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Careers and Organizational Labor Markets: Demographic Models of Organizational Behavior[1]

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It is commonly held that an individual's career prospects decline the higher he or she rises in an organization. In many cases this is not true; this paper identifies four organizational microstructures and two triggering mechanisms that provide clues for assessing one's career prospects in different organizations. The four microstructures are grade ratios, vacancy chains, managerial selection preferences, and cohort size. Growth and exit rates are important triggering mechanisms prompting these microstructures into action. In addition, the effects of being identified as a "star" are shown as they are mediated through these organizational structures. Since the microstructures stretch across the full set of hierarchical grades, they are used to explicate the sequential career chances over the full organizational career span and the comparative level of difficulty at each promotion "gateway." Biases from both retrospective and panel data also indicate the importance of sampling from labor markets as well as from career streams to identify the underlying structures that operate alongside the more commonly studied heterogeneity of individuals. The approach used here links three usually disparate areas—labor, organizations, and demography—and in some cases extends the results of stable population theory within organizational demography. Data from three organizations—in both private and public sectors—are used to illustrate the model and to conduct empirical tests and thereby provide initial confirmation of the theory.

I. ORGANIZATIONAL LABOR MARKETS

The usual view of organizations as hierarchical pyramids is not the best view of one's own career prospects. Other features of organizational struc-

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ture or process provide better clues—four microstructures and two triggering mechanisms. The first microstructure shown to influence careers is grade ratios—a distributive form of structure.[2] The second structural effect is processual, involving the transformation of simple grade ratios into multiple grade ratios through vacancy chains. The third is a choice structure, operative in terms of managerial preferences for individual skills at each grade. And the fourth is a cohort size effect conditional on vacancies, having four acceleration principles. Growth and exit rates (the latter tied to organizational "age" or length of service, career prospects, and work relationships) are important trigger mechanisms prompting these microstructures into action. In addition, the early identification of "stardom" is shown to affect career chances and outcomes as they unfold within these organizational structures. These are the primary theoretical results of this paper.

One methodological result pertinent to sampling is also presented. Very large data biases are apparent from both one-point panel and retrospective sampling. To the extent that individual behavior is contingent on such microstructures as are described above, we must sample from the structures, not simply from one-point populations of persons. The implications of this finding extend well beyond the area of organizational labor markets to a more general problem of identification; that is, identifying underlying structures through which the effects stemming from individual variation are mediated.

The organizational labor market (OLM) approach we use links three usually disparate areas—labor, organizations, and demography.

Labor

Individual careers and income have been the central topic of two major streams of research in sociology and economics—status attainment (Blau and Duncan 1967; Duncan, Featherman, and Duncan 1972; Jencks et al. 1972; Hauser and Featherman 1974) and human capital (Mincer 1974; Becker 1975). Significant advances have been made on the supply side of the process through this work, which stresses individual variation. Recently, the theoretical imbalance stemming from the lack of attention to the demand side of the process has been increasingly realized. Spilerman (1977) has developed the career-line concept, relating it directly to labor market structure, including internal or organizationally administered labor markets (see Doeringer and Piore 1971). Stolzenberg (1978) has stressed the size of the firm in which the worker is employed. And Konda and Stewman (1980) and Stewman (1981) look inside an organization to investigate how aging and seniority interact with job vacancies to produce individual career

[2] For a clear discussion of both distributive and processual forms of social structure, see Nadel (1957).

movement. In each of these recent developments regarding careers, organizations are being incorporated.

In fact, one might easily consider organizations the behavioral arbiter of the "idealized" competitive labor market. Organizations vary significantly in their range of work and across product lines (i.e., the industrial sector). Even when they appear similar in these respects they differ in employment practice: hiring, evaluation, promotion, and retirement policies; incentive schemes; degree of unionization. In addition, organizations vary in size, growth rate, geographical dispersion, divisional structure, and their distributive allocation of occupations and of hierarchical grades within occupation, that is, in relative sizes per grade (span of control) and in number of levels. There is also an underlying stratification of organizations, even within product lines, providing a hierarchy of organizations in which the individual worker is located. There should be little question, then, that such intermediaries as organizations have a differential impact on careers, since individual labor market behavior is carried out in differently structured labor markets.

Organizations

Sociology has both organization and career theories, but it is as though the two did not operate in conjunction with labor markets. This is in spite of the fact that careers occur within an organization or stream of organizations and these organizations form internal labor markets (ILMs). In economics, on the other hand, the theory of the firm is a theory of markets, not a theory of organizational structure or decision making (cf. Cyert and March 1963). Nor does the theory of the firm consider careers of workers and managers in terms of the full life cycle of labor supply and continued individual motivation, aspiration, and development.

Yet careers and labor markets are ideal processes for developing and testing theories of organizational behavior. Note that one way to view organizational decision making is in terms of assigned staff. Within an organization, the staff constitutes not a single labor market but a set of ILMs. Hence, individual career behavior, even in organizations, reflects the general fragmentation of the labor force along occupational lines, and organization theory should take into account these separable OLMs. At a bare minimum, the distributional properties of the OLMs will affect an individual's development within the organization and thereby his career choices. In other words, while organizations are designed in terms of products and along product lines, the staff performing the jobs in such a divisional structure is simultaneously responding to a parallel structure—that of the OLMs which specify the career ladders on which individuals move.

Moreover, staff assignment involves the continuous renewal of organizations. First, the allocation of jobs into job distributions determines the structure of the organization—both horizontally and vertically. As new jobs are created or old ones become vacant, the manager may choose to reallocate these distributions and hence change the organization's design; the manager also selects new occupants who may change the character of the jobs as well as the performance level. And, if we think of multiple assignments, the possibility arises of new mixtures of skills, experience levels, and even the formation of selected "critical masses." Along the lines of such mixtures, March (1975) has suggested viewing committee decision making in terms of a mixture of career streams or individuals located at various points in their career life cycles, and Keyfitz (1980*a*) has referred to the importance of cohort mixtures for research productivity in universities. The development of new ideas from "new blood" entering the organization and from the nurturing of "young blood" by the "old blood" and vice versa is a distinct possible effect of staff renewal. In brief, the "changing of the guard" does not occur only with changes in administration or in administrative policy but is a continuous reality throughout the organization.

Finally, not only does the staff assignment process provide the elementary setting for decision making about work by both management and worker, but also we can deal with demand factors affecting careers, such as job distributions and especially job vacancies, and thereby lay the foundations for study of the microstructural effects which, in addition to individual heterogeneity, explain career behavior and organizational performance. In brief, not only are labor theorists beginning to incorporate organizational processes into their work, but also the present time affords an excellent opportunity for organization theorists to include labor market behavior as an integral component of organizations, thereby engendering an active two-way flow in the theoretical development. (For initial work along these lines see Keyfitz [1973, 1977, 1980*b*]; March [1975]; Pfeffer [1981]; Stewman [1981]).

Demography

Demography? Recent analytical work on organizational staff flows and distributions (Young 1971; Young and Almond 1961; Forbes 1971; Bartholomew 1973; Young and Vassiliou 1974; Stewman 1975*b*, 1978, 1981; Bartholomew and Forbes 1979; and Konda and Stewman 1980) might be termed organizational demography since it describes the behavior of organizational populations. Yet such work is certainly not at the core of demographic theory as is, for example, stable population theory. In this paper, we will show how the two strands of research overlap and why this paper may also be considered part of a newly developing species within demography, labeled "organizational demography" by Keyfitz (1977).

Plan of the Paper

In Section II we summarize the current theoretical linkages between careers and OLMs. Keyfitz's work on organizational demography (1973, 1977, 1980*a*, 1980*b*) serves as an important precedent and points to some very interesting questions. Other recent work by Stewman (1978, 1981) and by Konda and Stewman (1980) utilizing a different type of organizational demographic model also points toward a new avenue for such linkages. In Section III we demonstrate the four microstructures and two triggering mechanisms mentioned above, and in Section IV we address the issue of sampling biases from retrospective and panel data.

The data for the analysis of grade ratios and vacancy chains pertain to managerial OLMs in four organizations—a private corporation, a state police force, a military unit, and the U.S. Civil Service. In addition, growth and exit rate data were available for the first three organizations, and the analyses combine these rates with the prior two structures. In the remainder of the analysis, the data are limited to the lower level and managerial hierarchy of the state police organization and include all recruitment cohorts and the full labor market processes (i.e., continuous organizational operations) from 1934 to 1970. The organizations were chosen, not to provide an exhaustive range or a sampling, but because of the availability of data. Nevertheless, the results are quite encouraging—they illustrate the model's applicability to both the private and public sectors and they provide initial confirmation of the theory via the tests.

