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Turnover in the Labor Force

EVERY MONTH, AN IMPORTANT FRACTION of the population moves from one economic activity to another: Some are laid off and must seek work, or they quit to take new jobs; young people leave school and look for work; workers leave the labor force because of disability or duties at home. The continual process of turnover seems to be the characteristic of the modern American economy that distinguishes it from those of other developed countries, where the experience of individual workers appears to be much more stable over time. Is high turnover inevitable in a postindustrial economy? How do the various demographic groups in the labor force differ with respect to turnover? What is the relation between turnover and unemployment? What are the social benefits and costs of turnover and unemployment? These are some of the critical questions that I address in this paper.

Any modern treatment of turnover and unemployment must distinguish between the role of events outside the control of the individual and the role of his response to his economic environment. Fluctuations in the demand for labor are the most important external source of disturbances in an individual's career, so it is conventional to distinguish between the demand side of the problem and the supply side. Turnover among jobs was the traditional explanation of the frictional unemployment that exists to some extent in every economy, but until recently, it received little discussion. Even ten years ago, economists considered unemployment a simple shortage of

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jobs, without asking how the distribution of the labor force among the jobs changes from month to month.

The federal government's accidental experimentation with a high-pressure economy starting in 1965 brought about two important shifts in the thinking of economists about unemployment. First, it forced a much closer consideration of the role of turnover in the process that generates unemployment. Economists can no longer speak of the employed and the unemployed as if they were distinct groups over time, although this mistake still appears in popular accounts of unemployment. Second, tight labor markets prompted an examination of the role of supply—of the voluntary activities of workers—in creating turnover and its consequent unemployment. Workers can decide to quit, and do so in larger numbers when labor markets are tight. Further, once looking for work, whether because they chose to or were laid off, workers make conscious decisions about what kinds of job to accept. The notion that some component of unemployment is voluntary, in the sense that through different choices workers could lower the unemployment rate, has been advanced occasionally. Obviously, there is heavy political content in the debate about the voluntary character of unemployment. Liberals fighting for low unemployment at the cost of high inflation are reluctant to accept the suggestion that part of the unemployment they hope to reduce results from the choice of the unemployed.

The distinction between the two recent developments in the theory of turnover and unemployment is critical. A student of turnover need not take a position on the importance of voluntary activity in bringing it about, and measurements of turnover do not themselves shed much light on the question of the voluntary character of unemployment. The finding that blacks, women, or teenagers become unemployed more frequently than adult white males tells nothing about the responsibility of unemployed workers in these groups for their own plights. The first part of this paper is devoted to more refined measurement of turnover using data that do not permit separation of the influences of external events (mainly layoffs) from those of the conscious decisions of individuals.

I shall say something about the relative importance of conditions on the supply side and the demand side, however. Most of my evidence is indirect, but it leaves the impression that fluctuations in the demand for labor are a critical aspect of the process of turnover.

The focus of the paper is almost exclusively on turnover among members of the labor force, that is, on the process by which workers leave or lose

jobs and find new jobs. Inadequate data make it difficult to deal with the equally important problem of movements in and out of the labor force.

The Theory of Turnover

A general theory of turnover underlies the whole paper. On the demand side I consider the economy as composed of a large number of employers, most of whom account for only a tiny part of the whole.[1] Employers sell relatively specialized products and so face random fluctuations in demand. Most of the fluctuations are unrelated to changes in the overall rate of economic activity and thus tend to cancel each other statistically when aggregate output or employment is calculated. Employers meet their fluctuating needs for labor through a personnel policy that balances the costs of hiring and firing against the costs of holding excess workers during a period of slack or of paying overtime and using temporary sources of labor during periods of peak demand. An important question is how much training and knowledge will be lost if a worker leaves one firm and takes a job with another.[2] Workers with a good deal of such training—for example, those with positions in a bureaucracy who communicate with many other workers—will be held as overhead labor during a slump when those whose skills can be replaced with little cost will be laid off. Further, the layoff policy of a firm depends on conditions in the labor market in which it hires. The apparent sensitivity of this dependence is one of the surprising findings of this paper. In slack markets, firms have a good chance of recalling workers who are laid off, and, in any case, find it easy to recruit qualified replacements.[3] Thus, everything else held constant, firms should lay off workers more frequently in slack markets.

Workers also face events that are random, at least from the point of view of the observer. They may learn about better jobs or decide to change their

1. By "employer" I mean the productive unit, not necessarily the firm. Large firms producing a variety of products in a number of plants should be considered as a group of separate units for the purposes of the theory.

2. This is what Gary Becker calls "firm-specific" human capital. See his *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education* (Columbia University Press for the National Bureau of Economic Research, 1964), pp. 18–29.

3. This seems to hold even apart from the fact that slack markets may have unemployed workers available at wages below the market wage.

types of work. Again, their decisions to quit will depend on the amount of the loss involved and the cost of finding new work. Everything else held constant, slack markets should discourage quits.

Unemployment is one of the key variables in a theory of turnover because it serves as the main indicator of distress in labor markets. Basic to understanding the relation between turnover and unemployment is the fact that only a fraction of those looking for work ever become unemployed. To be recorded as unemployed, a person must be out of work and looking for work. A worker who quits his present job to take a new one never enters unemployment. The same rate of turnover among jobs, as measured by the sum of quits and layoffs, will correspond to a higher unemployment rate if there is a higher proportion of layoffs. As George Perry has pointed out, the probability that an individual looking for work will become unemployed is a more sensitive indicator of conditions in the labor market than is the probability that a person, once unemployed, will find work in a given time period.[4]

Preview

This paper discusses the results of two empirical studies of turnover. The first covers the entire population of working age and uses data on the number of spells and the number of weeks of unemployment reported by individuals to estimate the probability that an individual with particular characteristics will become unemployed in a given week if not unemployed, or that he will leave unemployment if already unemployed. From these probabilities it is possible to derive the fraction of the year that each individual should expect to be unemployed. The results of this study can be used to break down unemployment rates of demographic and economic groups into components of frequency, measured directly as the probability of becoming unemployed, and duration, measured as the inverse of the probability of leaving unemployment.

The second study covers only men aged 45 and above and is concerned with job changes. It distinguishes voluntary changes, generally quits, from involuntary changes, mainly layoffs. The data are drawn from employment histories, so it is possible to examine the important relation between length of tenure and the probability of leaving the job.

4. "Unemployment Flows in the U.S. Labor Market," *Brookings Papers on Economic Activity* (2:1972), pp. 245–78.

The third part of the paper brings the results of the first study to bear on the issue of the geographical distribution of turnover. Data on turnover from the official data for manufacturing industries are also discussed.

Four main themes appear in the discussion of these studies. First, layoffs are a major source of turnover, especially of job changes that require a spell of unemployment. Further, layoffs are extremely sensitive to conditions in the labor market. This shows up most clearly in the comparison of cities—Chicago, a city with a tight market, consistently has layoff rates that are a small fraction of the national average. In the concluding section, I argue that the sensitivity of layoff rates to the degree of tightness is one of the obstacles to a direct attack on unemployment by expansion of aggregate demand: In an economy with low unemployment and low layoff rates, employers cannot afford to pay real wages that are as high as they could pay during a period of sustained higher unemployment.[5]

Second, turnover is much higher among workers who have taken their current jobs recently. This is shown indirectly in the pattern of declining frequency of unemployment with age revealed in the study covering the entire population. It appears directly in the results of the study of mature men: The probability of both layoffs and quits drops rapidly over the first few years on the job. The process of gathering information is symmetric between employers, who are likely to discharge a worker in the first few months of employment if he proves unsatisfactory, and workers, who are likely to leave a job in the first few months if it proves unsatisfactory. The importance of the employer in this process should not be overlooked.

Third, most of the very large difference between the unemployment rates of blacks and whites is associated with differences in the frequency of unemployment rather than in its duration. This is apparent from the published data on the duration of unemployment for blacks and whites. The contribution of my study is to show that the conclusion is just as strong after extensive adjustment for the personal characteristics of the two groups. Further, my study of mature men makes it possible to compare layoff and quit rates for blacks and whites, a comparison that is not possible with the published data. The results are striking: Blacks have the same likelihood of quitting but are more likely to be laid off.

Finally, the first study sheds some light on the comparison between

5. Here I am comparing one steady state to another. The dynamic operation of the labor market in response to fluctuations in aggregate demand is beyond the scope of the paper.

women and men. The duration of unemployment is somewhat shorter among women than among men, so the difference in their unemployment rates is less than the difference in their turnover rates. I have no results for women comparable with those for mature men, in which layoffs can be distinguished from quits, but I again caution against the conclusion that high turnover is a symptom of greater willingness to become unemployed, or that women have only a marginal attachment to the labor force.

APPROACHES TO THE STUDY OF TURNOVER

Turnover is a probabilistic phenomenon. Random events outside the control of an individual affect his behavior, and his behavior itself may have a random element. Any study of turnover, therefore, requires a theoretical and empirical framework in which the role of probability is explicit. Past work on unemployment and turnover has generally proceeded by isolating one dimension of turnover, defining a variable that measured it, and estimating a regression model relating it to a variety of right-hand variables. For example, my first paper for the Brookings panel presented the results of a regression in which weeks of unemployment was the left-hand variable.[6] George Perry has recently used the weekly probability of remaining unemployed as the left-hand variable.[7] Although I have no fundamental objection to this approach, I believe there may be advantages to dealing more directly with the underlying probabilities in a unified model of turnover, from which results like the average number of weeks of unemployment can be derived.

The basis of my approach is to consider a small set of alternative activities in which an individual might engage. I then estimate the probabilities of moving from one activity to another as functions of the characteristics of the individual and of his environment, and of his history. From these probabilities of movement (and from those of remaining in the same activity) it is possible to calculate the probabilities of being in each activity at a given time, no longer conditional on past activities. Thus the final result of my study of unemployment, for example, is the probability that an individual will be unemployed at a given time.

6. "Why Is the Unemployment Rate So High at Full Employment?" *Brookings Papers on Economic Activity* (3:1970), pp. 369–402.

7. "Unemployment Flows."

Probabilities of Entering and Leaving Unemployment

This section presents the results of an empirical application of the very simplest model of the sort proposed above. Only two activities are considered: not unemployed and unemployed.[8] Because of my particular interest in the geographical pattern of unemployment, the form of the model is strongly circumscribed by the nature of the data available. Much more elaborate and realistic models can be estimated when the data consist of actual employment histories, but at present no longitudinal data with satisfactory geographical coverage are available. A number of large cross-sections, including the 1967 Survey of Economic Opportunity used in this study, report two statistics that by a happy coincidence are suitable for estimating a simple but useful model of turnover—the number of weeks of unemployment and the number of spells of unemployment over the course of a year. The model posits a probability, α, that a worker who is not unemployed in one week will be unemployed the following week, and a second probability, β, that a worker who is unemployed one week will not be unemployed the next week. Then α measures the frequency of unemployment and β is inversely related to the duration of unemployment. Appendix A discusses the method I have used to estimate α and β from the data in the Survey of Economic Opportunity (conducted by the Bureau of the Census in the spring of 1967) on the number of weeks and the number of spells of unemployment in 1966. The method is based on the fact that, except for spells at the beginning and end of the year, the number of spells is both the number of times an individual became unemployed and the number of times he left unemployment. The number of times he could have become unemployed is the number of weeks he was not unemployed, and the number of times he could have left unemployment is the number of weeks of unemployment. Thus, data are available to construct frequencies for each individual that correspond to the underlying probabilities, α and β. To these frequencies I fitted a statistical model of the logit form in which α and β are considered functions of the characteristics of the individual. The

8. Not unemployed includes both employed and out of the labor force. The data do not permit the distinction between becoming unemployed after working and becoming unemployed after an absence from the labor force, though such a distinction would be valuable. Since the second source of unemployment is more important than the first among some groups, excluding those not in the labor force from my estimates is not a satisfactory solution.

logit model is not a linear regression, although it can be thought of as a nonlinear regression. Its precise form is given in Appendix A.

