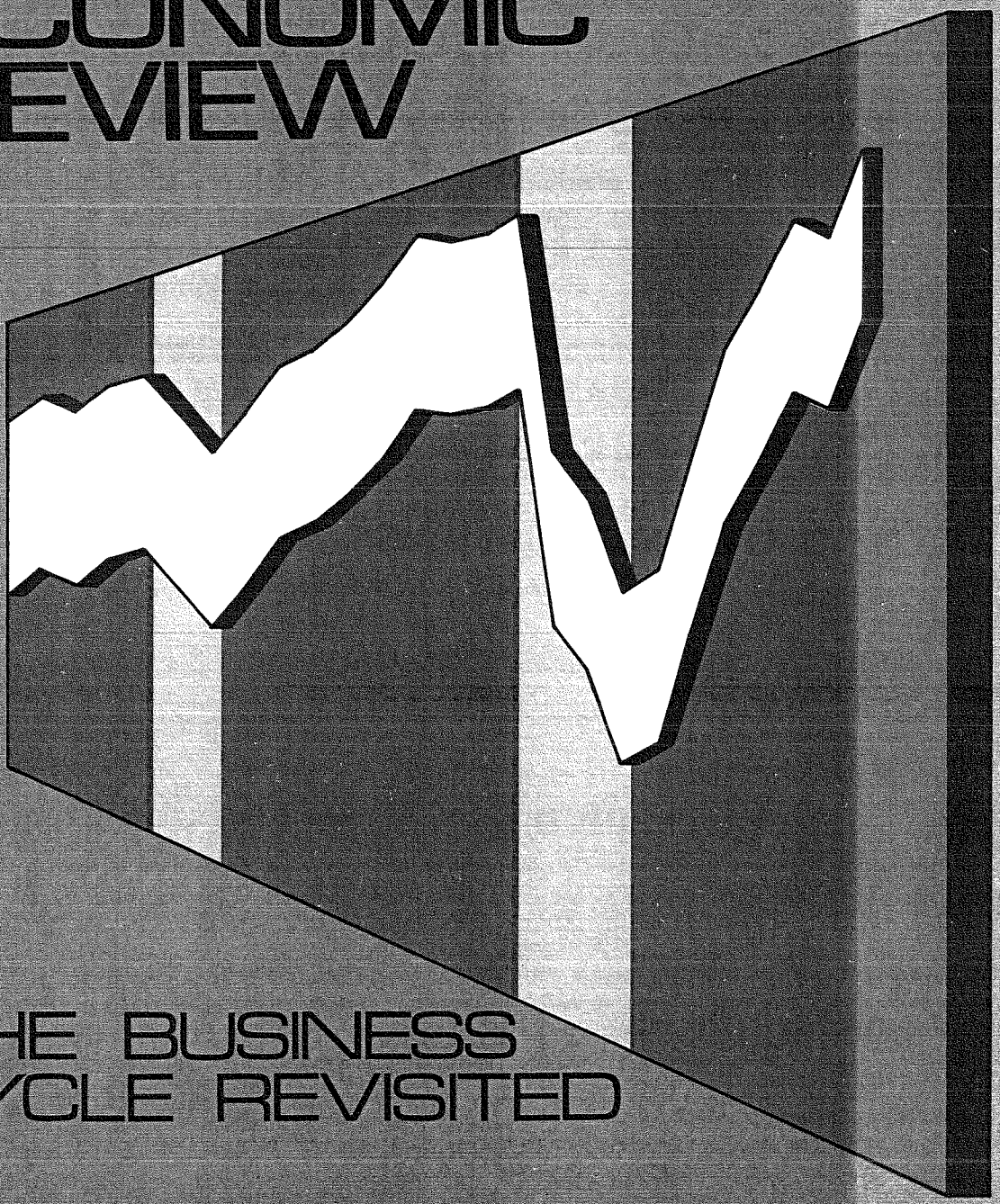
FEDERAL RESERVE BANK OF SAN FRANCISCO

ECONOMIC REVIEW



THE BUSINESS CYCLE REVISITED

SPRING 1977

Labor Force Participation and Unemployment Insurance

Rose McElhattan*

The need to ask for unemployment-insurance benefits is an unhappy prospect for some unemployed Americans, yet it is a necessity for many and may be a way of life for others who (deliberately or not) have a long wait between jobs. Benefit payments, aside from providing income maintenance for the unemployed, may also have helped increase the supply of labor over time. Some individuals who lose their jobs might otherwise leave the labor force, were it not for benefit payments which reduce the cost of searching for another suitable job. Certain unemployed persons, on the other hand, may report job search in order to receive jobless benefits (and be counted in the labor force) although no attempt is made to secure employment. Other individuals might search for seasonal or intermittent employment in order to be eligible for benefits, when the income from such employment alone would not be sufficient to warrant labor-force participation.

This article analyzes the economic factors which have contributed to cyclical variations in labor-force participation rates since 1950. Our primary purpose is to measure the impact, if any, of the unemployment-insurance (UI) program upon the aggregate labor-force participation rate. Certain simplifying assumptions are made about the growth of population and labor-force participation. For example, we estimate the supply of labor from given population measures, and account for the secular behavior in labor force participation with a simple time trend and with a series which measures the number of young children (5 and under) as a percentage of the adult population. The increase in the latter factor has helped account for the increasing participation rate of females, which in turn has been the major reason for the rising trend in the aggregate labor-force participation rate in the postwar period.

