job are asked the job search questions to establish if they have been looking for work in order to potentially be classified as unemployed. It could be that by reducing respondent irritation with the survey, directly asking older respondents if they currently want a job after they have said they are retired, and the "part-time" reference could prompt some older individuals to report that they have looked for work. In addition, reducing the level of respondents' irritation in combination with the automation of the survey could reduce the propensity for interviewers to make a personal assessment of older respondents and inappropriately lead them through the questionnaire.

The effect of applying the multiplicative adjustment factor for men age 65 and older can be seen in Graph 3.

**GRAPH 3**

**Unemployment Rate of Men 65 and Older  
Multiplicatively Adjusted versus Published Data**



In addition to noting the dramatic shift in the graph for men age 65 and older -- the multiplicative factor increases the unemployment rate for older men as measured by the unrevised CPS 69 percent-- it also is interesting to note that the redesign brings older men's unemployment rate closer to the unemployment rate for prime age males. Consequently, as the population ages, the redesign could have an effect on the overall level of the unemployment rate independent of what other societal and economic changes may occur.

### *Reasons for Unemployment*

In addition to the unemployment rate, analysts frequently are interested in the reasons why individuals are unemployed. The CPS allows unemployed individuals to be classified into one of five reasons for unemployment. Individuals could be unemployed because they were laid off from their jobs, lost their jobs for some other reasons, voluntarily left their jobs, were reentrants into the job market, or were new entrants in the job market. Table 2 provides adjustment factors for these five reasons for being unemployed for all unemployed, unemployed men, and unemployed women respectively. Again, asterisks indicate point estimates that are statistically significant at a 5 percent level.

TABLE 2

**REASONS FOR UNEMPLOYMENT  
ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**  
(As a Percentage of Unemployed)

	Multiplicative Factor	Additive Factor	'93 Annual Average
<b>TOTAL</b>			
Laid Off	0.975 (0.027)	-0.51 (.40)	12.6
Other Job Losers	0.952* (0.014)	-1.89* (0.56)	42.0
Job Leavers	0.866* (0.027)	-1.39* (0.31)	10.8
Reentrants to the Job Market	1.308* (0.022)	7.79* (0.47)	24.6
New Entrants to the Job Market	0.622* (0.021)	-4.01* (0.30)	10.0
<b>MEN</b>			
Laid Off	0.932* (0.031)	-1.30* (0.57)	15.0
Other Job Losers	0.974 (0.017)	-1.02 (0.76)	47.7
Job Leavers	0.910* (0.041)	-0.88* (0.40)	9.9
Reentrants to the Job Market	1.354* (0.035)	6.80* (0.58)	18.5
New Entrants to the Job Market	0.592* (0.029)	-3.74* (0.39)	8.9
<b>WOMEN</b>			
Laid Off	1.068 (0.053)	0.43 (0.53)	9.6
Other Job Losers	0.914* (0.024)	-2.84* (0.81)	34.5
Job Leavers	0.822* (0.037)	-2.03* (0.49)	12.0
Reentrants to the Job Market	1.266* (0.027)	8.85* (0.76)	32.4
New Entrants to the Job Market	0.649* (0.030)	-4.28* (0.48)	11.5

Although the new methodology does not seem to have affected the overall unemployment rate, the adjustment factors in Table 2 suggest that the new methodology did affect the overall composition of individuals' reasons for unemployment. For all unemployed, the adjustment factors indicate that the new methodology significantly increased the proportion

of unemployed classified as reentrants and decreased the proportion of unemployed in the other four reasons categories, with the proportions classified as "other job losers," "job leavers," and "new entrants" decreasing significantly. For men, the estimated adjustment factors also indicate that the new methodology significantly decreased the proportion classified as "on layoff."

The estimated effect of the new methodology on reentrants is probably related to a combination of questionnaire wording and minor definitional changes. First, the wording of the question where the majority of unemployed provide their reasons for unemployment was changed from "At the time you started looking for work, was it because you lost or quit a job or was there some other reason?" in the unrevised CPS to "BEFORE you started looking for work, what were you doing: working, going to school, or something else?" with the follow-up for those who said they were working, "Did you lose or quit that job, or was it a temporary job that ended?" in the revised CPS.

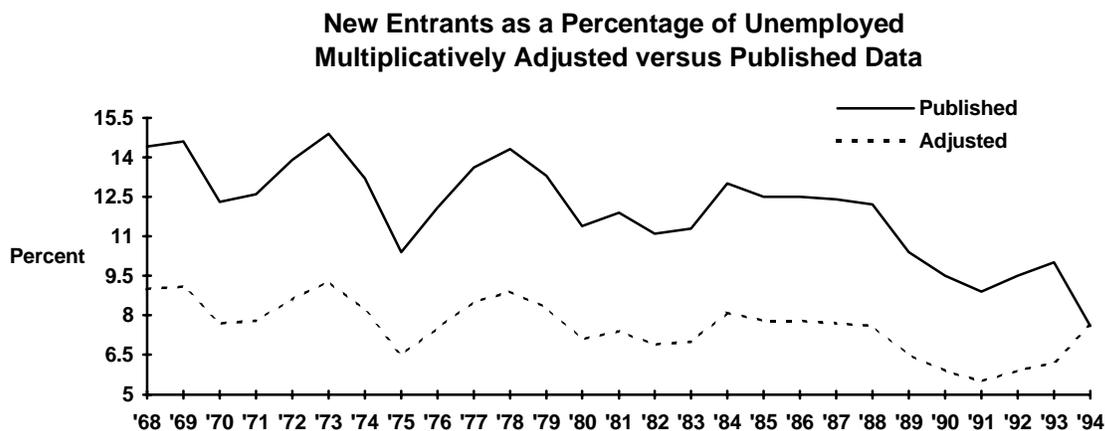
Second, part of the new methodology effect on the estimate of reentrants can be attributed to a seemingly innocuous definitional change. In the unrevised CPS individuals were asked when they had last worked full time for two weeks or longer. With this question only individuals who had worked full time were considered to have previous work experience and thus were classified as reentrants. Individuals whose entire work experience was part time or had lasted less than two weeks were classified as new entrants. The wording in the revised CPS was broadened to take into account any type of previous work experience, which should serve to reduce the proportion of unemployed classified as new entrants and increase the proportion classified as reentrants.