Table 1 presents the probabilities calculated from the statistical results of Appendix A. These probabilities should be interpreted in the follow-

Table 1. Weekly Probabilities of Entering and Leaving Unemployment, and Fraction of the Year Unemployed, for Men with Selected Characteristics, 1966

Percent

Characteristic	*Weekly probability*		*Fraction of the year unemployed*
	Of becoming unemployed	*Of leaving unemployment*	
Color			
Black	0.38	10.2	3.6
White[a]	0.22	13.6	1.6
Wage rate per hour (dollars)			
1.50	0.28	11.0	2.5
2.00	0.24	12.5	1.9
3.00[a]	0.22	13.6	1.6
4.00	0.16	12.3	1.3
Annual family income per adult (dollars)			
2,000	0.21	13.8	1.5
4,000[a]	0.22	13.6	1.6
7,000	0.15	9.8	1.5
10,000	0.27	10.1	2.6
Age (years)			
18	0.22	22.2	1.0
22	0.32	16.5	1.9
30[a]	0.22	13.6	1.6
45	0.16	15.3	1.0
65	0.16	12.6	1.3
Type of worker			
Not reported	0.12	5.5	2.1
Private wage or salary[a]	0.22	13.6	1.6
Government	0.10	12.2	0.8
Self-employed			
Salaried	0.25	29.9	0.8
Not salaried	0.09	16.0	0.6
Marital status			
Married[a]	0.22	13.6	1.6
Not married	0.40	12.0	3.2

Source: Calculated from statistical results of Appendix A below.
a. Values of the characteristic used in calculations for other categories.

ing way: There is a reference group to which the constant in the equation refers (white, preschool children only, living in New York, expected to earn \$3.00 per hour if a man or \$2.00 per hour if a woman, family income of \$4,000 per year per adult, age 30, private wage or salary worker, and married). For each characteristic, the probabilities are calculated for each of its values, holding the other characteristics at their reference values (indicated by note *a* in Tables 1 and 2). Thus the variations in the probabilities for alternative values of one characteristic measure the pure effects of varying that characteristic. The mathematical form of the specification is essentially multiplicative. Thus, for example, the probability that an unmarried 22-year-old man will become unemployed is $(0.32/0.22) \times (0.40/0.22)$ times higher than the probability for the reference group of married 30-year-olds.

Also shown in the tables is the derived fraction of the year unemployed. This is also the fraction of the population that is unemployed in a given week. If it remains the same from one week to the next, it has the following relation to α and β:

$$u = \alpha(1 - u) + (1 - \beta)u;$$

of the fraction $1 - u$ of the population not unemployed last week, α have just become unemployed, and of the fraction u unemployed last week, $1 - \beta$ remain unemployed. This equation can be solved to get

$$u = \frac{\alpha}{\alpha + \beta},$$

which is presented in the third column of Tables 1 and 2.

For men, the results show that most of the very substantial difference between the unemployment rates of blacks and whites is associated with higher frequency rather than longer duration of unemployment.[9] Blacks are 73 percent more likely to become unemployed than whites, and, if unemployed, are 25 percent less likely to leave unemployment each week. Since these results take account of the tendency for blacks to have other characteristics that are associated with high turnover—they have fewer

9. Much the same result is reported by Ralph E. Smith and Charles C. Holt, in "A Job Search-Turnover Analysis of the Black-White Unemployment Ratio," in Gerald G. Somers (ed.), *Proceedings of the Twenty-third Annual Winter Meeting, 1970*, Industrial Relations Research Association Series (IRRA, 1971), pp. 76–86. Their analysis of the published data on the duration of unemployment does not consider dependence of the frequency and duration of unemployment on detailed individual characteristics, as my method does.

skills, are somewhat younger, and are less likely to be married—they show rather strikingly the magnitude of the problem they encounter in the labor market. Blacks have somewhat more trouble than whites in finding jobs, and a great deal of difficulty in keeping them. Discrimination seems to take the form of restricting blacks to unstable jobs while whites are able to find permanent and high-paying jobs. I have discussed this phenomenon at length in my two previous contributions to *Brookings Papers*, and regard these results as confirming my earlier view with more direct evidence. Moreover, evidence from my study of mature men, discussed in the next section, sheds light on the ambiguity about where the responsibility for turnover lies—with the worker or the employer—that my earlier work left unresolved.[10] The results from the current study tend to support the view that it is the instability of the jobs open to blacks much more than the instability of the blacks that is the heart of the problem.

Workers with few skills (those expected to earn $1.50 per hour) and those with average skills ($3.00 per hour) have smaller frequency and duration differentials than is the case with race: Unskilled men are 27 percent more likely to become unemployed and 19 percent less likely each week to leave unemployment.

The results for teenagers are inconsistent with the official unemployment rates. They suggest that teenagers are about as likely to become unemployed each week of the year as 30-year-olds, and 63 percent more likely to leave unemployment in each week of unemployment. Together these imply that 18-year-olds who have all the reference characteristics except for age spend only 1 percent of the year, about three days, unemployed. Even after taking account of the fact that teenagers do not generally have the reference values of other characteristics—they earn less than $3.00 per hour and are less likely to be married—the fraction of the year unemployed is less than that suggested by the official data.[11] The results for other age

10. Two years ago I wrote, "Some groups exhibit what seems to be pathological instability in holding jobs. Changing from one low-paying, unpleasant job to another, often several times a year, is the typical pattern of some workers." ("Why Is the Unemployment Rate So High?" p. 389.) Many other writers have made similar statements.

11. The fraction of the year unemployed is the product of the unemployment rate and the fraction of the year in the labor force. The official unemployment rate for white males aged 18 and 19 in 1966 was 8.9 percent and the average participation rate over the year was 65.4 percent, suggesting that they spend 5.82 percent of the year unemployed. Both the SEO and the Current Population Survey of the U.S. Bureau of the Census obtain data from a single respondent in the household, rarely a teenager and probably frequently a person who is not very familiar with the teenager's activities.

groups do not seem to disagree with the official data as seriously. Twenty-two-year-old men are 45 percent more likely than 30-year-olds to become unemployed and 21 percent more likely to leave unemployment each week. Forty-five-year-olds are 27 percent less likely than 30-year-olds to become unemployed and 12 percent more likely to leave unemployment. It seems clear that adults over the age of 30 are able to find significantly more stable employment than are young adults. The magnitude of the differences seems consistent, however, with the view that they arise from experimentation by employers with young workers, in which they find likely candidates for permanent employment, and similar experimentation among young workers trying out alternative jobs. The latter process, often called job shopping, receives more attention in most discussions of turnover among young adults, but I suspect the role of employers is just as important.

Taken together, the results for men seem to confirm the view that differences in turnover, as measured by the frequency of unemployment, are if anything more important than differences in duration as a symptom of the adverse experience of some groups in the labor force. At this point I should emphasize that high turnover is not necessarily evidence that unemployment is somehow voluntary and therefore not burdensome to those experiencing it. In fact, my results suggest that the frequency of unemployment may be somewhat lower for individuals with higher incomes, while a theory of voluntary turnover presumably would suggest that frequency would rise with income. On the other hand, the results do offer a little support for the view that individuals who are better off take longer to find work once they are unemployed.

Interpretation of the results for women is somewhat more difficult because they have lower and more variable rates of participation in the labor force. To overcome this problem, I have chosen private wage and salary workers as the reference type of worker because they have high participation rates. The type refers to the job held longest during 1966 and among women most of the responses of "not reported" come from those who did not work at all during the year. Even so, the variation in participation rates for alternative values of a given characteristic should be kept in mind in interpreting the probabilities of becoming unemployed and the fraction of the year unemployed shown in Table 2 (the latter is the product of the participation rate and the unemployment rate).

Comparison of Tables 1 and 2 suggests that women who are not definitely out of the labor force have substantially higher frequencies of unemploy-

Table 2. Weekly Probabilities of Entering and Leaving Unemployment, and Fraction of the Year Unemployed, for Women with Selected Characteristics, 1966

Percent

Characteristic	*Weekly probability*		*Fraction of the year unemployed*
	Of becoming unemployed	*Of leaving unemployment*	
Color			
Black	0.68	10.6	6.0
White[a]	0.32	15.1	2.1
Wage rate per hour (dollars)			
1.50	0.27	17.5	1.5
2.00[a]	0.32	15.1	2.1
3.00	0.20	34.5	0.6
4.00	0.12	9.5	1.2
Annual family income per adult (dollars)			
2,000	0.40	15.1	2.6
4,000[a]	0.32	15.1	2.1
7,000	0.29	10.3	2.7
10,000	0.04	6.8	0.6
Age (years)			
18	0.41	21.5	1.9
22	0.53	15.6	3.3
30[a]	0.32	15.1	2.1
45	0.24	14.3	1.7
65	0.21	12.8	1.6
Type of worker			
Not reported	0.09	20.6	0.4
Private wage or salary[a]	0.32	15.1	2.1
Government	0.15	14.1	1.1
Self-employed			
Salaried	1.15	13.8	7.7
Not salaried	0.20	18.1	1.1
Marital status			
Married[a]	0.32	15.1	2.1
Not married	0.40	14.3	2.7

Source: Calculated from statistical results of Appendix A below.
a. Values of the characteristic used in calculations for other categories.

ment than do men in practically every category.[12] Black women have more than twice the frequency of white women in the reference group, close to twice that of comparable black men, and more than three times that of white men. White women are more than 30 percent more likely than comparable white men earning the same wage to become unemployed (0.32 percent against 0.24 percent). The data do not permit the division of unemployment among women between that associated with movements into the labor force after prolonged absence and that arising from interruptions of more or less continuous periods in the labor force.[13]

The duration of unemployment seems to be slightly less among women than among comparable men: Unemployed black women have a probability of 10.6 percent of leaving unemployment against 9.4 percent for black men, while white women have a probability of 15.1 percent against 12.5 percent for white men, again adjusting the figures for men to the $2.00 reference wage. It is dangerous to infer from these figures that women find jobs as quickly as men, since women are probably more likely than men to terminate unemployment by leaving the labor force.[14]

Since the duration of unemployment is less for women than for men, the difference in their unemployment rates understates the difference in their frequencies of unemployment. The instability of employment of women, especially black women, is a problem of the first magnitude. I suspect that a large part of the problem arises, as it does with black men, from the instability of the jobs available to women and not from the instability of the women themselves.[15]

The influence of other characteristics on frequency and duration seems

12. The comparison requires some care. The reference wage for men is $3.00 per hour while that for women is $2.00 per hour. Table 1 would be only slightly different if a reference wage of $2.00 were used, but Table 2 would be quite different if the reference wage were $3.00.

13. Only the longitudinal data just becoming available can answer this question (see note 16). The Current Population Survey tabulates unemployment by cause (quit, layoff, new entrant, and reentrant) but provides no information on the previous activity of reentrants.

14. George Perry presents evidence on this point in "Unemployment Flows."

15. Part of this is associated with the crowding of women into occupations with high turnover. Occupation is not included in the equation because it is not a personal characteristic nor a good indicator of the markets that an individual can participate in. Its inclusion would give rise to a set of occupational effects that would partially obscure the differences between men and women without being explicable themselves.

to be about the same for women as for men. Frequency declines with increasing wage rates while duration increases (except for the figure for $3.00 per hour, which seems to be a statistical fluke). Higher income exerts more downward pressure on the probability of becoming unemployed for women than for men, probably mainly because of the negative relation between income and labor force participation for women. The pattern of decreasing frequency and increasing duration of unemployment with age is similar to that found for men. Unmarried women are somewhat more likely to become unemployed than married women, but the effect of marital status is so much less than in the case of men that unmarried women and unmarried men have almost the same probability of becoming unemployed.

JOB CHANGES AMONG MATURE MEN

As a group, mature men exhibit substantial employment stability. This is apparent in the results on the frequency of unemployment presented earlier: White males aged 45 have a weekly probability of entering unemployment of only 0.16 percent, or about 8 percent per year. Here I will report briefly on a study of annual job changes among mature men. The data for this study were taken from the 1966–67 National Longitudinal Surveys, directed by Herbert Parnes.[16] The data give the status of about 5,000 men in 1966 and again in 1967, together with partial employment histories for each. My study is based on changes in jobs between adjacent years from 1962 to 1967. Using methods similar to those discussed in Appendix A, I have estimated the probabilities that an employed worker will leave a job involuntarily, because of a layoff, or voluntarily, by quitting. These probabilities are functions of personal characteristics—race, years of education, and age—and dummy variables for the years. In addition, time on the present job is a determinant.[17]

16. National Longitudinal Surveys—The Survey of Work Experience of Men 45–59 Years of Age, sponsored by the Manpower Administration of the U.S. Department of Labor, and conducted by the U.S. Bureau of the Census. Tabulations from the data appear in U.S. Department of Labor, Manpower Administration, *The Pre-Retirement Years*, Manpower Research Monograph 15, Vol. 1 (1970) and Vol. 2 (1970). The raw data were obtained from the Bureau of the Census.

17. In this respect the model is a substantial improvement over the one applied to the data on unemployment in the SEO. The improvement is made possible by the fact that the Parnes data give actual job histories and not just summary data. The reader should also note that my study of mature men focuses on the probability of changing jobs rather than on the probability of becoming unemployed.

Table 3. Annual Probabilities of Males 45–59 Years of Age Taking New Jobs, by Reason, 1962–67 Experience

Percent

Characteristic	*Annual probability for employed worker*		
	Of taking new job next year, by reason		
	Layoff	*Quit*	*Of remaining at same job*
Color			
White[a]	1.2	2.6	96.2
Black	1.4	2.6	96.0
Years on job			
0	5.0	15.2	79.9
1	1.9	6.1	92.0
3	1.0	3.6	95.4
6[a]	1.2	2.6	96.2
15	0.6	1.1	98.3
40	0.2	0.7	99.1

Source: Author's estimates derived from the National Longitudinal Surveys—The Survey of Work Experience of Men 45–59 Years of Age, sponsored by the Manpower Administration of the U.S. Department of Labor, and conducted by the U.S. Bureau of the Census. Data used here are based on changes in jobs in adjacent years between 1962 and 1967.

a. Values of the characteristic used in calculations for other categories.

