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LABOR FORCE PARTICIPATION: TIMING AND PERSISTENCE

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ABSTRACT

This paper examines the relative importance of timing and persistence elements in explaining cyclical fluctuations in labor supply. Data from the natural experiment provided by World War II and cross-sectional data on American local labor markets, as well as aggregate time-series data are used in the empirical work. We find little evidence that timing effects play an important role in labor market dynamics. The evidence suggests that views emphasizing persistence are more accurate, and that previous employment tends to raise the probability of subsequent employment.

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Much of the development of applied economic theory within the past 25 years has emphasized the importance of viewing economic decisions in a life cycle context. Consumption decisions are today frequently viewed as being determined by wealth or permanent income. The human capital revolution has brought life cycle considerations to the forefront of modern labor economics. While the life cycle dynamics of labor force participation decisions have important implications for macroeconomic theory and policy, they have received relatively little empirical attention. With the notable exceptions of Lucas and Rapping (1969) and Hall (1980), none of the large body of work on cyclical fluctuations in employment has explicitly relied on a dynamic model of labor supply.[1]

This paper uses several types of data to examine two elements of participation dynamics. The first is the aspect of "timing" which is implicit in the work of Lucas and Rapping, and in Mincer's (1966) early discussion of hidden unemployment. The timing argument, which is presented most explicitly in Ghez and Becker (1975), holds that leisure is easily substitutable across periods. Hence relatively small transitory movements in the perceived real wage or real rate of return can have large effects on the path of labor supply as individuals time their participation to coincide with periods of high transitory wages. On the other hand, permanent changes, because they do not affect the timing decision, are expected to have a much smaller effect on participation.

It is this view of labor supply which underlies new classical macroeconomic models. The dependence is made explicit in Lucas (1975), who

claims that "what we do know indicates that leisure in one period is an excellent substitute for leisure in other nearby periods." The ability of classical macroeconomic models to explain fluctuations in employment depends on the presence of strong intertemporal substitution effects. Unless leisure is very substitutable across periods, large observed cyclical variations in employment could not possibly be caused by the response of labor supply to the relatively small fluctuations which are found in real wages and real interest rates.

It is by now clear that models in which only timing elements are present cannot fully account for cyclical fluctuations. The restrictions imposed by rationality imply that the expectational errors which generate business cycles are serially uncorrelated. The serial correlation which is characteristic of business cycles can only be explained in terms of mechanisms which cause shocks to be propagated over several periods. While Lucas (1975), Blinder and Fischer (1980) and Sargent (1980) have considered alternative explanations of persistence in the demand for labor, little attention has been devoted to the question of persistence in labor supply. To a substantial extent, a demonstration of substantial persistence in labor supply decisions undercuts the plausibility of models based on a high elasticity of labor supply with respect to transitory wage movements since it is difficult to see why a long-run decision should be strongly responsive to transitory developments.

The second element of labor force dynamics which we consider is embodied in the "persistence" hypothesis. In this view, past work ex-

perience is a key determinant of current employment status. Because of high separation costs and costs of finding new employment, those who are employed tend to remain employed. Persistence of employment might also be rationalized on human capital grounds. Those who are employed longer tend to accumulate more human capital, which raises the return to work in the future relative to leisure. Those out of the labor force may also develop household-specific capital or commitments (i.e., children) which reduce the return to working relative to remaining outside the labor force. There is also some reason to believe that the taste for work may be affected by work experience. Such habit formation effects have been well documented in demand analysis.[2]

This aspect of labor force dynamics appears to be quite important in microeconometric studies of employment patterns. Freeman (1977) presents extensive evidence indicating that the probability of separation from employment declines with the duration of employment. This result is obtained separately for voluntary separation (quits) in Freeman (1977b) and for voluntary separations (layoffs) in Medoff (1979). Of course it is possible that this pattern results from individual heterogeneity. Those with high withdrawal possibilities are less likely to be observed as employed than those with low probabilities. Heterogeneity has been considered by Heckman (1978) and Yatchew (1977) as an explanation of persistence in labor force participation; both conclude that at least for married women, true state dependence exists. Chamberlain (1978) has devised a methodology for estimating the size of the persistence effect. He finds that, after controlling for individual differences, prior experience

raises the odds of participation by a factor of seven. Other researchers have found evidence that persons with employment experience are more likely to be re-employed quickly when unemployed. Persistence effects of this magnitude imply that any measure which affects employment will have important long-run effects.

The differing macroeconomic implications of models in which timing or persistence effects predominate are highlighted by the following example. In an economy which is initially in equilibrium, the government unexpectedly undertakes expansionary policy.[3] Irrespective of whether timing or persistence predominates, the initial impact of the change is an increase in employment and labor force participation. However, timing and persistence effects are opposite in the longer run. An extreme version of the timing hypothesis would hold that individuals desire to spend a fixed proportion of their lives in the labor force which they schedule to coincide with periods of maximum opportunity. If this is the case, labor supply after the shock will be less than it would have been had the shock never occurred, as individuals "schedule" themselves out of the labor force.

Such scheduling effects have been used to counter arguments that the fluctuations in participation that accompany changes in the unemployment rate imply a significant discouraged worker effect.[4] What appears to be discouragement is actually the effect of individuals timing their participation to coincide with periods of maximum opportunity. When timing predominates, output gains from expansionary policy are illusory. They will be cancelled by a reduction in subsequent output as workers time

their withdrawal from the labor force. Thus, models with strong intertemporal substitution effects imply that a transitory increase in the real wage will reduce subsequent labor supply. Moreover, a permanent upgrading of opportunities in a timing world would imply a much smaller increase in participation than observed in the short run because scheduling effects would no longer occur.

Persistence effects, however, yield a long-run increase in labor supply. Short-run increases in employment will tend to persist as workers remain in the labor force because of habit formation, adjustment costs, or human capital accumulation. Hence, concurrent changes, on this view understate the total increment to output from expansionary policy. The effects of persistence described here potentially complement the process of worker upgrading discussed in Okun (1973), and Thurow (1976).[5]

The relative empirical importance of timing and persistence effects in labor supply is an issue with important implications for macroeconomic theory and policy. Both effects essentially deny the "natural rate" hypothesis as a medium-run proposition. They imply that policy can have an extended impact on the rate of employment without repeatedly fooling economic agents, because in both views labor supply is conditioned by past employment experience.[6] It is this link which translates short-run policy effects into longer-run impacts. As is clear from the preceding discussion, timing and persistence effects have exactly the opposite implications for the long-run direction of expansionary policy. This paper is directed at determining their relative importance in economic fluctuations.

The next section of the paper examines a natural experiment which potentially can shed light on the question at hand. During World War II, the level of female employment and participation rose precipitously. We examine the aftermath of the conflict to see whether the war had a positive or negative impact on subsequent female participation. The third section of the paper lays the groundwork for the econometric analysis, by outlining a simple model of life cycle labor supply which is capable of embodying both timing and persistence effects. The model developed in this section can be examined using several types of data. Section 4 of the paper uses the model to examine the relative importance of timing and persistence effects in accounting for the time-series behavior of the aggregate labor force participation rate. The fifth section of the paper examines the timing and persistence effects using cross-section data. Essentially, the analysis relies on the observation that differences in unemployment over time are dominated by transitory movements, whereas geographic differences are for the most part permanent. The sixth section of the paper summarizes the empirical results and discusses their implications.

