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Reassessing Cyclical Changes in Workers' Labor Market Status: Gross Flows and the Types of Workers Who Determine Them

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Abstract

This analysis, using Current Population Survey data, yields statistically compelling evidence that cyclical variations in gross flows of U.S. workers-that is, variations by business cycle phase in the number of workers transitioning from one labor market state to another each month-were substantially smaller in 1986-2005 than in 1968-86. The authors identify six types of workers who would be expected to contribute to cyclical variations in these flows. Counter-intuitively, one such group consists of individuals whose decisions to enter or exit the labor force are independent of labor market conditions. Estimates suggest that these "noncyclical movers" are an empirically important component of gross flows into the labor force. The authors contend that the presence of noncyclical movers precludes accurate measurement of the contributions of workers whose entry and exit decisions are consciously influenced by labor market conditions.

KEYWORDS: cyclical changes in labor market status, gross flows

REASSESSING CYCLICAL CHANGES IN WORKERS' LABOR MARKET STATUS: GROSS FLOWS AND THE TYPES OF WORKERS WHO DETERMINE THEM

T. ALDRICH FINEGAN, ROBERTO V. PEÑALOZA, and MOTOTSUGU SHINTANI*

This analysis, using Current Population Survey data, yields statistically compelling evidence that cyclical variations in gross flows of U.S. workers—that is, variations by business cycle phase in the number of workers transitioning from one labor market state to another each month—were substantially smaller in 1986–2005 than in 1968–86. The authors identify six types of workers who would be expected to contribute to cyclical variations in these flows. Counter-intuitively, one such group consists of individuals whose decisions to enter or exit the labor force are independent of labor market conditions. Estimates suggest that these "noncyclical movers" are an empirically important component of gross flows into the labor force. The authors contend that the presence of noncyclical movers precludes accurate measurement of the contributions of workers whose entry and exit decisions are consciously influenced by labor market conditions.

The U.S. economy achieved much steadier economic growth in 1986–2005 than in the two preceding decades. This paper compares the cyclical behavior of gross worker flows (the monthly tally of workers transitioning between labor market states, such as between employment and unemployment) during these two periods, both before and after adjustments for classification errors and missing observations and for time-aggregation bias. Given the well-documented differences between the two periods in patterns of economic growth, do they also differ with respect to the magnitudes of the six flows? For example, were cyclical swings in the gross flows either smaller or larger in recent years than in the earlier period? We seek to answer that question. Our analysis also helps identify the different kinds of workers who contribute to cyclical swings. Surprisingly, we find that the members of one group, whom we designate "noncyclical movers," enter and leave the work force for reasons that are *independent* of labor market conditions.

We begin by offering a brief overview of U.S. data on gross flows and the estimation problems they raise. Next, we introduce the model actors who cause these flows to rise or

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The authors will send their data sets for 1986–2005 to others on request. Contact the first author at American Economic Association, 2014 Broadway, Suite 305, Nashville, TN 37203–2418.

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fall over the cycle and predict the directional influence of each actor on each flow. The heart of the study is an empirical investigation of how a negative shock to aggregate economic activity influenced gross flows during 1968–86 and 1986–2005. We apply a structural vector autoregression (VAR) designed by Blanchard and Diamond (1990) to monthly time series data with and without adjustments for classification errors, missing observations, and time-aggregation bias. Then we assess the empirical importance of noncyclical movers in explaining gross inflows and, in the final section, point out how the presence of this group results in biased estimates of the contributions of others.

An Overview of the Data and Estimation Problems

Between any two adjacent months, a surprisingly large number of people move into or out of the labor force or between employment and unemployment. For over 50 years, the Bureau of Labor Statistics has estimated the size of these movements from data gathered by the Current Population Survey (CPS) in its monthly survey of households. In essence, unpublished estimates of these flows are generated by matching the records on the labor force status of the same individuals surveyed in two consecutive months.[1] Because the measurement of cyclical swings in gross flows raises serious estimation issues, we begin with a brief discussion of those issues.

First, the matching process itself is beset by multiple problems, including missing observations, errors in responses and in the coding of responses, rotation group bias, and the different seasonality of each flow.[2] Several studies have devised adjustments for these problems, notably Abowd and Zellner (1985), Fuller and Chua (1985), and Poterba and Summers (1986). Unfortunately, these adjustments produce corrected flows of different size (Flaim and Hogue 1985; Ritter 1993). Abowd-Zellner (A-Z) adjustments have proved most popular.

Abowd and Zellner showed that the ratio of adjusted to unadjusted values of each flow varies over time. Blanchard and Diamond, on whose findings we draw, used unpublished data to incorporate this time-varying component into the A-Z corrections in their paper.[3] Most studies, however, have used scalar A-Z adjustments based on average values of adjusted to unadjusted data for each flow. As we show later, these two kinds of A-Z adjustments, which we label "full" and "proportionate," may produce quite different impulse responses (paths of outcomes after a shock occurs) for some flows.

