Volume Title: The Youth Labor Market Problem: Its Nature, Causes, and Consequences

Volume Author/Editor: Richard B. Freeman and David A. Wise, eds.

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-26161-1

Volume URL: http://www.nber.org/books/free82-1

Publication Date: 1982

Chapter Title: Labor Turnover and Youth Unemployment

Chapter Author: Linda Leighton, Jacob Mincer

Chapter URL: http://www.nber.org/chapters/c7876

Chapter pages in book: (p. 235 - 276)

8 Labor Turnover and Youth Unemployment

Linda Leighton and Jacob Mincer

8.1 Introduction: The Youth Unemployment Problem

Public concern about youth employment problems in the U.S. derives from three facts: (1) the unemployment rate of young people is high in absolute numbers, both in relation to adult unemployment and in comparison with other countries; (2) unemployment rates of black youths are much higher and a large fraction of nonworking black youths does not even search for jobs: (3) youth unemployment rates have increased in recent years. The trend is not pronounced among whites, but the rate for black youths has risen from levels comparable to white rates in the 1950s to the present depressionlike levels.

In this chapter we do not address the problem of trends. It is an important question for assessing the plight of black youths and a smaller one for the white population beyond the adverse but temporary conjunction of the business and demographic cycles. Rather, our question refers to the more permanent fact of high youth unemployment. Why is it so high? Are there criteria by which we can judge that it is too high? Why does it decline with age in a particular fashion?

Recent developments in the economics of labor markets provide two complementary approaches to the understanding of differential unem-

Linda Leighton is associated with Fordham University and with the Center for the Social Sciences at Columbia University. Jacob Mincer is associated with Columbia University and with the National Bureau of Economic Research. This work is an outgrowth of Leighton's study of unemployment (1978) and of the Mincer-Jovanovic study of labor mobility (1978). We are grateful to the U.S. Department of Labor, the National Science Foundation, and to the Sloan Foundation for support of this work. We benefited from the comments of Alan Gustman, Kip Viscusi, Robert Shakotko, and from competent research assistance of Margaret Lennon, Frank Nothaft, and Stephen Zuckerman. We are grateful to Carl Rosenfeld of the BLS for the unpublished data in table 8.3. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research or of the Columbia University Center for the Social Sciences.

ployment. Search models are applicable, in principle, to the analysis of duration of unemployment, as they highlight the conditions under which job search terminates. On the other hand, episodes of unemployment originate in the context of job or interlabor force moves, so that models of labor turnover are most useful in understanding the incidence of unemployment. Since age differences in the incidence of unemployment are even larger than differences in unemployment rates, we emphasize labor turnover as the main framework for analyzing the relationship between age and unemployment. We also employ a search model which captures some relevant aspects of the age differentials in job separation and in the duration of unemployment.

Our data sets are the panels of men in the National Longitudinal Surveys (NLS) and in the Michigan Income Dynamics surveys (MID). The data lend themselves to several analyses with which we attempt to illuminate the structure of unemployment. In section 8.2 we decompose the "unemployment rate" observed in a period into incidence, or proportion of persons experiencing unemployment some time during the period, and average duration of unemployment during the period. This enables us to assess the relative importance of each component in creating unemployment differentials among age or any other population subgroups.

We observe the incidence and duration of unemployment in periods longer than a year in section 8.3. The rate at which incidence and duration increase as the period is lengthened indicates the degree of persistence of unemployment or its converse, the degree of turnover among the unemployed. The observed degree of persistence may be due to positive serial correlation in the probability of experiencing unemployment for given individuals, or to heterogeneity in this probability across individuals, or both. These categories cannot be distinguished by lengthening the period, but are explored in regression analyses (section 8.5).

In section 8.4 we relate current unemployment incidence $P(u)$ to current labor mobility, defined as the probability of job separation from the current employer $P(s)$. We compare $P(u)$ and $P(s)$ over the life-cycle and by length of job tenure. The apparent absence of "aging effects" on the incidence of unemployment is tested in comparisons of youths with migrants. According to the identity $P(u) = P(s) \cdot P(u \mid s)$, factors underlying labor mobility $P(s)$ ought to account for some of the patterns of incidence $P(u)$, especially when recall unemployment is excluded from $P(u)$. We explore the factors underlying the probabilities $P(s)$ and $P(u)$ in regression analyses in section 8.5.

Further insights into differences in conditional unemployment $P(u \mid s)$ and in duration of unemployment are obtained in a search model presented in section 8.6. This model also carries implication for quit/layoff behavior and for wage changes connected with separations and unemployment.

Section 8.7 is a replication of regression analyses on data for blacks and an analysis of the racial differentials.

8.2 Components of Unemployment

The same rate of unemployment is observed during a survey week when a certain proportion of the labor force is unemployed two months on average or when only one-third of that proportion is unemployed for a period of six months. The rate does not tell us whether a large number of those affected share a small burden or whether the opposite is the case. If the observation period is sufficiently long, the rate can be decomposed into incidence and duration of unemployment. Whether or not time spent in unemployment is to be interpreted as distress or as productive activity, we want to know whether it is incidence or duration which is mainly responsible for the differences in particular comparisons of population groups.

To do this we may define a personal unemployment rate during the period (e.g., a year) by the ratio of weeks spent in unemployment to weeks spent in the labor force:

$$u_i = \frac{W_{ui}}{W_{Li}} \tag{1}$$

A simple average of u_i would measure the group unemployment rate in an average week if each person spent the same number of weeks per year in the labor force. Otherwise the individual u_i must be weighted by his time in the labor force W_{Li} in averaging. As a result the group rate is obtained in:

$$\bar{u} = \frac{\sum_i W_{Li}\left(\frac{W_{ui}}{W_{Li}}\right)}{\sum_i W_{Li}} = \frac{\sum_i W_{ui}}{\sum_i W_{Li}} = \frac{N}{L}\cdot\frac{\bar{W}_u}{\bar{W}_L} = \frac{N}{L}\cdot\bar{W}_u\cdot\frac{1}{1-\bar{W}_o} \tag{2}$$

where N is the number of persons unemployed some time during the period, L the number of people in the labor force some time during the period. N/L is the incidence of unemployment during the period. $\bar{W}_u$ is the average fraction of the period spent in unemployment by the unemployed, $\bar{W}_L$ the average fraction of the time period spent in the labor force by the labor force group, and $\bar{W}o = 1 - \bar{W}_L$.

Table 8.1 provides decompositions of unemployment experience by the NLS samples of young and mature men for the years 1969–71. The young men ranged in age between 17 and 27, the older men were 48 to 62 years old. The men are classified by school enrollment status, educational attainment, and race. Unemployment followed by a return to the same employer ("recall" or "temporary layoff") is excluded from table 8.1, but is included in appendix tables.[1] The left-hand panel shows the compo-

Table 8.1 **Decomposition of Incidence, Duration, and Nonparticipation NLS, 1969–71 (Excludes Temporary Layoffs)**

	Levels			
	U	$\frac{N}{L}$	$\bar{W}_u$	$\frac{1}{(1-\bar{W}_0)}$
Young whites	.052	.328	.136	1.15
n	(2364)			
Students	.075	.455	.127	1.36
n	(850)			
Nonstudents	.041	.257	.151	1.06
n	(1514)			
Education				
0–11	.056	.327	.156	1.10
12	.043	.261	.154	1.06
⩾13	.025	.181	.135	1.04
Young blacks	.089	.458	.165	1.18
n	(835)			
Students	.127	.581	.153	1.43
n	(217)			
Nonstudents	.079	.414	.172	1.11
n	(618)			
Mature whites	.018	.090	.194	1.06
n	(2167)			
Education				
0–11	.022	.099	.209	1.07
12	.013	.080	.160	1.03
⩾13	.016	.081	.189	1.04
Mature blacks	.030	.117	.236	1.08
n	(967)			
	Percent Differentials			
	U	$\frac{N}{L}$	$\bar{W}_u$	$\frac{1}{(1-\bar{W}_0)}$
Young blacks minus young whites	.545	.332	.193	.022
Students	.525	.243	.229	.052
Nonstudents	.648	.478	.127	.049
Young whites minus mature whites	1.02	1.29	−.354	.087
Nonstudent young whites minus mature whites	.801	1.04	−.250	.006
Young blacks minus mature blacks	1.10	1.36	−.356	.091
Nonstudent young blacks minus mature blacks	.976	1.26	−.319	.032
Mature blacks minus mature whites	.473	.257	.195	.019

Table 8.1 (continued)

	Percent Differentials			
	U	$\frac{N}{L}$	$\bar{W}_u$	$\frac{1}{(1-\bar{W}_0)}$
Education:				
less than H.S. minus H.S.				
Nonstudent whites	.273	.226	.011	.032
Mature whites	.515	.209	.264	.039
H.S. minus >H.S.				
Nonstudent whites	.522	.367	.136	.018
Mature whites	−.192	−.012	−.166	−.009

NOTE: $\bar{W}$ = proportion of time spent unemployed by unemployed.
$\bar{W}_0^u$ = proportion of time spent out of the labor force by labor force participants.
$\frac{N}{L}$ = incidence of unemployment.
n = sample size.

nents of levels of unemployment. The nonparticipation component $1/1 - \bar{W}_o$ is the major one among students in the period 1966–69 though not in 1969–71.[2] It is followed in relative importance by incidence and duration. Among the young, incidence exceeds duration in producing the unemployment total, while the opposite is true with the older groups. Both incidence and duration are greater with blacks than whites and with the less educated youths compared to the more educated.[3] In the right-hand panel, percent differentials in the unemployment rate and its components are calculated for selected groups. Clearly, higher unemployment rates of the young are attributable to higher probabilities of unemployment; duration actually works in the opposite direction. While duration always increases with age in the white sample, the age differential for blacks is quite small for 1966–67 and 1967–69.

On average, almost 40% of all unemployed older men were on temporary layoffs and were recalled by the employer, while about 18% of the nonstudent young unemployed workers were recalled. Inclusion of recall unemployment shows a narrowing of the age differential in both the incidence and duration components of unemployment. This is because of the greater proportion of recall unemployment among older workers.

A comparison of decompositions for 1967–69 and 1969–71 provides information about cyclical changes. Going from the tight labor markets of 1967–69 to the recession years 1969–71 we find that duration of unemployment shows a greater increase (proportionately twice as large) than incidence of unemployment, and that the age differentials widen in incidence and narrow in duration. Both incidence and duration of unemployment are more cyclically sensitive in the young than in the old labor force. Whatever the cycle phase, we conclude higher incidence is the

reason for higher youth unemployment. It is, therefore, the component of major interest for our study.

