Using gross flows to explore movements in the labor force

Despite limitations, gross flows statistics contain a considerable amount of information that is useful for analyzing short-term labor force developments

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During the 1990–92 period, the unemployment rate rose sharply, growth in employment came to a standstill, and the labor force participation rate stopped its long-term upward trend and began to fluctuate widely. On occasions when both labor force participation and unemployment rise, are these events attributable to a greater influx of jobseekers from outside the labor force, or reduced exits from the labor force?

To answer this question, the gross flows statistical series provides a way to examine, for example, how many workers enter or leave the labor force or move from employment to unemployment. Gross flows statistics stem from the limited longitudinal character of the Current Population Survey (CPS) in that they are generated from successive reports of labor force status from the same respondents. (See box.)

However, some factors can create bias in gross flows statistics, preventing direct reconciliation with the official CPS labor force statistics. No one technique has been proposed to simultaneously account for all major sources of potential errors in the gross flows data.[1] To help analyze labor force developments that emphasize market flows,[2] many labor force experts and official review official commissions have called for the Bureau of the Census and the Bureau of Labor Statistics to improve and publish the gross flows statistics.

If the gross flows data cannot be directly reconciled to CPS statistics and may be subject to various errors, how can they provide useful information for analysis of the current employment situation? To assess changes over time, rather than estimate levels, the gross flows data still provide usable information if the errors in the data are stable over time; under these conditions, fluctuations in the flows would not be dominated by fluctuations in the error component. Although this article does not provide direct evidence on how stable these errors in the gross flows actually are, it does show the very high correlation between net changes in the published CPS labor force statistics and net changes in labor force stocks implied by gross flows statistics. We take this finding as strong evidence for the unobserved errors in the data to be relatively small. Thus, this article uses seasonally adjusted gross flows data to analyze the connections between recent movements in labor force growth and unemployment, especially for comparing gross flows during the 1990–91 recession with labor market developments in 1992.

Measurement concepts and limitations

To use gross flows as a source of information for decomposing changes in aggregate employ-

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ment and unemployment (and in related statistics such as the labor force participation rate and the unemployment rate), we focus on the six flows that indicate changes or transitions in labor force status. (See box.) The following list describes each of these flows:

- *Labor force entries to employment* (NE flows): Total transitions from not in the labor force last month to employment this month. The magnitude of these flows depends on both labor force participation decisions and the demand for labor (that is, the number of job prospects).
- *Labor force entries to unemployment* (NU flows): Total transitions from not in the labor force last month to unemployment this month. As with the flows from labor force entries to employment, the movement from not in the labor force to unemployment depends on both labor force participation decisions and the demand for labor.
- *Employment separations to unemployment* (EU flows): Total transitions from employment last month to unemployment this month includes quits, terminations, and layoffs. These movements tend to increase during recessions.
- *Employment accessions from unemployment* (UE flows): Total transitions from unemployment last month to employment this month reflects the number of unemployed persons who find jobs.
- *Labor force exits from employment* (EN flows): Total transitions from employment last month to not in the labor force this month include retirements and some layoffs, but the seasonal variation in these flows suggests that seasonal quits (for example, students who quit their jobs at the end of each summer) are a dominant component.
- *Labor force exits from unemployment* (UN flows): Total transitions from unemployment last month to not in the labor force this month. An early study used variations in these flows as a measure of discouraged worker effects in business downturns.[3]

Each flow can be tabulated by worker characteristics, such as sex or age, but nonetheless each represents a high degree of aggregation of the matched CPS responses that are difficult to relate to constraints or opportunities for individual workers.[4] For example, Olivier Blanchard and Peter Diamond found that the number of employment accessions from unemployment increased during recessions, even though there was a *lower* probability of individuals making the transition from unemployment to employment.[5] This inconsistency can be partially reconciled by realizing that the pool of workers in unemployment status is larger during recessions.

Because the gross flows statistics have a high degree of aggregation, it has been argued that improvement of CPS data files should focus on developing better micro files of matched responses to allow more sophisticated multivari-

Gross flows statistics

Each month, the Current Population Survey is administered to many of the same households and individuals who were questioned in the survey in the previous month. By design, about three-fourths of the sample is common to successive months of the survey. This month-to-month overlap allows the tabulation of "flows" or "changes" in labor force status from month to month. These data have not been published on a regular basis, but are available from the Bureau of Labor Statistics by request.