For January 1968 to May 1986, average month-to-month unadjusted flows across all three classifications (employed, unemployed, and not in the labor force) totaled 11.9 million persons, or 7.5% of the civilian noninstitutional population (CNP), ages 16 and over. Abowd and Zellner's proportionate adjustments for missing observations and response errors would reduce the average sum of flows to 8.3 million, or 5.3% of the CNP.[4] In the more recent period from June 1986 to December 2005, comparably adjusted average monthly flows carried more persons (9.4 million) but a somewhat smaller percentage of the CNP (4.6%).[5]

Specifically, the six gross flows are those between employment and unemployment (where EU indicates a flow from employment to unemployment, and UE the reverse), between employment and not in the labor force (to be designated EN and NE), and between unemployment and not in the labor force (to be designated UN and NU). Flows EU and UE consist mainly of primary breadwinners,

[1]For an introduction to the construction, limitations, and uses of gross flow data for analyzing short-run changes in the size of the labor force, see Barkume and Horvath (1995).

[2]For a discussion of these problems and a menu of possible solutions, see Flaim and Hogue (1985). More recently, Davis and Haltiwanger (1998) presented a comprehensive assessment of alternative sources of data on worker and job flows, along with a summary of what is known about these flows.

[3]Personal correspondence with Olivier Blanchard.

[4]The flow-specific scale adjustments and further information are given in the Appendix.

[5]Full A-Z adjustment of the data for 1968–86, as devised by Blanchard and Diamond, led to a slightly larger decline in average monthly flows to 7.8 million, or 5.0% of CNP. A comparable estimate is not available for 1986–2005.

whereas secondary workers, especially teens and persons 20–24, comprise most of the other four flows (Blanchard and Diamond 1990).

There are also problems of suppressed transitions across labor force states. It is tempting to think of the individuals in gross flow XY as moving directly from X in survey *t* to Y in survey *t*+1, and to suppose that those with the same recorded state in both surveys remained uninterruptedly in that state between surveys. But with three possible labor force states (E, U, and N) and data collected only once a month, unreported transitions occur and are potentially troublesome. For example, whenever someone employed at the time of a given survey loses a job and finds another one before the next survey, both the job separation and the job finding go unrecorded.

In a recent influential paper, Robert Shimer (2005b) offered evidence that suppressed separations are quantitatively important and that counting most of them causes the job-separation rate to exhibit much smaller cyclical swings. He contended that the conventionally estimated job-loss transition rate contains a large time-aggregation bias (TAB) that earlier studies overlooked.[6] Shimer's conclusion that TAB-corrected job separations are nearly acyclical has been challenged by Fujita and Ramey (2006) and by Elsby, Michaels, and Solon (2007), leaving this issue unresolved.[7] We use Shimer's TAB-corrected data in one vector autoregression (VAR) run for 1986–2005.

[6]Important earlier studies of cyclical swings in gross flows include Blanchard and Diamond (1990), Ritter (1993), Davis, Haltiwanger, and Schuh (1996), Jones and Riddell (1998), and Bleakley, Ferris, and Fuhrer (1999). In more recent years, attention has shifted to some extent from labor force flows to transition probabilities, especially job separations and job finding, as estimated from CPS time-series data on unemployment rates and duration of joblessness as well as gross flow data (see Abraham and Shimer 2001; Hall 2005; and Shimer 2005b).

[7]Fujita and Ramey presented graphical evidence that the cyclical components of both job loss and hiring flows, after adjustment for TAB and missing observations, rose sharply during downturns from 1976 to 2005. They suggested that different procedures to correct for trends may explain why their results and Shimer's differ. Using a different way of correcting for TAB itself, Elsby, Michaels, and Solon also found that flows UE and EU both have large cyclical components.

Interval censoring also leads to under-reporting of job finding, as when a jobseeker finds a job and then loses it between surveys. It turns out, however, that the fraction of all hires represented by censored hires of unemployed workers is much smaller than the fraction of all separations represented by censored separations (King 2005). Hence the bias from not adjusting for unreported hires is much smaller.

A somewhat different censoring problem obscures the interpretation of labor force inflows, NE and NU. Relatively few persons enter the labor force with a job in hand.[8] For all others, a period of search is needed; but for some, that period is so short that they find jobs before the next month's survey. An NU transition goes unreported, and with it the UE transition that follows. The transition is recorded as NE. Those needing longer to find work are recorded as NU.

Since the rate at which jobseekers find jobs is strongly pro-cyclical (Shimer 2005a), a fall in the job finding rate will reduce the fraction of new market entrants who find work before they can be counted as unemployed, reducing inflow NE at the expense of NU. However, unlike the aggregation bias in separations, what happens here leaves total labor force accessions unchanged. Furthermore, as we show later, the reported reallocation of exogenous entrants between NE and NU that occurs over the business cycle is the essence of how noncyclical movers affect gross inflows.

Sketches of the Flows of Labor

For an individual family member, the decision to work (or seek work) in the labor market depends on such considerations as that person's potential earnings and nonlabor income, the probability of finding work, the size and composition of the family, the income of other family members, and a vector of factors that determine the value of time to that individual in various nonmarket activities (including schooling, home production, and

[8]These jobs include those in family-owned enterprises, those arranged by family members, and some seasonal jobs with firms where the same employees have worked before—altogether a very small fraction of all reported NE transitions.

leisure). The persons who have just entered the labor force are presumably those for whom the net attractiveness of market work has recently increased, and the converse is true for those who have just left.

All but one of the model participants sketched here have appeared in the literature on cyclical variations in labor force participation, but seldom in the context of gross flows. The newcomer is the noncyclical mover, whose decision to enter or leave the work force is independent of market conditions, but whose pathway in or out is influenced by those conditions. Here we explore how a recession would be expected to change each group's contribution to each flow in or out of the labor force.[9] These expectations are only directional (for example, two prototypes contributing more to a flow may be outweighed by one group contributing less) and are summarized in the left-hand panel of Table 1.