8.3 Short- and Long-run Unemployment Experience

The longitudinal data unable us to observe the incidence and the amount of time spent in unemployment over periods of several years. As indicated in table 8.2 the average incidence in a single year (p) in the 1966–69 period was 13.5% for young white nonstudents. Over the three-year period it was $P_3 = 27.9\%$. For the same group the average number of weeks spent in unemployment during a single year was 7.7. It was 11.3 over the three-year period. We may define "complete persistence" in unemployment experience when the same persons are unemployed in the three-year period as are in a single year. Then $P_3 = p$ and $W_3 = 3w$. "Complete turnover" is the opposite case, when those unemployed in one year are not unemployed in the other two years. Then $P_3 = 3p$ and $W_3 = w$. The actual figures are between the extremes, so that a significant degree of persistence coexists with a great deal of turnover.

Table 8.2 **Turnover and Persistence of Unemployment NLS, 1966–69**

	p	P_n	$\hat{P}_n$	N	λ
Young whites					
Students	.177	.370	.442	1023	.727
Nonstudents	.135	.279	.353	803	.659
Education					
0–8	.220	.458	.526	118	.776
9–11	.177	.357	.442	196	.679
12	.104	.215	.281	377	.624
13–15	.113	.235	.301	68	.650
16+	.023	.068	.067	44	1.04
Young blacks					
Students	.296	.619	.650	291	.910
Nonstudents	.242	.454	.564	335	.658
Mature whites	.067	.128	.187	3459	.506
Education					
0–8	.088	.163	.242	1274	.488
9–11	.064	.119	.180	708	.471
12	.055	.109	.157	872	.526
13–15	.058	.124	.168	298	.618
16+	.028	.064	.082	343	.667
Mature blacks	.095	.176	.258	1491	.496

NOTE: P_n = the observed probability of unemployment in an n-year period.
p = an average of the n-year single probabilities.
$\hat{P}_n = 1 - (1-p)^n$ assuming p is an independent yearly probability.
$\lambda = \dfrac{P_n - p}{\hat{P}_n - p}$
N = sample size.

There are two possible and not mutually exclusive reasons why the number of people experiencing unemployment sometime in an n-year period is less then n-times the number of unemployed in a single year. First, the experience of unemployment in one year increases the probability of becoming unemployed the next year. The events are dependent in probability because of time or *tenure dependence*: the longer a person stays in the job the less likely he is to separate, hence to become unemployed. The other possibility is independence in probability over time, but differences in sizes of probability across people in the group: those with higher probabilities are more likely to be found unemployed at any time than are others. Both possibilities give rise to the persistence in observed incidence, so that $P_n < np$ and $W_n > w$.

Let us consider the two cases separately.

1. The assumption of homogeneity, that is, $p_i = p$ for all individuals i, with time independent probabilities yields an upper limit for P_n (it is clearly less than np, which would require a negative serial correlation). Denote the upper limit by $\hat{p}_n$, $\hat{p}_n = 1 - (1 - p)^n$. The observed n-year incidence is $P_n \leq \hat{P}_n$, and a natural measure[4] of the degree of persistence is $1 - \lambda$, where $\lambda = P_n - p / \hat{P}_n - p$. When $\lambda = 1$, there is no persistence in the unemployment experience.

2. Assume independence, but heterogeneity. Here the group consists of individuals whose p_i differ. Define $p = E(p_i)$ and $q_i = 1 - p_i$, $q = E(q_i)$. Then $E(\hat{P}_{ni}) = E[1 - (1 - p_i)^n] < 1 - (1 - p)^n$, and $1 - E[(q_i)^n] < 1 - q^n$. The inequality holds because, as is well known, $E[(q_i)^n] > [E(q_i)]^n$. In other words, if homogeneity and independence obtained within each of the subgroups differing in p_i, the observed p_n would be smaller than $\hat{P}_n$ expected on the assumption of homogeneity of the whole group.

In table 8.2, $\lambda = 65.9\%$ for young white nonstudents, so the degree of persistence for this group is 34.1%; it is 49.4% for old NLS whites. Racial differences in λ are small but they are not standardized by education. Among the young, persistence is greater in groups with education levels above high school and it does not change with age. Among the less educated, persistence increases with age. Apparently, tenure dependence is weaker and/or heterogeneity smaller in the young less educated than in the more educated groups. According to our analysis in the next section, this is reasonable if the less educated acquire less firm specific skills on the job. Over time there is a differentiation in these groups into people who acquire job attachments and others who continue to drift. The result is a growth of tenure dependence and of heterogeneity with age.

Of course, the observed P_n will be even smaller if time dependence (or heterogeneity) obtains within the subgroups. Consequently, $\lambda < 1$ may reflect heterogeneity or time dependence or both. The data in table 8.2 cannot distinguish whether it is heterogeneity or time dependence which

produce a less than proportionate increase in incidence and in time spent in unemployment. Regression analyses described in section 8.5 explore these matters further and suggest that both factors are at work in producing the result.

8.4 Incidence of Unemployment and Labor Turnover: Experience and Tenure Profiles

Since it is incidence that is responsible for high levels of youth unemployment, we direct our attention primarily to the analysis of $P(u)$ and secondarily to the question why adult men experience longer spells of unemployment. Spells of unemployment occur, if at all, during job change or during movement between the nonmarket (household, school, the military) and the labor market. They also occur without job change in the case of recalled workers on temporary layoffs.

Unemployment incidence is definitionally related to labor turnover in the probability formula $P(u) = P(s) \cdot P(u|s)$ with recall unemployment excluded. For the sake of completeness, our findings include also recall unemployment (not shown in the text).

Published data classified by age show that the high rates of youth unemployment drop quite sharply to relatively low levels beyond the first half-decade of working life. Table 8.3 shows the age profiles of unem-

Table 8.3 **Job Mobility and Unemployment**

	Men, 1961					
Employed in 1961	18–19	20–24	25–34	35–44	45–54	55–64
Percent job changers (jc)	23.5	24.4	14.9	10.2	7.1	4.0
Percent of jc unemployed	47.7	50.1	46.0	46.7	49.2	54.2
Percent of jc laid off	41.5	43.6	43.8	49.8	58.4	70.6
Percent of jc who quit	58.5	56.4	56.2	50.2	41.6	29.4

SOURCE: BLS, Special Labor Force Report no. 35, *Job Mobility in 1961.*

	Men, 1977					
	18–19	20–24	25–34	35–44	45–54	55–64
Percent with job tenure less than a year in Jan. 1978[a]	69.8	49.6	27.6	16.2	10.5	8.9
Percent with unemployment during 1977[b]	34.5	32.2	17.7	11.8	10.2	9.6

SOURCES: *Job Tenure of Workers, January 1978,* and *Work Experience of the Population in 1977,* unpublished, BLS.

NOTES: [a]Employed in January 1978.

[b]In labor force some time during the year. Includes temporary layoff unemployment.

ployment in relation to labor mobility. The upper panel, based on a 1961 BLS survey (the last available survey of this kind), shows the incidence of unemployment among *job changers*. It suggests strongly that the age profile of unemployment is very much a reflection of the typical age-mobility profile. Almost half of the job changers became unemployed during the year, although this proportion increased somewhat with age. In the lower panel mobility is defined more broadly as the proportion of the labor force that has held the current job (with the current employer) less than a year in January 1978. Unemployment incidence among all men in the labor force and not merely among job changers is shown in the lower row of the lower panel. Here the age curve of incidence is also convex as is the mobility curve, but flatter, expecially beyond age 35. This is because (1) temporary layoff unemployment is included in the figures, which almost doubles the incidence at older ages, and (2), even when temporary layoffs are excluded, the quit/layoff ratios decline with age (see rows 3 and 4 of the upper panel). Since the probability of unemployment is higher following layoffs than quitting, unemployment conditional on separations increases with age. In view of the relatively minor changes in conditional unemployment, the steep decline of youth unemployment in the early years of experience can be attributed to the convex shape of the age curve in labor mobility.

Mincer and Jovanovic (1979) show that the age decline in job separations is due primarily to the fact that the probability of separating declines with tenure in the current job, whether or not the separation is initiated by the worker or the employer. The theory underlying this relation is that the informational process of job matching and the accumulation of specific capital on the job create differences between worker productivity in the current job and elsewhere as well as differences between wages in current and alternative employments. The convexity of the tenure-mobility profile is due to the initially sharp decline in the probability of a separation following a successful job-matching ("probation") period, and an eventual leveling off of $P(s)$ following completion of specific capital accumulation in the firm. The experience (working-age) profile of mobility is easily derived from the tenure profile. Given $s = f(T, x)$ where s is the mobility (separation) rate, T length of tenure, and x length of experience in the labor market,

$$\frac{ds}{dx} = \frac{\partial s}{\partial T} \cdot \frac{dT}{dx} + \frac{\partial s}{\partial x} \tag{3}$$

The negative slope of the tenure curve (relation between tenure and separations) $\partial s/\partial T$ diminishes with T, and dT/dx is positive and nonincreasing.[5] The convexity of the experience mobility curve $s(x)$ is thus due to the convexity of the tenure curve. The "aging effect" $\partial s/\partial x$ steepens the slope of the experience profile but does not affect its convexity. The aging effect represents declines of mobility with experience at

fixed levels of tenure, and is pronounced in quits but not in layoffs (Mincer and Jovanovic, table 1).

The longer a worker stays in a firm the less likely he is to separate. Consequently, he is less likely to become unemployed, unless separations after a longer stay in the firm carry a sufficiently higher risk of unemployment. This may be true of "permanent" (not recalled) layoffs which are less expected by higher tenured employees, while the opposite ought to hold for quits since the opportunity cost of unemployment increases with tenure. These predictions are weakly confirmed in MID regressions, not shown here. The opposing signs of unemployment conditional on quitting, and layoff cancel in total separations so that $P(u|s)$ shows no clear pattern with tenure as is shown in table 8.4.

Consequently, the tenure profile of unemployment should reflect the profile of separation, and the analyses of the experience profile of unemployment incidence can be represented equivalently to equation (3) in:

$$\frac{dp(u)}{dx} = \frac{\partial P(u)}{\partial T} \cdot \frac{dT}{dx} + \frac{\partial P(u)}{\partial x} \tag{4}$$

Decline and convexity of the experience profile of unemployment is thus due, as was true of separations, to the sharp decline and convexity of the tenure profile of incidence.

A comparison of tenure profiles of incidence and of separations is shown in table 8.4. Over the first few years of tenure, the decline in unemployment incidence appears to be somewhat more rapid than the decline in separations for both age and race groups. Aside from a first year decline, the probability of unemployment conditional on separation $P(u|s)$ does not change systematically. However, as we already noticed in table 8.3, $P(u|s)$ is higher at older ages.

