Federal Reserve Bank of San Francisco

Economic Review

Summer 1984

Number 3

The Federal Reserve Bank of San Francisco's Economic Review is published quarterly by the Bank's Research and Public Information Department under the supervision of Michael W. Keran, Senior Vice President. The publication is edited by Gregory J. Tong, with the assistance of Karen Rusk (editorial) and William Rosenthal (graphics).

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Cyclical Unemployment and Employment: Effects of Labor Force Entry and Exit

Michael C. Keeley*

Cyclical variation in the rates at which persons enter and leave the labor force strongly affect the unemployment rate. Analysis of monthly data on employment-status transition probabilities shows that, during recessions, the probability an unemployed person will drop out of the labor force decreases and the probability a person not in the labor force will enter the labor force to search for employment increases. The cyclical behavior of these two transition probabilities thus casts doubt on the widely accepted discouraged-worker hypothesis, which predicts just the opposite cyclical pattern. On net, the variation in the rates of labor force entry and exit over the business cycle cause the unemployment rate to be much higher during recessions and much lower during expansions than if the rates were constant. Therefore, the cyclical variation in the unemployment rate does not correspond to the cyclical variation in the demand for labor.

The effects of the cyclical variation in the labor force participation rate on unemployment in terms of "added-worker" and "discouraged-worker" effects have been controversial topics since the Great Depression, in part, because of their macroeconomic policy implications. For example, if many persons seeking work become discouraged and leave the labor force during recessions (which many recent studies imply), then measured unemployment during recessions would be lower (because of the decline in the number of people classified as unemployed) than if decisions to give up searching for a job did not vary over the business cycle. On the other hand, if during recessions many persons entered the labor force to seek jobs (added workers), perhaps because of unemployment by a family member, measured unemployment during recessions would be higher.

In 1966, in a classic article dealing with these issues, Jacob Mincer (1966, p. 73) wrote that "After three decades of research and occasionally animated controversy, the short-run behavior of the labor force is still not well understood." Although there has been a considerable body of research since then[1], a comprehensive understanding of the cyclical behavior of the labor market and the relationship between labor force participation and unemployment still eludes us. This paper contributes to this literature by analyzing the effects of the cyclical variation in labor force entry and exit rates, which in turn determine the labor force participation rate, on unemployment and employment.

The cyclical variation in labor force entry and exit rates reported in this paper cast doubt on several widely accepted hypotheses regarding the short-run behavior of the labor market. One key finding is that variations in these rates over the business cycle cause measured unemployment to be much higher during recessions than it otherwise would be. This contrasts with the generally accepted hypothesis that cyclical variations in labor force entry and exit cause unemployment to be lower because of the

*Economist, Federal Reserve Bank of San Francisco. Jennifer Eccles provided valuable research assistance. Comments from Jack Beebe, Fred Furlong, Rose McElhattan, Randall Pozdena, and John Scadding are much appreciated.

discouraged-worker effect.

Many previous studies have attempted to test the added-worker and discouraged-worker hypotheses indirectly by analyzing the effects of the cyclical variation in the labor force participation rate on unemployment. This paper, however, uses disaggregated data on monthly transitions among the states of unemployment, employment and not-in-the-labor-force to test these hypotheses directly. For example, labor force entry and exit probabilities are disaggregated into their four basic components: entry into (1) unemployment and (2) employment, and exit from (3) employment and (4) unemployment. Transition probabilities (the monthly probability of moving from one labor force status to another) are estimated using gross-flow data from matched monthly Current Population Surveys from January 1968 through March 1984.

The results indicate that disaggregation reveals many aspects of labor market behavior that are masked in aggregate data. For example, increased labor force exit from a state of employment increases the unemployment rate because the number unemployed (the numerator) is unaffected while the labor force (the denominator) decreases. Similarly, increased exit from a state of unemployment decreases the unemployment rate. Both sorts of exit, however, reduce the labor force participation rate.

The stock-flow model of the labor market presented in this paper is useful for analyzing labor-market-business-cycle dynamics because it focuses on the variation in flows among different employment status categories: disaggregated labor force entry and exit rates and transition rates between employment and unemployment. Variations in aggregate unemployment and employment (stocks) are determined by these transition rates (the flow in minus the flow out) so that if the dynamics of these transition rates are understood, the dynamics of unemployment and employment are too.

An analysis of the cyclical variation in transition rates provides an explanation for the much larger cyclical variation in unemployment rates than in employment rates.[2] For example, although unemployment rates during the last recession were the highest since the Depression, employment rates were only slightly lower than their historical high. This apparent divergence in two indicators of tightness in the labor market can be explained by the cyclical behavior of labor force entry and exit rates and their differential effects on unemployment and employment.

This paper is organized as follows. In Section I, a brief review of the theory and evidence regarding the cyclical behavior of employment, unemployment and labor force participation and their interrelationships is presented. Section II presents a description of the stock-flow model of the labor market and the data used to estimate its parameters. Section III presents the estimates of the monthly labor market transition probabilities for the 1968-1984 period, discusses the cyclical determinants of variations in these probabilities, and shows how the variation in these probabilities explain the cyclical variation in unemployment and employment rates. Finally, Section IV summarizes the research and presents the conclusions.

I. A Review of the Theory and Evidence

Although there is no widely accepted theory explaining business-cycle variations in the demand for labor or the cyclical variation in unemployment, cyclical variations in the supply of labor often have been described in terms of the added-worker and discouraged-worker hypotheses. Below these hypotheses and their policy implications are reviewed along with evidence regarding the relationship between cyclical variations in labor force participation and unemployment.

In the literature, it is unclear exactly what the discouraged-worker and added-worker hypotheses are. On one level, these "hypotheses" can be taken as simple descriptions of how labor force entry and exit vary over the business cycle. "Additional" workers are hypothesized to enter the labor force during recessions and "discouraged" workers to leave. As simple descriptions of aggregate labor force behavior, these hypotheses can be taken as separate and opposing "theories." However, at a more fundamental level, these hypotheses can be assumed to refer to basic economic forces affecting decision-making about labor force activity. In fact, Mincer (1966) interpreted the discouraged- and

added-worker effects as substitution and income effects respectively. Thus, both forces would coexist. For some workers, the forces of discouragement would dominate, while for others, inducements to work would dominate.

This interpretation of the discouraged-worker hypothesis—that labor force participants are more likely to withdraw and potential entrants are less likely to enter the labor force during recessions because of lower current wages relative to normal wages—can be thought of as an intertemporal substitution effect in a life-cycle model. That is, given that there is temporal variation in wage rates over the life cycle due to the business cycle, it is optimal to work the most when wage rates are high. This would result in a procyclical variation in the quantity of labor supplied[3]. Such cyclical variations in labor force participation in response to cyclical variations in actual wage rates would represent movements along an aggregate labor-supply curve. As such, they do not imply that there are a group of workers who should be counted as unemployed during recessions because movements along the labor-supply curve could occur even if unemployment were always zero. They only imply that the aggregate labor force participation function is positively sloped. Perhaps because this interpretation of the discouraged-worker effect pertains to the slope of the labor-supply function, and not on how it shifts over the business cycle, it is not widely accepted.

The most common modern interpretation of the discouraged-worker hypothesis is that the increased costs of searching for employment during a recession relative to the implicit value of time in non-market activities cause "discouragement" (See Gronau, 1971, Ehrenberg and Smith, 1982, and McElhattan, 1977, 1980). Search costs, it is argued, increase during a recession because a lower job vacancy rate results in a reduced stream of job offers and possibly because the personal rate of discount increases. A relative increase in search costs would lower a searcher's minimum acceptance wage compared to the value of time in non-market activities. This, in turn, would increase the likelihood that an unemployed worker would abandon his or her job search and withdraw from the labor force, and it would decrease the likelihood that a person not in the labor force would enter the labor force to search for employment. Increases in search costs would also lower the likelihood that an employed person would quit his or her job to search for a better one.

This search-cost interpretation of the discouraged-worker effect implies that the aggregate labor-supply function shifts leftward when discouragement increases. For example, suppose a group of workers earns exactly the minimum wage and that declining labor demand during a recession brings the market-clearing wage below the minimum. Some fraction of those employed will lose their jobs and some of them may drop out of the labor force because of an increase in search costs caused by a decline in the probability of obtaining a minimum wage job. This causes a leftward shift in the labor-supply function, which leads to lower measured unemployment than if all those who lost their jobs remained in the labor force.

In an attempt, perhaps, to measure the size of the group of persons who are not in the labor force because of high search costs, the Census Bureau, in 1967, added some questions to the monthly Current Population Survey. The Bureau defines discouraged workers as those persons who are not working and not looking for work but who indicate they want a job and believe they cannot get one. Such a definition is, however, difficult to interpret since no questions are asked regarding the type of job and wage the person expects. In one sense, all non-workers would be discouraged workers by this Census definition since all non-workers would want a job at some wage. Furthermore, non-working persons who are not looking for work are not looking because the value of their time in non-market pursuits exceeds the expected wage they can obtain. Presumably, then, all non-working persons believe no acceptable work can be found, or at least that it is not worthwhile to spend resources actively searching. Thus, it is unclear how persons are interpreting and answering these questions aimed at identifying discouraged workers. Given the ambiguity of the questions, it is not surprising that this Census measure is not useful. For example, an empirical study by McElhattan (1980) indicates that the survey response is unsuccessful in distinguishing discouraged workers from other non-participants in terms of actual labor market behavior.