1. *Discouraged workers* (DWs). The model discouraged worker is someone who loses a job, searches in vain for another one, and then stops looking because the expected payoff from further search falls below the expected costs. When the search stops, the person leaves the labor force via gross flow UN. In a dynamic economy, with job destruction and worker separations occurring continually, some DWs will join this outflow even in good years. The DW hypothesis holds that more will do so in bad years as more workers are let go, job vacancies decline, and the average duration of unemployment rises. We show this expectation in the table with a plus sign for DWs beside flow UN.[10] Unfortunately, the number of DWs exiting the work force in any given period cannot be directly observed.[11]

2. *Market timers* (MTs) are family members with attractive nonmarket uses of their time who wish to devote only a fraction of their potential working years to the labor force, and who therefore have an incentive to participate when wages are higher and jobs are easier to find. Such pro-cyclical behavior would lead to smaller inflows of MTs during downturns, as we show in Table 1. Both NE and NU will be smaller because a decision to postpone looking for work precludes the chance of finding it right away. Also, the MTs who lose their jobs or whose earnings decline (or workloads rise) during a downturn would be expected to leave the work force, increasing outflows UN and EN.

3. *Counter-cyclical enrollees* (CEs) are youngsters who elect to continue their schooling or return to school when poor job prospects lower the opportunity cost of doing so. Such enrollment decisions are potentially important for gross flows because persons under age 25 accounted for about 60% of the cyclical swings in these flows during 1968–86.[12] Youngsters deciding to remain in school for the time will make inflows NE and NU smaller, while youngsters deciding to return to school will enlarge outflow UN—and perhaps outflow EN as well, if part-time jobs are given up in order to return to full-time studies.

4. *Added workers* (AWs) are family members with market skills who usually prefer to engage in nonmarket activities but who enter the work force when the primary breadwinner becomes unemployed—an event that lowers the shadow price of such members'

[9]We attempt no predictions of how model participants influence flows between employment and unemployment because such secondary effects lie beyond the scope of this paper.

[10]Some economists (for example, Benati 2001) have defined discouraged workers more broadly so as to include all groups whose labor force activity varies pro-cyclically. We prefer the narrower definition because these groups influence somewhat different gross flows.

[11]The Bureau of Labor Statistics has long published CPS survey data on discouraged workers defined differently—as persons who looked for work in the previous twelve months, who wanted a job and were available for work during the last four weeks, but who were not actively seeking work, because they expected searching to fail. While the number of reported DWs varies counter-cyclically, these data are of little help in estimating the size of DW outflows. One reason is that an individual need not have lost a job to be recorded as discouraged. Some persons may have entered the labor force in search of work and, not finding it, ceased looking. More important, the CPS count of discouraged workers is not a flow but a stock, and it can grow in a recession either because fewer persons leave it or because more enter it (or both).

[12]Authors' calculations from Blanchard and Diamond (1990), Tables 6 and 7. We are unable to make a comparable estimate for more recent years.

Table 1. Predicted Effects of a Recession on Gross Flows of Model Participants, and VAR Estimates of Cumulative Impulse Responses, by Flow: 1968–86 and 1986–2005.

	Predicted Responses of Model Participants[a]					*Predicted Cumulative Six-Month Responses of Gross Flows to a One-Standard-Deviation Negative Activity Shock (Thousands of Persons)*[b]				
	Pro-Cyclical Movers		*Counter-Cyclical Movers*		*Noncyclical Movers*	*B-D*[c]		*Authors' Applications of B-D's VAR*		
						Jan. '68–May '86		*June '86–Dec. '05*		*June '86–Feb. '05*
Gross Flow	*DWs*	*MTs & CEs*	*AWs*	*EWs*	*NMs*	*Unadj. (A)*	*Adj.: Full A-Z (B)*	*Unadj. (C)*	*Adj.: Propor. A-Z (D)*	*Adj.: Shimer's TAB*[d] *(E)*
Inflows:										
NE	0	–	+	0	–	–88***	–137***	–61**	–36**	–54*
						(18)	(21)	(24)	(15)	(29)
NU	0	–	+	0	+	94***	44***	49***	43***	19
						(17)	(15)	(11)	(10)	(18)
Total	0	–	+	0	0	6	–94	–12	7	–35
Outflows:										
EN	0	+	0	–	–	–90***	–169***	–47**	–29**	–29
						(17)	(27)	(22)	(13)	(27)
UN	+	+	0	–	+	58***	–7	41***	26***	43***
						(10)	(11)	(9)	(6)	(16)
Total	+	+	0	–	0	–32	–175	–6	–2	14
Intra Labor Force:										
UE						45***	56***	13	11	–31
						(14)	(16)	(12)	(10)	(23)
EU						256***	305***	82***	66***	66***
						(26)	(30)	(15)	(12)	(21)

Abbreviations: A-Z = Abowd and Zellner (1985); B-D = Blanchard and Diamond (1990); AWs = Added Workers; DWs = Discouraged Workers; MTs = Market Timers; CEs = Countercyclical Enrollees; EWs = Extended Workers; NMs = Noncyclical Movers; VAR = Vector Autoregression; TAB = Time-Aggregation Bias.

[a]Signs of predicted responses by model participants indicate only the direction of each response. No predictions are made for the intra–labor-force flows.