Finally, the proportion classified as reentrants could be affected by a change in the implementation of the on layoff concept. According to the official CPS definition, individuals must expect to be recalled to be classified as on layoff. However, the unrevised CPS did not verify whether individuals who said they were on layoff expected to be recalled. After asking a direct question about whether an individual is on layoff, the revised CPS verifies whether individuals expect to be recalled through a series of two questions. Respondents are first asked if they were given a date to be recalled. If they say "no," respondents are then asked if they expect to be recalled in the next six months. Only individuals who indicate either that they were given a recall date or that they expect to be recalled in the next six months are classified as on layoff in the revised CPS. Those who do not meet the layoff criteria continue to the job search questions. Consequently, even those who do not expect to be recalled have an opportunity to be classified as unemployed in the revised CPS. For men, the adjustment factors indicate that the expectation of recall questions did screen respondents from being classified as on layoff. However, the lack of

significant adjustment factors for men's unemployment rates seem to indicate that the recall expectation questions did not have an effect on men's overall rate of unemployment.

Graph 4 plots adjusted and unadjusted series for new entrants.

**GRAPH 4**



*Duration of Unemployment*

The distribution of the length of time individuals have been unemployed is one indicator of the economy's relative position in a business cycle. In addition, economists examine the duration of unemployment spells to obtain a measure of economic hardship, and to test alternative theories about the effects of unemployment insurance or alternative wages. Table 3 presents adjustment factors for the proportion of the unemployed who have been unemployed less than 5 weeks, 5 to 14 weeks and 15 weeks or more.

**TABLE 3**

**DURATION OF UNEMPLOYMENT  
ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**  
(As a Percentage of Unemployed)

	Multiplicative Factor	Additive Factor	'93 Annual Average
Less than 5 weeks	0.830* (0.011)	-6.32* (0.46)	36.2
5 to 14 weeks	1.014 (0.016)	0.36 (0.49)	28.9
15 weeks and over	1.169* (0.019)	5.58* (0.54)	34.9

Examination of the adjustment factors in Table 3 reveals that 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. The 17 percent change between the revised and unrevised questionnaire in the proportion of the unemployed reported to be without work 15 weeks or longer probably can be attributed to two methodological changes.

The first change involved the use of dependent interviewing. Previous research indicated that the duration of unemployment was not reported consistently for individuals who had been unemployed in consecutive months. (Polivka and Rothgeb). Results collected using the unrevised CPS from November 1992 through December 1993 verified this previous research. Specifically, when unemployment durations were collected independently using the unrevised procedures each month, only 26.1 percent of those unemployed in consecutive months increased their reported durations by four weeks plus or minus a week. Only 15.3 percent increased their length of unemployment by exactly four weeks. Approximately 46 percent of those unemployed in consecutive months reported a duration in the subsequent month that was less than three weeks greater than the duration reported in the previous month, and 28.5 percent reported a duration that was more than five weeks greater than the length of unemployment reported in the previous month.

In the revised CPS, these reporting inconsistencies were eliminated through the use of dependent interviewing and automatic updating. Rather than asking everyone each month how long they had been unemployed, individuals who were looking for work or on layoff in consecutive months had their initially reported durations automatically increased by 4 or 5 weeks in the subsequent months. The choice of adding 4 or 5 weeks was based on the number of weeks between surveys.

The second methodological change that probably influenced the reported duration of unemployment involved the reduction of response burden for the longer term unemployed.

In the unrevised CPS, respondents were forced to report how long they had been looking for work or on layoff in weeks. Research by Bowers and Horvath found that forcing respondents to report in weeks resulted in the under reporting of durations for those with spells of unemployment lasting 26 weeks or longer. In the revised CPS respondents are permitted to report their durations of joblessness in weeks, months, or years as they prefer. To incorporate this change the question wording was changed from "How many weeks have you been looking for work?" ("How many weeks ago were you laid off?") to "As of the end of LAST WEEK, how long had you been looking for work?" ("As of the end of LAST WEEK, how long had you been on layoff?")

There is evidence that the choice of reporting periodicity and alternative wording in the revised questionnaire increased the reported durations of unemployment independent of the effect of dependent interviewing. Specifically, the average durations of unemployment from November 1992 through December 1993 for those who were either in their first or fifth monthly interviews or not unemployed in consecutive months were 14.96 weeks for those who received the unrevised CPS and 17.19 weeks for those who received the revised procedures. In addition, in January 1994 when there was no dependent interviewing in the revised CPS, the proportion of unemployed whose durations were 15 weeks or longer was 34.23 percent for those who received the revised procedures compared to 29.3 percent for those who received the unrevised procedures.

### *Industry and Occupation of the Unemployed*

In addition to variations in the measurement of unemployment in the aggregate and for various demographic groups, analysts are also interested in the cyclical behavior of unemployment within various industries and occupations. To facilitate comparisons after the redesign, Table 4 presents adjustment factors for the proportion of unemployed with previous work experience in nine broad industry categories, and Table 5 provides adjustment factors for the proportion of unemployed in six broad occupation groups. <sup>6</sup>

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<sup>6</sup> Unemployed individuals who were classified as new entrants to the labor market or whose immediate work experience was in the military were excluded from the analysis.