Section 2: The Impact of World War II

Before developing a formal model of life cycle labor supply, it is instructive to examine the one natural experiment which history has provided. The Second World War period and its aftermath offer an ideal testing ground for timing and persistence effects. From 1940 to 1944 real output in the United States increased 46.4% while the unemployment rate fell from 14.6 to 1.2 percent and averaged 1.3 percent from 1943 - 1945. The expansion in real output occurred at a time when large numbers of men were drawn into the Armed Forces increasing the job prospects and potential earnings of women. After 1945, unemployment rose slightly but remained below 4.0 percent through 1948. In the recession of 1949, the unemployment rate rose 2.1 points to 5.9%. The decade of the 1940's provides a good example of a large spurt in aggregate demand followed by a return to normal growth.

In perhaps the first statement of the timing hypothesis Milton Friedman underscored the instructive quality of the World War II period:

> ...the reaction to a higher wage rate expected to be temporary and then to revert to a lower level will tend to be very different than the reaction to a higher wage rate expected to be permanent. The temporarily higher wage rate would seem more likely to bring forth an increased quantity of labor from a fixed population than a permanently higher one, since there would be strong temptation to take advantage of the opportunity while it lasts and to buy leisure later.
>
> An interesting case in point is the experience of the United States during World War II, when both the fraction of the population in the labor force and the average number of hours worked per week were substantially higher than during the pre-war period.[7]

Friedman provides no explicit empirical analysis of changes in participation over the period, yet it is implicit in his discussion that World War II marked

a period of transitory wage gains which ought to be followed by an increased purchase of leisure in later years. This effect should have been accentuated by the large buildup of wealth which took place during the War. In contrast, if persistence effects were dominant market attachment would have increased with increased work experience, and World War II would have had a long-run positive impact on observed participation.

The issue of long-run versus transitory effects seems particularly important for the female labor force, and particularly for married women. Since almost all able males are always in the labor force, there is little variation in male participation and thus little to be learned about the impact of transitory movements in job opportunities and wages. Females participate much less than men, and their behavior appears to be much more sensitive to labor market conditions. Moreover, because of the large increase in the Armed Forces and the consequent increase in job opportunities, women were particularly affected by the expansion of demand during World War II.

The impact of World War II on the participation of adult women is documented in Table I.[8] From 1890 - 1940, the participation rate of adult women 25-64 increased from 13.9 to 25.7 percent, a compounded annual rate of increase of 1.2 percent per year. In striking contrast, between 1940 and 1944, the participation rate rose 23.5 percent (25.7 to 32.5) or 6.0 percent per year. Among married women, participation increased 2.5 percent per year from 1890 to 1940 (4.6 to 15.6), but a remarkable 11.3 percent from 1940 to 1944 (15.6 to 23.9). The marked increase in participation of married women was not confined to a specific age group. After rising very slowly in the

TABLE I

Participation of Adult Women
by Marital Status and Age
1890-1950

AGE/MARITAL STATUS	1890	1900	1920	1930	1940	1944	1947	1950
(1) Adult Women 25-64	13.9	16.0	19.6	21.8	25.7	32.5	28.8	31.1
(2) Married Women	4.6	5.6	9.0	11.7	15.6	23.9	20.0	23.0
MARITAL STATUS BY AGE								
(3) Women 25-44	15.1	17.5	21.7	24.6	30.5	36.1	31.2	33.3
Married	--	--	9.0	13.9	16.1	28.8	--	24.3
Single	--	--	--	75.4	76.8	82.0	--	77.7
(4) Women 45-64	12.1	13.6	16.5	18.5	20.2	27.1	25.3	28.8
Married	--	--	6.2	7.3	9.0	21.4	--	19.1
Single	--	--	--	47.5	56.6	59.1	--	64.8

Source: Line 1 is a weighted average of participation rates for women 25-44 and 45-64 taken from census data in Historical Statistics of the United States (1975), Part 1, Series D38-D39, p. 132. Population weights were taken from the same source. The values for 1944 and 1947 are based on CPS data and have been reduced to make them comparable to the Census definitions. We assumed that the growth rate of participation in the CPS data 1944-1950 was accurate; we thus extrapolated the growth rates back from the 1950 census value. The CPS values are 36.1 for 1944 and 32.0 for 1947.

Line 2 is series D60 from p. 133 of Historical Statistics. The data are for women 15 and over from 1890-1930, and

14 and over, 1940-1950. Married refers to all married women whether husband is present or not. As in line 1, the data for 1944 and 1947 were adjusted to accord with Census definitions. The CPS values were 25.6 for 1944 and 21.4 for 1947.

The data in lines 3 and 4 were taken from Census publications as follows:

1920: U.S. Census, 1920, vol. 4, p. 694, table 5 - data refer to married women with no distinction based on absence or presence of spouse. The entry for women 45-64 is the rate of participation of women 45 and over.

1930: U.S. Census, 1930, vol. 5, General Report on Occupation, Chapter 5, table 5, p. 274 - data refer to all married women.

1940: U.S. Census, 1940, Employment and Family Characteristics of Women--Special Report, table 1, p. 9, and table 2, p. 10. Data refer to married women, spouse present.

1950: U.S. Census, 1950, Special Report P-E, No. 1-A, Employment and Personal Characteristics, table 10, p. 1A-101. Data refer to married women, spouse present. Data for 1950 suggest that the category married-spouse present dominates the married-total group. Total married participation rates were 25.8 for women 25-44, and 20.4 for women 45-64.

twenty-year period before 1940, for example, participation by married women ages 45-64 more than doubled in the early years of the war.

The data in Table I suggest that the war had a major impact on the market behavior of adult women, particularly those who were married.[9] The data also suggest that the increase in participation was not short-lived. Table II presents projected values of labor force participation, based on trends estimated over the periods 1890 - 1930 and 1890 - 1940, for married women and adult women 25-64. Comparison of actual and predicted values confirms the long-term effects of the war. For adult women 25-64, the trend fitted through 1940 predicts the 1940 participation rate, but the actual rate remains above the trend throughout the subsequent decade. The results for married women are even more striking; the actual rate averages 24.7 percent above the trend for the three time periods noted.[10]

The failure of the participation rate to fall below the trend after the transitory developments of the war had passed seems to be evidence that persistence effects dominated the effects of timing. It is important to note that both effects seem to have been present. The fact that we observe a decline in participation after 1945 suggests that a significant number of women responded to the extraordinary opportunities of that period, and then scheduled themselves out of the labor force in subsequent years. Yet there is little support for a strong version of the timing hypothesis, which would have predicted a fall of labor supply below trend after the war. It seems evident that strong persistence effects were at work. Indeed, the labor

TABLE II

Predicted Trends in Participation
1940-1950

	Adult Women 25-64			Married Women		
	Actual	Predicted 1890-1940 Trend	Predicted 1890-1930 Trend	Actual	Predicted 1890-1940 Trend	Predicted 1890-1930 Trend
1930	21.8	22.3	21.9	11.7	11.8	11.5
1940	25.7	25.4	24.4	15.6	15.1	14.6
1944	32.5	26.3	25.5	23.9	16.7	16.0
1947	28.8	27.3	26.4	20.0	17.9	17.2
1950	31.1	28.2	27.3	23.0	19.3	18.4

Source: Table I

force participation rate of women, especially married women, appears to have been permanently increased by World War II.[11]

Two alternative explanations of the apparent positive long-run effect of the war experience deserve further comment. First, it is frequently argued that the war brought changes in social attitudes towards women in the workplace. However, these changes were caused in large part by the increase in the number of women working during the war. Changes in attitudes should be viewed as factors through which the effect of employment experience on long-run increases in participation is mediated. That work experience during the war affected attitudes is evident in a 1944 survey conducted by the United Auto Workers.[10] Half of the women surveyed, who had never worked in a factory before the war, professed a desire to continue in a factory after the war. Over 85% desired to remain employed in some capacity.[11] The view that the increased participation of women was due to a general change in attitudes rather than the conditioning effect of wartime experience is also belied by a comparison of cohort participation rates. The participation rate of women 20-24, who were not directly affected by the war actually fell between 1940 and 1950. If the change in attitudes were general, it would have been expected to rise along with other participation rates.