Among blacks the age differential in $P(u|s)$ varies over the business cycle. It is observable for 1969–71, but not for 1967–69. As noted before, a similar cycle pattern was observed in age differentials in duration. The age increase in $P(u|s)$ arises mainly from the increase in the layoff/quit ratio (apparent in table 8.3), but also from an increase in the probability of unemployment conditional on layoff $P(u|L)$. However, $P(u|Q)$ decreases slightly with age.[6]

The age increase in the conditional probability $P(u|s)$ is the reason for the absence of an aging effect ($\partial P(u)/\partial x$ in equation [4]) in unemployment in the face of a significant aging effect in separations. At given levels of tenure the difference in $P(u)$ between the young and the old white men is small although the difference is evident among the blacks who show a stronger "aging effect" in separations (temporary layoffs excluded). The age differences also increase in the recession period 1969–71.

We check on the age effect with the MID data which covers the complete age range. The absence of an aging effect in the probability of

Table 8.4 **Incidence of Unemployment by Tenure NLS, 1967–69 (Excludes Temporary Layoffs and Students)**

Tenure as of 1967	Young white men			Young black men			Mature white men			Mature black men		
	$P(U)$	$P(S)$	$P(U\|S)$	$P(U)$	$P(S)$	$P(U\|S)$	$P(U)$	$P(S)$	$P(U\|S)$	$P(U)$	$P(S)$	$P(U\|S)$
0	.262	.686	.381	.448	.753	.594	.244	.472	.491	.264	.472	.560
1	.134	.444	.303	.216	.581	.372	.090	.285	.317	.121	.258	.471
2	.107	.393	.271	.128	.282	.454	.083	.208	.300	.300	.367	.818
3	.067	.278	.240	.231	.577	.400	.053	.187	.286	.167	.208	.800
4	.069	.327	.294	.091	.546	.167	.092	.277	.333	.119	.190	.625
5	.077	.462	.167	.167	.333	.500	.050	.117	.429	.161	.355	.454
6	.059	.118	.500	.000	.333	.000	.051	.136	.375	.154	.231	.667
7	.125	.250	.500	.000	.500	.000	.046	.197	.231	.050	.100	.500
8	.000	.400	.000	.000	.333	.000	.052	.121	.429	.069	.103	.667
9	1.000	1.000	1.000	—	—	—	.050	.175	.286	.059	.176	.333
10–14	.500	.500	1.000	.500	.500	1.000	.028	.089	.320	.046	.110	.417
15–19							.029	.089	.292	.028	.042	.500
20–24							.044	.064	.625	.050	.115	.438
>25							.024	.081	.235	.032	.105	.231
Total	.178	.518	.342	.337	.642	.525	.066	.163	.382	.095	.179	.519
n	(1065)		(552)	(410)		(263)	(2084)		(340)	(892)		(160)

unemployment of whites is confirmed in the MID data even though the period covered (1975–76) was a period of high unemployment. A regression of $P(u)$ on experience x, defined as years spent in the labor force, yields the equation (t-ratios in parentheses):

$$P(u) = .162 - \underset{(2.7)}{.006x} + \underset{(1.8)}{.001x_2} \tag{5}$$

When job tenure T is included in the equation, the effect of x vanishes. Tenure effects are strong: unemployment declines twice as rapidly over a year of tenure than over a year of experience.

$$P(u) = .172 - \underset{(.9)}{.002x} - \underset{(.8)}{.00004x^2} - \underset{(4.3)}{.0132T} + \underset{(2.8)}{.0003T^2} \tag{6}$$

Both the experience profile in (5) and the tenure profile in (6) are convex.[7] Clearly, $P(u)$ *does not depend on* x, *but on* T. In other words, unemployment declines with age not because of aging but because of the lengthening of tenure: $dT/dx > 0$ and $\partial P(u)/\partial x = 0$ in equation (4).

The conclusion must be that the short tenure level of the young is the main reason for the age differential in the incidence of unemployment. By definition, new or recent entrants and reentrants into the labor market have short levels of tenure. The fact that their unemployment incidence is not higher than the incidence of older men at comparable levels of tenure suggests that it is not behavior or circumstances peculiar to young people, but the dynamics of "job shopping" in the labor market which is largely independent of age.

Does the finding of similar incidence at comparable tenure levels of the young and the old mean that youth unemployment is not excessively high? Not necessarily. One may argue that turnover is excessively high, so that tenure is unduly short among the young. One may also argue that older job movers with whom we are comparing the early tenured young represent an adverse selection of unstable workers. There is some evidence that this suspicion is correct: older men with short tenure tend to be persistent movers whose wages and wage progress over their careers are lower than those of stayers, while such differences (between movers and stayers) are negligible among the young (Mincer and Jovanovic 1979, tables 5 and 6).

Is it excessive turnover or is it newness in the labor market that produces the high early unemployment of the young? It is possible that among workers of *comparable quality* a first encounter with the labor market produces more turnover and unemployment than at early levels of tenure on any subsequent job. Being new in a labor market is an experience not restricted to the young. We may, for instance, compare the young with international and internal migrants of all ages who also encounter a new labor market. Since migrants do not represent an

adverse selection, indeed the opposite is argued and shown to be the case in migration studies (e.g., Chiswick 1978), their unemployment is not likely to reflect *excessive* turnover.

Table 8.5 presents comparisons between the unemployment experience of migrants (of all ages) and of young natives: while unemployment rates of young nonmigrants (aged 18–24) are over twice as high as the rates of adult men, the rates of men who arrived in the U.S. from abroad were twice as high as the youth rate in *all* age groups (panel A). The reason the immigrant rates are higher is because they had at most only a year of experience in the U.S. labor market, certainly less that the (18–24) youths had on average. Rates of the immigrants are comparable to the unemployment rates of men who entered or reentered the labor force during the year (panel B), and, indeed, are somewhat higher than the rates of young (18–24) men who have less than a year of experience in the labor market.

In panel C immigrants (regardless of age) are compared with natives of the same educational level (high school, the largest group) by *years of experience* in the U.S. labor market. During the first two years the unemployment rate of immigrants is somewhat higher than of the young natives but it declines more rapidly. Initial handicaps (perhaps language) in settling in a job are overcome more quickly by immigrants. The slower

Table 8.5 Unemployment Rates of Men by Migration Status

(A) Newly Arrived Migrants, March 1963 (migration after March 1962)

	All	18–24	25–44	45–64
Nonmigrants	5.5	11.2	4.8	4.8
Migrants	12.2	15.5	9.2	16.7
Immigrants	22.1	22.9	18.0	22.5

(B) Labor Force Entrants (not in labor force, March 1962; in labor force, March 1963)

	All	18–24	25–44	45–64
Nonmigrants	20.0	19.6	18.5	23.0
Migrants	18.6	21.5	15.0	22.4

SOURCE: BLS, Special Labor Force Report no 44, *Geographic Mobility and Employment Status*.

(C) Immigrants and Natives by Experience 1970 Census Week

Experience	0–2	2–4	4–6	6–8	8+
Natives	9.3	6.0	4.7	4.1	2.0
Immigrants	11.4	3.5	2.5	3.4	1.9

SOURCE: DeFreitas (1979).

rate of decline among the young reflects the change from single to married status and from part-time, part-period to full-time, full-period work. Thus, although the high initial turnover and unemployment of the young men are no greater than those of immigrants, a group that is highly motivated and committed to the labor market, the decline in turnover and unemployment is slower. The growth of commitment to the labor market takes time in the transition from dependent member of parental household to head of own family, with the mix of school, leisure, and work shifting toward the latter in the allocation of time. The significance of these factors in affecting unemployment incidence is shown in regression analyses to be described in the next section.

Internal migrants represent a group which is intermediate in an informational and cultural sense between immigrants and native experienced (nonmigrant) workers. Their unemployment rates are lower than those of immigrants during the first year in the new location and comparable to the rate of young nonmigrants (row 2 of panel A). Again, this comparison is biased because the young nonmigrants have had more than one year of labor market experience, while the migrants have been only a year or less in the new location.

Table 8.6 drawn from the NLS data, compares the incidence of unemployment of migrants during the first four years in the new labor market with the unemployment of young men with at most four years of labor market experience in 1967. Migrants who were unemployed at origin just before migrating were eliminated from the sample so as to avoid a possible adverse selection which would bias upward the destination unemployment of migrants. Within-firm geographic transfers were also eliminated to avoid an opposite bias. Temporary layoffs were excluded, and the sample restricted to nonstudent, white men. The results are that incidence of adult married migrants was 14%, about the same as for the young married men, and 19% for the nonmarried adult migrants compared to 26% for young single men. Inclusion of temporary layoff unemployment raises the figures for the young somewhat more than for the older migrants, the reverse of the general case.

We think it is fair to conclude that the major circumstance responsible for high youth unemployment is newness in the labor market rather than young age and unstable behavior. This is not to say, however, that the frequency of unemployment among the young stands in an immutable ratio to that of adults. Increases in young cohorts consequent on the "baby boom" create larger proportions of young workers with short tenure. Similarly, longer schooling means that work experience and tenure are shorter at a given age (e.g., 18 years), so that unemployment of young nonstudents is more prevalent (relative to adult unemployment) in countries with higher educational attainment. Of course, the partial labor market commitment of youths in transition between school and

Table 8.6 **Incidence of Unemployment NLS White Men, 1967–69**

	All	Married	Not married
	(excludes temporary layoffs)		
Mature men 0–4 years residence in 1967	.148	.141	.187
n	(859)	(786)	(73)
Young nonstudents experience 0–4 years in 1967	.189	.128	.260
n	(644)	(344)	(300)
	(includes temporary layoffs)		
Mature men 0–4 years residence	.168	.165	.188
Young nonstudents 0–4 years experience	.230	.160	.310

NOTE: Respondents with unemployment in place of origin are deleted.

family status is a factor in greater turnover as is the interruption of work experience by military service. Minimum wage legislation may also be important although its impact on employment and labor force participation is probably stronger than on unemployment or on turnover (Mincer 1976). Note that black youths were not included in our comparisons with migrants and we have already seen that their unemployment incidence exceeds not only that of whites but also that of black adults at comparable levels of tenure, especially in early tenure where most unemployment is concentrated.

8.5 Factors Affecting the Incidence of Unemployment

The apparently close relation between turnover and unemployment suggests that some or most of the variables that affect separations are factors which also affect unemployment. We ascertain these factors and the similarity of their effects in parallel regressions of separations and of unemployment incidence on the same set of independent variables.