**TABLE 4**

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**INDUSTRY OF THE UNEMPLOYED**  
**ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**  
(As a Percentage of Unemployed Who Had Previous Work Experience)

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	<b>Multiplicative Factor</b>	<b>Additive Factor</b>	<b>'93 Annual Average</b>
Agriculture	1.264* (0.088)	0.69* (0.19)	3.0
Mining	0.79 (0.13)	-0.105 (0.081)	0.7
Construction	0.981 (0.029)	-0.26 (0.37)	12.3
Manufacturing	0.910* (0.023)	-1.57* (0.46)	19.1
Transportation and Public Utilities	0.979 (0.051)	-0.10 (0.26)	5.2
Wholesale and Retail Trade	0.980 (0.020)	-0.43 (0.53)	25.4
Finance, Insurance and Real Estate	0.941 (0.057)	-0.19 (0.21)	4.1
Services	1.089* (0.020)	2.50* (0.54)	27.9
Public Administration	0.848* (0.062)	-0.30 (0.19)	2.4

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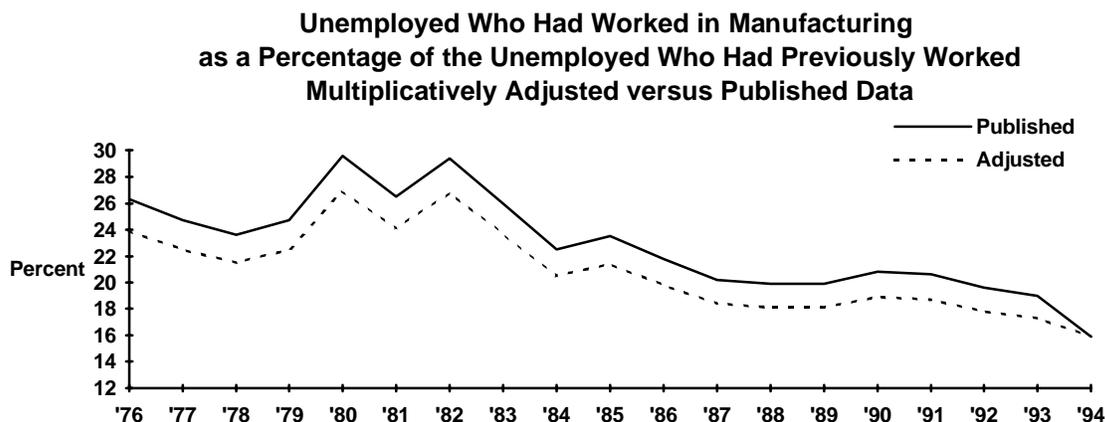
TABLE 5

**OCCUPATION OF THE UNEMPLOYED  
ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**  
(As a Percentage of Unemployed Who Had Previous Work Experience)

	Multiplicative Factor	Additive Factor	'93 Annual Average
Managerial and Professional Specialty	1.009 (0.033)	0.23 (0.39)	12.7
Technical, Sales and Administrative support	0.986 (0.019)	-0.39 (0.53)	26.8
Service Occupations	1.049 (0.026)	0.87 (0.46)	17.6
Precision Production, Craft and Repair	0.952 (0.028)	-0.72 (0.42)	14.8
Operators, Fabricators and Laborers	0.973 (0.020)	-0.65 (0.51)	24.3
Farming, forestry and Fishing	1.190* (0.071)	0.71* (0.22)	3.8

The adjustment factors in Table 5 indicate that the new methodology significantly increased the proportion of unemployed with previous work experience who had worked in the Agriculture and Service industries, and significantly decreased the proportion who had worked in the Manufacturing sector. Graph 5 plots adjusted and unadjusted series for the proportion of unemployed with previous work experience in the Manufacturing sector.

GRAPH 5



Graph 5, along with the indication provided by the adjustment factors that the almost 9 percent decrease in the proportion of unemployed who had worked in the manufacturing sector corresponded to an almost 9 percent increase in the proportion of unemployed classified as having worked in the Service sector, suggest that not accounting for the redesign could distort comparisons over time of slack demand within industries.

The adjustment factors for the occupations of the unemployed with previous work experience indicate that the new methodology increased the proportion classified as having worked in the Farming, Forestry and Fishing occupation by 19 percent. None of the other occupational adjustment factors were significant at the 5 percent level.

The changes between the new and old methodologies in the industry and occupation distributions of the unemployed with previous work experience are probably due to a combination of factors. As was previously noted, the new methodology was estimated to cause a smaller proportion of the unemployed to be classified as new entrants.

A decline in the proportion of unemployed classified as new entrants would cause an increase in the proportion of the unemployed classified as having previous work experience which in turn could influence the industry and occupation distribution of the unemployed with previous work experience.

Other changes in the revised questionnaire such as an explicit probe about the existence of a family business or farm and the reordering of the questions asking unemployed individuals about the industry and occupation of their previous employment also could have affected the industry and occupation distribution of the unemployed.

## **Employment and Related Employment Estimates**

### *Employment-to-Population Ratios*

Table 6 presents adjustment factors for employment-to-population ratios for various demographic groups.

TABLE 6

EMPLOYMENT-TO-POPULATION RATIO  
ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE

	Multiplicative Factor	Additive Factor	'93 Annual Average
Total 16+	1.0053* (0.0017)	0.33* (0.10)	61.6
Men 16+	0.9964* (0.0020)	-0.25* (0.14)	69.9
Women 16+	1.0156* ((0.0025)	0.84* (0.13)	54.1
White Men 16+	0.9967 (0.0025)	-0.23 (0.18)	71.3
White Women 16+	1.0169* (0.0030)	0.92* (0.16)	54.7
Black Men 16+	0.9831* (0.0089)	-1.02* (0.53)	59.1
Black Women 16+	1.0093 (0.0089)	0.48 (0.45)	50.5
Teenagers (16-19)	1.005 (0.011)	0.21 (0.45)	41.7
20-24 Year Olds	0.9920 (0.0056)	-0.55 (0.38)	69.0
25-54 Year Olds	1.0035* (0.0018)	0.27 (0.14)	78.7
55-64 Year Olds	1.0124 (0.0075)	0.65 (0.39)	53.8
65 Years and Older	1.078* (0.019)	0.84* (0.20)	10.9
Men 16 -19 Years Old	0.988 (0.014)	-0.41 (0.60)	42.2
Men 20-24 Years Old	0.9815* (0.0068)	-1.38* (0.51)	73.8
Men 25-54 Years Old	0.9969 (0.0019)	-0.27 (0.16)	87.1
Men 55-64 Years Old	0.9927 (0.0089)	-0.44 (0.55)	63.1
Men 65 Years and Older	1.062* (0.025)	0.88* (0.36)	15.1
Women 16-19 Years Old	1.025 (0.017)	0.97 (0.68)	41.2
Women 20-24 Years Old	1.0047 (0.0079)	0.30 (0.50)	64.4
Women 25-54 Years Old	1.0110* (0.0027)	0.77* (0.19)	70.5
Women 55-64 Years Old	1.032* (0.011)	1.47* (0.47)	45.4
Women 65 Years and Older	1.098* (0.027)	0.77* (0.20)	7.92
Adult Men (20+)	0.9970 (0.0024)	-0.21 (0.18)	72.0
Adult Women (20+)	1.0150* (0.0029)	0.83* (0.16)	55.0