II. ORGANIZATIONAL CAREER MODELS

For simplicity, consider two types of processes governing organizational staff flows. In one, an individual's probability of promotion is proportional to the number of persons within his grade having the same set of attributes. Thus, an individual's promotion chances may change upon reaching some "marker" such as a certain age or level of experience (seniority, number of hours worked), or job performance level; or promotion chances may be stable but differ across persons due to their having different attribute sets such as educational level and quality. More likely, of course, for each individual there is a mixture of stable and changing attributes. Nevertheless, since in this first type of process the individual's chances of promotion depend on his set of attributes, organizational staff flows are responsive to the attribute mixes within grades. Thus, when larger proportions of staff reach the "markers" or have higher quality education, the promotion probability of the entire grade level is increased accordingly. Such a labor market is therefore highly dependent on hiring sequences. When a large number of persons are hired, the result will reverberate later through the

OLM in the form of larger numbers of promotions.[3] Career outcomes in such OLMs are attribute based, although different organizations may use different markers.

Alternatively, in the second type of process, an individual's probability of promotion is conditional on the number of available job vacancies, a managerial preference distribution on attributes, given a vacancy and the individual's relative attribute standing in comparison with the other persons being considered to fill a vacancy. Hence, if the managerial preferences are stable, a person's promotion chances will depend on the ratio of that person and his competitors to the number of job vacancies. For instance, if experience or seniority was the criterion for selection, the individual's promotion chances would be equal to the number of job vacancies allocated to his seniority level divided by the number of persons at that seniority level, or the ratio of supply to demand. Thus organizational staff flows are responsive to vacancy generators—exits, new jobs, and higher level promotions. Career sequences in such OLMs are contingent not only on individual attributes but also on organizational growth rates, the hierarchical profile or spans of control, staff exit rates, and hiring at upper grade levels from outside the OLM, which decreases the number of vacancies available for promotion from within.

Organizational career models of the first type of process have been developed by McGinnis (1968), McFarland (1970), Spilerman (1972), Hopkins (1973), and Wise (1974).[4] The second type of organizational career modeling is more recent, involving Keyfitz (1973, 1977, 1980*a*, 1980*b*), Stewman (1978, 1981), and Konda and Stewman (1980). The latter type of model allows more interaction between organizational and career processes. Consequently, we focus our attention in the remainder of this paper on this supply and demand type of OLM model.

Keyfitz (1973) poses a simplified two-grade organization for analytic convenience. He sets a constant span of control or ratio, k, between the two grades and bases hiring, promotion, and retirement on age. All persons are hired at age α, promoted at age x, and retire at age β. In addition, there is a uniform growth rate, r, and an age-specific survival probability from birth to age a, $l(a)$. For a given α and β, Keyfitz then asks about the effect of differential growth (and decline) rates on age of promotion. For a given growth rate, he also compares the effect of a changing organizational span

[3] Assuming hiring and promotion policy does not change or the quality of labor supplied decline. Certainly in the case of universities during the 1960s, the attribute-driven model might well apply and, for that matter, it may still apply.

[4] Wise (1975) used a binary logit model to estimate the effect of heterogeneous attributes on promotion probabilities in the Ford Motor Co. He assumed a constant promotion rate across grades. Rosenbaum (1979) tested no model but did examine three managerial level promotion probabilities in terms of their consistency with alternative models of this type.

of control, k, implicitly treating hierarchical levels of an organization. Keyfitz's application of stable population theory, insightfully reformulated for a simple organizational structure, yields powerful results on factors affecting organizational careers. A brief summary of his findings is as follows:

1. Promotion is considerably faster in a growing organization than in a stable one. "Change from the 2% annual increase of the United States a few years ago to its prospective stationary condition implies a delay in reaching the middle positions of the average factory or office of $4\frac{1}{2}$ years" (Keyfitz 1973, p. 335).
2. Promotion at the top of the organization ($k = .2$) is less affected by growth than is promotion at the middle ranks ($k = 1$).
3. There are diminishing returns with increased growth (e.g., the promotion effect of an increase from zero to 1% is more than that of an increase from 3% to 4%).
4. The effect of population growth is much greater than the effect of mortality. "A rapidly increasing population is more than three times as advantageous (to the survivors) as a high level of mortality" (Keyfitz 1973, p. 339).
5. Resignations, deaths, and growth all tend to push an individual upward through the several steps, and a given change in any has the same numerical effect on his rate of progress.
6. A decrease in organizational size has an even greater effect on promotion than a comparable increase. If we use 1968 U.S. mortality rates, we see individuals at the halfway point ($k = 1$) of the organizational age distribution at age 26.61 in an organization increasing at the rate of 10% per year, at age 40.86 in a stable one, and at age 56.96 in one decreasing by 10% per year (over a 45-year period).
7. The growth effect on age of promotion is approximately proportional to the age range from initial labor market entry to retirement.
8. Regarding nonstable age distributions, a person born in a cohort that is small relative to those before and after his will benefit by the retirements above him and the entrants below him. The advantage will be with him throughout life since the cohorts maintain their relative size as they move forward in age and time.
9. "The effect of recruiting a fixed proportion of the work force at every age is the same as reducing the rate of increase by that fixed proportion. Conversely, if each year 1% of the employees of each age are dismissed, then the promotion of those who remain is speeded up . . ." by the same amount as by a 1% growth rate (Keyfitz 1973, p. 347).
10. The promotion effect of young immigrants entering the labor force at the bottom is the same as a natural growth rate of that size.

Basic to Keyfitz's analysis is an assumption of a distributional gateway which, within a comparative statics framework, shifts across stable age structures until it reaches the staff ratio, k. Because of the stable age distribution of each organization's population, the fixed ratio of jobs above to those below effectively redistributes individuals as if there were an underlying vacancy chain, as in White's (1970) model. That is, the growth and exit rates specify the number of vacant jobs; the staff ratio, k, allocates new jobs above or below the gateway and then age group x is promoted to fill the vacancies and recruits enter to maintain the lower proportion of the population. The binary k ratio can be shifted up and down the population of the organization as if to treat multiple levels.

Working directly from White's (1970) vacancy chain model and Bartholomew's (1973) renewal model, Stewman (1978, 1981) and Konda and Stewman (1980) develop a model that explicitly treats vacancies, multiple organizational levels, and managerial selection from among a distribution of attributes. Staff exits and new jobs per grade trigger the chain reaction of promotions. Thus far new jobs per grade have been allocated in proportion to the relative grade size, and staff exits have been assumed to be conditional on an attribute, such as length of service in the organization, and whether or not the individual was promoted. Promotions are assumed to be conditional on (1) the number of vacancies in the grade, $v_j(t)$; (2) a managerial selection probability distribution $\lambda_{ji}(s)$, where s represents seniority within grade i; and (3) the number of persons in grade i with seniority s at time t, $n_i(s, t)$. Let $p_{ij}(s, t)$ be the probability of promotion from grade i to j for an individual with seniority s in grade i at time t. The promotion equation which Konda and Stewman (1980) use is

$$\bar{p}_{ij}(s, t) = \frac{v_j(t)\lambda_{ji}(s)}{n_i(s, t)} . \qquad (1)$$

Vacancies are generated by the departure of individuals (up by promotion or out to the external market) and by newly created jobs. As internal candidates are promoted to fill vacancies they, in turn, open additional vacancies creating a chain reaction of promotions.

To date, Konda and Stewman (1980) have tested the model in a specific management hierarchy (state police), and Stewman (1981) has conducted a simulation on aging and organizational behavior using data from several sources. Their findings pertaining to careers are summarized below:

1. There is a Venturi or hourglass promotion effect from the organization's hierarchical staff ratios. The promotion probabilities accelerate, then decelerate at a middle grade, and then accelerate once again toward the top of the organization (Stewman 1978).

2. There is a hierarchical level effect: an individual's best selection

chances occur earlier, the higher he is in the organization (Konda and Stewman 1980).

3. The behavior predicted from the model reveals dramatic bursts in promotion chances over time in response to either increased demand or decreased supply at the attribute level chosen (Konda and Stewman 1980; Stewman 1981).

4. Managerial promotion rates have been shown to be dependent on the chain reaction process depicted by the model (Stewman 1978, 1981; Konda and Stewman 1980).

5. Under stable hiring policies, such as are generally practiced today (hiring primarily in the twenties, or in the 20–49 age band), we may expect significantly higher proportions (150%–400%) of persons aged 60 or above in higher management levels of organizations over the next 20 years and thereafter, implying decreased future promotion rates due to shifts toward stable organizational age distributions from current ones (Stewman 1981).

6. Grade profiles by age in the upper levels of the U.S. government labor force demonstrate a major break between the age groups above and below 40, providing behavioral support for the age-40 promotion benchmark noted by Sofer's (1970) managerial staff and Sheehy's (1976) male worker (Stewman 1981).