Although the Census definition of discouraged

workers is not meaningful, there, in fact, may be workers who report themselves as not in the labor force who would be in the labor force if it were not for various restrictions such as the minimum wage. Such persons may want and be willing to accept a below-minimum-wage job, but do not make the effort to find employment. Thus, artificial labor market barriers might cause workers to become "discouraged," drop out of the labor force and not be counted as unemployed even though they would be labor market participants if the barriers were removed. Such a shift in the aggregate labor-supply function would imply that the unemployment rate does not move in tandem with aggregate demand and that increases in unemployment during recessions, in a sense, would underestimate the decline in demand.

The added-worker effect, first extensively analyzed by Woytinsky (1940), is that the rate of entry into the labor force during recessions is higher because additional persons try to find work. The added-worker effect is often described in terms of an income effect— falling family income during a recession, due to lower wages or unemployment of the primary earner, decreases the implicit value of time (in non-market pursuits) of other nonworking family members relative to market wages and thus makes their entry into the labor force more likely. The income-effect interpretation of the added-worker hypothesis implies a rightward shift in the aggregate labor-supply function. Such a shift would increase measured unemployment and would imply that the unemployment rate overstates the effects of a recession on the labor market.

The interpretation of the added-worker effect as an income effect is, however, inconsistent with the life-cycle model.[4] This is because in a life cycle context, consumption, including the consumption of leisure (and hence labor supply), depends on permanent income (wealth). Minor transitory changes in income, due to a recession, which have only minor effects on wealth, are therefore predicted to have only minor effects on labor supply. In fact, to the extent they can be anticipated, such transitory income changes have no effects on wealth and thus would have no effects on labor supply. Furthermore, the income-effect interpretation of the added-worker hypothesis requires that the implicit value of time of non-workers decline *relative* to expected market wages, which presumably also are declining during a recession.

Another, perhaps more plausible theoretical interpretation of the added-worker effect applies the household-production model (see Becker, 1965). This model assumes that unemployment has a large stochastic component (that is, it is difficult to predict accurately) and that the time one spouse contributes to household production is a substitute for the time of the other spouse. These assumptions imply that the unemployment of one spouse, which increases that spouse's input of time into household production, would lower the (shadow) value of the other spouse's time.[5] Thus, it is more likely that the other spouse will seek employment, and for a period, both spouses would be recorded as unemployed. If in fact this sort of effect were important empirically, it would mean that the increase in the measured unemployment rate would overstate the deterioration in labor market conditions because the loss of one job would result in two persons being recorded as unemployed.

Early empirical work by Long (1958) indicated that neither the added-worker nor discouraged-worker effect appeared to dominate and that labor force participation did not vary with the business cycle.

A study by Hansen (1961), covering the 1948-1959 period was one of the first to use gross-flow data. It found that entry into unemployment rose during recessions, but unlike the results in this paper, that labor force exit from unemployment also increased, approximately offsetting the increased entry. Thus, his results suggest that the number of unemployed is not affected by cyclical changes in entry and exit. However, Hansen did not analyze labor force entry and exit from employment. Since labor force entry into employment is likely to be procyclical, Hansen's results suggest net procyclical variation in the labor force participation rate.

More recent studies, such as those by Dernberg and Strand (1966), Barth (1968), Tella (1964), Kuch and Sharir (1978) find evidence, based on time-series macro data, supporting procyclical labor-force participation. These studies typically regress labor force participation rates on employment rates and various other variables and find a positive relationship between the employment rate[6] and the labor-force participation rate.

Time-series models like these have been used to estimate the number of discouraged workers, which is also referred to as "hidden" or "disguised" unemployment or the labor force "reserve".[8] Hypothetical "full employment" levels are set for the independent variables (that is, the employment rate) to predict the full-employment level of the labor force, and employment is assumed to be fixed at its actual level. The difference between the actual labor force and the hypothetical full-employment labor force is used as a measure of hidden unemployment or discouraged workers.

These studies *assume* that all the cyclical variations in the labor force participation function represent shifts in the aggregate labor force participation function, not movements along it. However, the hypothetical increase in the number of labor force participants would not necessarily result in a one-for-one increase in the number of the unemployed because employment is not determined solely by demand—it depends on supply factors also. Therefore, cyclical changes in the labor force participation rate do not necessarily represent shifts in the aggregate labor-supply curve instead of movements along it.

To the extent business cycles represent variations in the demand for labor, aggregate labor force participation should be procyclical. The labor force participation rate should be a positive function of the own wage *ceteris paribus* and hence procyclical because, as noted by Ben Porath (1973), even though wage increases have offsetting income (negative) and substitution (positive) effects on labor supply, they do not have any (own) income effect on labor force participation. That is, an increase in one's wage rate cannot make one more likely to leave the labor force or less likely to enter. This is especially true in terms of the life-cycle model, in which cyclical wage changes have no income effects. If the procyclical variation in the labor force participation rate simply reflects a positively sloping aggregate labor force participation function, then this has no implications for the normative concept of discouraged workers or the existence of a pool of "hidden" unemployed persons because the slope of the labor force participation function does not depend on unemployment.

Thus, procyclical labor force participation alone does not imply net discouragement or the existence of discouraged workers. Although net discouragement due to higher search costs, for example, may lead to procyclical labor force participation, labor force participation may vary procyclically for a variety of other reasons including a procyclical variation in actual wages (and perhaps even cyclical variation in implicit wages in the non-market sector).

In fact, results presented in Section III contradict the hypothesis that the cyclical variation in labor force entry and exit rates causes measured unemployment to be lower during recessions. These new results indicate that the cyclical variation in labor force exit and entry rates (which determine the labor force participation rate) cause the measured unemployment rate to be higher during recessions than it would be if these rates were constant. In addition, the results show that the high-search-cost interpretation of discouragement is inconsistent with the observed pattern of labor force exit from and entry into unemployment.

II. A Stock-Flow Model of the Labor Market

In this section, a three-state—employment, unemployment, and not-in-the-labor-force—Markov model of the labor market is described. Such a model, with its six possible transitions (that is, flows) among the three states, provides much more information about the cyclical behavior of the labor market than the three stocks of persons in each state, which have been the focus of most work on the cyclical behavior of the labor force.

One reason that flows do provide more information is that the labor force is dynamic not static. For example, in an average month, the number of persons who become unemployed by entering the labor force is almost as large as the number of employed persons who lose their jobs and become unemployed. Thus, labor force entry and exit and whether entry is into or exit is from unemployment or employment can have very large effects on unemployment and employment rates.

This dynamic nature of the labor market is one reason that aggregate unemployment and employment statistics may give very different pictures of

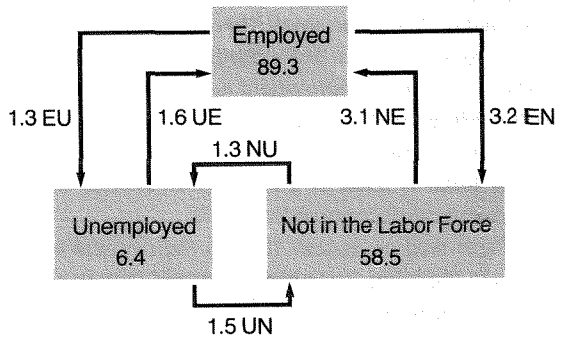
the cyclical variation in the labor market. In contrast, if the labor force were static and consisted of a given group of the population that either worked or were unemployed, then the unemployment rate would have a straightforward interpretation. High unemployment would mean a smaller probability of being employed for a member of the group. Furthermore, if the labor force group were a constant fraction of the population, employment and unemployment rates would be mirror images of the same phenomenon—high unemployment would imply a low likelihood of employment and vice versa. Aggregate statistics on the stocks of the population in various labor force statuses mask large counterbalancing flows. It is possible, however, to analyze these flows and their relation to the stocks.

During the last ten years, the application of stock-flow analysis to the labor market has increased the ability to analyze, measure and interpret changes in aggregate unemployment and employment.[9] It can be shown that employment and unemployment rates are the outcomes of a process related to the decisions of employers and individuals, both in and out of the labor force, regarding labor market transitions between employment, unemployment and not-in-the-labor-force.

Monthly flows among these three states are available from unpublished data from matched Current Population Surveys.[10] Some researchers have been concerned that reported flows may be biased because of possible selective attribution from the matched sample and selective entry in the special matched sample required to estimate the flows.[11] Such a bias would be especially important for the analysis in this paper if selective attrition and entry varied with the business cycle. However, we have employed a statistical method of adjusting the flow data to make it more consistent with the full-sample data and to control partially for possible selective attribution and entry bias over the business cycle. (This method, originally suggested by Smith and Vanski, 1978, is described in Keeley, 1984). The results in this paper are not sensitive to this adjustment process. The flows were also seasonally adjusted using the Census Department's "X11" seasonal adjustment program.