Examination of the adjustment factors indicates that the new methodology significantly raised the overall employment-to-population ratio; however, the estimated adjustment factors also indicate that the overall effect masked differences by gender. Specifically, the multiplicative adjustment factors for all men, black men, and men 20 to 24 years old were significantly less than 1 at a 5 percent significant level, and the additive factors were negative and statistically different from 0 at a 5 percent level. These results suggest that the new methodology significantly lowered the employment-to-population ratio for these groups. In contrast, the estimated adjustment factors indicate that the new method would significantly raise the employment-to-population ratio for women, white women, women age 55 to 64, and women 65 and older. The only group of men who did not follow this pattern was men who were 65 years and older. Using the estimated adjustment factor to account for the new methodology would significantly raise the employment-to-population ratio for these men.

The effect of the new methodology on women's and older worker's employment-to-population ratios probably is at least partially attributable to changes in wording of the questionnaire. These changes include the elimination of the opening labor force question inquiring about major activities last week which may have caused some respondents to think that the CPS was not interested in more casual or intermittent work activity; the rephrasing of the questions asking about work activities last week to specifically refer to any work for pay and to remove the phrase "not counting work around the house"; and explicitly asking about employment in family businesses.<sup>7</sup>

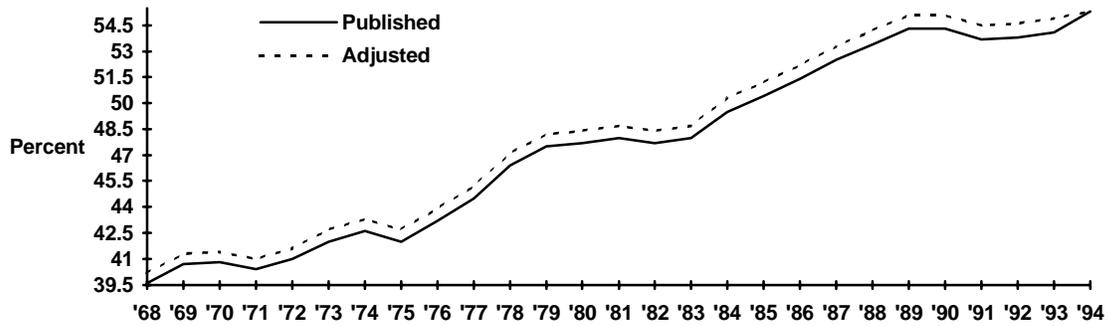
Graph 6 plots both adjusted and unadjusted employment-to-population ratios for women.

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<sup>7</sup> See Cohany, Polivka, and Rothgeb (1994), Polivka (1994) and Rothgeb (1994) for a more detailed discussion of why women's employment-to-population ratio may be larger with the new methodology.

## GRAPH 6

**Women's Employment-to-Population Ratio  
Multiplicatively Adjusted versus Published Data**



The increase in women's employment-to-population ratio may not seem large; however, the increase implied by the multiplicative factor is equivalent to approximately 750,000 women.

### *Part-time Workers and Workers Who are Part-time for Economic Reasons*

In addition to the proportion of the population employed, economists, sociologists and policy analysts are also interested in the percentage of employed who are working part-time and the percent of the employed who are part-time for economic reasons such as poor business conditions or the inability to find full-time work. Table 7 provides adjustment factors to account for the effect of the new methodology on the number of part-time workers and workers who are part time for economic reasons.

TABLE 7

**PART-TIME WORKERS AND ECONOMIC PART-TIME WORKERS  
ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**  
(As a Percentage of Employed)

	<b>Multiplicative Factor</b>	<b>Additive Factor</b>	<b>'93 Annual Average</b>
<u>Part-time Workers</u>			
Total	1.0983* (0.0080)	1.73* (0.13)	17.5
Adult Men	1.074* (0.016)	0.65* (0.13)	8.5
Adult Women	1.1246* (0.0094)	2.81* (0.20)	22.8
Teenagers	1.0329* (0.0092)	2.35* (0.64)	67.7
<u>Part-time Workers for Economic Reasons</u>	0.806* (0.011)	-1.003* (0.062)	5.3

The adjustment factors for part-time workers imply that the unrevised CPS either was not completely enumerating individuals who were working part time or was misclassifying them. Specifically, the multiplicative adjustment factors indicate that the unrevised CPS underestimated the percentage of employed who were working part time by 9.8 percent. The adjustment factors further indicate that this incomplete enumeration or misclassification occurred across various age and gender groups since both the multiplicative and additive factors for adult men, adult women and teenagers all are significantly different from 1 or 0 respectively at a 5 percent level.