7. There are differential cohort promotion rates, suggestive of differences in the distribution of talent or exceptional persons (Konda and Stewman 1980).

Having briefly summarized two streams of organizational supply and demand research, each of which identifies career acceleration and deceleration, we wish to examine both analytically and empirically certain supply and demand factors generating such career effects. Among these factors are organizational growth, hierarchical ratio or span of control, chain reactions of opportunities, hierarchical level, managerial selection preferences, exit rates, cohort size, and the "star" or exceptional person.

III. CAREER CHANCES AND OUTCOMES

This analysis will be organized around four topics: hierarchical ratios and organizational Venturis, managerial preferences, stars, and cohorts. Throughout the analysis, we will utilize and extend the vacancy model of Konda and Stewman (1980), relating the discussion to several of the research findings cited above and attempting to specify important structural conditions affecting career changes and career outcomes. Moreover, these analyses will focus on multiple promotion "gateways" or sequential promotion chances over the full organizational career span, the comparative level of difficulty at each gateway, and the relation of these sequential chances to the organizational labor market.

A. Hierarchical Ratios and Organizational Venturis

Alternative OLM Profiles for Viewing Career Prospects

1. *Grade distributions.*—Recent studies of managerial staff OLMs provide an initial set of data points regarding staff distributions. Selected profiles, depicted as the percentage of total OLM staff per grade (G5 being the top grade), are provided in table 1.

As may be seen in the top section of figure 1, each OLM is pyramidal. The peicentage per grade is depicted by a corresponding percentage of the area within the pyramid. The distributions are portrayed as if they are for OLMs of the same size, and therefore it is the location of the gateways between levels which distinguishes the OLMs.[5]

2. *Grade ratios.*—While the percentage profiles in figure 1 are informative, it is not the percentages per grade but the grade ratios which are important for career promotions. The corresponding grade ratios for these OLMs are shown in table 2. In each organization, we observe a Venturi tube or hourglass effect for hierarchical ratios as depicted in the middle section of figure 1. Career chances clearly change—and do not steadily decline as one moves up in a firm.

TABLE 1

OLM Profile in Terms of Percentage Distribution per Grade

	OLM			
Grade	(1)	(2)	(3)	(4)
G5.........	.03	.018	...	...
G4.........	.04	.022	.05	.01
G3.........	.07	.10	.11	.05
G2.........	.28	.20	.33	.13
G1.........	.58	.66	.52	.81

Note.—(1) = managerial staff, private firm (Young and Vassiliou 1974); (2) = managerial staff, state police (Stewman 1978); (3) = military hierarchy (Forbes 1971); (4) = managerial staff, U.S. government (Stewman and Konda, current research).

[5] Owing to the importance of identifying grade locations, a point should be made regarding the number of grades and their location in the OLMs analyzed here. In OLMs 1–3 the gateways have been identified in previously published work. Thus, their number and location or placement in each OLM hierarchy are specified in earlier work on promotion. Less used here, OLM 4 refers to the top management levels of the Federal Civil Service in the United States, GS 15–18. In general, in discrete ranked hierarchies there should be no problem in identifying grades. In continuous ranking, as in White's (1970) church size, the cutting points are more arbitrary for the analyst. The main issues even there, however, are two. (1) Does the selection of gateways yield new insights into the organization's staffing processes? (2) If there is movement across more than one grade, managerial selection should be directed toward multiple gateways as in Section IIIB, where internal and external selections are treated. In other words, the entire OLM population below gateway x would be the "promotion pool." A multivariate selection process conditional on vacancies has been formulated elsewhere by us.

3. *Opportunity induced or multiple grade ratios (MGRs)*.—In table 3 we provide the multiple grade ratios resulting from vacancy chains. The shift in OLM structure from simple grade ratios to the opportunity induced grade ratios produced by vacancy chains is shown in the bottom section of figure 1. The hatched area denotes the vacancy chain effect and as we will

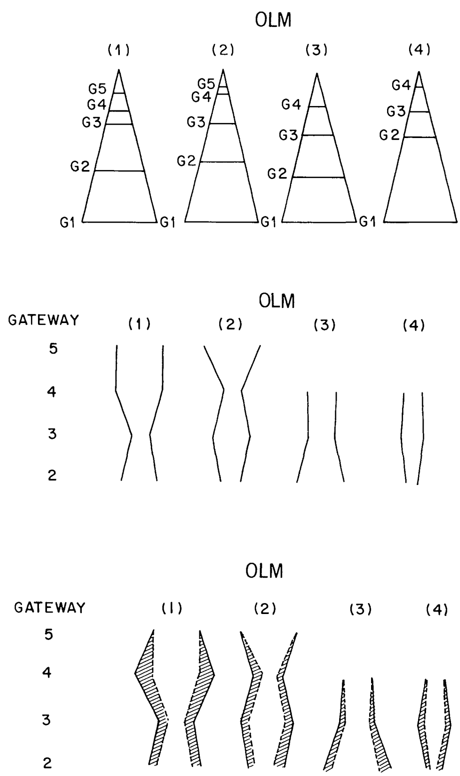


FIG. 1.—Top, organizational labor market profile in terms of percentage distribution per grade. Middle, organizational labor market profile in terms of grade ratios at each gateway. Bottom, organizational labor market profile in terms of multiple grade ratios (MGRs) at each gateway.

TABLE 2

OLM PROFILE IN TERMS OF GRADE RATIOS

	OLM			
GRADE RATIO	(1)	(2)	(3)	(4)
G5/G4......	.65	.82	...	...
G4/G3.... .	.67	.22	.40	.28
G3/G2......	.24	.51	.34	.35
G2/G1......	.47	.29	.63	.16

NOTE.—See table 1.

show, it is this multiple grade ratio which determines promotion chances at each gateway.

The Multiple Grade Ratio (MGR) Equations

The formulae for determining promotion probabilities will help to clarify the underlying structure, including the relative impact of exits and organizational growth as well as the vacancy chain effects, which transform simple grade ratios into multiple grade ratios. In this paper we will omit time and individual attribute arguments (s, t) from our terms, although the relations still pertain to an interval of time $(t, t + 1)$ as in equation (1). In addition, we point out that this is a discrete time model with all vacancies being treated as if they are filled instantaneously within the interval and from the top of the OLM down. In other, more technical, journals more detailed mathematical analysis will be presented. Here, our focus is more substantive and theoretical and therefore only a skeletal mathematical treatment is given.

Denote total OLM staff size by N; total newly created jobs by J; the grade ratio of grade j to grade i by S_{ji}, where $S_{ji} = n_j/n_i$; and the current staff distribution by $\alpha_i = n_i/N$. Vacancies at grade i are generated by exits from the OLM, $n_i p_{io}$, by newly created jobs in the grade, j_i, and by promotion, $n_i p_{i,i+1}$, which in turn is generated by higher level exits and new job creations and so on. Hence,

$$v_i = \sum_{l=i}^{K} n_l p_{lo} + j_l \,, \tag{2}$$

where K is the top grade.

Let ρ_i represent the probability of allocating a new job to grade i, $\rho_i = j_i/J$. Denote the growth rate, $r = J/N$, and $m_i = \rho_i/\alpha_i$ as the redistributional growth parameters, in relation to the current staff distribution, α_i. For the present discussion, we will omit the managerial selection parame-

TABLE 3

OLM PROFILE IN TERMS OF MULTIPLE GRADE RATIOS (MGRs)* AT EACH GATEWAY

PROMOTION GATEWAY	OLM (1)	(2)	(3)	(4)
5	.65	.82	. .	. .
4	1.1	.40	.41	.28
3	.50	.72	.48	.44
2	.71	.50	.94	.23

* Cf. eq. (3), $\sum_{l=i+1}^{K} S_{li}$.

ters, λ, of equation (1). Hence, the promotion probability from grade i to $i + 1$ may be expressed as

$$\bar{p}_{i,i+1} = v_{i+1}/n_i$$
$$= \sum_{l=i+1}^{K} S_{li}(p_{lo} + m_l r) . \quad (3)$$

When growth is proportional to the current staff distribution, $m_l = 1$, and when there is no growth, $r = 0$. From the parameters of equation (3) we may separately specify five processes affecting an individual's career chances—(1) the hierarchical ratio of grade i to $i + 1$, $(S_{i+1,i})$; (2) the additional hierarchical ratios of grade i to grades $i + 2$ to K, generated by the chain reaction of promotions further above in the OLM, S_{li}, $l = i + 2$ to K; (3) exit probabilities, p_{lo}; (4) allocation of new jobs per grade in relation to current allocation, m_l; and (5) the OLM's growth rate, r.