A second explanation of the long-run increase in female participation following the war relies on the argument that reduced discrimination and increased productivity led to a rise in the permanent relative wage of women

following World War II, and thus to an increase in participation. Insofar as this reflected human capital accumulation during the war, it is consistent with persistence effects. However, there is not much evidence that the male-female wage differential fell between the immediate pre- and post-war periods.[12]

The results presented in this section, while quite suggestive, are based on relatively fragmentary data. While there is an indication in the data that persistence effects dominated timing effects, this conclusion deserves much more careful scrutiny. In the next section we develop the model which underlies the more sophisticated econometric analysis of the timing and persistence effects presented in subsequent sections.

Section 3: The Model

This section outlines the model which provides the basis for the empirical work in this study. The model follows closely that of Lucas-Rapping (1969). However, it does differ in several respects, notably the treatment of expectations and our focus on participation rather than aggregate labor supply. Because much of the focus of this study is on how past behavior as well as expected future developments influence participation, it is necessary to employ a three-period framework, rather than the more common two-period formulation.

Individuals are assumed to maximize an intertemporal utility function of the form:

$$U = U(c_{t-1}, \ell_{t-1}, c_t, \ell_t, c_{t+1}, \ell_{t+1}), \qquad (1)$$

where c represents consumption and ℓ represents leisure, measured as a proportion of total time endowment. The period t-1 is assumed to represent the entire past, and the period t+1 embodies the whole future. It is assumed that the individual at time t takes consumption and labor supply decisions in period t-1 as given.

Individuals maximize the utility function (1), taking as predetermined previous employment experience, and the level of assets A_t, which may be positive or negative. The solution to the maximization problem will depend on their expectations of future nominal wages, w_{t+1}, future prices p_{t+1}, and the interest rate r_t. The budget constraint holds that lifetime consumption cannot exceed lifetime earnings.

Since the focus of this analysis is on the participation decision, the first-order conditions for the maximization of (1) are of little concern. It suffices to observe that an interior maximum with positive participation will occur if the market wage w_t, exceeds the reservation wage w_t^*. The reservation wage, w_t^*, is the minimum wage at which an individual will supply a positive amount of labor, that is, join the labor force.

For the moment we assume, following Lucas and Rapping, that the labor market is in equilibrium, though this assumption will be relaxed subsequently. If the labor market is in equilibrium, the prevailing market wage is potentially available to any possible participants. The reservation wage will depend on tastes, past employment, future opportunities, and assets. This may be written as:

$$w_t^* = f((1-\ell_{t-1}),\ p_t,\ \frac{w^e_{t+1}}{(1+r)},\ \frac{p^e_{t+1}}{(1+r)},\ A_t) \qquad (2)$$

Notice that we assume here that economic agents know the true price level at each point in time and so rule out misperceptions of the types stressed in some recent macroeconomic models.

The central question of this paper can be posed in terms of the signs of the derivatives of w_t^* with respect to the arguments in (2). The standard assumption that leisure is a normal good yields the unambiguous conclusion that $f_4 > 0$, that is, an increase in wealth, ceteris paribus, raises the reservation wage. The signs of the effects of the other variables in (2) depend on the form of the utility function (1).

Consider first the sign of f_1, the impact of previous employment experience on current labor supply. With assets held constant, previous employment will affect the reservation wage only insofar as it affects the marginal rate of substitution between current leisure and consumption. The types of arguments usually put forward in discussions of intertemporal substitution suggest that $\frac{\partial w_t^*}{\partial(1-\ell_{t-1})}$ is negative. Increases in previous work effort raise the marginal disutility of current labor. Formulations adopting this assumption explicitly have been used by Sargent (1980) and Kydland and Prescott (1981). The effect however is theoretically ambiguous. In the presence of adjustment costs, habit formation effects, or accumulation of "leisure capital" the sign can easily be positive.

The effects of changes in the other arguments of (2) can be analyzed in a similar fashion. Both expected future wages and prices have uncertain effects. Increases in future wages have a negative income effect on current labor supply. The substitution effect depends on the sign of $U_{\ell_t\ell_{t+1}}$. If it is positive, the substitution effect is positive and leisure today and in the future are complements. In the case of an additively separable utility function $\frac{\partial w_t^*}{\partial w_{t+1}^e}$ is unambiguously negative.[13] This illustrates that past experience and future opportunities do not have symmetric effects, since past employment experience has no effect in this case. The difference arises essentially because of the income effects of future wage changes. Increases in expected future prices have a positive income effect on labor supply, and an ambiguous substi-

tution effect depending on $U_{\ell_t c_{t+1}}$.

So far the theory has been developed for a single individual. People will in general differ in both their tastes and market opportunities as well as in their previous experience and asset accumulation. As a result there will exist a joint distribution of market and reservation wages. The aggregate participation rate L^s is then given by:

$$L^s = \iint_{w > w^*} g(w,w^*)\, dw\, dw^* \qquad (3)$$

It is readily apparent that $\frac{\partial L^s}{\partial w} > 0$: an increase in wages available to all workers will unambiguously raise the participation rate. The so-called "added worker" effect cannot exist in this model. Essentially, this is because at zero labor supply, increases in the wage do not change income. Income effects could be brought in if labor supply was modelled as the result of joint maximizaton by individuals within a family. They may also arise from changes in non-contemporaneous wages.

It follows from (3) that the participation rate is a function of the wage level, and the determinants of the shadow wage. Recognizing that the labor supply relation is homogeneous of degree zero in wages and and prices leads to the labor supply function:

$$L^s = f((1-\ell_{t-1}), \frac{w_t}{p_t}, \frac{w^e_{t+1}}{p_t(1+r)}, \frac{p^e_{t+1}}{p_t(1+r)}, \frac{A_t}{p_t}), \qquad (4)$$

where L^s is the fraction of the population in the labor force. For convenience we assume a logarithmic functional form. Equation (5) may then be rewritten as:

$$\ell n\ L^s = \beta_0 + \beta_1\ \ell n(1-\ell_{t-1}) + \beta_2\ \ell n(\frac{w_t}{p_t}) + \beta_3\ \ell n(\frac{w^e_{t+1}}{p_t(1+r)})$$

$$+ \beta_4\ \ell n(\frac{p^e_{t+1}}{p_t(1+r)}) + \beta_5\ \ell n\ \frac{A_t}{p_t}\ . \qquad (5)$$

Equation (5) differs from the Lucas-Rapping formulation in that the term $(1-\ell_{t-1})$ is included, reflecting the assumed dependence of the demand for leisure on leisure enjoyed during the preceding period. While such a dependence would seem to be a clear property of the Lucas-Rapping model, it is lost in the translation into their estimating equation. The term $(1-\ell_{t-1})$ does appear in their equation but only as a result of a Koyck transformation. While they expect and obtain a positive impact of previous labor supply, it is clear from the above discussion that the effect is actually ambiguous. A strong form of the timing hypothesis would predict a negative effect of lagged labor supply (apart from its role as a distributed lag generator).