As is well understood in the analysis of labor mobility, the observed reduction of separation probabilities as tenure lengthens may be a statistical illusion rather than a description of individual behavior. Suppose that individual propensities to move are not reduced by tenure but still differ among workers. In that case, the estimated tenure profile of mobility $S(T)$ observed across a sample of workers will have a downward slope and will be convex as well. Persons with high propensities to move separate at early levels of tenure while those with lower propensities stay on for longer periods. As only stayers remain in long tenure classes, the

apparently declining tenure curve would level off at low separation rates in the long-tenured classes.

Much the same phenomenon may be expected to appear in the statistical treatment of umployment incidence. Unemployment risk may not be related to duration of job tenure, yet differences among individuals in the unemployment risk to which they are subject can create exactly the same spuriousness in the tenure profile, given the relation between separation and unemployment. Actually, heterogeneity and "tenure dependence" are not mutually exclusive hypotheses regarding labor mobility and unemployment incidence. Indeed, the theory of job sorting and of acquisition of specific human capital implies heterogeneity in levels and slopes of tenure profiles (Mincer and Jovanovic 1979). Therefore heterogeneity does not fabricate an unreal tenure curve: it merely steepens the slope of the real (average) tenure curve.

Differences in levels of tenure profiles can be indexed by observations on past mobility behavior. If so, their inclusion in the regression should reduce the bias in the tenure slope. Other measured factors represent heterogeneity not captured by the limited observations on past mobility. Their inclusion further reduces the tenure slope while increasing the explanatory power of the regressions.

A comparison of the separation and unemployment regressions shows that the probability of unemployment is, just as labor mobility, subject to tenure dependence and that individual characteristics, such as education, health, marital status, local unemployment rate, and job training, affect the probabilities of separation and of unemployment, given tenure. These regressions appear in tables 8.8 and 8.9 for NLS young white nonstudents (1969–71), in tables 8.10 and 8.11 for the MID (1976–76), and in tables 8.12 and 8.13 for mature NLS men (1969–71). For the NLS, the dependent variables are defined as number of separations and number of unemployment spells during the period; for the MID survey, as the probability of separation and the probability of unemployment respectively. Results are similar for both number and incidence of events; however, we refer to both as incidence of unemployment and separation. Temporary layoffs are excluded. Comparable regressions covering the period 1967–69 for NLS, and 1973–74 for MID both including and excluding recall unemployment are available in the appendix. With minor exceptions, inclusion of recall unemployment yields qualitatively similar results. Sample means of the independent variables appear in table 8.7. The following regression variables are used in the tables:

X	Number of years since beginning the first job after leaving full-time school.
T	Duration of job held at beginning of interval.
JTRAIN	One if respondent received any training while employed in the job held at beginning of interval.

Table 8.7 Sample Means for Separation and Unemployment Regressions

	NLS 1969–71				MID 1975–76
	Young whites	Mature whites	Young blacks	Mature blacks	Whites
X	4.63	35.64	4.45	37.02	18.65
X^2	33.31	1317.16	30.05	1424.30	515.59
T	1.61	13.15	1.10	10.89	7.18
T^2	6.95	313.83	4.84	236.73	112.13
JTRAIN	.221	—	.083	—	—
PTRAIN	.369	—	.228	—	—
LOCRATE	4.88	3.80	5.24	4.35	8.38
PSEP	3.81	.496	4.19	.570	.093
PCOND	.163	.068	.328	.111	.113
EDUC	12.21	10.53	10.35	7.31	12.65
HLTH	.042	.222	.020	.192	.074
GOV	.114	.187	.109	.231	.196
UNION	.318	.378	.323	.457	.308
MARRY	.626	.912	.448	.800	.908
PTIME	.137	.086	.167	.137	.030
OLF	.328	.200	.405	.253	.051
SEP	.852	.278	1.01	.323	—
SEP^2	2.63	.541	2.73	.589	—
ENTRY	.472	—	.601	—	.153
n	1351	1957	504	866	1562

PTRAIN One if respondent received any training aside from regular school prior to job held at beginning of interval.

LOCRATE Unemployment rate for labor market of current residence.

PSEP Prior separations per year since 1966 (NLS); probability of separation per year since 1968 (MID).

PCOND Ratio of prior unemployment spells to prior separations (NLS); prior unemployment incidence (MID).

EDUC Completed years of education.

HLTH One if health is poor.

GOV One if public employee.

UNION One if wages are set by collective bargaining.

MARRY One if married, spouse present.

PTIME One if 34 hour workweek or less.

OLF One if incidence of nonparticipation in current period (NLS); one if incidence of nonparticipation in prior years (MID).

SEP Number of job separations.

ENTRY Number of spells of nonparticipation (NLS); one if incidence of nonparticipation (MID).

Table 8.8 The Determinants of Separations for Young White Men, NLS 1969–71

	β	*t*	β	*t*	β	*t*
	(1)		(2)		(3)	
CONST	1.12		.749		1.50	
X	−.110	3.23	.064	1.76	.056	1.50
X^2	.007	2.61	−.003	1.16	−.003	1.06
T			−.264	4.99	−.188	4.70
T^2			.022	3.36	.015	3.01
JTRAIN			−.260	2.61	−.150	1.55
PTRAIN			−.001	.00	.053	.92
LOCRATE			.014	.57	.008	.34
PSEP			.040	4.66	.036	4.41
PCOND			.147	1.80	.045	.57
EDUC					−.064	3.83
HLTH					−.202	1.16
GOV					−.101	.99
UNION					−.159	2.10
MARRY					−.261	3.28
PTIME					.283	2.78
OLF					.613	7.96
R^2	.008		.102		.173	
$\bar{Y}$	.852					
n	1351					

NOTE: β = regression coefficient.
$\bar{Y}$ = mean of the dependent variable.

The first column of the separation and incidence regressions in tables 8.8–8.13 shows an experience profile which disappears once tenure is added. This means that within the observed age range (which is limited in the NLS), probabilities of both separation and unemployment are the same as given levels of tenure regardless of experience. In the complete age range (available in the MID data) the inclusion of tenure reduces but does not eliminate experience effects on separations. However, such "aging effects" are eliminated in the unemployment incidence equations.

Next, the inclusion of heterogeneity indices of past behavior and of heterogeneity factors (col. 3) reduces the tenure slope in both separations and in unemployment incidence. Most of the reduction is achieved when prior mobility indices are added to tenure. As an example which holds in all the regressions, compare column 2 in table 8.11 with equation (6) above. Both prior separations (per year) and prior unemployment (conditional on separations) were used as indices in NLS. Prior unemployment incidence is unconditional in MID. Tenure remains significant after all other variables are included.

Two training variables were used in the young NLS regressions: training on the current job and training prior to the current job. Of these only the first approaches statistical significance and, as would be expected on

Table 8.9 **The Determinants of Spells of Unemployment for Young White Men, NLS 1969–71**

	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*	Spells among separators and entrants β	*t*
	(1)		(2)		(3)		(4)		(5)		(6)	
CONST	.642		.115		.650		.007		−.056		.337	
X	−.068	2.61	.039	1.39	.035	1.20			−.004	.17	.007	.35
X^2	.004	1.79	−.002	1.08	−.002	1.13			−.000	.21	−.001	.44
T			−.163	3.97	−.120	2.97			−.032	1.06	−.039	1.26
T^2			.013	2.62	.010	1.95			.002	.69	.002	.43
JTRAIN			−.078	1.01	−.005	.07			−.381	1.14	.054	.84
PTRAIN			−.045	.74	−.008	.14				.88	−.018	.46
LOCRATE			.064	3.41	.056	3.03			.054	3.94	.028	2.28
PSEP			.023	3.56	.021	3.31			.002	.51	.005	1.21
PCOND			.244	3.84	.172	2.71			.153	3.30	.076	2.14
EDUC					−.043	3.29			−.011	1.17	−.015	1.69
HLTH					−.117	.85			.002	.00	.008	.01
GOV					−.095	1.07			−.046	.69	−.073	1.04
UNION					.081	1.32			.151	3.43	.105	2.58
MARRY					−.239	3.87			−.101	2.17	−.061	1.45
PTIME					.160	1.94			.001	.03	−.022	.41
OLF					.350	5.75			—	—		
SEP							.434	14.79	.408	13.53		
SEP^2							.017	3.95	.019	4.43		
ENTRY							.063	2.31	.028	1.03		
R^2	.007		.082		.133		.505		.521		.035	
$\bar{Y}$	.452										.315	
n	1351										737	

Table 8.10 **The Determinants of the Incidence of Separation for White Men, MID, 1975–76**

	β	*t*	β	*t*	β	*t*
	(1)		(2)		(3)	
CONST	.266		.228		.452	
X	−.010	3.92	−.007	2.37	−.007	2.42
X^2	.0002	2.58	.0001	1.98	.010	1.70
T			−.010	2.51	−.012	3.07
T^2			.0002	1.44	.0003	1.95
LOCRATE			.001	.20	.001	.48
PSEP			.166	3.02	.136	2.44
PCOND			.124	2.85	.094	2.05
EDUC					−.010	2.74
HLTH					.090	2.64
GOV					−.027	1.22
UNION					−.024	1.18
MARRY					−.073	2.38
PTIME					−.122	2.24
OLF					−.070	1.59
R^2	.024		.056		.075	
$\bar{Y}$	.149					
n	1562					

specific capital grounds, it reduces both separations and unemployment incidence.

Unemployment incidence is positively affected by the local level of unemployment which, however, does not affect separations. This finding appears in the NLS regressions for young men in both periods (1969–71 and 1967–69) and in MID regressions for 1973–74 and less strongly for 1975–76. We also find that the local rate is not related to quits but is positively related to layoffs. These findings suggest that differences in local unemployment reflect differences in local demand for labor somewhat more clearly than differences in turnover. It it were turnover only, local rates would be positively related to separations, which is not observed. If only labor demand differs, there would be no relation between the local unemployment rate and separations, a positive relation with layoffs, both of which are observed, and a negative relations with quits, which is not observed.

Both separations and unemployment incidence are negatively related to education and to marital status among the young. Short hours (part-time work) and nonparticipation some time during the year (or in prior years) are associated with higher probabilities of separation and of unemployment in the young NLS data and in the MID data for 1973–74. (In 1975–76 part-timers appear to have fewer separations and the effect of part-time work on unemployment incidence disappears.)