A depiction of a stock-flow model of the labor market is presented in Figure 1. At any given time, every individual is in only one of three employment

Figure 1
A Stock-Flow Model of the Labor Market
(in Millions of Persons, Average Monthly Flows 1969–1984)



status categories and can change status by leaving his or her current state and moving to one of the other two states. An unemployed person, for example, can either become employed or drop out of the labor force. In Figure 1, average monthly flows among three employment status categories and average monthly stocks in these categories for January 1968 through March 1984 are presented. These data show the highly dynamic nature of the labor market. For example, in the "average" month, 3.1 million unemployed persons (48 percent of the unemployed), either found employment (1.6 million) or dropped out of the labor force (1.5 million), while 2.6 million other persons became unemployed.

Stock-flow data, like those in the figure, can be used to calculate the monthly transition probabilities of any of the six possible transitions. The monthly transition probability, for example, between unemployment and employment is defined as the number of initially unemployed persons (in month t) who subsequently (in month t+1) find employment, divided by the total number of initially unemployed persons.

If we denote the states of employment, unemployment, and not-in-the-labor-force as E, U, and N, respectively, the monthly Current Population Survey can be used to compute the Markov matrix of transition probabilities, P_t for month t, where:

$$P_t = \begin{bmatrix} ee_t & eu_t & en_t \\ ue_t & uu_t & un_t \\ ne_t & nu_t & nn_t \end{bmatrix} \qquad (1)$$

and where ij_t is the monthly probability of transition from state i to state j in month t. Although this matrix has nine elements, there are only six independent numbers since ee, for example, equals 1-eu-en. Given an initial distribution of the population in month t (E_t, U_t, N_t), (where E_t, for example, is the fraction of the population employed), the distribution in the next month t+1 is given by:

$$(E_t, U_t, N_t)\, P_t = (E_{t+1}, U_{t+1}, N_{t+1}) \qquad (2)$$

Applying equation (2) recursively, the distribution of the population at any moment, T, is given by:

$$(E_o, U_o, N_o)\, P_o\, P_1 \ldots P_{T-1} = (E_T, U_T, N_T) \qquad (3)$$

Thus, the employment-status distribution of the population at any moment in time is completely determined by the initial distribution of the population and the matricies of monthly transition probabilities. Thus, any *changes* in the distribution are entirely determined by the monthly transition probabilities and changes in monthly probabilities.

Since each element of the P_t matrix is greater than zero, it can be shown that a steady-state distribution of the population among the three employment states exists that is independent of the initial distribution. The steady-state distribution has the property that

$$(E_s, U_s, N_s)P = (E_s, U_s, N_s) \qquad (4)$$

where (E_s, U_s, N_s) is the steady-state distribution associated with a particular transition matrix P. Thus, given a transition matrix P that does not vary over time, the steady-state distribution (E_s, U_s, N_s) will result eventually.

The steady-state distribution is of interest, not because the labor market is necessarily ever in steady-state equilibrium, but because the steady state indicates where the labor market is headed if the current transition probabilities were to remain constant. Large differences between the current distribution and the steady state are expected to occur when the labor market transition probabilities change rapidly, as during the beginning of a recovery, for example. In fact, the steady-state unemployment rate generally does exceed the actual rate during recessions, when rates are rising, and does fall below the actual rate during expansions, when rates are declining.

Transition Probabilities, Unemployment and Employment Rates

As equation (3) indicates, cyclical variations in employment or unemployment can be explained in terms of cyclical variations in transition rates. Below, the mathematics of the effects of changes in transition rates on unemployment and employment are explored.

The unemployment rate, u, is given by

$$u = \frac{U}{U+E} \qquad (5)$$

where U is the fraction of the population unemployed and E is the fraction of the population employed.

To analyze how the unemployment rate varies when a transition probability changes in the short-run (one period), equation (2) is substituted into the total differential of 5:

$$du = \frac{(U+E)(Edeu - Udue)}{(U+E)^2}$$

$$\frac{+\, EU\,(den - dun) + ENdnu - UNdne}{(U+E)^2} \qquad (6)$$

The first term in brackets shows how changes in flows within the labor force (eu and ue) affect unemployment, while the second term in brackets shows how changes in labor force entry and exit probabilities (en, un, nu and ne) influence unemployment. Equation (6) shows that a change in any one of the six transition probabilities can affect the unemployment rate directly.

Changes in Flows within the Labor Force

Changes in either of the two rates (eu or ue) of transition within the labor force, while labor force entry and exit rates (en, un, nu and ne) are held constant, do not affect the size of the labor force or the labor force participation rate directly (since N does not depend on eu or ue). Changes in these two rates do affect the unemployment rate in a straightforward manner consistent with the common interpretation given to the unemployment rate.

Increases in the probability of becoming employed if unemployed (ue), or reductions in the probability of becoming unemployed if employed (eu), both result in short-run decreases in the unemployment rate. Effects on the employment rate are

basically effects on E (dE = −Edeu + Udue) since the denominator of the employment rate (the population) is not affected by changes in either of these rates. Thus, increases in ue or decreases in eu increase the employment rate (since dE = -dU). The effects on the steady-state unemployment and employment rates have the same sign as these one-period effects.[12]

Changes in Labor Force Entry and Exit Rates

The effects of changes in the four labor force entry and exit probabilities, holding constant the within-labor-force transition probabilities, are given by the second term in brackets in equation (6).

Changes in labor force entry and exit rates can affect the fraction of unemployed and employed persons (stocks) in the population as well as the labor force participation rate. Increased flows from those not in the labor force into unemployment (nu), other things equal, increase the unemployment rate, while increased flows into employment (ne) reduce it. Also, reduced labor-force exits from unemployment (un) increase the unemployment rate while reduced labor-force exits from employment (en) reduce it. However, in a given month, the employment rate is positively affected only by increased labor force entry into employment (ne) or reduced labor force exit from employment (en), and is not affected by entry into or exit from unemployment (nu or un). This means that the unemployment rate would vary more over the business cycle than the employment rate if nu and un vary over the business cycle in such a way that their effects on the unemployment rate do not offset each other. The steady-state effects of changes in these rates on unemployment also can be shown to have the same signs as the short-run effects.[13]

The labor force participation rate is also affected by changes in all four labor force entry and exit probabilities. The labor-force participation rate is given by:

$$L = \frac{E + U}{E + U + N} \qquad (7)$$

Totally differentiating equation (7) and substituting the entry and exit transition equations gives:

$$dL = \frac{-den\,(E_0^2 + 2E_0N_0) + dne\,(2N_0^2 + 2E_0N_0)}{(E + U + N)^2} \frac{-dun\,(2N_0U_0 + E_0U_0) + dnu\,(2N_0^2 + E_0N_0)}{(E + U + N)^2} \qquad (8)$$

Equation (8) shows that increased labor-force entry into either employment (ne) or unemployment (nu) increases the labor force participation rate. However, equation (6) shows that increased labor force entry into employment (ne) reduces the unemployment rate while increased entry into unemployment (nu) increases the unemployment rate. Similarly, increased labor force exit from either employment (en) or unemployment (un) reduce the labor force participation rate while the former (en) increases the unemployment rate and the latter (un) reduces it. Thus, there is no simple correspondence between changes in labor force participation and unemployment.

As discussed in Section I, many authors have argued that labor force participation falls during recessions and that, as a result, unemployment is lower than it otherwise would be. The preceding analysis suggests that this argument is too simplistic. Whether unemployment is lower when the labor force participation rate is lower depends on the source of the decline in labor force participation. If labor force participation declines because of increased flows out of unemployment (un) or reduced flows into unemployment (nu), changes consistent with the search-cost interpretation of the discouraged-worker hypothesis, then it is true that lower labor force participation is associated with lower measured unemployment. If, on the other hand, lower labor-force participation were due to increased flows out of employment (en) or reduced flows into employment (ne), measured unemployment would be higher. The resolution of these issues is primarily an empirical matter.

III. Empirical Results

Below, estimates of the six monthly labor force transition probabilities for the January 1968 through March 1984 period are presented. First, we consider the cyclical variation in flows within the labor force (eu and ue) and then look at labor force entry and exit. The cyclical variation of flows within the labor force conform to the patterns expected while flows between unemployment and not-in-the-labor-force are the opposite of those predicted by the widely accepted discouraged-worker hypothesis.

