The Age Structures of Occupations and Jobs[1]

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Age segmentation in the labor force can be analyzed in terms of the age distributions of occupations. In this paper we show that the majority of detailed census occupations conform to one of five basic age profiles. Further, these age profiles have meaning as they derive from the operation of well-defined institutional forces. We discuss the relevance of industry for a refined understanding of occupational-age patterns and conclude with some observations about the likely consequence of a change in the age of compulsory retirement for the age distributions of different occupations.

In attempts to comprehend the process of individual achievement, increasing attention has been given to job change behavior (Parnes 1970; Doeringer and Piore 1971; Stinchcombe 1975; Leigh 1976). The importance of this consideration is apparent with respect to status attainment since, by definition, a change in occupational status can occur only as a result of a job shift. This is not the case with earnings, which can evolve during the course of employment in a single position, yet job switching remains an important mechanism for securing earnings growth over the life cycle. There is evidence, for instance, that a job shift is frequently accompanied by an increase in salary (Ornstein 1976, pp. 109–29; Parnes et al. 1974, pp. 103–13). There is also reason to suspect that, especially among young workers, job changing is used to situate oneself favorably with respect to long-term earnings prospects, if not immediate returns (Spilerman and Miller 1977).

Job changing is hardly a random phenomenon, in regard to rate of movement or choice of destination. Rather, characteristic patterns can be asso-

ciated with particular origin occupations and industries (Palmer 1954, pp. 62–80; Reynolds 1951, pp. 28–37). This presence of determinable avenues of movement is another way of saying that the labor market is "Balkanized" (Kerr 1954), "segmented" (Piore 1975), or organized into "career lines" (Spilerman 1977), in the sense of there existing sequences of positions with high rates of being traversed. Irrespective of terminology, the implication is that the labor market is structured with respect to movement, so that, for most workers, job changing is not a chaotic process.

If job shifting is an important mechanism in status and earnings attainment, and if this behavior is patterned, it would appear desirable to understand the linkages which exist between jobs. Indeed, the notion of labor market *structure* is not alien to occupational sociology (though an interest in movement patterns per se has been only an incidental concern). Thus, with respect to the professions and craft occupations, there is the concept of a "life-time commitment" (Caplow 1954, p. 107; Ritzer 1972, p. 203), which implies a low rate of occupational change. In contrast, descriptions of careers of foremen and managers typically contain lengthy discussions of prior and subsequent occupations (Sofer 1970, pp. 234–51).

The traditional approach to labor market structure has been to examine organizational arrangements and institutional rules which impede job changing or, conversely, define conduits along which individuals do move. With respect to craft occupations, for instance, it has been noted (e.g., Stinchcombe 1959) that the number of entrants into a union is limited, a union is commonly coterminous with a single craft, employment is obtained through union referrals, and duration with an employer tends to be brief. In this circumstance, a considerable investment is built up by a worker in his craft and in its union, and a low rate of occupational turnover can be expected. In industrial firms, by comparison, jobs are organized into hierarchical sequences (job ladders) and seniority with the firm is a principal consideration in promotion, as well as a determinant of job security and pension rights. Employment therefore tends to be of long duration and is punctuated by periodic occupational shifts.

If the traditional approach to labor market structure emphasizes the institutional arrangements which underlie movement patterns, a second strategy would be to focus directly on the transition probabilities among jobs. This approach would complement the study of norms and rules in that information would be obtained on behavior, as well as on prescription. Yet, the task of delineating movement patterns is not simple, even when attention is restricted to transitions between pairs of jobs, rather than full historical sequences (careers) being examined. Because transferability of work skills often is limited to technologically related occupations and industries, detailed occupation and industry categories are necessary in order to cap-

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ture the fine structure of movement. (In aggregate classifications technologically proximate categories tend to be grouped together, which results in an underestimation of the true amount of movement.) Also, most jobs lead to multiple destinations, and the probabilities of transition to the various destinations change with a worker's age. These sorts of considerations complicate the endeavor of describing the structure of work careers from job change data, but see Spilerman (1977) and Rosenbaum (1979) for attempts at such delineations.

As an alternative to examining job transitions directly, we consider one of the implied consequences of a labor market in which movement is patterned. If determinable job sequences exist, such linkages should find expression in the *age distributions* of occupations and jobs.[2] Some positions, at the entry level into career lines, should have a concentration of young workers; others, at the apex of career lines, should contain an overrepresentation of middle-aged persons. Conversely, given the presence of a diversity of occupational-age distributions, one may be able to infer particular movement patterns; *thus, the age characteristics of work positions can serve as an instrument for probing labor market structure.* An investigation of the age features of occupations should be informative about more than job linkages, since occupations with similar age profiles may have in common other aspects of the organization of work as well. Further, an understanding of age segmentation is pertinent to forecasting some societal consequences of a change in the age of compulsory retirement, a topic currently of public concern.

In this paper we examine the age distributions of occupations and jobs to ascertain what these facts may indicate about labor market structure and ancillary matters.[3] We first outline the mechanisms which generate different occupational-age patterns and provide illustrations of the occupations that belong to each age category. This account is then supported by a formal analysis of the causal forces which contribute to the observed age patterns. In the concluding sections we sketch some complications which arise when considerations of industry are introduced, and review policy implications which derive from this study.

[2] Where we distinguish "job" from "occupation" we shall mean by job an occupation $\times$ industry position. Common parlance would associate job with an occupation $\times$ employer position, but lacking data at the employer level we use three-digit industry codes as a first approximation. (Thus we exploit the fact that firms in the same industry tend to employ similar technologies; as a result, much of the interfirm variation in the organization of work can be attributed to industry differences.) Where confusion is unlikely, we shall use "job" interchangeably with work position or occupation.

[3] For discussions of occupational age structures from the special perspectives of counseling and industrial psychology, the reader is referred to Griew and Tucker (1958), Murrell (1962), Richardson (1953), and Smith (1968, 1969, 1973).

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MECHANISMS WHICH GENERATE OCCUPATIONAL-AGE DISTRIBUTIONS

The presence of a variety of age distributions among occupations derives from the operation of multiple factors. To cite a few: (1) Jobs differ in task demands, which make them differentially attractive to the various age groups. (2) In large organizations, work positions are commonly arranged in hierarchies (job ladders) in which progression is unilineal; the age-grading of occupations is one consequence. (3) The replacement of old technologies by more efficient ones can generate a decline in demand for labor; often this is implemented via low rates of hiring into contracting occupations (and industries), with a consequent increase in the average age of incumbents. We now review considerations of these sorts.