Our analysis indicates that UI payments to individuals have acted to increase the supply of labor over time and to weaken the familiar "discouraged worker" effect. According to the latter hypothesis, an increase in unemployment signals an increase in the difficulty and cost of finding a suitable job, causing some unemployed workers to become discouraged and withdraw from the labor force—and to await a time when jobs are more plentiful and the cost of finding work is reduced. However, the payment of unemployment-insurance benefits may actually keep unemployed workers in the labor force. Our analysis suggests that, considering both the cost of finding a job and the payments of jobless benefits, there is far less responsiveness of labor as a group to changes in unemployment rates than previous estimates of the discouraged-worker effect have suggested.

In addition, the statistical results indicate that since the late 1960's there has been a change in the net response of labor to cyclical changes in the average real wage rate. From the late 1940's and into the 1960's, labor-force participation generally declined whenever current real wage rates were perceived as temporarily high, implying a diminished need for additional family members to supplement income as the pay of the main earner rose. However, this negative labor-supply response to transitory wage changes has diminished over time, and has even become slightly positive since 1967. Some labor market observers have suggested that the growth in

*Economist, Federal Reserve Bank of San Francisco.

The author wishes to acknowledge the editorial assistance of Ken Froewiss and Jack Beebe along with the research assistance of David McKinnis.

labor supply will slow down as real wages rise in the current recovery, since the increased family income implied by the higher wage rate will permit supplementary household workers to return to nonmarket pursuits. Our results indicate that this is not likely to happen. The tendency of some individuals to leave the labor force as real wages rise appears to have been offset since 1967 by the behavior of others who want to take advantage of the higher real wages. Section I provides the conceptual framework for our labor-force participation model, and Section II provides the estimated results of that model.

I. A Model of Labor Force Participation—Conceptual Framework

The underlying notions of the labor-supply model in this paper come from the established economic theory of consumer behavior.[1] According to this theory, individual choices with regard to labor supply concern the division of time between market activity and nonmarket activity—the former including both working and looking for a job, and the latter including all other activities, such as child care, cooking, eating, housework and leisure time in general. The individual's allocation of time will be influenced by the net real income (that is, dollars of constant purchasing power) which his or her services can command in the marketplace. Three elements are considered in this paper to enter into the calculation of that net income: the real wage rate, the cost of finding a suitable job, and the payment of unemployment insurance benefits.

Real wages

In the first instance, an increase in the real wage rate which an individual expects to receive in the market increases the cost to him of spending time in nonmarket pursuits. Normally, a change in the real wage rate will alter the allocation of an individual's time, so that different quantities of labor services will be offered on the market at different real wage rates.

The individual's reaction to a change in real wages, however, will depend upon how permanent the change is expected to be. Put differently, any change in real wage rates may be considered as made up of "permanent" and short-lived, "transitory" components. Two separate hypotheses can be used to explain labor's reaction to wage changes. The first is the permanent wage effect, analyzed in the work of Milton Friedman.[2] According to this effect, workers will plan their labor activity to coincide with periods when the current actual wage is high relative to their perception of some "normal" or "permanent" wage. This hypothesis implies that if current wages (W) are rising relative to normal real wages (W*)—that is, if the ratio W/W^* is increasing—more labor will be supplied.

An alternative hypothesis is the relative wage effect, described in the works of Richard Easterlin and Michael Wachter.[3] According to this hypothesis, the ratio (W/W^*) represents a relative standard-of-living variable; that is, it measures today's standard of living, which is represented by current wages (W), in relation to the expected standard (W*). When current standards of living are rising relative to those expected on the basis of past experience—that is, when W/W^* is increasing—workers may choose more nonmarket activity rather than work in the market. This choice may show up, for example, in the withdrawal of supplementary family workers from the labor market when the wage of the main family earner increases. Conversely, when the current standard of living falls relative to the expected standard, secondary workers may be induced to sacrifice nonmarket activity to enter the labor market to supplement the family income. The impact of an increase in the ratio of current to permanent wages upon the labor-force participation rate thus may be either positive or negative, depending on whichever is the dominant influence—the permanent-wage effect or the standard-of-living effect.

Cost of search and unemployment benefits

Ordinarily, an individual making a labor-force decision will have to spend some time and effort searching for a suitable job. We may infer that the individual, in offering labor services, has

considered both the cost of looking for a job and the expected market wage from a prospective job. We may also infer that the net benefits of market activity to the individual are at least equal to the benefits he would obtain by staying at home—or, more precisely, engaging in nonmarket activity. An increase in the cost of searching for a job reduces the expected net benefits from market activity, and could thus lead to a decline in labor-force participation.

The availability of unemployment-insurance (UI) benefits also enters into the calculations of an individual's expected cost of job search. Unemployed workers may consider UI benefits as an offsetting payment to the direct cost of job search. By reducing the individual's search costs, UI payments increase the net benefits expected from market activity. An increase in UI payments, therefore, tends to offset the discouraged-worker effect and to strengthen labor-force participation.[4]

Some individuals also may be attracted into the labor force by the prospect of receiving benefits after a short period of employment. UI payments may encourage seasonal or other intermittent employment when the wages available from employment alone are not sufficient to warrant labor-force participation. For this reason too, we may expect the labor-force participation rate to increase when jobless benefits are increased.[5]

We could reason that, to the extent the program is self-financing, UI payments should not impact upon the labor supply. According to this argument, the payments have already been incorporated into the individual's expected wages. Although benefits are paid by the employer, they are considered the same as other employee benefits which are deducted from the employee's total wage. At least in the short run, however, individuals may not consider their contribution to the insurance program as being a self-financing matter. Although the program was intended to be self-financing, it has not been so for the past several years of high unemployment.[6]

In addition, most state laws create a rather loose relationship between the benefits received by an unemployed worker and the payments made on his behalf. Consequently, as the average covered wage increases, the maximum weekly benefit also increases. In such a case, however, revenues to finance the system do not increase proportionately, because the taxable wage base increases much more slowly than average wages. For these reasons, benefit payments in their own right tend to affect labor-force participation decisions.