The results are summarized in Table 3. Certain biases inherent in the data deserve mention. First, turnover is understated because the method of collecting the partial employment histories causes workers with high turnover to contribute fewer years of data to the study. I attempted to minimize this effect by using only a few recent years, discarding a great many observations for earlier years from more stable workers. Turnover is further understated by the use of an annual interval between observations. A worker who changes jobs more than once in a year is counted only once in this study. Third, the probability of layoff is understated because only those layoffs that resulted in a job change are counted; those terminated by recall are ignored, even though they result in unemployment.[18] Subject to these qualifications, the results show that a white male, 50 years old, with a college education and six years on the job had a probability of 1.2 percent of being forced to change jobs because of a layoff in 1965. The probability of his quitting, at 2.6 percent, was more than twice as high. A comparable black was slightly more likely to be laid off (1.4 percent) and no more likely

18. Laid-off workers are counted as unemployed in the official data even if they are confident of early recall.

than a white to quit. Among mature men, turnover is only slightly higher for blacks than for whites, and the difference is in layoffs, not quits. There is no evidence here of greater voluntary instability among blacks.

The probabilities of both layoffs and quits are much higher early in a worker's tenure on the job. In the first few months a worker in the reference group faces a probability of 5 percent per year (or about 0.4 percent per month) of losing his job. Layoff here includes any involuntary separation including discharge. It is clear that employers gather information rapidly in the early months of employing a worker, and are much more likely to send him away at that time than after he has accumulated knowledge and training. Institutions operating both through collective bargaining and outside it protect the individual's and the firm's investment in firm-specific human capital by requiring that the least experienced workers be laid off first.[19] The probability of quitting declines even more rapidly with tenure. Individuals are most likely to leave a job when they have found out exactly what it involves but have not made a substantial personal investment whose future returns would be sacrificed by quitting.

Turnover in Twelve Large Cities

Up to now I have focused on the determinants of individual turnover, taking the economic environment as given. In this section I will reexamine my earlier results in terms of the theory of economic equilibrium. The aim is to say something about the way the economic environment is shaped by the collective actions of large numbers of workers and employers. I have chosen to look at the geographical dimension of turnover, simply because that dimension is identified explicitly in the data. The reader will recognize similarities between my discussion of differences among cities and George Perry's discussion of differences over time.[20]

A fair amount of agreement seems to exist about the ingredients of a

19. Inverse seniority provisions that allow the most senior workers to be laid off first are a special form of vacation (with a highly favorable tax treatment) and do not involve permanent separation of the worker from the employer. Martin Feldstein has recently called attention to the importance of unemployment compensation and provisions of collective bargaining agreements in this connection. See his "Lowering the Permanent Rate of Unemployment," A Preliminary Report Prepared for the Joint Economic Committee of the U.S. Congress (no date; processed).

20. "Unemployment Flows."

theory of geographical differences among labor markets. Following is a list of general considerations that most economists would find important:

1. Workers can migrate from one city to another. Their propensity to do so depends on relative wages, relative stability of jobs, and the relative costs of finding jobs.

2. Employers can migrate as well. Their location decisions depend on relative wages, relative stability of workers, and relative costs of recruiting workers.

3. Wages rise faster in cities with tight labor markets than in those with loose ones. Unemployed workers demand high wages when they become unemployed and lower their aspirations as their periods of unemployment continue.

4. Random shifts in the demand for goods produced in each city occur continually. Thus at any point in time, the pattern of differences among cities will not necessarily represent an equilibrium of the slow-working process of migration and wage adjustment.

5. Cities differ in their attractiveness to workers and employers. In equilibrium, wages would embody "equalizing differences" to account for these differences.

The theories proposed by various economists differ mainly in the importance assigned to these considerations, which in turn varies partly according to the contexts in which geographical differences in labor markets have been examined. John Harris and Michael Todaro, in studying urban and rural labor markets in Africa, took wage differentials and the location of employers as given and examined the equilibrium rates of unemployment that arise when migration of workers equates the rural and urban wages, where the latter are adjusted for the expected cost of finding work.[21] They concluded that if urban wages are held higher than rural wages by governmental or other forces, workers will migrate to the cities until the urban unemployment rate times the urban wage is equal to the wage differential. In a recent unpublished paper, Joseph Stiglitz has extended their model to consider the relation between the wages and productivity of workers and their rate of turnover.[22] He argues that wage

21. John R. Harris and Michael P. Todaro, "Migration, Unemployment and Development: A Two-Sector Analysis," *American Economic Review*, Vol. 60 (March 1970), pp. 126–42.

22. "Alternative Theories of Wage Determination and Unemployment in L.D.C.'s: I. The Labor Turnover Model," Discussion Paper No. 335 (Cowles Foundation for Research in Economics at Yale University, 1972; processed).

differentials can be explained by the low turnover of urban workers, which in turn is explained by high urban wages and unemployment rates.

Within the context of the theory of inflation, Lipsey, Archibald, and Tobin have emphasized random shifts in demand across geographical areas.[23] Although workers and employers respond to these shifts through migration and relocation, they do so with a lag so that the markets are in "perpetual disequilibrium," in Tobin's words.[24]

In my earlier paper, "Why Is the Unemployment Rate So High at Full Employment?" I studied the unemployment rates in twelve large cities of the United States in 1966. I concluded that relatively little of the substantial differences in their unemployment rates could be explained by recent random changes in demand, because the pattern across cities is so stable over time. The accumulation of data for two more years has not changed this conclusion. I also noted a positive correlation between wage rates and unemployment rates in the cities, and offered the conjecture that a process somewhat like that later proposed by Stiglitz was at work: High wages could be paid in cities with high unemployment rates precisely because the high rates discourage quits, and a work force with a low quit rate is more productive. According to this conjecture, an equilibrium could exist with very different unemployment rates among cities in which no incentive existed for either workers or employers to migrate. I think it is worth elaborating on this conjecture by developing an explicit theory along the lines it suggests. I have done so in Appendix B and have summarized the results for a single city in Figure 1. Workers are in equilibrium when the wage in this city, w, adjusted by the unemployment rate, u, is equal to the adjusted wage elsewhere:

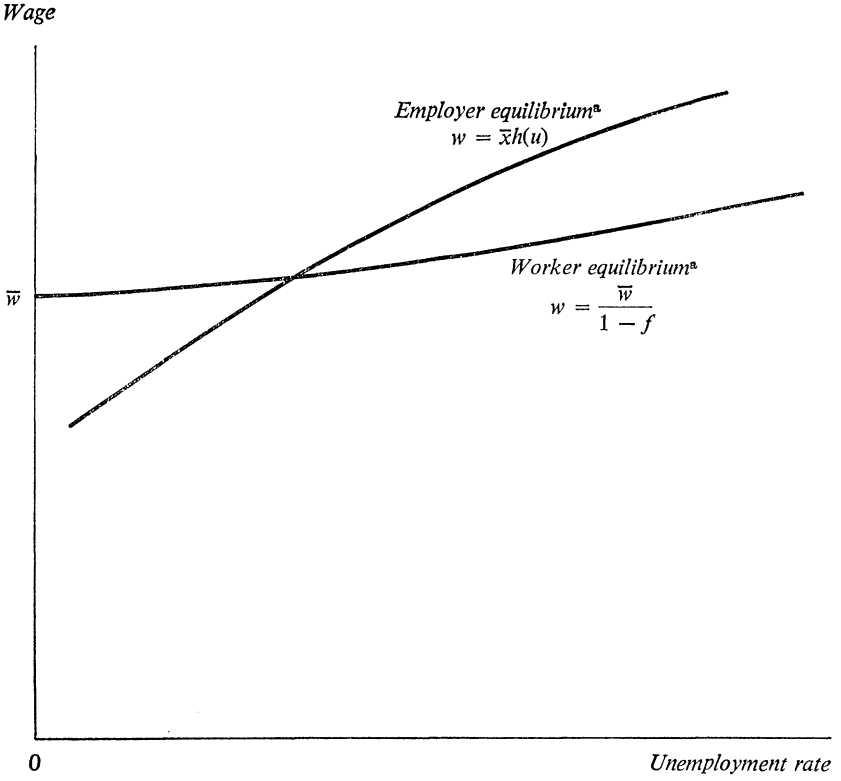
$$(1 - u)w = \bar{w}, \text{ or } w = \frac{\bar{w}}{1 - u}.$$

Employers are in equilibrium when the wage they pay is matched by the productivity of workers in this market, $\bar{x}h(u)$. The dependence of productivity on the unemployment rate is deduced from a more elaborate con-

23. Richard G. Lipsey, "The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1862–1957: A Further Analysis," *Economica*, New Series, Vol. 27 (February 1960), pp. 1–31; G. C. Archibald, "The Structure of Excess Demand for Labor," in Edmund S. Phelps and others, *Microeconomic Foundations of Employment and Inflation Theory* (Norton, 1970), pp. 212–23; James Tobin, "Inflation and Unemployment," Presidential Address before the American Economic Association, *American Economic Review*, Vol. 62 (March 1972), pp. 1–18.

24. *Ibid.*, p. 10.

Figure 1. Equilibrium Wage and Unemployment Rate for a Single City



Source: Summarized from results of Appendix B below.
a. w = wage in this city; $\bar{w}$ = adjusted wage elsewhere; u = unemployment rate; $\bar{x}h(u)$ = productivity of workers in this city.

sideration of the behavior of workers and employers as they respond to unemployment and vacancy rates.[25] The equilibrium in Figure 1 occurs at the intersection of the two schedules at a wage and unemployment rate that puts workers and employers simultaneously in equilibrium.

25. My use of the term "productivity" is unconventional. The high productivity of workers in cities with high unemployment arises not because they work more effectively when at work but rather because a larger fraction of those employed are at work producing output at any given time. Fewer are working in the personnel and training departments and fewer are idle overhead workers if the market is slack. The reader should note the contrast with cyclical changes in demand, where tight markets are associated with high productivity.

So far I have summarized a theory of the equilibrium in a single city, holding conditions elsewhere fixed. The theory applies just as well to comparisons among cities: In equilibrium, all cities must have the same effective wage rate and the same effective cost of labor. The discussion up to now has shown that in each market there is probably only a single combination of unemployment rate and wage that is compatible with equilibrium (assuming only a single intersection in Figure 1). Thus the theory implies that when all cities are in equilibrium, they will all have the same wages and unemployment rates.

The starting point for this analysis was the discovery that there are substantial differences in unemployment rates among cities, and that these differences were stable over time and therefore probably characteristic of equilibrium. A theory that implies equality among cities seems wide of the mark. However, a simple and realistic extension of the theory seems capable of explaining what is observed. Cities are not, in fact, identical, and the theory turns out to predict that small differences in the underlying determinants of unemployment can be magnified into large differences in unemployment itself. The reason is apparent in Figure 1. Since both schedules slope in the same direction, a small upward or downward shift in one of them will cause a large horizontal shift in the location of their intersection. In the theory presented in Appendix B I treat differences in the attractiveness of cities to workers and employers as random variables and apply the econometric theory of simultaneous equations to study the expected relation between wages and unemployment that the theory implies. The theory suggests that unless there is a sharply negative correlation between the attractiveness of cities and the advantages of producing in them apart from conditions in their labor markets, the observed set of wage-unemployment combinations should be scattered around a line that lies between the two schedules in Figure 1.

It is not unreasonable to interpret the theory as supporting the view that in equilibrium some cities will have high unemployment and high wages and others low unemployment and low wages. This interpretation implies the following about other conditions in the markets: First, vacancies will probably be lower in high-wage cities, although the theory will tolerate a weak positive relation between unemployment and vacancies. Second, the rate of job finding will be lower in high-wage cities, as unemployed workers must compete with more of their colleagues for fewer vacancies. Third, the

rate of job filling will be higher, for the same reason—fewer competing employers and more candidates for jobs. Fourth, the quit rate will be lower because of the greater cost of finding new jobs. Finally, the layoff rate will be higher, since employers can replace workers easily after a temporary decline in demand and therefore will hold relatively little overhead labor. Only the last of these represents any departure from traditional views of the differences between slack and tight labor markets. My main point here has been to propose an explanation for the persistence over time in the geographical distribution of slackness.

The data available on turnover by cities differ from the concepts that would be ideal according to the theory. I have estimated two basic probabilities: α, the probability that a worker will become unemployed, and β, the probability that an unemployed worker will find work. These are related to, but are by no means the same as, the sum of the quit rate and the layoff rate, on the one hand, and the rate of job finding, b, on the other. In the theory, b is the fraction of those people looking for work in a period who find it. It is substantially larger than the fraction of the unemployed who find work because many of those looking never become unemployed.[26] In the SEO, a worker who quits or is laid off and immediately takes another job does not report a spell of unemployment. As Perry suggests, a reasonable model relating b and β is the following:

$$b = s + (1 - s)\beta,$$

where s is the probability of not becoming unemployed when changing jobs. The fractions s, β, and b all vary together: In tighter labor markets there is a higher probability of finding work immediately, and, failing that, a higher probability of finding work in each week of looking. The response of the unmeasured s, however, means that β is a fairly insensitive index of the rate of job finding. The pattern that β traces across cities partially conceals a more diverse b pattern.