Flows within the Labor Force

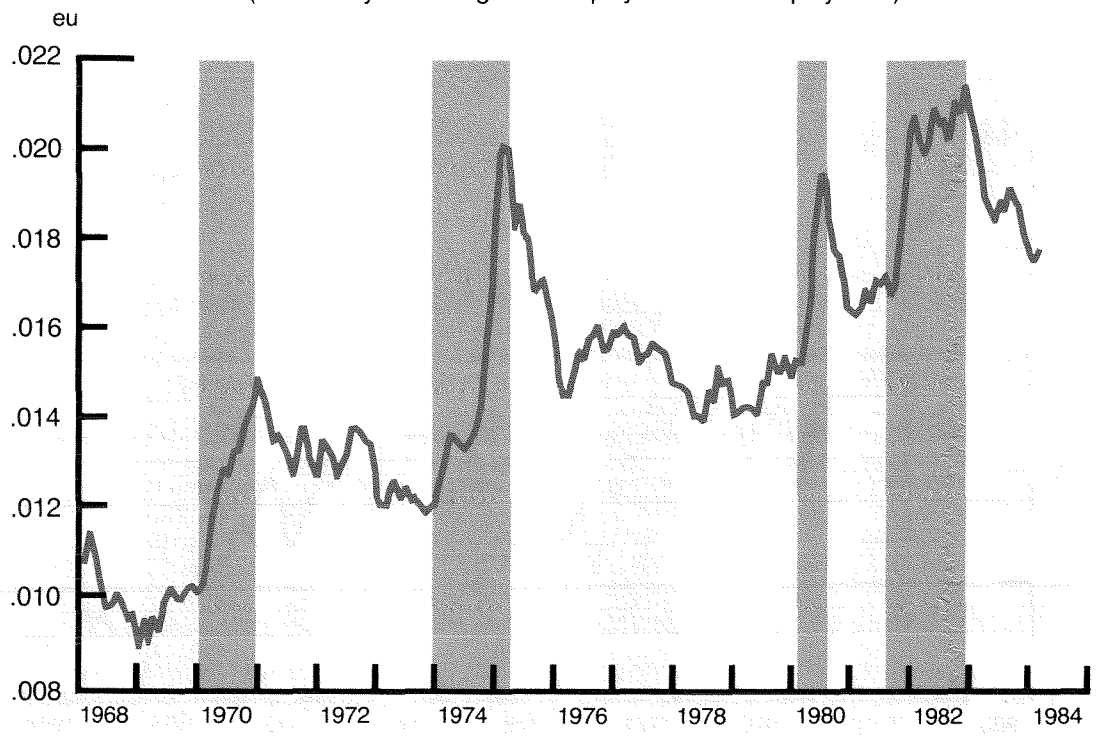
During a recession, declines in aggregate output lead to increased layoffs as employers reduce the sizes or rates of growth of their workforces. This results in an increase in the probability that an employed person will become unemployed (eu) because a large proportion of workers who are laid-off become unemployed[14] and only a very small proportion leave the labor force. Very few laid-off workers leave the labor force because they either search for another job or wait to be recalled to their previous job and because most laid-off workers are eligible for unemployment compensation, receipt of which is conditional on remaining in the labor force.[15]

The data in Chart 1 on monthly transition probabilities between employment and unemployment (eu) confirm this notion, showing sharp increases in the probabilities of workers becoming unemployed during recessions and declines during expansions. For example, the probability of becoming unemployed if employed rose almost 25 percent from peak to trough during the 1981-1982 recession, and there was almost a 75-percent increase during the 1973-1974 recession.

Chart 1

Flows Within the Labor Force (EU)

(Probability of Moving from Employment to Unemployment)



(Seasonally Adjusted 3-month Moving Averages)

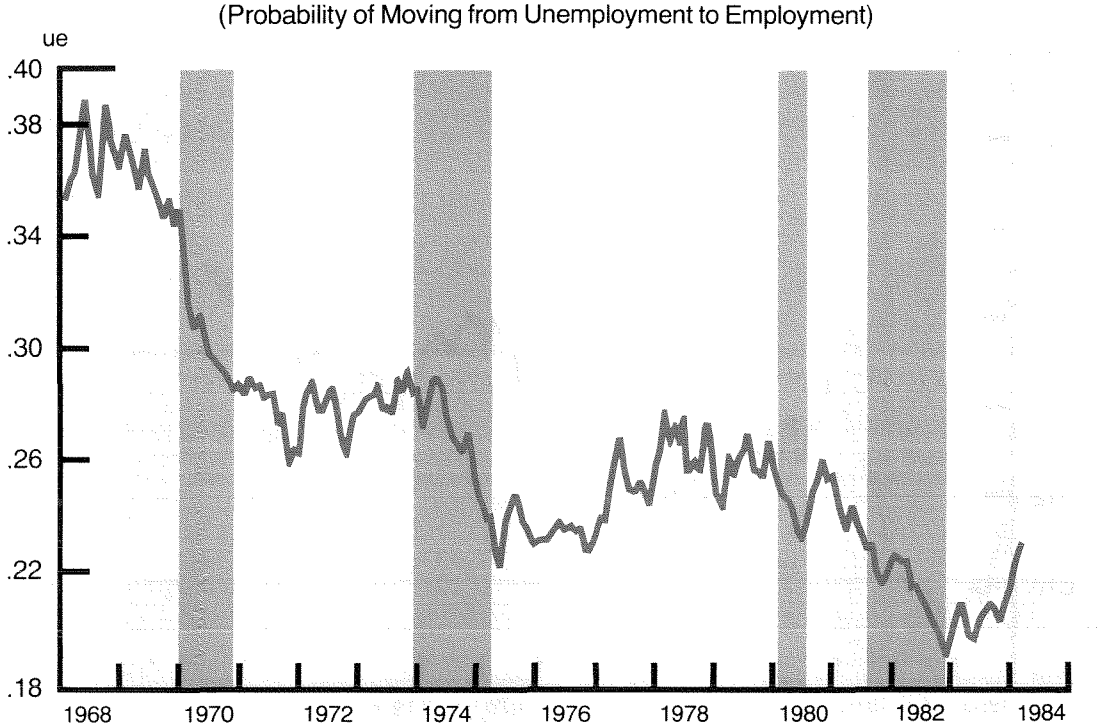
During a recession, the probability that an unemployed person finds employment is expected to decline. This is because it is less likely that a job offer will exceed the searcher's minimum reservation wage (and be acceptable) and because a searcher will receive fewer job offers.

The data in Chart 2 confirm that the probability of finding employment if unemployed (ue) does vary strongly with the business cycle. For example, during the 1981-1982 recession, this rate declined dramatically from about .25 per month to .20 from peak to trough. This implies that the expected duration of unemployment for those who found employment increased from 4 to 5 months. During the 1973-1974 recession, the rate declined from about .31 to .23—or over 50 percent.

These changes in flows within the labor force[16] (increases in the probability of becoming unemployed if employed and reductions in the probability of becoming employed if unemployed during recessions) are consistent with the normal interpretation given to changes in the unemployment rate. A higher unemployment rate is typically taken to mean more job losses resulting from layoffs and more difficulty in finding employment if unemployed—and both of these factors increase the unemployment rate and decrease the employment rate.

The unemployment rate, however, increases more than either factor alone because the number of unemployed is positively affected by both factors and the size of labor force is not affected by either. If, in fact, these two transition probabilities were the only ones affected by the business cycle, then the unemployment rate would be a good measure of labor market conditions, although one could not determine whether changes in one or both of the transition rates were affecting the unemployment rate. In the next section, it is shown that a large fraction of the cyclical variation in the unemployment rate is *not* explained by the cyclical variations in these two within-labor-force rates. In fact, changes in labor force entry and exit rates affect the

Chart 2
Flows Within the Labor Force (UE)
(Probability of Moving from Unemployment to Employment)



(Seasonally Adjusted 3-month Moving Averages)

unemployment rate significantly and make its interpretation less straightforward.

Labor Force Entry and Exit

The net effects of labor force entry and exit over the business cycle determine how the labor force participation rate varies. In Chart 3, the de-trended, seasonally adjusted labor force participation rate for the 1968-1984 period is plotted. The labor force participation rate generally rises during expansions and declines during recessions although the magnitude of the cyclical variation is very small—less than 1 percentage point.[17]

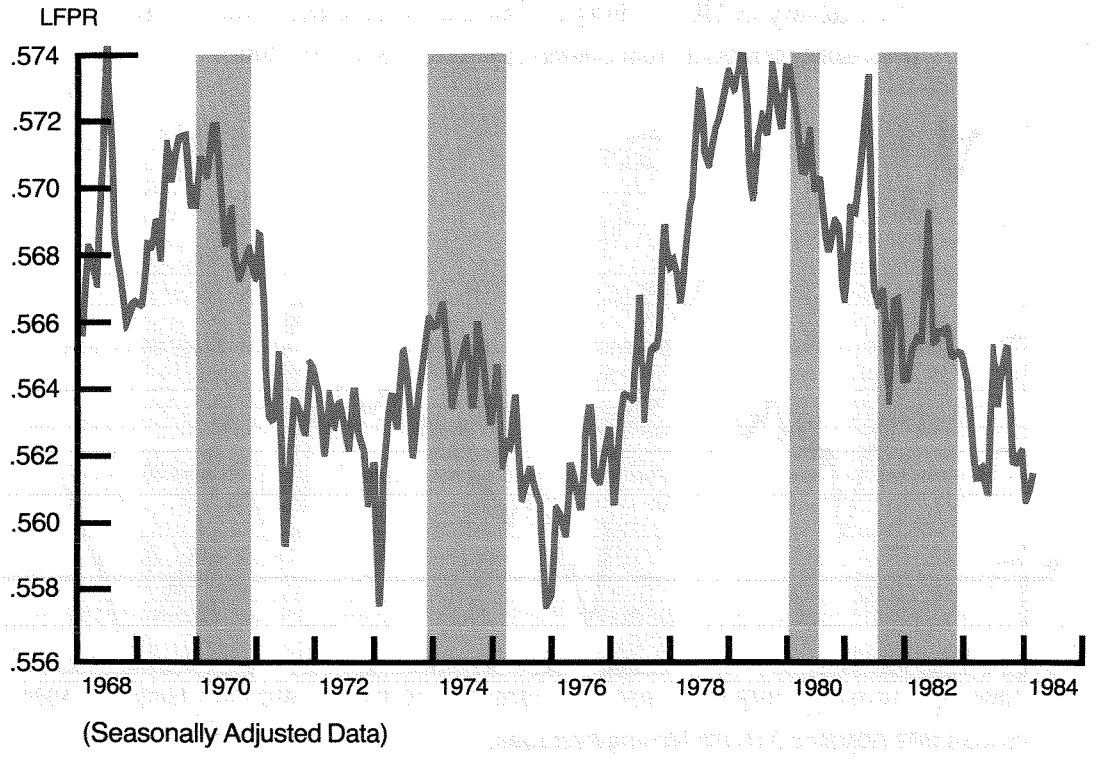
This procyclical variation in the labor force participation rate has been taken as evidence in support of the discouraged-worker hypothesis and evidence that the discouraged-worker effect must dominate the added-worker effect if there is one. However, one implication of the discouraged-worker hypothesis is that the probability an unemployed person gives up searching for a job and drops out of the labor force rises during recessions, when labor market conditions are deteriorating. This is because the costs of search have increased and the searcher's expected wage has declined relative to the implicit non-market wage. Below, direct evidence that is inconsistent with this implication of the discouraged-worker hypothesis is presented.

