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ABSTRACT

The project focuses on two loosely-related hypotheses regarding a contradiction existing in the results of previous research on the relationship between labor force participation and unemployment. This contradiction is the persistent tendency of the estimated effect of unemployment on labor force participation--and hence estimates of "hidden unemployment"--to be greater when cross section data based on Standard Metropolitan Statistical Areas (SMSA) aggregates are used than when economy-wide time series data are used. The hypotheses put forward to explain this contradiction are: (1) that the cross section estimates are biased as the result of labor force heterogeneity across SMSA's; and (2) that the problem of mutual determination of labor force participation and unemployment is a much more likely cause of spurious correlation between these two variables in the cross section than in the time series data. (Author)

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A DISAGGREGATE STUDY OF THE EFFECT OF UNEMPLOYMENT RATES ON LABOR SUPPLY

by

Belton M. Fleisher and Donald O. Parsons

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A DISAGGREGATE STUDY OF THE EFFECT OF UNEMPLOYMENT RATES ON LABOR SUPPLY

Summary

The project focuses on two loosely-related hypotheses regarding a contradiction existing in the results of previous research on the relationship between labor force participation and unemployment. This contradiction is the persistent tendency of the estimated effect of unemployment on labor force participation--and hence estimates of "hidden unemployment"--to be greater when cross section data based on SMSA aggregates are used than when economy-wide time series data are used. The hypotheses put forward to explain this contradiction are: (1) that the cross section estimates are biased as the result of labor force heterogeneity across SMSA's; and (2) that the problem of mutual determination of labor force participation and unemployment is a much more likely cause of spurious correlation between these two variables in the cross section than in the time series data.

The first hypothesis is tested using disaggregate data from the National Longitudinal Surveys (NLS) for men who were 45-59 years old in 1966 and for married women who were 30-44 years old in 1967. Except for black women, no evidence of a statistically significant, negative relationship between labor force participation and unemployment emerges from analysis of the disaggregate NLS data. Ordinary least squares (OLS) regression analysis and probit analysis were the techniques used to analyze the disaggregate data. In order to test the second hypothesis, aggregate SMSA data, primarily from the 1970 Census of Population, were analyzed with two stage least squares (2SLS) regression analysis being the primary estimation technique used.

These results turn out to be quite sensitive to specification of the unemployment and labor force participation equations, but they suggest that aggregate demand is not the principal force determining local labor market unemployment rates. Hence, considerable doubt is placed on inferences of the amount of hidden unemployment that rely on previous cross section estimates of the labor force participation-unemployment relationship.

Policy implications emerge as much from the framework used to explore the unemployment-labor force participation relationship as from the empirical results. The conceptual framework used to investigate the mutual determination of labor force participation and unemployment is useful in emphasizing the role of a likely policy variable--employment--in affecting both unemployment and labor force participation. Even if the "effect" of local unemployment rates on labor force participation is as large as previous estimates based on SMSA aggregate cross section data would lead us to believe, simple policy options to reduce "hidden unemployment" by focusing on aggregate demand at the local level are probably not available to us.

A DISAGGREGATE STUDY OF THE EFFECT OF UNEMPLOYMENT RATES ON LABOR SUPPLY

Research Report
by
Belton M. Fleisher and Donald O. Parsons

I

Research Problem

The problem investigated in this project centers on the relationship between one measure of labor supply, labor force participation, and labor market unemployment. This is an important problem, because understanding how members of the population respond in their labor supply decisions to the "tightness" of the labor market bears implications for the proper measurement of the impact of the level of economic activity on the labor force, as well as for the magnitude and timing of corrective labor market policies in the face of fluctuating aggregate demand. Knowledge of how workers respond to variations in the difficulty of finding work is significant not only for aggregate economic policy, but also for attempts to improve economic conditions in local labor markets. An unresolved puzzle emerging from recent research is that estimates of labor supply responses to labor force unemployment are much larger in studies based on cross section data than in studies which use data of the entire economy over time. The specific objective of our research has been to help resolve this puzzle.

Our approach involves testing the robustness of the cross section labor force participation-unemployment relationship when it is estimated under alternative treatments of the data. We show: (1) that the estimated relationship is much smaller when based on disaggregate data instead of the SMSA aggregates which have been used for cross section estimates in the past; and (2) that unemployment rates in local labor markets do not primarily reflect recent or lagged effects of changes in overall labor demand; rather, local unemployment rates appear to be remarkably stable among local labor markets and determined simultaneously with labor force participation rates; i.e., there is a "natural" or "normal" rate of unemployment for each local labor market determined by the peculiar characteristics of its labor force and industrial environment; these features of the local economy also determine normal labor force participation. The absence of adequate disaggregate data to use in previous cross section studies and failure to recognize the possible simultaneous determination of normal labor force participation and unemployment have both contributed to misleading inferences regarding the extent and importance of "hidden unemployment" in our economy.

Relationship to Previous Research. Interest in the effect of unemployment on labor force participation stems from research on the "added" and "discouraged" worker effects of unemployment on the size of the economy's labor force that goes back at least as far as the work of Woytinsky (1940), followed by that of Long (1953, 1958). The high unemployment rates of the 1930's and the low rates of the mid-1940's stimulated attempts to measure more accurately the effects of labor force responses to unemployment on the measurement of unemployment itself, and on measurement of the size of the labor force. Mincer (1962) once again drew attention to the effect of unemployment on labor force participation as part of his pathbreaking work on the labor supply of married women; his findings suggested that the discouraged worker effect of unemployment on labor force participation predominates, at least in cross-sectional data. Mincer's findings in this regard were corroborated by those of Cain (1966), Bowen and Finegan (1965).

Hansen (1961), using data of gross flows into and out of the labor force over time, also addressed this question, concluding that there was little net effect of unemployment on labor force size over the course of fluctuations in aggregate economic activity; similar findings emerged from a more detailed study by Altman (1963). Also using gross flow data, Smith (1973) has found that the probability of labor force entrance or exit from a state of either employment or unemployment is not explainable in terms of the discouraged worker effect and that the major cause of the net tendency of the labor force to shrink during periods of high unemployment is probably the relatively high probability of unemployed workers to leave the labor force during all stages of business fluctuations.

In contrast, using direct measurements of unemployment (or employment) rates and labor force participation rates in aggregate time series data, Dernburg and Strand (1964), Tella (1964), and Cooper and Johnston (1965), reported finding substantial corroboration of the discouraged worker effect for various age-sex groups. However, Mincer (1966) was severely critical of these studies, and he had further reservations about the reliability of results based on aggregate cross section data when such phenomena as intercity migration were not taken into account. Therefore, the debate over the magnitudes of the discouraged and added worker effects in both time series and cross section studies was again thrown open. Mincer also drew attention to the discrepancy between his own view of the true effect of unemployment on labor force participation as measured in the time series data (Mincer's findings are more akin to those of Hansen and Altman than to those of Dernburg and Strand, Tella, and Cooper and

Johnston) and the typically larger relationship which emerged from his own cross section studies and those of others. This discrepancy was confirmed in subsequent studies of Barth (1968), Wachter (1972), and Bowen and Finegan in their mammoth work, The Economics of Labor Force Participation (1969).

Mincer based his criticism of cross-sectional analysis as a method for estimating "hidden" unemployment on two grounds: (1) possible spurious correlation between the labor force participation rate $\frac{E + U}{P}$ and the unemployment rate $\frac{U}{E + U}$ where

E = the number of employed persons

U = the number of unemployed persons

P = the number of persons in the population

when the labor force participation rate (l.f.p.) is the dependent variable and the unemployment rate (u) is an independent variable; and perhaps more fundamentally, (2) long-run responses in local labor markets to differences in demand conditions would induce intercity migration and lead to a greater relationship between l.f.p. and u than could be sustained in the economy as a whole. Furthermore, Mincer also questioned whether area differences in unemployment reflect short-run variations in job opportunities as do cyclical variations, noting that there is a substantial correlation between area unemployment rate levels over time and little correlation between these levels and recent changes in unemployment (1966, p. 80).

Bowen and Finegan (1969) argue with Mincer's objections on empirical grounds. They report that migration does not seem to account for the time series-cross section discrepancy in the effect of unemployment on labor force participation (pp. 80-81);[1] they tend to reject Mincer's allegation of spurious correlation between l.f.p. and u a priori, and they report empirically that using measures of "labor market conditions" other than the unemployment rate does not significantly reduce the difference between the time series and cross section results (pp. 502-504).

Furthermore, Bowen and Finegan make a strong point of the persistence in area unemployment differences, claiming that these inter-city unemployment rate differences represent varying degrees of labor market "tightness" and that the greater association between l.f.p. and u in the cross section is due to the lagged effect of persistent demand deficiency on labor force participation. Bowen and Finegan claim that the smaller magnitude of the relationship in the time series data as compared to the cross section data is caused by a lagged response of labor force participation more accurately reflected in the SMSA results. Their work with a distributed lag model (pp. 522-529 and Appendix D) using the economy-wide time series data in no way supports their contention, however. The only confirming evidence (Ch. 17) they produce is based on the extrapolation of trends of labor force participation rates into the "1963-67 boom" resulting from the war in Southeast Asia, in which labor force participation rates rose more than might have been anticipated based on trends estimated from data for those quarters between 1959 and 1963 in which the overall rate of unemployment was between 5.2 percent and 5.9 percent (p. 531).

[1] R. K. Baer (1972) has subsequently found that when the migration variable is made specific to the age group studied, it does help to explain labor force participation of men; it does not, however, substantially alter the estimated effect of unemployment.

Overview of Our Research

The research project reported here was stimulated largely by skepticism that Bowen and Finegan have removed the grounds for suspicion of the time series-cross section discrepancy. Following the hypotheses raised by Mincer, we explore the following possible explanations which are not mutually exclusive: (1) the time series-cross section discrepancy is due to aggregation biases induced by relying on SMSA aggregates in cross section analyses; and (2) biased estimates of the effect of unemployment on survey week labor force participation have been obtained in past research because inadequate attention has been paid to the simultaneous determination of local labor market participation and unemployment rates (i.e., there is no adequate theory of unemployment).[2] The main part of this report contains a summary of our empirical work on these problems, while an appendix contains the beginnings of an abstract model which analyzes the forces determining labor force participation, unemployment, and vacancies.

Unraveling the mutual determination of labor force participation and unemployment leads us into perhaps the most fascinating area of research dealt with in our project, because it forces us to try to identify the determinants of normal unemployment rates. We have met with only partial success in our efforts. Previous research (Reder, 1969; Doeringer and Piore, 1971) has emphasized the negative relationship and mutual determination of normal labor participation and unemployment among major labor force groups such as teenagers, prime-age males, married women, etc. Our problem, however, is that there is a pronounced negative relationship between labor force participation and unemployment in the aggregate cross section data _within_ these groups (even when the unemployment

[2]This point has been emphasized previously; see, e.g., Mincer (1966) and Fleisher (1971 and 1973).

rate used pertains to the entire local labor market). While initially this may seem to indicate that the true long-term effect of demand-associated unemployment on labor force participation is indeed greater than time series estimates suggest, evidence to the contrary emerges from so many sources that reconciliation is called for before reaching firm conclusions.

Two major bodies of data have been used in our research: (1) disaggregate data from the National Longitudinal Surveys (NLS), based on a national probability sample of four age-sex groups of the United States population conducted between 1966 and 1972; and (2) aggregate data (mostly from the U.S. Census of Population) pertaining to the SMSA's typically examined in previous labor force participation studies, for the years 1950-70. The NLS data are used to explore what happens to labor force participation equation estimates when they are based on disaggregate data, with particular emphasis on the coefficient of the unemployment rate. This part of our research is unique since, to our knowledge, no other body of data permits the use of local labor market statistics such as the unemployment rate along with information about the behavior of individual persons. The panel nature of the NLS data also provides a means to explore the channels through which labor force participation and labor market unemployment interact; in particular we are able to investigate the interrelationship between labor force entry, labor force participation, unemployment experience, and labor market unemployment rates.

The aggregate cross section data are used to study the following problems: (1) the forces determining local labor market unemployment rates; (2) the extent to which the relationship between labor force participation and unemployment reflects aggregate demand phenomena; and (3) the sensitivity of labor force participation-unemployment relation estimates to alternative specifications, especially to the simultaneous equation estimating technique of two-stage least squares (2SLS).

Because of their importance in the labor force, and the marked difference between time series and cross section estimates of their labor force participation responses to unemployment, as well as data availability, our empirical investigation centers on the behavior of men and married women.

II

Research Methods and Results

The Effect of Disaggregation.

In exploring the role of aggregation phenomena in cross section estimates of the effect of unemployment on labor force participation, we have proceeded at two levels. In the first we have searched for prima facie evidence that aggregation bias exists. We believe that a prima facie case that aggregation bias has influenced cross section estimates of the labor force participation-unemployment relationship could be made if such estimates differ markedly depending upon whether they are based on aggregate or disaggregate data. That is, if the aggregate estimates are unbiased, then one would expect that estimated effect of unemployment on labor force participation to remain essentially unchanged when disaggregate data are used. At the second level, we have searched more deeply for the underlying causes of aggregation bias. Presumably bias occurs because the labor market aggregates used are not homogeneous.

Heterogeneity leading to aggregati may involve individual differences in labor supply response to demand-associated unemployment and/or to differences in labor force attachment which lead to both low normal labor force participation and high unemployment.

Men.

In order to test directly for the influence of aggregation bias, we performed regression analysis of the labor force participation equations using aggregate and disaggregate data from the National Longitudinal Surveys (NLS). These comparisons are presented in Table 1 for men 45-59 years of age. . addition, in order to establish a benchmark to test for the possible effects of aggregation, we show the results of similar regressions which are contained in Bowen and Finegan's (B-F) work. We have attempted to replicate B-F as closely as the nature of our data permit. In aggregating the NLS data, the units of aggregation correspond to the 100 SMSA's upon which B-F based their study. The disaggregate NLS data similarly include only observations from the same 100 SMSA's.

The coefficients of determination and t-values of the regression coefficients tend systematically to be smaller in the NLS aggregate regressions than in the B-F regressions. We believe this is due to the substantially smaller number of observations per SMSA in the NLS data. This number ranges from 6 to 285, averaging 49 observations per SMSA, whereas B-F used published and unpublished results of the 1960 Census of Population. The following regression coefficients from the aggregate NLS results for men differ in magnitude and significance substantially from those of B-F: (1) index of demand for male labor (the "industry mix" variable); (2) wage; (3) proportion nonwhite; and (4) marital status.