If the flow of job seekers arises from quits, q, and layoffs, y, only, the same model suggests the following relation between separations, $q + y$, and the probability of becoming unemployed, α:

$$\alpha = (1 - s)(q + y).$$

26. George Perry discusses the same issue in "Unemployment Flows," and comes to much the same conclusion.

High-wage, high-unemployment cities have low quit rates, high layoff rates, and low probabilities of finding jobs if separated. As a result, they have high probabilities of unemployment, even though their separation rates may be no different from those of cities with tight markets. This is one key point in reconciling the finding that high-wage cities have high turnover in the sense of frequent unemployment with the theory that high wages are justified in the eyes of employers by the low turnover of the labor force.

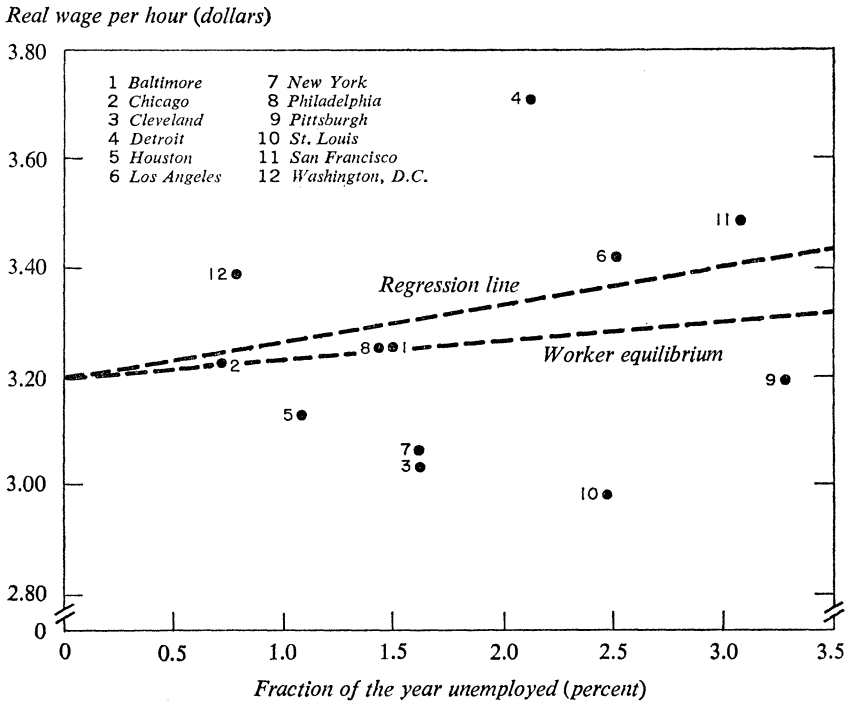
In an economy where the traditional pattern of specialization within the family still predominates, the theory outlined above applies mainly to men. For this reason I will discuss the empirical results for men only, although as symmetry between men and women becomes the rule, the theory will become applicable to women as well. Substantial changes in this direction have taken place even since the collection of the data used in this study.

A Tale of Twelve Cities

Figure 2 shows the relation between the unemployment rates estimated from the probabilities of entering and leaving unemployment and the real wage rate in the twelve cities identified in the SEO. The real wage rates in the cities were estimated in the following way: A regression was estimated in which the left-hand variable was the log of the hourly wage and the right-hand variables measured the age, education, race, health, and union membership of the individual. In addition, dummy variables for the twelve cities were included. Nominal wages by city were estimated as the antilogs of the coefficients of the city dummies, multiplied by the base wage for New York. The resulting wage rates are fully adjusted for observed differences in the compositions of the labor forces of the cities. They were then adjusted for differences in their price levels, but the data used for this adjustment are inadequate. The official index of prices by city, which is used to deflate the wages shown in Figure 2, attempts to measure the cost of attaining a specified standard of living in each city, and so is conceptually superior to a simple fixed-weight index; but it thereby embodies many arbitrary judgments about how the weights should vary among cities.[27]

27. Taken from U.S. Bureau of Labor Statistics, *Three Standards of Living for an Urban Family of Four Persons, Spring 1967*, Bulletin 1570-5 (1969).

Figure 2. Real Wage Rates and Unemployment Rates in Twelve Large Cities, 1966



Source: Derived by author from regressions described in accompanying text. The basic city data are from the Survey of Economic Opportunity conducted by the Bureau of the Census, Spring 1967.

A good deal of dispersion appears in Figure 2. In addition to that arising from the unmeasured differences among cities discussed earlier, dispersion is introduced by the techniques of measurement used in this study. There are statistical errors in the estimates of the unemployment rate whose magnitudes are indicated by the standard errors of the city effects in Table A-1, and similar errors in the estimates of the nominal wages. The process of deflation introduces further errors of unknown magnitude. Nonetheless, the data do suggest a positive relation between the unemployment and wage rates. A regression is a natural way to show this, and also makes it possible to incorporate information about the reliability of the wage data through the use of weighted least squares. The regression of the real wage

rate on the derived unemployment rate, weighted by the inverses of the standard errors of the wage estimates,[28] is:

$$w = \underset{(0.14)}{\$3.20} + \underset{(0.071)}{0.068u}.$$

(The numbers in parentheses here and in the following equations are standard errors.) That is, the real wage rate in cities with, say, 2 percent unemployment is about 7 cents higher per hour than that in cities with 1 percent unemployment. The regression is shown as the top line in Figure 2. Also shown there is the condition for worker equilibrium,

$$w = \frac{\bar{w}}{1 - u},$$

with $\bar{w}$ set equal to the constant in the regression, \$3.20. It is important to note that the regression line is steeper than is the schedule of worker equilibrium. I have argued earlier that the regression line lies between the two schedules in Figure 1, so this finding suggests that the relation between wages and unemployment induced by the reaction of productivity to conditions in the market is the more steeply sloped of the two equilibrium conditions.

The statistical reliability of this conclusion arouses understandable concern. The size of the standard error of the slope coefficient suggests that an estimate of 0.068 or greater would be obtained with a probability of about 15 percent even if the true slope were zero. Some other results may reduce this concern. First, the official unemployment rate may be a more satisfactory right-hand variable in this regression than is the derived rate, simply because the official rate is estimated from a much larger body of data. The weighted regression of my estimated real wage rate on the official unemployment rate (reported below in Table 4) is

$$w = \underset{(0.24)}{\$2.97} + \underset{(0.072)}{0.107u};$$

the slope is significantly greater than zero at better than the 10 percent confidence level.

28. The logic of the weighting is the following: Sampling errors in the wage estimates are larger for smaller cities, so these cities should receive smaller weights. The statistical theory of weighted least squares suggests that the weights should be inversely proportional to the standard errors of the disturbances. The inverses of the standard errors of the coefficients of the city dummies in the wage equation provide the appropriate weights if sampling errors account for most of the disturbances in the wage-unemployment regression.

Second, the errors in the price index may introduce more dispersion than is justified by the theoretical improvement of deflation. A simple model of price differences among cities would have untraded goods whose prices were essentially proportional to local wages, and traded goods whose prices were the same nationwide. In this case the prices and wages would be roughly proportional, but wages would vary more than prices. The nominal wage would substitute well for the real wage except for overstating its sensitivity to the unemployment rate. Following this logic, I present the weighted regression of the nominal wage on the derived unemployment rate:

$$w = \underset{(0.18)}{\$3.13} + \underset{(0.092)}{0.111}u.$$

As predicted, the slope is greater than in the first regression. The data and the regression line appear in Figure 3. Finally, the most robust relation of all is between the nominal wage and the official unemployment rate:

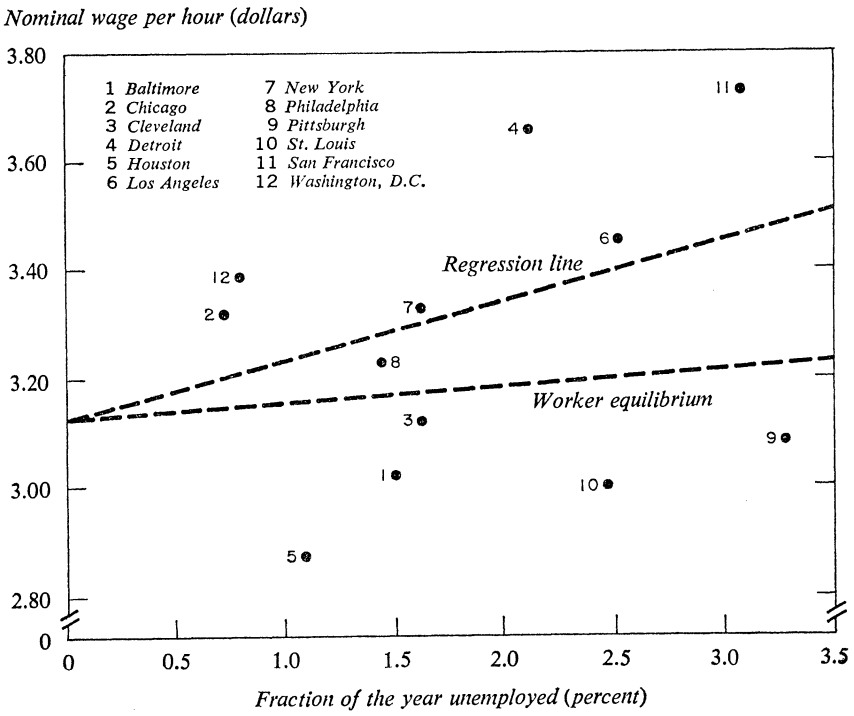
$$w = \underset{(0.29)}{\$2.73} + \underset{(0.088)}{0.181}u.$$

Taken together, these results give reasonable support to the basic prediction of the theory that wages and unemployment rates are positively related in a cross-section of cities.[29] Further, at a somewhat lower level of statistical confidence, they support the view that the productivity of workers is more sensitive to the unemployment rate than is the schedule of worker equilibrium.

Table 4 summarizes other information available about conditions in the twelve cities. In addition to the probabilities of entering and leaving unemployment estimated from the SEO and the derived estimate of the fraction of the year the average worker spends unemployed, the table reports the layoff and quit rates for manufacturing industries, gathered from employers by the Bureau of Labor Statistics, and the unemployment rate as estimated by the state employment departments. Unlike my results, the layoff, quit, and official unemployment rates are not adjusted for differences in the composition of the labor forces of the various cities. Still, all

29. I have experimented with a specification that permitted α and β to vary for recent migrants. Although the estimates showed the expected relationship, the city effects were changed hardly at all.

Figure 3. Nominal Wages and Unemployment Rates in Twelve Large Cities, 1966



Source: Same as Figure 2.

of the data seem to conform fairly well to the theory of geographical differences in labor markets outlined above. Some cities have tight markets, notably Chicago, Houston, and Washington, D.C. They have low probabilities of unemployment, low layoff rates, high probabilities of leaving unemployment, and low derived and official unemployment rates. Further, Chicago has much the highest quit rate of any city. On the other hand, some cities have slack markets—Detroit, Los Angeles, Pittsburgh, St. Louis, and San Francisco. They have high probabilities of becoming unemployed, high layoff rates (except for Pittsburgh and St. Louis), low quit rates (except for Los Angeles and possibly San Francisco), low rates of leaving unemployment, and high derived and official unemployment rates.

Table 4. Selected Data on Conditions in the Labor Markets of Twelve Large Cities, 1966

Percent

City[a]	Probability of becoming unemployed (1)	Manufacturing: Layoff rate (2)	Manufacturing: Quit rate (3)	Probability of leaving unemployment (4)	Derived fraction of year unemployed (5)	Official unemployment rate (6)	Real wage (7)	Nominal wage (8)
Washington, D.C.	0.15	0.05	0.48	18.7	0.8	2.4	$3.39	$3.39
Houston	0.20	0.09	0.53	18.1	1.1	2.4	3.13	2.87
Chicago	0.15	0.12	0.74	20.9	0.7	2.6	3.22	3.32
Cleveland	0.22	0.18	0.46	13.8	1.6	2.6	3.03	3.12
Baltimore	0.23	0.30	0.42	15.6	1.5	2.9	3.25	3.02
Pittsburgh	0.41	0.18	0.21	12.4	3.3	3.0	3.19	3.08
Philadelphia	0.21	0.21	0.39	14.9	1.4	3.3	3.25	3.23
Detroit	0.32	0.42	0.42	14.9	2.1	3.3	3.71	3.65
St. Louis	0.30	0.18	0.46	12.2	2.5	3.3	2.98	3.00
New York	0.22	0.53	0.42	13.6	1.6	4.2	3.06	3.33
San Francisco	0.38	0.51	0.51	12.4	3.1	4.4	3.48	3.73
Los Angeles	0.32	0.30	0.65	12.6	2.5	4.5	3.42	3.45

Sources: Columns (1), (4), (5)—Calculated from Table A-1; columns (2), (3)—*Employment and Earnings*, Vol. 15 (May 1969), Table 3, pp. 136–38, divided by 4.33 to adjust to weekly rates, except San Francisco, which is based on monthly data from various 1966 issues of *Employment and Earnings*; column (6)—*Manpower Report of the President*, 1970, Table D-8, pp. 284–86; columns (7) and (8)—same as Figure 2.