The type of tabulation possible is illustrated by the 3 by 3 table below showing labor force status of individuals (in thousands) for the months of November and December 1993. If an individual remained in the same status from November to December, he or she would be included along the diagonal of the matrix (in bold). If an individual were employed in November, but became unemployed in December, he or she would be included among the 1.7 million individuals identified in row 1, column 2. The table highlights the churning in the labor force, and illustrates such facts as the number of the unemployed (4.17 million of the total 7.33 million) who are unemployed in two consecutive months. Many people expect that most of the unemployed in one month remain unemployed the next month. (For a complete discussion of the gross flows data, see Paul O. Flaim and Carma R. Hogue, "Measuring labor force flows: a special conference examines the problems," *Monthly Labor Review*, July 1985, pp. 7–17.)

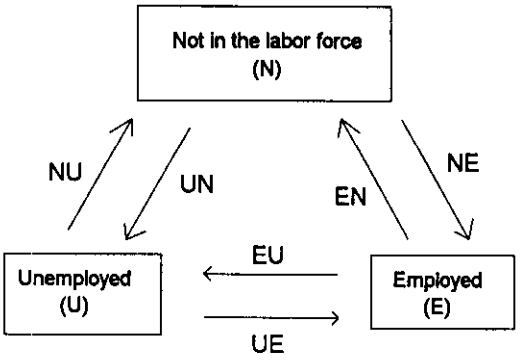
	Status in December		
Status in November	*Employed*	*Unemployed*	*Not in the labor force*
Employed	**116,950**	1,517	2,672
Unemployed	1,631	**4,173**	1,532
Not in the labor force	2,403	1,403	**61,993**

ate analyses of these data.[6] While we acknowledge the analytical value of developing better matched micro data files, we also follow the view of Janice Shack-Marquez that matched micro data files and the gross flows tabulations are complementary data sources.[7] Shack-Marquez stressed the importance of the gross flows tabulations in conducting the *current* analysis of the labor force situation:

> The gross flows can help in the interpretation of month-to-month and year-to-year changes in employment, unemployment, and labor force participation and can supplement the snapshot view of the economy that is provided every month in the BLS report on the employment situation. Most importantly, gross flows data can be made available in a very timely manner, as they are generated in the production process along with other aggregate statistics from the CPS.

Exhibit 1 shows how the six gross flows statistics are related to the observed changes in the size of the labor force and the level of unemployment if there was no population growth over time. In this case, the inflows to unemployment would be the sum of the NU and EU flows and the outflows from unemployment would be the sum of the UN and UE flows; the inflows to the labor force would be the sum of the NU and NE flows and the outflows from the labor force would be the sum of the UN and EN flows.

Exhibit 1. Relationships between gross labor force flows and net labor force changes



NOTE: Month-to-month change in the size of the labor force equals:
(NU-UN) + (NE-EN)

Month-to-month change in the level of unemployed equals:
(NU-UN) + (EU-UE)