Having shown the MGR structure graphically and specified the MGR equations, we wish to present a brief example before continuing the theoretical analysis. Table 4 provides illustrative data. From equation (2) we observe that $v_3 = n_3p_{3o} + j_3 = 1 + 2 = 3$; $v_2 = (n_3p_{3o} + j_3) + (n_2p_{2o} + j_2) = v_3 + n_2p_{2o} + j_2 = 3 + 2 + 3 = 8$; and similarly, $v_1 = v_2 + n_1p_{1o} + j_1 = 8 + 2 + 5 = 15$. From equation (3), therefore, we find that $p_{12} = 8/20 = .4$ and $p_{23} = 3/20 = .15$. To understand further the structure generating these promotion probabilities, the more detailed second expression of equation (3) should be used. Hence, $p_{23} = S_{32}(p_{3o} + m_3r) = .5[.1 + (1.0 \times .2)] = (.5)(.3) = .15$. Since $m_3 = 1$, there is no grade redistribution for grade 3 and the exit and growth trigger mechanisms have direct effects, both taking place through the MGR structure. The grade 1–2 promotion probability is $p_{12} = S_{31}(p_{3o} + m_3r) + S_{21}(p_{2o} + m_2r) = .5[.1 + (1.0 \times .2)] + 1.0[.1 + (.75 \times .2)] = (.5)(.3) + (1.0)(.25) = .15 + .25 = .40$. We will not elaborate on these illustrative data, but will now study the effects on career behavior of the first two microstructures—grade ratios and vacancy chains. We will then analyze the effects of exit and growth processes as they are filtered through the MGR structure.

TABLE 4

PARAMETERS AND STATE VARIABLES FOR THE EXAMPLE

Grade	n_i	α_i	j_i	ρ_i	m_i	p_{io}	n_ip_{io}
3	10	.2	2	.2	1.0	.1	1
2	20	.4	3	.3	.75	.1	2
1	20	.4	5	.5	1.25	.1	2
	$N=50$	1.0	10	1.0	...	...	5 (= total exits)

NOTE.—$r = 10/50 = .2$; $S_{32} = .5$; $S_{21} = 1.0$; $S_{31} = .5$; $v_3 = 3$; $v_2 = 8$; $v_1 = 15$ (26 vacancies in all).

Organizational Pyramids Do Not Imply Declining Career Chances

If we assume exit rates to be equal across grades ($p_{io} = p_o$) and growth allocations to be proportional to the current staff distribution ($m_l = 1$), then equation (3) implies that career acceleration will be found where the sum of the higher grade ratios increases (i.e., $\Sigma S_{l,i+1} > \Sigma S_{li}$) and career deceleration where there is a corresponding decrease ($\Sigma S_{l,i+1} < \Sigma S_{li}$) as at the relatively narrow gateways or MGR Venturis in the bottom of figure 1 above.[6] Therefore, in terms of career progress in each OLM, the following ordering of career chances can be expected:

$$\text{OLM 1: } p_{12} > p_{23} < p_{34} > p_{45} \, ;$$

$$\text{OLM 2: } p_{12} < p_{23} > p_{34} < p_{45} \, ;$$

$$\text{OLM 3: } p_{12} > p_{23} > p_{34} \, ;$$

$$\text{OLM 4: } p_{12} < p_{23} > p_{34} \, .$$

A "greater than" sign denotes deceleration and a "less than" sign acceleration. Selected promotion probabilities for OLMs 1, 2, and 3 are given in table 5.[7] Of the eight comparisons, seven are in the expected direction. For the nonconforming case—OLM 1, $p_{12} < p_{23}$—we have no reported exit probabilities and therefore cannot hypothesize a specific effect, but we do know the exits are not equal. Below we will show the approximate size of the exit probabilities necessary to permit the acceleration found.

We point out that, contrary to commonly held opinion, a pyramidal grade structure does not imply declining career chances as one proceeds up the hierarchy. In organization 1 promotion chances are accelerated at lower and middle management; in organization 2 there is acceleration from lower to middle management, deceleration at middle management levels, and acceleration at the top; organization 4 suggests acceleration until one gets toward the top and then deceleration; and it is only organization 3 (the

TABLE 5

Promotion Probabilities from Each Grade by OLM

OLM	Promotion Probability			
	p_{12}	p_{23}	p_{34}	p_{45}
(1)........ ...	.04	.06	.09	.04
(2)..........	.05	.09	.07	.15
(3)..........	.10	.05	.03	. .

[6] Take grades 3, 4, and 5, e.g., with staff equal to n_3, n_4, and n_5. A pyramid says that $n_5 < n_4 < n_3$. But the MGR structure will be increasing if the n's are 9, 10, and 40—$.9 > .48$—and decreasing if the n's are 9, 10, and 20—$.9 < .95$.

[7] For OLM 4 we have no reported staff flow parameters.

military) which has the "traditional" declining promotion chances. In short, commonly held opinion regarding managerial career prospects is based on a false perception obtained by looking directly at managerial grade distributions, which are generally pyramidal. Instead, one should be looking at the multiple grade ratios(MGRs) to see whether there is a MGR pyramid, which is an entirely different "animal," as may be easily seen in figure 1.

In the table above, containing the expected ordering of promotion probabilities in three OLMs, we made the simple assumptions that exit rates were equal across grades ($p_{io} = p_o$) and that $m_l = 1$. The postulated promotion effects found for the OLMs having available data were therefore due to the grade ratios S_{li}, $l = i + 1$ to K. That such strong effects are found simply from knowing the grade ratios and postulating a chain reaction process underscores the importance of considering organizational microstructures, as well as individual attributes, when analyzing careers. Equally important for our purposes, equation (3) may also be used to specify under what conditions the additional factors (p_{lo}, m_l, and r) must be taken into account. For instance, we will specify the conditions under which Keyfitz's second and sixth findings hold: (2) Promotion at the top of the organization ($k = .2$) is less affected by growth than is promotion in the middle ranks ($k = 1$); and (6) a decrease in organizational size has an even greater effect on promotion than a comparable increase. We will also highlight the overall consistency between the results obtained from Keyfitz's model (findings 1, 3, 4, 5, 8, and 9) and those obtained from the present model.

Conditions Determining Growth's Hierarchical Impact

Since no staff flow parameters were reported for OLM 4, it will be excluded from further analysis. Exit probabilities, which we will now utilize, are provided in table 6 for OLMs 1–3.

For pyramidal OLMs as in organizations 1–4, if growth is allocated in proportion to the current staff distribution, as is the case if we adjust the ratio k in a stable population, then the impact of growth is mediated by the

TABLE 6

GRADE SPECIFIC EXIT PROBABILITIES BY OLM

Exit Probability	OLM (1)*	OLM (2)	OLM (3)
p_{50}	.055	.15	...
p_{40}	.125	.10	.098
p_{30}	.13	.06	.10
p_{20}	.028	.01	.134

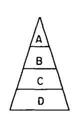
* Since no exit probabilities were reported for OLM 1, we have used eq. (3) to estimate them.

differential exit probabilities. The following results, specifying the conditions under which Keyfitz's second finding holds, can be proved analytically on the basis of equation (3): (1) if exit probabilities are equal, growth's impact on promotion chances will also be equal (in percentage terms) at all hierarchical levels;[8] (2) on the other hand, if exits decline monotonically as one moves upward (OLM 3), the greatest impact of growth is at the top; and (3) if exits increase monotonically (OLM 2 and Keyfitz's hypothetical OLM), the greatest impact is at the bottom.[9] For the last two results, the impact is greatest at the point of lowest exit probability; the next greatest impact is at the second lower exit probability, and so on, producing a monotonic effect on promotion chances (in terms of percentage change). For OLMs in which exit probabilities are not monotonic or equal (e.g., OLM 1), equation (3) may be used to obtain the result.

If we continue to assume the hierarchical ratios are fixed, we can examine more directly the grade level effects of growth within OLMs 1, 2, and 3 by deriving grade specific equations from equation (3) as shown in table 7.

Clearly, the growth effect is positive (cf. the growth [r] coefficients in table 7), increasing promotion rates, a result consistent with Keyfitz's first finding. Moreover, the differences in growth coefficients across organiza-

[8] This result may be shown easily from eq. (3). Since $m = 1$, $p_{ij} = \Sigma^{K}_{l=j} S_{li}(p_{lo} + r)$. But $p_{io} = p_o$ for any i; therefore exits and growth become a common scalar for all grades and $(p_{ij}/p_{jk}) i < j < k$ is simply $(\Sigma^{K}_{l=j} S_{li})/(\Sigma^{K}_{l=k} S_{lj})$. The impact is thus shown to be equal in percentage terms regardless of the growth rate. Visually, this may be observed as follows. Let the OLM be represented as shown in the unnumbered figure below, where A, B, C, and D represent the staff size in the corresponding grade. If $r = 0$,



$$p_{BA} = p_o \frac{A}{B}, \quad p_{CB} = p_o \frac{(A + B)}{C}, \quad p_{DC} = p_o \frac{(A + B + C)}{D}.$$

If $r > 0$,

$$p_{BA} = (p_o + r) \frac{A}{B}, \quad p_{CB} = (p_o + r) \frac{(A + B)}{C},$$

$$p_{DC} = (p_o + r) \frac{(A + B + C)}{D}.$$

The percentage increment is thus r/p_o for each promotion probability and the new promotion probability per grade, p'_{ij}, is $p'_{BA} = p_{BA}\ (1 + r)$, $p'_{CB} = p_{CB}\ (1 + r)$, $p'_{DC} = p_{DC}(1 + r)$ or $p'_{ij} = p_{ij}(1 + r) V_{i,j}$. Hence, the growth impact is positive and uniform across all grades.