TABLE 1

Comparative Results for Aggregate and Disaggregate Data
Men 45-54

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	B-F	NLS Aggregate		NLS Disaggregate			
Independent Variable	Table B-4 Men 45-54 Regression Coefficient	(Weighted regression) Regression Coefficient	(Weighted regression) Regression Coefficient	OLS Regression Coefficient	Probit Coefficient*	OLS Regression Coefficient	Probit Coefficient*
Unemployment	-0.51 (4.17)	-0.63 (1.5)	-0.58 (1.5)	-0.27 (0.8)	-0.075 (0.3)	0.37 (0.8)	1.05 (0.7)
Industry Mix	0.29 (2.95)	0.05 (0.8)	0.068 (1.0)	-0.003 (0.04)	-0.015 (0.2)	-0.13 (1.5)	- .44 (1.7)
Wage	0.14 (3.2)	0.038 (0.77)	---	---	---	---	---
Other Income	-0.36 (1.3)	-0.318 (2.5)	-0.31 (2.5)	-0.30 (9.1)	-0.15 (7.6)	-0.22 (7.3)	- .42 (6.5)
Schooling	0.32 (1.4)	0.63 (0.89)	0.93 (1.6)	1.02 (7.5)	0.63 (6.9)	0.75 (4.4)	1.64 (3.3)
Nonwhite	-0.05 (2.4)	0.012 (0.38)	0.015 (0.5)	-0.010 (0.9)	-0.011 (1.2)	-0.028 (2.1)	- .09 (2.3)
Marital Status	-0.10 (1.4)	0.27 (3.9)	0.29 (4.3)	+.11 (7.8)	0.06 (6.9)	0.098 (5.6)	.19 (11.5)
Migration	-0.04 (1.2)	---	---	---	---	---	---
Health	---	---	---	---	---	-0.20 (14.3)	- .41 (11.5)
	$R^2 = .56$	$R^2 = .24$ $\bar{R}^2 = .18$	$R^2 = .24$ $\bar{R}^2 = .19$	$R^2 = .09$ $\bar{R}^2 = .09$	$R^2 = .07$	$R^2 = .16$ $\bar{R}^2 = .16$	$R^2 = .12$

*Coefficients in probability units at mean of dependent variable
For a description of the variables, see Appendix B.

TABLE 1 (Continued)

Variables	Units of Measurement: B-F	Units of Measurement: NLS	Adjustment*
Labor Force Participation	Percentage of males 45-54 years in the civilian labor force during the census week (1960).	The percentage of males 45-59 in the civilian labor force during survey week, 1967.	
Unemployment	Percentage of the civilian labor force unemployed during the census week (1960).	Percentage, 12-month average of CPS measure of civilian labor force unemployed during survey week of CPS, 1967.	--
Industry Mix	A measure of the percentage of jobs which we might expect to be held by men; based on industry mix of each SMSA (1960).	Same as B-F measure.	--
Wage	Mean income in 1959 of all males who worked 50-52 weeks in hundreds of dollars.	Average hourly pay for wage and salary workers on current or last job (in dollars) (1966).	X .05
Nonemployment Income	Median income from nonemployment sources in 1959 per recipient of any kind of income (hundreds of dollars).	Average nonemployment income in hundreds of dollars per year (1966).	--
Schooling	Median number of school years completed by all males 25 years and older (1960).	Average number of school years completed.	--
Nonwhite	Percentage of all persons in household who were nonwhite (1960).	Percentage of black men; LGS sample	--
Marital Status	Percentage of all males age 25-54 years in the civilian institutional population who were married with wife present (1960).	Same as B-F.	--

In using the disaggregate data, the dependent variable and the independent variables for marital status and color have become dummy variables instead of percentages. The units of measurement of the regression coefficients are comparable between the disaggregate and aggregate results.

We are indebted to Professor John Cragg of the University of British Columbia for making his probit analysis program available to us.

*adjustment factor applied to NLS coefficient to make it comparable to B-F in units of measurement. Results reported here for NLS have been modified as indicated.

Regarding this last variable, the B-F regressions for practically all male samples yielded coefficients implying a negative relationship between the proportion of married men and labor force participation--opposite to that expected. Bowen and Finegan were never able to rationalize this phenomenon satisfactorily, in our opinion.[3] On the other hand, our regression coefficients rather closely approximate those of B-F for the nonemployment income, education, and unemployment variables. We did not use a variable representing migration in the men's regressions since in B-F's work, it did not turn out to be important. Despite the weakness of the NLS data for aggregate analysis, the relatively strong association between labor force participation and unemployment persists. We think this is noteworthy.

The Effect of Disaggregation. The results of disaggregate analysis of the NLS data are also shown in Table 1. Unfortunately "no-data" situations in the wage variable, which can easily (although not necessarily correctly) be handled in the aggregate data by implicitly assigning to each missing data point the mean of the relevant variable for the appropriate unit of aggregation, create a problem in maintaining comparability between the aggregate and disaggregate regressions. Since we have not edited the disaggregate data in this manner, we are forced to delete any observation with no data for any variable in the regression. There is virtually no problem induced by no-data situations for the dependent variable, labor force participation, but for other variables, missing data occur more frequently, and in some cases omissions may well be correlated with labor force status. This is particularly true of

[3]Moreover, we have been unable to replicate their findings with Census data for 1960.

the wage variable. For the self-employed it is impossible to construct a wage variable for men who did no work during the 1967 survey week; for wage and salary workers, the rate of pay question pertains to current or last job, and no-data situations clearly arise more frequently for men who were not currently working and whose last job was some time prior to the survey week. While no-data situations occur for various reasons, including refusal to answer, in other variables (most notably with respect to assets and nonemployment income), there is no strong evidence that a serious bias is induced by having to omit such observations from the sample. In order to avoid serious alteration of the sample characteristics, we have dropped the wage variable from the analysis of the disaggregate data. For the sake of comparison, we have also analyzed the aggregate data, dropping the wage variable.

The magnitude of the regression coefficients based on the disaggregate data differ surprisingly little from those of the aggregate data (either with or without the wage variable), except for the coefficient of area unemployment, which is less than half as large in the disaggregate results as in the aggregate, with roughly proportional decline in the t-value to about 0.8. The statistical significance of all the individual (as opposed to area-specific) variables except race is substantially higher in the disaggregate than in the aggregate regressions.

It is well known that ordinary least squares (OLS) regression analysis is not optimal when a probability function, such as that implicit in the analysis of the disaggregate data, is to be estimated.[4]

[4]See, for instance, A. S. Goldberger, Econometric Theory, New York: John Wiley and Sons, 1964, pp. 248-251.

Not only does OLS yield biased estimates of the standard errors of the regression, but the linear form OLS imposes is unappealing when the labor force participation relationship is considered in probabilistic terms. One problem of a linear OLS relationship, for example, is that the predicted values of the dependent variable can fall outside the 0-1 range, which is impossible for the observed values. Probit analysis, on the other hand, is a technique that avoids many of the statistical problems of OLS when the dependent variable is binary. In probit analysis the relationship between dependent and independent variables is assumed to take the well-known S-shape form, bounded by zero and one, of the cumulative normal distribution function. In probit analysis, the probability that an observation takes on the value of 1 as opposed to zero is assumed to depend on a linear combination of the independent variables, just as in OLS, but the probability density function assumed is the standard normal frequency distribution rather than a rectangular distribution. The probit regression results, also shown in Table 1, are transformed to be comparable with the OLS results. They represent the change in the probability of being in the labor force per unit change in the independent variables (as do the OLS results), calculated at the sample mean of the dependent variable. The probit results do not reveal, any more than do those obtained by OLS, any evidence of a negative, significant relationship between labor force participation and unemployment.

The NLS data contain information on self-reported health. Considering the pronounced economic and social pressure for men in this age group to work or seek work under most circumstances, one suspects that health problems would be important in explaining the behavior of those few who have withdrawn from the labor force. Columns (6) and (7) of Table 1 contain the results of OLS and probit analysis of the disaggregate labor force participation relation when a dummy variable is added, equal to 1 if a respondent reports a work-limiting health problem and equal to zero otherwise. The most obvious effect of including this health variable is to double the explanatory power of the regression and probit relationships. The coefficient of the industry mix variable, insignificant in the estimated relationships which do not include the health variable, retains its unanticipated negative sign and becomes much more significant when the health variable is included. The role of health in explaining male labor force participation is explored in greater depth in the following section. The results reported there suggest that the role of health in determining males' labor force participation is even more pervasive than the estimates reported in Table 1 would suggest.

The results of our disaggregate analysis strongly suggest that when important labor force characteristics (i.e., health, schooling, nonemployment income, and race) of each individual are measured individually and incorporated along with labor market unemployment in disaggregate analysis, the former swamp any effect of the latter on the labor force participation of men. This lends support to the assertion that previous estimates of the unemployment-labor force participation relationship based on aggregate, cross section data are not reliable indicators of individual labor force responses to unemployment rate differentials.

Further Disaggregation. One reason why the labor force participation-unemployment relationship appears stronger in aggregate than in disaggregate data may be heterogeneity of the relationship among various population groups. With this possibility in mind, we present the results of further disaggregate analysis in Table 2. Results for the following

TABLE 2

Disaggregate Analysis of Stratified Samples and Alternative Dependent Variables
NLS Data, Men 45-59
(t-values in parentheses)

Independent Variable	Healthy (1) OLS	Healthy (1) Probit	Unhealthy (2) OLS	Unhealthy (2) Probit	Whites (3) OLS	Whites (3) Probit	Blacks (4) OLS	Blacks (4) Probit
Unemployment	0.20 (0.6)	0.23 (0.6)	0.0011 (0.0)	0.014 (0.0)	0.14 (0.3)	.059 (0.1)	1.5 (1.4)	1.6 (1.5)
Industry Mix	-0.12 (1.7)	-0.10 (1.6)	-0.34 (1.1)	-0.40 (1.2)	-0.0062 (0.1)	-0.26 (0.3)	-0.32 (1.8)	-0.32 (2.0)
Wage	—	—	—	—	—	—	—	—
Other Income	-0.082 (3.3)	-.092 (3.1)	-1.07 (8.1)	-0.87 (6.9)	-0.15 (5.4)	-0.10 (4.9)	-1.4 (8.6)	-0.76 (6.3)
Schooling	-0.0035 (0.0)	-0.023 (0.2)	2.5 (4.9)	2.7 (4.5)	0.55 (2.8)	0.36 (2.2)	0.88 (2.7)	0.69 (2.2)
Marital Status	0.0023 (0.1)	0.0024 (0.2)	0.28 (5.9)	0.25 (5.2)	0.11 (5.0)	0.056 (3.8)	0.091 (3.1)	0.065 (2.5)
Nonwhite	-0.029 (2.5)	-.027 (2.5)	-0.039 (0.9)	-0.029 (0.6)	—	—	—	—
Health	—	—	—	—	-0.17 (10.5)	-0.10 (8.6)	-0.21 (7.0)	-0.13 (5.5)
	$\bar{R}^2$ = .01 N=1574	R^2 = .01	$\bar{R}^2$ = .26 N=434	R^2 = .24	$\bar{R}^2$ = .12 N=1399	R^2 = .09	$\bar{R}^2$ = .26 N=609	R^2 = .20

Independent Variable	Married (5) OLS	Married (5) Probit	Unmarried (6) OLS	Unmarried (6) Probit	Healthy Blacks (7) OLS	Healthy Blacks (7) Probit	Unhealthy Blacks (8) OLS	Unhealthy Blacks (8) Probit
Unemployment	0.11 (0.3)	0.10 (0.3)	0.037 (0.0)	0.52 (0.2)	0.91 (1.0)	0.91 (1.0)	4.1 (1.5)	7.5 (1.7)
Industry Mix	-0.16 (1.7)	-0.12 (1.7)	-0.12 (0.4)	-0.21 (0.6)	-0.22 (1.4)	-0.18 (1.3)	-1.2 (2.6)	-1.65 (2.4)
Wage	—	—	—	—	—	—	—	—
Other Income	-0.20 (6.8)	-0.10 (5.9)	-0.26 (2.2)	-0.22 (2.2)	-0.33 (2.0)	-0.21 (1.8)	-2.5 (8.1)	-3.1 (5.9)
Schooling	0.62 (3.6)	0.38 (2.7)	1.1 (1.8)	0.84 (1.3)	-0.16 (0.5)	-0.14 (0.5)	2.8 (3.3)	4.4 (3.0)
Marital Status	—	—	—	—	0.0040 (0.1)	0.0019 (0.1)	0.24 (3.6)	0.31 (3.0)
Nonwhite	-0.033 (2.4)	-0.026 (2.3)	-0.033 (0.7)	-0.04 (0.8)	—	—	—	—
Health	-0.14 (9.9)	-0.087 (8.4)	-0.47 (10.3)	-0.39 (7.8)	—	—	—	—
	$\bar{R}^2$ = .09 N=1746	R^2 = .07	$\bar{R}^2$ = .33 N=262	R^2 = .30	$\bar{R}^2$ = .00 N=463	R^2 = .01	$\bar{R}^2$ = .44 N=146	R^2 = .42

For a description of the variables, see Appendix B.

stratifications are shown: (1) white men and black men; (2) married (spouse present) men and non-married men; (3) men who reported no work-limiting health problem in 1966 and those who did report such a problem; and (4) black men with a health problem and those who did not report such a problem. In none of these strata is there a statistically significant negative relationship between labor force participation and unemployment. While the black, unmarried, and "unhealthy" groups all tend to be more sensitive in their labor force response to most of the independent variables than their white, married, and "healthy" counterparts, any relationship with unemployment nearing the usual criterion of statistical significance tends to be positive rather than negative. Examination of the stratified, disaggregate data, then, does not yield evidence of any subgroups of the male population whose labor force decision responds at all sensitively and negatively to labor market unemployment.

The estimated labor force participation relationship for men who reported a work-limiting health problem is of particular interest. The variables such as schooling and marital status which are of considerable importance in the disaggregate regressions of Table 1 appear to be important only among unhealthy men in the stratified samples. The leaving of the labor market by healthy men appears to be largely a random event. It is of particular interest that although black men as a group exhibit a strong relationship between labor force participation and schooling and marital status, this remains so only among unhealthy black men when the data are stratified by health. The importance of schooling among unhealthy men, one suspects, arises from the fact that lower skill jobs are more physically demanding and therefore less able to fulfill while in poor health.

The critical dependence of the labor force participation relation on health status can be observed in the means of characteristics of various subsamples of men, 45-59 in 1966, in the 100 largest SMSA's. These means are reported in Table 2a. Recall that in the NLS surveys blacks were oversampled, accounting for approximately 30 percent of the total. In Table 2a, Column 1, means for the total sample are reported. Approximately 91 percent of these men were in the labor force in the survey week. Twenty-one percent reported an activity limiting health problem.

As Column 2 indicates, the means for individuals out of the labor force are strikingly different. Almost two-thirds (65%) of men in this age bracket out of the labor force report a limiting health condition. Those out of the labor force averaged two years less schooling. They also were 50 percent less likely to be white-collar workers, 50 percent more likely to be black, and substantially more likely to be single.

These latter characteristics of the out-of-labor force men are themselves the result of health difficulties. When the out-of-labor force sample is partitioned into those with and without health problems, Columns (3) and (4), the low skill, low marriage characteristics are apparent only among the sample with health problems. Except for the higher fraction black, the means for healthy men out of the labor force are quite similar to the means for the total men's sample reported in Column (1). To the extent skill level enters the labor force participation relationship it seems to be due to the greater likelihood unhealthy workers in higher skill classes can remain employed, not to any skill or wealth effect independent of health.