Table 8.11 **The Determinants of the Incidence of Unemployment for White Men, MID 1975–76**

	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*	Incidence among separators and entrants β	*t*
	(1)		(2)		(3)		(4)		(5)		(6)	
CONST	.162		.099		.296		.018		.090		.769	
X	−.006	2.73	−.003	1.26	−.001	.57			−.0001	1.28	.013	1.17
X^2	.0001	1.74	.0001	1.08	−.000	.00			.002	.98	−.0003	1.28
T			−.008	2.58	−.007	2.06			−.001	.46	−.0001	.00
T^2			.0002	1.63	.0001	1.32			.000	.33	−.000	.45
LOCRATE			.003	1.20	.004	1.60			.003	1.62	.020	1.69
PSEP			.100	2.10	.114	2.52			.052	1.40	.076	.47
PCOND			.246	7.10	.209	5.68			.166	5.43	.387	2.86
EDUC					−.010	3.53			−.006	2.38	−.034	2.36
HLTH					.050	1.82			.010	.42	−.009	.00
GOV					−.043	2.37			−.030	2.04	−.042	.47
UNION					−.015	.94			−.005	.37	.051	.69
MARRY					−.084	3.40			−.052	2.49	−.204	2.20
PTIME					.034	.76			.087	2.40	−.125	.46
OLF					.105	3.00			.131	4.48	.239	1.33
SEP							.475	28.08	.451	26.50		
ENTRY							.034	2.01	.018	1.10		
R^2	.012		.047		.103		.336		.383		.112	
$\bar{Y}$	.094										.498	
n	1562										231	

Table 8.12 **The Determinants of Separations for Mature White Men, NLS 1969–71**

	β	*t*	β	*t*	β	*t*
	(1)		(2)		(3)	
CONST	.478		.480		.294	
X	−.019	1.71	−.016	1.62	−.005	.56
X^2	.0004	2.19	.000	1.89	.000	.47
T			−.019	4.85	−.014	3.97
T^2			.0004	4.08	.0003	3.29
LOCRATE			.003	.35	.004	.43
PSEP			.177	18.66	.164	18.31
PCOND			.080	2.32	.021	.62
EDUC					.003	.62
HLTH					.042	1.35
GOV					−.083	2.48
UNION					−.000	.00
MARRY					−.064	1.41
PTIME					.078	1.69
OLF					.505	15.22
R^2	.004		.235		.326	
$\bar{Y}$	.278					
n	1957					

Union membership reduces separations and has no significant effect on incidence, unless temporary layoff unemployment is included when the effect becomes positive. Employment in the government sector has a weak negative effect on separation and on unemployment in the young NLS, but both effects are stronger at older ages (MID and NLS).

Bad health has no clear effects on separations and a positive effect on unemployment incidence in 1967–69 in the young NLS sample. Both effects are positive in the MID but not clear in the older NLS samples.

The following conclusions may be drawn. Regression results strongly support the turnover hypothesis of unemployment incidence. To the extent that differences in job sorting and specific capital processes underlie variation in labor mobility across people, they are important in creating differential unemployment. Therefore both tenure dependence and heterogeneity are characteristic of unemployment incidence as they are of separations. Factors which account for the convex (decelerating) decline of the incidence of unemployment with age are lengthening of tenure with age, change from single to marital status, and the shift from part-time and part-period work activities to full-time work.

We should note the relevance of marital status, part-time work, and nonparticipation in understanding the comparison with migrants in table 8.5 (panel C). The transition from school to market and from parental to one's own household which is observed in a cross-section of young people is gradual. It results in a slower decline of separation (lengthening of

Table 8.13 **The Determinants of Spells of Unemployment for Mature White Men, NLS 1969–71**

	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*	Spells among separators and entrants β	*t*
	(1)		(2)		(3)		(4)		(5)		(6)	
CONST	.248		.245		.266		.000		.147		.383	
X	−.011	1.41	−.010	1.42	−.088	1.26			−.006	1.22	.004	.24
X^2	.0002	1.62	.0002	1.51	.0001	1.25			.000	1.34	−.000	.24
T			−.006	2.41	−.005	1.99			.000	.03	.008	1.01
T^2			.0001	1.63	.0001	1.18			−.000	.64	.000	.01
LOCRATE			.001	.09	.001	.16			−.001	.27	−.002	.10
PSEP			.098	14.74	.096	14.34			.014	2.54	.010	.98
PCOND			.097	4.00	.086	3.49			.077	4.14	.102	2.04
EDUC					.002	.60			.001	.34	.010	1.30
HLTH					−.015	.63			−.027	1.54	−.102	1.77
GOV					−.007	2.70			−.029	1.56	−.155	1.89
UNION					.008	.39			−.003	.17	−.027	.46
MARRY					−.063	1.87			−.036	1.41	−.086	1.05
PTIME					−.011	.31			−.043	1.66	−.085	1.10
OLF					.110	4.45			−.089	4.37		
SEP							.286	13.77	.302	13.05		
SEP^2							.061	10.35	.054	8.91		
R^2	.001		.163		.174		.516		.528		.051	
$\bar{Y}$	.112										.367	
n	1957										391	

tenure) compared to the experience of largely adult migrants, whose work in the new labor market was the major reason for migration.

A comparison of unemployment $P(u)$ regressions with separation regressions leaves out questions about the conditional probability of unemployment. This probability $P(u|s)$ enters the product in $P(u) = P(s) \cdot P(u|s)$. It was shown to increase with age in contrast to both $P(s)$ and $P(u)$. What are the factors associated with $P(u|s)$ and why does it increase with age? We try to estimate factors affecting $P(u|s)$ in two ways. In "augmented regressions" we add separation variables to all the others (col. 5 of the tables) and study factors affecting unemployment given separations. The alternative procedure is to restrict the regressions to workers who moved, that is, to job separators as well as to entrants and reentrants (col. 6). These we call "restricted regressions."

In both kinds of regressions the variables that remain significant are the local unemployment rate, prior conditional unemployment, marital status, education, and, less clearly, part-time work. Union membership becomes positive and significant at least in the 1969–71 period. Similar results are found in MID regressions. The variables show higher t-scores in the restricted regressions (col. 6), but the bulk of "explanatory power" in the augmented regressions is due to the turnover variables. For example, in the 1969–71 NLS sample of young men these variables produce an $R^2 = .505$ which increases only to .521 when all the factors are added.

Table 8.3 suggested that both separations and unemployment are more heavily weighted by layoffs than by quits at older ages. Some of the variables that are significant in affecting conditional unemployment in the regressions are apparently more closely associated with layoff unemployment. This is true of the local unemployment rate, as already noted. Prior conditional unemployment must be weighted toward layoff, since unemployment conditional on layoffs is twice as high as unemployment conditional on quitting. The same holds for unemployment of union members. However, education, marital status, and short hours affect both quits and layoffs and so affect the conditional in each type of separation.

Altogether, the NLS regressions are not very helpful in explaining the age increases in conditional unemployment. Lower levels of education and of health and more frequent union membership among the old account for a part of it. The other variables have no or even opposite effects on age patterns. That the variables we were able to measure do not account for the growth of conditional unemployment with age is apparent in observing the effects of experience on incidence in the regressions restricted to job movers. The effect is positive in the older NLS (ages 48 and over), and less so in MID (average age near 40) before and after all other variables are included. There are no experience effects in the restricted regressions within the first decade of work experience (the young NLS sample). Evidently, the probability of unemployment, when

separating, increases at adult ages within each of the classes (levels) of the variables we have measured.

8.6 Conditional Unemployment and Age Differences in the Duration of Unemployment: A Search Model

Although we are not able to ascribe much of the higher conditional unemployment at older ages to the factors we have measured, we know that it is largely associated with the increased layoff/quit ratio. Why does quitting decline more rapidly at older ages than do layoffs?

At given tenure levels a worker's incentives to quit decline as he ages because the payoff period to whatever benefit his quitting might produce is getting shorter. Furthermore, we suggest that potential job changers encounter a diminished probability of finding a job at older ages. There are several possible reasons for this. Short prospective tenure inhibits hiring by employers in the presence of hiring or training costs. A record of job mobility at older ages is a deterrent to hiring for the same reasons, insofar as it suggests a higher probability of further separation as it does in our findings. On the supply side, workers' human capital, even if not specific to the firm, becomes progressively more specialized to a narrower cluster of firms within an industry or occupation. The proportion of job changers who also change industry and occupation diminishes at older ages.[8]

In the terminology of search models, we argue that, on average, older workers who separate from jobs have a lesser probability of finding a job per unit of search time, not because they are holding out for a higher acceptance wage within the relevant wage offer distribution (though it is true of some), but because the probability of getting any offer, that is, the probability of finding a vacancy, is smaller. On this assumption we can show that older workers who separate will search longer when unemployed, and quit less frequently, while their acceptance wage will be relatively lower, so the wage gain will be smaller (or negative) for older job movers than for younger ones.

In the standard search model, the individual samples from his wage offer distribution $f(w)$ receiving one offer per unit of time. The worker decides on an optimal wage floor which equates the gain from an additional unit of search to the cost of it. The resulting rule is:

$$P_a(\bar{W}_a - W_a) = c = W_a - z \tag{7}$$

where W_a is the lowest acceptable wage, P_a is the probability of getting an acceptable wage offer, that is, of $W \geq W_a$, $\bar{W}_a$ the mean of all acceptable wage offers; c is the (marginal) cost of search which includes opportunity and other costs. The highest opportunity cost or foregone wage is W_a.

Income offsets z which are contingent on continued search, such as unemployment compensation or the current wage when searching on the job, enter costs with a negative sign. Duration of search D is inverse to P_a. In this model search is longer the higher the acceptance wage, which is higher the lower cost of search.

Now the probability of accepting a wage offer must be redefined given that the probability of finding any offer in a unit period can be less than 1. A lesser frequency of vacancies may be a result of depressed business conditions in general, or depressed markets for a particular type of labor, or a function of lesser efficiency or intensity of search. The optimum condition becomes:

$$p \cdot P_a (\bar{W}_a - W_a) = c = W_a - z \tag{8}$$

Here p is the probability of finding a job offer, P_a the probability of finding an acceptable job conditional on finding a vacancy, and $p \cdot P_a$ is the probability of finding an acceptable job. D is now the inverse of the product $p \cdot P_a$. As before, changes in c produce a positive relation between W_a and D. However, changes in p over the business cycle or otherwise, or differences in p across people, tend to produce a negative correlation between W_a and D.