[b]Standard errors are shown in parentheses. All data are seasonally adjusted; other adjustments are indicated in column headings. Data on UN and NU for 1986–2005 are also adjusted for 1994 revisions in the CPS questionnaire (see Appendix).

[c]Authors' replication of B-D's VAR after a minor correction.

[d]Flows constructed by the authors from instantaneous transition rates provided by Robert Shimer.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level (two-tailed tests).

nonmarket time. They leave the labor force once that primary earner returns to work.

When the "added worker effect" was conceived during the Great Depression, the model worker in this category was a married woman and the primary breadwinner was her husband. Nowadays, with about 70% of married women under age 65 already in the labor force, and with women of all marital statuses assuming the role of primary earner in a growing share of U.S. households, the family status of AWs is probably more diverse. Further, their ranks have been thinned by the availability of unemployment benefits (Cullen and Gruber 2000).

We expect AWs to increase inflows NE and NU during downturns, when primary workers are being let go, and later increase outflows EN and UN during upswings, when primary earners are being rehired or finding new jobs.

5. *Extended workers* (EWs) are family members who happen to be employed or seeking work when the family's primary breadwinner is let go and who, for that reason, choose to extend their stay in the labor market. They have the same motivation as added workers. But while AWs must enter the work force, EWs simply postpone a planned withdrawal. They, too, presumably leave the labor market after the primary earner has returned to work.

The same cyclical swings that drive the entry and exit of added workers are in play here. But since EWs are already in the labor force, only their outflows change. Thus, layoffs of householders should lead to a fall in outflows EN and UN by EWs, while recalls and job finding of householders should contribute to a rise in both outflows.[13]

6. Awaiting recognition, *noncyclical movers* (NMs) are persons who enter or leave the labor force for reasons that are *independent of labor market conditions,* but where such conditions influence the *allocation* of entrants between NU and NE, and of leavers between EN and UN. Consider entrants first.

By definition, the number of NMs who enter the labor force does not vary with labor market conditions; so the association between this *total inflow* and the unemployment rate must be zero. But we contend that how these exogenous entrants get divided between the two component inflows, NE and NU, does vary over the cycle, and just as one would expect: when the unemployment rate is high, more enter via NU and fewer via NE, with their sum unchanged. When the unemployment rate is low, the reverse is true.

This cyclical reallocation of entering NMs is fundamentally different from the contributions of our five previous prototypes: these five make *behavioral responses* to changed economic conditions, whereas the reallocation of NMs simply captures cyclical swings in how many exogenous entrants happen to be employed versus unemployed one month after entry. We look at the implications of this difference in the final section.

A prime example is students who have previously decided—or been told by their parents—to go look for a summer job at the end of the school year. For these inframarginal summer participants, the state of the market will influence only the duration and outcome of their search. The higher the ratio of vacancies to jobseekers, the larger the number of these students who will find a job right away (perhaps before the end of classes), entering the market through flow NE, and the fewer who will have to search for some time, entering through NU.

Other groups whose entrance into the work force may be largely predetermined include most new college graduates, plus most agricultural or sales workers at the start of the on-season. But NM inflows are not limited to persons who decide to enter the market before doing so. Rather, they include all exogenous entrances where labor market conditions influence whether the transition is through NE or NU.

There are also some NMs among persons leaving the labor force. Seasonal participants account for an important share of exogenous labor force withdrawals—students leaving

[13]Aaronson et al. (2006:121) pointed out that employed individuals who are concerned about future job prospects are less likely to quit their jobs and leave the labor force temporarily when the economy is weak. Such behavior suggests another kind of extended worker—that is, one responding to precautionary motives rather than loss of family income. This second group could be larger than the one described in the text.

the summer job market to return to school, seasonal sales workers returning home after Christmas, and so on. Here the time of withdrawal is predetermined, but the state of origin (E or U) may depend on the labor market. Hence, one would expect a downturn to result in more NMs leaving the work force through UN and fewer through EN, with their total outflow unchanged.[14]

While one can find a few examples of NMs in the literature on gross flows, so far as we know the group itself has not been previously recognized as a *cyclical component* of such flows.

Empirical Evidence

Our empirical evidence comes from a structural vector autoregression (VAR) developed by Blanchard and Diamond (1990), which they applied to monthly gross flow data for January 1968 to May 1986. We use the same VAR with its original assumptions to extend the analysis to a second period, June 1986 to December 2005. The VAR is designed to predict how a one–standard-deviation negative shock to the aggregate economic activity residual would change the cumulative response of each gross flow after lags of various length. We report only six-month responses here.

A key assumption in B-D's VAR analysis is that the level of each gross flow is a function of current and lagged values of three labor market stocks: employment (E), unemployment (U), and job vacancies (V). In turn, E, U, and V are assumed to be driven by three kinds of unobservable shocks: aggregate activity, reallocation, and labor force innovations.

To get from the reduced form VAR to a structural model requires several identifying assumptions. By imposing these assumptions, B-D first estimated the effect of the identified (negative) activity shock on the above labor market stocks.[15] In stage two, predicted changes in flows were obtained from auxiliary regressions of each flow on the current values and four lagged values of these stocks, along with a constant and a time trend.

Table 1 assembles our estimates for both periods. Our main objective is to see how estimates of cyclical swings in these flows differ across periods and how sensitive they are to adjustments for errors in the data and time-aggregation bias.