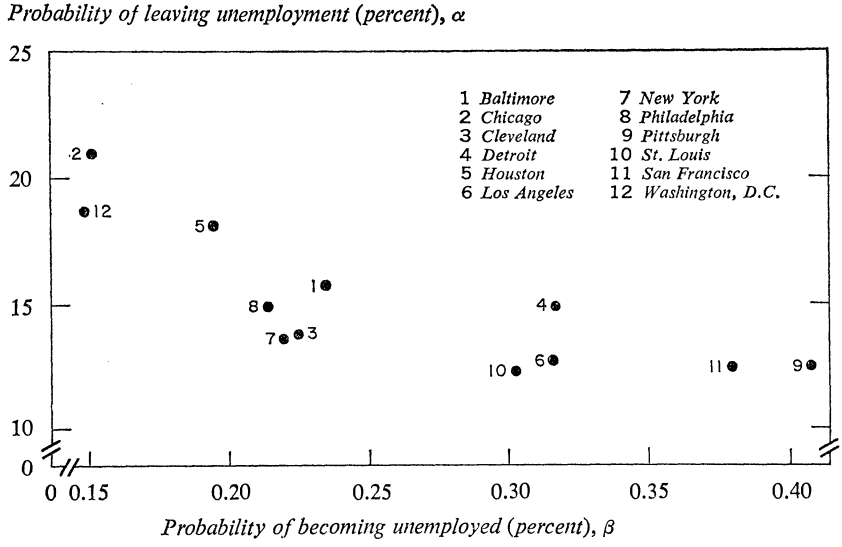
a. Data in general are for standard metropolitan statistical areas, identified by the largest cities therein, but there is some variation in the areas covered by the various sources cited.

Only in Pittsburgh is there a substantial discrepancy between my results and the published data; it has the highest frequency of unemployment in my study and yet a low layoff rate and fairly low official unemployment rate. It is the only city where the derived unemployment rate, standardized for adult white males, exceeds the official rate, which is an unadjusted average for all demographic groups. All of the measures of conditions in labor markets in Table 4 show substantial variation. The least variable, the probability of leaving unemployment, is lowest in St. Louis at 12.2 percent and highest in Chicago at 20.9 percent, a difference of 71 percent. The official unemployment rate almost doubles over the range, from 2.4 percent in Houston and Washington, D.C., to 4.5 percent in Los Angeles. My derived unemployment rate shows much wider variation—by a factor of more than 4—from 0.7 percent in Chicago to 3.1 percent in San Francisco and 3.3 percent in Pittsburgh. The estimated probability of becoming unemployed varies from 0.15 percent in Chicago and Washington, D.C., to 0.38 percent in San Francisco and 0.41 percent in Pittsburgh, a ratio over the range of close to 3. The layoff rate in manufacturing seems to

be in rough agreement with the probability of becoming unemployed (except for Pittsburgh), but the layoff rate has much more variation, from 0.05 percent in Washington, D.C., and 0.09 percent in Houston to 0.51 percent in San Francisco and 0.53 percent in New York, a ratio of high to low of more than 10. The average level of the layoff rate is about the same as the probability of unemployment, while the quit rate is considerably higher. Since two other major sources of unemployment—entrance and reentrance to the labor force—are omitted from the table, it is apparent that in a boom year like 1966 only a small fraction of those looking for work ever become unemployed.

The relationship between the probability of becoming unemployed and the probability of leaving unemployment is surprisingly close, as shown in Figure 4. Cities with tight markets appear in the upper left. Workers in those cities have low probabilities of becoming unemployed, because layoffs are infrequent and changing jobs without becoming unemployed is

Figure 4. Weekly Probabilities of Entering and Leaving Unemployment, Twelve Large Cities, 1966



Source: Table 4.

Table 5. Weekly Layoff Rate in Manufacturing in Twelve Large Cities, 1962, 1966, and 1970

Percent

City	Year		
	1962	*1966*	*1970*
Baltimore	0.48	0.30	0.37
Chicago	n.a.	0.12	0.25
Cleveland	n.a.	0.18	0.39
Detroit	n.a.	0.42	0.67
Houston	n.a.	0.09	0.09
Los Angeles	0.39	0.30	n.a.
New York	0.67	0.53	0.69
Philadelphia	n.a.	0.21	0.39
Pittsburgh	n.a.	0.18	0.39
St. Louis	0.39	0.18	0.32
San Francisco	0.76	0.51	n.a.
Washington, D.C.	0.07	0.05	0.05

Sources: *Employment and Earnings*, various May issues. Data are adjusted to weekly rates by dividing by 4.33. Data for New York for all years and for Washington in 1966 and 1970 are for the standard metropolitan statistical area.
n.a. Not available.

easy. Once unemployed, they are able to find work quickly. Conditions are just the opposite in the cities at the lower right of Figure 4.

The equilibrium theory suggests that employers react to differences in conditions in labor markets through the adjustment of their policies of hiring and laying off. In slack markets, an employer can afford an unstable policy in which most of a fluctuation in demand can be met by a corresponding change in his labor force, since a large fraction of those laid off will still be available for recall even after a month or two, and, in any case, new hiring is easy because of the large pool of unemployed workers. In tight markets, laid-off workers are less likely to be available for recall and new hires more difficult, so an employer is induced to stabilize his labor force by holding idle workers during fluctuations in his output. The large differences among the layoff rates of the twelve cities of the study are quite surprising. Apparently the relation suggested by the theory is quite strong. Further, just as the pattern of unemployment rates is stable over time, so is the pattern of layoff rates. Table 5 presents the published rates for manufacturing industries, again at weekly rates, for 1962, 1966, and the recession year, 1970. The cities with low layoff rates in 1966—Chicago, Houston, and

Washington, D.C.—were low in 1970, as well; Washington (the only one of the three for which data are available) was also low in 1962.

IMPLICATIONS OF THE STUDY OF TWELVE CITIES FOR REGIONAL MANPOWER POLICIES

The theory I have proposed suggests that relatively subtle differences among cities can induce fairly large differences in the conditions in their labor markets, especially in layoff and unemployment rates. The data appear to be consistent with the theory and to discredit its main competitor, the theory of perpetual disequilibrium caused by transitory shifts in demand among cities.[30] The theory has plain implications about the potential impact of regional manpower policies. I distinguish two main types of policies intended to deal with the problem of slack labor markets in certain geographical areas: those that attempt to increase the demand for labor by subsidizing employers in depressed areas and those that attempt to decrease the supply of labor by subsidizing the relocation of workers from slack to tight markets. The first kind is typified by the Area Redevelopment Act of 1961 and the second by more recent experimental programs of the Department of Labor. An expansion of the latter programs has been advocated by Charles Holt and his colleagues at the Urban Institute as part of their proposal for a comprehensive revision and enlargement of federal manpower programs.[31]

Subsidies to employers in depressed areas can take a variety of forms—tax credits or rebates, provision of free services such as highways, and so forth—but these can be incorporated at least roughly in the theory as an upward shift in the schedule of employer equilibrium in Figure 1. If that schedule is steeper than the one for worker equilibrium, then the intersection shifts in the direction of lower wages and less unemployment. Productivity falls by more than the amount of the subsidy, but on the other hand each worker is employed a larger fraction of the year. If the schedule for employers is less steep than the one for workers, just the opposite happens: Wages and unemployment rates rise and productivity rises by more than

30. That is, discredit it as a unitary explanation of the geographical pattern of unemployment. Obviously, transitory shifts in demand cause perturbations around the equilibrium described by my theory. In this sense, the two theories are complementary.

31. Charles C. Holt and others, "Manpower Proposals for Phase III," in *Brookings Papers on Economic Activity* (3:1971), pp. 712–22.

the amount of the subsidy. In both cases the equilibrating mechanisms of the market defeat the hope that such policies will decrease unemployment and increase wages simultaneously.[32]

Policies for inducing workers to move from slack markets to tight markets with relocation allowances are not as easy to incorporate in the theory. One way they might operate in practice is simply to make low-unemployment regions more attractive to workers. This can be portrayed as a downward shift in the schedule of worker equilibrium in Figure 1 and has exactly the same effect as the upward shift in the other schedule just discussed. Either unemployment and wages fall to even lower levels in the low-unemployment region, or they both rise. Only in the second case does the economy move toward the equalization of unemployment differentials that presumably is the goal of programs that subsidize relocation from high- to low-unemployment areas.

My main point is that if the pattern of regional differences is in fact characteristic of equilibrium, the change in the equilibrium brought about by the policies may well be perverse. An understanding of the nature of the mechanism determining regional differences in economic activity is essential to the formulation of appropriate regional policies. I do not believe that the simple theory of disequilibrium, which seems to underlie the two kinds of policies considered here, is a satisfactory basis by itself for designing programs.

The Social Costs and Benefits of Unemployment

Every contemporary account of unemployment grants the usefulness of a certain level of unemployment. Without a careful process of looking for work on the part of prospective employees, the matching of jobs and workers that is an essential feature of the efficient operation of the labor market would not take place. Most discussions seem to assume, however, that the private interests of individual unemployed workers coincide with the interests of the society as a whole, that there are no external benefits or costs associated with their individual decisions. In its extreme form, this view leads to the belief that the level of unemployment in a competitive economy in equilibrium is optimal. The theory of turnover suggests, on the

32. Joseph Stiglitz, in "Alternative Theories," has made much the same point with regard to policies for subsidizing urban employment in developing countries.

contrary, that an important externality operates through unemployment. Conditions in the labor market affect the productivity of workers, and these conditions are affected by the decisions of individuals. An unemployed worker who takes a job imposes a cost on the society by reducing the unemployment rate and thereby decreasing the productivity of the economy. He receives a benefit in the form of the wage he earns. The net social benefit or cost is the difference between the two. Social efficiency is achieved when the marginal value of putting another person to work is exactly equal to the social cost of the reduction in productivity brought about as a consequence of the tightening of the labor market. I will argue that part of the cost is a true externality, not reflected by any private cost, so there is no reason to expect an efficient level of unemployment in a purely competitive economy.[33]

The notion of an optimal amount of excess capacity—of both labor and capital—within a firm is a familiar one. Occasional idleness is a sign of efficiency, since it means that someone is available for high-priority tasks that may arise unexpectedly. I will argue here that the unemployed perform a similar function in the aggregate economy. The crucial difference is that in the firm, private and social costs and benefits coincide for decisions about the allocation of individual workers, so the management should choose an efficient level of excess labor, while in the aggregate economy, the decision-making agents face private costs that differ from the social costs. The essence of my argument is that the unemployed perform a socially useful function for which they are not necessarily compensated, and that employers are not necessarily rewarded enough (or charged enough) for putting the unemployed to work.

Why is it necessary to maintain a labor reserve outside the firm and to require individual workers to finance periods of unemployment at least in part from their own funds? The first reaction of most economists to the suggestion of an externality is to look for economic institutions that could make externalities of single individuals internal to a group. Many such institutions do in fact exist; firms that supply temporary clerical help are

33. In "Inflation and Unemployment," James Tobin has made the general point that externalities in the process of job search invalidate the presumption that the competitive equilibrium is efficient. He mentions externalities of a sort not dealt with here but does not consider the relation between the level of unemployment and productivity that is central to my argument.

a clear example. But there is a fundamental limitation to the scope of these institutions. At whatever level they operate, they cannot take charge of all of the reserve of workers available for employment, because part of the reserve consists of workers from the outside. For a firm, the availability of workers laid off from other firms in the same industry makes it undesirable to meet all fluctuations in labor requirements through an internal reserve. Similarly, the availability of workers from other industries limits the scope of an institution that maintains an internal reserve within a single industry, although industrial unions do have this role to a certain extent. Since no rigid boundaries restrict the occupational, industrial, and geographic mobility of labor, private institutions are incapable of making the costs of maintaining a reserve of workers fully internal and private.

Not all of the returns to unemployment are social rather than individual. To the extent that the unemployed search actively for jobs, they may capture some of the benefits of unemployment for themselves in the form of better jobs. In the extreme, all of the benefits of unemployment described above could accrue to the individual. I find this implausible because it suggests that the unemployed consistently improve their prospects by waiting for the right job, whereas in fact many of the unemployed find waiting to be a pure burden because they expect to return to their old jobs or ones just like them. The point remains, however, that some workers can make good use of their time while unemployed. Some fraction of the social return to unemployment calculated in the next section is probably captured by the individual unemployed worker.