Our argument thus suggests that changes in the aggregate labor-force participation rate depend upon changes (both permanent and temporary) in real wage rates, the cost of job search, and unemployment-insurance benefits. An increase in the cost of job search would tend to reduce the participation rate, while an increase in UI payments would tend to increase the labor supply. The wage effect upon labor supply is less certain, depending upon the relative importance of the permanent or relative wage effect. If the latter is dominant, changes in the supply of labor—in response to temporary changes in wages—may be the result of supplementary family members moving in and out of the labor force in an effort to maintain the family's accustomed standard of living. On the other hand, the growing importance of women in the labor force—particularly married women whose work experience indicates an increased attachment to full-year participation[8]—detracts from the importance of the relative wage hypothesis. Since the two hypotheses we have considered imply different signs on the wage coefficients, we can test in our model to see which effect is dominant.

II. Estimation of Labor Supply Model

It is seldom an easy matter to proceed from a general theoretical framework to a specific regression which can be estimated from available historical data. The model described above needs several adjustments before empirical estimation can proceed. The discussion of those refinements is followed by the estimation results (including forecast results) and a summary of their implications.

From theory to testing

There are no historical data which directly measure the cost of job search. In general,

changes in the unemployment rate have been used in labor supply studies to signal changes in the number of jobs available, with an increase in unemployment, for example, indicating an increase in the cost and difficulty of finding a job. In this paper, the unemployment rate of prime age males (25-54) is used to represent the cost of finding a job since this rate, more than any other, reflects cyclical changes in job opportunities and in the overall demand for labor. This is because the supply of prime age males (from a given population) is relatively insensitive to cyclical economic conditions so that changes in their unemployment rate basically reflect changes in job opportunities and in the demand for labor in general.[9]

Our model attempts to explain the aggregate behavior of different population groups. Demographic changes in the population, in particular changes in the age/sex distribution, may well affect labor participation behavior over time in ways not captured by the model. To handle this aggregation problem we have used the share of prime age males (25-54) in the population (MIX) to measure the impact of changes in population composition upon participation decisions in the estimation period, 1950.1 to 1974.4. In particular, we have permitted the variable MIX to affect both the relative-wage and unemployment-rate effects on the labor-force participation rate, entering those two explanatory variables with coefficients of the form (a + b MIX) where a and b are estimated constants.[10]

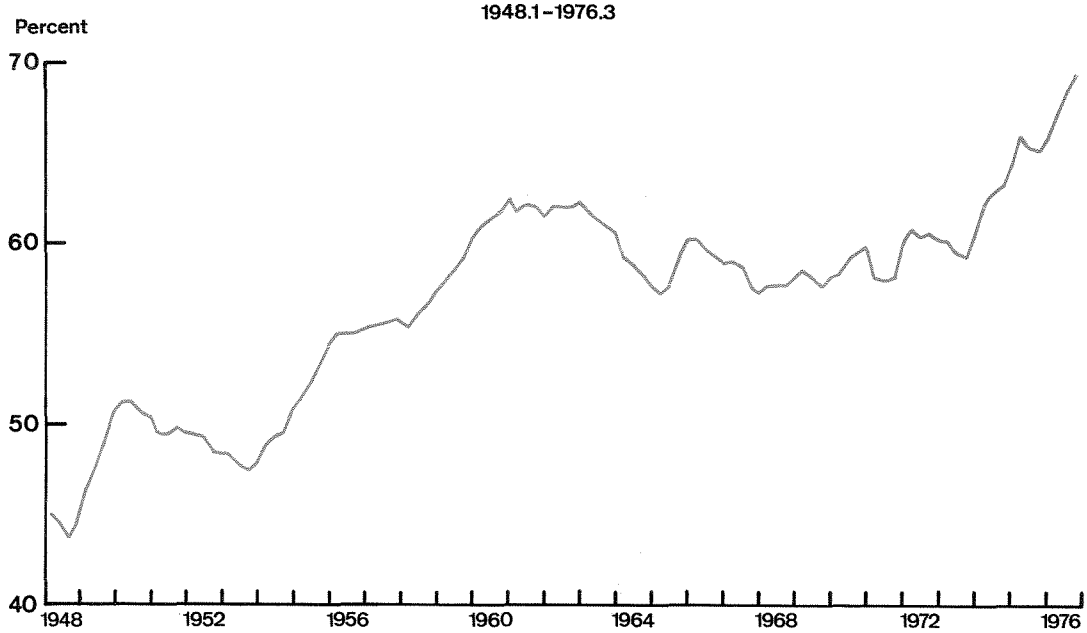
In addition, we have entered the unemployment-insurance benefits variable (UIB) in the labor-supply equation as a measure affecting the unemployment rate's impact upon the labor supply. We would expect a rise in UIB to keep more people in the labor force to the extent the unemployment rate increases; that is, the greater are the number of individuals faced with the work-nonmarket activity decision. Thus, to account for the effects of both MIX and UIB, the unemployment rate (RU) is written in the form $RU' = (a + bMIX + cUIB)RU$, where a, b and c are estimated constant coefficients. In other words, the unemployment impact upon the labor-force participation rate will vary over time

Chart 1

UNEMPLOYMENT INSURANCE BENEFITS

(Maximum weekly UIB payments as a percentage of weekly spendable wages)

1948.1-1976.3



with changes in the population (MIX) and changes in unemployment benefits (UIB).