In Chart 4, the probability of becoming a discouraged searcher—that is, the monthly probability that an unemployed person drops out of the labor force (un)—is plotted over time. During each of the four recessions since 1968, the probability of being a discouraged searcher has *declined* dramatically; during each of the expansions, it has generally increased. For example, during the last recession, the probability declined by almost 25 percent. This procyclical behavior of the probability of becoming a discouraged searcher is just the opposite of what the discouraged-worker hypothesis predicts.

One reason that the probability of becoming a discouraged searcher may decline during recessions

Chart 3

Detrended Labor Force Participation Rate



is that the composition of the unemployed changes. During a recession, relatively more workers who are permanently attached to the labor force are laid off. These workers are very unlikely to give up their search and drop out of the labor force because of their attachment to the labor force, because many are eligible for unemployment compensation, receipt of which is conditional on job search, and because many are only temporarily laid off. This change in composition could explain the decline in the probability of becoming a discouraged searcher during a recession even if any given person were more likely to become discouraged.

To test the hypothesis that compositional changes in the stock of the unemployed explain the cyclical variation in the probability of becoming a discouraged searcher, the probability of becoming a discouraged searcher is regressed on capacity utilization (to measure cyclical effects), time and time squared (to allow for time trends) and lagged flows from employment and not-in-the-labor-force to unemployment relative to lagged unemployment (to measure compositional effects).

The results are:

$$\begin{aligned} un = {} & -.20^{***} + .0062^{***}CU \\ & \quad (.04) \qquad (.00039) \\ & - 5.9E{-}5^{***}TIME \\ & \quad (.72E{-}5) \\ & + 4.9E{-}9^{***}TIME^2 \quad -.037^{**}EULAG \\ & \quad (.54E{-}9) \qquad\qquad (.018) \\ & + .12^{***}NULAG \\ & \quad (.040) \end{aligned}$$

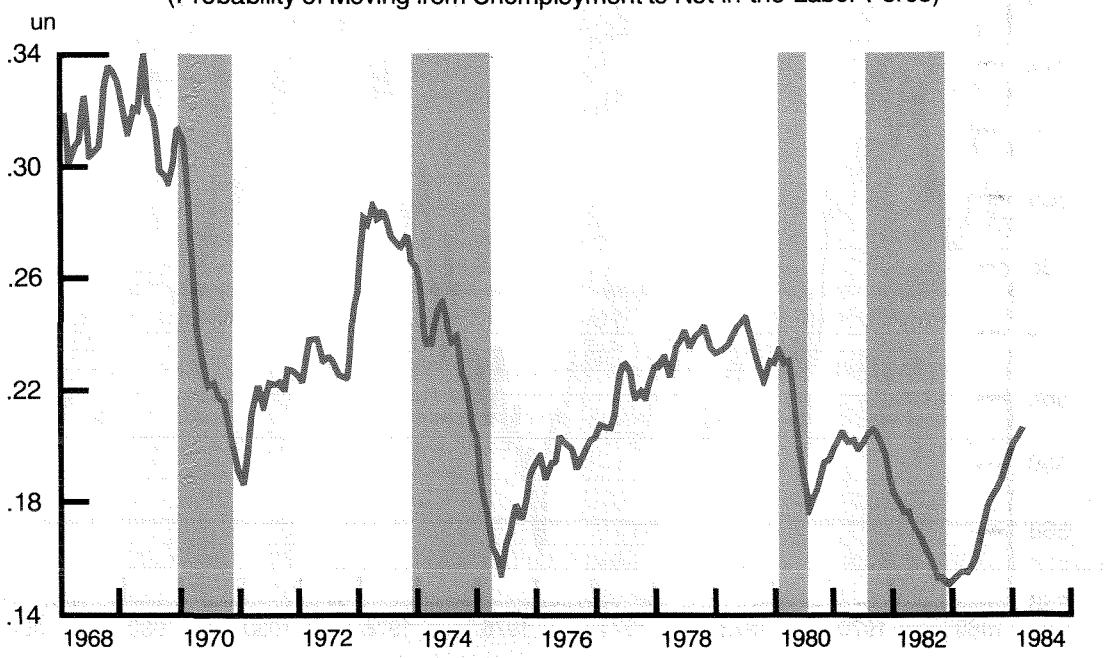
$$\text{where: } EULAG = \sum_{i=1}^{4} EU_{-i} \Big/ \sum_{i=1}^{4} U_{-i} \Big/ 4$$

$$NULAG = \sum_{i=1}^{4} NU_{-i} \Big/ \sum_{i=1}^{4} U_{-i} \Big/ 4$$

Chart 4

Probability of Becoming a Discouraged Searcher (UN)

(Probability of Moving from Unemployment to Not-in-the-Labor-Force)



(Seasonally Adjusted 3-month Moving Averages)

The results show that larger previous flows from employment to unemployment relative to the previous level of unemployment (EULAG) cause the probability of becoming a discouraged searcher to fall as expected. Increased previous flows from out-of-the-labor-force (NULAG) lead to higher probabilities of becoming a discouraged searcher. This may be because such persons are less permanently attached to the labor force than previously employed persons.

Furthermore, the regression indicates that there is still a strong procyclical behavior in the probability of becoming a discouraged searcher (because the coefficient of CU is positive and significant) even controlling for compositional changes in the stock of the unemployed. In fact, the coefficient of CU falls only slightly from .0068 to .0062 when the lagged flow variables are introduced. This suggests that some underlying behavioral factor must account for the cyclical pattern and not just compositional changes.

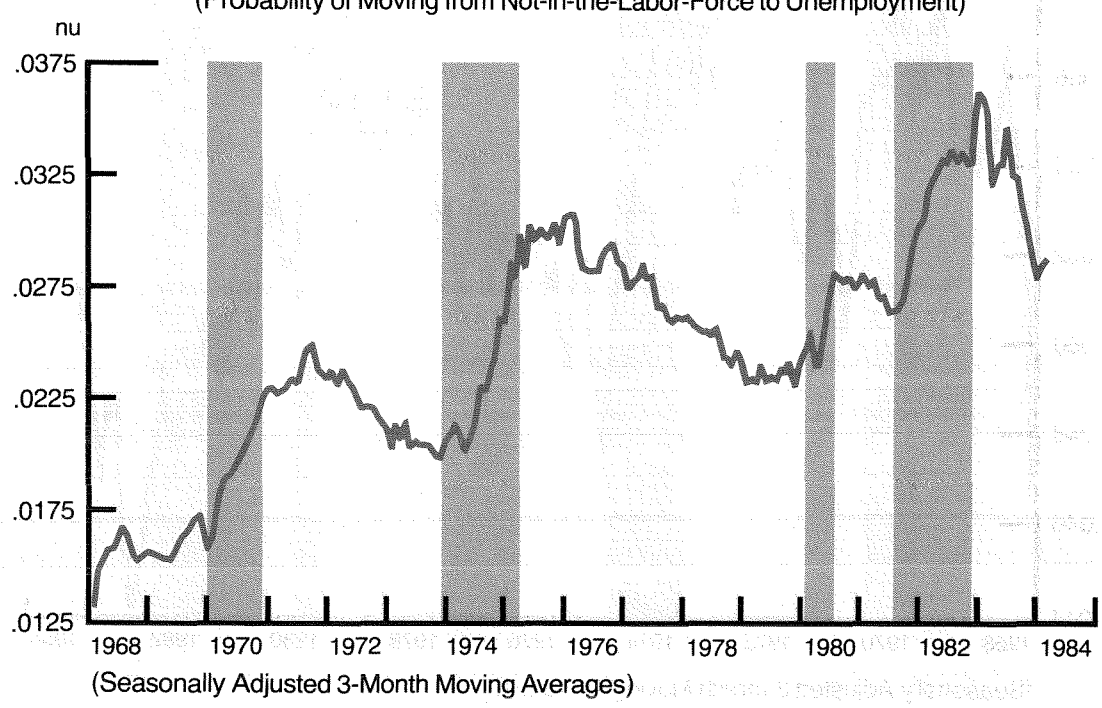
If the increasing costs of search discourage job seekers during recessions, persons not in the labor force should be less likely to enter the labor force to search for employment (that is, to become unemployed). The cyclical variation in this probability is depicted in Chart 5. This chart shows that the probability of entering the labor force to search for employment, in fact, rose in each of the four recessions since 1967 and generally declined during expansions—just the opposite of what the search-cost interpretation of the discouraged-worker hypothesis would predict. In fact, this cyclical behavior suggests that the added-worker effect dominates decisions to enter the labor force to search for employment.[18]