Physical Requirements of Tasks

Occupations differ in the extent to which the work is physically difficult or exhausting. Some manual jobs (e.g., warehouseman, electrical lineman, fireman) necessitate exertions of the kind that can be performed on a daily basis only by the able-bodied. We expect these occupations to exhibit an age distribution skewed to the young end, as workers in middle age transfer to other lines of endeavor. There also are occupations which, while not exhausting, require quick reflexes and a high level of motor coordination (e.g., airline pilot, professional athlete). The need for such abilities should also result in truncation of the age distribution at the upper end.

Retirement Rules

Closely related to physical requirements of tasks are formal rules that compel retirement by a certain age. In some instances, retirement rules are intended to insure that, where performance declines sharply with age (e.g., airline pilot, policeman), employees depart from the occupation rather than reduce their quality of work. Yet retirement rules are more pervasive than can be accounted for by a narrow consideration of task demands. Large bureaucracies have age ceilings even when little justification is apparent in terms of work requirements. Rather, the reasons appear to be ones of discouraging rancorous conflict between age cohorts over the timing of succession (*New York Times* 1977, p. 38), permitting the infusion of young talent and new ideas into an organization (Breen 1966, p. 386), and enabling a firm to divest itself gracefully of workers who have reached an age in which illness is likely to take an increasing toll in work regularity (Report 1973, pp. 69–70).

While the age specified in retirement rules places an upper bound to the age distribution of an occupation, the typical age of departure may be

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younger. Considerations relevant to early retirement decisions include pension plan features and skill transfer prospects. Pension plan features are consequential because retirement plans differ in the length of service at which attractive benefits become available (instances of extreme generosity are the plans of postal workers, military personnel, and New York City policemen and firemen; typically they permit retirement after 20 years employment at one-half the terminal year's salary). Skill transfer prospects are relevant because many early "retirees" wish to remain in the labor force and initiate retirement only after assuring themselves of other job opportunities.[4] (For example, the availability of watchman and bank guard positions for former policemen probably contributes to a high rate of early retirement from that occupation.)

Work Setting

If many occupations have formal rules which compel departure by a certain age, we can also suggest the kinds of positions which permit individuals to remain in the labor force until a comparatively late age. Elderly workers require occupations in which they can vary the hours of employment and set the rate of work flow according to their daily condition. The most obvious circumstance in which this is possible pertains to free professionals (doctors, lawyers) and self-employed businessmen, such as retail shopkeepers. Some employment situations permit similar flexibilities: Realtors and insurance salesmen are often paid on a commission basis and tie down few organizational resources (machinery, office space); employers therefore might not be averse to a leisurely work tempo for individuals in these occupations. Building janitors provide another example of an occupation in which employees have latitude in scheduling tasks.

Education and Training

To this point we have discussed job features which constrain occupational-age distributions at the upper end of the age continuum. For some occupations, however, the age range is truncated at the lower end, as a consequence of education and training requirements. This is most apparent with respect to professions in which graduate study is a prerequisite for certification (e.g., medicine, law, college teaching), though lengthy training periods are not unusual in blue-collar crafts, where they take the guise of apprenticeship programs.

[4] More generally, workers may delay changing employers until they have accumulated enough years of service to qualify for a pension, or until rights to a pension have become vested.

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Job Linkages

In discussing organizational requirements we have stressed constraints on age of input (education and training prerequisites) and limits to continued membership (retirement rules). We wish now to emphasize age patterns which arise from a different kind of organizational consideration, the division of labor and linkages among jobs within a firm. In large industrial enterprises, work positions are arranged in hierarchies (job ladders), with service at one occupational rung a prerequisite for employment at the next higher level. In part, the presence of job hierarchies reflects the need for acquiring skills and experience before advancment; in part, it results from pressure by unions to reserve upper-level slots for currently employed workers (internal labor market). Whatever the explanation in a particular firm, the consequence for occupational-age structures is that each position in a job sequence will have a narrow age distribution, with the mean age increasing over the successive positions.

Additional Institutional Considerations

Occupations that are linked together by a promotion ladder should have narrow age distributions. Institutional arrangements of another sort associate a "life-time commitment" with many professions and craft trades (Ritzer 1972, p. 203). Provided that these occupations are neither expanding nor contracting in employment, their age distributions should be flat, relative to the age distribution of the total labor force. An occupational-age structure of a still different kind is expected for positions that belong, institutionally, to the "secondary labor market."

The concept of a "dual labor market" is associated with the writings of Doeringer and Piore (1971), although the central ideas appear in earlier publications by Kerr (1954) and Dunlop (1957). The basic notion involves the dichotomization of jobs according to whether employers invest resources in the training of workers (primary labor market) or refrain from doing so (secondary market). With respect to positions of the former type, hierarchical job sequences and the provision of periodic salary raises constitute the reward structure in terms of which employers remunerate workers for training and experience. In contrast, the secondary sector consists of jobs for which employers choose *not* to upgrade worker skills. As a result, employees with several years of experience are no more attractive to an employer than new entrants into the firm, and there is little reason for the salaries offered to the two groups to differ. Returns to seniority are minimal; in this sense jobs in the secondary sector can be said to lack a future.

Because jobs in the secondary labor market are easy to enter and because

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new entrants are soon on an equal footing with veteran employees, secondary positions are often turned to for second careers, such as when task difficulty compels a job change. These positions should therefore have an overrepresentation of older workers. However, many secondary positions (e.g., gas station attendant, dishwasher, food service worker) also appeal to young individuals who have not yet committed themselves to a line of work or for other reasons desire intermittent employment (Doeringer and Piore 1971, pp. 170–80). In comparison, we expect a low rate of representation in these jobs by workers in their prime years, when they are able-bodied and have embarked upon careers.

Demographic Factors

New occupations are continually being created, accompanying the development of emergent technologies (e.g., computers, television); other occupations decline in employment as their functions become obviated by technological advance (e.g., blacksmith, railroad fireman). Employees in expanding occupations, especially when specialized training is required, tend to be drawn from recent entrants into the labor force; such occupations should therefore have a young age structure. Contracting occupations, in comparison, evolve by not replacing workers who have departed and should have an age distribution skewed to the old end. These comments pertain to the initial years of occupational growth or decline. Eventually, growth slows in expanding occupations, and replacement becomes necessary in contracting ones. The consequence of such changes in the rate of recruitment is to generate "waves" in the age distribution of the occupation; passage of these waves over the age range may be observed in successive decennial population censuses (e.g., Smith 1973).