Columns (A) and (B) present our corrected estimates of B-D's impulse responses for 1968–86.[16] The figures in column (A) are based on unadjusted data (save for seasonal corrections, which we applied to all data); those in column (B) are based on full (time-varying) Abowd-Zellner adjustments, as defined earlier. In both runs, a one–standard-deviation negative shock to economic activity during this period led to a predicted rise in the overall unemployment rate of about 0.3 percentage points after six months.[17]

In columns (C) and (D) we apply B-D's VAR, first to unadjusted data, then to data with proportionate A-Z adjustments (also explained earlier), for 1986–2005.[18] A one–

[14]Since several illustrations of NM entrances and exits involve seasonal transitions, seasonal adjustment of gross flow data (which is nearly universal) will no doubt reduce the size of NM flows. How large the remaining streams are is an empirical question.

[15]B-D conducted extensive tests with additional explanatory variables, alternative lag structures, and different specification assumptions. They found that plausible changes in all three had relatively small effects on their results. See Blanchard and Diamond (1990), pp. 96–101, and Appendix A, pp. 134–38, for a discussion of how these assumptions were derived and for the results of sensitivity tests.

[16]In replicating B-D's findings with their data set, we corrected a minor error in their program. This correction leads to small changes in specific flows but leaves their broad contours unchanged. (Blanchard and Diamond's published cyclical responses can be found in Table 5, p. 122, of their paper.)

[17]Predicted changes in the unemployment rate were obtained by summing the changes in the four flows into and out of unemployment and dividing the net change by the mean civilian labor force for the period.

[18]Monthly unadjusted flow data for this period were kindly provided by Fran Horvath of the BLS. These data were seasonally adjusted with the BLS X12-ARIMA seasonal adjustment program. To create job vacancy data for 1986–2005 comparable to B-D's data based on Abraham (1987), we drew on Jay Zagorsky's (1998) estimates for 1986–94 and spliced them to scale-adjusted data from the Conference Board's Help Wanted Index for 1995 to 2005.

Applying A-Z adjustments to gross flows well beyond standard-deviation negative shock raised the jobless rate by only one-fifth as much (about 0.06 points) in the second period. Finally, column (E) shows the results of rerunning B-D's VAR with data provided by Robert Shimer for nearly the same period (June 1986 to February 2005). These data incorporate his corrections for time-aggregation bias (TAB) but are not adjusted for errors in classification or missing observations. In all three runs we added corrections similar to those in Abraham and Shimer (2001) for the effects of 1994 revisions in the CPS questionnaire on the levels of flows NU and UN. (The means and standard deviations of all six gross flows in all five runs can be found in Appendix Table A1.)

Several inferences can be drawn from the results in Table 1.

1. During the earlier period (1968–86) and without Abowd-Zellner adjustment of flows, a negative activity shock led to predicted changes of similar size in most flows in and out of the labor force, except for a somewhat smaller change in UN (see column A). In short, NE and EN varied pro-cyclically and NU and UN varied counter-cyclically—the pattern observed in many prior studies—but with largely offsetting amplitudes. Full A-Z adjustments of the data, however, greatly enlarge the impulse responses between N and E and shrink those between N and U, leaving NE and EN predominant (see column B). Inflow NU is only half as large as before, and outflow UN is now essentially noncyclical. The flows between E and U increase about one-fifth as a result of these time-varying adjustments.[19]

2. Extending B-D's VAR to unadjusted data for 1986–2005 reveals dramatically smaller impulse responses by all six gross flows than we found in unadjusted data for 1968–86 (compare columns A and C). These declines were roughly 50% for NU and EN, 30% for NE and UN, and 70% for UE and EU. This comparison yields our best evidence of a downtrend in the size of cyclical swings in gross flows, and at least three kinds of economic change help to explain it: (a) variations in aggregate economic activity were smaller in the second period; (b) persons under age 25, who are over-represented in flows entering and leaving the labor force, represented smaller shares of the population and labor force in the second period; and (c) the labor force attachment of married women was stronger in the second period (Goldin 2006). All three trends should have reduced the cyclical sensitivity of labor force transitions—especially outflow EN, which is driven largely by voluntary quits.

3. Proportionate A-Z adjustments of second period data further reduce the size of all six impulse responses, but their pattern remains much the same (compare columns C and D). As before adjustment, the changes in component inflows and outflows are nearly offsetting. We cannot infer sensitivity trends by comparing columns (B) and (D) because the effects of full (time-varying) and proportionate A-Z adjustments are so different. Nor can we estimate what full adjustments would have disclosed for 1986–2005, since the needed corrections are not available. We do know, however, that after proportionate adjustments in *both* periods, impulse responses in the second period would have been smaller than in the first for every flow.[20]

4. Finally, flows based on Shimer's transition rates corrected for time-aggregation bias (TAB) appear in column (E). While five of the six flows have impulse responses in the same direction as their unadjusted counterparts in column (C) (the exception is UE, which turns negative), all six standard

those that A-Z studied is, of course, problematic; but we are not the first to do so (see Bleakley, Ferris, and Fuhrer 1999; Garibaldi and Wasmer 2005). A rationale is that some errors must still exist, and we have no evidence that the original adjustment factors are biased in either direction.

[19]Since the probability of finding a job is strongly pro-cyclical, the reader may be surprised to see that flow UE usually *rises* during a downturn—and did so significantly during 1968–86. The explanation is that the number of jobseekers also rises. The net change in the direction of the flow depends on how macroeconomic conditions and data adjustments affect these two competing determinants. It may also depend on how downturns are measured.