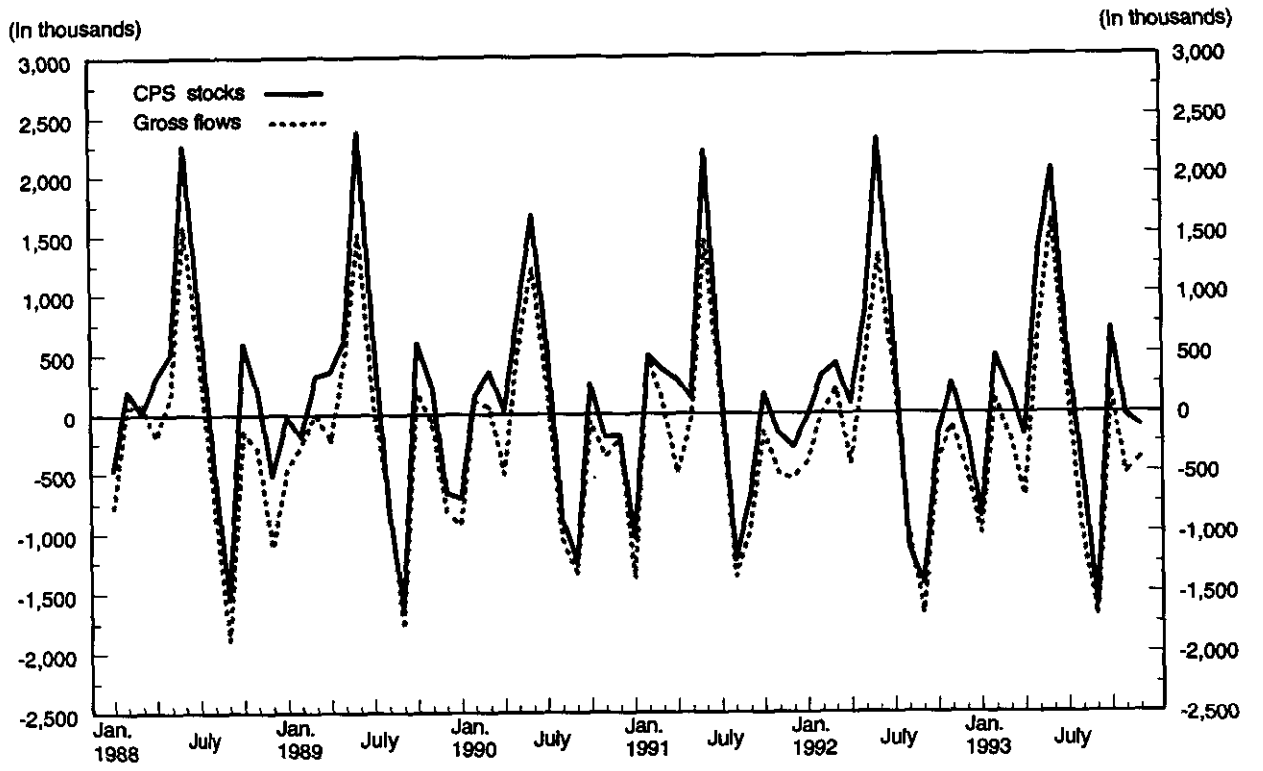
However, the presence of population growth and a number of aspects of the CPS survey design preclude a direct reconciliation of the changes in labor force and unemployment derived from the gross flows statistics with the official labor force statistics.[8]

One source of error in the gross flows statistics can arise because not all survey responses in successive months can be matched. Even among the three-quarters of the CPS sample for whom there are potential month-to-month matches, many individuals cannot be matched because of sample attrition. Carma R. Hogue emphasized that sample attrition through change in residence can frequently also entail change in labor force status (for example, the unemployed or the labor force entrant moving to obtain a job in another area). Hogue presents evidence that people for whom matched responses could not be made tended to have higher unemployment rates and lower labor force participation rates.

For CPS responses that can be matched, responses can vary over time even though the underlying labor force status is unchanged when there is interviewer error or a change in the interpretation of the labor force status questions by the respondent. In these cases, the gross flows statistics will overstate the true magnitude of labor force transitions, because some transitions would be spurious. For example, Paul O. Flaim and Carma R. Hogue emphasized that the tendency for CPS respondents to report (presumably mistakenly) higher rates of unemployment in the first and fifth months in the sample ("rotation group bias") could cause the true flows out of unemployment to be exaggerated.[9] Because one-third of the gross flows sample—compared with one-fourth in the CPS—is made up of persons in the first and fifth rotation groups, it follows that the flow from unemployment to out of the labor force could be overstated.

Even if response errors and sample attrition could be eliminated in the CPS, a growing population causes difficulty in relating the gross flows statistics to changes in the official labor force statistics. Part of the month-to-month changes in employment and unemployment result from flows into and out of the civilian noninstitutional population (such as young persons who turn age 16 and take a job and persons who migrate, die, or become institutionalized). While the net population growth is reflected in the estimators for the official labor force statistics, there are no corresponding official estimates for the gross flows from month to month between a labor force status within the scope of the survey and out of the survey scope.[10] Because only the labor market transitions between those who are within the scope of the survey in successive months are es-

Chart 1. **Monthly changes in the civilian labor force, using CPS and gross flows estimates, 1988–93**



timated, the gross flows tables impute a population weight for the *current* month to the *previous* month's labor force levels.[11] Any month-to-month change in population size is assumed away implicitly by matching the current month to the previous month's totals. In recent years, net population growth alone may have generated labor force growth of more than a million a year;[12] thus, the gross flows statistics will substantially underestimate labor force growth, and this bias will increase with the length of the period studied.