At this point, it is useful to consider the expected signs of $\beta_1, \ldots, \beta_5$. The signs depend on the relative importance of persistence and timing elements in fluctuations in labor supply. A key parameter is β_1, the elasticity of current labor supply with respect to past employment experience. Sufficiently large intertemporal substitution effects would insure that $\beta_1 < 0$ so that increases in experience reduce subsequent participation. On the other hand, persistence effects imply $\beta_1 > 0$ so that increases in employment experience raise the participation rate. The coefficient of β_2 is expected to be positive, as increases in contemporaneous real wages raise the attractiveness

of seeking work. The sign of β_3 depends on the relative size of timing and persistence effects. If timing elements predominate, β_3 will be negative as increases in expected wages cause labor supply to decline because of intertemporal substitution effects. In the context of a model like that of Lucas and Rapping, one would expect that $\beta_2 + \beta_3 \simeq 0$, since the long-run wage elasticity of labor supply is expected to be small. If adjustment costs or capital accumulation effects cause labor supply decisions to have a permanent character, the sign of β_3 will be positive. The sign of β_4 is ambiguous while β_5 is expected to be negative.

Equation (5) as it stands is a labor supply curve. If the labor market were always in equilibrium, it could be estimated directly using the employment ratio (proportion of the population who are employed) as the dependent variable. If, however, the labor market does not always clear, the level of employment cannot be taken as measure of desired labor supply. However, a measure of supply is provided by the labor force participation rate, the proportion of the population looking for work or working. This variable is the measure of labor supply used in this study. However, estimates using employment as the dependent variable are also discussed.

It is important to be clear about the issues involved in choosing between the employment and participation rates as dependent variables in equation (5). Lucas and Rapping take the position that an equation like (5) characterizes the level of employment, not the participation rate. On their hypothesis, workers who choose not to work because of a transitory decline in wages show up as unemployed and so are counted as labor force participants. Thus their argument implies that studying the labor force participation rate would obscure the important intertemporal substitution

effects of wage changes. Although estimates of equation (5) using employment are presented below, we regard the Lucas-Rapping interpretation of the unemployment rate as problematic for several reasons. First, it provides no explanation for the fluctuations in the participation rate which account for a sizeable part of observed employment fluctuations. Second, unemployment is defined as inability to find work at prevailing wages. Individuals who are intertemporally substituting out of employment presumably know the prevailing wage, and do not desire work. They should therefore not report themselves as unemployed. Finally, our previous analysis, Clark and Summers (1979), of individual unemployment experience suggests that the assumption of continuous labor market equilibrium is very problematic.

Once the possibility that the labor market may not clear is recognized, it is necessary to modify equation (5). When involuntary unemployment exists, the assumption that all who want them can get jobs at the prevailing wage is no longer appropriate. Individual decisions regarding labor supply will be affected by the knowledge that search costs are higher when unemployment is higher. Since the mean duration of a completed spell of employment in the United States is only about 20 months (Clark and Summers 1979a), relatively small changes in the duration of pre-employment search can have a large impact on the return to seeking employment. By increasing the duration of search as well as by reducing the pool of good jobs, and increasing the risk of layoff, unemployment discourages labor supply. We thus include the unemployment rate as an additional explanatory variable in some of our empirical work. In the next two sections we estimate alternative forms of (5) using both aggregate time-series and cross-section data for different demographic groups.

Section 4: Time-Series Evidence

This section describes the estimation of (5) using time-series data. Before the model can be estimated, it is necessary to develop operational measures of the variables. Both the proxy for previous employment experience and the measurement of expectations of inflation and the real wage require discussion. In equation (5) previous experience is represented simply by $(1-\ell_{t-1})$. This term is supposed to represent the entire past experience of a population group. Using simply the previous year's employment experience would be inappropriate since the logic of both the timing and persistence effects suggests current labor supply is conditioned by a longer history. We therefore follow the work of Houthakker and Taylor (1970) in developing a measure of the "stock" of past employment. We assume that the labor supply of a cohort depends on a set of variables Z (such as those contained in (5)) and on its past employment experience. Past employment experience is assumed to be represented by:

$$E_t^* = \sum_{i=1}^{\infty} \lambda^{i-1} E_{t-1} = \frac{E_{t-1}}{1-\lambda L}, \tag{6}$$

where L is the lag operator. Since participation is a function of this stock and the set of variables Z it is clear that:

$$PR_t = Z_t\beta + \beta_1 E_t^*, \tag{7}$$

where PR_t is the participation rate. Using (6) the model can be expressed in terms of observables as:

$$PR_t = Z_t\beta - Z_{t-1}\lambda\beta + \lambda PR_{t-1} + \beta_1 E_{t-1}. \tag{8}$$

Alternatively, as discussed in the previous section, the employment ratio could be taken as the dependent variable. Using equation (5) and (8), and appropriate measures for participation, employment and Z, the most general specification of our estimating equation can be written

$$PR_t = \beta_0 + \beta_1 E_{t-1} + \beta_2 W_t + \beta_{3t} W_f^e + \beta_{4t} P_f^e + \beta_5 t + \beta_6 UM_t + \lambda PR_{t-1}$$
$$- \lambda[\beta_2 W_{t-1} + \beta_{3_{t-1}} W_f^e + \beta_{4_{t-1}} P_f^e + \beta_5 (t-1) + \beta_6 UM_{t-1}] + v_t, \quad (9)$$

where t indicates time, W_t is the contemporaneous real wage, ${}_tW_f^e$ and ${}_tP_f^e$ are expected future discounted wages and prices, E_{t-1} is the ratio of employment to population in the previous period, UM_t is a measure of the unemployment rate, and v_t is an error term in M.[14] The time trend has been included to reflect the possible influence of slowly changing determinants not captured by other included variables. In this formulation, the coefficient β_1 measures the persistence of labor supply, while λ reflects the lag in formation of the habit stock. The long-run impact of an increase in employment experience is $\frac{\beta_1}{1-\lambda}$. This may be interpreted in two different ways. It represents the increase in the participation rate at time t, if employment in all previous periods were raised by one unit. It also can be interpreted as the sum over all future periods of the increases in participation arising from a one-shot increase in employment.

Equation (6) gives us a way of measuring the employment stock and deriving the estimating equation in (9); the second issue which must be considered is the development of measures of expected wages and prices. Most standard econometric procedures seem inappropriate because theory suggests

that labor supply should depend on the expected discounted value of wages and prices over a long horizon. Our procedure for medelling expectations begins with an estimate of a set of vector auto-regressions relating wages, prices, and real output.[15] These vector auto-regressions are then simulated using data for each year in the sample to generate forecasts of wages and prices for the succeeding 5 years. These variables, ${}_tw^e_{t+i}$, are then adjusted to an after-tax basis and discounted back to year t, using year t's municipal bond rate.[16] They are then averaged to form proxies for $\frac{w^e_{t+1}}{p_t(1+r)}$ and $\frac{p^e_{t+1}}{p_t(1+r)}$, which in their logarithmic form we have labelled ${}_tW^e_f$ and ${}_tP^e_f$, respectively.

This procedure is somewhat arbitrary in its choice of horizon and in the specification of the vector auto-regressions. However, it seems to be

the only computationally feasible way of handling the modelling of expectations which are more than one period ahead. Rational expectations techniques of the sort developed by McCallum (1976) are not applicable in the current example because of the quasi-differencing involved in moving to equation (8).

The data used in the actual estimation cover the period 1951 - 1981. We have chosen to use annual data because timing and persistence effects are likely to be badly confounded with seasonal fluctuations in higher frequency data. Our measures of the participation rate and employment ratio are age-adjusted rates calculated as fixed weight averages of age-specific rates. This age-adjusted participation rate is used to avoid biases introduced by the changing age structure of the population.