[9] Grade level p_{jo}'s, as in eq. (3), pose a problem for individual level predictions since they do not account adequately for retirement. However, under equilibrium conditions, as in a stable population, an OLM's age or length of service distribution per grade will be reflected in the grade level exit probabilities, thus providing a true measure of promotion opportunities. In short, an OLM's exit probabilities need not increase monotonically across higher grade levels. In fact, Forbes (1971) asserts that OLM 3 approximates an equilibrium case.

tions are due to their different hierarchical structures, as depicted by the MGRs (see the bottom of fig. 1).[10]

We can point to several basic principles by using the grade specific promotion equations in table 7 to derive the percentage increment in promotion chances for each percentage point of growth. If we divide the growth coefficient by the exit term (the constant in the equations with fixed exit probabilities) and then multiply by the growth rate, we obtain the percentage change in promotion probability due to growth. These data are given in figure 2. The first column provides the promotion increment for a growth rate of 1% and may also be interpreted as the promotion increment from a zero growth rate for each percentage point of growth rate. As an individual moves upward OLM 2 has monotonic decreases and OLM 3 has corresponding monotonic increases. Hence, the greatest percentage effects are at the grades with the lowest exit probabilities. In OLM 1, on the other hand, there is no set of monotonic exit relations and the greatest impact is at the bottom and the next greatest at the top.

Conditions Determining the Impact of Changes in Growth Rate

As may be seen from figure 2, since each additional equal increment in growth adds the same promotion increment, but to a larger base, there are, as Keyfitz pointed out (his third finding), diminishing returns with increased growth. On the other hand, since each equal shift in growth adds the same promotion increment, a shift up or down in growth will have the

TABLE 7

IMPACT OF GROWTH ON PROMOTION BY OLM

Fixed Exit Probabilities*	General Results
OLM 1:	
$p_{45} = .04 + .65r$	$p_{45} = S_{54}p_{5o} + .65r$
$p_{34} = .11 + 1.1r$	$p_{34} = \Sigma^5_{l=4} S_{l3} p_{lo} + 1.1r$
$p_{23} = .06 + .5r$	$p_{23} = \Sigma^5_{l=3} S_{l2} p_{lo} + .5r$
$p_{12} = .04 + .71r$	$p_{12} = \Sigma^5_{l=2} S_{l1} p_{lo} + .71r$
OLM 2:	
$p_{45} = .12 + .82r$	$p_{45} = S_{54}p_{5o} + .82r$
$p_{34} = .05 + .4r$	$p_{34} = \Sigma^5_{l=4} S_{l3} p_{lo} + .4r$
$p_{23} = .06 + .72r$	$p_{23} = \Sigma^5_{l=3} S_{l2} p_{lo} + .72r$
$p_{12} = 02 + .5r$	$p_{12} = \Sigma^5_{l=2} S_{l1} p_{lo} + .5r$
OLM 3:	
$p_{34} = .04 + .41r$	$p_{34} = S_{43}p_{4o} + .41r$
$p_{23} = .05 + .48r$	$p_{23} = \Sigma^4_{l=3} S_{l2} p_{lo} + .48r$
$p_{12} = .12 + .94r$	$p_{12} = \Sigma^4_{l=2} S_{l1} p_{lo} + .94r$

* Using exit probabilities from table 6.

[10] More general results are shown on the right side of table 7 to point out that pure growth effects are invariant to alternative formulations for exit behavior—whether exits are assumed constant, as on the left, or are directly tied to individual attributes such as age (Stewman 1981), within-grade seniority (Konda and Stewman 1980), or length of service in the firm (Konda, Stewman, and Belkin 1981).

	Promotion to Grade	.01	.02	.03	.04	.05	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15
OLM 1	G5	.16	.32	.49	.65	.81	.98	1.14			1.63					
				(33%)		(45%)					(62%)					
	G4	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0					
				(23%)		(33%)					(50%)					
	G3	.08	.17	.25	.33	.42	.5	.58	.67	.75	.83	.92	1.0			
				(20%)		(30%)					(45%)					
	G2	.18	.36	.53	.71	.89	1.06				1.78					
				(35%)		(47%)					(64%)					
OLM 2	G5	.07	.14	.21	.27	.34	.41	.48	.55	.62	.68	.75	.82	.89	.96	1.03
				(17%)		(25%)					(40%)					
	G4	.08	.16	.24	.32	.40	.48	.56	.64	.72	.8	.88	.96	1.04		
				(19%)		(29%)					(44%)					
	G3	.12	.24	.36	.48	.6	.72	.84	.96	1.08	1.2					
				(26%)		(38%)					(55%)					
	G2	.25	.5	.75	1.0	1.25					2.5					
				(43%)		(56%)					(71%)					
OLM 3	G4	.103	.21	.31	.41	.51	.62	.72	.82	.92	1.03					
				(24%)		(34%)					(51%)					
	G3	.10	.19	.29	.38	.48	.58	.67	.77	.86	.96	1.06				
				(22%)		(32%)					(49%)					
	G2	.08	.16	.24	.31	.39	.47	.55	.63	.71	.78	.86	.94	1.02		
				(19%)		(28%)					(44%)					

FIG. 2.—Percentage change in promotion probability for a shift in growth rate, from no growth to rate r. Percentages in parentheses are relative share of probability from growth rates at $r = .03$, .05, and .10.

same percentage impact on promotion (in contrast to Keyfitz's sixth finding). Thus, unless the grade distribution changes ($m_i < 1$ at higher levels, as in Keyfitz's "organization"), equivalent increments or decrements in growth rate will have equal effects on promotion although, of course, in opposite directions. This finding (1) clarifies Keyfitz's sixth finding, which also assumes a shift in the population grade distribution stemming from the different growth rates, producing different stable populations, and (2) permits us to analyze separately growth rate (r) and grade redistribution (m_i) effects.

The data in figure 2 may also be examined from another viewpoint. The percentages in parentheses for $r = .03$, .05, and .10 indicate the relative share of the promotion probability due to growth. Even at the low growth rate of 3%, growth generally accounts for 20% or more of the promotion probability. Thus, should an organization shift from 3% growth to no growth, a drop of 20% or more in promotion chances may be expected. And for organizations dropping from a 10% growth rate to no growth, a decrease in promotion chances in the range of 40%–70% is indicated. Expressed comparatively, two OLMs having the same hierarchical structure but different growth rates (3%–10%) may be expected to have substantial differences in promotion chances (20%–70%).

Relative Impact of Exits and Growth

Direct observations of equation (3) should also make it clear that exits and growth are substitutable—an equal increase in one will complement a decrease in the other, or an equivalent increase in either of the two will add the same increment to promotion. This is consistent with Keyfitz's fifth finding. Moreover, for OLM 2 there are also published data on mortality and growth (Stewman 1975*a*), further supporting Keyfitz's fourth finding that growth effects far outweigh mortality effects. In OLM 2, mortality accounted for 2% of entering vacancies over a 21-year period, while growth generated 54% of the vacancies.