A reduction in p leads to a downward revision of W_a, hence to an increase in P_a. The question is whether $p \cdot P_a$ will rise or fall in (8). No perfectly general answer can be given to this question, but a most plausible answer is that $(p \cdot P_a)$ will fall, hence the duration of search will lengthen even though W_a is revised downward in consequence of a fall in p.[9] It is easy to see that the difference $(\bar{W}_a - W_a)$ increases as W_a is lowered in a uniform or triangular wage offer distribution. When W_a is reduced, $\bar{W}_a$ is reduced by a smaller amount, so that $p \cdot P_a$ must fall if c is fixed or reduced. Actually, c will be reduced since lowering of W_a will lead to a fall in foregone wages when search is continued.

An increase in $(\bar{W}_a - W_a)$ implies an increase in the ratio $\bar{W}_a / W_a$ when W_a is reduced. It can be shown that $d(\bar{W}_a / W_a) / d W_a \leq 0$ for a wide class of functions. Consequently, our conclusions hold more generally since equation (8) can be rewritten in ratio form:

$$p \cdot P_a \left(\frac{\bar{W}_a}{W_a} - 1\right) = 1 - \frac{z}{W_a} \tag{9}$$

Only an unusually high skew in the distribution, such as in the Pareto distribution, yields a fixed $\bar{W}_a / W_a$ whatever the position of W_a. Even then $p \cdot P_a$ will fall as does the right-hand expression.

The conclusion that a lower p is very likely to produce longer search and lower acceptance wages holds both for unemployed and for employed searchers. In the latter case, $c = W_a - W_o$, where W_o is the wage paid on the job. An increased duration of search on the job, of course, means a reduction in the frequency of quit.

In sum, workers facing fewer vacancies in their search may be expected to have a longer duration of search and a lesser wage gain when unemployed, and to inhibit their job change (quitting) when employed. These conclusions are consistent with worker behavior during the business cycle: duration of unemployment increases and quits decline while layoffs increase, partly because employment demand declined and partly to substitute for a decline in attrition (quits). Note that in contrast to other models this explanation of behavior during the business cycle does not assume myopia or lags in adjustment.[10]

Applying the same model to the life-cycle, we may argue that either p or c declines at older ages. A decline in c is not plausible except very early when labor market entrants become eligible for unemployment compensation. A decline in c would lead to increases in W_a and in wage gains, but the opposite is implied by a fall in p and is observed. The implications that older men have a longer duration of unemployment, a reduced Q/L ratio, and a lower W_a when changing jobs are strongly confirmed by the data in table 8.14. The shorter duration of unemployment of the young is also due partly to relatively frequent interlabor force mobility. Again, this is characteristic of very early labor force behavior and cannot account for the age-uptrend in duration of adult unemployment. Nor can this upturn be ascribed to the somewhat longer duration of layoff than of quit unemployment. Duration increases with age in both cases. Table 8.14 shows that a similar search interpretation can be given to unemployment differentials by race and, somewhat less clearly, by education. We elaborate on the race differentials in the next section.

Although we have no direct evidence on the reduction of p at older ages, $P(u \mid L)$ may be a good index. It increases with age, is inverse to education, and is higher for blacks. The only exception is that $P(u \mid L)$ is

Table 8.14 **Conditional Unemployment and Duration NLS, 1967–69 (excludes temporary layoffs and students)**

	$P(U\|S)$	$P(U\|L)$	Q/L	Average duration	Δw
Young whites	.342	.573	4.66	5.30	.816
Education					
0–11	.423	.641	4.26	5.74	.827
12	.329	.546	4.78	5.20	.842
⩾13	.218	.471	5.36	3.93	.744
Young blacks	.525	.607	3.03	6.33	.608
Mature whites	.382	.623	1.62	9.99	.658
Education					
0–11	.443	.655	1.25	9.90	.543
12	.313	.640	2.20	10.29	.322
⩾13	.268	.385	3.00	10.03	1.830
Mature blacks	.519	.725	1.17	11.35	.414

NOTE: Δw = wage gain from job change.

less for the older, more educated whites compared to young whites in the same category.

In sum, as large as they are, age differentials in unemployment rates are attenuated by the longer duration of unemployment and higher probability of unemployment of older movers. Both the longer duration and the higher conditional probability of unemployment of older men can be ascribed to the decline in the probability of finding vacancies at older ages. Young white job changers face, on average, a more favorable environment in this respect.

8.7 Black/White Differences in Youth Unemployment

Black youth unemployment has grown relative to white youth unemployment over the past two decades or longer. A fuller understanding of the present differential, therefore, requires an analysis of this trend. This is beyond the scope of our present work. We did, however, replicate the statistical analyses on black data, and report some of the findings.

The salient features in the racial unemployment differentials are higher incidence, longer duration, and greater nonparticipation among black youths as shown in table 8.1. Those differences hold for both students and nonstudents. Age comparisons in 1966–67 and 1967–69 show that the duration of black youth unemployment is not much shorter than the duration of unemployment of older blacks. Since the race differential in duration of older men's unemployment is small, it is not clear whether our NLS sample of older blacks understates their adverse position or whether our findings about the young are, indeed, an indication of deterioration of labor market conditions in present cohorts of black youths. But these inferences are not mutually exclusive.

The longer duration of black youth unemployment compared with that of white youths is mirrored in table 8.4 in higher conditional unemployment at each level of tenure. The higher incidence of unemployment of black youths is due both to the higher separation rates and to higher conditional unemployment at fixed levels of tenure. The result is that while the black separation rates are 20% higher than the white rates, the black incidence of unemployment is twice as high as the white.

Table 8.14 shows also that the black conditional unemployment $P(u|s)$ is higher than the white largely because Q/L, the quit/layoff ratio is lower, and also because both conditional $P(u|L)$ and $P(u|Q)$ are higher.[11] Using the search model argument of the preceding section, we may conclude that because blacks face a lower probability of finding vacancies than do whites, their duration of unemployment is longer, wage gain smaller, and quit/layoff ratio lower. It has been noted that black quit rates are not higher than rates of whites.[12] In our interpretation, this does not suggest an equally stable work experience: total separations of blacks

are higher, but quits are inhibited because of an adverse labor market, and some of the excess layoff is in part a substitution for reduced quitting.

Some of the factors that appear to influence the higher black separation rates and their slower decline with experience are suggested in comparisons of black and white regressions in tables 8.15 and 8.16. The effects of experience on separations and on unemployment incidence of blacks are not significant in the MID sample and are positive in the young NLS sample. These findings may not be inconsistent, since the quadratic experience term in the NLS black regression has a negative coefficient and implies that the positive effect vanishes within less than a decade (the MID sample is over a decade older). Similarly, tenure is not significant in the black MID sample, though it is negative and significant in the NLS sample of young blacks. The tenure effects are somewhat weaker, and the effect of training on the current job is, if anything, positive rather than negative in the black sample. This suggests that blacks receive not only less training, but also a lesser specific component of it. Marital status, which reduces separations of whites, has little effect on separations of blacks in NLS and MID and on unemployment of blacks in MID. Education reduces unemployment of blacks for 1973–74 but not for 1975–76 in the MID sample. At the same time, prior unemployment conditional on separation predicts future separations more sharply among blacks than

Table 8.15 **The Determinants of Separations for Young Black Men, NLS 1969–71**

	β	*t*	β	*t*	β	*t*
	(1)		(2)		(3)	
CONST	1.32		.482		.432	
X	−.072	1.24	.138	2.17	.166	2.65
X^2	.000	.00	−.012	2.50	−.015	3.00
T			−.231	3.59	−.180	2.90
T^2			.019	3.04	.015	2.48
JTRAIN			.059	.28	.315	1.50
PTRAIN			−.041	.03	.038	.30
LOCRATE			.012	.38	.005	.16
PSEP			.070	4.71	.074	5.21
PCOND			.267	2.66	.239	2.46
EDUC					−.012	.58
HLTH					−.264	.68
GOV					−.332	1.85
UNION					−.479	4.07
MARRY					−.015	.13
PTIME					.368	2.53
OLF					.537	4.82
R^2	.023		.126		.203	
$\bar{Y}$	1.01					
n	504					

Table 8.16 **The Determinants of Spells of Unemployment for Young Black Men, NLS 1969–71**

	β (1)	*t*	β (2)	*t*	β (3)	*t*	β (4)	*t*	β (5)	*t*	Spells among separators and entrants β (6)	*t*
CONST	.931		.264		−.182		.038		−.397		.040	
X	−.045	.86	.119	2.09	.172	3.07			.079	1.77	.089	2.11
X^2	−.001	.19	−.011	2.44	−.014	3.15			−.006	1.75	−.009	2.32
T			−.208	3.58	−.173	3.09			−.071	1.39	−.144	3.60
T^2			.017	3.14	.016	2.89			.007	1.59	.014	3.33
JTRAIN			.195	1.04	.354	1.87			.157	1.01	.204	1.49
PTRAIN			.071	.59	.072	.62			.062	.65	.013	.17
LOCRATE			.016	.55	.020	.75			.020	.89	.023	1.30
PSEP			.046	3.40	.051	3.96			.012	1.11	.007	.90
PCOND			.265	2.94	.185	2.07			.049	.66	.008	.14
EDUC					.014	.71			.021	1.34	.016	1.22
HLTH					.868	2.50			.986	3.47	.664	3.27
GOV					−.158	.99			.010	.17	.025	.20
UNION					−.185	1.75			.090	1.04	.010	.14
MARRY					−.242	2.30			−.244	2.98	−.120	1.79
PTIME					.220	1.69			.019	.17	−.074	.93
OLF					.534	5.26			—	—		
SEP							.673	9.85	.622	8.83		
SEP^2							−.026	1.93	−.020	1.50		
ENTRY							.313	2.04	.082	1.69		
R^2	.018		.102		.179		.435		.458		.065	
$\bar{Y}$	.708										.443	
n	504										328	

among whites; that is, black movers who encounter unemployment are more likely to separate from jobs than are those who move without unemployment and more than comparable whites. Taken together, these effects may also explain why over the early years of experience the decline in separations and in unemployment incidence is not pronounced among nonstudent blacks when it is for whites.

So much for the differential regression effects as estimated in the regression coefficients. Differential characteristics of black youths also contribute to the higher unemployment. On average, black youths had less tenure, less training, lower education, fewer marriages, and more part-time and intermittent work.

In our regression, which was designed to spot factors influencing conditional unemployment, the clues that might explain why such unemployment is higher for blacks are sparse. Education has no effect on blacks while it is negative for whites. Again, the likely conclusion is that the conditional unemployment of blacks is higher because their quit/layoff ratio is lower at all levels of the factors.