TABLE 2a

Characteristic Means for Various Samples
of Men 45-59 in 1966, Blacks Oversampled (30%)*

		Out of Labor Force			In Labor Force		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LFP	0.91	0.00	0.00	0.00	1.00	1.00	1.00
Health Limitation	0.21	0.65	1.00	0.00	0.17	1.00	0.00
Education	9.90	8.01	7.21	9.49	10.08	9.53	10.19
White Collar	0.35	0.23	0.19	0.32	0.36	0.35	0.36
Black	0.31	0.46	0.45	0.49	0.29	0.29	0.30
Married	0.88	0.70	0.63	0.83	0.89	0.89	0.90
Age	51.45	53.20	53.45	52.72	51.28	51.92	51.15
PSU Unemployment	4.13	4.19	4.25	4.07	4.13	4.24	4.11
Sample Size	2493	215	139	76	2278	392	1886

*Data Source: National Longitudinal Surveys.

For a description of the variables, see Appendix B.

LFP, Health Limitation, White Collar, Black, Married are proportions.
PSU Unemployment is percent. Education, Age are years.

These relationships are not simply due to the fact that the lower skilled individuals are likely to be unhealthy. Dividing the sample of those who are in the labor force into healthy and unhealthy subsamples indicates no comparable difference in job skill between healthy and unhealthy men. The means for the two subsamples are reported in Columns (6) and (7) and have virtually identical characteristic means. Apparently a highly selective process occurs with unhealthy, low skilled workers more likely to be forced out of the market than unhealthy, high skilled workers. This is not surprising, given the greater physical demands of low skilled occupations.

The major conclusion of this analysis is that the labor force participation behavior of older men is largely the result of the interplay of health and job characteristics, not of the usual labor-leisure preference typically supposed by labor economists. An investigator wishing to understand the non-participation of older men must explore the economics of health and the relationship of health to job requirements. A model of labor force participation among healthy older men has virtually no explanatory power.

Married Women.

Table 3 contains a comparison of the B-F regression results using SMSA data for married women (spouse present) 35-39 years of age, results of regressions based on comparable NLS data for married women 30-44, and the results of the analysis of disaggregate NLS data. Once again, in aggregating the NLS data, we have aggregated over areas corresponding to the 100 SMSA's used by B-F. Similarly, the individual observations in the disaggregate data come only from those areas.

TABLE 3

Comparative Results for Aggregate and Disaggregate Data
Married Women Ages 30-44 Living with Their Husbands
(t-values in parentheses)

Independent Variable	(1) B-F Table B-17, Women 35-39 Regression Coefficient	(2) NLS Aggregate Regression Coefficient (weighted regression)	(3) NLS Disaggregate Regression Coefficient	(4) NLS Disaggregate Regression Coefficient	(5) NLS Disaggregate Probit Coefficient*
Unemployment	-1.04 (4.77)	-1.50 (1.5)	-0.32 (0.4)	-0.26 (0.3)	-0.26 (0.3)
Income of Husbands	-0.40 (3.54)	-0.14 (1.3)	-0.15 (5.2)	-0.11 (4.6)	-0.13 (4.7)
Wage	0.69 (4.58)	0.18 (1.1)	0.50 (6.6)	--	--
Other Income	-2.08 (3.57)	-0.030 (0.1)	--	--	--
Schooling	0.45 (1.0[illegible])	0.44 (0.2)	-0.29 (0.5)	1.36 (3.2)	1.6 (3.3)
Wages of Domestics	-0.96 (3.56)	--	--	--	--
Industry Mix	0.59 (3.44)	0.47 (0.98)	0.44 (1.1)	0.56 (1.5)	0.63 (1.5)
Supply of Females	-0.49 (1.46)	--	--	--	--
Nonwhite	0.17 (3.77)	0.16 (2.4)	0.19 (6.9)	0.19 (7.3)	0.20 (7.0)
Children < 6	-0.62 (5.07)	-0.26 (2.5)	-0.28 (12.1)	-0.26 (12.2)	-0.28 (11.8)
Migration	0.27 (4.25)	-7.56 (0.9)	--	--	--
	R^2 = .69	R^2 = .24	R^2 = .14	R^2 = .11	R^2 = .11
		$\bar{R}^2$ = .17	$\bar{R}^2$ = .14	$\bar{R}^2$ = .11	

*Coefficients in probability units at mean of dependent variable.

For a description of the variables, see Appendix B.

As was the case in the male regressions, the coefficients of determination and/or t-values of the regression coefficients tend systematically to be smaller in the NLS aggregate and disaggregate regressions than in the B-F regressions. The variables representing wages of domestics in each SMSA and supply of females are omitted in the NLS regressions because of data problems. The regression coefficients and t-values for migration and other family income differ substantially between the B-F and NLS results. In the case of other income, the reason is probably a very high proportion of observations with missing data for this variable. Also similar to our work with the data for males, the relatively strong association between labor force participation and area unemployment which B-F found is repeated in our findings from analysis of the NLS, although the t-value of the regression coefficient of unemployment in the NLS data is smaller than in the B-F results.

The Effect of Disaggregation. The results of disaggregate analysis of the NLS data are shown in Columns (3) - (5) of Table 3. The problem of "no data" situations in the wage variable, which is derived from information about earnings on the respondent's current or last job, are more serious for married women than for men, because the proportion of married women without recent work experience is relatively high. Consequently, an estimated wage rate based on schooling, degree of urbanization of residence, and experience for whites, and schooling, residence, and SES of occupation between leaving school and first marriage for blacks has been used in the regression shown in Column (3).[5] When

[5]See S. Kim, "Determinants of Labor Force Participation of Married Women 30 to 44 Years of Age," Columbus, Ohio, Center for Human Resource Research, The Ohio State University, 1972, pp. 124-127.

included, this wage instrument is statistically significant, raises R^2, and has a regression coefficient similar in magnitude to that obtained by B-F in their work. However, as indicated by a comparison of the regression results shown in Columns (3) and (4), the main effect of including the wage variable on the coefficient of the other variables is to reduce sharply the coefficient and statistical significance of the schooling variable.

In regressions whose results are not shown in Table 3, we attempted to assess the separate effect of husbands' recent work experience on their wives' labor force participation. Two measures of labor force participation were used: (1) a dummy variable equal to 1 if the wife was a labor force participant during the survey week; and (2) a dummy variable equal to 1 if she was a member of the labor force at any time during the preceding twelve months. We observed no evidence of a negative relationship, consistent with the "added worker effect," between weeks worked by the husband and labor force participation of the wife. This is also true when black and white wives were analyzed separately. These results are consistent with those reported by Duran Bell (1974), based on SEO data.

As in the male regressions, disaggregate analysis results in a statistically insignificant--and much smaller--estimate of the association between labor force participation and unemployment than is obtained when SMSA aggregate data are used. Only minor differences occur between the OLS and probit estimates.

The stratifications of the married women's data we analyzed are for black women, white women, women with children under six years of age living at home, and for women with children living at home between ages six and 17 only. The results, shown in Table 4, do suggest the likelihood that the labor force response to unemployment of black women is larger than that of white women. The regression coefficient of labor market unemployment for black women is quite large, even by comparison with the coefficient for all women in the B-F results. Although the t-value is not high, it is high enough to warrant serious consideration of the possibility that the labor force response of black women to labor market unemployment is not negligible. On the other hand, the coefficient of unemployment for white women is similar both in magnitude and t-value to that shown for all married women in Table 3.

Previous research, confirmed by our results, reveals that the presence of young children is a strong deterrent to the labor force participation of most women. The stratified regressions of Table 4 further suggest that the labor force participation of women with young children (less than six years of age) living at home is less responsive to husbands' income than is that of women whose children living at home are older than six years of age. Although the measure of statistical significance is not high, there is some evidence in Table 4 that women with children between six and 17 years old only are more likely than others to be discouraged from participating in the labor force by high unemployment than are other women. On the other hand, the regression coefficient of the industry mix variable is larger and more significant for women with children under six years of age than for women without such children.

TABLE 4

Disaggregate Analysis of Stratified Samples and Alternative Dependent Variables
NLS Data, Married Women 30-44 Living with Their Husbands
(t-values in parentheses)

Independent Variable	Whites (1) OLS	Whites (1) Probit	Blacks (2) OLS	Blacks (2) Probit	Whites (3) OLS	Whites (3) Probit	Blacks (4) OLS	Blacks (4) Probit	Children < 6 At Home (5) OLS	Children < 6 At Home (5) Probit	Children 6-17 only, At Home (6) OLS	Children 6-17 only, At Home (6) Probit
Unemployment	0.46 (0.6)	0.54 (0.6)	-2.7 (1.5)	-3.0 (-1.6)	0.43 (0.5)	0.51 (0.5)	-3.2 (1.7)	-3.6 (1.8)	0.15 (0.1)	0.18 (0.1)	-1.36 (1.0)	-1.53 (1.1)
Husband's Income	-0.036 (3.7)	-0.11 (3.9)	-0.035 (0.4)	-0.035 (-0.4)	-0.14 (4.5)	-0.16 (4.6)	-0.084 (1.0)	-0.090 (-0.9)	-.076 (2.2)	-0.10 (2.4)	-0.15 (3.8)	-0.18 (3.7)
Wage	--	--	--	--	0.60 (6.6)	0.62 (6.3)	0.15 (0.9)	0.17 (1.0)	--	--	--	--
Other Income	--	--	--	--	--	--	--	--	--	--	--	--
Schooling	-0.38 (0.8)	-0.37 (-0.7)	3.9 (4.8)	4.3 (4.7)	-2.2 (3.7)	-2.4 (-3.6)	3.0 (2.8)	3.3 (2.8)	0.49 (0.8)	0.53 (0.8)	1.66 (2.1)	1.86 (2.2)
Industry Mix	1.0 (2.4)	1.2 (2.5)	1.4 (1.8)	1.5 (1.7)	1.1 (2.3)	1.3 (2.4)	0.81 (1.0)	0.82 (0.9)	1.04 (1.8)	1.07 (1.8)	0.09 (0.1)	0.09 (0.1)
Nonwhite	--	--	--	--	--	--	--	--	0.20 (5.2)	0.19 (4.8)	0.26 (5.5)	0.29 (5.3)
Children < 6	-0.24 (10.1)	-.26 (9.8)	-0.23 (5.2)	-0.24 (-5.0)	-0.25 (9.7)	-0.28 (9.4)	-0.27 (5.8)	-0.28 (5.5)	--	--	--	--
	$\bar{R}^2$ = .07 N = 1491	R^2 = .08 N = 1491	$\bar{R}^2$ = .10 N = 479	R^2 = .11 N = 479	$\bar{R}^2$ = .11 N = 1292	R^2 = .12 N = 1292	$\bar{R}^2$ = .10 N = 432	R^2 = .11 N = 432	$\bar{R}^2$ = .05 N = 805	R^2 = .05 N = 805	$\bar{R}^2$ = .07 N = 704	R^2 = .08 N = 704

For a description of the variables, see Appendix B.

Summary of the Effect of Disaggregation. Analysis of the disaggregate regressions for men and married women produces much smaller estimates of the discouraging effect of labor market unemployment on labor force participation than are obtained from analysis of data aggregated by SMSA's. This finding persists when the disaggregate data are divided, for men, into married, unmarried, black, white, "healthy," and "unhealthy" strata; the disaggregate data for black, married women, however, and perhaps those for women with children between six and 17 years of age living at home, suggests that their labor force response to labor market unemployment may be substantial. These findings, we believe, provide a prima facie case supporting the hypothesis that estimates of labor force responses to labor market unemployment derived from analysis of cross section aggregate data are biased by aggregation. We have not, however, been able to go as far as we would like in showing how heterogeneous responses of labor force decisions to unemployment among different strata of workers actually contributes to the relatively large impact of unemployment inferred from results based on cross section aggregate data.

Mutual Determination of Labor Force Participation and Unemployment.

In this section we approach the problem of mutual determination of labor force participation and unemployment rates in aggregate data. Because of their importance in previous research and previous findings of a fairly sensitive relationship to labor market unemployment, we concentrate on the labor force participation of married women living with their husbands. Our aim is to estimate the relationship between labor force participation and that <u>component</u> of local labor market unemployment which is due to demand conditions alone.

Methods of Estimation. In a major part of our search for the cause of spurious correlation between labor force participation and unemployment, research has been devoted to testing the hypothesis, implicitly maintained in previous research (with the notable exception of Mincer, 1966), that local labor market unemployment rates mainly reflect aggregate demand phenomena. The data used are the same as, or similar to, those used in previous studies employing aggregate cross section data. This search for variables which can explain local labor market unemployment is incorporated into a two-stage least squares (2SLS) analysis of the labor force participation-unemployment relationship. In the first stage, or reduced form equation, local labor market unemployment is regressed on a variable reflecting change in labor demand (aggregate demand) and other variables representing the characteristics (e.g., wage, race, family size, industry mix, etc.) of the labor force and labor market which also are hypothesized to influence labor force participation. In the second stage or structural relationship, labor force participation is regressed on unemployment predicted from the results of the first equation and the labor force characteristic variables. Thus, the portion of variation in the predicted unemployment not held constant in the second equation reflects only variation in the measure of the change in labor demand; hence the coefficient of unemployment in this regression should reflect only the effect of overall labor demand forces on labor force participation and not spurious correlation induced by the simultaneous determination of labor force participation and the normal component unemployment which is not influenced by aggregate labor demand. The variable used to reflect change in labor demand is proportionate employment change. We have used as the measure of proportionate employment change data for the two years preceding the dates on which unemployment and labor force participation are measured.

The normal component of unemployment arises from the industrial and labor force characteristics peculiar to each labor market, apart from aggregate demand forces. Raising the level of labor demand would have no long-term effect on the normal component of unemployment; therefore, it would be incorrect to use the estimated relationship between labor force participation and the normal component of unemployment to calculate "hidden" unemployment. We emphasize that we do not mean to say that nothing can ever be done in labor markets with persistently high normal unemployment and low labor force participation rates to reduce the former and/or raise the latter. However, the appropriate policies to accomplish either of these goals would involve altering the fundamental characteristics of local labor forces (e.g., schooling, training, etc.) and the types of jobs offered by local industry.

In an alternative approach, labor force participation is regressed directly on the variable representing change in labor demand (aggregate demand) as described above, and labor force and labor market variables, and labor market unemployment. The coefficient of the aggregate demand variable is presumed to reflect the "true" effect of demand on labor force participation when the other forces influencing labor force participation are held constant.