Summary

From the preceding comments it is evident that systematic forces of an institutional and a demographic nature operate on occupations and are capable of creating a diversity of age patterns. Extrapolating from these remarks, we expect to find evidence for five types of occupational-age distributions:

1. Occupations in which young workers are overrepresented. These should include entry-level positions in job sequences and occupations organized around emergent technologies.

2. Occupations in which middle-aged workers are concentrated. We expect senior positions in job sequences (supervisors, foremen, managers) to fall in this category.

3. Occupations in which the elderly are overrepresented. These should

be primarily the sorts of jobs which permit a worker flexibility in setting his rate of work and scheduling hours of employment. We also expect contracting occupations to be in this category.

4. Occupations with a uniform age distribution. We expect to find the free professions and craft occupations here, since affiliation with these positions tends to be of long duration, spanning much of an individual's work life.

5. Occupations with a U-shaped age distribution. This category should contain jobs of low desirability, having poor advancement prospects.

We wish to emphasize that several of the factors we have enumerated as influencing the age distribution of an occupation may operate simultaneously, making a unique assignment of it to one of the five categories an impossible task. For instance, dentistry is a profession characterized by a lifetime commitment; hence, a uniform age distribution would be expected. At the same time, dentists are self-employed and control their hours of work; thus, they should be able to remain in the labor force until a comparatively late age. Consequently, the age distribution of this profession should reflect the operation of two distinct considerations.

Finally, in addition to the five patterns we have proposed, other irregular age distributions can be expected to characterize some occupations. These would reflect shaping forces such as abrupt changes in the rate of employment growth in prior decades (population waves), the idiosyncratic effects of industry (which we discuss in the final section), and interactions among the factors we have enumerated when several pertain to an occupation. Issues of these sorts, however, are second-order considerations in that they require a deep appreciation of the historical circumstance and organizational context surrounding an individual occupation. In the present paper, we avoid particularistic patterns, and concentrate instead upon unimodal and other simple age distributions which have broad relevance for our comprehension of labor market structure.

EVIDENCE FOR A DIVERSITY OF OCCUPATIONAL-AGE DISTRIBUTIONS

To pursue these issues we used the 1970 Census 1/100 sample tape (5% county group file), taking as observations all males over 17 years of age who were employed full-time in 1969[5] and were not disabled. Because we wished to examine age profiles for detailed occupations (three-digit census codes), a very large sample was required. We would have preferred to limit the investigation to a single labor market area, in recognition of the fact that age patterns differ somewhat among communities, but this would not

[5] Working full-time was defined as employed 40 or more weeks in 1969 and having earned $2,000 in that year.

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have provided a sample of sufficient size. Consequently, data from 12 large northern SMSAs were pooled.[6] To a degree, this regional and city-size restriction serves to reduce the magnitude of city differences in labor market organization.

Occupational-age patterns were constructed in the following manner.[7] The age distribution of each position was standardized against the age distribution of the total sample. That is, if P_{ao} = proportion of individuals in age category a of occupation o, and P_{a+} = proportion of the total sample in age category a, then our index of representation in age category a is given by $E_{ao} = P_{ao}/P_{a+}$. Thus, to the extent that E_{ao} exceeds 1.00, age category a is overrepresented in occupation o; to the extent E_{ao} is below 1.00, the age category is underrepresented in the occupation. The age *profile* for occupation o is given by the row of entries, $\{E_{ao}|a = 18–21, 22–27, . . . , \geq 65\}$.

We excluded from the analysis all occupations with fewer than 75 individuals in our sample (to obtain stable age patterns) and all those which represent census codes for allocated categories. This left 201 occupations, 80% of which ($N = 160$) could be classified, by inspection, into one of the five age patterns. That is to say, a *subjective* decision was made concerning the category to which an occupation would be assigned. An objective, confirmatory analysis was also performed and we compare the results from the two procedures later in this section.[8]

The first set of age profiles, reported in table 1, illustrates occupations in which young, middle-aged, and older workers are concentrated. The specific occupations listed were chosen to depict the variety of positions associated with an age category. Turning to occupations in which the young are overrepresented ($N = 43$), we find, consistent with expectation, a cluster which can be identified with heavy physical labor (electrical lineman, stock handler, warehouseman).[9] A second cluster contains positions that are entry-level occupations into career lines (assembler, bank teller, drafts-

[6] The 12 SMSAs are: Boston, Chicago, Detroit, Kansas City, Los Angeles, Minneapolis–St. Paul, New York, Philadelphia, Pittsburgh, San Francisco–San Jose, St. Louis, Washington-Baltimore.

[7] Similar approaches to age standardization have been taken by Lehman (1953), Murrell (1962), and Smith (1968, 1969, 1973).

[8] The subjective assignment must be carried out prior to completion of the objective procedure, since it serves as a guide in assigning age category boundaries once the occupations have been ordered using the objective scheme. We discuss our findings in reference to the subjective assignment because it is more revealing about substantive considerations which produce age patterns at the borderline between two categories. As we report later, the thrust of our results is the same irrespective of the classificatory procedure used.

[9] To conserve space, not all occupations mentioned in the text are reported in tables 1 and 2.

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TABLE 1

ILLUSTRATIVE AGE DISTRIBUTIONS: YOUNG, MIDDLE-AGE, AND OLD-AGE PROFILES[a]

OCCUPATION	N[c]	MEAN AGE	AGE GROUP[b]								
			18–21	22–27	28–33	34–39	40–45	46–51	52–57	58–64	≥ 65
A. Young-age occupations:[d]											
Electrical lineman (433)	183	36.7	1.43	1.22	1.65	1.37	1.00	.45	.59	.63	.15
Stock handler (762)	638	34.7	6.87	1.60	.80	.71	.49	.74	.74	.59	.59
Assembler (602)	1,243	37.8	2.02	1.69	1.10	.87	.78	.78	.84	.80	.32
Policemen (964)	1,356	37.1	.55	1.41	1.57	1.21	1.12	.77	.56	.34	.21
Gas station attendant (623)	347	36.0	6.79	1.45	.69	.59	.79	.55	.84	.64	1.25
Computer programmer (3)	498	30.5	.92	2.79	2.28	.93	.46	.22	.10	.06	.05
Computer repairman (475)	127	31.9	1.03	2.38	2.00	1.35	.51	.27	.19	.16	.00
B. Middle-age occupations:[e]											
Engineer; chemical (10)	170	41.2	.00	.68	1.29	1.22	1.31	1.29	.83	.43	.51
Engineer; mechanical (14)	719	42.2	.00	.65	1.12	1.14	1.32	1.29	.97	.67	.48
Bulldozer operator (412)	88	40.3	.37	.82	.93	1.62	1.27	1.17	.66	.72	.00
School administrator (240)	283	44.9	.00	.17	.70	1.34	1.71	1.31	1.03	1.04	.71
Sales manager, except retail (233)	881	43.6	.07	.41	.85	1.32	1.37	1.32	1.07	.81	.69
Pilot (163)	170	37.3	.00	.63	2.34	1.47	.85	1.13	.54	.06	.00
C. Old-age occupations:[f]											
Barber (935)	307	44.4	.42	1.08	.74	1.02	.75	.98	1.14	1.20	2.26
Tailor (551)	203	49.7	.48	.28	.71	.63	.81	.88	1.31	2.34	3.56
Sewer and stitcher (663)	168	46.9	.97	.38	.86	.85	.82	.69	1.34	2.07	2.58
Real estate agent (270)	473	46.9	.27	.47	.66	1.03	.98	1.06	1.34	1.43	2.44
Guard, watchman (962)	723	47.5	.90	.68	.58	.63	.79	1.01	1.34	1.75	3.20
Locomotive engineer (455)	115	50.0	.00	.12	.12	.37	1.25	1.85	2.10	1.83	.75
Railroad car shop repairman (486)	156	45.3	.00	.69	.75	.45	1.09	1.54	1.49	1.55	.37