This particular limitation of the gross flows estimates implies that the use of cumulated month-to-month flows will underestimate longer term changes in labor force and employment.[13] While the population and, correspondingly, the labor force usually grow from month-to-month in the stock figures, the gross flows are defined over a fixed-size—*zero* growth population.

Some limitations of gross flows statistics—particularly, errors generated by response inconsistency—are expected to be reduced as a result of the new questionnaire used in the redesigned CPS. Some of the questions are more sharply defined, which would yield more consistent responses. A critical data series to watch will be the new patterns of rotation group bias observed using the new survey. However, the problems associated with sample attrition and population growth will preclude complete consistency between the published labor force estimates and those derived from the gross flows statistics. Despite these remaining problems, we believe that the gross flows contain a considerable amount of information that is useful for analyzing short-term labor force developments—particularly in discussions of unobserved labor market flows that underlie the observed changes in labor force activity.

Chart 1 provides some indirect evidence for this position. It plots month-to-month changes for the period January 1988 to December 1993 for two time series: the actual (not seasonally adjusted) CPS labor force series, and a series derived from the gross flows statistics, using the relationships shown in exhibit 1. As noted earlier, the changes in the labor force series derived from the gross flows statistics cannot incorporate the impact of the net growth in the civilian noninstitutional population and are, therefore, smaller than the CPS changes. This gap between the two series is especially prominent in the month of June, the usual period when youth enter the labor force for summer jobs.

Despite this difference in the magnitude of change in the two series, labor force changes derived from the gross flows series track the CPS

change series very well, during the 1988 and 1989 employment expansions, as well as through the employment contraction and subsequent stagnation during the 1990–92 period. In particular, the series derived from the gross flows tracks the much smaller seasonal downturns in the labor force which occurred in the CPS series in September 1990 and 1991; the gross flows also echoed the absence of the usual seasonal downturns in the CPS labor force series during January and February 1992.

Another important problem with using gross flows statistics is the high degree of seasonality in the flows. Table 1 shows the degree of seasonality, and the relative magnitudes for the six gross flows statistics using 5-year averages for each month between 1985 and 1989—a period that had no distinctive cyclical episodes. (All data are expressed as a percent of the previous month's labor force.) As presented, these data do not provide an explanation of these seasonal differences,[14] but do indicate the average magnitude of the different flows and their usual range of variation within the year. Flows between "not in the labor force" and "employment" have been especially large and have varied by more than 1 percent of the labor force within the year for the 1985–89 period.

Any time series analysis of the gross flows must account for seasonal variation as indicated in table 1. The usual approach to this problem is to construct a seasonally adjusted series. We follow this practice by developing seasonally adjusted series for January 1982 through December 1993, using the standard BLS seasonal adjustment procedures.

It should be noted that there is a significant limitation in using seasonally adjusted gross flows data for analysis of the published labor force data along the lines we have suggested. We have argued in favor of viewing the gross flows as the "components" of the changes in the official statistics in labor force and unemployment, using the relationships between the flows and changes in the stocks identified in exhibit 1. Even though the gross flows statistics cannot be directly reconciled with the official CPS statistics, they can be used to generate a predicted value for monthly changes in employment and unemployment. If the correlation between changes in the official labor force statistics and the changes predicted by the gross flows is high (as is indicated by the data in chart 1), then examination of the behavior of the gross flows underlying these predictions provides some information for the labor force analyst. However, if each gross flow is independently seasonally adjusted, it is not clear whether aggregation of these seasonally adjusted components would provide valid predictions of changes in the *seasonally adjusted* published CPS labor force series.[15]

Although aspects of gross flows data limit their usefulness in the analysis of the current employment situation, seasonally adjusted estimates of the gross flows should make them easier to use in conjunction with the published labor force statistics.

The labor force pressure hypothesis

This section demonstrates the value of the gross flows in providing more information about recent labor force developments than can be obtained from the published CPS data alone.