Thus, the number of unemployed is greater during recessions because of increased entry into unemployment by persons not in the labor force and reduced labor force exit from unemployment than it otherwise would be if these two sorts of labor force entry and exit rates were constant. Furthermore, the cyclical behavior of these two labor force entry and exit probabilities is inconsistent with the search-

Chart 5

Probability of Entering the Labor Force to Search for Employment (NU)

(Probability of Moving from Not-in-the-Labor-Force to Unemployment)



cost interpretation of the discouraged-worker hypothesis and provides support for the added-worker hypothesis.

It is unclear what the predictions of the discouraged-worker hypothesis are regarding how flows from between not-in-the-labor-force and employment (ne) should vary over the business cycle because changes in a person's search costs would not directly affect this transition. However, one would expect flows from out-of-the-labor-force to employment (ne) to parallel flows from unemployment (ue) to employment because economic factors that increase the probability that unemployed workers will find acceptable employment should also increase the likelihood that persons not in the labor force will accept employment.

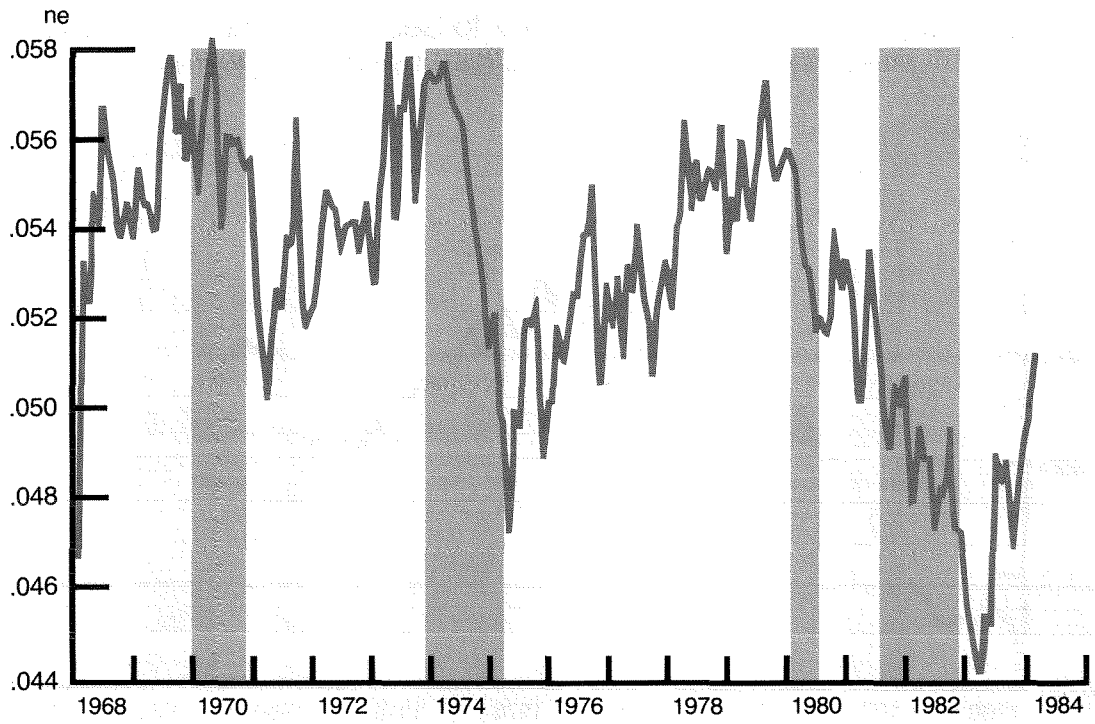
In Chart 6, the probability of becoming employed if not in the labor force (ne) follows a strong procyclical pattern—falling during recessions and rising during expansions—confirming the notion that flows from out-of-the-labor-force to employment parallel flows from unemployment to employment. (In fact, detrended ne and ue have a correlation coefficient of .36.) On the one hand, this pattern simply may be due to an increase in the probability of a market wage offer (which was generated without search) exceeding the value of time in the home as economic conditions improve. On the other hand, this pattern would be consistent with higher search costs and discouragement if most of the transitions directly to employment were really comprised of transitions to unemployment (nu) followed almost immediately by transitions to employment (ue). An nu transition followed by a ue transition would be recorded as an ne transition if the length of time spent unemployed were too short to be recorded by the monthly CPS.[19]

The cyclical variation in labor force entry into unemployment (nu) and employment (ne) have largely offsetting effects on the size of the labor

Chart 6

Probability of Entering the Labor Force and Becoming Employed (NE)

(Probability of Moving from Not-in-the-Labor-Force to Employment)



(Seasonally Adjusted 3-month Moving Averages)

force, although the net entry is somewhat higher during recessions.[20] Thus, the behavior of the net labor force entry (ne + nu) does not support the idea that the discouraged-worker effect dominates entry decisions. However, both the increase in entry into unemployment (nu) during recessions and the decrease in entry into employment (ne) increase the measured unemployment rate.

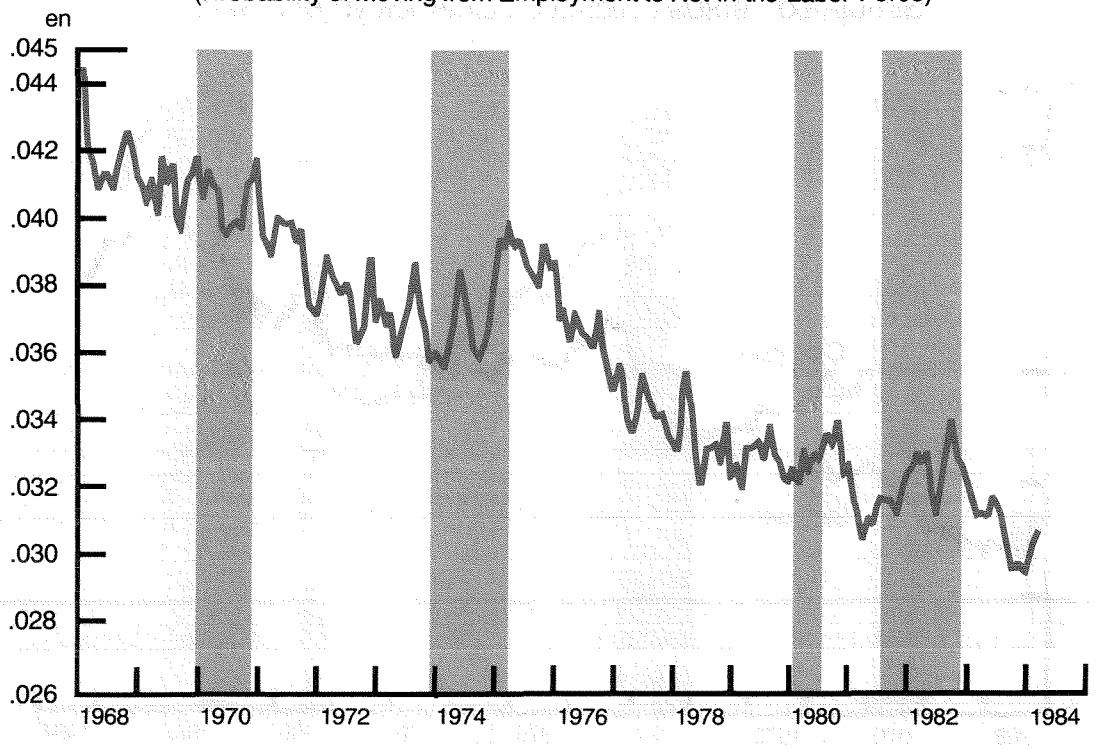
Labor force exit from employment (en) also varies with the business cycle. In Chart 7, the probability of labor force exit from employment is plotted. In general, it moves countercyclically—rising during recessions and falling during expansions. This is the sort of pattern expected since during recessions the compensation from employment declines relative to the implicit returns from nonmarket pursuits. Thus, the probability of leaving the labor force from employment (en) should follow fairly closely the probability of becoming unemployed if employed (eu). In fact, detrended en and eu have a correlation coefficient of .48. The cyclical pattern of this flow, like that of ne, is also consistent with (but does not imply) a discouraged-worker effect. This is because some persons who lose their jobs may drop out of the labor force rather than seek employment because of high search costs associated with the recession.