[a] Occupations were reselected to illustrate the variety of positions in an age category. Following each occupational title the three-digit 1970 census code is shown (in parentheses). Data are for males.

[b] Each entry reports the proportion of the occupation's members in the age category, relative to this figure for the total labor force. Entry >1 indicates overrepresentation of the age group in the occupation; entry <1 indicates underrepresentation. In particular, an entry equal to 2 means twice the representation that is expected; an entry equal to .5 means half the expected representation.

[c] Number of individuals in the occupation in our sample.

[d] Number of occupations in the young-age category equals 43.

[e] Number of occupations in the middle-age category equals 30.

[f] Number of occupations in the old-age category equals 38.

man), in that foremen, managers, and supervisors are commonly recruited from them.

The remaining occupations of young individuals are of diverse sorts. Police work entails difficult physical labor, but generous early retirement programs also contribute to a high departure rate in middle age. Notice, incidentally, that the very young are underrepresented in police work; often there are legal minimum age requirements in protection services. Attendant work in a gas station has many of the features we attributed to "secondary labor market" positions; pay is low, turnover is high, the job is easy to enter but leads nowhere though some workers do acquire mechanic skills. There is even a tendency to a U-shaped distribution ($E_{65+} = 1.25$), although the effect is modest in comparison with the overrepresentation of youth (e.g., $E_{18-21} = 6.79$). For this reason we placed the occupation in the young-age category. The final occupations in panel A (computer repairman, computer programmer) illustrate industry effects, a topic which we pursue in a subsequent section. Computer services utilize a new technology, and many affiliated occupations have young age distributions.

Middle-aged occupations are more varied in kind (panel B). Of the 30 positions in this category, several are engineering occupations[10] and a few are craft jobs, in particular, heavy machinery operators.[11] Yet the dominant cluster of occupations involves supervisory and middle-level tasks (school administrator, sales manager, vocational counselor). The middle-aged character of these occupations is probably due to their location in job sequences: promotion is an important avenue of entrance. This is especially apparent for school administrators, invariably former teachers; the representation rate of individuals under 30 is extremely low. Airline pilot is another middle-aged occupation. Underrepresentation of the young results from lengthy training requirements; underrepresentation after age 50 stems from health and retirement regulations. To summarize, the majority of middle-aged occupations can be understood in terms of placement in a job sequence, or in terms of entry credentials and retirement rules.

Occupations in which the elderly are concentrated (panel C, $N = 38$) conform closely to our expectations. One cluster with an overrepresentation of older workers consists of positions with high rates of self-employment (barber, tailor, taxi driver). Indeed, our data exhibit a monotonic increase with age in proportion self-employed. In the age range 28–33, total sample,

[10] All the engineering occupations were classified as middle-aged. This age pattern of engineers probably stems from truncation at the lower end due to educational requirements and, in later life, opportunities for movement into managerial positions.

[11] Bulldozer operators and cranemen are entrusted with expensive machinery and often have life-and-death control over other workers. Mature individuals are therefore sought for these jobs and the very young are underrepresented (interview with Mr. Reese Hammond, Research and Education Director, International Union of Operating Engineers).

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the rate is 6.3%, in the interval 46–51 it is 12.1%, and among the older-than-65 population, proportion self-employed equals 24.7%.[12]

Self-employment provides an individual with the opportunity to schedule his hours of work in accordance with personal needs. For the same reason, the free professions (doctor, lawyer, dentist) should contain an overrepresentation of the elderly, and they indeed do. Yet these occupations also have age features which resemble a uniform distribution and, for consistency with the literature on professions, they were assigned to the latter age profile category. As we have noted, multiple processes often influence the age distribution of an occupation and, at the boundary, assignment to a unique category is somewhat arbitrary.

Some situations of employment permit flexibilities in controlling the rate and hours of work similar to those of the self-employed. Consistent with our earlier discussion, real estate salesman, cleaner, and guard and watchman are found in this age category. Finally, there again is evidence of industry effects. Our data suggest that railroads and apparel manufacturing are industries of the elderly, presumably because of an employment decline in recent decades.[13] Notice, however, the impact of retirement rules (which are common in large enterprises) on the age structure of railroad occupations. After age 65 the representation rates fall below even the norm for the total labor force. For this reason, one might alternatively have assigned these occupations to the middle-age category.

In addition to concentrated, unimodal occupational-age distributions, we have postulated age patterns of two additional sorts. Extrapolating from the organizational situations of the free professions and craft occupations, we suggested that there should be a class of occupations which have a flat age profile. The reasons why these occupations would employ roughly the same percentage of each age group in the labor force are several. First, professional associations and craft unions control the supply of personnel in order to maintain high and steady demand (Hall 1975, pp. 70–71, 188–89: Ritzer 1972, pp. 60–61, 202–3). Craft unions do this through dominating apprenticeship programs; professions, by setting licensing standards and influencing the number of slots in professional schools. Since demand for these occupations is responsive to total population size, it is reasonable that shifts in supply would reflect changes in cohort size. Second, membership in these occupations tends to be a "life-time commitment" (Hall

[12] In every age group, proportion self-employed is higher in the old-age occupation profile category. In comparison with the text figures for the total sample, proportion self-employed in the old-age occupation category is 12.0%, 17.4%, and 31.9% for the three age groups, respectively.

[13] Between 1950 and 1970 employment in apparel and fabricated textile manufacturing declined by 12.1%; in railroad transportation the decline was 54.8%. During this same period total employment in all industries *increased* by 15.5%. Data are from the U.S. Bureau of the Census (1954, 1972).