In the results reported below, we have omitted assets from the estimating equation. Like others before us (e.g. Lucas and Rapping (1969)), we found assets to have no significant relationship to participation. This conclusion is based on an assets measure which includes the real value of household financial holdings, excluding equity. A variety of other assets measures which included equity, housing and social security wealth were tried with little change in the results.

Several econometric issues arise in the estimation of equation (9). First, the equation is highly non-linear in the parameters, necessitating non-linear estimation. Second, the error term v_t is likely to be serially correlated. Even if the error term in equation (7) relating participation to Z and E* were not serially correlated, the transformation of E* involved in deriving the estimating equation would induce moving average error. Serial correlation in the error term is parti-

cularly serious in this case because both lagged participation and employment are included in the regression equation. Since there is no reason to suppose that the error in (8) follows a simple auto-regressive scheme, the usual corrections (e.g. Cochrane-Orcutt) are not appropriate. We have chosen to estimate the equation using two-stage non-linear least squares, treating both lagged participation and employment as endogenous. The instrument list includes a time trend, a squared trend, real Federal government spending, the rate of money growth and the real per-capita stock of non-residential capital, along with the included exogenous variables. In addition, to allow for simultaneity, the contemporaneous wage is treated as endogenous.

A third econometric difficulty is collinearity, which frequently precludes disentangling estimates of λ, which determines the mean lag of the "past employment" effect, and β_1, the impact effect of changes in employment experience. Frequently, the estimated values of λ lie outside the range $0 \leq \lambda \leq 1$, and so the equations are not meaningful. Therefore, in many of the equations reported below, the value of λ is constrained to the a priori plausible value of .9. None of the qualitative conclusions were affected by the imposition of this constraint. In particular, all of the conclusions regarding the effects of transitory wage changes are wholly unaffected by the choice of λ.

Table III presents estimates of several variants of equation (9) using the log of the participation rate as the dependent variable. The results do not suggest that timing effects have an important role to play in explaining cyclical fluctuations. The estimated elasticity of labor supply with respect to a transitory wage change is always small and sometimes negative. Nor is there any clear evidence of a negative relationship

Table III

Timing and Persistence Effects in Time-Series Participation Equations

Equation	CONS	W	W*	P*	UM_t	TIME	E_{t-1}	λ	SEE	D.W.
1	4.975 (.320)	-.084 (.100)	.009 (.039)	-	-	-	-	-	0.005	1.48
2	6.620 (.815)	-.052 (.099)	-.157 (.122)	.186 (.125)	-	-	-	-	0.005	1.72
3	3.814 (0.060)	-0.186 (0.056)	-0.012 (0.041)	-	-	0.007 (0.001)	0.470 (0.234)	-0.501 (0.246)	0.009	1.125
4	3.777 (0.089)	-0.199 (0.060)	-0.030 (0.054)	-	-0.001 (0.003)	0.008 (0.002)	0.326 (0.293)	-0.352 (0.308)	0.008	0.920
5	4.232 (.052)	.219 (.426)	-.090 (.454)	.135 (.459)	-	-	.128 (.444)	-.127 (.437)	.016	.377
6	0.297 (0.428)	-0.321 (0.179)	0.066 (0.058)	-	-	0.009 (0.005)	0.019 (0.110)	0.9[b]	0.006	1.898
7	0.301 (0.399)	-0.287 (0.181)	0.027 (0.062)	-	-0.002 (0.002)	0.009 (0.004)	0.018 (0.102)	0.9[b]	0.006	1.974
8	-0.584 (0.518)	-0.028 (0.162)	-0.194 (0.466)	0.310 (0.520)	-	-	0.243 (0.123)	0.9[b]	0.006	1.820

Notes: a) Numbers in parentheses are standard errors.
b) The parameter was set equal to the value indicated.

between expected future wages and labor supply, as predicted by models which emphasize timing effects. No clear conclusions emerge about the effects of changes in the price of future consumption. It is noteworthy that the increases in the unemployment rate of mature men do appear to reduce the participation rate, as theory predicts.

The data provide weak support for the importance of persistence in explaining fluctuations in labor supply. It is not possible to interpret the estimated effect of employment experience in equations (3)-(5) of Table III because the estimated value of λ lies outside its permissible range. In equation (8), where a time trend is not included, the estimated effect of the "employment stock" variable is both substantively and statistically significant. However, when a time trend is included as in equation (6) and (7), the "employment stock" coefficient remains positive but becomes insignificant. Estimates using the employment-population ratio as a dependent variable are reported in Table IV. The results are qualitatively similar to those obtained using the participation rate as a dependent variable. Here the evidence of persistence effects is very weak. Even when the time trend is omitted as in equation (6) of the table, the employment stock variable is statistically insignificant. Not surprisingly, the cyclical indicator, UM_t, enters the employment equations in a highly significant way.

Table IV

Timing and Persistence Effects in Time-Series Employment Equations[a]

Equation	CONS	W	W*	P*	UM_t	TIME	E_{t-1}	λ	SEE	D.W.
1	4.183 (.041)	.020 (.114)	.158 (.101)	-	-	-	-	-	.013	1.94
2	4.197 (.090)	-.184 (.259)	.434 (.319)	-.235 (.319)	-	-	-	-	.013	1.91
3	0.128 (2.167)	-0.215 (0.636)	-3.043 (1.966)	3.056 (2.010)	-0.028 (0.010)	0.042 (0.014)	-0.003 (0.497)	0.888 (0.084)	0.021	1.545
4	3.662 (0.387)	0.540 (0.613)	-0.808 (0.922)	0.950 (0.980)	-	0.005 (0.006)	0.261 (0.897)	-0.250 (0.955)	0.018	1.512
5	3.967 (0.021)	-0.051 (0.058)	0.034 (0.057)	-0.169 (0.118)	-	-	-4.121 (2.351)	4.154 (2.346)	0.012	1.801
6	-0.490 (0.994)	-0.564 (0.358)	0.508 (0.457)	-0.166 (0.552)	-	-	0.220 (0.239)	0.9[b]	0.016	2.022
7	0.265 (1.013)	-0.591 (0.422)	0.298 (0.138)	-	-	0.008 (0.011)	0.026 (0.259)	0.9[b]	0.015	2.033
8	1.260 (0.326)	-0.305 (0.096)	-0.009 (0.053)	-	-0.015 (0.001)	0.009 (0.002)	0.05 (0.085)	0.9[b]	0.006	1.490

Notes: a) Numbers in parentheses are standard errors.
b) Parameter has been set equal to indicated value.

The time-series evidence presented here suggests that transitory variations in the perceived real wage have little effect on the rate of labor force participation. We find no indication in the data of the strong intertemporal substitution effects which are the basis of classical macro models. These findings on the effect of transitory wage changes are consistent with the positive impact of lagged employment found in Table III. While the quality of the evidence on lagged employment precludes strong conclusions, the results suggest that work may be habit-forming. Clearly, if experience in employment persists so that the decision to work is a relatively long-term commitment, it is not surprising that transitory wage changes have no discernible effect on labor supply.

These results conflict quite sharply with those of Hall (1980), who finds that the data support the intertemporal substitution hypothesis. Part of the conflict may lie in Hall's inclusion of fluctuations in hours per worker. The most serious problem, however, is Hall's measurement of the "intertemporal substitution parameter." He assumes that labor supply decisions are driven only by the price of future consumption in terms of today's labor. It is difficult to see what utility function would have this property in which the current price of consumption and future price of leisure are irrelevant. Our findings are consistent with the generally negative results obtained by Altonji (1982), and Mankiw, Rotemberg and Summers (1982) regarding the intertemporal substitution hypothesis.