Our findings convey some impressions of greater job instability of blacks which is partly due to less training, to fewer specific components of job experience, to greater nonparticipation, and to weaker effects of education and of family status. Greater difficulties in job finding are consistent with longer duration of unemployment, inhibition of quits, and augmentation of layoffs. We do not know, however, how much of the difficulties are matters of discrimination, of perception of potential productivities by employers, or of informational efficiency of job search. In contrast to the whites, unemployment of young blacks is higher than unemployment of older blacks at fixed tenure levels as we noted in table 8.4. Also, the race differential in duration is larger at younger than at older ages. Both of these findings may be a reflection of the deterioration in labor market conditions of recent cohorts of young blacks.

8.7.1 Plus ça change . . . ?

A 1969 survey of research on youth labor markets concluded that "the normally high level of teenage unemployment is due primarily to the fact that so many teenagers are labor market entrants or reentrants rather than to their deficiency or instability as employees."[13] We amend this conclusion by interposing a continuum of job experience and showing how it translates into a decelerating age decline in the incidence of unemployment.

Our evidence is based on far richer data than were available to the researchers in the 1960s. But we do face a question of data comparability: the NLS shows lower unemployment rates for young nonstudents, consequently a smaller age differential than does the CPS. Yet our finding no "aging effects" is also reproduced in the MID data, apart from being

consistent with the spirit of the conclusion reached a decade ago on the basis of fragmentary, cross-sectional CPS aggregates.

Notes

1. Appendix tables available on request.
2. When not shown in text tables, the findings appear in appendix tables.
3. The educational differences are stronger in the 1966–69 period.
4. This measure has sampling properties akin to the likelihood ratio, according to R. Shakotko. We do not explore these issues.
5. $dT/dx = (1 - s) - Ts > 0$, and $d^2T/dx^2 < 0$. For argument and evidence see Mincer and Jovanovic (1979).
6. White nonstudent job quitters report a probability of unemployment of .313 for 1967–69 compared with .213 for mature men. For blacks these figures are .503 and .333 respectively.
7. Equation (6) is an intermediate step between col. (1) and (2) in table 8.11.
8. Unpublished work of Bartel and Mincer.
9. The same conclusion was reached independently by S. Nickell (1978).
10. See Alchian in the Phelps (1970) volume.
11. See n. 6.
12. Flanagan (1978).
13. Kalachek (1969), p. 2. Although the quotation refers to all teenagers as a group, the special problems of black youths were noted by Kalachek as well.

References

Alchian, A. 1970. Information costs, pricing and resource unemployment. In Phelps, E. S. et al., *Microeconomic foundations of employment and inflation theory*. New York: W. W. Norton & Co.

Bancroft, G. and Garfinkle, S. 1963. Job mobility in 1961. BLS, Special Labor Force Report no. 35.

Chiswick, B. 1978. The Americanization of earnings. *Journal of Political Economy* 86:897–921.

DeFreitas, G. 1979. The earnings of immigrants in the American Labor Market. Ph.D. dissertation, Columbia University.

Flanagan, R. J. 1978. Discrimination theory, labor turnover, and racial unemployment differentials. *Journal of Human Resources* 13:187–207.

Jovanovic, B. and Mincer, J. 1979. Labor mobility and wages. National Bureau of Economic Research. Working Paper no. 357. New York: National Bureau of Economic Research.

Kalachek, E. 1969. *The youth labor market.* Policy papers in Human Resources and Industrial Relations no. 12. Ann Arbor, Mich.: The Institute of Labor and Industrial Relations, University of Michigan and Wayne State University.

Leighton, L. 1978. Unemployment over the work history. Ph.D. dissertation, Columbia University.
Mincer, J. 1976. Unemployment effects of minimum wages. *Journal of Political Economy* 84, part 2:S87–104.
Nickell, S. 1978. Estimating the probability of leaving unemployment. Center for Labor Economics, Discussion Paper no. 7, London School of Economics.
Saben, S. 1964. Geographic mobility and employment status, March 1962–March 1973. BLS, Special Labor Force Report no. 44.

Comment

Alan L. Gustman

The major concern of this chapter is the question of why youth unemployment declines from the relatively high levels observed for male teenagers not enrolled in school to the lower levels experienced by adults. To provide an answer, the authors disaggregate unemployment into definitional components and relate these to explanatory variables which themselves are related to age. Closely interweaving theoretical and empirical considerations, they extend the human capital approach and apply it to analyze the unemployment-age relation. In so doing, Professors Leighton and Mincer provide needed emphasis on theory in an area that has been characterized mainly by empirical inquiry with little theoretical grounding.

While there are a number of findings, the basic conclusion is that the decline with age in unemployment, rapid at first and then decelerating, stems from a similarly shaped decline in the probability of a separation with tenure on the youth's last job. Thus high youth unemployment is attributed to short tenure on a particular job rather than to the youth's age or limited overall labor market experience. The process of matching employers and employees, and the subsequent arrangement to share the costs and benefit of specific training if the match is successful, play the central theoretical role. They suggest that "it is not the behavior or circumstances peculiar to the young, but the dynamics of 'experience search' in the labor market which is *largely independent of age* [that is responsible for their high unemployment incidence]." High youth unemployment, at least among white youths, is not the result of unemployment being high at any given level of tenure, reflecting "young age and unstable behavior," but is a result of low youth tenure.

The conclusion that age and overall market experience do not play a very important role is an empirical one. Nothing in the theory excludes

Alan L. Gustman is professor of economics at Dartmouth College and is a research associate with the National Bureau of Economic Research.

the possibility that young age and overall inexperience might account for an important part of high youth unemployment. For example, one could well integrate screening on the part of employers based on age and experience into the discussion. A finding that age and experience played an important independent role would square with the impression about employer attitudes created by past interview data. From these it appears that some firms in some industries are reluctant to hire young people, let alone to train them (e.g., see Lester 1954, pp. 53–6 and Barton 1976). Young people may be viewed as accident-prone, not trustworthy with expensive equipment, and likely to let their attention wander. As a result, they may be less likely to secure a position which offers an extensive amount of specific training. The authors' finding of lower separations and unemployment for married people reflects the more stable behavior of married young people and perhaps also the response of employers which makes positions offering opportunities for specific training more available to those who are married. But again, despite the fact that age or experience would be a good screen for unstable behavior and thus may have affected the availability of opportunities for accumulating specific training, according to Professors Leighton and Mincer's findings, past turnover and tenure constant, age or experience do not play a strong, independent role reducing the likelihood of separations and unemployment within the younger NLS group.

Some of the empirical evidence supporting the conclusions that age and experience do not reduce separations and unemployment may be subject to question. In particular, the regressions fitted for black youths based on data from the NLS raise the most serious doubts. The results indicate not that general experience has a significant negative impact, but that, tenure and other factors constant, black youths have a significantly *higher* probability of separation and of unemployment the *higher* the level of general labor market experience (see tables 8.15 and 8.16). To give an idea of the size of these effects, the sum of the products of the coefficients of the experience variables times their means exceeds the comparable sum for the tenure variables with their means. Similar but less severe problems arise in the identical regressions for white youths. There, too, the sign on the basic experience variable is *positive* in the separation equation, with a *t*-statistic above 1.4 for the linear experience term (table 8.8). In the analogous unemployment equation, the coefficient of the linear experience variable is also positive, with a *t*-statistic below 1 (table 8.9). In contrast to these findings, in regressions for white males of all ages using data from the Michigan Income Dynamics Survey, the linear experience term has, more plausibly, a negative effect on the probability of a separation (table 8.10). This effect is significant. Using the same data, the sign on the linear term is found to be negative in the analogous equations explaining the incidence of unemployment, but the coefficient estimates

are not significant. None of these tables indicates a significant effect of experience on the probability of unemployment conditional on a separation.

Let me mention a possible reason for the counterintuitive results obtained in analyzing the NLS youth sample. Between 1966 and 1971, many young people were in the armed forces and were not sampled, and others who were sampled either were not eligible for the draft or may have altered their behavior expecting to be drafted. As a result, a disproportionate number of those with long experience may have been those who were turned down for military service. If this is so, it means that the Parnes data for young men, covering as they do a period when labor market activities were interrupted for selected individuals, may not be as useful as they might for tracing the process of integrating young workers into the labor force during more normal times. Another question concerns what accounts for the differences between the findings for black and white youths. As the authors note, some of the differences may reflect differences in the specific training received by each group, even at similar levels of tenure. A part of the explanation may also arise from differences in the way the draft affected individuals in each group.

Suppose the authors' findings that job tenure importantly influences youth unemployment, but age and overall labor market experience do not, is supported by further evidence. If this is so, I believe the implications for policy makers may be quite severe. Consider the finding that tenure plays a dominant role and that young people respond no differently from others with similar characteristics who are also new to the market. To reduce youth unemployment, at least that associated with permanent separations, one may have to improve the basic sorting process or, if possible, find a way to make employers take on the risk of increasing specific investment in younger workers beyond what they normally do, perhaps by providing a more reliable signal about new workers than is currently available. This is a difficult task.

A finding that market experience is not significant, tenure and past turnover constant, would not be very encouraging either. There is no reason to believe that general training *per se* reduces turnover. But one might think that the costs of specific investment can be reduced and search made more efficient by increasing the information the youth has about the nature of the labor market before he or she engages in serious job search. Aside from their direct training content, such programs as career education, cooperative vocational education, and other programs designed to provide work experience might be expected to increase a young person's knowledge of the market and of work. As a result, the youth may be less likely to find that a job he or she has chosen to sample is very different from what was expected, and may thus not be disappointed and quit. If early quttings were reduced by these programs, new em-

ployees who had completed the programs would constitute a less risky investment prospect for the firm. Once firms became aware of this, these young people would have a greater probability of finding specific training opportunities that ultimately reduce turnover. But one who strongly believed that these programs do improve the matching process would, in all probability, also expect that, turnover behavior constant, market experience informs the youth of what the labor market is like and makes the individual a better risk for specific investment. While one cannot infer from a finding that past experience will facilitate specific training that other labor market information programs will have a similar result, an advocate of programs promoting early labor market experience might be troubled justifiably by the finding that past labor market experience does not, tenure and past turnover behavior constant, reduce separations and unemployment.

An additional point should be made. In further attempts to test the author's model with a more suitable sample, it would be of interest to see the effect of measuring experience by something like total time at work in a civilian job, or both civilian and military employment, rather than the number of years since beginning the first job after leaving full-time school, the measure used by the authors. It is important to be sure the findings with respect to the role of experience are not sensitive to the definition of the experience variable.

In closing, let me note again that the chapter by Professors Leighton and Mincer contributes importantly to our understanding of the working of the youth labor market. It also provides a fruitful framework for analyzing policy. While scattered theoretical and empirical pieces and folk wisdom have been available, the extensive analysis contained in this paper provides a "critical mass" which can form the basis for much of our future work.