The pronounced rise in the unemployment rate beginning in mid-1990 and continuing upward until mid-1992 coincided with a halt in the long-

Table 1. **Usual seasonal fluctuation in gross flows statistics, 1985–89**

[In percent of labor force]

Month	Not in labor force to employed	Employed to not in labor force	Not in labor force to unemployed	Unemployed to not in labor force	Unemployed to employed	Employed to unemployed
January	2.232	3.017	1.373	1.303	1.244	1.936
February	2.290	2.402	1.397	1.322	1.705	1.501
March	2.308	2.178	1.319	1.334	1.689	1.330
April	2.322	2.585	1.305	1.368	1.819	1.298
May	2.642	2.639	1.454	1.213	1.673	1.360
June	3.448	2.911	1.704	1.115	1.735	1.459
July	2.834	2.737	1.405	1.244	1.766	1.489
August	2.357	3.100	1.207	1.309	1.686	1.404
September	2.798	4.331	1.312	1.244	1.793	1.483
October	2.598	2.579	1.254	1.204	1.601	1.410
November	2.228	2.549	1.115	1.213	1.431	1.449
December	1.930	2.229	0.976	1.215	1.290	1.310
Range[1]	1.518	2.153	0.728	0.253	0.575	0.638

[1] Difference in percent of the labor force between high and low month for each series.

NOTE: Figures represent mean values for the indicated month, 1985 through 1989.