Empirical Results. Table 5 shows the results of our efforts to unravel the forces underlying the mutual determination of labor force participation and unemployment in the cross section data and the possibly biasing effect of mutual determination on previous attempts to estimate the relationship between labor force participation and the aggregate demand component of unemployment. Because of the relatively large magnitude of the labor force participation-unemployment relationship for married women,

TABLE 5

Labor Force Participation and Unemployment - 1970
Married Women Living with Their Husbands, Age 16-59
(t-values in parentheses)

Independent Variables	(1) LFPRW	(2) LFPW6	(3) LFPWC	(4) LFPRW	(5) LFPW6	(6) LFPWC	(7) LFPRW	(8) LFPW6	(9) LFPWC	(10) LFPRW	(11) LFPW6	(12) LFPWC	(13) U70
	Dependent Variables												
1970 Unemployment	-1.3	-0.78	-1.3	—	—	—	-1.3	-0.44	-1.3	-1.4	-0.76	-1.5	—
	(4.0)	(2.5)	(3.3)				(3.8)	(2.0)	(3.0)	(4.4)	(2.4)	(3.6)	
1960 Unemployment	—	—	—	—	—	—	—	—	—	—	—	—	—
ΔE 1968-1970	—	—	—	0.11	0.17	0.13	0.026	0.12	0.039	0.050	0.13	0.067	-0.043
				(1.6)	(2.7)	(1.5)	(0.4)	(1.8)	(0.5)	(0.8)	(2.1)	(0.8)	(1.9)
Wage (Men)	-0.064	-0.21	-0.065	.13	-0.078	0.15	-0.059	-0.19	-0.058	-.0078	-0.15	0.0012	—
	(0.8)	(2.6)	(0.6)	(1.5)	(1.0)	(1.4)	(0.7)	(2.3)	(0.5)	(0.1)	(1.9)	(0.0)	
Wage (Women)	0.27	0.082	0.23	.13	0.005	0.078	0.27	0.073	0.22	0.32	0.11	0.28	—
	(2.0)	(0.6)	(1.3)	(0.9)	(0.0)	(0.5)	(2.0)	(0.6)	(1.3)	(2.5)	(0.9)	(1.7)	
Other Income	-0.26	-0.31	-0.25	-0.30	-0.34	-0.29	-0.26	-0.32	-0.25	-0.27	-0.33	-0.26	—
	(2.8)	(3.4)	(2.1)	(2.8)	(3.3)	(2.3)	(2.8)	(3.6)	(2.1)	(2.9)	(3.7)	(2.2)	
Schooling (Women)	0.16	0.45	0.12	0.55	0.73	0.60	0.14	0.39	0.10	0.91	0.92	0.98	0.33
	(1.8)	(5.3)	(1.1)	(1.9)	(2.9)	(1.7)	(1.4)	(4.2)	(0.8)	(3.4)	(3.5)	(2.8)	(3.7)
Schooling (Men)	—	—	—	-0.52	-0.39	-0.60	—	—	—	-0.69	-0.48	-0.79	-0.21
				(2.1)	(1.7)	(2.0)				(3.1)	(2.2)	(2.7)	(3.0)
Percent Nonwhite	-0.072	0.11	-0.15	-.054	0.12	-0.13	-0.073	0.11	-.15	-0.065	0.12	-.14	-0.021
	(1.6)	(2.6)	(2.6)	(1.1)	(2.8)	(2.2)	(1.6)	(2.6)	(2.6)	(1.5)	(2.7)	(2.5)	(1.4)
Industry Mix	0.62	0.060	0.56	1.2	0.46	1.2	0.64	0.12	0.58	0.75	0.20	0.72	—
	(2.9)	(0.3)	(2.1)	(6.2)	(2.5)	(4.9)	(2.9)	(0.6)	(2.1)	(3.6)	(1.0)	(2.6)	
Percent Men Married, Spouse Present	—	—	—	—	—	—	—	—	—	—	—	—	—
Percent Men 25-54	—	—	—	—	—	—	—	—	—	—	—	—	—
Children < 6	—	—	—	.015	—	—	—	—	—	—	—	—	—
				(0.1)									
	$\bar{R}^2$ = .44	$\bar{R}^2$ = .50	$\bar{R}^2$ = .28	$\bar{R}^2$ = .37	$\bar{R}^2$ = .51	$\bar{R}^2$ = .23	$\bar{R}^2$ = .44	$\bar{R}^2$ = .51	$\bar{R}^2$ = .27	$\bar{R}^2$ = .48	$\bar{R}^2$ = .53	$\bar{R}^2$ = .32	$\bar{R}^2$ = .15

TABLE 5 (Continued)

Independent Variables	(14) U70	(15) U70	(16) U70	(17) LFPRW	(18) LFPW6	(19) LFPWC	(20) LFPRW	(21) LFPRW6	(22) LFPWC	(23) U70	(24) LFPRW	(25) LFPW6	(26) LFPWC
				Dependent Variables									
1970 Unemployment	—	—	—	-1.5* (1.3)	-1.5* (1.3)	-2.3* (1.5)	-2.4* (1.7)	-3.3* (1.9)	-3.0* (1.6)	—	-4.0** (1.0)	-5.8** (1.1)	-4.7** (1.0)
1960 Unemployment	—	0.62 (8.2)	—	—	—	—	—	—	—	—	—	—	—
ΔE 1968-1970	-0.047 (2.0)	-0.025 (1.4)	-0.048 (2.2)	—	—	—	—	—	—	- .028 (1.2)	—	—	—
Wage (Men)	—	—	—	0.12 (1.6)	-0.089 (1.1)	0.14 (1.4)	.3 (1.6)	- .078 (0.8)	.14 (1.3)	—	.13 (1.0)	- .078 (0.4)	.14 (0.9)
Wage (Women)	—	—	—	0.12 (0.9)	-0.011 (0.1)	0.068 (0.4)	0.13 (0.9)	.0078 (0.05)	.075 (0.4)	—	.13 (0.6)	.0048 (0.02)	.078 (0.3)
Other Income	—	—	—	-0.27 (2.8)	-0.31 (3.2)	-0.24 (1.9)	-0.30 (2.8)	- .37 (2.9)	- .27 (1.9)	—	- .30 (1.8)	- .34 (1.5)	- .29 (1.5)
Schooling (Women)	0.26 (2.7)	0.15 (2.0)	0.30 (3.8)	1.03 (2.3)	1.19 (2.6)	1.32 (2.2)	1.28 (2.4)	1.71 (2.6)	1.52 (2.1)	—	.55 (1.2)	.73 (1.1)	.60 (1.1)
Schooling (Men)	-0.14 (1.8)	-0.019 (0.3)	-0.16 (2.4)	-0.75 (2.3)	-0.59 (1.8)	-0.98 (2.3)	-0.89 (2.4)	- .87 (2.0)	-1.1 (2.3)	—	- .52 (1.3)	- .38 (0.7)	- .60 (1.3)
Percent Nonwhite	-0.018 (1.1)	0.011 (0.8)	-0.0087 (0.6)	-0.059 (1.3)	0.12 (2.6)	-0.14 (2.4)	- .074 (1.5)	.087 (1.5)	- .15 (2.3)	—	.054 (0.7)	.12 (1.1)	- .13 (1.4)
Industry Mix	—	—	-0.23 (4.6)	0.90 (3.0)	0.11 (0.3)	0.72 (1.8)	0.70 (1.9)	- .29 (0.7)	.56 (1.1)	—	1.2 (4.0)	.46 (1.0)	1.2 (3.2)
Percent Men Married, Spouse Present	-0.024 (0.5)	0.057 (1.5)	—	—	—	—	—	—	—	—	—	—	—
Percent Men 25-54	-0.095 (1.8)	-0.028 (0.6)	—	—	—	—	—	—	—	—	—	—	—
Children < 6	—	—	-0.080 (2.0)	—	—	—	- .18 (1.1)	- .36 (1.8)	- .14 (0.7)	—	.015 (0.07)	—	—
	$\bar{R}^2$ = .17	$\bar{R}^2$ = .51	$\bar{R}^2$ = .35							$\bar{R}^2$ = .015			

* Estimated value of U70 based on Column (16).

** Estimated value of U70 based on Column (23).

For a description of the variables, see Appendix B.

we have concentrated our efforts on this group--specifically women who are married, spouse present, and 16-59 years of age in 1970. Data are from the 1970 Census of Population.

Columns (1) through (3) of Table 5 show the results of regressions comparable to those estimated by B-F for 1960, although there are some differences between the variables they used and those used in our research. The dependent variables we have used are: (1) LFPW, the labor force participation of all married women age 16-59 in 1970 living with their husbands; (2) LFPW6, the labor force participation for the substratum of such women with children less than six years old living at home; and (3) LFPWC, the substratum with children living at home, but only between the ages of six and 17. The results are similar to those of B-F for women 14-54 years of age (Table B-10, page 789), with the coefficient of unemployment for all women in 1970 being somewhat larger absolutely than B-F obtained using the 1960 data. The other variables in the regression for all married women, where statistically significant, are of the expected sign, with the exception of the proportion of women who are non-white. One would normally expect the regression coefficient to be positive, since black women tend to participate in the labor force to a greater extent than white women. Nevertheless, the coefficient we estimated for the proportion of non-white women in the population is negative and with a t-value which, while not very high, is large enough to suggest that the coefficient is not indistinguishable from zero.

Columns (2) and (3) contain our results for the two substrata of women with children living at home. Recall that in the regressions based on disaggregate data (Table 4) only the married women with children between ages six and 17 years of age exhibited any degree of labor force responsiveness to labor market unemployment. In the results based on aggregate data, the regression coefficient of unemployment for this stratum is some two-thirds larger, and more significant, than that for women with children living at home who are less than six years old, as is that for all married women taken together. This relationship of the unemployment rate regression coefficients among the three strata of married women persists regardless which variables are added to the regression in the OLS regressions. It does not repeat itself consistently, however, in the 2SLS regressions. The R^2 statistic in all regressions for the stratum of women whose only children at home are between the ages of six and 17 is considerably lower than for all married women or for women with children under six.

The addition of men's schooling to all the OLS regressions raises $\bar{R}^2$ and raises the t-values of several of the other independent variables. Men's schooling reflects a negative force operating on married women's labor force participation, presumably income available to families from sources other than wives' labor force participation and, possibly, the steadiness of husbands' employment. Except for women with children under six years old living at home, the direct measure of husband's earning power we have used for some reason does not yield a statistically significant, negative coefficient as was expected both on the basis of theory and the results of others' research in the past. Why men's schooling should reflect this influence on wives' labor force participation more accurately than a direct measure of husbands' earning power is not clear to us at present.

Before discussing the 2SLS results, we shall treat the results of the alternative attempt to separate the true influence of aggregate demand phenomena on labor force participation. This attempt involves including a measure of employment change directly in the OLS regressions. In these regressions the proportionate employment change between 1968 and 1970 is assumed to represent aggregate demand, while the coefficient of 1970 unemployment (when included) reflects only the association between labor force participation and normal unemployment. We report the results of these OLS regressions both including and excluding 1970 unemployment. To the extent the normal component of unemployment reflects otherwise unmeasured forces which also influence labor force participation it is probably appropriate to include this variable, along with employment change, in the labor force participation equations. On the other hand, since employment change is almost certainly not a perfect measure of demand phenomena, including 1970 unemployment may tend to obscure the effect of aggregate demand on labor force participation as reflected in the proportionate employment change between 1968 and 1970. Both of these possibilities are evidently of some importance, since including 1970 unemployment raises R^2, increases the magnitude and significance of some regression coefficients and lowers those of others. Consistently raised in magnitude and significance is the coefficient of the women's wage variable while consistently lowered are the coefficients of employment change and industry mix. The stratum with the largest and most significant regression coefficient of proportionate change in employment is mothers with children under six years of age. It is only within this stratum that the coefficient of employment change retains any semblance of statistical significance when 1970 unemployment is included in the regressions. The coefficient and significance of 1970 unemployment are virtually unaffected by the inclusion of the employment change variable, however.

The results of the regressions in which 1968-70 employment change has been used directly to represent aggregate demand--those reported in Columns (4) - (12) of Table 5--suggest that the influence of demand forces on labor force participation is most significant for women with children under six years of age living at home. For all women taken together the influence of demand if it exists is very difficult to distinguish from zero in those regressions which also include 1970 unemployment. In all the regressions for all women taken together, the regression coefficient is relatively small and less significant than has been inferred from previous analyses of cross section data.

We proceed now to discuss the estimates of the effect of aggregate demand--caused unemployment on labor force participation using 2SLS. Since of necessity 2SLS requires an investigation of the determinants of local labor market unemployment rates we shall discuss this phase of our research first.

The results of our analysis of local labor market unemployment rates are shown in Columns (13) - (14) of Table 5 and in Table 7. We have attempted to estimate the relationship between market unemployment and variables which reflect labor market attachment of the local labor forces and, hence, exposure to the risk of unemployment because of frequent labor force entry and exit, along with the relationship between unemployment and recent changes in labor demand. The regression coefficients of the "labor market attachment" variables are, for the most part, reasonable. The positive coefficient of women's schooling can be attributed to the positive influence of schooling on the labor force participation of women, who tend to have relatively high unemployment rates. The negative coefficient of men's schooling is probably due to the correlation between schooling and specific human capital, which theoretically results in a lower risk of unemployment. The negligible association of unemployment with the proportion of non-whites suggests that high unemployment among Negroes is due to the influence of the other variables which "explain" unemployment. Aggregate demand is measured by the proportionate change in employment between 1968 and 1970. Its association with unemployment is, although modest, negative as hypothesized. The most notable feature of these regressions is that far and away the most powerful variable "explaining" 1970 unemployment is 1960 unemployment. Not only is the simple correlation coefficient between these two variables 0.61, but the regression coefficient and t-value of 1960 unemployment in regressions where 1970 unemployment is the dependent variable are not very sensitive to the inclusion of additional explanatory variables. As is shown further on, this statement holds true for the relationship between 1960 and 1950 unemployment as well.

The high degree of stability of local labor market unemployment rates over time lends substantial support to the hypothesis that the normal component of unemployment is very important in determining local unemployment rates. The relative importance of employment change vs. 1960 unemployment in "explaining" 1970 unemployment is notably small, not only in its low correlation [see Column (23)], but also in the regression coefficient. For example, the coefficient of employment change shown in Column (13) implies that a 33 percent employment growth over a two-year period, approximately equal to the largest in our sample, lowers local labor market unemployment by only 1.6 percentage points compared to what it would have been with no employment growth at all. When 1960 unemployment is included in the regression, this effect falls to .8 percentage points. The bivariate relationship reported in Column (23) suggests that a 33 percent growth in employment over two years lowers unemployment by only .9 percent.

The fact that our measure of labor market unemployment is not specific to any particular population subgroup creates certain problems in specifying the appropriate regressors of both the unemployment and labor force participation equations in the 2SLS regressions. In order to see this, bear in mind that in the second stage, labor force participation, equation the net variation in unemployment should reflect only demand forces (as measured by proportionate employment change). This implies that every regressor included in the first stage, unemployment equation except proportionate employment growth, should also be included in the second stage equation. However, this requirement raises the following specification problem: What is the role of the variable, proportion of women with children under six years of age living at home, in the labor force participation equation for these women or for women whose only children living at home are between six and 17 years of age? It is obviously appropriate to include this variable in the labor force participation equation for all women. However, the interpretation of its "effect" in the two substrata we have used is by no means straightforward. We therefore report results both for regressions in which the proportion of women with children under six has been included and not included as a regressor in the second stage equations. Unfortunately the magnitude and t-values of the regression coefficients of unemployment are very sensitive to whether the variable in question is included.

As an alternative approach, we have, in the first stage equation, simply regressed unemployment on employment growth and, in the second stage equations, included the proportion of women with children under six only in the regression for all married women taken together. This set of regressions, reported in Columns (23) - (26) of Table 5, may be vi :d as an instrumental variables analog of the OLS labor force participation equations in which proportionate employment change is included as a substitute for the local labor market unemployment rate.