[20]One need only apply the proportionate adjustment factors in our Appendix to the flows in column (A) of the text table to derive scale-adjusted impulse responses for the earlier period.

errors are larger. As a result, only two flows (EU and UN) have cyclical movements still significant at 5%. Given the nearly acyclical job-separation probabilities that Shimer observed starting in the mid-1980s after TAB adjustment of the data, we expected to see a much smaller predicted EU impulse response in column (E) than in column (C). Instead, it declined by only one-fifth. It is likely that a downtrend in gross flows would still be evident after similar adjustments in both periods.

The smaller cyclical increase in NU after TAB correction can be attributed in part to the probability, mentioned earlier, that most persons who transit from N to E between successive surveys spend some time searching for work. Their actual transitions are N to U to E. When vacancies decline, fewer entrants find a job so quickly, causing NE to fall and NU to rise. But once we count some of the previously censored NU transitions that are part of the NE flow, the rise in NU during a downturn will be smaller. Hence, correcting for TAB should reduce somewhat the counter-cyclical influence of labor force entrants on inflow NU.[21]

We can also provide a little information on how the underlying dynamic relationships between the initial activity shock, the three labor force stocks, and the six gross flows changed between periods. A one–standard-deviation negative shock to the aggregate economic activity residual (measured in millions of workers) declined from –0.0491 to –0.0422, a fall of only 14%. At the same time, the predicted response level of each stock at six months (positive for U, negative for E and V) declined much more—by 47% for E, 60% for U, and 62% for V.[22] Taken together, these findings indicate that the responsiveness of labor force stocks to an activity shock of given size was much smaller in the second period. That, in turn, might be due to a change in the source or components of activity shocks, or in the transition mechanism from the activity shock to the stocks, or in the ability of firms to adjust output without changing the level of employment. In a similar vein, the six-month impulse responses of all six gross flows also declined, albeit by more diverse relative amounts (30–70%, as reported earlier). Since stocks are used to explain flows in our analysis, it seems likely that whatever turns out to explain the downtrend in the impulses of stocks will also be largely responsible for the decline in the responses of flows.

One feature of these findings that is difficult to explain is why the impulse responses of EU and UE shrank so much more, in percentage terms, across periods than did those for flows in and out of the labor force. This issue deserves further study.[23]

[21]Because inflow NU plays a key role in assessing the empirical importance of NMs (see the next section), we decided to test more directly the association between that inflow after TAB adjustment and labor market conditions. To that end, we ran an OLS regression of detrended quarterly averages of Shimer's NU transition rates (trNU) on the detrended mean overall unemployment rate in quarters t–1 and t–2 (LAGUR) and the change in the prime-age male unemployment rate between t–1 and t (DUPAM) for 1986:III to 2004:IV. The following results were obtained (t-values, based on Newey-West HAC standard errors, are shown in parentheses):

$$\underset{}{trNU} = \underset{(-0.33)}{-0.0000471} + \underset{(6.82)}{0.00227}\ LAGUR + \underset{(2.19)}{0.00145}\ DUPAM.$$

(R-square = 0.340; D-W = 2.02; S.D. dep. var. = 0.00179.)

Multiplying each regression coefficient by the mean number of persons not in the labor force during 1986–2004 (67 million), we find that one percentage point rises in LAGUR and DUPAM (estimated separately) were associated with predicted increases in inflow NU of 152,000 and 97,000 persons, respectively. We conclude that a strong positive association between TAB-corrected NU and labor market conditions prevailed during 1986–2005.

[22]While our choice of a six months response level is arbitrary, it provides a reasonable benchmark for comparing the responses of stocks across periods. Each stock's response function in the first period was concave with respect to the horizontal (response lag) axis, reaching a maximum impulse value near eight months after the shock. In the second period, the E and U functions were noticeably flatter (less concave), while the time path for V had a roughly constant recovery rate (no concavity) from one month after the shock. We will send a set of graphs and tables showing the response functions of all stocks and flows in each period to interested readers on request.

[23]While job losses in the 2001 recession were unusually small, employment growth during the first three years of the following recovery was also small by historic standards. There was also an unexpected decline in the labor force participation rate of adult women. It is unclear to what extent these events indicated new trends

To summarize: *we find strong evidence that cyclical variations in all six gross flows were markedly smaller in 1986–2005 than in 1968–86.* This decline was largest for flows between employment and unemployment and is most evident in unadjusted data. Proportionate A-Z adjustments, the only kind still available, reduce the impulse responses of all four flows in and out of the labor force during both periods. In the first period, the time-varying A-Z adjustments devised by Blanchard and Diamond enlarge the pro-cyclical swings between N and E and reduce the counter-cyclical swings between N and U. In the second period, Shimer's adjustments for time-aggregation bias increase the standard errors of all responses, reduce the impulse response for NU, and make UE pro-cyclical; swings in other flows change relatively little. The average size of activity shocks declined relatively less between periods than did predicted changes in either labor force stocks or gross flows.

How Important Are Noncyclical Movers in Gross Inflows?

Since the predicted contributions of the six model participants in Table 1 are only directional, and since different combinations of prototypes correctly predict the observed impulse responses of different flows, we cannot say which groups play a dominant or inconsequential role. Even so, it is possible to estimate the size of the added worker inflow of married women and, from that, to derive a lower-bound estimate of the inflow of noncyclical movers.