Social efficiency requires that a system of taxes be imposed to account for the externality associated with unemployment by making private costs and benefits, after taxes, equal the social costs and benefits. This requires a subsidy for unemployed workers, to compensate them for the social contribution they make by being available immediately for work, and a tax on employers for the social cost of withdrawing workers from the pool of idle workers.

The magnitude of the compensation and corresponding tax depends on the fraction of the benefits of unemployment that do not accrue to the individual. It is conceivable that the fraction is large and that social efficiency requires fairly generous unemployment compensation, but no empirical evidence is available to support this view. Martin Feldstein has recently calculated the effective rates of compensation under the existing system and

found that they are as high as 90 percent of previous wages for some workers in some states.[34] Current knowledge cannot answer the question about the efficiency of these high rates. My main point is that there is no reason to believe that unemployment compensation is invariably a source of inefficiency. I contrast my view with what I believe is the conventional view among economists that unemployment compensation is insurance against the risk of unemployment, and that the problem with it as insurance is the substantial moral hazard posed by the individual's control over his own unemployment.[35]

Are High Turnover and High Unemployment Inevitable?

Many economists are reluctant to accept the conclusion that high turnover and high unemployment are inevitable in view of the very low rates of turnover and unemployment found in other highly developed countries, especially West Germany and Japan. One of the contributions of this paper is to identify comparable examples from the U.S. economy: Chicago has far less new unemployment each week than the national average, and a substantially lower overall unemployment rate. Advocates of the view that high unemployment is inevitable often dismiss the evidence from West Germany and Japan on the grounds that these conservative societies induce much greater personal stability among their members than does the more open, liberal society of the United States. One could not equally plausibly argue the irrelevance of the evidence from the most American of all American cities, Chicago.

The theory of turnover presented at the beginning of the paper and refined through the comparison of the twelve large cities has implications for the aggregate economy. In the absence of international migration, labor mobility does not establish an aggregate connection between unemployment and wages of the sort proposed earlier. Within a country, the geographical pattern of wage differentials must match the pattern of differentials in unemployment rates, but nothing discussed so far determines the overall level of wages ($\bar{w}$ in my algebraic exposition). On the other hand, the connection between unemployment and wage rates arising from the lower productivity of workers in tight markets does operate at the aggre-

34. "Lowering the Permanent Rate of Unemployment."

35. See, for example, Edmund S. Phelps, *Inflation and Unemployment: The Cost-Benefit Approach to Monetary Planning* (Norton, 1972), pp. 97–99.

gate level (the value of $\bar{x}$ is set by the relation between prices and costs). Consequently, the aggregate economy faces a choice between tight labor markets and lower wages on the one hand, and slack markets and higher wages, on the other. The model can be closed in a variety of ways. The crude Keynesian would take the wage rate as fixed and given. The classical economist would take a particular unemployment rate as an indicator of market clearing. The modern economist would introduce a complex adjustment process linking the wage level to the past history of unemployment. If the adjustment process can be summarized by a stable long-run Phillips curve, the choices available are indexed by the rate of inflation: Tight markets and low real wage levels will be accompanied by high rates of inflation, and vice versa. In the limiting case of a vertical long-run Phillips curve, only a single unemployment rate, the natural rate, can be sustained indefinitely and it implies a certain set of conditions in the labor market. Nothing in the theory of turnover provides grounds for optimism about improving the performance of the labor market through aggregate expansionary policy by itself.

What would be a socially efficient policy for labor markets? I have neither the theory nor the empirical results to deal with this question for the contemporary American economy beyond my general remarks on the social costs and benefits of unemployment. I can, however, say something about a mythical economy. Suppose that no artificial factors barred mobility in the labor market and that all workers were effectively identical, so that none of the serious problems of the unequal distribution of unemployment among demographic groups existed. Suppose further that the aggregate relation between productivity and unemployment in the economy was the following:

$$w = \$3.15 + 0.04u.$$

To determine the hourly social return to unemployment in this economy, suppose that there are N manhours available in the labor force of which U are unemployed. Then $u = 100\ U/N$. Total output is the product of the number of manhours employed, $N - U$, and the productivity of each, w:

$$X = (N - U)w.$$

Now the net marginal contribution of one more unemployed worker is the derivative of X with respect to U:

$$\frac{dX}{dU} = (N - U)\frac{dw}{dU} - w.$$

The first term is the social benefit associated with the increased productivity of the remaining employed workers and the second is the social and private cost of the reduction in employment. Since

$$w = \$3.15 + 0.04u$$

$$= \$3.15 + 0.04\frac{100U}{N},$$

then

$$\frac{dw}{dU} = \frac{\$4.00}{N},$$

and the marginal social benefit of unemployment is

$$\$4.00\frac{N - U}{N}.$$

At, say, 2 percent unemployment, the marginal social benefit of unemployment is \$3.92 per hour, while the marginal social and individual cost is only \$3.23 per hour. In the mythical economy, there is too *little* unemployment! In such an economy the reserve of workers is a scarce resource that is inappropriately rationed because employers are not charged for withdrawing a worker from the pool. Similarly, workers do not face the appropriate incentive to remain unemployed. The mythical economy needs a policy that increases the unemployment rate to the point of equality of marginal social costs and benefits.

The mythical economy may bear some slight resemblance to the market for adult white males in the United States but surely not to the labor market as a whole. The markets in the United States for blacks, women, and youths seem to be separated from the market for adult white males by artificial barriers. The less permeable these barriers, the more the markets need to be analyzed separately. Markets for adult white males may well be chronically tight, with unemployment rates below the efficient level, while those for blacks, women, and youths are chronically slack with inefficiently high unemployment. This conclusion is certainly consistent with the empirical evidence on the turnover of individual workers presented earlier in the paper. It has the important implication that the social cost of removing one worker from the slack market is lower than the wage in that market while the social benefit of adding a worker to the tight market is greater than the wage there, so the wage differential may substantially understate the social benefits of moving workers across the barrier. Programs for putting disadvantaged workers into good jobs, such as those discussed in

the later sections of my previous paper, may have social benefits beyond the private benefits to the individuals in the programs.

What, then, of West Germany, Japan, and Chicago? There are both costs and benefits to tight labor markets. Turnover is a sign of efficiency as well as a source of individual distress. The existence of economies with low turnover and unemployment rates suggests the feasibility but not necessarily the desirability of achieving similar rates in the United States. The present state of knowledge does not justify a single-minded policy of tightening labor markets without attending to the fundamental structural problems ot lack of opportunity for many groups in the labor force.

APPENDIX A

Estimation of the Frequency and Duration of Unemployment

THE FREQUENCY OF UNEMPLOYMENT is measured by the probability, α, that a worker who is not unemployed in one week will become unemployed in the next; the duration of unemployment is inversely proportional to the probability, β, that an unemployed worker will no longer be unemployed in the next week. Neither of these probabilities depends on the past history of the individual. Thus, at the level of the individual, the model is a simple Markov model. This study differs from previous applications of Markov models to flows in the labor market[1] in the important respect that the transition probabilities are functions of individual characteristics.[2]

Natural estimates of α and β are the following:

$$\hat{\alpha} = \frac{\text{number of times unemployment began}}{\text{number of times unemployment could have begun}}$$

1. For example, Martin David and Toshiyuki Otsuki, "Forecasting Short-run Variation in Labor Market Activity," *Review of Economics and Statistics*, Vol. 50 (February 1968), pp. 68–77.

2. Since data are not available on the lengths of individual spells, nothing can be done here about the dependence of β on the length of the spell. George Perry has treated this problem in "Unemployment Flows."

and

$$\hat{\beta} = \frac{\text{number of times unemployment ended}}{\text{number of times unemployment could have ended}}.$$

Except for spells that began before the year began, or ended after the year ended, the numerators of these two estimators are both equal to the number of spells. Further (again except for the case of overlap), the denominator of $\hat{\beta}$ is observed directly as the number of weeks of unemployment and the denominator of $\hat{\alpha}$ can be obtained by subtracting the number of weeks of unemployment from 52; thus, except for beginning and ending effects, these estimators can be calculated directly from the data.

Now

$$S - 1 \leqq E \leqq S,$$

$$S - 1 \leqq B \leqq S,$$

$$W - 1 \leqq M \leqq W$$

and

$$51 - W \leqq N \leqq 52 - W;$$

so

$$\frac{S-1}{52-W} \leqq \hat{\alpha} \leqq \frac{S}{51-W}$$

and

$$\frac{S-1}{W} \leqq \hat{\beta} \leqq \frac{S}{W-1},$$

where

S = the number of spells
W = the number of weeks of unemployment
E = the number of times unemployment ended
B = the number of times it began
M = the number of times unemployment could have ended
N = the number of times it could have begun.

Since the probability of unemployment is well below one-half, the best single pair of estimators is probably that based on the assumption that no spell of unemployment overlaps the beginning or end of the year:

$$E = B = S,\ M = W, \text{ and } N = 51 - W.$$

The resulting estimators, $\alpha^* = S/(51 - W)$ and $\beta^* = S/W$, lie within the

bounds just given and are the ones used in this study. The following specifications were used for the probabilities:

$$\alpha = \frac{e^{x\cdot\delta}}{1 + e^{x\cdot\delta}}$$

and

$$\beta = \frac{e^{x\cdot\gamma}}{1 + e^{x\cdot\gamma}},$$

where x is the vector of the individual's characteristics and δ and γ are vectors of parameters to be estimated. Estimates were made by the method of maximum likelihood.

The characteristics, x, used in this study measure the race, number and ages of children, wage (imputed according to a formula similar to that in my study of labor supply[3]), income (including the value of the time of the worker, but not his actual earnings), age, marital status, city of residence, and type of employment (private wage or salary, government, self-employed, and unpaid family employment). The variables have the form of dummy variables for the characteristics that are categorical; for example, $x_2 = 1$ for blacks and 0 for whites. For each continuous characteristic (wage, income, or age), x consists of a set of variables that, when weighted by the estimated coefficients, form a continuous, piecewise linear function of the characteristic. Each coefficient δ_i or γ_i should be interpreted as approximately the proportional change in the corresponding probability associated with $x_i = 1$ rather than $x_i = 0$. Thus δ_2 is approximately the proportion by which the probability that a black will become unemployed exceeds the probability that a white will become unemployed. The exact interpretation of these coefficients is obtained by evaluating the expressions just given.

Data for this study were obtained from the Survey of Economic Opportunity (SEO), conducted by the U.S. Bureau of the Census in the spring of 1967, and refer to 1966 experience. All individuals living in the twelve large standard metropolitan statistical areas identified in the SEO were included, except those unable to work, those employed in the construction industry or the armed forces, and those for whom data on unemployment were

3. "Wages, Income, and Hours of Work in the U.S. Labor Force," in Harold W. Watts and Glen G. Cain, *Income Maintenance and Labor Supply: Econometric Studies*, Monograph Series, University of Wisconsin, Institute for Research on Poverty, forthcoming.

missing. Separate results were obtained for men and for women. The coefficients together with their estimated standard errors are presented in Tables A-1 and A-2. These estimates were based on 9,766 men and 12,287 women, contributing 432,974 and 567,728 weekly observations, respectively, to the estimation of α, and 13,990 and 12,040 observations to the estimation of β.

Table A-1. Coefficients for Weekly Probabilities of Entering and Leaving Unemployment for Men, by Selected Characteristics, 1966

Characteristic	*Parameter of probability of becoming unemployed, δ*	*Parameter of probability of leaving unemployment, γ*
Constant	−6.13	−1.85
	(0.14)	(0.15)
Color		
Black	0.56	−0.32
	(0.06)	(0.07)
White	0	0
Children		
None	0.19	0.16
	(0.10)	(0.11)
Preschool only	0	0
School age only	0.14	0.00
	(0.11)	(0.13)
Both ages	0.17	0.11
	(0.11)	(0.12)
City of residence		
Baltimore	0.07	0.17
	(0.12)	(0.13)
Chicago	−0.37	0.52
	(0.11)	(0.13)
Cleveland	0.03	0.02
	(0.16)	(0.17)
Detroit	0.36	0.09
	(0.10)	(0.12)
Houston	−0.12	0.34
	(0.15)	(0.17)
Los Angeles	0.36	−0.08
	(0.09)	(0.09)
New York	0	0
Philadelphia	−0.02	0.11
	(0.12)	(0.13)
Pittsburgh	0.63	−0.11
	(0.15)	(0.16)

Table A-1 (*Continued*)

Characteristic	*Parameter of probability of becoming unemployed,* δ	*Parameter of probability of leaving unemployment,* γ
St. Louis	0.32	−0.12
	(0.14)	(0.16)
San Francisco	0.55	−0.11
	(0.10)	(0.11)
Washington, D.C.	−0.40	0.38
	(0.13)	(0.14)
Wage rate per hour (dollars)		
0	0.50	0.15
	(0.82)	(0.96)
1.50	0.24	−0.24
	(0.14)	(0.16)
2.00	0.12	−0.10
	(0.13)	(0.14)
3.00	**0**	**0**
4.00	−0.28	−0.11
	(0.26)	(0.34)
10.00	−16.46	6.19
	(9.44)	(12.53)
Annual family income per adult (dollars)		
0	−1.30	0.45
	(0.46)	(0.49)
2,000	−0.05	0.02
	(0.11)	(0.12)
4,000	**0**	**0**
7,000	−0.40	−0.37
	(0.18)	(0.20)
10,000	0.20	−0.34
	(0.40)	(0.53)
40,000	−4.75	−9.60
	(6.27)	(14.58)
Age (years)		
15	−0.40	0.83
	(0.15)	(0.17)
22	0.40	0.23
	(0.12)	(0.14)
30	**0**	**0**
45	−0.30	0.14
	(0.12)	(0.13)
65	−0.33	−0.09
	(0.13)	(0.14)
98	−4.61	1.22
	(0.91)	(0.99)

Table A-1 (*Continued*)

Characteristic	Parameter of probability of becoming unemployed, δ	Parameter of probability of leaving unemployment, γ
Type of worker		
Not reported	−0.62	−0.99
	(0.09)	(0.09)
Private wage or salary	0	0
Government	−0.77	−0.12
	(0.14)	(0.11)
Self-employed		
Salaried	0.13	1.00
	(0.36)	(0.53)
Not salaried	−0.79	0.19
	(0.18)	(0.20)
Marital status		
Married	0	0
Not married	0.60	−0.14
	(0.08)	(0.08)

Source: Derived from the Survey of Economic Opportunity conducted by U.S. Bureau of the Census, Spring 1967. The data cover twelve standard metropolitan statistical areas, identified by the largest cities under "City of residence." The numbers in parentheses are estimated standard errors.