The equation of Column (16) is used as a first stage regression to derive a predicted value for unemployment used in the second stage regressions reported in Columns (17) - (22). The coefficients of local labor market unemployment resulting from the 2SLS estimates which do <u>not</u> include the proportion of women with children under six as a regressor are of about the same magnitude as those resulting from any of the OLS estimates, but the t-values are considerably smaller. However when this variable is added [Columns (20) - (22)], the regression coefficient <u>and</u> t-value of unemployment becomes much larger. The magnitudes and t-values of the other right-hand variables are affected only to a minor extent by the addition of the presence of young children variable, however. The results of the alternative approach in which the only regressor in the unemployment equation is proportionate employment growth are reported in Columns (23) - (26). In terms of the statistical significance of the regression coefficients, this approach is certainly less satisfactory than that in which a more elaborate specification of the unemployment equation is used.

There is a substantial increase in the regression coefficients of unemployment, but the t-values of these coefficients are considerably smaller than is the case either in Columns (17) - (19) or (20) - (22).

What do the 2SLS estimates tell us about the "true" effect of aggregate demand-induced unemployment on labor force participation, and how do these estimates compare with those obtained simply by including the employment change variable directly in the OLS regressions? In terms of statistical significance some of the 2SLS coefficients of unemployment are about the same as those of employment change in Columns (4) - (6). In the 2SLS estimates there is no persistent pattern among the strata in the magnitude or t-value of the coefficient of unemployment in the 2SLS regressions. In order to assess whether the 2SLS estimates imply an effect of aggregate demand-induced unemployment on labor force participation similar to that implied by the estimates obtained when employment change is directly included in the OLS regressions, we can make use of the reciprocals of the coefficients of employment change in the regressions of Columns (13) - (16) or (23) where the dependent variable is 1970 unemployment. In so doing, it is necessary to recall that this procedure provides an <u>overestimate</u> of the partial derivative of employment change with respect to 1970 unemployment, since the correlation between these variables is nowhere nearly equal to unity. The reciprocal of the coefficient of employment change ranges approximately between 20 and 40. Multiplying the coefficients of employment change in Columns (4) - (6) by 20 yields products which are <u>larger</u> than the coefficients of predicted unemployment in the 2SLS regressions in Columns (17) - (19). When 40 is used as a multiplier, however, the products are similar to the very large coefficients of unemployment in Columns (24) - (26). The t-values of employment change in those labor force participation regressions not including 1970 unemployments are roughly equal to or greater than those of 1970 unemployment in the 2SLS regression of Columns (17) - (19). For women with children less than six years of age living at home the t-value of employment change is much higher in the regression in which it is included than the t-value of unemployment in the corresponding 2SLS regression. The t-values of unemployment in the 2SLS regressions which include the presence of children variable are somewhat larger than those of the OLS regressions which include employment change directly (except for the stratum of women with children under six), and they are considerably larger than the t-values of unemployment in the 2SLS regressions based on the simple unemployment equation of Column (23). As mentioned above, the t-values of the coefficients of employment change are made much smaller by the inclusion of 1970 unemployment in the OLS regressions.

The preponderance of the evidence seems to be that the "true" effect of aggregate demand on labor force participation is much more uncertain than previous cross section estimates would suggest and that the estimate is extremely sensitive to specification of the regression equations.

The regression coefficients of the men's and women's wage variables in the 2SLS estimates tend to be insignificant and occasionally have signs opposite to those expected on the basis of theory and the results of previous research. The coefficients of both men's and women's schooling are as expected and have reasonable t-values except in the regressions of Columns (24) - (26). The coefficient of industry mix has the expected sign in all but one regression. The coefficient of the proportion of non-white women is often negative, contrary to expectations. It is positive, however, in the regressions for women with children under six years of age living at home.

We have repeated the tests performed on the 1970 data using data from the 1960 Census of Population.[7] Representative results of this replication are presented in Table 6. The magnitude and statistical significance of the coefficient of 1950 unemployment in the regression for 1960 unemployment is quite similar to those obtained in the 1970 regressions for 1960 unemployment. Once again the ten year-lagged unemployment rate is the most powerful variable in "explaining" local labor market unemployment. Proportionate employment growth between 1958 and 1960 is somewhat less important in the 1960 unemployment relationship, both in terms of the magnitude of its regression coefficient and its contribution to R^2 than is 1968-70 employment growth in the 1970 unemployment regression. The reason for this is unclear to us. Nevertheless despite the relatively modest contribution made by 1958-60 employment growth to 1960 unemployment, the magnitude and t-value of the regression coefficient of 1960 unemployment in the 2SLS labor force participation regression shown in Column (3) is similar to those reported in the comparable regressions of Table 5. The measures used for the other variables included in the 1960 labor force participation regression are not all identical to those in the 1970 regression. Even so, broad similarity between the 1960 and 1970 results is evident. The principal differences are in the coefficients of men's wage, industry mix, and number of children.

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[7]The 1960 data, developed for use by Bowen and Finegan in their research, were kindly supplied by Professor Orley Ashenfelter of Princeton University.

TABLE 6

Labor Force Participation and Unemployment - 1960
Married Women Living With Their Husbands, 25-54
(t-values in parentheses)

Independent Variable	Dependent Variable (1) LFP	(2) LFP	(3) LFP	(4) 1960 Unemployment	(5) 1960 Unemployment	(6) 1960 Unemployment
1960 Unemployment	--	-0.78 (3.6)	-1.7* (1.0)	--	--	--
1950 Unemployment	--	--	--	--	0.51 (6.6)	--
ΔE 1958-1960	0.043 (1.1)	0.031 (0.8)	--	-0.019 (0.9)	-0.030 (1.8)	-0.023 (1.2)
Wage (Men)	-0.11 (0.9)	-0.16 (1.5)	-0.062 (0.5)	--	--	--
Wage (Women)	0.21 (1.4)	0.20 (1.5)	0.25 (1.6)	--	--	--
Other Income	-0.93 (1.9)	-0.33 (0.7)	-1.1 (2.1)	--	--	--
Schooling (Women)	0.93 (1.9)	0.60 (1.3)	3.7 (3.0)	0.48 (0.8)	0.36 (0.8)	0.27 (0.5)
Schooling (Men)	--	--	-3.7 (2.2)	-0.88 (1.6)	-0.71 (1.6)	-0.69 (1.3)
Percent Nonwhite	0.051 (1.0)	0.043 (0.9)	-0.028 (0.4)	--	--	-0.031 (1.3)
Industry Mix	0.68 (3.8)	0.46 (2.6)	0.63 (1.8)	--	--	-0.14 (1.9)
Number of Children	-13.1 (4.5)	-11.2 (4.0)	-7.5 (1.5)	--	--	2.6 (1.8)
	$\bar{R}^2 = .47$	$\bar{R}^2 = .54$		$\bar{R}^2 = .10$	$\bar{R}^2 = .41$	$\bar{R}^2 = .23$

*Estimated value based on Column (6).

For a description of the variables, see Appendix B.

In the regression results shown in Columns (1) and (2) of Table 6, proportionate employment change between 1958 and 1960 is assumed to represent demand phenomena, just as in the regressions of Columns (4) - (12) of Table 5. Similarly, the coefficient of 1960 unemployment is assumed to reflect only the association between labor force participation and normal unemployment. The coefficients of employment change are of the same sign and of roughly the same magnitude as in Table 5, while the t-values, although small, are also similar to those in the comparable regressions of Table 5. The coefficient of 1960 unemployment is not much less than that reported by B-F (Table B-10) using 1960 Census data, even when employment change is included as a regressor.

While the replication of our 1970 regressions with 1960 data does not yield identical estimates of the corresponding coefficients, the main finding is corroborated: the attempts to estimate separately the association between labor force participation on the one hand and demand-related and normal unemployment on the other suggest that it is normal unemployment which dominates the overall cross section relationship. The effect of demand phenomena, operating through unemployment, on the labor force participation of married women in cross section data appears to be much less certain than previous cross section estimates have led many students of this problem to believe.

Searching for the Causes of Unemployment and Labor Force Participation. Our empirical results--particularly the robustness of the explanatory power of ten year-lagged unemployment--suggest to us that much remains to be learned regarding the determinants of local labor market unemployment and how it relates to labor force participation. Mutual determination of labor force participation and unemployment, inducing spurious correlation between them in aggregate cross section data, will result in an over-estimate of the effect of aggregate demand on labor force participation insofar as low labor force participation occurs among those who exit and enter the labor force relatively frequently. Although low labor force participation and frequency of labor force exit and reentry need not go together, there is evidence, we believe, that they do. Such evidence is contained, for example, in the previously cited studies of Reder and Doeringer and Piore. In addition, there is also some evidence in the NLS data that the proportion of new labor force entrants in the labor force is inversely related to the labor force participation rate. Using as a sample the NLS respondents (women 30-44) who resided in the 100 largest SMSA's of the United States, the proportion of those who entered the labor force between 1967 and 1968 in the total labor force of each area bears a weak negative relationship to the labor force participation rate. The weighed correlation between the two variables is -.16; the standard error of Z corresponding to this r (for approximately 100 degrees of freedom) is .10.

There are two related channels, or mechanisms, through which low participation and frequent movement into and out of the labor force are likely to induce high unemployment. One channel is that persons who spend less time working should be expected to acquire less firm-specific human capital than do other workers. This implies, cet. par., higher wage rates relative to productivity and consequently greater exposure to the risk of layoff leading to unemployment.

The second channel involves labor force reentry, which is accompanied by a relatively high risk of unemployment. For example, the NLS data for women 30-44 show that of the 2107 respondents who were labor force participants during both the 1967 and 1969 surveys, 20 percent experienced at least one week of unemployment during the two-year period, while of those 504 respondents who entered the labor force between the two surveys (and who were in the labor force during the 1969 survey), 31 percent had some unemployment experience.

With the preceding thoughts in mind, we have searched for additional variables in order to increase our ability to explain variation in local labor market unemployment. Table 7 reports the results of this search, using 1970 SMSA data. The new variables included fall into two categories: (1) variables which are hypothesized to reflect labor force attachment, i.e., a propensity toward stable labor force participation resulting in low exposure to the risk of unemployment; and (2) variables reflecting the personal cost of being unemployed as opposed to working. The new variables falling into the first category all reflect health status. There are four such variables as indicated in the table. Variables in the second category include the (state) average weekly earnings of workers covered by unemployment compensation, the (state) maximum legal weekly unemployment compensation, and the proportion of all workers in each area who are covered by unemployment compensation. The first of these variables was expected to be negatively related to local labor market unemployment, while the latter two were expected to be positively related.

The additional variables do help to explain 1970 unemployment. However, the single most important variable remains 1960 unemployment. Therefore, it cannot yet be said that we have identified all of the systematic forces contributing to local labor market unemployment.

The coefficients of the additional variables do not all have the expected sign, and only two are statistically significant at a conven-

TABLE 7

Searching for the Determinants of Unemployment
Dependent Variable 1970 Unemployment
(t-values in parentheses)

Independent Variables	(1)	(2)
1960 Unemployment	---	0.40 (4.2)
ΔE 1968-70	-0.048 (2.2)	-0.029 (1.4)
(State) Average Weekly Earnings Covered Workers	1.43 (1.6)	0.95 (1.2)
Schooling (Women)	0.22 (2.8)	0.17 (2.3)
Schooling (Men)	-0.050 (0.7)	-0.0021 (0.0)
Percent Nonwhite	-0.026 (1.7)	0.0035 (0.2)
Percent Men Married, Spouse Present	-0.10 (2.5)	-0.034 (0.8)
Percent Men 25-54	-0.15 (3.2)	-0.12 (2.6)
(State) Maximum Weekly Unemployment Compensation	-0.013 (1.7)	-0.0067 (1.0)
Percent Men Disabled > 6 Months	0.028 (0.4)	0.053 (0.9)
Percent Men Unable to Work	0.092 (0.8)	-0.019 (0.2)
Percent Women Disabled > 6 Months	0.016 (1.2)	0.0018 (0.1)
Percent Women Unable to Work	0.60 (3.2)	0.33 (1.8)
Percent of Covered Workers	0.011 (1.7)	0.011 (1.9)
Children <6	-0.0068 (0.2)	0.0050 (0.2)
Industry Mix	-0.24 (4.7)	-0.17 (3.5)
	$\bar{R}^2 = .55$	$\bar{R}^2 = .63$

For a description of the variables, see Appendix B.

tionally accepted level. Perhaps most surprising is the estimated negative relationship between maximum weekly unemployment compensation and unemployment. Although the coefficient of this variable is not statistically significant by conventional criteria in the regression reported in Column 2, which includes 1960 unemployment, we had expected a pronounced positive relationship a priori, since the cost of remaining unemployed rather than accepting a job (which may offer less in the way of pay and other amenities than a worker had anticipated) presumably falls as the weekly unemployment benefit rises.

Other researchers, in fact, have found a positive relationship between unemployment rates and the benefits which workers covered by unemployment compensation laws obtain by remaining unemployed. The measures of unemployment compensation benefits used by other researchers, while based on the same data as the measure we have used, have been formulated differently than our measure. Grubel and Maki (1974), for example, use the ratio of the average weekly unemployment compensation benefit to the average weekly wage of workers in covered employment. It is questionable whether the Grubel-Maki measure is appropriate, since average weekly benefits paid will vary inversely with the proportion of workers receiving payments for partial unemployment. Thus the ratio of average weekly benefits to average weekly wages of covered workers will vary with the amount of unemployment as well as with the amount of unemployment compensation per unit of time unemployed relative to hourly wage rates. This may well induce a positive bias in the relationship between the unemployment rate and Grubel and Maki's measure of the unemployment benefit-wage ratio. Another source of possible bias arising from the use of average weekly benefits in the numerator of the Grubel-Maki measure arises insofar as the likelihood of relatively highly-paid workers becoming unemployed rises with the severity of unemployment conditions. This would induce a positive correlation between average weekly benefits and the unemployment rate, from which no causation running from the benefit ratio to unemployment can be inferred.

The estimated effect of unemployment benefit liberality on unemployment rates obtained by Holen and Horowitz (1974) is more likely to be biased positively than those obtained by Grubel and Maki. Their measure of benefit liberality is "...the average compensation to the average unemployed person,...[divided] by the average wage in manufacturing" (p. 9). A moment's work with pencil and paper shows the Holen-Horowitz measure to be very closely related to the average number of weeks unemployed per worker multiplied by a measure of the relationship between weekly benefit payments and average full time earnings. This measure of benefit liberality is almost certain to be positively related to the unemployment rate even if there is no effect of benefit liability on unemployment experience.

One possible explanation of the unanticipated negative relationship between state maximum weekly benefits and unemployment rates which emerges from our research is that even this measure of benefit liberality, although not directly influenced by unemployment itself, may indirectly be determined by forces influencing state unemployment rates. In states whose labor forces experience relatively high normal unemployment, legislators may be loath to provide for relatively high benefits, since cost considerations will weigh relatively heavily when this use of state funds is balanced against other uses. Thus, our estimated effect of benefit liberality on unemployment rates may be negatively biased, while the estimates of Grubel-Maki and Holen-Horowitz are, we believe, positively biased.