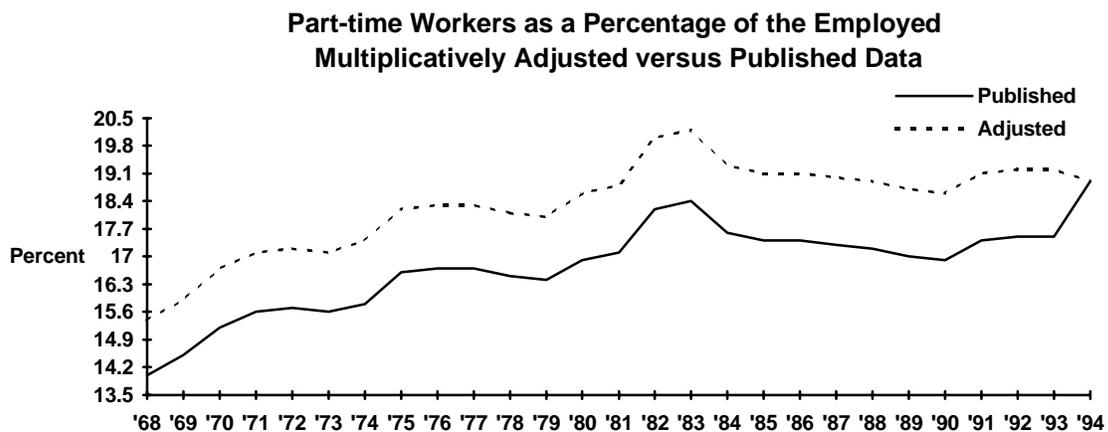
Part of the estimated effect of the new methodology on the proportion of employed classified as part-time workers could be due to the elimination of a misclassification caused by the structure of the unrevised CPS. In the unrevised CPS only individuals who actually worked less than 35 hours in the reference week were asked how many hours they usually worked. All individuals who were at work 35 hours or more were automatically classified as full-time, regardless of the number of hours they usually work. In the revised CPS all respondents are first asked how many hours they usually work, and are then asked in subsequent questions about their actual hours. The new methodology could also increase

the proportion of employed workers classified as part time if the additional workers measured in the revised CPS, as evidenced by the revised CPS's higher employment-to-population ratios, were disproportionately part-time workers.

At the same time that the adjustment factors imply that the new methodology increases the percentage of the employed working part time, they also indicate that the new methodology would decrease the proportion of the employed classified as part time for economic reasons by approximately 20 percent. The reduction in the proportion of the employed classified as part time for economic reasons most likely occurred because the unrevised CPS did not directly ask people if they wanted to and were available to work full time. Rather, individuals' desire and availability to work full time were assumed from the answers provided for why they were working part time. In the revised CPS individuals are asked directly if they want to and are available to work full time. In addition, part of the decrease in the proportion of employed working part time for economic reasons with the new methodology could be attributable to the more complete measurement of part time workers in the revised CPS.

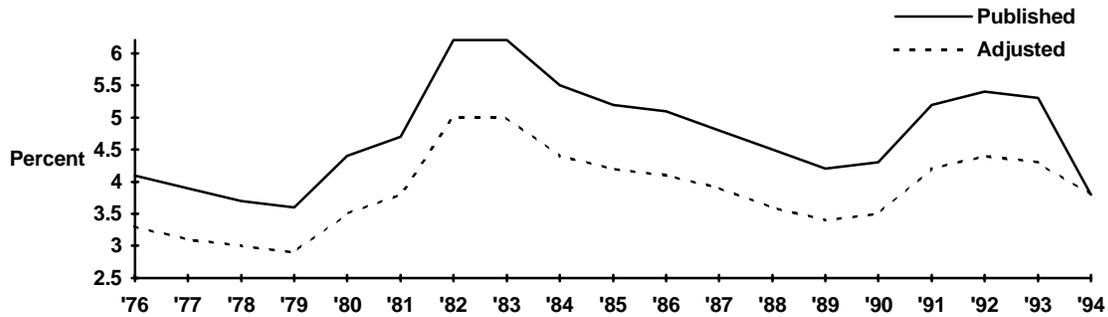
Graphs 7 and 8 plot multiplicatively adjusted versus published data for part-time workers and workers who are part-time for economic reasons respectively. The sharp jumps in the unadjusted data highlight the importance of adjusting the CPS data for the redesign when making comparisons over time. Failure to adjust the data could cause analysts to reach improper policy conclusions about societal or economic changes which may or may not have occurred between the early 1990's and later years.

### GRAPH 7



## GRAPH 8

**Workers who are Part time for Economic Reasons  
as a Percentage of the Employed  
Multiplicatively Adjusted versus Published Data**



### *Class of Worker*

Using the CPS data, employed individuals can be classified as wage and salary workers who work in the private sector, wage and salary workers who work for the government, self-employed incorporated, self-employed unincorporated, and unpaid family workers. Table 8 contains adjustment factors for these class-of-worker categories, along with factors for self-employed incorporated and self employed unincorporated combined, and all wage and salary workers. In addition, since BLS publishes estimates that classify the self-employed incorporated as wage and salary workers, adjustment factors for wage and salary workers and the self-employed incorporated combined are also provided.

TABLE 8

**CLASS OF WORKER**  
**ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**  
(As a Percentage of Employed)

	Multiplicative Factor	Additive Factor	'93 Annual Average
<b>TOTAL</b>			
Wage and Salary, Private	0.9925* (0.0018)	-0.55* (0.14)	72.6
Wage and Salary, Government	0.9783* (0.0070)	-0.34* (0.11)	15.5
Self-employed Incorporated	1.160* (0.022)	0.462* (0.058)	3.0
Self-employed Unincorporated	1.062* (0.012)	0.486* (0.091)	8.7
Self-employed Uni and Inc.	1.088* (0.011)	0.95* (0.11)	11.7
Unpaid Family Workers	0.750* (0.062)	-0.057* (0.015)	0.3
Wage and Salary and Self -emp Inc.	0.99535* (0.00089)	-0.429* (0.083)	91.1
<b>MEN</b>			
Wage and Salary, Private	0.9965 (0.0025)	-0.26 (0.18)	71.7
Wage and Salary, Government	0.986 (0.011)	-0.18 (0.14)	13.0
Self-employed Incorporated	1.099* (0.023)	0.401* (0.087)	4.3
Self-employed Unincorporated	1.004 (0.013)	0.03 (0.13)	10.9
Self-employed Uni and Inc.	1.031* (0.011)	0.44* (0.15)	15.2
Unpaid Family Workers	0.93 (0.13)	-0.007 (0.013)	0.1
Wage and Salary and Self -emp Inc.	0.9996 (0.0014)	-0.04 (0.12)	89.0
<b>WOMEN</b>			
Wage and Salary, Private	0.9881* (0.0025)	-0.88* (0.19)	73.6
Wage and Salary, Government	0.9677* (0.0086)	-0.61* (0.17)	18.5
Self-employed Incorporated	1.368* (0.049)	0.547* (0.060)	1.4
Self-employed Unincorporated	1.184* (0.022)	1.02* (0.11)	6.0
Self-employed Uni and Inc.	1.22* (0.02)	1.58* (0.12)	7.5
Unpaid Family Workers	0.673* (0.058)	-0.120* (0.024)	0.4
Wage and Salary and Self -emp Inc.	0.9902* (0.0010)	-0.925* (0.098)	93.5