Table A-2. Coefficients for Weekly Probabilities of Entering and Leaving Unemployment for Women, by Selected Characteristics, 1966

Characteristic	Parameter of probability of becoming unemployed, δ	Parameter of probability of leaving unemployment, γ
Constant	−7.45	−1.02
	(0.27)	(0.32)
Color		
Black	0.75	−0.40
	(0.07)	(0.07)
White	0	0
Children		
None	0.03	0.01
	(0.09)	(0.10)
Preschool only	0	0
School age only	−0.03	0.01
	(0.10)	(0.12)
Both ages	−0.05	0.32
	(0.11)	(0.12)
City of residence		
Baltimore	−0.35	0.06
	(0.14)	(0.15)

Table A-2 (*Continued*)

Characteristic	*Parameter of probability of becoming unemployed,* δ	*Parameter of probability of leaving unemployment,* γ
City of residence (*cont.*)		
Chicago	−0.43	0.07
	(0.11)	(0.13)
Cleveland	0.27	−0.10
	(0.14)	(0.16)
Detroit	0.11	−0.37
	(0.11)	(0.12)
Houston	0.07	0.44
	(0.15)	(0.18)
Los Angeles	0.19	−0.13
	(0.09)	(0.10)
New York	0	0
Philadelphia	−0.04	−0.25
	(0.11)	(0.12)
Pittsburgh	0.15	−0.32
	(0.19)	(0.20)
St. Louis	0.36	−0.29
	(0.14)	(0.16)
San Francisco	0.37	−0.20
	(0.10)	(0.11)
Washington, D.C.	−0.47	0.17
	(0.12)	(0.13)
Wage rate per hour (dollars)		
0	−1.19	−1.23
	(0.46)	(0.53)
1.50	0.31	−0.91
	(0.23)	(0.28)
2.00	0.49	−1.09
	(0.26)	(0.30)
3.00	0	0
4.00	−0.46	−1.61
	(0.86)	(0.93)
10.00	16.97	1.00
	(3.79)	(3.61)
Annual family income per adult (dollars)		
0	−0.45	0.43
	(0.37)	(0.42)
2,000	0.22	0.00
	(0.11)	(0.12)
4,000	0	0
7,000	−0.09	−0.43
	(0.19)	(0.22)
10,000	−2.17	−0.89
	(1.08)	(1.45)

Table A-2 (*Continued*)

Characteristic	*Parameter of probability of becoming unemployed, δ*	*Parameter of probability of leaving unemployment, γ*
Income (dollars) (*cont.*)		
40,000	6.71	−0.52
	(1.16)	(1.25)
Age (years)		
15	−0.04	0.49
	(0.14)	(0.16)
22	0.51	0.04
	(0.12)	(0.13)
30	0	0
45	−0.30	−0.06
	(0.12)	(0.14)
65	−0.44	−0.19
	(0.15)	(0.16)
98	−4.74	0.13
	(1.07)	(1.30)
Type of worker		
Not reported	0	0
Private wage or salary	1.22	0.38
	(0.07)	(0.07)
Government	0.45	0.30
	(0.11)	(0.12)
Self-employed		
Salaried	2.51	0.28
	(0.39)	(0.44)
Not salaried	0.77	0.60
	(0.27)	(0.30)
Marital status		
Married	0	0
Not married	0.22	−0.06
	(0.06)	(0.07)

Sources: Same as Table A-1. The numbers in parentheses are the estimated standard errors.

APPENDIX B

*Geographical Differences in Unemployment, Turnover, and Wage Rates**

THE THEORY STARTS in the following way: I consider the behavior of workers and employers in a single city. Both may consider moving to other cities, workers because of higher wages or lower unemployment rates, employers because of lower wages or more productive workers. I will assume that unemployed workers follow reasonable strategies in trying to find work, and that, as a result, there is a probability, b, of finding work each week. To some extent, this probability is within the control of the unemployed worker, although this should not be taken to mean that unemployment is somehow voluntary. I will assume that b is a stable function of two measures of conditions in the market, the unemployment rate, u, and the vacancy rate, v:

$$b = B(u, v).$$

Similarly, employers trying to fill jobs are assumed to have a probability, r, of filling a given vacancy each week, again assumed to be a function of u and v:

$$r = R(u, v).$$

In addition, each worker is assumed to have a probability, q, of quitting each week, while employers have a probability, y, of laying off a given worker each week. In equilibrium, the unemployment rate in this system is

$$u = \frac{q + y}{q + y + b}$$

and the vacancy rate is

$$v = \frac{q + y}{q + y + r}.$$

* My debt to the thinking of Charles C. Holt will be apparent to all readers of this appendix. See appendix of Charles C. Holt and others, *The Unemployment-Inflation Dilemma: A Manpower Solution* (Urban Institute, 1971), pp. 94–102.

The effective wage elsewhere in the economy is assumed to be fixed exogenously at the level $\bar{w}$. In order that workers in this city have no inducement to emigrate, and that workers elsewhere have no inducement to immigrate, effective wages here and elsewhere must be equal:

$$(1 - u)w = \bar{w}.$$

I will refer to this as the condition for worker equilibrium.

The similar condition for employer equilibrium is that effective labor costs here and elsewhere must be equal. I assume that the net productivity, $f(r, q)$, of workers in a given labor market depends on the cost of recruiting, as measured by the probability of filling a job, r, and on the quit rate, q. Net productivity is higher when r is higher, since in that case it is cheaper to replace workers who have quit and also possible to lay off workers in the event of a brief reduction in demand. If unit labor cost elsewhere is $\bar{x}$, the equilibrium condition for employers is

$$\frac{w}{f(r, q)} = \bar{x}.$$

Quits and layoffs depend on conditions in the market. I will assume that the quit rate depends on the cost of finding new work:

$$q = Q(b);$$

and that the layoff rate depends on the cost of filling jobs:

$$y = Y(r).$$

In principle, y should also depend on the quit rate, but nothing essential is lost by making this simpler assumption.

Since the quit and layoff rates depend on the rates of job finding and job filling, which in turn depend on the underlying measures of conditions, u and v, it is possible to write the unemployment rate as a function of itself and the vacancy rate:

$$u = \frac{Q(B(u, v)) + y(R(u, v))}{Q(B(u, v)) + y(R(u, v)) + B(u, v)}.$$

This can be solved to get v as a function of u:

$$v = g(u).$$

The function $g(u)$ tells what vacancy rate is necessary to achieve the quit rate, layoff rate, and rate of job finding that are consistent with the specified unemployment rate, u. It may slope upward or downward. In general, a

higher unemployment rate is associated with a lower quit rate, a higher layoff rate, and a lower rate of job finding. If the first of these dominates the other two, a higher level of vacancies will be necessary to balance a higher employment rate. Otherwise, vacancies will be lower when unemployment is higher.

The equilibrium condition for employers can now be written in terms of the wage level and the unemployment rate:

$$\frac{w}{f(R(u, g(u))),\ Q(B(u, g(u)))} = \bar{x}.$$

Unless the quit rate is very sensitive to the rate of job finding, $R(u, g(u))$ will be an increasing function of u (recruiting is easier in a market with higher unemployment) and $Q(B(u, g(u)))$ will be a decreasing function of u (since jobs are harder to find when unemployment is higher). Both of these considerations make workers more productive when the unemployment rate is higher. This relation can be summarized by a function,

$$h(u) = f(R(u, g(u))),\ Q(B(u, g(u))),$$

which is increasing in u.

Full equilibrium in the market requires that worker and employer equilibrium hold together. In the diagram of Figure 1, this takes place at the intersection of the schedules

$$w = \frac{\bar{w}}{1 - u} \quad \text{and} \quad w = \bar{x}h(u).$$

Differences among Cities

Suppose first that cities differ in their attractiveness to workers, and that this difference can be measured by a variable, a, which enters the equilibrium condition for workers in the following way:

$$(1 - u)w = \bar{w} - a.$$

Workers will not leave an attractive city with a high value of a even though the effective wage there is lower than elsewhere. This is a simple application of the principle of equalizing differences. Similarly, suppose that cities differ in productivity for reasons apart from conditions in their labor markets. I define a measure, z, which shifts the net productivity of workers so as to make the equilibrium of employers the following:

$$w = [h(u) + z]\bar{x}.$$

Differences in climate among cities are likely to affect both their attractiveness and productivity; for example, in warmer cities both workers and employers pay less for heating. On this account I would expect a positive relation between a and z. On the other hand, many differences will affect only workers or only employers, so there need not be any strong systematic relation between a and z. Rather than attempt to create a theory that depends on measurements of a and z, I will treat them as random variables and ask what relation between wages and unemployment is likely to be observed in the face of random differences of the sort just described.

Nothing much is lost and a great simplification gained by considering the following linearized versions of the two conditions for equilibrium:

$$w = (1 + u - a)\bar{w};$$
$$w = (h_0 + h_1 u + z)\bar{x}.$$

The slope of the observed relation between w and u induced by differences in a and z is[1]

$$\theta\bar{w} + (1 - \theta)h_1\bar{x},$$

where

$$\theta = \frac{\bar{x}^2\sigma_z + \bar{x}\bar{w}\rho\sigma_a\sigma_z}{\bar{x}^2\sigma_z^2 + 2\bar{x}\bar{w}\rho\sigma_a\sigma_z + \bar{w}^2\sigma^2}$$

and σ_z is the standard deviation of z, σ_a is the standard deviation of a, and ρ is their correlation. Several conclusions follow from this formula. First, if there are no differences in productivity among cities ($\sigma_z = 0$), then $\theta = 0$ and the slope is $h_1\bar{x}$, exactly the slope of the equilibrium condition for employers. Similarly, if there are no differences in attractiveness among cities ($\sigma_a = 0$), observed points trace out the equilibrium condition for workers. Otherwise, the observed relation is different from either equilibrium condition. If θ lies between 0 and 1, the observed slope must lie between the slopes of the two equilibrium conditions. Since both are positive, the observed relation must slope upward. A glance at the formula for θ shows that it will always be positive and less than one if a and z are positively correlated (which I find likely), and will in fact behave well for negative ρ as long as ρ exceeds a certain lower limit.

1. I will not burden the reader with the details. See Franklin M. Fisher, *The Identification Problem in Econometrics* (McGraw-Hill, 1966), Chaps. 1–3. By slope I mean the ratio of the expected value of $u \cdot w$ to the expected value of u^2.

Comments and Discussion

Aaron Gordon: This paper falls into two parts. The first is a useful study of the contribution of labor turnover to unemployment, both in the aggregate and among different sectors in the labor force. The second deals with geographical differences in wages and unemployment and is much more controversial. In this part of the paper, I am convinced neither by Hall's analytical model nor by his reported statistical results.

The findings in the first part are interesting. On the whole they contribute to our understanding of how unemployment is generated and why its level is different for different segments of the labor force. Hall computes the weekly probability of a person becoming unemployed, and of a person leaving unemployment. Unfortunately, the data do not permit him to distinguish unemployment arising from layoffs or quits from that arising from entering or reentering the labor force. That information is particularly important for youths and married women.

I found it difficult to accept Hall's results for teenagers. He finds that the probability of becoming unemployed in a given week is no greater for male teenagers than for 30-year-olds. In addition, he finds that male teenagers spend a smaller fraction of the year unemployed than do persons of any other age group except those in their forties. That flatly contradicts all other evidence on this problem with which I am familiar. The fact that the current population survey may give particularly unreliable evidence on teenage unemployment is certainly relevant but can hardly be the entire answer. Finally, one point to which not enough attention is paid is the effect of occupation, which is particularly important in unemployment differences by age and sex.