The actual value of UI payments in the estimated regression is an index of the relative size of benefits. Specifically, the variable UIB is the maximum average weekly benefit, stated as a percentage of the average weekly spendable wages of a worker with three dependents in the nonfarm private business sector (Chart 1).[11] Unemployment benefits have increased from about 50.5 percent of spendable earnings in 1950 to 69.4 percent in 1976.3, but the rise has accelerated in recent years. The increase from 1973.1 to 1976.3 was by far the greatest for any four-year period since 1948.[12]

To estimate permanent wages (W*), we have assumed that the permanent real wage rate in a given period is equal to a percentage of the trend level of labor productivity. That percentage is equal to labor's share in total output produced—a relatively constant measure over time. The details of the procedure used to calculate W* are given in the appendix.

Although we are concerned with short-term or business cycle variations in the labor-force participation rate, the labor-supply data incorporate both trend and short-term movements, which means we must devise some way of adjusting for trend. The rise in the aggregate labor-force participation rate in the postwar period reflects the dramatic increase in the female participation rate.[13] Women's labor-force participation tends to be associated with the number of small children in the family, so to pick up that factor, we have included in the regression model the number of children 5 years old and under as a percentage of the adult population. That percentage, which began to decline sharply in the mid-1960's, apparently accounts for a significant amount of change in the aggregate participation rate. Also, that percentage apparently serves as a useful proxy for several other related influences which have had an important influence upon female labor supply—such as the trend toward later marriages and the rise in female-education levels—but which we have not attempted to estimate separately.

To capture additional secular forces influencing the aggregate participation rate, we have chosen a nonlinear time trend (1/time, where time = 13 in 1950.1 and 119 in 1976.3). This time trend was the most statistically significant of the several considered, and it has the desirable long-run property of approaching a value of zero as time progresses. This is a desirable property; the participation rate has a maximum value of one and a time trend without a limitation on the values it can assume would imply a participation rate with possible values greater than one.

Finally, we have assumed that the supply of labor from a given population responds to both current and past changes in the economic determinants included in the equation. The time adjustment model which proved most statistically significant was one in which the supply of labor responds to past changes in the different economic determinants with the same distributed lag pattern. In the conventional way, we have incorporated this behavior by entering the lagged dependent variable on the righthand side of the equation.[14]

Empirical Results

The following least-squares equation, estimated over the 1950.1-1974.4 period, appears to explain the movements in the labor-force participation rate quite well. The adjusted coefficient of determination ($\bar{R}^2$) of .95 means that about 95 percent of the variation in the aggregate labor-force participation rate can be accounted for by the model. The standard error of .24 percentage points indicates a very close fit between actual and estimated values, since this error represents only .3 percent of the mean labor-force participation rate (69.9 percent) over the sample period.

$$LFPR_t = \underset{(5.27)}{28.1644} - \underset{(-2.30)}{9.70906}TT - (\underset{(-3.15)}{2.34380} - \underset{(3.16)}{6.61831}\,MIX_t - \underset{(2.40)}{.00969}\,UIB_t)\,RU_t + (\underset{(2.82)}{.996122} - \underset{(-2.87)}{4.08348}MIX_t)\left(\frac{W}{W^*}\right)_t - \underset{(-4.34)}{.204513}N5_t + \underset{(9.52)}{.648341}LFPR_{t-1}$$

Adjusted $\bar{R}^2$ = .95

Durbin Watson = 2.11

Standard Error = .24

Mean LFPR = 69.9

Estimation Period 1950.1-1974.4

Numbers in parentheses are t statistics

where

LFPR = labor force participation rate of all persons between the ages of 16 and 64, in percent

MIX = numbers of males in the population between the ages of 25 and 54 divided by the total population 16 years and over, in percent

UIB = maximum weekly benefits payable under the unemployment-insurance system, divided by spendable average weekly earnings of production worker with 3 dependents, in percent

RU = rate of unemployment of males between the ages of 25 and 54, in percent.