Section 5: Cross-Section Evidence

The comparison of the relationships between labor market variables which are observed in time-series and cross-section data can shed light on the importance of timing and persistence effects. In particular, this section shows that recognizing the distinction between transitory and permanent effects embodied in the two hypotheses provides a framework for reconciling the large differences between cross-sectional and time-series estimates of the relationship between unemployment and participation rates. The conflict between these two types of evidence emerged in the early 1960's when several studies found large discouraged worker effects using decennial census data on local participation and unemployment rates, while other studies found very small effects using time-series data (Long 1958, Barth 1968, Bowen and Finnegan 1969).

Attempts to reconcile the divergent results have generally focused on possible biases in the cross-section evidence. In his often cited review of the evidence Mincer (1966) conjectured that cross-section estimates were biased by omission of migration, seasonal differences across SMSA's in census timing and common errors in the rate of participation and unemployment which give rise to a spurious association. Mincer also noted but did not pursue the permanence of state unemployment differentials. Bowen and Finnegan (1969) have examined each of these possibilities and suggest that none can satisfactorily explain the difference between the two sets of estimates.[17] More recent attempts to resolve the anomaly (e.g. Fleisher and Rhodes 1976) have also been unpersuasive.[18]

These results suggest that cross-section and time-series estimates cannot be reconciled by pointing to biases in the cross-section data. A potentially more fruitful approach is to recognize the fundamental differences between intertemporal and interspatial variations in unemployment. At any point in time in any labor market the rate of unemployment is composed of both a permanent and a transitory component. In cross-section data, most variation in unemployment is presumably due to variation in the permanent component across regions. This is in contrast to the aggregate time-series data where variation in the transitory component is likely to be dominant. Cast in these terms, the cross-section data provide estimates of the long run or permanent effect of unemployment, while transitory effects are captured with time-series data.

At this point, it is important to be clear about the interpretation of the measured unemployment rate. In this section, we adopt the "traditional" interpretation, which holds that the labor market does not clear and that the unemployment rate affects the attractiveness of seeking work. It is then meaningful to speak of the effect of changes in differences in unemployment rates on labor force participation rates. We prefer the traditional interpretation of the unemployment rate to that of Lucas and Rapping for several reasons. Most important, the substantial permanent component in the differences between local unemployment rates suggest that they are not consequences of transitory wage movements. In addition, the evidence that participation and unemployment rates are negatively correlated is difficult

to account for in the classical view. Indeed, in its strong form, it lacks an explanation for fluctuations in the participation rate. Other results described below also incline us towards the "traditional" interpretation of unemployment fluctuations.

In order to reconcile the time-series and cross-section estimates, it is necessary to examine the relationship between transitory and permanent effects, and to establish the conditions under which the permanent effect dominates. This is precisely the issue discussed in Section 3 which distinguishes the timing and persistence effects. There we found that persistence effects imply that employment in previous periods raises current participation. Short-run effects persist. If persistence effects predominate, the response of labor supply to permanent changes in demand should exceed the response to transitory changes. This prediction, which is borne out by the data, is not consistent with strong forms of the timing hypothesis, which imply that the response to transitory fluctuations should exceed the response to permanent changes.

It thus would seem that the predominance of persistence effects receives substantial support in the comparison of cross-section and time-series evidence. Similar support emerges from a comparison of transitory and permanent effects using cross-section data. Use of cross-section data provides a strong test of the relative importance of timing and persistence effects since the two views of labor force dynamics have sharply different implications for the appropriate demand variable in cross-sectional equations. The timing view holds that the important determinant of participation is the deviation of demand from its normal level.

When it is above its normal level, workers schedule themselves into the labor force, leaving when it falls below normal. The persistence view, on the other hand, implies that the normal level of demand is the appropriate variable since workers make labor supply decisions on a long-term basis.

The model embodied in this discussion can easily be made explicit. It is assumed that the level of demand may be represented by ER, the proportion of those desiring work who have it (1 - the unemployment rate). We postulate that participation in region i, PR_i, depends on the permanent level of demand, ER_i^p, and the level of transitory demand, ER_i^t, defined as $(ER_i - ER_i^p)$. A simple characterization of the participation equation is given by:

$$PR_i = f(ER_i^p, ER_i^t, Z_i) \tag{10}$$

where Z_i is a vector of variables other than demand conditions which influence the participation rate.

As the discussion in the preceding paragraph makes clear, the persistence view predicts that $f_{ER_i^p}$ will be large while $f_{ER_i^t}$ is not important; the timing hypothesis has the opposite implication. The distinction between the two hypotheses may be drawn more sharply by considering their implications for a change in the normal rate of employment holding constant the current rate. It is apparent from equation (10) that

$$\frac{\partial PR_i}{\partial ER_i^p} = f_{ER_i^p} - f_{ER_i^t} , \tag{11}$$

The preceding discussion implies that this expression should be positive if persistence dominates and negative under the timing hypothesis. Intu-

itively, with current opportunities held constant, a decline in future opportunities will increase labor supplied by a worker who can easily substitute leisure across periods. On the other hand, it will make current employment less attractive to a worker for whom leisure is complementary across periods.

These implications of the timing and persistence hypotheses are clearly subject to empirical verification. To test the conditions laid out above we have estimated a basic labor supply model using the data from the 1970 U.S. Census on participation and selected determinants by state. Time-series data (1966 - 1974) on unemployment by state were taken from the Manpower Report of the President. These series are based on a combination of data on unemployment insurance, payrolls and, for some states, the monthly CPS. In addition to variables measuring the permanent and transitory effects of unemployment we have included measures of the permanent or expected real wage as well as structural and demographic variables which affect participation through the shadow wage. As a first approximation we assume that variation in nominal wages across states reflects primarily variation in the permanent component of real wages, so that the level of prices is excluded from the model.[19] For women the basic equation is:

$$\begin{aligned} \ln PR_{ij} = {} & \alpha_1 + \alpha_2 \ln(WM)_i + \alpha_3 \ln(WW)_i + \alpha_4 EDW_i + \alpha_5 RW_i \\ & + \alpha_6 RBW_i + \alpha_7 URB_i + \alpha_8 MIGR_i + \alpha_9 C6_i + \alpha_{10} \ln(ER)_i^p \\ & + \alpha_{11} \ln(ER)_i^t + v_{ij}, \end{aligned} \qquad (12)$$

where the variables are defined as follows:

PR_{ij} = participation rate of the j^{th} demographic group in the i^{th} state

WM = median earnings of men 18 and over

WW = median earnings of females 18 and over

EDW = median years of schooling - females 18 and over

RW = proportion of females in the population 16 and over

RBW = proportion of non-white females in the population 16 and over

URB = proportion of the population residing in Census urban areas

MIGR = total net migration 1960 - 1970 as a proportion of 1970 population

C6 = proportion of families with a child less than six living at home

ER = state aggregate employment rate

$\ln(ER)^p$ = average of ln(ER) for 1966 - 1974

$\ln(ER)^t = [\ln(ER) - \ln(ER)^p]$.