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1975, p. 189), obviating any need to overemploy young workers in order to compensate for later outmovement. For both these reasons uniform age patterns would be expected.

Representative occupations from the collection judged to have a flat age profile ($N = 29$) are presented in table 2, panel A. As anticipated, many crafts (e.g., carpenter, electrician, plumber, compositor and typesetter) have age distributions which parallel that of the total labor force (i.e., the entries all approximate 1.00 in value). For the free professions (dentist, doctor, lawyer) the age pattern is somewhat different, though over the range of middle years (28–64), it is quite flat. There is considerable under-representation of the youngest age groups, a consequence surely of the lengthy education period necessary for entrance. There is overrepresentation in the late ages, due probably to the self-employed character and physical ease of the pursuits. As we have remarked, these professions might equally be viewed as having old age distributions.

A final type of age pattern was deduced from the features of "secondary labor market" positions, which are, descriptively, "dead end" jobs. By the latter term we mean occupations with low status and earnings, which require minimal skill and training, and, especially, are not part of a coherent job sequence. Such occupations tend to absorb the more marginal workers in the labor force—the young seeking temporary work and the elderly who are compelled to change jobs because of task difficulty or retirement rules. For these reasons the age distributions of many "dead end" occupations should be U-shaped.

In panel B of table 2 we report age profiles for a representative selection of occupations which have a U-shaped pattern ($N = 20$). With the exception of bookkeeper, the presence of each occupation on the list is comprehensible in terms of the preceding discussion. The most striking examples of U-shaped distributions are the age profiles of food service worker, and office and messenger boy. In the latter instance, the youngest age group is overrepresented in the occupation by a factor of 4.7, the oldest age group by a factor of 8.0, while individuals of prime working age are substantially underrepresented (0.4 for the interval 34–39). Not only are the U-shapes pronounced, but the positions constitute classic examples of dead-end occupations: remuneration is poor and prospects for promotion or upgrading are dim.

To conclude the description of occupational-age patterns, we summarize the data in a way which emphasizes the magnitude of differences between the age categories. For this purpose, Indices of Dissimilarity[14] (Taeuber and Taeuber 1965, p. 236) were computed for each pair of the 201 occu-

[14] For two probability distributions $\{P_{1i}\}$ and $\{P_{2i}\}$, the Index of Dissimilarity is defined as $50 \Sigma |P_{1i} - P_{2i}|$. The extent of difference between the distributions ranges from 0 to 100.

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TABLE 2

ILLUSTRATIVE AGE DISTRIBUTIONS: UNIFORM AND U-SHAPED PROFILES

OCCUPATION	N[a]	MEAN AGE	AGE GROUP								
			18–21	22–27	28–33	34–39	40–45	46–51	52–57	58–64	≥65
A. Uniformly distributed occupations:[b]											
Carpenter (415)...............	1,566	42.6	.79	.80	.98	.97	1.16	1.17	1.10	.98	.81
Electrician (430).............	1,085	41.8	.63	1.03	1.06	.93	.93	1.11	1.03	1.04	.77
Plumber and pipefitter (522)...	921	43.2	.85	.83	.83	.98	1.02	1.07	1.13	1.21	1.10
Compositor and typesetter (422)...	455	43.1	1.22	.76	.94	1.04	1.03	.85	1.01	1.28	1.59
Dentist (62).................	326	47.6	.00	.15	1.03	.98	1.04	1.09	1.12	1.23	3.46
Doctor (65).................	860	44.7	.07	.34	1.14	1.39	1.04	.85	1.01	1.27	1.85
Lawyer (31)................	1,065	45.4	.06	.46	1.20	1.22	.96	.80	.83	1.35	2.82
B. U-shaped profile occupations:[c]											
Bookkeeper (305)............	848	41.9	1.46	1.37	.82	.73	.85	.88	.86	1.20	1.91
Food service worker (916).....	125	42.7	3.66	.86	.55	.80	.68	.99	1.20	1.18	2.08
Office and messenger boy (333)...	104	47.4	4.72	.76	.46	.41	.50	.33	.72	1.42	8.07
Elevator operator (943)........	134	51.5	1.46	.16	.51	.32	.63	1.02	1.55	1.97	5.61
Counter clerk except food (314)...	189	39.4	1.90	1.98	.80	.56	.76	.62	.84	1.06	1.83
Gardener (755)...............	504	44.8	1.23	.98	.64	.78	.70	1.05	1.12	1.46	2.58
Mail handler except post office (332).....	209	39.3	4.23	1.69	.69	.58	.54	.49	.76	1.52	1.94

[a] Number of individuals in the occupation in our sample. See notes to table 1 for additional details.
[b] Number of occupations with uniform age profiles equals 29.
[c] Number of occupations with U-shaped age profiles equals 20.

pational-age distributions. The means of the indices between occupations in the same age category, and the means between occupations in different categories, are presented in table 3. Notice that the smallest distances are always within-category (main diagonal entries) and the largest are between very different sorts of age profiles (e.g., between young and old occupations), except in the case of the unclassified occupations, which are not very distant from any of the other categories as they constitute a heterogeneous, residual class.

This clear division of occupations into different age categories reflects, in many respects, segmentation of the labor market along the lines of institutional forces which operate to mold career lines in diverse ways. On the one hand, there are the crafts and professions, with their life-time commitments and control over occupational entry. At the opposite extreme, in regard to individual commitment and associational power, are positions in the secondary labor market. The age profiles observed for these two occupational groupings follow from the sorts of theoretical considerations that we have outlined. In comparison, concentrated, unimodal age distributions arise from a variety of factors; probably the most significant theoretically is the fact of linkages among occupations in career sequences. In short, unimodal distributions speak to patterns of movement among jobs.

A Confirmatory Analysis of Occupational-Age Patterns

Our subjective assignment of occupations to age categories may be checked by an objective assignment, according to the following scheme. The Indices of Dissimilarity between all pairs of the 201 occupations were analyzed by means of a Guttman-Lingoes Smallest Space Analysis (SSA) (Guttman 1968; Roskam and Lingoes 1970). The purpose of SSA is to determine the smallest euclidean space, in terms of number of dimensions, in which the

TABLE 3

MEANS OF INDICES OF DISSIMILARITY[a] BETWEEN OCCUPATIONS CLASSIFIED
IN SAME AND IN DIFFERENT AGE CATEGORIES

Age Category	N[b]	Young	Middle-Aged	Old	Uniform	U-Shaped	Unclassified
Young..........	43	19.1					
Middle-aged....	30	31.7	13.3				
Old.............	38	24.1	22.3	14.2			
Uniform.......	29	22.1	16.4	16.1	10.5		
U-shaped.......	20	27.5	28.8	21.7	19.5	18.9	
Unclassified[c]....	41	23.1	18.2	17.9	13.4	20.6	15.2

[a] Index of Dissimilarity between occupations 0_1 and 0_2 equals $50 \Sigma_a |P_{a0_1} - P_{a0_2}|$. Index varies from 0 to 100; large values indicate great differences between occupational-age patterns.