Look again at the expectations for inflow NU in Table 1. Unless other actors are at work here, the observed cyclical change in NU, which is positive in all five runs, must equal the sum of the increased inflow of AWs and NMs, minus the reduced inflow of MTs and CEs. Since the offset is of unknown size but must be negative, a lower-bound estimate of the contribution of NMs can be obtained by assuming that offset to be zero.

James Spletzer (1997) provided an estimate of the added worker effect on NU transitions for married women, based on four-month CPS matched data for December 1988 to June 1989 and for December 1990 to June 1991. Before controlling for differences in both the demographic characteristics of wives and the market participation of both spouses in the previous year, Spletzer found that the probability of a not-in-the-labor-force (NLF) wife entering the labor force within three months following a job loss by her husband was about 0.08 larger than for all NLF wives, a statistically significant difference, and that nearly all of this inflow went into unemployment. After he controlled for such characteristics, however, the added worker probability shriveled to a nonsignificant 0.02.[24]

During 1986–2005, a one–standard-deviation negative shock to the aggregate economic activity residual in our three runs led after six months to predicted job losses (that is, an increase in EU) of 82,000 or 66,000 workers and to NU inflows of 49,000, 43,000, or 19,000 (see columns C, D, and E of Table 1).[25] To be conservative, assume that the largest projection of job losses (82,000) and the smallest projection of inflow NU (19,000) are right. We estimate that about one-third of the job losers (27,000) were married men. If about 60% of them had wives who were already in the labor force, that would leave about 11,000 wives who were potential added workers. Multiplying Spletzer's adjusted coefficient of 0.02 by this base suggests that the NU inflow of 19,000 persons contained only *220* added-worker wives. But if the AW inflow is really of that order of magnitude, then nearly all of the predicted rise in NU would be due, it seems, to an inflow of NMs!

That estimate of the AW inflow of wives might, however, be too small because it shows their response only for the period up to three

or simply a period of diminished job opportunities in the wake of the boom of the late 1990s. (Juhn and Potter [2006] and Aaronson et al. [2006] suggested a role for each.) Either way, our VAR may have "interpreted" these end-of-period changes as "cyclical," leading to a larger positive impulse response for outflow UN.

[24]Maloney (1991) reached a similar conclusion.

[25]Since each individual estimate has a confidence interval, the actual range of possible layoffs is wider. But all we seek here is a first approximation of that number.

months after their husbands' job loss. An analysis that examines a longer period following the husband's job loss—six-months, say—might show a considerably larger response. But if we were to *quadruple* (to 0.08) the probability that the wife of a job-losing husband will enter the labor force, the estimated number of wives doing so would still be under a thousand.

Of course, other family members may also serve as added workers. To get some idea of how many there might be, we used Integrated Public Use Microdata Series (IPUMS) data from a 1% Sample of the 2000 Census of Population to count the number of family members, besides wives, who were age 16 or over, not in the labor force, and living in a family household where either the householder or the householder's spouse (if any) was employed. Ten million other family members passed these screens, including just under five million teenagers. In contrast, we found about twelve million NLF wives with employed husbands. So unless the ten million other family members have an added-worker entry probability higher than 0.08, doubling the added-worker inflow as a fraction of the rise in NU would still leave almost 90% of the latter unaccounted for.[26]

Other contributors to counter-cyclical inflows may await discovery.[27] Until then, the evidence presented here strongly suggests that noncyclical movers are an empirically important component of inflow NU, and hence of inflow NE as well. They may also be important in explaining gross outflows, but we are unable to test this hypothesis with the data at hand.

Conclusion

Using a vector autoregression designed by Blanchard and Diamond (1990), we have offered evidence that macroeconomic variations in gross flows were smaller in 1986–2005 than in 1968–86. This conclusion appears to be robust to data adjustments for errors in responses, missing observations, and time-aggregation bias. Given that the past two decades have seen greater macroeconomic stability, a smaller share of the work force represented by persons under age 25, and stronger labor force attachment of married women, the conclusion also seems consistent with important inter-period trends. Future researchers might, nonetheless, appraise the sensitivity of the relative declines in different flows to alternative measures of aggregate economic activity and different estimation methods. Their further investigations could reveal other types of change strengthening the downtrend at issue, and perhaps a change or two working against it.

We also identified six worker prototypes who contribute to cyclical variations in gross flows and tried to predict the direction of change in their flow-specific contributions during a downturn. One previously overlooked group consists, oddly enough, of "noncyclical movers" (NMs) who enter or leave the labor force for reasons unrelated to labor market conditions, yet whose gross flow pathways in and out are influenced by these conditions. Our evidence indicates that these participants are an empirically important component of gross inflows.

If researchers care only about *associations* between gross flows and market conditions, the presence of NMs is trouble-free. Also, for some interesting issues, such as the contribution of labor force inflows and outflows to cyclical variations in unemployment, the reasons for entrances and exits can be ignored. If, however, we are interested in

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[26]That residual appears to have been somewhat smaller in 1968–86. Blanchard and Diamond's fully A-Z-adjusted impulse responses predict job losses of 305,000 and an NU inflow of 44,000 (see Table 1, column B). Applying a 0.08 entry probability to a potential AW base that includes other family members yields an AW estimate of 6,400, or 15% of NU, leaving 85% as imputed NMs.

All these estimates of NMs assume (implausibly) no reduction in NU transitions by MTs and CEs during a downturn. Should enough decide not to enter the work force so that inflow NU falls by one thousand, the estimate of NMs who find themselves in this inflow will rise by one thousand. So the number of entering NMs might *exceed* the reported rise in NU.