Chart 2. **Civilian labor force unemployment rate, 1988–93**

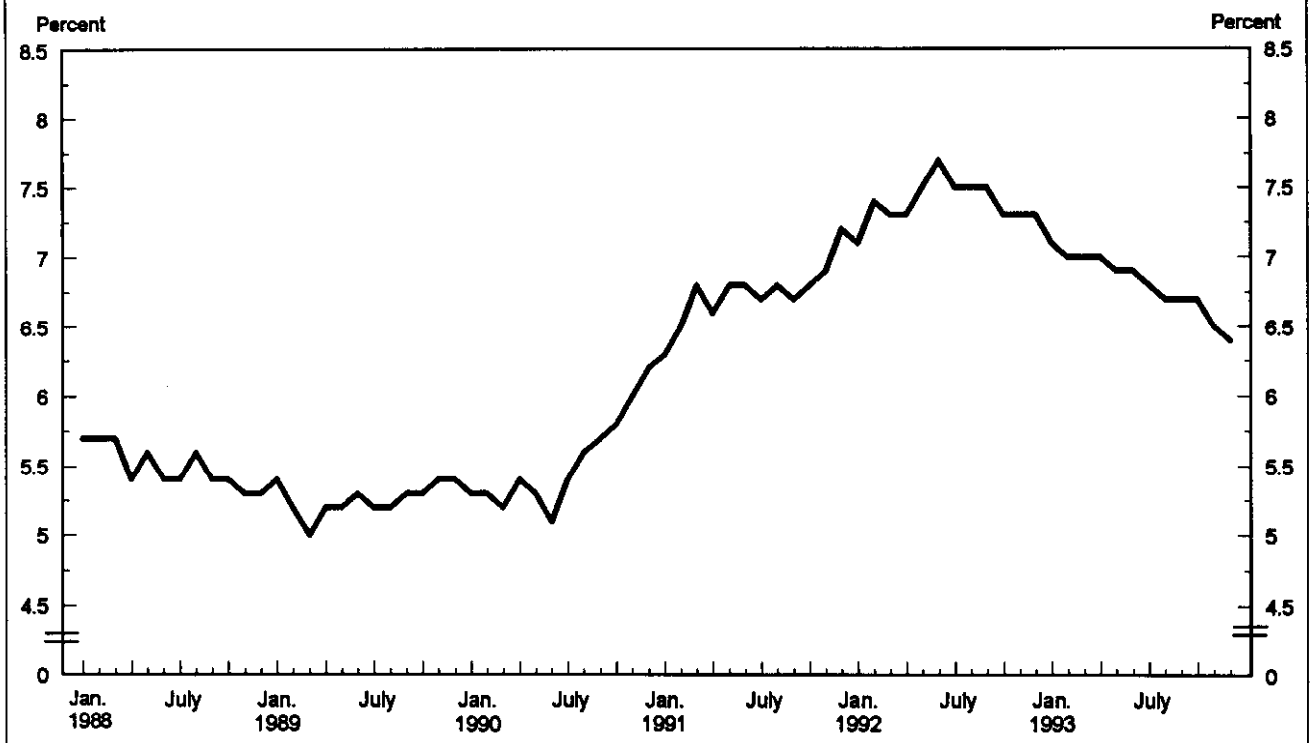


Chart 3. **Civilian labor force participation rate, 1988–93**

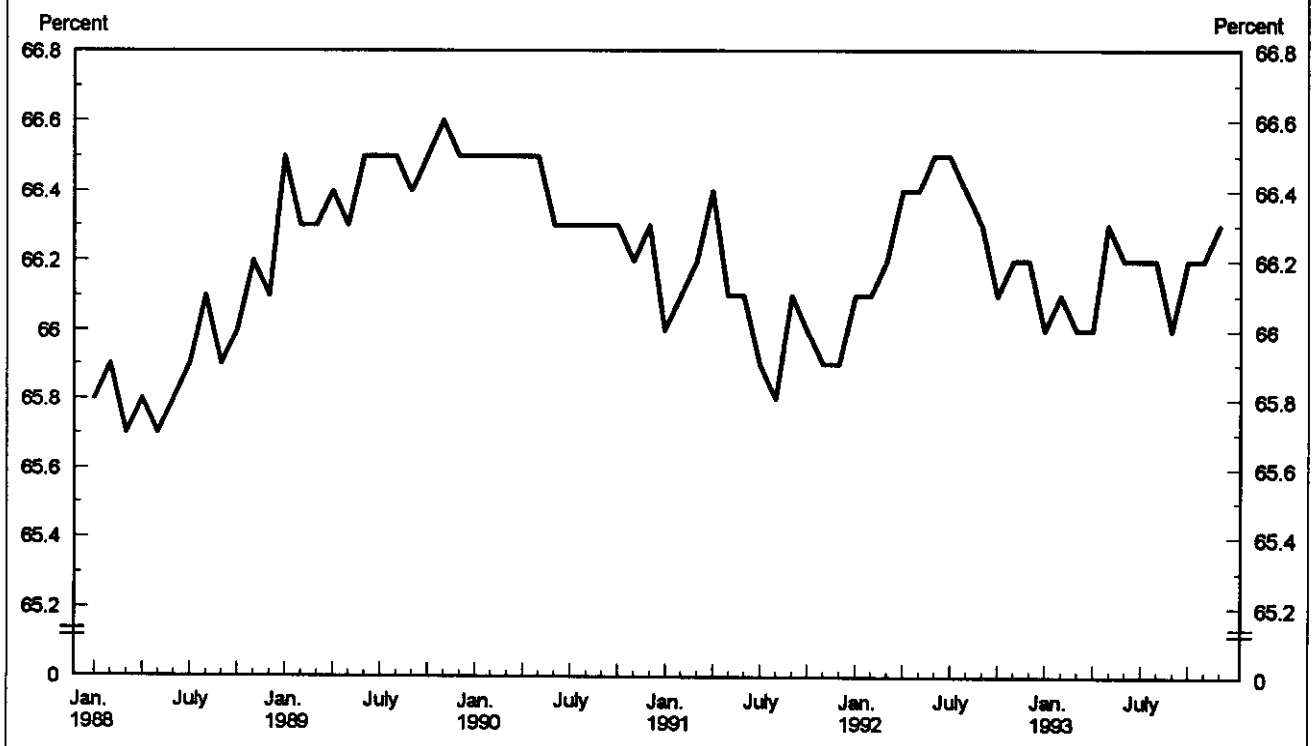


Table 2. **Average gross flows per month in selected periods, seasonally adjusted, 1988–93**

[In percent of labor force]

Type of flow	Jan. 1988–Dec. 1989	July 1990–June 1991	July 1991–June 1992	July 1992–Dec. 1993
Unemployment inflows—	2.450	2.748	2.852	2.793
From out of the labor force	1.116	1.249	1.372	1.368
From employment	1.334	1.499	1.480	1.425
Unemployment outflows—	2.595	2.719	2.907	2.895
To out of the labor force	1.096	1.166	1.275	1.290
To employment	1.499	1.553	1.632	1.605
Labor force entries—	3.621	3.560	3.547	3.590
To unemployment	1.116	1.249	1.372	1.368
To employment	2.505	2.311	2.175	2.222
Labor force exits—	3.855	3.742	3.698	3.769
From unemployment	1.096	1.166	1.275	1.290
From employment	2.759	2.576	2.423	2.479

term upward trend in the labor force participation rate, with the labor force participation rate then experiencing large fluctuations from 1990 to 1993. (See charts 2 and 3.) From July 1990 to June 1991, the unemployment rate rose by 1.4 percentage points while the labor force participation rate declined by 0.2 percentage points. In contrast, the labor force participation rate rebounded by 0.7 percentage points from July 1991 to June 1992, while the unemployment rate continued to increase by another 1.0 percentage point.