On the other hand, total exits, including death, generated 40% of the initial vacancies in OLM 2. These data on entering vacancies should not be interpreted directly with regard to promotion effects for the following reason. Since exits occur much more frequently at the top and more growth occurs at the bottom, the vacancy chain multiplier will add more weight to vacancies at the top. Thus, while mortality effects are very small compared to those of growth, even taking into account the vacancy chains, overall exit effects relative to growth are much more powerful. Returning to figure 2, which includes the vacancy chain effect, it is only when the growth impact reaches 1.0 that the effects of growth equal those of exits. Thus, for these organizational labor market structures, it takes high growth rates ($\simeq$10%) for growth to equal exits and very high growth rates for growth to dominate exits. The only exceptions are for OLM 1, grades 2 and 5, and OLM 2, grade 2. Thus, unless an organization's labor market is growing very fast or the organization is a new one with a young labor force, we generally expect exit effects on promotion to be greater than those of growth.[11]

Growth Does Not Imply "Equalization"

One final aspect of the relationship between growth and promotion will be pointed out. Although growth has a positive impact on promotion chances at each grade, it also often accentuates the promotion differences, making them greater than they were before. This is true in seven of eight cases for the three OLMs here as will be shown below. Thus, while each person's lot is improving, some persons' lots are improving more than others, meaning that growth per se should not be considered "the great equalizer" mechanism. To demonstrate this point, we will assume fixed OLM grade ratios, thereby holding constant the OLM's relative grade distribution. From equation (3) we can solve for the impact of growth on promotion differences between grades by using the MGRs and defining the following difference equation:

$$p_{jk} - p_{ij} = \delta_j \,, \tag{4}$$

where $i < j < k$. Since we have been considering promotions only to the next higher grade, our concern will be with $j = i + 1$, $k = i + 2$. For example, at $r = 0$ in OLM 1 there is an increase of .02 ($\delta_2 = p_{23} - p_{12} = .06 - .04 = .02$) in promotion chances as one moves from the gateway at grade 1 to the gateway at grade 2. Our current interest is whether growth will widen this difference. The grade specific equations by OLM, produced from equations (3) and (4), are shown below.

Impact of Growth on Promotion Differences (δ's) by OLM

OLM 1:

$$\delta_4 = .22p_{5o} - .67p_{4o} - .45r \,,$$

$$\delta_3 = .33p_{5o} + .51p_{4o} - .24p_{3o} + .59r \,,$$

$$\delta_2 = .06p_{5o} + .08p_{4o} + .13p_{3o} - .47p_{2o} - .21r \,.$$

OLM 2:

$$\delta_4 = .64p_{5o} - .22p_{4o} + .42r \,,$$

$$\delta_3 = .09p_{5o} + .11p_{4o} - .51p_{3o} - .31r \,,$$

$$\delta_2 = .07p_{5o} + .08p_{4o} + .36p_{3o} - .29p_{2o} + .22r \,.$$

[11] The specific growth effects occur at a given grade, however, and thus, even in organizations with moderate growth rates (3%–6%), certain grade ratios will have very strong growth effects, as, e.g., in the exceptions cited above.

OLM 3:

$$\delta_3 = .27p_{4o} - .34p_{3o} - .07r ,$$

$$\delta_2 = .05p_{4o} + .13p_{3o} - .63p_{2o} - .46r .$$

If we assume both fixed grade distributions, as in table 3, and fixed exit probabilities, as in table 6, we may answer our question regarding the three organizations with the data given in table 8. If the sign on the constant term, produced by exits, is the same as that for the growth coefficient, then promotion differences are accentuated by growth. Only if the signs are opposite is the growth impact an equalizer. Moreover, if both signs are negative, then $\delta_j < 0$, and promotion chances are decelerating further; if both signs are positive, then $\delta_j > 0$, and promotion chances are accelerating more; and if $\delta_j = 0$, one's promotion chances are equal across grades. As may be seen from table 8, in all cases but OLM 1, δ_2, the signs are the same, meaning growth widens promotion differences. Thus, in seven of eight cases for these three OLMs, if one's chances are accelerating at a given growth rate, r, as one rises in the OLM, then they will accelerate even further for a higher growth rate, r', or if they are decelerating, they will decelerate more.

To understand how the processes above came about in the three organizations, we will use the initial equations regarding the effects of growth on promotion differences and specify the exit relationships which would have been necessary to decrease these differences. The logic used is as follows. Given the sign of the growth coefficient, what relationship between exit probabilities is necessary at each δ_j in order to obtain the opposite sign? For instance, in OLM 1 we have, $\delta_4 = .22p_{5o} - .67p_{4o} - .45\,r$. Thus, for growth to reduce δ_4 we must have $.22p_{5o} > .67p_{4o}$.[12] We will take as observed or given all higher level exit probabilities at each grade and iteratively ask in what range the remaining exit probability must be and then compare it to the observed exit probability. The results presented in table 9 demon-

TABLE 8

IMPACT OF GROWTH ON PROMOTION DIFFERENCES BY OLM GIVEN FIXED GRADE DISTRIBUTION AND EXIT PROBABILITIES

	OLM		
	(1)	(2)	(3)
δ_4	$-.07-.45\,r$	$.07+.42\,r$	...
δ_3	$.05+.59\,r$	$-.01-.31\,r$	$-.01-.07\,r$
δ_2	$.02-.21\,r$	$.04+.22\,r$	$-.07-.46\,r$

[12] This condition holds, of course, only to the point that growth reduces δ_j. It could possibly also reverse the sign of δ_j and increase δ_j, depending on the size of the exit inequality.

TABLE 9

REQUIRED AND ACTUAL EXIT PROBABILITIES FOR GROWTH TO REDUCE PROMOTION DIFFERENCES ACROSS GRADES (Given Grade Distribution)

Given	Required Exit Probability	Actual* Exit Probability	Is Actual within Required Range?
OLM 1:			
$p_{5o} = .055$	$p_{4o} < .02$	$\hat{p}_{4o} = .125$	No
$p_{5o} = .055$; $p_{4o} = .125$	$p_{3o} > .34$	$\hat{p}_{3o} = .13$	No
$p_{5o} = .055$; $p_{4o} = .125$; $p_{3o} = .13$	$p_{2o} < .06$	$\hat{p}_{2o} = .028$	Yes
OLM 2:			
$p_{5o} = .15$	$p_{4o} > 44$	$\hat{p}_{4o} = .10$	No
$p_{5o} = .15$; $p_{4o} = .10$	$p_{3o} < .05$	$\hat{p}_{3o} = .06$	No
$p_{5o} = .15$; $p_{4o} = .10$; $p_{3o} = .06$	$p_{2o} > .14$	$\hat{p}_{2o} = .01$	No
OLM 3:			
$p_{4o} = .098$	$p_{3o} < 08$	$\hat{p}_{3o} = .10$	No
$p_{4o} = .098$; $p_{3o} = .10$	$p_{2o} < .03$	$\hat{p}_{2o} = .134$	No

* Actual here means estimated from observed data (except in OLM 1 where it was generated from eq. [3]).

strate why growth produces accentuated promotion differences in seven of eight cases and how the process meets the requirements in the eighth case.

Since the growth coefficient is totally determined by two structures—grade ratios and vacancy chains—producing the opportunity induced or multiple grade ratio, table 9 also demonstrates why the earlier predictions regarding promotion acceleration and deceleration were correct in seven of eight cases with the assumption of equal exits. That assumption has the same effect as the assumption that exit probabilities will not alter the direction of the joint structural effect produced by grade ratios and vacancy chains. Moreover, had we known the "actual" exit probabilities in OLM 1, the eighth prediction would also have been correct, for in this one instance the structural effects of grade ratios and vacancy chains are not the only primary factors—exit inequalities have an effect in the opposite direction and thus all relationships must be known.

Rather than take higher exits as given, we can obtain more general results if we return once more to the equations regarding the impact of growth on promotion differences, establish possible ranges for the exit inequalities, and then predict the exit orderings necessary to have growth act as an equalizer. In most cases the results are not unique, but they narrow the possibility space sufficiently to let us ask whether such orderings are plausible. The results are provided in figure 3.

In OLMs 1 and 2, the necessary rank orderings of exit probabilities shown on the right side of figure 3 do not seem to be likely possibilities, indicating that for more diverse exit formulations and outcomes, growth cannot be expected to equalize promotion chances throughout the OLM. In fact, our results indicate that growth may often be expected to accentuate existing inequalities, thus widening the differences from a relative viewpoint while