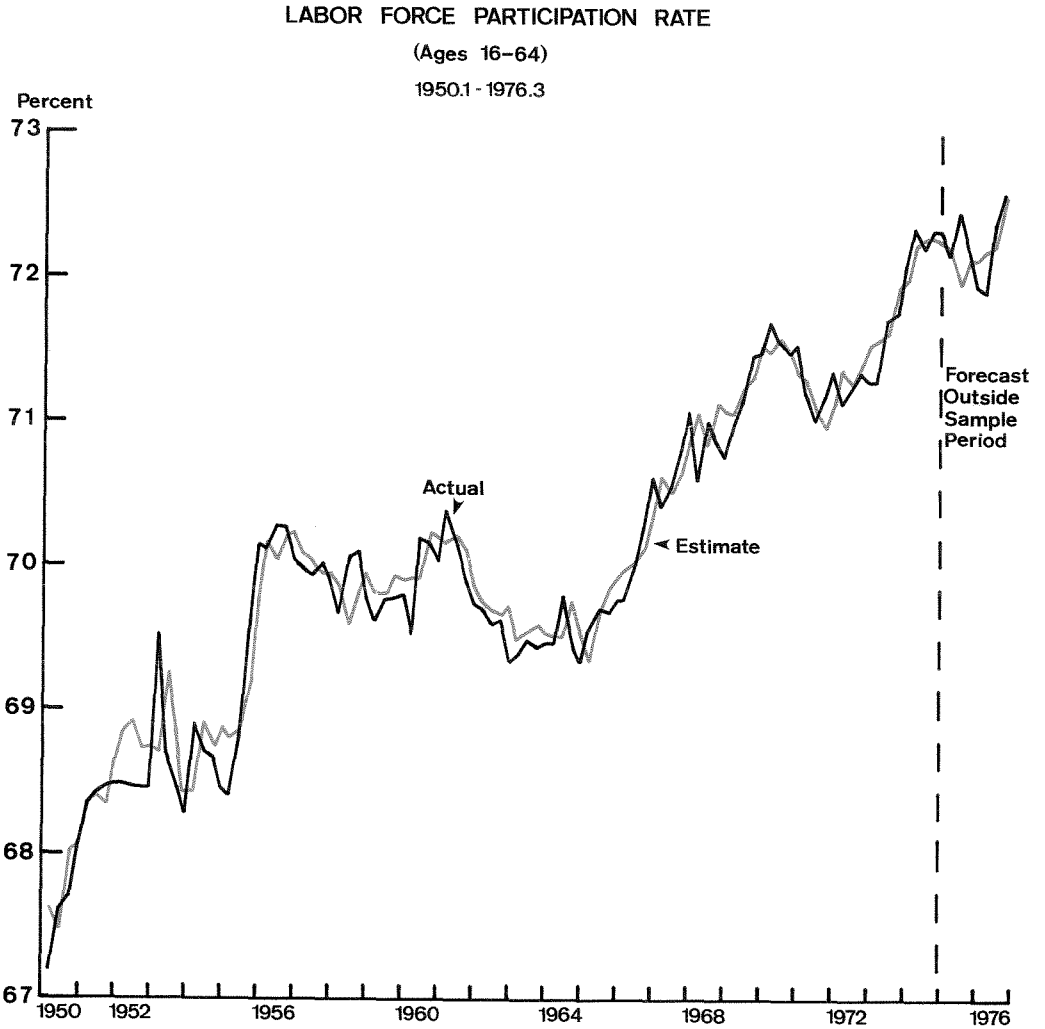
W/W* = current real wages of employees in nonfarm private domestic business sector, divided by normal wage, in percent

TT = 1/Time - Time is equal to 13 in 1950.1 and 112 in 1974.4

N5 = number of children 5 years old and under in the population, divided by number of people 16 years old and over in this population, in percent

The more pertinent test for a model, however, is how well it can forecast movements in the

Chart 2



dependent variable after the estimation period. The years 1975 and 1976 provide a particularly good test, since that period incorporated a considerable amount of variation in labor behavior, including (in 1976) the highest labor-force participation rate on record (Chart 2).

The model performed very well over the post-sample period, especially by capturing the unusual 1976 increases in labor supply (Table 1). The mean absolute forecast error for the seven quarters (1975.1-1976.3) is .17 percentage points, while the average error is only –.07 percentage points; both are well within the .24 standard error of the equation over the estimation period.

The movement over time in the supply of labor has been dominated by population growth, along with other long-run changes which have produced a shift in preferences between work and nonmarket activity. The strong trend-like movement in the labor-force participation rate is captured in the model by the time trend, the constant term, N5 (the children/adult ratio), and the lagged dependent variable. To determine the statistical significance of the cyclical economic variables, we re-estimated the model with only the time trend, constant, N5 and lagged dependent variables, and then compared the unexplained variation in the participation rate from this abbreviated model with that of the full model (equation 1). The additional variables included in the full model were found to reduce the unexplained variance in the participation rate by 20 percent. In addition, a statistical test indicated that this reduction represented a statistically significant decrease in the unknown variance in the labor-force participation rate.[15] We can thus conclude that the wage, unemployment and unemployment-insurance variables account for a significant amount of cyclical variation in labor-supply behavior.

Table 1
Labor Force Participation Rate of Population aged 16-64
Forecasts Outside the Estimation Period
1975.1—1976.3

	Labor Force Participation Rate		
	Forecasted*	Actual	Forecast Error
1975.1	72.170	72.155	.015
.2	71.933	72.449	–.516
.3	72.115	72.203	–.088
.4	72.012	71.932	.081
1976.1	72.146	71.896	.250
.2	72.185	72.369	–.184
.3	72.528	72.585	–.058

Mean Absolute Error, 1975.1—1976.3 = .170

*Forecasts are outside the estimation period (1950.1—1974.4) and have been calculated with all variables on the right hand side of the equation equal to actual values. In a dynamic ex-post simulation in which estimated values of the lagged-dependent variable replace actual values, the mean absolute error is .23 percentage points.

Table 2
Short-term Unemployment Coefficients for Selected Periods
Unemployment Rate—Prime Age Males:
Total Coefficient = -2.34380 + 6.61831MIX + .00969UIB

	(1) Coefficient excluding Unemp. Insurance Benefits (-2.34380 + 6.61831MIX)	(2) Coefficient including only Unemp. Insurance Benefits (.00969 UIB)	(3) Total Size of Coefficient (1) + (2)
1950.4	–.524	.485	–.039
1955.4	–.524	.524	.0
1960.4	–.596	.601	.005
1965.4	–.709	.581	–.128
1970.4	–.762	.579	–.183
1975.4	–.769	.636	–.133
1976.1	–.769	.651	–.118
1976.2	–.769	.662	–.107
1976.3	–.769	.672	–.097

The coefficients of the unemployment rate (RU) and the wage term (W/W*) vary over time (Tables 2 and 3), and these coefficients are associated with the current-quarter independent variable. The lagged dependent variable in our equation means that some time is required for labor to adjust fully to a change in an independent variable; ultimately, the long-run response will be about 2.8 times larger—1/(1–.648)—than the current coefficient estimate. Henceforth, we will focus upon current-quarter coefficient values, since this provides the essence of labor-supply behavior. The longer-run reaction can be derived easily, by multiplying the reported results by 2.8.