The adjustment factors in table 5 indicate that under the new methodology a significantly higher proportion of the total employed and employed women were classified as self-employed incorporated and self-employed unincorporated. At the same time a significantly smaller proportion were classified as wage and salary workers --either government or private-- and unpaid family workers. The larger proportion of employed classified as self-employed incorporated and unincorporated with the new methodology is probably due to a combination of changes incorporated into the revised questionnaire. These include a direct question about household businesses at the beginning of the labor force questions, the reordering of the class of worker and industry/occupation questions to prevent interviewers from entering responses without asking all the appropriate questions, and the general changes in the measurement of employment embodied in the revised CPS.

#### *Industry and Occupation of the Employed*

In addition to determining whether individuals are wage and salary workers or self-employed, the CPS also collects information about the industry and occupation in which people work. Table 9 contains adjustment factors for the proportion of employed who were classified as working in one of six broad industry categories. Table 10 presents adjustment factors for the proportion of employed who were reported as working in one of nine major occupation groups.

**TABLE 9**

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**INDUSTRY OF THE EMPLOYED**  
**ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**  
(As a Percentage of Employed)

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	<b>Multiplicative Factor</b>	<b>Additive Factor</b>	<b>'93 Annual Average</b>
Agriculture	1.088* (0.024)	0.195* (0.051)	2.6
Mining	1.078 (0.056)	0.028 (0.019)	0.6
Construction	0.960* (0.013)	-0.247* (0.081)	6.1
Manufacturing	1.0197* (0.0069)	0.33* (0.11)	16.4
Transportation and Public Utilities	0.976* (0.011)	-0.177* (0.079)	7.1
Wholesale and Retail Trade	0.9925 (0.0059)	-0.16 (0.12)	20.8
Finance, Insurance and Real Estate	1.015 (0.012)	0.099 (0.075)	6.7
Services	0.9987 (0.0041)	-0.05 (0.15)	35.1
Public Administration	0.991 (0.014)	-0.042 (0.064)	4.8

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**TABLE 10**

**OCCUPATION OF THE EMPLOYED  
ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**  
(As a Percentage of Employed)

	<b>Multiplicative Factor</b>	<b>Additive Factor</b>	<b>'93 Annual Average</b>
Managerial and Professional Specialty	1.0155* (0.0050)	0.42* (0.14)	27.1
Technical, Sales and Administrative Support	0.9947 (0.0048)	-0.17 (0.15)	30.9
Service Occupations	0.9983 (0.0078)	-0.02 (0.11)	13.8
Precision Production, Craft and Repair	0.9837 (0.0089)	-0.18 (0.10)	11.2
Operators, Fabricators and Laborers	0.9805* (0.0076)	-0.28* (0.11)	14.3
Farming, forestry and Fishing	1.082* (0.026)	0.196* (0.058)	2.8

Examination of the adjustment factors in Table 9 indicate that the new methodology significantly increased the proportion of employed classified as working in Agriculture, Manufacturing and Finance, Insurance and Real Estate industries. The adjustment factors also indicate that at the five percent level, the new methodology significantly decreased the proportion of employed classified as working in Construction, and Transportation and Public Utilities industry.

The adjustment factors for the proportion of employed working in various occupations indicate that the new methodology significantly increased the proportion classified in the Managerial and Professional Specialty and significantly decreased the proportion of employed classified as working as an Operator, Fabricator or Laborer.

Shifts between the revised and the unrevised CPS in the industry and occupation distribution of the employed are probably attributable to a combination of methodological differences. Again as with the class of worker distribution, the industry and occupation distributions could be influenced by the different ordering of the class of work and industry/occupation questions, and the inclusion of a direct probe about the existence of a household business or farm in the revised questionnaire. In addition, the industry and

occupation distributions of the employed could be affected by the increase in work activity, particularly among women, measured in the revised questionnaire.

## **Labor Force Participation and Discouraged Workers**

### *Labor Force Participation Rates*

Table 11 presents multiplicative and additive adjustment factors for the labor force participation rate, the proportion of the population that is either employed or unemployed, for various demographic groups.

**TABLE 11**

**LABOR FORCE PARTICIPATION RATE  
ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**

	<b>Multiplicative Factor</b>	<b>Additive Factor</b>	<b>'93 Annual Average</b>
Total 16+	1.0064* (0.0014)	0.423* (0.093)	66.2
Men 16+	0.9979 (0.0022)	-0.16 (0.16)	75.2
Women 16+	1.016* (0.0027)	0.95* (0.15)	57.9
White Men 16+	0.9988 (0.0022)	-0.08 (0.17)	76.1
White Women 16+	1.0194* (0.0031)	1.12* (0.17)	58.0
Black Men 16+	0.9885 (0.0076)	-0.83 (0.52)	68.6
Black Women 16+	0.9990 (0.0076)	-0.04 (0.45)	57.4
Teenagers (16-19)	1.0173* (0.0090)	0.90* (0.44)	51.5
20-24 Year Olds	0.9941 (0.0044)	-0.46 (0.34)	77.1
25-54 Year Olds	1.0024 (0.0015)	0.20 (0.12)	83.5
55-64 Year Olds	1.0190* (0.0071)	1.04* (0.38)	56.4
65 Years and Older	1.094* (0.019)	1.03* (0.20)	11.3
Men 16 -19 Years Old	1.004 (0.012)	0.24 (0.60)	53.1
Men 20-24 Years Old	0.9847* (0.0053)	-1.30* (0.45)	83.1
Men 25-54 Years Old	0.9960* (0.0015)	-0.37* (0.14)	92.6
Men 55-64 Years Old	0.9961 (0.0087)	-0.25 (0.56)	66.5
Men 65 Years and Older	1.084* (0.026)	1.25* (0.38)	15.6
Women 16-19 Years Old	1.033* (0.014)	1.67* (0.65)	49.9
Women 20-24 Years Old	1.0049 (0.0066)	0.35 (0.46)	71.3
Women 25-54 Years Old	1.0099* (0.0024)	0.74* (0.18)	74.7
Women 55-64 Years Old	1.043* (0.01)	2.03* (0.47)	47.3
Women 65 Years and Older	1.106* (0.026)	0.85* (0.20)	8.2
Adult Men (20+)	0.9975 (0.0022)	-0.20 (0.17)	76.9
Adult Women (20+)	1.0153* (0.0027)	0.90* (0.16)	58.4