It is also somewhat surprising to us that the average weekly earnings of covered workers is positively related to unemployment. Again, a priori considerations akin to those regarding obtainable unemployment benefits suggest the effect of potential earning power on unemployment should be negative. Also, the Grubel-Maki and Holen-Horowitz papers mentioned previously used measures of earning power in the denominators of their unemployment benefit variables; their results, therefore, suggest a negative relationshp between unemployment and earning power. The basic nature of our finding, however, is unaffected when the maximum weekly benefit variable is combined as the numerator with the weekly earnings variable in ratio form. Theoretically, it is possible to rationalize the positive regression coefficient of the earnings variable in terms of a wealth effect on job search and/or possibly in terms of union-influenced wage levels on an excess supply of workers. Much more extensive theoretical and empirical analysis is clearly required, however, in order to achieve an understanding of the influence of earning power and benefit liberality on observed unemployment rates.

The proportion of workers covered by unemployment compensation laws, as expected, is positively related to local labor market unemployment rates. Disappointing results emerged for the four health variables. The only one of these variables whose regression coefficient suggests a significant positive relationship between bad health and local labor market unemployment is the proportion of women unable to work. A channel via which women's work disability affects labor market unemployment may be that when women are unable to work, other family members (e.g., youth, older family members) who generally experience relatively high unemployment seek work when otherwise they would devote their time to non-labor force activities. The same argument should also apply to men's work disability too, it would seem; thus the lack of statistical significance for the coefficient of this variable would appear to contradict our explanation of the influence of women's work disability. It may be that the men's age group variable reflects the influence of health, however; the correlation between the proportion of men 25-54 and men unable to work is -.32 and its correlation with the proportion of men with work disability lasting more than six months is -.28.

Apart from 1960 unemployment, the variable with the most significant regression coefficient is industry mix, otherwise known as the "index of demand for female labor." Its regression coefficient is somewhat more negative and more significant in the 1970 unemployment regressions than in explaining 1960 unemployment, however. As described in B-F, Appendix B, this variable is "designed to measure structural differences among metropolitan areas in the relative abundance of those jobs commonly held by females. . . ." Thus it reflects an industrial structure which, a priori, one would expect to be less prone to produce the kind of unemployment associated with the auto, steel, and other heavy manufacturing industries.

III

Conclusions, Implications, and Recommendations

In our research, we have used relatively simple econometric techniques to identify the causes of the difference between time series and cross section estimates of the relationship between labor force participation and unemployment. Using data from the National Longitudinal Surveys, we have shown, for men aged 44-59 and women aged 30-44, that the estimated relationship between labor force participation and unemployment is considerably larger when the data are aggregated by SMSA's than when the estimate is based on disaggregate observations. The estimated association between labor force participation and unemployment derived from analysis of disaggregate data is negligible, except for black men and women; for black men, however, the estimated relationship is positive rather than negative. Admittedly, the unemployment rate data we have available for use with the NLS data are not as reliable as might be desired. They are unpublished twelve-month averages of the CPS unemployment estimates in the years during which the NLS data were obtained. However, even when NLS data for respondents living in only the ten largest SMSA's are used (in order to include only the most reliable of the unemployment estimates), our findings with respect to the labor force participation-unemployment association are not changed. The fact that the estimated association between labor force participation and unemployment we obtain using aggregated SMSA data from the NLS is approximately equal in magnitude (although not in statistical significance) to that obtained for similar population groups using decennial census data leads us to believe that the dissimilarity between our estimates based on disaggregate data and those obtained in previous research is truly a function of disaggregation and not of problems with the data.

Using data from the decennial censuses of 1950 through 1970, we have searched for evidence that mutual determination of labor force participation and local labor market unemployment rates is an important factor contributing to the persistently strong association between labor force participation and unemployment estimated from SMSA aggregate data. Our results in this area are inconclusive. The estimates we have obtained are quite sensitive to specification of both the unemployment equation and the labor force participation equation when the 2SLS estimation technique is used to try to identify the effect on labor force participation of that component of unemployment attributable to aggregate demand forces. The 2SLS estimates of the effect of demand-associated unemployment on labor force participation are not small compared with the OLS estimates obtained in previous research. The question of their statistical significance, however, is crucial to interpreting the 2SLS estimates. Unfortunately, there is substantial uncertainty regarding this problem, particularly when only one predetermined variable (employment change) is excluded from the labor force participation equation (Fisher, p. 35). Our judgment is that much more needs to be learned both theoretically, in the direction suggested by the Appendix to this report, and empirically about the forces determining local labor market unemployment rates if this issue is ever to be resolved.

One possible explanation of the "large" estimated effect of demand-associated unemployment on labor force participation lies in recognizing that the unemployment rate is only a proxy for the probability that a worker of given characteristics can find a job paying a given wage with a given amount of effort. We have adopted the working hypothesis in our research that recent employment change is a better surrogate for this probability than measured unemployment; furthermore, employment is a likely intermediate target of labor market policy aimed at reducing unemployment and simultaneously increasing labor force participation. Our attempts to "explain" local labor market unemployment uniformly suggest that the response of unemployment rates to employment change is small. For example, our estimates suggest that to raise employment in a local labor market by ten percentage points over a two-year period would result in a decline in unemployment of the order of magnitude of about .3 percentage points. Another way of viewing this relationship is to note that a ten percent rise in employment might induce an increased labor force participation rate of married women in the order of .5 to 1.5 percentage points, if our estimates are taken at their face value. Presumably workers respond in their labor force decisions, other things equal, to the availability of jobs, not to the unemployment rate as such. Therefore, given the labor force participation response to employment growth, the smaller is the association between employment growth and unemployment, the larger will appear to be the "response" of labor force participation to unemployment. Our future research will attempt to relate the employment change-unemployment association observed in the cross section data to that observed in economy-wide time series data in order to test the hypothesis suggested here that the time series-cross section difference in the labor force participation-unemployment relationship is due to a difference in the relationship between unemployment and aggregate demand.

The policy implications of our research emerge as much from the framework used to explore the unemployment-labor force participation relationship as from the empirical results themselves. The most negative policy implications arise from the labor force participation equation estimates based on disaggregate data. These estimates imply that policies aimed at reducing "hidden unemployment" in local labor markets need not be undertaken, because labor force participation shows little systematic relationship to unemployment. The conceptual framework used to investigate the mutual determination of labor force participation and unemployment is useful, however, in emphasizing the role of a likely policy variable--employment--in affecting both unemployment and labor force participation. The most consistent finding to emerge from this part of our research is the high correlation of local labor market unemployment rates over time and the relatively minor impact of employment change, taken as a measure of aggregate demand. These results stand when attempts (not reported above) are made to eliminate from the data SMSA's whose employment growth may be attributable to population shifts independent of labor demand conditions--due perhaps to movement toward areas favorable for retirement for example. Even though we have not been as successful as we had hoped in identifying the "true" relationship between demand-associated unemployment and labor force participation, we can be fairly certain that local unemployment rates are not highly responsive to crude attempts to raise employment levels which ignore the peculiar characteristics of local labor forces themselves. Consequently, even if the "effect" of local unemployment rates on labor force participation is as large as previous estimates based on SMSA aggregate cross section data would lead us to believe, simple policy options to reduce "hidden unemployment" by focusing on aggregate demand at the local level are probably not available to us.

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APPENDIX A

A Theoretical Model

In this Appendix an abstract model of the labor market is developed to provide some insight into the forces which determine labor force participation, unemployment, and vacancies. Although a job search model is used to characterize worker behavior in this stylized market, the uncertainty considered is the possibility of a job offer being extended. The wage rate for a given skill will be assumed known and equal across firms. The unknown factor is the identity of the firms with openings at the prevailing wage.

This approach is, therefore, somewhat different from the main thrust of the search literature which stresses wage dispersion as the fundamental information problem.[1] It is more in keeping with the work of Reder and Holt in this aspect. This emphasis on job openings was motivated by evidence that indicated that variations in search behavior over time are largely explained by variations in job vacancies.[2]

Beyond the assumption that the major element of uncertainty in job search is the identification of firms who are hiring rather than the distribution of wage rate offers, a traditional expected wealth maximizing individual is assumed. The individual is assumed to allocate his or her time into three activities; market work or employment (E), home production (H), including leisure, and the search for work or unemployment (U). The demand for search time is derived from the demand for employment among workers not presently employed. I ignore search undertaken by employed individuals since the bulk of these individuals don't enter the unemployed ranks but rather go directly to new jobs. The major sources of unemployed workers are layoff and new entry.

The firms in this abstract economy are assumed to be expected profit maximizers. The role of the firm in the short run is limited to the decision to hire a worker at the prevailing wage or not. In the long run the firms can adjust wages as well although this aspect is considered only briefly below. It will be assumed throughout, however, that all firms with openings for those of a given job skill will offer the same wage. It should be noted that the firms are subject to uncertainty since they do not know for sure that an opening will be filled.

The behavioral interaction of individuals and firms in a job matching model is the main objective of this chapter. The chapter is organized in the following way. Section A develops at greater length the behavior of individuals and firms and the job matching environment in which they are assumed to operate. Section B explores the behavior of the market over time. In Sections C and D respectively we consider initial period and long run consequences of various changes in labor market structure.

A. The Economic Agents and Job Matching Environment

The Individual. In this section I explore the search decision process of an individual of a particular skill class who is currently not employed and develop the condition under which he (or she) will continue to seek work (and thereby remain in the labor force). I assume below that all firms pay the same wage for workers of a given skill class, say w, and that job search is limited to finding an opening at that wage rate. I assume for simplicity that a dollar value can be placed on a unit of home time as well, say h. The search decision rule in an expected value framework, if there are no "start up" costs to search, is to remain looking for work as long as the expected net returns are positive or

$$1)\quad \theta_t \left\{\sum_{i=1}^{N} (w_{t+i}-h_{t+i})\delta^i\right\} - (h_t+c_t) \geq 0$$

where

$\theta \equiv$ the probability of finding an opening, the job assumed to begin at the start of the next period.

$N \equiv$ the worker's job horizon.

$\delta \equiv 1/1+r$ where r is the discount rate per period.

$C \equiv$ the direct cost (or subsidy) of search.

If an initial investment must be undertaken to search productively, then the expected returns over the whole interval of periods where search returns are net positive must be considered. Such discrete costs, which might include an initial investment in information from indirect (non-contact) sources, will be ignored here.

Equation 1 summarizes rather the forces which will influence search behavior. An individual will be more likely to drop out of the labor force the lower the probability of finding a job (θ), the less the difference between the value of employment and home production, and the higher the absolute level of search costs in terms of both direct costs and foregone home production. Presumably the definition of primary and secondary workers in the labor force pivots about the frequency of workers with $w \approx h$, where h broadly defined would include welfare payments, etc. Direct search costs may be negative for previously employed workers eligible for unemployment compensation as it is basically a search subsidy. Where eligible for such programs, a laid-off worker might well drop out of the labor force only after such compensation is exhausted. The lag of labor force dropouts from the unemployed is obviously partially institutional in nature.

In the model used here the underlying supply factor will be home productivity. Home productivity is, of course, a function of intra-family time allocations as well as personal characteristics. Smith and Gronau have considered these issues at some length. For the purpose of this exercise it is sufficient to note certain rather obvious supply regularities. For men, schooling activities, marital status, age, etc., are likely to influence labor supply. For women, the presence of children adds an additional supply element. In any case, these elements ultimately are reflected in the value of h.

In the analysis which follows it will be assumed that $h_t = h$ for all t. This assumption greatly simplifies the model although not without cost. Basically it eliminates the bulk of the quit motive for job turnover since workers will by assumption not enter or leave the labor force because of changing home conditions. Ultimately we hope to integrate this aspect into the market model. Quits, in this model, will only occur if market wages change: quits will not occur in a stationary state economy.

It is also assumed below that individuals are myopic, never looking more than one period into the future. The search decision rule specified in Equation 1 then reduces to:

$$2) \quad \theta_t \delta\{W_{t+1} - h\} - (h + C) = 0.$$

The critical level of h, say h*, below which a not employed worker will seek work in period t is

$$3) \quad h^*_t = \frac{\theta_t W_{t+1}\delta - C}{1+\theta\delta}.$$

The number of searchers in the preceding period then is the number of individuals with home productivity equal to or less than h* among those individuals not already employed or

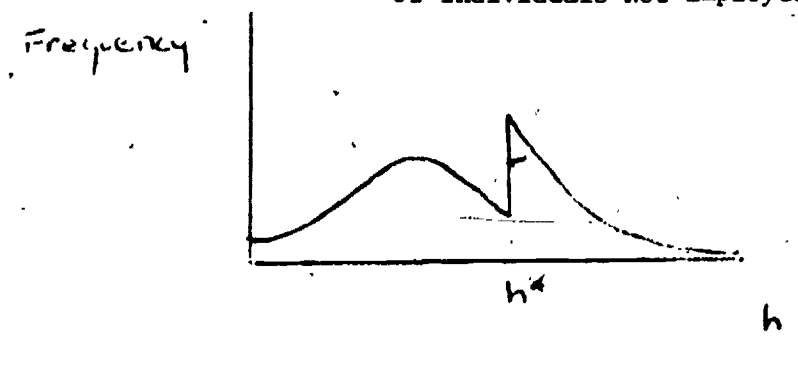
$$4) \quad U_t = \int_0^{h^*} g_t(h^*)\,dh$$

where $g_t(h^*)$ is the density function of home productivity among not employed workers. It is easily demonstrated that with any usual distribution of h across individuals the supply of searchers will increase when (1) the probability of a job offer increases, when (2) market wages rise, when (3) the interest rate falls, and (4) when job search costs fall. The density function must be time indexed since the number of not employed workers and therefore, the density function will vary over time. If many workers are laid off in a given period or if searchers are particularly unsuccessful at finding job openings, the number of not employed workers in the next period will rise.

The <u>form</u> of <u>g</u> may itself vary over time since it is composed of two groups of individuals: workers persistently out of the labor force at prevailing levels of market wages ($h < h^*$) and workers temporarily out of work because of layoff and subsequent rehiring problems ($h < h^*$). If h is distributed normally across the whole population and if firms lay off and hire workers independent of their non-market productivity, the distribution of g will have a form summing the frequencies of these two groups. A typical form is represented in Figure 1 below.

Figure 1

The Distribution of Non-Market Productivity (h) of Individuals Not Employed



The distribution to the left of h* represents searchers or unemployed workers while that to the right represents those out of the labor force because they are too productive in the home to be attracted by the market.

Since the distribution g is itself variable it is useful to approach the unemployment function as labor force participants minus employed workers. Labor force participants (LFP) can be defined as follows:

$$5) \quad LFP = \int_{-\infty}^{h^*} f(h)\,dh$$

where f(h) is the population density function, invariant over time by our assumptions, and unemployment

$$6) \quad U = LFP - E$$

The model of job search for the individual when combined with demand by firms for individuals with a particular job skill provides insight into the nature of employment and unemployment equilibrium in a particular labor market. Presumably, the local economy's demand for a particular class of workers is a function of aggregate demand conditions, of the prevailing wage rate, and of its industrial composi on. Ultimately, of course, the characteristics of local industry are themselves determined by economic considerations such as proximity to particular markets or resources and the supply characteristics of the local labor force. The skill class of workers is also changeable over time by human capital investments and migration. The latter force was emphasized by Mincer as an explanation for the apparent inconsistencies in labor force participation studies. Below, however, we assume skill cohorts of fixed size.