References

Barton, P. E. 1976. Youth transition to work: The problem and federal policy setting. In National Commission for Manpower Policy, *From School to Work: Improving the Transition.* Washington, D.C.: U.S. Government Printing Office.

Lester, R. A. 1954. *Hiring practices and labor competition.* Princeton: Industrial Relations Section, Department of Economics and Sociology.

Comment

W. Kip Viscusi

Several recent analyses have documented the effects of age and firm-specific experience on worker turnover and unemployment. The principal contribution of the Leighton-Mincer chapter is that it greatly extends our knowledge of both the direction and convexity of these relationships. With the exception of some aberrant age-separation results,[1] the empirical patterns of interest are established quite firmly.

What is less clear is how one should interpret these findings. Most particularly, the age-related decline in worker separations is due largely to the increase in firm-specific experience (tenure) with age, which in turn diminishes turnover. Although the econometric effects are clear-cut, age nevertheless may be important. Workers who are older may be more mature, better motivated, and better matched to appropriate jobs. Even though tenure *per se* may have no substantive impact, these age-related effects would diminish worker turnover, increase the value of the tenure variable, and generate the observed relationship. Indeed, it is impossible to construct any model with age affecting turnover in which tenure also doesn't increase, since lower turnover increases one's firm-specific experience.

The substantive impact of the pivotal tenure variable is difficult to assess. However, as I will note later, excessive attention to this issue may lead one to ignore the primary insight provided by the human capital literature regarding worker turnover.

Search, Experience, and Age

One of the more intriguing findings is the lengthening of the duration of unemployment for older workers. Although this effect may be attributable in part to an adverse selection problem, it may also reflect an important aspect of the employment process. Considerable recent attention has been devoted to job search among alternative wage offers. In reality, workers are choosing among jobs with uncertain implications, such as the likelihood of promotion or being injured. Here I will sketch a simple model which is the first analysis to incorporate both job search among lotteries and adaptive worker behavior once on the job.[2] A major implication of this framework is that workers may substitute labor market search for on-the-job experimentation as they age. This behavior would generate both the observed relationship between age and the duration of unemployment as well as the higher turnover by youths.

W. Kip Viscusi is IBM Research Professor of Business Administration at Duke University and is a research associate at the National Bureau of Economic Research. This discussion draws on the results of the author's broader study of youth unemployment sponsored by the Rockefeller Foundation.

Consider the following model with three periods and two types of jobs. In each period the worker can choose to remain on his job or search for an alternative job. Search takes one period, is associated with a cost of $-c$ (where c may be negative if the value of leisure exceeds direct search costs), and offers a probability q that a type 1 job will be found and $1-q$ that a type 2 job will be found.

In every period, each job offers some probability of a successful job outcome with wage w and a probability of an unsuccessful outcome with wage w', where $w > w'$. Job 2 is preferred since it offers a prior probability of success p_2, which exceeds the comparable value p_1 for type 1 jobs.[3] These independent priors are updated in Bayesian fashion based on experiences with that type of job. Let γ_i be a measure of the worker's prior information for job i. For probabilities belonging to the beta family, the posterior probability of success $p_i(m, n)$ after m successful outcomes and n unsuccessful outcomes on that job type is given by

$$p_i(m, n) = \frac{\gamma_i p_i + m}{\gamma_i + m + n}$$

so that

$$\frac{\partial p_i(1, 0)}{\partial \gamma_i} < 0 \text{ and } \frac{\partial p_i(0, 1)}{\partial \gamma_i} > 0$$

The final bit of notation is that ß is the discount factor.

Several features of the optimal strategy should be noted at the outset.[4] First, one never leaves an uncertain job after a favorable job outcome. Workers will be motivated to quit and undertake a job search only after unfavorable experiences. Second, since search takes a period of time, it will never be optimal to search in period 3. Searchers in period 2 will accept whatever job is generated by their search in that period since continued search will be unattractive. Third, workers will never leave a job because of an adverse experience after period 1. The period required by search makes quitting followed by subsequent search unproductive after the initial period. In short, search may be optimal in periods 1 and 2, whereas on-the-job experimentation may only be optimal in period 1. Time horizon effects create a bias toward search as opposed to on-the-job experimentation as the worker ages. The analysis below will focus on other age-related effects that reinforce this pattern.

Suppose the worker has the option of choosing between job 1 or job search with three periods remaining. Utilizing the above results regarding the nature of behavior, the value V' of job 1 is given below.

$$\begin{aligned} V' = {} & [p_1 w + (1 - p_1)w'] + ßp_1[p_1(1, 0)w \\ & + (1 - p_1(1, 0))w'](1 + ß) \\ & + (1 - p_1)ß \; Max \; \{[p_1(0, 1)w \end{aligned}$$

$$+ (1 - p_1(1, 0))w'](1 + ß),$$
$$- c + qß[p_1(0, 1)w + (1 - p_1(0, 1))w']$$

where the first bracketed expression is the expected first period reward, the second is the discounted expected reward in periods 2 and 3 following a successful period 1 outcome, and the final term represents the only subsequent decision facing the worker who starts on job 1. Following an unfavorable outcome, the worker must choose whether he will remain on job 1 thereafter or search for an alternative job in period 2. The condition for undertaking a job search simplifies to

$$(1) \qquad p_2w + (1 - p_2)w' > \frac{c + p_1(0, 1)w + (1 - p_1(0, 1))w'}{ß(1 - q)} + p_1(0, 1)w + (1 - p_1(0, 1))w'$$

If the worker chooses instead to begin period 1 by searching, the discounted expected value V^s of his choice is given by

$$\begin{aligned} V^s = & - c + ß(1 - q)[p_2w + (1 - p_2)w'](1 + b) \\ & + ßq \; Max\{- c + qß[p_1w + (1 - p_1)w'] \\ & + (1 - q)ß[p_2w + (1 - p_2)w'], [p_1w \\ & + (1 - p_1)w'](1 + ß)\} \end{aligned}$$

where the worker incurs a search cost c, has a probability $(1 - q)$ of finding a job of type 2 for work in periods 2 and 3, and a probability q of finding a type 1 job that he either accepts or rejects in favor of continued search. The unsuccessful searcher will continue his search in period 2 if

$$(2) \qquad p_2w + (1 - p_2)w' > \frac{c + p_1w + (1 - p_1)w'}{ß(1 - q)} + p_1w + (1 - p_1)w'$$

Consider the search decision in period 2. Since $p_1(0, 1) < p_1$, the worker is more likely to search after an unfavorable job experience than after search in period 1, as comparison of equations 1 and 2 indicates. Work on the job provides a motivation for additional job search.

A particularly striking feature of equations 1 and 2 is that V^s is independent of the sharpness γ_i of either prior probability, whereas V_1 is independent of γ_i only if the worker will never find it optimal to leave his job, as one can verify by substituting for the beta values of $p_1(0, 1)$ and $p_1(1, 0)$. If job search is preferred to remaining on job 1 after an unfavorable job 1 outcome, then $\partial V^1 / \partial \gamma_1 < 0$. The attractiveness of work on job 1 declines with the precision of the worker's prior beliefs. To the extent that the worker's experiences lead to a sharpening of γ_i with age, the attractiveness of on-the-job experimentation V^1 will be diminished. Abstracting

from the change in one's time horizon with age, there will be an age-related experience effect that diminishes the value of on-the-job experimentation and has no effect on the value of search, so that search will become a relatively more attractive mechanism for finding an optimal job match.

Both the high turnover of youths and the greater longevity of search by older workers are consistent with a hybrid model of search and adaptive behavior. The shortening time horizon with age will diminish the attractiveness of on-the-job experimentation before it makes search unattractive. Moreover, independent of any time horizon effect is the role of worker learning, which enhances the relative value of search as a form of information acquisition and labor market sorting.

Toward a General Theory of Turnover

Leighton and Mincer are quite eclectic in their discussion of the theoretical underpinnings of turnover, utilizing diverse insights from human capital theory, search theory, and sorting and matching theories. A central issue in any analysis is the substantive effect of the tenure variable on separations. Consider two extreme models. In a standard human capital framework, the tenure variable would reflect specific training that enhanced the worker's firm-specific productivity. In a pure sorting model, the worker's productivity may not have been altered with experience, but he is more likely to be matched optimally to a job as his on-the-job experience increases.[5] Workers who discover that the job match is inappropriate have left the enterprise, and the optimally matched individuals remain.

Although these theories differ sharply in the process generating the tenure effect (training versus a lottery outcome), they share a common feature. Let us define "specific information" as experiences that affect one's probabilistic beliefs, only regarding the attractiveness of work at the firm, while "general information" also affects one's probabilistic beliefs about work elsewhere.[6] The learning in the adaptive model presented earlier was specific.

Specific information reduces the worker's incentive to quit since subsequent adverse experiences are less likely to diminish the job's attractiveness and lead him to quit. In contrast, general information has an ambiguous effect.[7] Even favorable experiences may lead to worker turnover since the relative attractiveness of work elsewhere may have increased. Moreover, worker turnover is always greater with general information than specific information. A firm's learning about the worker's productivity is quite similar. The firm is less likely to terminate an employment relationship if it has substantial knowledge about the worker's firm-specific capabilities, whereas knowledge concerning the worker's capabilities elsewhere is irrelevant. Information acquired regarding the pro-

ductivity of other workers in the employment situation may lead to greater termination of the economic matchups by the firm. As with worker learning, turnover is negatively related to the specific information component.

These parallels suggest that the elusive search for a determination of the operative mechanism in the human capital theory may not be the appropriate focus. The theory's primary insight relating to turnover is the importance of specific as opposed to general learning. This distinction plays a pivotal role in pure sorting and adaptive behavior models as well as in analyses of actual training processes.

Notes

1. See, for example, the findings for young black men in tables 8.15 and 8.16.

2. This model extends my earlier work in which a search process was not included as part of the job choice problem. See, for example, *Employment Hazards: An Investigation of Market Performance*, Harvard Economic Studies Series no. 148. Cambridge: Harvard University Press, 1979.

3. The precision of each prior is also assumed to be such that job 2 is preferred. As the discussion below indicates, in the case considered, only the precision γ_1 is of consequence.

4. Many of these properties are formalized in my earlier work cited in n. 2.

5. Sorting models may include specific human capital investment as part of the process, but they need not.

6. This analysis is developed more fully in my paper, "Specific Information, General Information, and Employment Matches under Uncertainty," NBER Working Paper no. 394 (1979).

7. This is the case of interdependent prior beliefs considered in chapter 4 of my *Employment Hazards* volume cited in n. 2.

This Page Intentionally Left Blank