In general, the adjustment factors for the labor force participation rates follow the pattern one would expect after examining the unemployment rate and employment-to-population ratio adjustment factors. The estimated factors indicated that the new methodology would significantly raise the labor force participation rate of all women, white women and women in every age category except 20 to 24. In contrast, the adjustment factors suggest that the new methodology would significantly lower the labor force participation rates of men 20 to 24 years old and 25 to 54 years old.

### *Discouraged Workers*

In the unrevised CPS, individuals who are not in the labor force who wanted jobs, but had not looked for work in the prior month because they believe no jobs are available, were defined as discouraged workers. Discouraged workers have been the focus of attention in the past as one indicator of the economy's health and as a group of individuals who may be suffering particular economic hardship. Nevertheless, the definition of discouraged workers in the unrevised CPS frequently has been criticized. The National Commission on Employment and Unemployment Statistics faulted the definition as being too subjective because it was based primarily on individuals' desire for work rather than on more objective criteria such as recent job search. The definition in the unrevised CPS also has been criticized because individuals' information about availability for work was inferred from their reasons for not looking. To address the Commission's concerns, two new requirements were added to the definition in the revised CPS questionnaire. To be classified as discouraged under the new methodology, individuals have to have engaged in some job search within the past year (or since they last worked if they have worked within the last year) and currently be available to take a job, in addition to the old criteria of currently wanting a job, and having given up looking for reasons related to the economy<sup>8</sup> The adjustment factors for discouraged workers, contained in Table 12, indicate that the two additional criteria in the revised CPS decreased the proportion of those not in the labor force classified as discouraged workers by fifty percent.

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<sup>8</sup> Also starting in January 1994, the series of questions that potentially classifies those not in the labor force as discouraged are asked of the entire CPS sample, rather than being limited to individuals in their fourth and eighth monthly interviews as was done in the past.

**TABLE 12**

**DISCOURAGED WORKERS  
ADJUSTMENT FACTORS FOR '94 METHODOLOGICAL CHANGE**  
(As a Percentage of those Not in the Labor Force)

	<b>Multiplicative Factor</b>	<b>Additive Factor</b>	<b>'93 Annual Average</b>
Total	0.500* (0.011)	-0.782* (0.025)	1.72

**Note on Aggregation**

The adjustment factors presented in the tables in the preceding sections were estimated to be optimal for the statistic specified. In order to obtain a set of estimates that are consistent for both an overall statistic and mutually exclusive subgroups beneath the overall statistic (for example, the total unemployment rate, adult men's unemployment rate, adult women's unemployment rate, and teenagers unemployment rate), it would be necessary to subdivide the population into the lowest level of mutually exclusive subgroups for whom consistent estimates are desired, and then adjust the component levels that are used for calculating the statistics for each of the subgroups (for example, employment levels, unemployment levels and, by subtraction from the population estimates, not in labor force levels). Once the adjusted levels for the subcategories have been obtained, consistent estimates for the statistics of interest for the subgroups and the aggregate could be derived. It is important to note, however, that enforcing consistency would not necessarily result in the same adjusted aggregate statistics as would be obtained if the aggregate statistic had been adjusted directly. The issues of aggregation surrounding the adjustment factors for the redesign are similar to those surrounding the aggregation and estimation of seasonally adjusted statistics. For statistics that BLS seasonally adjust, consistent estimates are obtained by first seasonally adjusting levels for subgroups and then aggregating. Adjustment factors for the 12 basic labor force series which are seasonally adjusted to obtain the seasonally adjusted Total National unemployment rate are provided in Appendix A. A comparison of what the annual unemployment rate would have been in 1992 if the multiplicative adjustment factor for the redesign had been applied directly as opposed to adjusting the subgroups first is also provided in Appendix A. It should be noted that the estimates are only different by .03 percentage point.

## Conclusion

The purpose of this paper was to provide adjustment factors in order that individuals could continue to use CPS data historically after the redesign.<sup>9</sup> In addition, the adjustment factors were examined to provide insight into how the unrevised CPS might have been providing a distorted picture of the American economy. Overall, the adjustment factors suggest that the unrevised CPS was not mismeasuring individuals who were working full time in steady jobs or the vast majority of individuals looking for work, those in the center of the lens so to speak. Rather, the adjustment factors indicate that the unrevised CPS was less in focus for those on the periphery of the labor market -- those involved in more casual, intermittent or marginal work activities, individuals who might have tentatively tested the labor market, and older workers. The adjustment factors also imply that the unrevised CPS was not measuring as accurately as possible some of the characteristics of the employed and the unemployed. Specifically, the adjustment factors suggest that the unrevised CPS underestimated the proportion of employed who were part-time workers, overestimated the proportion of employed who were part-time for economic reasons, and mismeasured the individuals' reasons for being unemployed. By providing adjustment factors, it is hoped that a clearer picture of the economy through a redesigned CPS can be obtained without precluding the comparisons of CPS estimates over time.