There was much speculation in the press about how the labor force and unemployment developments were related. Commentary on the current employment situation at that time emphasized that the changing rate of labor force growth could have affected the unemployment rate.[16]

How could labor force growth have influenced the level of unemployment? Setting aside issues of causality which underlie the "discouraged worker" and "additional worker" hypotheses, one direct definitional relationship between changes in the labor force and changes in unemployment can be easily understood in terms of gross flows by referring back to exhibit 1. If labor force entries to unemployment increase relative to labor force exits from unemployment and all other gross flows remain constant, then both unemployment and the labor force will increase by the same amount. In this case, the observed net increase in the labor force indicates the increase in the net flow from out of the labor force to unemployment.

However, without examining the gross flows data, it is also possible that a coincident rise in labor force and unemployment might have been a result of changes in other gross flows components, with no direct labor force "pressure" on unemployment levels. For example, the labor force and unemployment could increase by the same amount—with no change in flows from "not in the labor force to unemployed" or "unemployed to not in the labor force"—as a result of simultaneous equal increases in labor force entries to employment and employment separations to unemployment; this could occur with simultaneous layoffs in some parts of the economy, but elsewhere, strong job growth inducing higher labor force entries.[17]

To help assess these issues, table 2 provides some direct evidence on changes in the average magnitudes of gross flows (expressed as a percent of the labor force) for selected periods from the beginning of 1988 to the end of 1993. January 1988 to December 1989 was a period of strong labor force growth and a slowly declining unemployment rate. July 1990 marked the start of the official recession, and, about then, the labor force participation rate also started to decline. Unemployment continued to rise through mid-1992, well after the "official" end of the recession, but the labor force participation rate started to rebound in mid–1991.[18]

The limitations of the gross flows statistics should be kept in mind when examining the statistics in table 2. Most importantly, gross flows statistics do not account for population growth. Thus, the difference between labor force entries and labor force exits in table 2 will understate the net growth in the labor force and can not be reconciled with the official labor force statistics. However, as chart 1 shows, the predicted changes in the labor force from the gross flows track the actual month-to-month changes in the published CPS labor force statistics (not seasonally adjusted) fairly well, except for a population scale effect. Comparing the magnitudes of the flows across the different periods therefore provides useful insights into the components of published changes of labor force and unemployment, even if a complete reconciliation is not possible.

With these limitations in mind, it is useful to note a few patterns in the data in table 2 that are relevant to the labor force "pressure" thesis which was relied upon to interpret movements in the unemployment rate during 1991 and 1992. Both NU flows and the net difference (NU–UN) between the two increased substantially from the July 1990–June 1991 period to the July 1991–June 1992 period. This is consistent with CPS data showing that entrants and reentrants among the unemployed (as a percentage of the labor force) increased between these two periods.[19] However, the gross flows data also show that these particular flows did not account for the acceleration in labor force growth that occurred between the 1990–91 and 1991–92 periods. It is true that labor force entries to unemployment rose substantially between 1990–1991 and 1991–92 from

1.249 to 1.372 percent, but this was offset by a greater decline in labor force entries to employment so that total labor force entries actually fell between the 1990–91 and 1991–92 periods; poor labor market prospects with the higher unemployment rate in the latter period simply increased the risk of being unemployed when entering the labor force.

The gross flows data in table 2 do indicate that the source of acceleration in labor force growth between the 1990–91 and 1991–92 periods was a large *reduction* in labor force *exits* from employment; perhaps because of the poor labor market conditions at the time, people were not leaving jobs at the usual rate. Even though total labor force entries declined, the reduction in the rate of exits between these two periods acted to swell labor force growth. Without examining this information on the composition of labor force flows, it is easy to see how analysts who study the current employment situation would mistakenly attribute the growth in *both* the labor force and unemployment to more entrants and reentrants, when in fact, labor force entries declined. The value of having the gross flows for analysis of this case is that the movements into and out of the labor force that are not picked up in the unemployment stocks (that is the flows from not in the labor force to employment and from employment to not in the labor force) can be followed, and it is important to do so because of the large magnitudes of these flows. □

Footnotes

[1] Many problems have been reduced with the implementation of the new data collection system of the CPS design.