[27]These candidates include family members who enter the labor force when another member's earnings decline, and recipients of state general assistance who might face non-work opportunities that vary pro-cyclically due to state budget constraints. We are grateful to an anonymous referee for pointing out these potential contributors to NU inflows during recessions.

learning how changes in these conditions *influence decisions* to enter and leave the work force, the presence of NMs is problematic. In essence, when gross flows are regressed on labor market variables, the cyclical redistribution of NMs across individual flows will lead to biased estimates of the number of persons who are moving *because* of changes in these variables.[28] To correct for this bias, we would need estimates of flow-specific cyclical variations in NMs alone, so that they could be subtracted from total cyclical changes in these flows. Obtaining the data needed for this correction would seem to present a major challenge.

[28]Put more precisely, the marginal effects estimated by regressions of gross flows on labor market variables will combine the effects of these variables on the number of NMs *and* cyclically motivated movers. As a result, changes in the inflows and outflows of cyclical movers alone may be overstated, understated, or even incorrectly signed. In short, this is a case of a dependent variable that contains a nonrandom measurement error highly correlated with one or more regressors, leading to biased results.

Appendix

This appendix further explains two kinds of adjustments that have been made to some of the data in this paper: Abowd-Zellner adjustments, and adjustments for changes in the CPS questionnaire introduced in January 1994. Then Appendix Table A1 presents the means and standard deviations of all six gross flows in all five VAR runs for both periods.

1. *Abowd-Zellner adjustments* were designed to correct (1) for non-random missing observations in gross flow data and (2) for spurious transitions resulting from classification errors in the recording of labor force states (employment, unemployment, and not in the labor force). These adjustments were based on an extensive study of published and unpublished CPS data for January 1977 through December 1982.

The A-Z adjustments used by most studies, including our run in column (D) of Table 1, are based on the *average* ratio of adjusted to unadjusted values of each gross flow for 1977–82, as shown in A-Z (1985), p. 267, Table 5. We designate these fixed correction factors as "proportionate." Such scalar corrections have, of course, the same relative effect on the impulse responses of flows and on their average size and standard deviation. Here are the rounded correction factors for each flow *as a percentage* of its unadjusted value for the CNP, ages 16 and over, both sexes, during this period: NE, –40; EN, –39; NU, –11; UN, –36; UE, –16; and EU, –20. There are also adjustments for persons reported in the same labor force state in consecutive months (again in percentages): EE, +2; UU, +23; and NN, +2. The overall effect of these adjustments is to reduce movements across states and increase the number of persons staying in the same state.

Blanchard and Diamond's adjustments, based on supplementary data from A-Z's paper, are quite different: they capture both scale and time-varying elements of data corrections. We call them "full A-Z adjustments," and these are what B-D used in the VAR shown in column (B) of our Table 1. As noted in the text, these adjustments can have quite different effects on the amplitude of cyclical swings in flows and on their average size and standard deviation.

2. *Changes in the CPS questionnaire* were introduced in January 1994; see Polivka and Miller (1998) for a full discussion of these changes. For reasons that are unclear, the new survey instrument evidently increased significantly the probability of both UN and NU transitions without noticeably affecting the others (see Appendix B in Abraham and Shimer 2001).

Drawing on Abraham and Shimer, we made adjustments in the UN and NU flows in all three VARs that used data for 1986–2005. In runs (C) and (D) in Table 1, these adjustments had the effect of reducing the average levels of UN and NU for 1994–2005 by about 20% and 13%, respectively. In run (E), which used Shimer's TAB-adjusted data, the relative downward adjustments for UN and NU were about 16% and 19%, respectively.

Appendix Table Al
Means and Standard Deviations of Monthly Gross Flows, by Period and Data Adjustments
(Millions of Persons)

	Jan. '68–May '86		*June '86–Dec. '05*		*June '86–Feb. '05*
	Unadj. *(A)*	*Adj.: Full A-Z* *(B)*	*Unadj.* *(C)*	*Adj.: Propor. A-Z* *(D)*	*Adj.: Shimer's TAB* *(E)*
Gross Flow:					
NE	2.77	1.40	3.19	1.92	2.95
	(0.18)	(0.21)	(0.34)	(0.20)	(0.34)
NU	1.46	1.06	1.51	1.34	2.06
	(0.34)	(0.32)	(0.18)	(0.16)	(0.25)
EN	3.14	1.58	3.59	2.19	3.42
	(0.18)	(0.23)	(0.38)	(0.23)	(0.40)
UN	1.38	0.88	1.41	0.90	2.12
	(0.32)	(0.27)	(0.19)	(0.12)	(0.20)
UE	1.66	1.60	1.97	1.65	2.82
	(0.37)	(0.36)	(0.14)	(0.12)	(0.24)
EU	1.44	1.27	1.74	1.40	2.41
	(0.41)	(0.41)	(0.14)	(0.11)	(0.20)
Totals	11.85	7.79	13.40	9.40	15.77

Notes: Standard deviations in parentheses. All data are seasonally adjusted; UN and NU flows for 1986–2005 have also been adjusted for 1994 revisions of the CPS questionnaire. Abbreviations: A-Z = Abowd and Zellner (1985); TAB = Time-Aggregation Bias. Totals may differ from sums of flows due to rounding.

Source: Authors' calculations from data sources identified in the text and Table 1.

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