Our estimates indicate that the impact of labor-market conditions—represented by the prime-age male unemployment rate (RU)—on the labor-force participation rate has varied significantly over time. In particular, the supply of labor has become more sensitive to changes in labor-market conditions in the 1970's than was evident twenty years ago (column 1). Those estimates measure the unemployment coefficient, excluding the effect of unemployment insurance but including the response to demographic changes. The MIX variable (the proportion of prime age males in the population) has shown a secular decline since the early 1950's, and this has increased the labor-supply reaction to changes in the unemployment rate. This should be expected, since prime-age males are less likely than others to move in and out of the labor force in response to changes in the cost and difficulty of finding a job. The values in column 1 indicate that a 1-percentage point increase in adult male unemployment would lead to a decline in the average labor-force participation rate of .524 percentage points in 1950.4, .709 percentage points in 1965.4, and .769 percentage points in 1976.

Table 3
Wage Coefficient for Selected Periods
Coefficient = .996122 -4.08348MIX

	Total Size of Coefficient
1950.4	–.127
1955.4	–.127
1960.4	–.082
1965.4	–.012
1970.4	+.020
1975.4	+.024
1976.1	+.024
1976.2	+.024
1976.3	+.024

However, the negative response of labor supply to unemployment-rate changes has been considerably reduced (in absolute terms) by the payment of unemployment-insurance benefits. As the positive values in column 2 indicate, for any given unemployment rate, an increase in UI payments leads to an increase in labor supply. For example, in 1950.4, when the unemployment rate of prime-age males was equal to 3.0 percent, UI payments added 1.46 percentage points to the participation rate (.485x3.0). If unemployment conditions had remained unchanged, UIB would have increased the participation rate by 1.74 percentage points in 1965.4 (.581x3.0); 1.91 percentage points in 1975.4; and 2.02 percentage points in 1976.3.

Considering the opposing forces at work—the cost of finding a job and the payment to unemployed workers—the total size of the unemployment coefficient (column 3) is considerably smaller than it would be with no benefit payments (column 1). Thus, previous estimates of the discouraged-worker effect may have overestimated the response of labor supply to unemployment-rate changes by not considering the positive labor response to increases in UI payments. Some labor studies have used an employment rate rather than an unemployment rate to represent job opportunities and the cost of job search. Our results suggest that these studies also may exaggerate the discouraged-worker effect when the importance of UI payments is ignored.[17]

The MIX variable also has affected the size of the wage coefficient over time. The signs of the coefficients indicate that the relative wage effect had been dominant until the late 1960's. Until 1967, whenever wages fell relative to expected income, the labor force increased as additional entrants attempted to supplement the family's desired standard of living. Conversely, whenever wages rose relative to expected income, supplementary family workers left the labor force. Subsequently, however, the relationships have been reversed. Even more strikingly, the impact of wages upon labor supply has diminished

considerably over time. The negative value of .127 in the early 1950's has even turned to a small positive .024 in 1976.

The growing weakness in the relative wage effect may be due to offsetting behavior by different groups in the labor force. Since the early 1950's, married women (with husbands present) have accounted for a growing percentage of the labor force. This group of workers has shown an increasing attachment to the labor force and has traditionally displayed a strong positive response to changes in their wages.[18] The increasing importance of married women in the labor force may have offset the negative response of other workers to temporary increases in the average wage.

III. Summary and Conclusions

This paper has analyzed the economic variables which determine cyclical behavior in labor supply, with emphasis upon the influence of unemployment-insurance benefits in the period since 1950. The findings indicate that the payment of UI benefits has weakened the discouraged-worker effect, so that when jobs become difficult to find, less workers leave the labor force (or are discouraged from entering) than would be the case if no payments were provided to the unemployed. Some individuals might view an increase in UI payments as a reduction in the cost of searching for a job and, hence, as an inducement to remain in the labor force as an unemployed worker rather than to leave for nonmarket pursuits. Other individuals might be encouraged to enter short-term employment when the wages alone from such work would not be sufficient inducement to do so. Our model does not distinguish between these or other motivations. It simply suggests that the impact of changes in labor-market conditions should be considered a net response—one allowing for the cost of finding a job on the one hand and payment of UI benefits on the other. Otherwise, the unemployment/labor-supply relationship will be overstated.

These findings have implications for the interpretation of the official unemployment data published by the Bureau of Labor Statistics. Many observers question the use of the aggregate unemployment rate as an indicator of the strength of the economy. Understanding the economic picture requires understanding the causes of fluctuations in the jobless rate, such as the labor-supply factors estimated here.

If the discouraged-worker effect is weaker than originally thought, the unemployment rate should have greater amplitude and conform more closely with cyclical changes in aggregate output. Fewer workers would leave the labor force during the recession and fewer would enter during the recovery, so that changes in the jobless rate would more likely reflect changes in aggregate demand.