<u>The Firm and Industry</u>. Turning to the demand for labor, we develop below a simplified model of the firm and industry. It retains elements, however, which are of particular interest to us. We assume that:

(1) there are N firms in the local economy who utilize workers of the skill class in question.

(2) each firm employs either zero or one worker in any given period, never more than one.

(3) sales or more precisely orders for next period's production are distributed randomly among the firms presently with employees and those without employees with the fraction P_1 of each receiving positive orders, say of value R_1, if they have a worker in the production period. This process becomes clearer below.

(4) firms are myopic, never looking more than one period in the future.

(5) wage rates are exogenously determined, perhaps by an effective minimum wage law.

Firms will be employing workers, then, only if $R_1 > W$ which will be assumed and $P_1 N$ firms will desire workers in any period. Vacancies (V) or job openings will be less than $P_1 N$ since some firms will already have a worker from the previous period so

7) $V = P_1 (N-E)$.

Similarly firms which have a worker but receive no order for next period's production will lay off (L) their workers at the end of the current production period so:

8) $L = (1-P_1)E$.

This model assumes that firms without orders in the preceding period and firms with orders in the preceding period are equally likely to receive orders in this period. To the extent some correlation of orders across periods exists the volume of job turnovers and therefore layoffs and vacancies will be correspondingly reduced.

Assumption 4, which suppresses the wage decision, is introduced to simplify an already complex model. The wage factor will be considered in an extension of this paper. It might be interesting to note, however, that the simple competitive model of wage determination is inappropriate here since the firm does not face a perfectly elastic supply of workers at the prevailing wage. The firm and industry will presumably adjust wages to the point the increased probability of hiring a worker times his net value to the firm equals the corresponding expected increment in wage payments. But again this issue will not be considered further here.

<u>Labor Market Matching</u>. To complete the model, the job matching process must be specified under particular assumptions about job matching, the number of job searchers, and number of openings can be converted into the probability of a searcher finding a job (θ) and the probability of a firm finding a worker (ψ). These latter probabilities can then be inserted into worker flow models which let us make assertions about equilibrium employment, unemployment, and vacancies.

A simple model of the search process will be used to illustrate the operation of the labor market. Assume that:

(1) each active job searcher hunts for exactly one job possibility which may or may not lead to a job offer and employment.

(2) as a job seeker and job opening are matched, the firm in question drops out of the labor market and is no longer a job possibility for any worker who has not yet searched for his possibility.

(3) each worker perceives k possible job openings. Since k refers to worker perceptions, it need not be equal to N, the actual number of potential employers. We will assume that k is more than the number of searchers.

The model described in the last paragraph is equivalent to an "urn model" in which balls equal in number to the number of searchers (U) are drawn without replacement from an urn containing a total of k balls, m of which are marked to indicate a job possibility. The number of marked balls indicate job matches. The process is hypergeometric. The probability a firm will get a new worker if it wishes one is U/k under this process so

9) $\Psi = \frac{U}{k}.$

The worker's probability of finding a job is $\frac{V}{k}$ or the number of openings divided by the number of possibilities; so

10) $\theta = \frac{V}{k}.$

In this case, although not generally, the worker's probability of getting a job is independent of the number of other workers. If the search process were derived from an "occupancy" model in which workers could use up their job search on a firm already matched, θ would depend on U as well. Similarly in other models the probability that a firm with an opening finds a worker will generally depend on the number of other firms searching as well as the number of unemployed workers. The expected number of new hires $E(NH_t)$ in any period for employment in the next period is

$$11) \quad E(NH_t) = \theta U = \Psi V = \frac{UV}{k}.$$

B. The Structure of the Model Over Time

In a formal sense the model outlined above should be handled as a dynamic programming problem. At the beginning of each period the various state variables, employment, unemployment, and vacancies are fixed with a random element (the job match) introduced into the new hire process. This random shock affects the state variables in the next period. The randomness itself does not interest us here so we shall assume that new hires are equal to expected new hires in every period or

$$11') \quad NH = \theta U = \Psi V = \frac{UV}{k}.$$

In the section which follows we will consider the impact on unemployment, employment, and vacancies of various changes in aggregate demand, labor market characteristics, and individual characteristics. We wi consider both the initial period effects of these changes and the long run equilibrium consequences. Since the latter concept is somewhat more complex we will discuss the nature of long run equilibrium in this section before continuing on to the analysis of equilibrium change.

Long Run Equilibrium. Since both non-participation in the labor force and unemployment will be unchanged over time if employment and the system parameters are constant, it is sufficient to explore employment equilibrium. Employment will be in equilibrium when outflows from employment (due solely to layoffs since quits equal zero in equilibrium under our assumptions) are equal to new hires, or L = NH. Recalling equations (8) and (11'), then, equilibrium can be defined as:

12) $(1-P_1)\ E = \frac{UV}{k}$

Substituting further for U and V yields the equilibrium equation

13) $(1-P_1)\ E = \frac{1}{k}\ [\int_{-\infty}^{h^*} f(h)dh - E]\ [P_1(N-E)]$

where

14) $h^* = \frac{\delta\theta W-C}{1+\delta\theta}$ with $h^*_\theta > 0$, $h^*_\delta > 0$, $h^*_w > 0$, and $h^*_c < 0$

and

15) $\theta = \frac{V}{k} = \frac{P_1(N-E)}{k}$ with $\theta_{P_1} > 0$, $\theta_N > 0$, $\theta_k < 0$, $\theta_E < 0$.

Basically equilibrium is achieved in (13) because the number of layoffs rises when employment rises, total orders constant, while new hires fall with higher employment levels, ceteris paribus. The latter can be demonstrated as follows:

16) $\frac{\partial NH}{\partial E} = \frac{1}{k}\ \{\frac{\partial U}{\partial E}\ .\ V + \frac{\partial V}{\partial E}\ .\ U\}$

and

17) $\frac{\partial U}{\partial E} = f(h^*)h^*_\theta\ \theta_E -1 < 0$

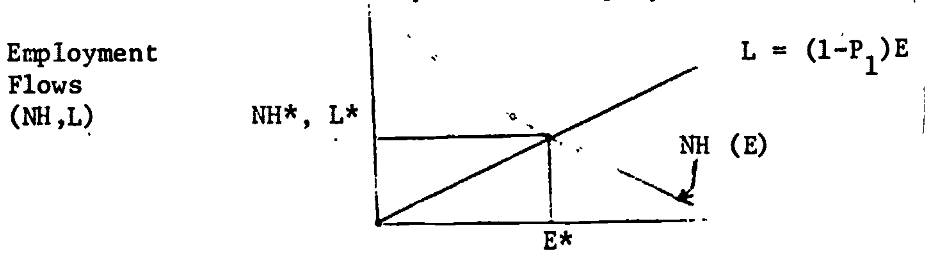
18) $\frac{\partial V}{\partial E} = -P_1 < 0$

so $\frac{\partial NH}{\partial E} < 0.$

Basically new hires are down with higher employment in equilibrium since (1) vacancies are reduced because firms with production orders in the following period are more likely to already have workers with higher employment, ceteris paribus, and (2) searchers are fewer as a consequence of the reduced vacancies and because more potential searchers already have jobs. Graphically employment equilibrium in the long run can be represented by the intersection of the layoff and new hire function as indicated in Figure 2.

Figure 2

Equilibrium Employment



Employment Stock (E)

The following section on long run equilibrium under different parametric changes can be visualized in terms of Figure 2.

Note On Labor Market Size. To this point the analysis has focused on absolute numbers of workers but the nature of the results would not be asymmetrically altered by variation in labor market size. In particular it is possible to see by inspection that if population, number of firms (N), and number of possible job options all increase proportionately, (say α), equilibrium employment will increase proportionately. In such a world, the equilibrium expression would be altered to

$$(1-P_1)\hat{E} = \frac{1}{\alpha k}\{\alpha \int_{-\infty}^{h^*} f(h)dh-\hat{E}\}\{P_1 (\alpha N-\hat{E})\}$$

where the new equilibrium $\hat{E} = \alpha E$.

C. The Response to Labor Market Variations

The elements of the model required to trace out the impact of structural changes in labor market characteristics on market behavior are now complete. Before exploring these implications it is useful to summarize the main labor market characteristics or parameters to be considered. These include:

i) aggregate demand parameters: P_1 (fraction of firms with positive sales or orders)
: N (number of firms)

ii) labor market characteristics: k (number of perceived job possibilities)
: C (direct search costs)
: W (exogenous wage effects)

iii) individual characteristics: δ (time discount factor)

The impact of the variation of these characteristics will be explored in the short run and long run.

Initial Period Effects. An exploration of the initial period effects of a change in labor market characteristic has interest in its own right as well as illustrating the operation of the market. To understand the initial period consequences it is useful to recall the precise time sequencing of the market decisions. At the beginning of each period employment is fixed by the new hires and layoffs executed at the end of the preceding period. Firms who win orders for next period production and do not presently have an employee announce vacancies or job openings. Firms without next period orders who have an employee announce the plan to lay off their workers at the end of this production period. Individuals who are not employed at the beginning of the period then decide on the basis of their likelihood of ge 'ng a job and the prevailing wage whether to seek work or not. Employment is fixed, then, in the short run although clearly not between periods.

TABLE 1

Signs of Partial Derivatives of Parameter Changes on the Labor Market: Short Run

Parameter	Labor Market Behavior		
	V	U	LFP
P_1	+	+	+
N	+	+	+
k	0	-	-
c	0	-	-
w	0	+	+
δ	0	+	+

V ≡ job vacancies

U ≡ unemployed individuals

LFP ≡ labor force participants

P_1 ≡ fraction of firms with positive production orders

N ≡ number of firms

k ≡ number of potential employers

c ≡ direct search costs

w ≡ wages per period

δ ≡ discount factor

The signs of the partial derivative of parametric changes on labor market behavior are summarized in Table 1. The calculations of these qualitative results are straightforward since employment is fixed and need not be spelled out at length here. Since

$$V = P_1(N-E)$$

the initial period effects on vacancies are obvious from inspection. Similarly unemployment and labor force participation must move in the same direction since employment is fixed and LFP = U+E. Since

$$LFP = \int_{-\infty}^{h^*} f(h)dh$$

with $h^* = h\ (\theta, \delta, W, C)$ and $\theta = \frac{V}{k} = \frac{P_1(N-E)}{k}$,

the parameters affect labor force participation and unemployment in the same direction as they affect h*, the index of search incentive. Recall that the partial derivative of labor force participation with respect to an unspecified parameter is

$$\frac{\partial LFP}{\partial x} = f(h^*)\ \frac{\partial h^*}{\partial x}.$$

The indicated qualitative effects are then easily verified.

Summarizing the initial period effects, an increase in aggregate demand either through more firms (N) or a higher probability of existing firms receiving sales orders will have the expected effect of increasing job vacancies but also increasing unemployment and labor force participation as the job market becomes more attractive as a consequence. To the extent the labor market becomes less "efficient," either through higher search costs (C) or less accurate perception (k) of which firms are potential employers, unemployment and labor force participation will fall. The initial period effect of a wage (w) rise, say a jump in an effective minimum wage, is to raise unemployment and labor force participation. Similar results occur for a shift in time preference toward the future since present search costs are weighed less heavily than the expected future returns.

These initial period effects need not persist over time, however, since changes in these parameters affect the volume of layoffs and new hires at the end of the period and thereby next period's level of employment. In the next section we explore the consequences of these changes for long run equilibrium levels of employment, unemployment, labor force participation, and vacancies.

D. Long Run Equilibrium in the Labor Market

In Section B above we developed characteristics of long run equilibrium in the labor market. The basic characteristic of such equilibrium is that new hires equal layoffs. In this section we explore the effect of the structural changes on long run equilibrium. A summary of the signs of partial derivatives of equilibrium employment, etc., with respect to various parameter changes are reported in Table 2. Unfortunately the derivation of these signs are considerably more involved than those for the short run effects. These derivations are available upon request in appendix form.

Graphically the employment effects in equilibrium can be easily rationalized. Recalling Figure 2, the parametric changes can be analyzed in terms of shifts in the new hire function and the layoff function. The parameters representing numbers of firms in the economy (N), wage rate (w), and time preference (δ) all involve simple outward shifts in

TABLE 2

Signs of Partial Derivatives of Parameter Changes on the Labor Market: Long Run Equilibrium[a]

Parameters	Labor Market Behavior			
	E	V	U	LFP
P_1	+	+	?	+
N	+	+	-	+
k	-	+	?	-
C	-	+	-	-
w	+	-	+	+
δ	+	-	+	+

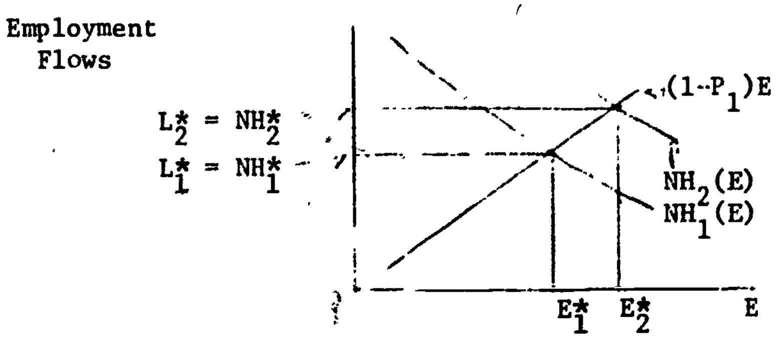
[a]Notation Defined in Table 1 except

E ≡ employed individuals

the number of new hires at a given employment level, therefore shifting out employment in long run equilibrium from E_1^* to E_2^* in Figure 3. Notice that gross employment flows increase at the same time. Both the perceived

Figure 3

Equilibrium Employment Shift

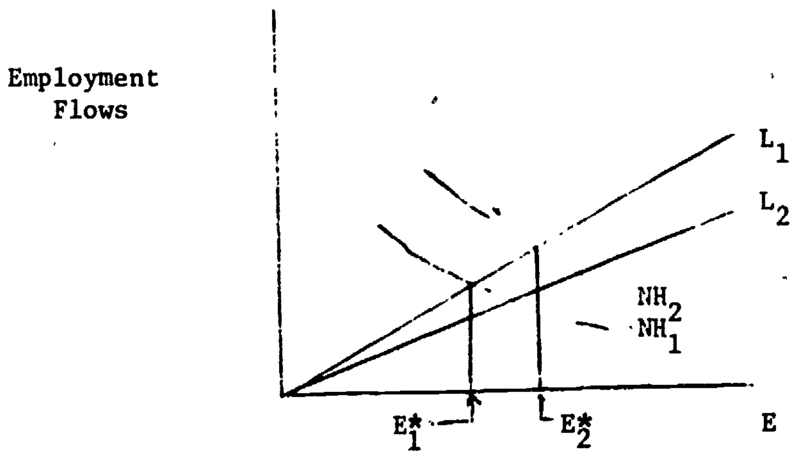


job possibilities (k) and job search costs (C) will shift inward the new hire function and therefore equilibrium employment.