As discussed earlier, the labor force exit probability from unemployment (un) has just the opposite cyclical pattern—it falls during recessions and rises during expansions. Thus, the net effects of labor force exit from unemployment and employment, like the net effects of ne and nu on labor force entry, are largely offsetting, although net exit is somewhat higher during recessions.[21] Although the net effects of these two types of labor force exit are small, the increase in exit from employment (en) and the decrease in exit from unemployment (un) during recessions both cause the measured unemployment rate to rise.

Chart 7

Probability of Labor Force Exit From Employment (EN)

(Probability of Moving from Employment to Not-in-the-Labor-Force)



(Seasonally Adjusted 3-month Moving Averages)

Even though both labor force entry and exit move countercyclically, labor force participation has a slight procyclical variation because the countercyclical variation in exit is slightly larger than the countercyclical variation in entry. However, very small changes in their relative magnitudes could easily lead to a countercyclical variation in the labor force participation rate.

A summary of how these four labor force exit and entry probabilities vary over the business cycle is presented in Table 1. The cyclical variation in each of these four probabilities leads to greater measured unemployment during recessions and lower unemployment during expansions than would otherwise occur if these probabilities did not vary over the business cycle.

In Chart 8, the variation in the actual unemployment rate over several recent business cycles is compared to how it would vary if labor force exit and entry rates were held constant at their mid-cycle levels[22] (the simulated rate) but with flows within the labor force (eu and ue) taking their actual values. This chart shows that a substantial proportion of the cyclical variation in the actual unemployment rate is due to variation in labor force exit and entry probabilities. Furthermore, the very high unemployment rates that occurred in the 1973-74 and 1980-82 recessions were partly due to cyclical changes in exit and entry probabilities, not changes in the probability of becoming unemployed if employed (eu) or the probability of becoming employed if unemployed (ue). These results show that even though the net effect of the cyclical variation in these four exit and entry probabilities leads to a slight procyclical variation in the labor force participation rate, the cyclical variation in labor force entry and exit rates leads to higher measured unemployment rates during recessions.

Chart 8

Simulated Versus Calculated Unemployment Rate

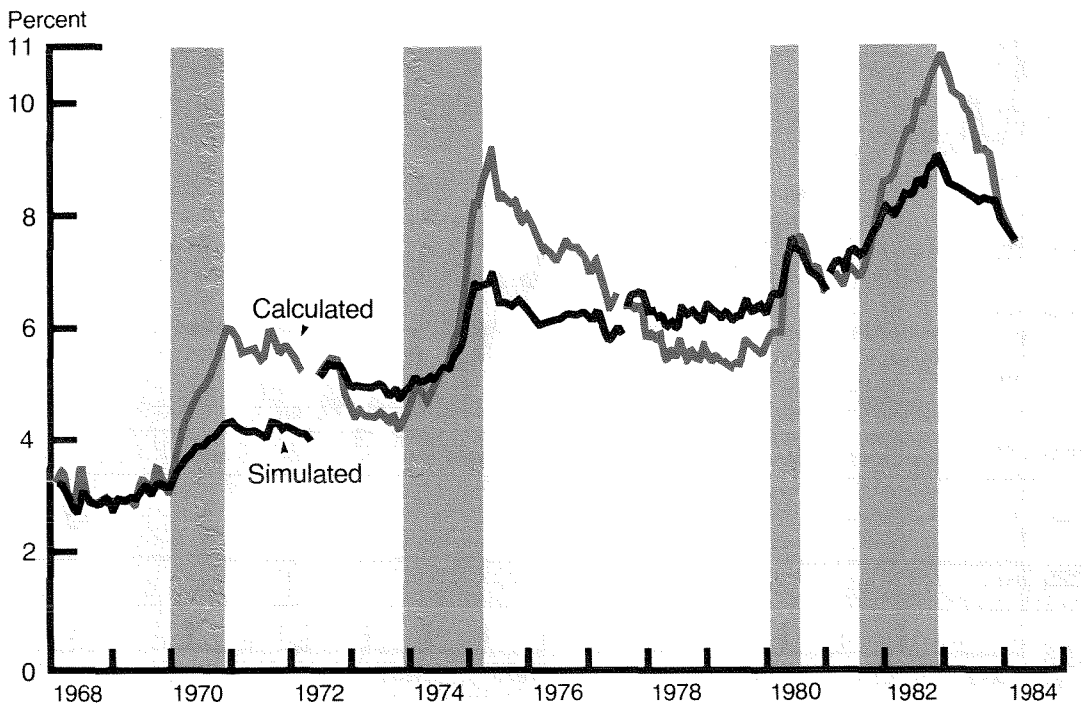


Table 1
Labor Force Entry and Exit Probabilities
Over the Business Cycle

Probability of Labor Force Exit or Entry	Change in Probability During Recession	Change in Probability During Expansion	Effect on the Unemployment Rate During a Recession
un Labor force exit from unemployment	−	+	+
nu Labor force entry to search for employment	+	−	+
en Labor force exit from employment	+	−	+
ne Direct labor force entry into employment	−	+	+
Net labor-force entry $(ne + nu)$	+	−	
Net labor-force exit $\left(\frac{E}{E+U}\,en + \frac{U}{E+U}\,un\right)$	+	−	

IV. Summary and Conclusions

One interpretation of the discouraged-worker hypothesis is that search costs rise during recessions and cause an increase in the probability that an unemployed person will drop out of the labor force (un) and a decrease in the probability that a person not in the labor force will enter the labor force to search for unemployment (nu). The evidence presented in this paper is inconsistent with this interpretation of the discouraged-worker hypothesis. The likelihood of becoming a discouraged searcher—giving up job search and leaving the labor force—actually declines during recessions. This is just the opposite of what the conventional interpretation of the discouraged-worker hyopthesis predicts. Moreover, the probability of entering the labor force to search for employment (that is, to become employed if previously not in the labor force) rises during recessions. This result is consistent with the added-worker, not the discouraged-worker hypothesis.

Labor force exit from employment (en) does vary countercyclically—being higher during recessions—and this might be consistent with the discouraged-worker hypothesis. During recessions some laid-off workers may drop out of the labor force rather than search for new employment because search costs are higher during recessions. However, increased labor force exit from employment during recessions also may reflect falling market wages relative to implicit values of time in the non-market sector, and this would not have any implications about discouraged workers. Similarly, the procyclical pattern of labor force entry directly to employment (ne) might also be consistent with the discouraged-worker hypothesis because the ne transition may be comprised of a nu transition followed by a ue transition, both of which might not be captured in the CPS data if the duration of unemployment were sufficiently short. However, a decline in market versus non-market wages also would explain the decline in direct labor force entry into employment during recessions.

Although there might be some eclectic interpretation of the discouraged-worker hypothesis that is consistent with the observed cyclical pattern of all four labor force exit and entry probabilities, the explanation of discouragement in terms of higher search costs during recessions is not. The conventional interpretation of the procyclical pattern of labor force participation as being due to increased rates of labor force withdrawal by unemployed workers (un) and reduced rates of entry to search for

unemployment (nu), is not consistent with the evidence presented in this paper.

The cyclical variation in labor force entry and exit rates cause the measured unemployment rate to vary much more over the business cycle—being higher during recessions and lower during expansions—than it would be if these entry and exit rates were constant and if the within-labor force transition rates took on their actual values. Moreover, the procyclical variation in labor force entry into (nu) and the countercyclical variation exit from unemployment (un) both cause the unemployment rate to be much higher during recessions than would be the case if they were constant. Because the variation in these two rates does not directly affect the employment rate, the unemployment rate has a much larger cyclical variation than the employment rate. This suggests that using only the unemployment rate to gauge labor market conditions may be misleading and that the employment rate may be a better indicator of labor market conditions.

Finally, the results of this paper cast doubt on the validity of the techniques commonly used to measure "hidden" unemployment, or the number of discouraged workers. Although the labor force participation rate does vary procyclically, this alone does not imply that unemployment during recessions is necessarily lower than it otherwise would be or that this variation can be used to measure the number of discouraged workers. The results in this paper suggest that during recessions some persons who report themselves to be out of the labor force would be employed if labor market conditions were better, and that there are also persons who report themselves as unemployed who would not be in the labor force if labor market conditions were better.

FOOTNOTES

1. For examples of recent articles see Clark and Summers (1979), Denton (1973), Marston (1976), Smith (1977), Toikka (1976), Kuch and Sharir (1978), Lundberg (1981), Lilien (1982), Wachter (1974), and Lucas and Rapping (1969). The very early work on this subject is Long (1958), Hansen (1961) and Woytinsky (1940). Some of the key papers reviewed by Mincer were Tella (1964), Strand and Dernberg (1964). Also see Dernberg and Strand (1966) and Barth (1968).

2. It should be noted that neither unemployment nor employment "rates" as commonly defined are rates of flow in a mathematical sense. Rather they are ratios of two stocks. A rate is a measure of a flow per unit time.

3. Lucas and Rapping (1969) attempt to test this hypothesis directly by including current actual wages as well as expected permanent wages as explanatory variables in a model of labor supply. Also, see Wachter (1974).