[2] For a recent statement for the logic of this point of view, see Olivier J. Blanchard and Peter Diamond, "The Flow Approach to Labor Markets," *American Economic Review*, May 1992, pp. 354–59.

[3] W.L. Hansen, "The Cyclical Sensitivity of the Labor Supply," *American Economic Review*, June 1961, pp. 299–309.

[4] See R.E. Smith and J.E. Vanski, "Gross Change Data: The Neglected Data Base," *Data Collection, Processing and Presentation, National and Local*, Volume II of the Appendix to *Counting the Labor Force*, the report of the 1978 National Commission on Employment and Unemployment Statistics, pp. 132–150. Smith and Vanski suggested that the production gross flows tabulations represent less than 1 percent of all the potential information on labor force transitions contained in the matched responses.

[5] Olivier J. Blanchard and Peter Diamond, "The Cyclical Behavior of the Gross Flows of U.S. Workers," *Brookings Papers on Economic Activity*, No. 2, 1990, pp. 85–156.

[6] J. Antos, "Discussion" [on "Uses of Gross Changes Data in Assessing Demographic Labor Market Dynamics"] in U.S. Department of Labor and Department of Commerce, Proceedings of the Conference on Gross Flows in Labor Force Statistics, June 1985.

[7] Janice Shack-Marquez, "Discussion" [on "Uses of Gross Change Data"], in the U.S. Department of Labor and Department of Commerce, 1985, pp. 13–14.

[8] For a discussion on the nature of these problems with the gross flows statistics, see Smith and Vanski, "Gross Change Data," pp. 139–142; Carma R. Hogue, "History of Problems Encountered in Estimating Gross Flows," (U.S. Department of Commerce and Department of Labor, 1985, pp. 1–8); and Paul O. Flaim and Carma R. Hogue "Measuring labor force flows: a special conference examines the problems," *Monthly Labor Review*, July 1985, pp. 7–17.

[9] Flaim and Hogue, "Measuring labor force flows," *Monthly Labor Review* pp. 7–17.

[10] W. A. Fuller and T.C. Chua. "Gross Change Estimation in the Presence of Response Error," U.S. Department of Commerce and Department of Labor,1985, pp. 65–77. Fuller and Chua do develop their own estimates of these flows for their proposed approach to reduce errors in the gross flows tables.

[11] See Hogue, "History of Problems Encountered," 1984, p.4.

[12] For example, the over-the-year increase in the civilian noninstitutional population from August 1992 to August 1993 was 2,003,000. Because the labor force participation rate was on the decline over this period (from 66.4 percent in August 1992 to 66.2 percent in August 1993) the 1 million increase observed in the labor force over this period could be attributable largely to the net population growth.

[13] See, for example, Flaim and Hogue, "Measuring Labor Force Flows:" "In fact, had the gross flows data been used to compute the cumulative change in the labor force over the December 1983–December 1984 period, they would yield a *decline* of 3.7 million— this, over a period when the labor force had posted an *increase* of 2.2 million," p. 9.

[14] Further examination of the matched CPS records could perhaps indicate the degree to which these movements are attributable to labor force entry and exits by the same people within the year.

[15] This problem of independent seasonal adjustment was found to be a significant source of difficulty in reconciling the BLS estimates of employment from the 790 and CPS surveys of employment; see J. Antos, A. J. Barkume, J.W Mixon, and J.E. Triplett, "Why Employment Estimates Differ: A Study of Discrepancies Between the BLS Household and Payroll Estimates," *BLS Working Paper No. 65*, July 1976.

[16] See, for example, Christopher Farrell, "Numbers do lie. Just look at unemployment," *Business Week*, Dec. 23, 1991, p.26.

[17] It should be recognized that labor force analysts have other data to help establish which explanation is more plausible. For example, the classification of the stock of unemployed by previous status (job losers, job leavers, entrants and reentrants) provides useful information on the underlying labor market transitions. Unemployed entrants and reentrants as a percent of the labor force did increase between 1990 and 1992, but also remained at high levels in 1993, despite a lower overall labor force participation rate than that in 1992.

[18] Even though these periods have different calendar reference periods, the statistics are comparable because they are averages of seasonally adjusted data.

[19] Using seasonally adjusted data, new entrants and reentrants constituted 2.142 percent of the labor force on average during the period July 1990–June 1991, and 2.375 percent of the labor force during the July 1991–June 1992 period.