[b] Number of occupations in the age category.

[c] Occupations with complex age profiles, which were not classified into one of the five categories.

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rank order of the distances between points (occupations in the present application) is reasonably well preserved. The Index of Dissimilarity between two occupational-age distributions was used as the measure of distance.

Given size limitations for the SSA program it was not possible to perform the analysis on all 201 occupations simultaneously. Consequently, we used SSA to produce a spatial configuration for 99 of the 201 occupations (randomly chosen) and then added the remaining 102 occupations to this initial configuration. For the first 99 occupations the coefficient of alienation, which indicates how well the rank order of original distances is preserved, was .319, .113, and .088 for one, two, and three dimensions, respectively. Because the two-dimensional solution adequately fits the data and because of the ease of interpreting two, as opposed to three, dimensions, we chose to work with the former solution. The remaining 102 occupations were added one at a time to this two-dimensional space with an average coefficient of alienation[15] equal to .108, indicating that the rank order of the distances between the additional occupations and the first 99 is well maintained.

In figure 1, the two-dimensional solution is reported with the 160 occupations that could be classified by inspection indicated on the output. Each occupation is labeled by its subjective category: young (1), middle-aged (2), old (3), uniform (4), and U-shaped (5); the *locations* of the points, though, were determined by the objective SSA routine. Using the subjective assignment as a guide in defining boundaries, we see that the space can be partitioned into five regions, each clearly though not perfectly enveloping occupations in one of the five subjectively determined age categories. Even using simple, linear partitions, such as the ones shown, only 15 of the 160 occupations classified by inspection appear in the wrong sector, and the majority of these are close to a boundary division.

Of equal relevance, the two dimensions of the space can be interpreted. The horizontal axis reflects the mean age of an occupation, and ranges (left to right) from young, to intermediate, to old. The vertical axis depicts the extent to which occupations have a concentration of workers in the middle years, and ranges (top to bottom) from overrepresented, to uniform, to underrepresented. Overall, the results of the SSA procedure support the contention that occupations have distinctive age structures, and indicate that our subjective assignment of them to categories approximates the partitions that would be drawn on the basis of an objective assessment of distances between occupational-age profiles.[16]

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[15] For each occupation added to the initial configuration, SSA computes a coefficient of alienation which indicates how well its placement preserves the rank order of the distances to the occupations in the initial configuration. These values were averaged to produce a summary measure of fit.

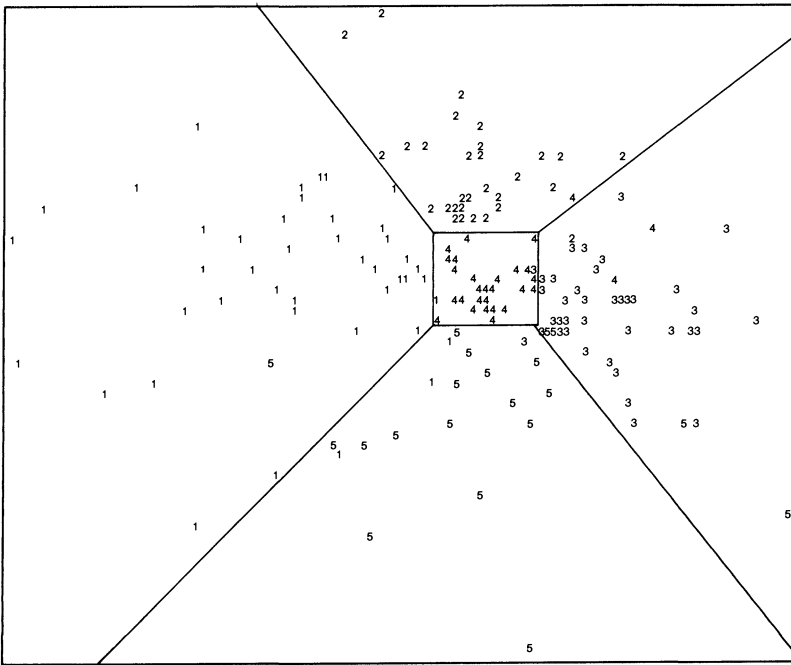[16] Why, then, was an objective procedure not used? In particular, the subjective assign-

FIG. 1.—Smallest space analysis of the occupational-age profiles. Numbers refer to subjective classification: 1 = young, 2 = middle-aged, 3 = old, 4 = uniform, 5 = U-shaped. Locations of points were determined by the objective SSA procedure. Lines indicate linear partitions for defining occupational-age categories.

EVIDENCE FOR MECHANISMS
WHICH GENERATE OCCUPATIONAL-AGE PATTERNS

Now that a factual basis has been established for the five occupational-age distributions that were postulated, we turn to the matter of validating some

ment could have been employed as a first stage, to define partitions on the SSA output; in turn, the partitions could have been used to classify occupations into age categories. Our objection to total reliance on the objective procedure stemmed from our desire to emphasize certain organizational forces where several act on an occupation. For example, while SSA would have placed dentist, doctor, and lawyer in the old-age category, we preferred to emphasize other aspects of their age structures, namely, the uniformity of the age profile over the major portion of the age range and the organizational considerations which give rise to this uniformity.

We could have defined "distance" differently, such as by assigning a weight to each portion of the age range, and thereby given precedence to one or another feature of the age profile as a determinant of the category to which an occupation would be assigned. However, because the Index of Dissimilarity is a familiar measure, and because the thrust of our analysis is well supported using this simple distance measure, we chose not to complicate the calculations and instead view the objective procedure as a confirmatory test of the main theme of our investigation.

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of the mechanisms that were offered to explain their presence. In this sec-
tion we report an elementary analysis which relates the occupational-age
patterns to broader issues of labor market structure. In the next section
we indicate some limitations of our formulation, particularly in relation to
its neglect of industry effects.

To ascertain how different causal forces contribute to the observed occu-
pational-age distributions, a multivariate logit analysis (Nerlov and Press
1973) was carried out. Multivariate logit regression is appropriate for the
following formulation: Assume that an occupation can be in one of five
classes (age categories); the classes constitute the set of dependent vari-
ables. The regressors, in turn, are measures of factors which, drawing upon
our prior discussion, are believed to influence an occupation's presence in
one or another of the classes.