In the latter part of the paper, dealing with geographical differences in unemployment and real wages, the statistical findings are presented within

the framework of what is called a theory of equilibrium. This theory is static and, in effect, assumes perfect competition in product markets and local labor markets. Production of goods and services is subject to diminishing marginal productivity in the short run, while in the long run marginal and average productivity of labor may rise, but only through technical change. All employers and workers are profit maximizers. Labor and capital are free to move geographically. The corollary to these assumptions is that real wages must fall as employment expands, except as the production function shifts in the long run.

If my description is even approximately correct, I fail to see the connection between this model and the world from which the actual data are taken. Hall assumes that there are permanent geographic differentials in unemployment rates. Judging by the official figures for unemployment in the twenty largest standard metropolitan statistical areas since the beginning of the 1960s, that assumption does not hold up. A number of the SMSAs did, indeed, retain approximately the same ranking, having the second highest or the tenth highest or the twelfth highest rate of unemployment, but not all of them. In Hall's sample, Chicago has the lowest unemployment rate. Although it had one of the lowest unemployment rates throughout the 1961–71 period, its rate was higher than that of several of the other twenty largest metropolitan areas in 1961 and in most of the other years up to 1971. Detroit had the highest unemployment rate in 1961 and again in 1970 and 1971, but was near the median during the 1964–67 period. St. Louis was below the median in 1964 and 1965 and above it in 1967. I was unable to standardize these rates for changes in the various dimensions in the labor force as Hall did. But I assume that this does not matter much for changes over a period as short as twelve years.

In Figure 2, the positive slope is not very definite, and the standard errors on the regression coefficients confirm this uncertain fit. If Detroit and San Francisco were excluded, would the regression have any positive slope at all? This seems to me a weak empirical basis for the model, or even for an ad hoc generalization that high real wages and high unemployment always go together—now, ten years ago, or twenty years ago. Table A-1 in the appendix reinforces these observations. Four out of the eleven coefficients for the SMSAs for the probability of becoming unemployed are smaller than their standard errors. For the probability of leaving unemployment, six coefficients are smaller than their standard errors and only three are equal

to twice their standard errors. The correlations are better for the other characteristics measured than for the ones on geographical location.

I missed any reference to differences in occupational and industrial patterns of employment among the standard metropolitan statistical areas that might have something to do with observed unemployment differences. And finally, in his discussion of deflating wages by city, Hall ignores the difference between the deflated wage concepts that are relevant for employers and for employees. The employer is concerned with *product* wage in determining profitability. Presumably it is the *real* wage that attracts the worker. On a local or regional basis, product wages would be extremely difficult to determine.

Charles Holt: I think Robert Hall has made an important contribution with this paper. He has combined the dynamics of turnover in the labor market and a competitive model of prices and wages into a static theory of wage differentials. The importance of this accomplishment is that most theory up to this point has come out with an equilibrium price, while Hall comes out with two mechanisms for allocating resources in these imperfect markets: One is the wage offered and the other is the availability of jobs. That both of these are important has long been recognized; but Hall has made real progress in putting them together in a model that has extremely fruitful implications. And his insight should carry over to other kinds of differentials besides the one on which he reports.

On more specific points: The fact that Hall's model of productivity rises when unemployment rises is clearly a long-term static phenomenon. It certainly is not true cyclically, where labor productivity increases as employment rises. As the empirical work advances, we must round out Hall's model by fully incorporating it into a dynamic theory reflecting this cyclical behavior.

The first part of the paper contains a good deal of discussion of the probabilities of becoming unemployed and of leaving unemployment. Hall's work suggests that ratios of these probabilities between different groups in the labor force are stable. One has to keep in mind that these ratios were observed for 1966. Some of them, like the black-white unemployment ratio, are known to be relatively stable. More recent work, however, demonstrates systematic variation in others. These ratios certainly should not be taken as parameters.

In some of his inferences about policy, Hall may have been premature. One has to be careful not to conclude that this paper implies unemployment is a good thing simply on the basis of social efficiency arguments. Before we use an efficiency argument alone, we must look carefully at questions like, Who is unemployed? What are the economic costs of unemployment in terms of suicide, divorce, crime? What is the impact of unemployment on income distribution? What will be the impact on future labor force participation of young people suffering high levels of unemployment? These kinds of issues have to be much more thoroughly explored before we can begin to think about the policy implications of Hall's analysis.

In Figure 1, two curves—the worker equilibrium and the employer equilibrium—are depicted. The discussion points out that they might cross in one of two ways, depending on which is steeper. The policy implications of this sound paradoxical: Increasing mobility may increase unemployment, and labor subsidies may increase unemployment. The difficulty here is that one kind of intersection is unstable and the other—the one drawn in Figure 1—is stable. In that case, mobility and subsidies would produce the kind of results one would anticipate. On the other hand, with the slopes shown, the forces restoring equilibrium once it is disturbed are not strong. And this raises the chances that other variables, such as union influence or flows of workers into different markets, would be important.

Vacancy statistics for the cities could be added to Table 4. They are in the analysis now and appear in the appendix. We know quite a lot about the functional form in which vacancies enter the analysis and even about the size of the parameters to be expected. The log of both Hall's alpha and his beta variables would be linearly related to the vacancy rate and the unemployment rate.

I am puzzled by Hall's denial of a connection between unemployment and wages operating through labor mobility. On discovering strong equilibrium patterns of unemployment and wages across cities, Hall seems inclined to accept the equilibrium as necessarily a good thing. Reallocating workers from markets that have more workers than are needed to others that have fewer than could be absorbed might decrease the total level of unemployment and increase output without increasing inflation.

Hall recognizes that when the ratio of vacancies to unemployment is high, quits will be relatively high. Many of those quitting will not pass through unemployment at all. Yet this process of changing jobs is an important part of the mechanism producing a creeping inflation process.

In the discussion of social costs and benefits, Hall considers a "tax on employers for the social cost of withdrawing workers from the pool of idle workers." It is important to recognize that, although he stresses dynamic turnover in his analysis generally, here he refers to a reduction in the *stock* of workers, not the gross flow of new hires from the stock.

The overall thrust of this paper underlines once again the limitations of aggregate demand policy in treating inflation and unemployment and the need for effective policy measures to improve the structure of the labor market.

Robert Hall: In reply to some of Aaron Gordon's comments, let me first reiterate that in the comparison of cities that I make, I am talking about a long-run equilibrium comparison rather than transitory differences in unemployment. Treating them as long-run differences across cities, we are looking at cases where the capital stock and the level of employment are in equilibrium for purposes of comparing one city with another. I certainly do not believe my productivity arguments apply in a cyclical context.

There is one important misunderstanding, I believe, in his criticism of my basic model. I do not assume decreasing marginal or average product of labor in the long run. High unemployment does not necessarily imply low employment, because I consider the size of the labor force free to vary. In the model, the relation between unemployment and productivity operates not through the level of employment but directly through the personnel policies of employers.

The results on teenagers do pose a serious problem. However, I do not think we can take the official data from the Current Population Survey as the final word and say that every study ought to reproduce those statistics. The monthly survey statistics have some serious problems. We know about the rotation group problem: The answer to how much unemployment there is varies considerably depending on how many months the respondents have been in the survey sample, and this problem is especially severe among teenagers. Unemployment is a state of mind, and the mere act of asking about it seems to have a considerable effect on the answer. Regarding the results for teenagers in this paper, I am working on the problem with what I believe will be much better data, so I have not given the subject too much attention here.

I am uncomfortable about the issues of adjusting for occupational differences, but not quite sure what to do. The modern theory of discrimina-

tion is really one of occupational crowding. It does not assume that people are not paid the marginal products, but rather that women are crowded into certain kinds of occupations and are paid their marginal products in those occupations even though they may not be the best occupations for them. If this is the case, introducing dummy variables for occupation would show substantial effects. But I would not be sure how to interpret them. I would rather have this kind of occupational effect show up as a difference between men and women rather than as an occupational difference. But I admit to some uncertainty about exactly how best to proceed. I did have some results standardizing for occupations. They do not affect the basic conclusions of the paper; but they do affect the comparison between men and women that is reported here.

As to equilibrium, in my model, basically it is a condition in which no unexploited opportunities remain through which individuals can make themselves better off. I think the kind of theory I have talked about is robust with respect to some of the imperfections in markets that may exist, and that concern Aaron Gordon.

Holt makes the basic point that the parameters I estimated apply for 1966 and that they can be expected to change through time. All of the work I have done should be thought of as a function of time, observed at a particular point in time. The parameters I report characterize the economy only for the 1966 cross-section.

General Discussion

There was considerable criticism of the role played by the unemployed as a labor reserve in Hall's model. Charles Schultze described the model as an economy in which the presence of unemployed hungry workers reduces quits, making it possible to have more layoffs and to schedule production better. Through this mechanism, a net increase in productivity is achieved by increasing unemployment. But Hall then removes this effect by arguing that it is necessary to pay enough unemployment compensation to make sure that workers are not hungry—that, indeed, they are indifferent between employment and unemployment. And similarly, Schultze argued that there was a big difference between having 3 million unemployed actively seeking a job and 3 million unemployed not scrambling for a job at all. Hall replied that it was not the hunger of unemployed workers but

their mere availability that permitted more efficient personnel policies by firms in a slack labor market. Arthur Okun noted, however, that if unemployment compensation were approximately equal to wages, people would take jobs less rapidly, assuming there were any costs to searching for a job; on the other hand, he pointed out, despite specific examples to the contrary, unemployment compensation currently replaces only a small fraction of lost wages. From mid-1969 to mid-1972, for example, unemployment compensation payments increased by $3.5 billion (annual rate) as unemployment rose by 2 million people. Hall agreed that incentive considerations implied that the level of unemployment compensation ought to be a parameter in the model helping to determine the socially optimal level of unemployment and compensation, but he felt that otherwise his analysis remained appropriate.

Robert Solow pointed out the uncertainty about where equilibrium would occur in Hall's type of model. Only a small change in the slope of the equilibrium locus between employees and employers would lead to larger differences in unemployment rates. If Hall's model is taken literally, zero unemployment would be optimal when the slope was flat. If there were a noticeable slope, the marginal productivity of unemployment would be very high, and implausibly high unemployment rates, along with large unemployment compensation payments, would be called for. R. J. Gordon thought that Hall's regression could support two different stories. The first is the one he has told, in which all workers are homogeneous; in tight labor markets employers need a large personnel department, which reduces productivity. The other story is that in low-unemployment economies, the employer scrapes the bottom of the barrel, employing people with low ability. This situation reduces the average productivity of all workers but imposes no social cost because the productivity of the people hired earlier is not affected. Hall agreed that his regression slopes could contain some of this second effect.

William Poole questioned the assumption of externalities to unemployment. He noted that, if unemployment compensation did not exist, in competitive labor markets wages would be higher in occupations that have predictable seasonal patterns of unemployment than in occupations that did not, so that, allowing for the value of leisure, annual earnings would be the same. He argued that this same effect should operate between Hall's high- and low-unemployment markets and would not give rise to externalities. Hall replied that he did not argue that externalities had to

exist. He could imagine a labor market operating as Poole described, in which the private returns to remaining unemployed equaled the social returns because the worker would do all the work of finding the job. However, the empirical results suggest that this is not true. Some evidence exists that suggests an externality such that employers have a role in the process of finding work. In its extreme, this theory of unemployment has all unemployed workers sitting around idle exactly as if they were idle on the job. They are providing a useful service by making themselves available to employers but they are not being compensated for it. Poole questioned whether, if such externalities do exist, there would not be more firms providing temporary workers to other firms that had fluctuating employment needs. Hall replied that the externality is global because the unemployed worker is functioning as a reserve across a wide variety of alternative employers. Thus there is no way to internalize it completely except by collective action across the whole society. That is why the government has to be responsible for maintaining the appropriate level of employment and compensating unemployed workers just as they would be compensated within the firm.

R. J. Gordon pointed out that the results for different demographic groups are very hard to interpret when participation rates vary as much as they do. So long as the probability of leaving unemployment included probabilities for both dropping out and finding work, the results could not be compared across groups. He noted that this might help explain the unusual results for teenagers, since their low unemployment durations reflected periods spent out of the work force rather than unemployed.

Hyman Kaitz noted that different cities had markedly different employment patterns, a fact that might influence Hall's intercity comparisons. They differ noticeably in the participation rates of secondary workers in the labor force and in the proportion of workers looking for part-time work. Since all the evidence suggests that unemployment is a threshold phenomenon and that small differences in circumstances or habits can push a person over the threshold, unemployment measures for different cities might not be exactly comparable. Kaitz also noted that annual surveys of work experience have shown respondents to be quite reliable in recalling their employment, but less so in recalling unemployment. This may be behind some of the discrepancy in the teenage unemployment results reported by Hall compared with the results from the monthly Current Population Survey.