The effect on equilibrium employment of a change in the probability a firm will receive a production order (P_1) will shift both the layoff and new hire functions inward. In particular at any given level of employment new hires will rise and layoffs fall with higher P_1, both leading to higher equilibrium employment as illustrated in Figure 4. The initial

Figure 4

Equilibrium Shift Due to Increase in P_1



levels of the new hire and layoff function and equilibrium employment, all indexed with the subscript 1, are shifted by an increase in P_1 to the new equilibrium level, subscripted 2. Note, however, the equilibrium gross employment flow changes are ambiguous in sign, they can rise or fall.

The equilibrium vacancy results are rather straightforward, given equilibrium employment changes. For an unspecified parameter x

$$\frac{dV}{dx} = \frac{\partial V}{\partial x} + \frac{\partial V}{\partial E}\frac{\partial E}{\partial x}$$

The direct effect of the parameters on vacancies holding constant E are reported in Table 1. Since $V = P_1(N-E)$

$$\frac{\partial V}{\partial E} = -P_1 < 0.$$

The vacancy column of Table 2 can then be generated with the additional knowledge of $\frac{\partial E^*}{\partial x}$ in Table 2. It turns out that aggregate demand (P_1, N) and search difficulties (k, c) both increase vacancies while the wage and time preference affects decrease vacancies because each leads to increase in searchers.

Perhaps the easiest way to grasp intuitively the equilibrium unemployment results is to recall that in equilibrium layoffs equal new hires or

$$(1-P_1)E^* = \frac{U^*V^*}{k} = \frac{U^*(P_1)(N-E^*)}{k}$$

so

$$U^* = \frac{k(1-P_1)E^*}{P_1(N-E^*)}$$

where $\frac{\partial U^*}{\partial E^*} = \frac{(1-P_1)kN}{PP_1(N-E^*)^2} > 0.$

For those parameters which have their effect on U* purely through E* (namely C, W, δ), the partial derivative signs will be the same as the employment effect signs. The parameters P_1, k, and N have a direct effect on U*, unfortunately in a direction offsetting the indirect employment effect since $\frac{\partial U^*}{\partial k} > 0$, $\frac{\partial U^*}{\partial P_1} < 0$, and $\frac{\partial U^*}{\partial N} < 0$. Since the full derivatives are

$$\frac{dU^*}{dx} = \frac{\partial U^*}{\partial x} + \frac{\partial U^*}{\partial E^*}\frac{\partial E^*}{\partial x}$$

only for changes in N is the sign of the net effect unambiguous. See the unattached appendix. For both P_1 and k, the results are ambiguous at this general level of development although that may not be true once more specific functional forms are introduced (particularly in the reservation wage distribution).

The results for labor force participation do not share this same ambiguity. For the parameters C, W, and δ, both E* and U* change in the same direction so LFP* must change in the same direction by definition. For the others direct calculation is required. Because the attractiveness of the market is a function of vacancies and therefore employment levels, the effect of parametric changes on labor force participation is again both direct and indirect.

$$\frac{dLFP}{dx} = \frac{\partial LFP}{\partial x} + \frac{\partial LFP}{\partial \theta}\frac{\partial \theta}{\partial V}\frac{\partial V}{\partial E^*}\frac{\partial E^*}{\partial x}$$

with $\frac{\partial LFP}{\partial \theta} > 0$, $\frac{\partial \theta}{\partial V} > 0$, and $\frac{\partial V^*}{\partial E^*} < 0$. The signs of the partial effects on labor force participation are reported in Table 1 since they are equivalent to short run effects. The equilibrium effects on employment ($\frac{\partial E^*}{\partial x}$) are reported in Table 2. Specific derivations of the net effects, reported in Table 2, can be found in the Appendix mentioned above.

It seems useful to summarize these results without the technical aspects interwoven above. An increase in aggregate demand (P_1, N) will increase equilibrium employment, vacancies, and labor force participation. An increase in firms (N) will also decrease unemployment although strictly speaking the same conclusion does not follow for the percentage of firms hiring and laying off. Decreased labor market efficiency (k, c) will decrease employment and labor force participation while increasing job vacancies. Unemployment will fall with higher search costs.

Higher wage rates, say induced by higher effective minimum wages, as well as higher time discount factors will increase employment and labor force participation in equilibrium and decrease vacancies but will also increase unemployment. The higher wages induce more people to seek jobs even though the chance of finding such a job diminishes for a given worker. It should be noted here that essentially the firm's demand for a worker is perfectly inelastic in this model: job matching effects alone lead to these predicted long run effects.

E. Conclusions

The implication of this model for the labor force participation and unemployment relationship is straightforward. The two stocks are simultaneously determined and therefore treating one (unemployment) as causing the other is inappropriate. As one can observe from Table 2 unemployment and labor force participation may work in the same or opposing directions depending on the underlying source of structural change. It is apparently not even necessary that unemployment and aggregate demand (P_1) move in the opposite direction.

There is, moreover, no reason to expect that variations in unemployment cross-sectionally are the result of differences in aggregate demand. Unemployment may vary with a wide range of structural labor market differences-search costs, ability to identify potential employers, wage levels, etc. It is these structural factors which likely explain the persistent high level of unemployment in some areas over long periods of time rather than persistent aggregate demand problems.

These "conclusions" are obviously just illustrative. A much more refined model of the labor market must be developed and estimated before more can be said. Among the major extensions required in the present model are the introduction of variation in the value of home time, which would require analysis of quit behavior. An explicit model of the firm, particularly of wage determination, is also necessary if we are to have a good understanding of the long run behavior of the labor market. These developments will require considerable further research effort and are not within the scope of the present project.

FOOTNOTES

[1]See particularly Stigler, Alchian, Gronau, and Pars

[2]See Parsons.

[3]See Matilla.

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APPENDIX B

Table	Variable Name	Description of Variable	NLS Public Tape Variable Number
1	Wage	Hourly rate of pay at current or last job, 1967 (dollars)	1028
1,2	Unemployment	Percentage unemployment rate for labor market of current residence in 1967	2805
1,2	Industry Mix	1960 index of demand for male labor for labor market of 1967 residence: (100 - index of demand for female labor) (percentage measure)	Obtained from variable 1062 on Women's tape (1)
1,2	Other income	Total net family income - (Sum of all earned income of family members), in 1966 (hundreds of dollars)	880, 1222, 1223, 1224, 1225, 1226, 1227
1,2	Schooling	Highest grade completed as of 1966	1983
1,2	Non-White	Percentage of black men	5
1,2	Marital status	Percentage of all males age 45-59 years who were married with wife present in 1966	4
1,2	Labor force participation rate	The percentage of males age 45-59 in the civilian labor force during survey week 1967	945
1,2	Health	Percentage of males age 45-59 who have a health problem that limits amount or kind of work they can do in 1966	508
3	Migration	Percentage of females who have lived at current residence less than 11 years	709
3,4	Labor force participation rate	The percentage of females age 30-44 in the civilian labor force during survey week 1967	212
3,4	Unemployment	Percentage unemployment rate for labor market of current residence in 1967	2487

Table	Variable Name	Description of Variable	NLS Public Tape Variable Number
3,4	Income of husbands	Income of husband from wages and salary in 1966 (hundreds of dollars)	646
3,4	Wage	Hourly wage rate at current or last job, 1966 (dollars) (2)	752
3,4	Other income	Total family income - (Sum of all earned income of family members), in 1966 (hundreds of dollars)	1106, 646, 647, 649, 650
3,4	Schooling	Highest grade completed as of 1967	1112
3,4	Industry Mix	1960 index of demand for female labor for labor market of 1967 residence (percentage measure)	1062 (1)
3,4	Non-White	Percentage of black women	10
3,4	Children < 6	Percentage of women who have children less than 6 years old living at home, in 1966	963

(1) Variable 1062 on the Women's tape was constructed by the Center for Human Resource Research, The Ohio State University, using the method of Bowen and Finegan. See The Economics of Labor Force Participation, Bowen and Finegan, Princeton University Press, 1969, pages 772-776. A respondent was assigned the 1960 index of demand for female labor according the SMSA she resided in in 1967.

(2) Used a reported wage where possible, otherwise used an estimated wage rate based on schooling, degree of urbanization of residence, and work experience for whites; schooling, residence, and Duncan socioeconomic index of occupation between leaving school and marriage for blacks. See S. Kim, "Determinants of Labor Force Participation of Married Women 30 to 44 Years of Age," pages 124 and 127, Columbus, Ohio, Center for Human Resource Research, The Ohio State University, 1972.

(3) The Public tape variable numbers for Tables 1 and 2 refer to the Men's data tapes.

(4) The Public tape variable numbers for Tables 3 and 4 refer to the Women's data tapes.

Table	Variable Name	Description of Variable	Source of Variable
5	LFPRW	Percent of married women ages 16-59 who are in the labor force during the census week in 1970, who are living with their husbands	U.S. Census 1970, Table 165
5	LFPW6	Percent of married women ages 16-59 who are in the labor force during the census week in 1970, who are living with their husbands, and have children less than 6 years old living at home	U.S. Census 1970, Table 165
5	LFPWC	Percent of married women 16-59 who are in the labor force during the census week in 1970, who are living with their husbands, and have children between the ages of 6 and 17 only	U.S. Census 1970, Table 165
5	Wage of Men	Median total earnings of men ages 14 and over who worked 50-52 weeks in 1969 (hundreds of dollars)	U.S. Census 1970, Table 195
5	Wage of Women	Median total earnings of women ages 14 and over who worked 50-52 weeks in 1969 (hundreds of dollars)	U.S. Census 1970, Table 195
5	Other income	Median income from nonemployment sources per family in 1969 (hundreds of dollars)	U.S. Census 1970, Table 205
5,7	Unemployment 1970	Percent of the civilian labor force unemployed in each SMSA during the census week in 1970	U.S. Census 1970, Table 85
5,7	Employment change 1968-70	Percent change in employment rate from 1968 to 1970: ((Number employed 1970 - Number employed 1968)/Number employed 1968) * 100	"Number of Employees Mid-March Period," U.S. County Business Patterns, Table 3, published by Bureau of the Census, 1968 and 1970 Volumes, Library of Congress Number 49-45747
5,7	Percent men married, spouse present	Percent of men aged 25 years or older who are married, spouse present in 1970	U.S. Census 1970, Table 152

Table	Variable Name	Description of Variable	Source of Variable
5,7	Percent men 25-54	Percent of males between the ages of 25 and 54 during census week in 1970	U.S. Census 1970, Table 152
5,7	Percent Non-White	Percent of females in each SMSA who are non-white in 1970	U.S. Census 1970, Table 23
5,7	Schooling (Women)	Percent of ~~women over~~ 25 years of age with schooling of more than 12 years in 1970	U.S. Census 1970, Table 83
5,7	Schooling (Men)	Percent of men over 25 years of age with schooling of more than 12 years in 1970	U.S. Census 1970, Table 83
5,7	Children < 6	Percent of married women ages 16-59 who have a child < 6 years old living with them in 1970	U.S. Census 1970, Table 165
5,6,7	Unemployment 1960	Percent of the civilian labor force unemployed in each SMSA during the census week in 1960	U.S. Census 1960, supplied by Professor Orley Ashenfelter, Princeton University
5,6,7	Industry Mix	Index of female industry-mix in 1960 (percentage measure)	_The Economics of Labor Force Participation_, Bowen and Finegan, Princeton University Press, 1969, pages 774-776.
6	Wage (Men)	Median income of all males who worked 50-52 weeks in 1959 (hundreds of dollars)	U.S. Census 1960, supplied by Professor Orley Ashenfelter, Princeton University
6	Wage (Women)	Median income of all females who worked 50-52 weeks in 1959 (hundreds of dollars)	U.S. Census 1960, supplied by Professor Orley Ashenfelter, Princeton University
6	Other Income	Mean income from nonemployment sources of any kind, per recipient in 1959 (hundreds of dollars)	U.S. Census 1960, supplied by Professor Orley Ashenfelter, Princeton University
6	Schooling (Women)	Median number of years of school completed by all females aged 25 and over in 1960	U.S. Census 1960, supplied by Professor Orley Ashenfelter, Princeton University

Table	Variable Name	Description of Variable	Source of Variable
6	Schooling (Men)	Median number of years of school completed by all males aged 25 and over in 1960	U.S. Census 1960, supplied by Professor Orley Ashenfelter, Princeton University
6	Number of Children	Number of children under age 18 per married couple with one or more such children in 1960	U.S. Census 1960, supplied by Professor Orley Ashenfelter, Princeton University
6	Percent Non-White	Percent of all persons in households who were non-white during the census week in 1960	U.S. Census 1960, supplied by Professor Orley Ashenfelter, Princeton University
6	Employment Change 1958-60	Percent change in employment rate 1958 to 1960: ((Number employed 1960 - Number employed 1958)/Number employed 1958)* 100	"Area Labor Market Indicators," <u>Labor Market and Employment Security</u>, 1958 and 1960 volumes, published by U.S. Department of Labor, Bureau of Employment Security
6	Unemployment 1950	Percent of the civilian labor force unemployed in each SMSA during the census week in 1950	U.S. Census 1950, Table 35
6	Labor Force Participation	Percent of married women ages 25 to 54 who are in the labor force during the census week in 1960	U.S. Census 1960, supplied by Professor Orley Ashenfelter, Princeton University
7	Maximum weekly unemployment compensation	Maximum weekly level of unemployment benefits, by state (dollars)	"Status Report on State Unemployment Insurance Laws," Joseph A. Hickey, <u>Monthly Labor Review</u>, January 1971
7	Average weekly earnings of covered workers	Average weekly earnings of workers covered by unemployment compensation, by state, 1970: Weekly unemployment compensation/Ratio of weekly unemployment compensation to weekly wage total (hundreds of dollars)	"Status report on State Unemployment Insurance Laws," Joseph A. Hickey, <u>Monthly Labor Review</u>, January 1971
7	Percent men disabled > 6 months	Percent of men aged 25 to 54 with a disability of longer than 6 months, 1970	U.S. Census 1970, Tables 169 and 24

Table	Variable Name	Description of Variable	Source of Variable
7	Percent women disabled > 6 months	Percent of women aged 25 to 54 with a disability of longer than 6 months, 1970	U.S. Census 1970, Tables 169 and 24
7	Percent men unable to work	Percent of men aged 25 to 54 with a disability of longer than 6 months who are unable to work, 1970	U.S. Census 1970, Tables 169 and 24
7	Percent women unable to work	Percent of women aged 25 to 54 with a disability of longer than 6 months who are unable to work, 1970	U.S. Census 1970, Tables 169 and 24
7	Percent of covered workers	Percent of workers covered by unemployment compensation, 1960-1970: (Total unemployment rate) (Insured unemployment under state, federal employee, and ex-servicemen's programs)/(Total unemployment) (Insured unemployment rates under state, federal employee, and ex-servicemen's programs)	"Manpower Report of the President," Tables D7, D8, D9, D10, pages 274-281, April, 1971

(1) In the 1970 Census data, the table numbers refer to tables in the following 1971 publications of the U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census: General Population Characteristics, General Social and Economic Characteristics of the Population, Detailed Characteristics of the Population. Volumes of these works are given by state. Each volume contains a set of tables in which data are given for each SMSA.