However, other economic conditions could stimulate changes in the supply of labor and thus interfere with this conformity. Increases in unemployment-insurance benefits have tended to add to the labor-force participation rate. For example, an increase in UI benefits during an economic downturn acts to increase the labor supply, and thereby to increase the unemployment rate more than would be justified by aggregate-demand conditions alone. This behavior helps to explain the unusual and largely unexpected increases in the labor-force participation rate observed during last year's "pause." The slowdown in final demand for goods and services which began early in 1976 acted to moderate growth in labor supply. At the same time, the maximum weekly UI payment increased substantially, and thus acted to stimulate increased labor-force participation. The increase in the ratio between UI benefits and weekly spendable earnings was unusually large, and the increase between 1976.1 and 1976.3 may have added about 145,000 workers to the labor force and about .14 percentage points to the unemployment rate in 1976.3.

In addition, the aggregate labor force has shown little response to temporary changes in the relationship between current and expected real wages. However, this response may represent the offsetting behavior of different groups. Indeed, it could become a stronger positive factor in labor-supply growth if married women continue to increase their representation in the labor force.

APPENDIX I

For normal wages (W*), we assume that the permanent real-wage rate in a given period of time is equal to a percentage of the trend level of labor productivity. The percentage is equal to labor's share in total income produced (gross business domestic product)—a ratio which has been relatively constant over time. We rely upon the relative constancy of this ratio to derive a measure of normal wages.

This constancy can be represented as:

k = (Total Labor Income/Gross Business Domestic Product).

Total labor income can be written as the average wage per worker times the number of workers (WxN); and Gross Business Domestic Product can be written as a measure of the average price level times a measure of the real quantity of output produced (PxQ). Or, rewriting the above, $k = (WxN)/(PxQ)$. This equation can be rewritten so that real wages (W/P) are expressed as a constant percentage (k) of the average output of labor (Q/N):

$$W/P = k\,x\,(Q/N).$$

To derive an estimate of normal or expected real wages (W*), we substitute the trend level of labor productivity for the average output of labor, which we designate as $(Q/N)'$. Then $W^* = k\,x\,(Q/N)'$.

FOOTNOTES

1. For examples of a formal derivation of a labor supply model see W.G. Bowen and T. Aldrich Finegan, "The Economics of Labor Force Participation," pages 569-570; Robert E. Lucas, Jr., and Leonard A. Rapping, "Real Wages, Employment, and Inflation," **Journal of Political Economy,** 1969, pages 721-754.
2. Friedman, Milton, **Price Theory,** Aldine Publishing Co., Chicago, Ill., 1962, page 205.
3. Wachter, Michael, "A Labor Supply Model for Secondary Workers," **Review of Economics and Statistics,** 1972, pages 141-151, "A New Approach to the Equilibrium Labour Force," **Economica,** February, 1974, pages 35-51.
4. For a review of how unemployment insurance benefit payments are incorporated in general theories of search as well as a comprehensive review of search theory see "Theories of Search in a Labor Market," Kenneth Burdett, Technical Analysis Paper No. 13, Office of Evaluation, Office of the Assistant Secretary for Policy, Evaluation and Research, Department of Labor, October 1973.
5. Feldstein, Martin, "The Economics of the New Unemployment," **The Public Interest,** No. 33, Fall 1973.
6. There has been a particularly large drain on the UI system caused by the recent recession. "As of October 1, 1976, the 21 states that have depleted their trust funds have borrowed $3.1 billion from the Federal Unemployment Account. In turn, this account, as well as the Federal Extended Unemployment Compensation Account (which finances the Federal share of extended benefits and all supplemental benefits) have both been depleted and are borrowing from Federal general revenue funds. Even with proposed tax increases to be effective January 1, 1978, it is estimated that the deficit in the Federal accounts will be over $5 billion by the end of 1981." See Steven Zell, "Unemployment Insurance: Programs, Procedures, and Problems," **Monthly Review,** Federal Reserve Bank of Kansas City, February, 1977, especially pages 41-42.
7. Zell, Steven P., "Unemployment Compensation," Background Paper No. 15, Congressional Budget Office, Congress of the U.S., Washington, D.C., December 8, 1976, especially Chapter 2, page 13.
8. Regarding the increasing attachment to the labor force of many secondary workers, see Joseph L. Gastwirth, "Estimating the Number of 'Hidden Unemployed,'" **Monthly Labor Review,** U.S. Department of Labor, Bureau of Labor Statistics, March 1973, pp. 17-26.
9. For a review of the use of unemployment rates in labor force participation rate models, see Jacob Mincer, "Labor Force Participation and Unemployment: A Review of Recent Evidence," in **Prosperity and Unemployment,** Robert A. Gordon and Margaret S. Gordon, editors, John Wiley and Sons, Inc., New York, 1966. Mincer points out that the unemployment rate of the primary labor force is a better cyclical index than the rates of other sex-age components. It is therefore also likely to be superior, in this respect, to the aggregate unemployment rate. The unemployment rate of prime age males may not be a perfect proxy for overall labor market tightness and therefore for the general cost of finding a job if, as Mincer points out, "as a result of minimum wages, employers tend to substitute experienced for inexperienced workers, the unemployment rate in the primary group may have decreased, in part, at the expense of higher rates in other groups," page 107. Of the various employment and unemployment rates that may proxy for labor market tightness, the prime age male unemployment rate appears the best indicator and is the reason for its use in this paper. This does not preclude the possibility, however, of finding another perhaps better indicator of labor market tightness in future research. For a discussion of the results of several labor market indicators see Bowen and Finegan referenced in footnote 1, especially pages 516-522.
10. For a similar treatment of the aggregation problem, see Wachter, Michael, "A New Approach to the Equilibrium Labour Force," **Economica,** February, 1974.
11. Actually, I estimated the regression model in two ways. The first used the maximum average weekly benefits payable to individuals divided by the consumer price index as a measure of the real value of UIB payments. The second estimation used the ratio of real UIB payments divided by real weekly spendable earnings as described in the text above. The first measure should serve as a useful proxy for the effect of unemployment insurance since increases in its value indicate an increase in the cost of remaining out of the labor force. The ratio measure, however, represents the relative value of an individual's time; that is, people may value their time at least as high as current wage rates and UIB payments relative to the current wage rate may be the relevant value in the trade-off decision between market and nonmarket activity for individuals. In practice, the