The following variables were used as regressors:

a) Occupational growth—measured by percentage increase in occupa-
tional size, 1950–70. This variable was expected to differentiate between
young-age occupations (high growth rate) and the two categories, old-age
plus uniform-age distribution occupations (low rate of growth). Data are
from U.S. Bureau of the Census (1968, 1973).

b) Specific vocational preparation (SVP). This measure is from the
Dictionary of Occupational Titles (U.S. Department of Labor 1965) and
indexes the amount of specialized training necessary to perform a job task.
Our expectation is that low SVP should be associated with the U-shaped
occupational-age category. We suggested that this category would contain
many low-skilled "secondary labor market" positions, and low SVP should
predict to these occupations. This variable was constructed from a merging
of our census data tape with a file containing DOT information, to which
census occupational codes had been assigned.

c) Percentage stayers in an occupation, 1965–70. This variable was also
expected to distinguish the U-shaped age category from several others. In
particular, if the U-shaped category contains "secondary labor market"
positions—jobs characterized by little opportunity for skill development
and a low return to seniority—attachments to the occupations should be
low. At the opposite end of the attachment continuum would be occupa-
tions with a uniform age distribution. Many of these are professions and
crafts, in which training is long and investment in occupationally specific
skills is considerable.

For a different reason a low rate of attachment should characterize occu-
pations in the young-age category, and a high rate occupations in the old-
age category. In this instance, the difference in rate of staying would be
derivative of an individual-level attribute, the tendency of young persons
to be more mobile occupationally than mature workers.

d) Percentage self-employed. This variable was expected to distinguish

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old-age occupations and uniform-age distribution occupations (both expected to have high rates of self-employment) from the other categories. Percentage self-employed was computed from the 1970 Census 1/100 sample tape.

e) Mean education. This term was introduced as a control, to hold constant an occupational characteristic that both is a determinant of occupational-age category and is correlated with several of the preceding variables that are of more central substantive interest. Mean education was calculated for each occupation from the 1970 Census 1/100 sample tape.

The results of the multivariate logit analysis are reported in table 4. In most respects our prior expectations are supported. In particular, occupations in the young-age category have low rates of staying and high growth rates (col. 1). Old-age occupations, in contrast, have high rates of staying, high rates of percentage self-employed, and low growth rates (col. 3). The latter figures are significantly different from those for the young-age category (though some are not statistically different from the population mean); more to the point, there is a consistent shift in the values of the parameters as one moves from young to middle-aged to old-age occupations.

Uniform-age distribution occupations have high rates of self-employment and low rates of growth (col. 4); both effects correspond with our expectations. Yet, surely the most interesting findings pertain to the U-shaped age category (col. 5). Percentage stayers is substantially negative, in comparison with the other occupational-age categories. Similarly, in conformity

TABLE 4

LOGIT REGRESSION ANALYSIS OF THE OCCUPATIONAL-AGE PATTERNS[a]

Independent Variable	Young	Middle-Aged	Old	Uniform	U-Shaped
Occupational growth..	.00260*	.00213**	.00041	−.00604*	.00090
	(2.51)	(1.95)	(.29)	(−2.16)	(.50)
SVP...............	.05183	.41176**	.11364	.00705	−.58428*
	(.33)	(1.92)	(.74)	(.04)	(−2.43)
% stayers[b]	−.55242*	.31691	.79578*	.34510	−.90536*
	(−2.29)	(.98)	(2.33)	(1.00)	(−2.86)
% self-employed[b].....	−.16356	−.11406	.04200	.16590**	.06971
	(−1.54)	(−1.11)	(.47)	(1.80)	(.46)
Mean education......	.06021	.17391	−.29325*	.06532	−.00620
	(.57)	(1.53)	(−2.54)	(.54)	(−.03)
Constant.......... ..	3.92256**	−7.34907*	−3.55207	−2.80635	9.78493*
	(1.89)	(−2.64)	(−1.22)	(−.97)	(3.33)

[a] Entries are unstandardized logit regression coefficients; *t*-ratios are in parentheses. For a given age category (column) the coefficients report the effects of the independent variables on the log of the odds of being in that age category.

[b] The square roots of these variables were used in the analysis to reduce skewness.

* $P < .05$, two-tail test.

** $P < .10$, two-tail test.

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with our argument, the SVP measure is negatively associated with presence in the U-shaped category. We conclude that occupations with this age distribution display features which many authors (e.g., Doeringer and Piore 1971; Reich, Gordon, and Edwards 1973) have associated with the "secondary labor market"—low requirements for job-specific skills and high rates of turnover.

Thus, despite the small number of occupations ($N = 160$) available for this multivariate analysis, our results are consistent with the operation of mechanisms of the sort postulated above as determinants of occupational-age patterns. In general, we find compelling evidence for the contention that the age categories derive from fundamental organizational features of the labor market. In particular, we find especially impressive the correspondence of a distinctive age structure with occupations that have little future or otherwise are of low desirability.

INDUSTRY EFFECTS ON OCCUPATIONAL-AGE PROFILES

To this point we have discussed occupations as undifferentiated entities with respect to the determination of their age profiles. There exist, however, systematic, often divergent, influences on the age structures of *segments* of occupations. Except for the free professions and vocations in which self-employment is common, occupations are not organized as autonomous units; rather, performance of their roles requires employment in an industry (more precisely, in a firm).[17] Growth or decline in occupational size is one consequence of growth or decline in total employment in the industries in which the occupation is concentrated. Thus, occupations associated with several industries may be experiencing simultaneous expansion and contraction in different industry sectors. For example, during the period 1950–70, employment of managers and operatives increased in computer manufacturing while it decreased in apparel manufacturing (U.S. Bureau of the Census 1954, 1972).

The importance of industry growth and decline for occupational-age profiles is that contracting segments of occupations tend to have an old age structure, while expanding segments have a young age distribution. Contracting industries reduce personnel through layoff (which usually proceeds in reverse order of seniority) and by not replacing voluntary departers. In each case the effect is to create an older work force. Expanding industries, in comparison, hire disproportionately from among new entrants to the

[17] Although firms are the employing units, lacking data at the firm level we use industry as a proxy. As remarked in n. 2 above, much of the interfirm variation in organizational features arises from industry differences. Firms in the same product category industry tend to use similar technologies, which limits the variety in organizational arrangements that can be established.