4. In a life-cycle labor-supply model estimated using micro-household data, Heckman and McCurdy (1980) find no labor-supply response to transitory income variations among married women.

5. The employment rate is the fraction of the population employed. The labor-force participation rate is the number of persons employed plus the number unemployed divided by the population. Equivalent regressions of employment on unemployment are also used in some studies.

6. Lundberg (1981) finds strong empirical support for this hypothesis using micro-household data from the Seattle and Denver Income Maintenance Experiments.

7. Since the labor force is the sum of the employed and unemployed, such a procedure leads to an upwardly biased estimate if there are measurement errors in employment. A positive measurement error increases both the left- and right-hand side variables and a negative measurement error decreases both variables. This leads to a positive coefficient of the employment-rate variable even if the true effect were zero. More importantly, some of these studies omit trend variables, and unless trend variables are included in the regression, this procedure does not distinguish the effects of cyclical variations in employment rates from permanent changes. For example, during the last 20 years there has been a sharp increase in both female labor-force participation rates and employment rates.

8. See, for example, Flaim (1973), Gastwirth (1973), Dernberg and Strand (1966), and especially Mincer (1973) for a review of this literature.

9. Marston (1976) was one of the first to show the usefulness of stock-flow data in explaining demographic differences in unemployment rates. He showed that much of the observed demographic differences in unemployment rates is *not* due to differences in the rate of finding employment once unemployed, but is due to differences in the rate of entering unemployment. Smith (1977, 1978), Toikka (1976), and Toikka et al. (1977) have also used these data in time-series models.

10. These data were originally published by the Department of Labor from May 1948 through December 1952. Publication ceased then because estimates of unemployment and employment from the restricted sample required to compute the flows (persons who complete two consecutive surveys) were somewhat different than estimates from the full sample. However, because of requests from researchers, publication of the gross-flow data resumed in 1982.

For a description of these data see Smith (1978), and the U.S. Department of Labor (1980, 1982). One reason for differences between gross-flow estimates and the full-sample estimates is what is called "rotation group bias". Rotation group bias occurs when survey responses depend

on whether one has been recently surveyed. For a discussion of this problem see Bailar (1975). The CPS sample is comprised of eight "rotation" groups. A household is interviewed for four consecutive months, is off for eight months and then is interviewed for four more consecutive months. Groups 1 and 5 (those not surveyed recently) report higher unemployment, perhaps because of a learning process associated with being repeatedly served. If so, the subsample used to compute the flows (groups 2–4 and 6–8) provides more accurate estimates. However, a priori it is unclear whether the full sample or the matched sample provide estimates with less bias.

11. That is the flows are estimated from a sample of identical persons who complete the two consecutive months. Thus, any persons in the sample the first month who do not complete the second month's survey and vice versa are excluded.

12. It can be shown that the steady-state unemployment rate is given by:

$$u = \frac{a}{a+b}$$

where: $a = eu + (1 - \frac{ne}{ne+nu})en$

and $b = ue + (\frac{ne}{ne+nu})\,un$

Taking the partial derivatives of (u), gives:

$$\frac{du}{deu} = \frac{b}{(a+b)^2} > 0$$

$$\frac{du}{due} = \frac{-a}{(a+b)^2} < 0$$

thus proving the long-run effects have the same sign as the short-run effects. It can be shown that the effects on the steady-state employment rate are of opposite sign as expected.

13. The effects of changes in these rates on the steady-state unemployment rate are given by:

$$\frac{du}{dun} = \frac{-a\,\frac{ne}{ne+nu}}{(a+b)^2} < 0$$

$$\frac{du}{den} = \frac{b(1 - \frac{ne}{ne+nu})}{(a+b)^2} > 0$$

$$\frac{du}{dnu} = \frac{\frac{ne\ en}{b\ (ne+nu)^2} + \frac{ne\ un}{a\ (ne+nu)^2}}{(a+b)^2} > 0$$

$$\frac{du}{dne} = \frac{-\frac{b\ nu\ en + a\ nu\ un}{(ne+nu)^2}}{(a+b)^2} < 0$$

Thus, the steady-state effects have the same signs as the short-run effects.

14. Only about 20 percent of the unemployed who were employed immediately preceding their unemployment spell quit their jobs, presumably to look for better ones.

15. In addition, the unemployment insurance system, by not being fully experience rated, provides an incentive for employers to respond to cyclical changes in demand through temporary layoffs as opposed to wage reductions (see Topel (1983), Feldstein (1973)). Lilien (1982) presents evidence that a substantial fraction of cyclical unemployment is due to shifts of employment demand among different sectors of the economy. This also suggests that during recessions eu should rise because of layoffs by employers experiencing declines in demand and ue should fall because of the time needed for laid-off workers to relocate.

16. As another test of the response of flows within the labor force to changes aggregate demand, eu and ue are regressed on time (in days), time squared, and capacity utilization (CU). The results are:

$$eu = \underset{(.0019)}{.033^{***}} - \underset{(.000019)}{.00035^{***}}\ CU + \underset{(.37E-6)}{2.6E-6^{***}}\ TIME + \underset{(.31E-10)}{1.4E-10^{***}}\ TIME^2$$

$$ue = \underset{(.035)}{.23^{***}} + \underset{(.00036)}{.0037^{***}}\ CU - \underset{(.67E-5)}{8.1E-5^{***}}\ TIME + \underset{(.51E-9)}{5.4E-9^{***}}\ TIME^2$$

***significant at the 1% level.

These regressions confirm that an increase in capacity utilization leads to a statistically significant increase in the probability that unemployed persons will find employment and a statistically significant decrease in the probability that an employed person will become unemployed.

17. Similarly, a regression run over the '68-'84 period shows that the labor-force participation rate is positively related to capacity utilization:

$$LFPR = \underset{(.0059)}{.54^{***}} + \underset{(.000060)}{.00044^{***}}\ CU + \underset{(.11\ E\text{-}6)}{5.14\ E\text{-}6^{***}}\ TIME + \underset{(.96E-10)}{3.8^{***}\ E\text{-}10}\ TIME^2$$

However, this regression indicates that a 10 percentage point increase in the capacity utilization rate increases the labor-force participation rate by only .4 percentage points. During this analysis period, the maximum range of capacity utilization was 20 percentage points, thus indicating that the maximum magnitude of the cyclical effect is very small. (These results imply an .8 percentage-point variation from minimum to maximum due to cyclical effects whereas during this period the labor-force participation rate actually increased 5 percentage points.)

18. In addition, the probability of labor-force entry to search for employment (nu) was regressed on capacity utilization, time, and time squared to test this hypothesis more formally. The results were:

$$nu = \underset{(.0029)}{.053^{***}} - \underset{(.000030)}{.00062^{***}}CU + \underset{(.56E-6)}{6.6E-6^{***}}TIME - \underset{(.47E-10)}{4.3E-10^{***}}TIME^2$$

Thus, this regression confirms a strong, statistically significant countercyclical movement of the probability of entering the labor force to search for employment.

19. The CPS defines persons as unemployed if they are not employed during the survey week, were available for work, and (a) had made specific efforts to find employment sometime during the prior four weeks, or (b) were waiting to be recalled to a job from which they had been layed off, or (c) were waiting to report to a new job within 30 days. Thus, some fraction of all unemployment spells that are less than 3 weeks in duration will not be recorded by the monthly CPS.

20. Although labor-force entry directly into employment is procyclical, the probability of entering the labor force and experiencing a spell of unemployment is countercyclical. The net effect of these two types of entry are largely offsetting. To determine whether there is any cyclical behavior of labor-force entry, the probability of labor-force entry was regressed on capacity utilization, time and time squared with the following results:

$$\begin{aligned} nu+ne = \; & .068^{***} \; -.00020^{***} \; CU \\ & (.0071) \quad (.000073) \\ & +8.7E{-}6^{***}TIME \; -6.4E{-}10^{***}TIME^2 \\ & (1.4E{-}6) \qquad (1.2E{-}10) \end{aligned}$$

This regression indicates labor-force entry follows a countercyclical pattern—entry rates are actually somewhat higher during recessions. Thus, the increased entry into unemployment is slightly larger than the decreased entry into employment during recessions.

21. To test this hypothesis formally, the probability of labor-force exit was regressed on capacity utilization time and time squared with the following results:

$$\begin{aligned} PRLEXT = \; & .067 \; - \; .00015^{***}CU \\ & (.0033) \quad (.000033) \\ & -7.8 \; E{-}7 \; TIME \; - \; 6.2 \; E{-}11 \; TIME^2 \\ & (6.2 \; E{-}7) \qquad (5.3 \; E{-}11) \end{aligned}$$

This regression indicates that labor force exit follows a countercyclical pattern. Thus, the increased exit from employment during recessions must be somewhat larger than the decreased exit from unemployment.

22. That is, for each cycle's midpoint, entry and exit rates are fixed. The simulated unemployment rate is then calculated starting with the actual employment-status distribution at each cycle's midpoint using actual flows within the labor force but holding constant entry and exit rates at their midcycle levels. The actual unemployment rate is calculated using the initial employment status distribution and letting all six transition probabilities take on their actual values.

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