Letting EDM_i indicate median years of schooling of males 18 and over, and RBM, the proportion of non-white males in the population, the basic equation for the male group is:

$$\ln PR_{ij} = \beta_1 + \beta_2 \ln(WM)_i + \beta_3 EDM_i + \beta_4 RBM_i + \beta_5 URB_i + \beta_6 MIGR_i + \beta_7 \ln(ER)_i^p + \beta_8 \ln(ER)_i^t + u_{ij} \quad (13)$$

The expected effects of the structural and demographic variables included in equations (12) and (13) have been dealt with at length in a variety of places and will receive only brief mention here. Education and degree of urbanization are expected to have a positive effect on participation through their effects on labor force attachment and the costs of transportation. Migration is expected to raise participation in the receiving areas and

lower participation in states with net outflow. The proportion of black men (women) in the population is included to control for well-known differences in participation behavior between blacks and whites. The variable is expected to have a positive sign in the female equation, and a negative sign in the equation for males. The proportion of women in the population is included as a measure of potential competition among women; the expected sign is negative. The proportion of women with a child under six is expected to raise the shadow wage and thus to reduce participation. The expected sign of own-wage variables ($\ln WW_i$ in (12) and $\ln WM_i$ in (13)) is positive. Male earnings have been included in the female equation to allow for the effects of joint decision-making in the family and are expected to reduce female participation. Female earnings on the other hand are specified to have no effect on male participation.

The differing implications of the timing and persistence views are captured in the coefficients of $\ln(ER)_i^p$ and $\ln(ER)_i^t$. Using the female equation, under the timing hypothesis α_{11} is expected to be positive and to dominate α_{10}, so that $\alpha_{10} - \alpha_{11} < 0$. The persistence hypothesis, on the other hand, implies that permanent effects are dominant so that $\alpha_{10} - \alpha_{11} > 0$. In addition to the basic equations (12) and (13) we also have estimated a specification which allows no role for transitory effects so that $\alpha_{11} = \beta_8 = 0$.

Estimates of the basic model for both men and women are presented in Table V. The principal coefficients of interest, α_{10} and α_{11} (β_7 and β_8 for men) are presented in rows 9 and 10; for convenience we have computed the sum of the coefficients in row 11. The results provide clear support for the importance of persistence effects. The long-run effects of unemployment clearly dominate the transitory effects in virtually all demographic groups. The difference between the permanent and transitory components is less than zero in only three cases, and in no case is the negative coefficient significant. We find the strongest evidence of the persistence effects among women for whom the timing phenomenon was expected to be particularly relevant. In each of the female age groups, except women over 65, the transitory employment rate is totally insignificant, often entering with a negative sign. In contrast, the permanent effects are large and significant. For women 45 - 64, for example, the permanent effect (α_{10}) is 2.46, which implies that a decline in the permanent rate of unemployment from 0.06 to 0.05 would raise the participation rate by 2.46 percent. The transitory effect for this group, on the other hand, is -3.15, clearly reflecting the dominance of the permanent employment rate which enters negatively in the deviation. The total effect of the permanent rate is thus 5.61. Similar positive effects are found for younger women as for women 45 - 64. Only among women over 65 does the timing hypothesis find any support and here the estimates are not particularly precise. The sum of the permanent and transitory effects is -.10, which may be marginally important in determining the participation behavior of women over the age of 65. A somewhat stronger finding

Table V

Estimates of the Basic Cross Section Model for Men and Women
(standard errors in parentheses)

	MALE					FEMALE				
	16-19	20-24	25-44	45-64	65+	16-19	20-24	25-44	45-64	65+
1. Male Earnings (WM)	.19 (.13)	-.03 (.07)	.06 (.01)	.17 (.04)	.31 (.21)	.42 (.24)	-.07 (.11)	-.39 (.11)	-.17 (.16)	.04 (.24)
2. Female Earnings (WW)	-	-	-	-	-	.34 (.20)	.40 (.09)	.41 (.09)	.53 (.13)	.55 (.20)
3. Education (EDM, EDW)	.05 (.04)	-.0007 (.02)	.004 (.005)	.03 (.01)	.17 (.07)	.06 (.08)	-.01 (.04)	.03 (.04)	.06 (.05)	.21 (.08)
4. Proportion Female (RW)	-	-	-	-	-	2.28 (3.02)	1.65 (1.41)	-.04 (1.38)	4.13 (1.99)	.52 (2.93)
5. Proportion Black (RBW, RBM)	-.44 (.28)	.02 (.14)	-.05 (.03)	-.16 (.08)	.53 (.44)	-1.59 (.52)	-.30 (.24)	.41 (.24)	-.41 (.34)	.37 (.50)
6. Urbanization (URB)	-.0009 (.001)	-.0003 (.0007)	-.0004 (.0001)	-.0003 (.0004)	-.004 (.002)	-.0002 (.002)	.00003 (.0009)	-.0004 (.0009)	-.001 (.001)	-.005 (.002)
7. Children Under 6 (C6)	-	-	-	-	-	.008 (.01)	.004 (.005)	.004 (.005)	.01 (.007)	.02 (.01)
8. Net Migration (MIGR)	.32 (.11)	.21 (.06)	.02 (.01)	-.05 (.03)	-.27 (.18)	-.08 (.19)	.006 (.09)	.23 (.09)	-.007 (.12)	-.33 (.18)

(continued)

Table V, continued

	MALE					FEMALE				
	16-19	20-24	25-44	45-64	65+	16-19	20-24	25-44	45-64	65+
9. Permanent Employment Rate (ER^p)	2.56 (1.09)	-.38 (.56)	.63 (.12)	1.33 (.30)	3.29 (1.72)	5.97 (1.78)	2.96 (.83)	2.46 (.82)	2.31 (1.18)	2.17 (1.73)
10. Transitory Employment Rate (ER^t)	-3.26 (2.11)	-.42 (1.08)	-.05 (.23)	.12 (.58)	4.62 (3.33)	.85 (3.37)	-.07 (1.57)	-3.15 (1.55)	-.29 (2.22)	2.27 (3.27)
11. Full Permanent Effect (line 9 - line 10)	5.82 (2.33)	.04 (1.19)	.68 (.25)	1.21 (.65)	-1.32 (3.68)	5.12 (3.82)	3.03 (1.78)	5.61 (1.75)	2.60 (2.52)	-.10 (3.71)
12. Permanent Employment Rate (ER^p)[a]	2.64 (1.11)	-.37 (.55)	.63 (.12)	1.33 (.30)	3.18 (1.74)	5.97 (1.76)	2.96 (.82)	2.45 (.85)	2.31 (1.16)	2.17 (1.72)
R^2	.52	.26	.65	.74	.33	.71	.67	.76	.60	.60
SEE	.09	.04	.009	.02	.14	.12	.06	.06	.08	.12

a) Line 12 reports the coefficient of ER^p when ER^t is excluded from the equation.

for men over 65 leads to the paradoxical conclusion that the timing view, a construct based on life cycle considerations, finds its support only among those nearing the end of their adult lives.

The results in rows 10 and 11 of Table V clearly suggest that changes in the expected rate of unemployment strongly influence the participation decisions of most demographic groups. This conclusion is buttressed in row 12 of Table V, which presents estimates of the effect of unemployment assuming no transitory effects (i.e., $\alpha_{11} = 0$). Among most demographic groups the expected rate of employment enters significantly with a relatively large positive coefficient. Differences in the size of the employment effect within and across demographic groups are consistent with the theoretical role of unemployment laid out in Section 3. We find that unemployment is more important in those groups where employment durations are short. Thus within the male and female categories teenagers are more sensitive to variations in unemployment than are older persons. Similarly, within age groups, women tend to be more responsive than men. It should be noted, however, that the coefficients for the older adult men are far from trivial. We estimate that a 1 point decline in the long-term unemployment rate (0.06 to 0.05) leads to a 0.6 percent increase in the participation of men 25 - 44, and a 1.3 percent increase in the rate of participation of men 45 - 64.