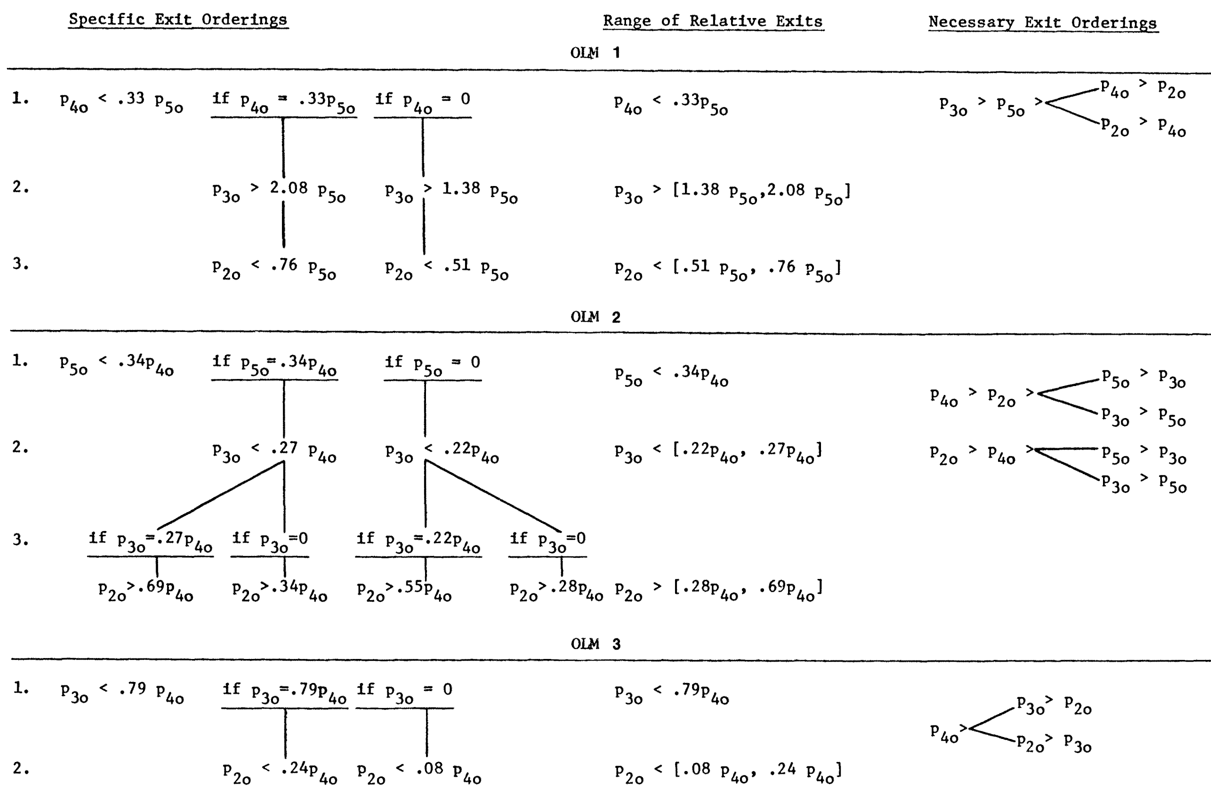


FIG. 3.—Relative exit relations necessary for growth to reduce promotion differences across grades, given grade distribution

at the same time benefiting all persons from an absolute viewpoint (i.e., increased promotion chances). The one case which might indicate otherwise, organization 3, suggests that when the multiple grade ratio decreases monotonically, the higher the grade, and exits increase monotonically, growth will produce an equalizer effect. What actually happens with regard to exits in this organization is the opposite—monotonically decreasing exit probabilities—which support rather than oppose the structural effects, therefore resulting in the accentuation of current promotion differences. However, one set of plausible organizational conditions that would equalize promotion differences and could occur in other organizations has been identified.[13]

B. Managerial Preferences

Internal Preferences and Venturis: Joint Structural Effects

A type of structural effect very different from those in the preceding section is the underlying managerial preference or choice structure in selecting individuals to be promoted (the λ of eq. [1]). The data come from the study of organization 2 in the preceding discussion and from our previous study of the same organization (Konda and Stewman 1980). In the latter we found a selection accelerator—the higher an individual rises in the OLM, the earlier are his best selection chances. This monotonic accelerator occurred in spite of the OLM's Venturi, which was shown above to have significant effects on promotion. Thus the present task is to examine how the organizational structures of grade ratios and vacancy chains and the managerial preference structure operate jointly to affect careers. Since this third structural principle, which we found earlier (Konda and Stewman 1980), will be used directly in the analysis, we include the 1950–70 managerial preference estimates,[14] which capture 99% of the career selections for the organizational staff working in 1970. These data are given in table 10. The selection estimates (λ's) per grade form a probability distribution of managerial preferences across seniority levels, and they operate when there is an available vacancy. We point out three aspects of these data: (1) the higher the grade, the narrower the selection band; (2) with the exception of grade 2, the higher the grade, the higher the peaks of the

[13] We have also examined results holding the promotion differences (δ's) constant and looking at necessary shifts in exit probabilities or grade ratios, for career paths having only career acceleration at each successive gateway and for career paths having equal rates throughout the career. Shifts in exits do not appear plausible as a mechanism for reversing a Venturi effect on career progression; however, under certain growth conditions, rather small structural shifts in grade ratios may reverse such effects, further underscoring the significance of organizational structure, both distributive (grade ratios) and processual (vacancy chains), in affecting organizational career behavior.

[14] In the 1980 article we were interested in predicting staff flows and therefore estimated the managerial preference distribution from 1950–59 data and tested the model for 1960–69 staff flows.

TABLE 10

MANAGERIAL PREFERENCE DISTRIBUTION*
BY GRADE FOR OLM 2

Seniority Level	G2	G3	G4	G5
S17........	.04			
S16........	.04			
S15........	.07			
S14........	.08			
S13........	.11			
S12........	.12			
S11........	.17			
S10........	*.19*	.10		
S9........	.08	.08		
S8........	.04	.08	.17	
S7........	.03	.11	.10	
S6........	.03	.15	.17	.08
S5........	.01	*.17*	.15	.13
S4........	0	.12	*.20*	.08
S3........	0	.13	.17	.16
S2........	0	.05	.04	*.36*
S1........	0	.01	0	.18
N........	784	378	115	61

$$* \ \hat{\lambda}_{ji}(s) = \left[\sum_t n_{ij}(s, t) \Big/ \sum_t n_{ij}(t) \right],$$

where $n_{ij}(s, t)$ is the number of persons having seniority s in grade i at time t who are promoted to grade j by $t + 1$, and $n_{ij}(t) = \Sigma_s n_{ij}(s, t)$.

preference distribution; and (3) the higher the grade, the lower the seniority levels to which the peak of the preference distribution decreases (see italicized probabilities in table 10). All three factors point to acceleration, but it is the first and third which provide for monotonic acceleration and thus compete with the grade ratio–vacancy chain effects at the gateway 4 Venturi.

The individual career data for this analysis concern the 1970 organizational staff who are in grades 3, 4, and 5. Table 11 provides an example for grade 5 careers. The first number of the three-digit position code denotes the grade and the last two digits refer to the number of years in that grade. Both seniority level of the mover and year of movement are indicated for each gateway traversed. For example, row 1, column 3, shows that the individual moved from grade 1, seniority 12, to grade 2, seniority 1, in 1948. Thus, we observe that the careers of persons in rows 3 and 4 accelerated at each higher gateway, but those of persons in rows 1 and 2 decelerated at gateways 4 and 5, respectively.

The results from the joint operation of both types of structures are quite striking. The data given below are expressed in terms of acceleration:

$$p_{12} < p_{23}\text{: } 93\%; \quad p_{23} < p_{34}\text{: } 54\%; \quad p_{34} < p_{45}\text{: } 91\%;$$
$$N = 204 \qquad\qquad N = 46 \qquad\qquad N = 23, \qquad \text{(a)}$$

$$p_{12} < p_{23} < p_{34}\text{: } 50\% \quad N = 46\,, \tag{b}$$

$$p_{12} < p_{23} < p_{34} < p_{45}\text{: } 43\% \quad N = 23\,. \tag{c}$$

As may be seen from figure 4 and table 10, the two types of structures reinforce one another at gateways 3 and 5 but oppose one another at gateway 4, with the Venturi forcing career deceleration and the managerial preferences calling for career acceleration. Viewing the left graph in figure 4, we find that 93% of the individuals accelerate from gateway 2 to 3, but only 54% accelerate from gateway 3 to 4; and then 91% accelerate from gateway 4 to 5. Thus, when the structures reinforce one another, over 90% of the careers accelerate, in contrast to the 54% doing so when the structures oppose one another. These results indicate that the effects of the two structures are each quite large and about equal. Expressed differently, both of the following statements could be made, depending on which viewpoint we chose to adopt: (1) the Venturi effect decreases by 40% the proportion of staff who are accelerating; and (2) in spite of the major contraction in the multiple grade ratio at gateway 4, 54% of the staff continue to accelerate from gateway 3 to 4.