estimation results indicated that there was little to choose between the two measures since they are highly correlated in time. The close relationship between the two measures may be the result of state laws which generally increase UIB payments whenever covered wages increase. The ratio measure was chosen for the regression results presented in this paper since the ratio estimate has the most likely property of a limiting value of one, as does the dependent variable, the labor force participation rate. For a paper with somewhat similar results regarding the use of real UIB payments and the ratio of payments to weekly earnings see Thomas W. Wallace, "The Effect of Unemployment Insurance on the Measured Unemployment Rate," Discussion Paper No. 155, July 1974, Queen's University, Kingston, Ontario.

12. The series used in the denominator of the ratio, weekly spendable earnings of a worker with three dependents, has been questioned by Geoffrey H. Moore as being an underestimate of what an average family of this type actually earns. "Workers' Earnings: Higher Than They Look," **The Morgan Guaranty Survey,** October, 1976. Nevertheless, the close relationship between the ratio measure and real UIB payments, as well as other features referenced in footnote 11, led me to use the ratio measure in the regression estimates of the aggregate labor force participation.

13. See for example, three articles on women in the labor force in the **Monthly Labor Review,** November 1975, U.S. Department of Labor, Bureau of Labor Statistics.

14. There has been some controversy in the literature as to whether labor supply responds contemporaneously or with a distributed lag to the determinants in the supply function. Labor supply functions which assume the former have a high degree of auto-correlation in the error terms and the Cochrane Orcutt procedure has been applied to correct for this factor. My tests indicate, however, that this representation and estimation of the labor supply function may be a misspecification of the labor supply behavior. If first-order serial correlation of the error terms is an appropriate specification of a model, we can write this model in general terms as:

$$y_t = \alpha X_t + \rho u_{t-1} + e_t, \text{ or}$$

$$y_t = \alpha X_t + \rho Y_{t-1} - \rho\alpha X_{t-1} + e_t$$

where $u_{t-1} = Y_{t-1} - \alpha X_{t-1}$, and e_t is a normally distributed, zero mean, finite variance random variable uncorrelated over time and ρ is the estimated auto-correlation coefficient.

If the Cochrane Orcutt estimation procedure is the correct specification, we should find that the lagged variables, X_{t-1} and Y_{t-1} are statistically significant and the estimated coefficients bear the relationship expressed in the above equations. I found that the labor supply function, specified as the second above equation, did not result in statistically significant estimated coefficients for the lagged values of the equation's determinants, although the lagged dependent variable was statistically significant. Therefore the adjustment model appears to be the more meaningful interpretation of labor supply behavior than models which have assumed no distributed lag in the response of labor to the model's determinants. The results suggest that labor supply models which do not take into account a delay in the response of labor to changes in economic variables may represent a misspecification of the supply function. For a detailed discussion of choosing between a Cochrane Orcutt estimation technique and a distributed lag such as chosen in this paper, see Mike Salant and Nick Sargen, "The Supply of Wheat: A Study in Cereal Correlation," May 25, 1968, unpublished paper. Dr. Sargen is an Economist at the Federal Reserve Bank of San Francisco.

15. The calculated F-value was 5.33; the critical values at the 5 percent point for F(5,91) is 2.30 and at the 1 percent point is 3.20.

16. Griliches, Zvi, "Distributed Lags: A Survey," **Econometrica,** Vol. 35. No. 1 January, 1967.

17. The two best-known studies which find a negative relationship between changes in the supply of labor and a measure of labor market tightness (i.e., an employment rate) are by Alfred Tella ("Labor Force Sensitivity to Employment by Age, Sex," **Industrial Relations,** Vol. 4, No. 2, February 1965, pp. 69-83) and Thomas Dernburg and Kenneth Strand ("Hidden Unemployment 1953-63," **American Economic Review,** Vol. 56, March 1966, pp. 71-95). More recent studies which find a discouraged worker effect between unemployment and labor force participation are those of Bowen and Finegan, **The Economics of Labor Force Participation,** Princeton University Press, 1969; Wachter, Michael L., "A New Approach to the Equilibrium Labour Force," **Economica,** February, 1974. A recent cross section study by Arlene Holen and Stanley A. Horowitz, "The Effect of Unemployment Insurance and Eligibility Enforcement on Unemployment," **The Journal of Law and Economics,** October, 1974, especially pages 410-11, finds a strong discouraged worker effect and a positive impact upon participation rates of a change in an unemployment insurance benefits index.

18. Mincer, Jacob, "Labor Force Participation of Married Women," **Aspects of Labor Economics,** National Bureau of Economic Research, Princeton University Press, 1962. Cain, Glen G., **Married Women in the Labor Force,** The University of Chicago Press, 1966.