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labor market. Salaries are lower for young workers and a longer expected duration of employment means greater potential return to the firm from training costs.[18] Reinforcing this hiring preference, mature workers often are reluctant to change employers because investments have been made in seniority and pension rights. In summary, occupations associated with multiple industries may be expanding and contracting in different sectors. This makes for more complex age profiles than the results we have presented, in which occupations were viewed as undifferentiated units.[19]

For the purpose of understanding industry effects on occupational-age profiles, industries can usefully be considered as bundles of occupations in which the occupational mix is determined by technology.[20] To a considerable extent, expanding and contracting industries must maintain their technologically determined occupational mix, so changes in total employment in an industry carry analogous implications for the age structures of most associated occupations. Evidence in support of this contention is reported in Kaufman (1977).

By virtue of their growth histories, industries therefore contribute second-order effects, modulating the dominant age structure of an occupation. Nor is this the only manner by which industries influence occupational-age patterns. Industries also differ in the rules that are followed when filling upper manual and lower white-collar positions. In some, component firms traditionally promote from lower ranks (internal labor market);[21] while in other

[18] Bogue (1959, p. 501) reaches a similar conclusion: ". . . the younger generations enter new fields that are just opening up, and avoid fields that are declining in importance."

[19] For example, the mean ages of managers in computer manufacturing and apparel manufacturing are 39 and 47, respectively. The corresponding mean ages of operatives in the two industries are 33 and 46. Systematic calculations reveal that in every major occupational category there is a correspondence between industry growth rate and age distribution. Thus, in industries which expanded by less than 70% between 1950 and 1970, the proportion of managers older than 52 years equals 38%, while in industries which expanded by more than 140% the proportion of managers older than 52 equals 26%. For sales workers the corresponding figures are 39% and 24%; for operatives they are 32% and 24%. The analysis presented above cannot be carried out with detailed occupations (three-digit census codes) because many of them (e.g., policeman, teacher, railroad engineer, typesetter) are industry specific. Data are from our tape on 12 SMSAs.

[20] The extent of technological determination of the occupational mix differs by industry. In some (e.g., auto assembly production), few alternate technologies (to the assembly line) are available, and there is a considerable degree of determination of firm organization and occupational mix by technology. In other industries (e.g., housing construction) alternative technologies are in use (site construction, prefabrication) and variability is present among firms in occupational composition. For enlightening discussions of the relation between technology and firm organization see Woodward (1965), Blauner (1964), Stinchcombe (1959), and Perrow (1967).

[21] See Kerr (1954), Doeringer and Piore (1971), Stinchcombe (1959), and Zald (1971, pp. 61–65) for discussions of promotion rules, labor market organization, and how these considerations relate to industry.

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industries, there is a tendency to hire directly into upper-level slots from outside the firm. Such considerations are relevant to occupational-age distributions, as they speak to the rate at which workers pass through an occupation and to the movement prospects of individuals with high seniority (presumably older workers).

The intent of our argument here is to suggest the utility of taking *occupation* $\times$ *industry* as the unit of observation in analyses of age segmentation, rather than occupation alone. Such an approach has the additional virtue that occupation $\times$ industry positions constitute the building blocks of moderately realistic descriptions of career trajectories (sequences of jobs), in that they permit consideration of the two main dimensions of movement—across occupations and across industries. Moreover, career trajectory categories (e.g., orderly career, chaotic career, craft career) carry strong implications for the age composition of the component positions in a trajectory (Spilerman 1977),[22] so that the intimate association between age segmentation and movement patterns is made especially evident.

With all this said about the desirability of using occupation $\times$ industry positions as the units of observation, the practical problems of analyzing age segmentation at this detailed level are immense. For this reason we limited the present investigation to a more aggregate characterization of labor force composition, in which the occupational dimension is emphasized.

IMPLICATIONS OF THE STUDY

One can hardly write about occupational-age structures without noting their special relevance to policy issues facing this nation. In particular, if compulsory retirement rules are eliminated or the age of compulsory retirement is raised, our analysis suggests a very different impact on an occupation according to the age category it is in. Occupations with an old-age profile or with a U-shaped profile would be little affected, as few currently have retirement requirements. To the extent that they are affected, these occupations stand to *lose* elderly workers since many are entered late in life by individuals who have departed from a prior career line, often as a consequence of retirement rules. Raising the age of compulsory retire-

[22] An "orderly" career trajectory may be thought of as a collection of jobs in which movement among the component positions is principally in one direction. This usually entails performance of low occupational tasks at the outset, followed by higher-level positions within the firm (Slocum 1966, p. 5). The implications for age segmentation are that the successive jobs would be characterized by correspondingly higher mean ages of incumbents, and that the standard deviation of worker ages in each position would be small. In comparison, a "chaotic" career trajectory consists of a collection of jobs in which there is a high density of movement but without a coherent direction; in short, cycling among the positions is common. This implies little difference among the component jobs in mean age of workers and a large standard deviation of worker ages for each position.

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ment would therefore reduce the inflow of older workers into these two age-profile categories.

Occupations with a uniform age distribution would also be affected only marginally by a change in retirement policy. This category contains the free professions, in which self-employment and absence of retirement rules is the norm. Also present here are the craft trades. Many (e.g., carpenter, electrician) provide opportunities for part-time or occasional work after formal retirement, though this is not common in other crafts (e.g., heavy machinery operator). Raising the age of retirement would permit individuals in the latter trades to remain in the labor force. Thus, the average age of workers should increase, though the aggregate effect on employment in this age-profile category would be small.

A change in retirement policy would have greater impact on the young and middle-aged categories. Occupations with a young age distribution that are part of a career track would experience an *increase* in the mean age of incumbents. That is, if the proportion of senior-level slots in the economy remains constant, raising or eliminating the age ceiling should produce a later average age of retirement from them and, as a result, a later average age of promotion from positions in the young-aged category.

Yet the impact of a change in the age of compulsory retirement would be most consequential for occupations in the middle-aged category. We refer especially to senior-level positions, in hierarchical organizations, which are entered late in an individual's work life. Managers, administrators, and other supervisory personnel constitute the most evident examples. Our data show the highest decline in representation rate after age 60 for occupations in this age-profile category. Because many of these positions have a concentrated age distribution (e.g., in the interval 50–65), removal of the upper-age constraint would have a considerable impact on their age composition.[23] The fact that these occupations tend to be ones of power and influence in our society should create special cause for concern about the consequences of altering current retirement policy.

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[23] Ignored in this brief discussion are demographic considerations. For example, the short-term consequence of raising the retirement age is a function of the current age distribution in the occupation. Similarly, if an occupation is expanding in size, raising the retirement age will have a smaller impact on its age composition than if it is contracting.

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