The evidence on the relative importance of timing and persistence in the cross-section data relies on the use of the unemployment rate to capture market opportunities. We have already discussed some of our reasons for preferring this kind of interpretation in section 3. But there are

two additional issues that need to be addressed. In the first place, classical models would call for the use of permanent and transitory real wages rather than unemployment rates as explanatory variables. The results of including real wages in time-series regressions have been discussed in the preceding section. We have made an attempt to gauge their effect in the cross-section analysis by calculating real wages by state. We used the BLS Standard of Living Estimates for 35 cities to construct state price indices; wages were based on data for manufacturing by state. Both permanent and transitory wage variations had only minor effects on state participation and employment rates. Therefore the unemployment rate has been used as a proxy for the attractiveness of entering and remaining in the labor force. The role of wages and prices in explaining cross-section differences in participation remains an important area for future research.

A second problem concerns the effect of omitted variables. Although we have included a number of structural characteristics of each state in the equation, there is always the possibility that omitted common third factors account for the observed correlations between unemployment and participation rates. We explored this issue by using other variables such as the employment-population ratio in place of the unemployment rate. This had little effect on the qualitative conclusions.[20]

The analysis in this section has shown the predominance of the expected or natural level of demand in explaining participation differences across states. Except for those over 65, there is no evidence for the notion that transitory changes in opportunities play a significant role in decisions about participating in the labor force. These results suggest that a

rise in expected opportunities, holding current opportunities constant, will call forth an increase in participation, a response consistent with the implications of persistence in labor supply. The notion that individuals schedule their labor supply according to variations in current opportunities finds little support in these data.

Section 6: Conclusions

The results in this paper suggest the importance of persistence in labor market decisions. A variety of types of evidence suggest that previous employment experience has an important effect on subsequent labor supply. This implies that labor supply decisions are not very responsive to transitory changes in employment opportunities. While no one of the tests presented in this paper can be regarded as decisive, in conjunction they suggest that persistence elements are more important than timing elements in explaining fluctuations in either the number of persons employed or the number participating in the labor force. Our results leave open the possibility that timing elements are important in explaining cyclical fluctuations in average hours worked and in work effort.

Acceptance of these conclusions has important implications for both macroeconomic theory and policy. These results cast doubt on the medium-run relevance of the natural rate hypothesis. Because policy affects the level of employment in the short run, it has a long-run effect on the position of the labor supply schedule. Workers drawn into the labor force by cyclical upturns tend to remain even after the boom has ended. The converse is true for shocks which reduce employment. At this point, the quantitative importance of these effects is uncertain, although our interpretation of the evidence reported here suggests that they are quite important.

This paper has only begun to touch on the implications of alternative life cycle labor supply models for macroeconomic questions. Both the empirical and theoretical work described in this paper could usefully be extended

in several directions. It would be valuable to develop tests which can distinguish different aspects of persistence. In particular, the model developed here completely ignores the accumulation of human capital. The explicit inclusion of human capital in the model would provide a more satisfactory basis for rationalizing the observed persistence in labor supply, and would also suggest relationships between employment experience and subsequent wage levels. It would be valuable to extend the empirical work reported here by attempting direction estimation of utility function parameters using recently developed rational expectations techniques. Unsuccessful estimates of a relatively simple utility function which takes no account of persistence effects are presented in Mankiw, Rotemberg and Summers (1982). While these extensions would be valuable, it is unlikely that they would call into question the main conclusion reached here that a proper theory of labor supply must come to grips with the persistence of participation.

FOOTNOTES

1. At the conference where this paper was presented we became aware of the important paper by Altonji (1982). His work provides a comprehensive set of econometric tests of what this paper calls the timing hypothesis.

2. The most extensive empirical work is reported in Houthakker and Taylor (1970). Theoretical analysis is surveyed by Pollack (1978).

3. In a Keynesian framework, this may be interpreted as temporarily increasing aggregate demand, and increasing employment opportunities. In the context of a classical model, it can be thought of as an unexpected increase in the money stock, leading to a transitory increase in the perceived real wage. In either case the expansionary policy is taken to be temporary in its direct effect.

4. For a recent statement of this argument, see Wachter (1977).

5. It is tempting but inaccurate to regard persistence effects as arguments in support of expansionary policy. If the economy is initially at an optimal Walrasian equilibrium, locking additional workers into employment is not an efficiency gain. Of course this conclusion does not hold if the "natural rate" of unemployment is inefficiently high, as Phelps (1972) suggests is likely to be the case. If, as has been suggested, work is habit-forming, no clear basis exists for welfare judgments.

6. Such hysteresis effects in which the equilibrium level of employment is affected by the transition path have been discussed by Phelps (1972), but have, to our knowledge, received no empirical attention.

7. Milton Friedman, Price Theory: A Provisional Text, 1962, p. 200.

8. Ideally one ought to look at the participation of women of different ages rather than different cohorts. Thus, for example, the appropriate way to examine the impact of the war on 50-year-old women is to look at 46-year-olds in 1940 and 56-year-olds in 1950. Available data, however, precludes such an analysis.

9. This result was also obtained using employment instead of labor force participation as a measure of labor supply. It should be noted that the participation rates for married women have not been adjusted for differences in fertility. As others have noted, adjusting for fertility would accentuate the divergence between actual rates and extrapolation of 1930 - 1940 trends (See: Bowen and Finnegan, 1969, pp. 200 - 201). Fertility in 1940 was exceptionally low, while 1950 was part of the post-war baby boom. It may be that a fertility correction is inappropriate since fertility is jointly determined with labor supply.

10. It might be argued that the purportedly permanent shifts in participation induced by the World War II experience actually reflect the very weak economy of 1940. In order to test this possibility, trends were estimated in 1930. This leads to even greater discrepancies between predicted and actual participation, both during and after the war. As a further check, we estimated trends using data for the whole 1890 - 1980 period. The results were qualitatively similar, although the estimated effects of the war on subsequent participation were significantly reduced. Of course, this procedure may be inappropriate because the war presumably affected post-war data.

11. Monthly Labor Review, May (1944).

12. Both in aggregate and within occupations, there was virtually no change in the ratio of male and female hourly and/or yearly earnings between 1939 and 1950. The data must be interpreted cautiously because of a plethora of selection effects.

13. Strictly speaking, all that is required is that (1) can be represented as $V_1(c_{t-1},\ell_{t-1}) + V_2(c_t,\ell_t c_{t+1},\ell_{t+1})$.

14. In the empirical work below, we use the unemployment rate for 35 - 44 year old men. This avoids problems of demographic adjustment.

15. The estimates were performed using annual data for the period 1949 - 1981. Two lags on each variable were included. Wages are measured using an index of compensation in the private business sector. Prices are measured using the consumption price deflator, and output is measured as real GNP.

16. The tax rate is the sum of the average marginal tax rate imposed on labor income, Federal income taxes, state and local taxes and Social Security taxes. The municipal bond rate is then used as a crude proxy for the other tax interest rate.

17. In the empirical work reported below, we control for migration so this difficulty does not arise. In results which are not reported, measures of demand were used other than the unemployment rate with very little effect on the results. The problem of seasonality in the census sampling is not dealt with.

18. Fleisher and Rhodes argue that the unemployment rate is properly treated as endogenous in participation equations. However, the instrumental variables they employ, such as the growth rate of employment are probably at least as likely as unemployment to be correlated with the error term in the participation equation.

19. In the results reported below, earnings are used as a wage proxy. This creates an obvious upwards bias in the estimate of wage effects on labor supply.

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