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### <sup>9</sup> Note on Micro data Weighting

Our primary concern has been to develop adjustment factors, both additive and multiplicative, for aggregate series. Undoubtedly, some researchers will want “adjusted micro data weights” so that they can do analyses which are comparable before and after the redesign. A tempting way to do this is next described by example. First partition the population into Men aged 16-19, Men aged 20+, Women aged 16-19, Women aged 20+, and cross these classifications with the labor force categories Unemployed, Employed in Agriculture, Employed in Nonagricultural Industries, and Not in Labor Force. Multiplicative adjustment factors for twelve of these are given in Appendix A. Implied adjustment factors for the remaining four Not-in-Labor Force categories could be obtained by taking the adjusted Not in Labor Force total (obtained by subtracting the adjusted labor force total from the unadjusted population count for each group) and dividing that by the unadjusted Not in Labor Force total. This ratio would be different for any given month (unlike the direct adjustment factors for unemployment and employment) because Not in labor force is obtained indirectly by subtraction from the population total which is assumed fixed and not subject to adjustment. Once the sixteen multiplicative adjustment factors are obtained, they could be applied to the sampling weights for each of the respondents within each of the sixteen groups, producing “adjusted micro data weights.” Then, the sum of all of the respondents within each of the sixteen groups, using the “adjusted micro data weights,” would equal the multiplicatively adjusted aggregate total by the distributive law. While this may be tempting, we do not recommend using these “micro data weights” for any analyses other than constructing totals for each of those sixteen groups, since there is no guarantee that these weights would have any meaning if used in more complicated analyses.

## APPENDIX A

The table below contains adjustment factors for the 12 series that are seasonally adjusted and then aggregated together to obtain a seasonally adjusted total national unemployment rate. Adjusted levels of those not in the labor force could be obtained by subtraction from the population estimates for the given characteristic.

### UNEMPLOYMENT AND EMPLOYMENT LEVELS ADJUSTMENT FACTORS FOR '94 METHODOLOGY

Characteristic	Multiplicative Factor	Additive Factor
Unemployed Teenage Men	1.030 (0.036)	20963 (26192)
Unemployed Teenage Women	1.063 (0.044)	44656 (25338)
Unemployed Adult Men	1.0024 (0.016)	12765 (70595)
Unemployed Adult Women	1.018 (0.017)	62617 (58405)
Teenage Men Employed in Agriculture	1.076 (0.094)	10340 (13515)
Teenage Women Employed in Agriculture	1.034 (0.18)	-1799 (6861)
Adult Men Employed in Agriculture	1.042 (0.024)	80156 (47058)
Adult Women Employed in Agriculture	1.326* (0.057)	175713* (24904)
Teenage Men Employed in Nonagriculture	0.986 (0.017)	-32305 (48911)
Teenage Women Employed in Nonagriculture	1.022 (0.020)	56280 (53558)
Adult Men Employed in Nonagriculture	0.9956* (0.0023)	-263973* (138281)
Adult Women Employed in Nonagriculture	1.012* (0.0026)	627993* (135314)

The 1992 annual average unemployment rate obtained when the levels for the subgroups were adjusted and the unemployment rate was then calculated was 7.45 percent. The 1992 annual average unemployment rate when the multiplicative adjustment factors in Table 1 were applied directly was 7.47 percent.

## APPENDIX B

The table below contains differences in 1993 annual average CPS labor force estimates when 1990 versus 1980 census-based population controls were used. The differences are defined as the 1990 estimates minus the 1980 estimates.<sup>10</sup>

### DIFFERENCE IN 1993 ANNUAL AVERAGE LABOR FORCE ESTIMATES USING 1990 VS 1980 POPULATION WEIGHTS (Difference =1990-1980)

	Unemployment Rate	Employment-to- Population Ratio	Labor Force Participation Rate
Total 16+	0.10	0.08	0.16
Men 16+	0.10	0.17	0.26
Women 16+	0.10	-0.02	0.04
White Men 16+	0.09	0.07	0.15
White Women 16+	0.06	-0.09	-0.06
Black Men 16+	0.03	0.85	1.01
Black Women 16+	0.13	0.38	0.52
Teenagers (16-19)	0.03	-0.04	-0.03
20-24 Year Olds	0.06	-0.13	-0.09
25-54 Year Olds	0.04	-0.10	-0.07
55-64 Year Olds	-0.02	-0.02	-0.03
65 Years and Older	-0.01	-0.07	-0.08
Men 16 -19 Years Old	-0.04	0.08	0.08
Men 20-24 Years Old	0.00	0.07	0.08
Men 25-54 Years Old	0.04	-0.08	-0.05
Men 55-64 Years Old	-0.03	0.04	0.02
Men 65 Years and Older	0.00	-0.05	-0.05
Women 16-19 Years Old	0.09	-0.16	-0.14
Women 20-24 Years Old	0.11	-0.42	-0.38
Women 25-54 Years Old	0.05	-0.14	-0.12
Women 55-64 Years Old	0.00	-0.09	-0.09
Women 65 Years and Older	-0.02	-0.03	-0.04
Adult Men (20+)	0.07	0.28	0.36
Adult Women (20+)	0.07	0.03	0.08

<sup>10</sup> The proportion of the population within any subgroup may not remain constant when 1980 versus 1990 population weights are used. For example, the percentage of women age 25 to 54 when 1980 population weights were used was 55.8 percent. When 1990 population weights were used the percentage was 71.7 percent. Since the proportion of the population within subgroups may not remain constant when different weights are used, the difference between estimates for an aggregate group (e.g., the labor force participation rate for all women) does not have to be bound by the differences for various subgroups (e.g., the labor force participation rates for women age 16-19, 20-24, 25,-54 55-64 and 65 years and older).

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## **The CPS After the Redesign: Refocusing the Economic Lens**

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December, 1994

Revised March, 1995

The views in this paper are those of the authors,  
and do not represent official BLS policy

This paper was prepared for the CRIW Labor Statistics Measurement Issues Conference held December 15-16, 1994 in Washington, DC.