It is from the hierarchical sequencing of the binary structural effects

TABLE 11

CAREERS OF THE STAFF WHO WERE IN OLM 2, GRADE 5, ON JANUARY 1, 1970

Current Position (1970)	Entrance at G1 (Year)	G1 → G2	G2 → G3	G3 → G4	G4 → G5
509.....	1935	112→201/48	203→301/51	307→401/58	403→501/61
506.....	1937	111 → 49	205 → 54	303 → 56	407 → 64
512.....	1937	110 → 47	206 → 54	303 → 57	401 → 58
512.....	1937	109 → 46	206 → 53	304 → 57	401 → 58
514.....	1937	108 → 46	203 → 49	305 → 54	402 → 56
506.....	1940	110 → 51	205 → 56	307 → 63	401 → 64
501.....	1941	114 → 56	209 → 65	302 → 66	402 → 69
504.....	1941	114 → 56	203 → 59	305 → 64	402 → 66
504.....	1941	112 → 54	206 → 60	305 → 65	401 → 66
501.....	1941	108 → 50	207 → 57	309 → 66	405 → 69
503.....	1941	112 → 54	203 → 57	309 → 66	401 → 67
502.....	1947	108 → 56	203 → 59	306 → 65	403 → 68
504.....	1947	109 → 57	202 → 59	306 → 65	401 → 66
503.....	1947	109 → 57	202 → 59	306 → 65	402 → 67
505.....	1947	105 → 53	203 → 56	304 → 60	405 → 65
504.....	1948	108 → 57	202 → 59	306 → 65	401 → 66
501.....	1948	107 → 56	203 → 59	308 → 67	402 → 69
504.....	1948	107 → 56	205 → 61	304 → 65	401 → 66
502.....	1948	108 → 57	205 → 62	304 → 66	402 → 68
501.....	1948	109 → 58	205 → 63	304 → 67	402 → 69
501.....	1949	107 → 57	205 → 62	304 → 66	403 → 69
504.....	1949	106 → 56	204 → 60	304 → 64	402 → 66
501.....	1951	106 → 59	206 → 65	302 → 67	402 → 69

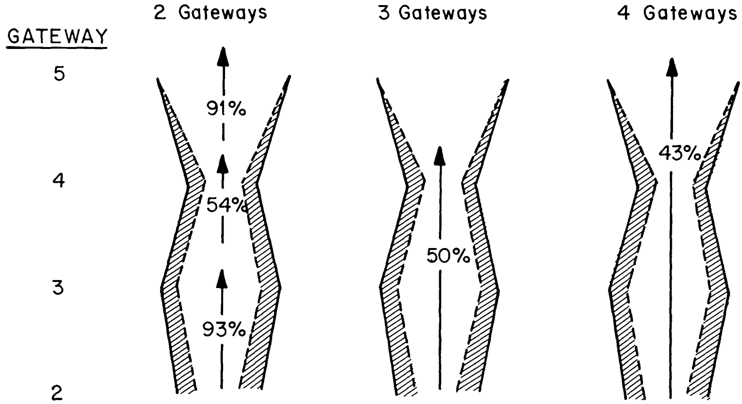


FIG. 4.—Proportion of 1970 staff in OLM 2, grades 3–5, having career acceleration

shown in the left part of figure 4 that we obtain the results for the remaining two parts. Thus, in the middle of figure 4 we find that 50% of the staff reaching grade 4 have careers which accelerate at each higher level, with only a small drop to 43% for staff reaching grade 5, as may be seen in the third part. If we consider only the effects of the preference structure, which postulates a monotonic career acceleration, the 50% outcome for acceleration through gateways 2, 3, and 4 is perplexing. However, when we take into account both the Venturi effects and the preference effects, it is no longer surprising.

External Preferences and the Dampening Effect on the MGR Venturi

Before considering the third accelerator in the form of population heterogeneity, we wish to point out that a manager may choose to fill a vacancy from outside the OLM rather than from inside it. If the selection is external, the vacancy chain will either end in one move (when the selection is at the top of the chain) or be truncated. In either case, the multiple grade ratio is moved back toward its original shape and promotion chances are reduced. If external selections are a fixed proportion of the grade's staff, say h, this process is consistent with Keyfitz's ninth finding. The following equation shows the correspondence:

$$\bar{p}_{i,i+1} = \sum_{l=i+1}^{K} S_{li}(p_{lo} + r) - hS_{li}$$

$$= \sum_{l=i+1}^{K} S_{li}(p_{lo} + r - h) \tag{5}$$

$$= \sum_{l=i+1}^{K} S_{li}(p_{lo} + r') ,$$

where $r' = r - h$. In other words, when external recruitment is a fixed proportion of each grade, h, such selections are equivalent to a decrease in growth rate by h, as Keyfitz stated.

A much more likely situation than that described above would be that of a manager's deciding to fill a proportion of the job vacancies, say, λ_{jo}, from the outside. To incorporate internal/external choice as a preference distribution for any vacancy, the following equation will hold:

$$\bar{p}_{i\ i+1} = \sum_{l=i+1}^{K} \prod_{\tau=i+1}^{l} (1 - \lambda_{\tau o})[S_{li}(p_{lo} + m_l r)]\ , \tag{6}$$

where $\lambda_{\tau o}$ is the probability that a manager fills a vacancy in grade τ from the outside and $\Sigma_s \lambda_{\tau i}(s) + \lambda_{\tau o} = 1$. The chain reaction process is dampened at each gateway j by λ_{jo}, and thus the impact at lower gateways is multiplicative.

Denote by v'_j those vacancies originally starting in grade j. At gateway j the MGR tube or profile is dampened as follows: for vacancies originating at the top grade of the OLM, v'_K, it is reduced to $\Pi^K{}_{\tau=j}(1 - \lambda_{\tau o})v'_K$; for vacancies originating in grade $K - 1$ it becomes $\Pi^{K-1}{}_{\tau=j}(1 - \lambda_{\tau o})v'_{K-1}$, and so on. Hence, this dampening action at grade j may be thought of as arising from two types of events: in the first kind, the dampening effect at grade j, $(1 - \lambda_{jo})$, is conditional on the outcomes of all higher level recruitment decisions, $\Pi^l{}_{\tau=j+1}(1 - \lambda_{\tau o})v'_l$ in the chain of vacancies which could have arrived from above grade j, v'_l, $l = j + 1, \ldots, K$; in the second kind, the dampening effect at grade j, $(1 - \lambda_{jo})$, is applied to vacancies originating there, v'_j. The outcome of this external recruitment process is, of course, to reduce promotion chances all along the path the vacancy chain would have traveled (e.g., reducing the hatched part of the MGR tube in figure 1). Thus, while exits and growth increase promotion chances, external recruitment decreases them and a shift in external recruitment will negate a corresponding, equivalent shift in either exits or growth.

C. Stars or Exceptional Persons

Yet a third career acceleration effect is operating, but this time in terms of individual variation since structural effects have already been taken into account. The careers of exceptional persons or stars should be evident in terms of relative acceleration or deceleration. A rather strong assumption would be that individuals attaining higher grade levels would move faster at each lower grade. In other words, there will be a monotonic difference at each grade between persons whose careers end at different levels.

Since the organizational staff working in any given year will consist of a mixture of populations—some persons who have already reached the highest grade they will ever attain and others who will move yet higher—

analysis of stars requires different data from those of the last section. Thus, here we will consider only completed careers within OLM 2.

Stardom as Reflected in Mean Waiting Time before Promotion

The mean waiting time before promotion for staff who were promoted at least once is given in table 12. There is a monotonic acceleration—those who attain higher grades move faster at each grade.[15] Thus, the process is not one of each person having the same promotion likelihood until he reaches his potential (or exceeds it by one level, if Peter's Principle is correct). Instead, a form of heterogeneity is reflected in these differences from the onset of the career and at each subsequent gateway. Hence, we may speak of stars or exceptional persons in relative terms, ranking stardom by the highest grade attained. The Venturi at gateway 4 is also evident in an increase in mean waiting time—from 4.8 to 7.0 for those whose careers end at G4 and from 4.1 to 5.3 for those who later move on to G5. The structural effects are clearly still operating alongside the individual heterogeneity.

Stardom as Reflected in Managerial Preferences

A different view of this third type of accleration and one which yields insight into the process determining career chances is provided in table 13. The data show the cumulative proportions of staff who were selected at a given seniority level, differentiated by highest grade attained. The divergencies at each gateway are clear in terms of acceleration effects. The peaks of the preference distributions are shown in bold type and reveal,

TABLE 12

MEAN NUMBER OF YEARS IN GRADE BEFORE MOVING UPWARD OR OUT BY HIGHEST GRADE ATTAINED

Highest Grade Attained	Mean Number of Years in Origin Grade before Moving					
	G1 → G2	G2 → G3	G3 → G4	G4 → G5	Highest Grade → Out	N
G2........	13.3	...	...	...	11.1	103
G3........	11.5	6.7	...	...	7.9	161
G4........	10.4	4.8	7.0	...	5.0	41
G5........	8.5	4.1	5.3	3.6	7.2	54

[15] If we sum the mean waiting times at each grade, we find that persons whose careers end at G5 reach there (21.5 years) before persons whose careers end at G4 reach G4 (22.2 years), which underscores the escalating acceleration of the brightest stars. There is also a monotonic length-of-service effect by highest grade attained. Those whose careers end at higher levels stay in the organization for more years or have longer careers: G5 = 28.7 years, G4 = 27.2, G3 = 26.1, G2 = 24.4.

TABLE 13

Cumulative Distribution of Managerial Preferences by Promotion Gateway and Highest Grade Attained

Seniority within Grade	Seniority at Promotion to Grade 2 by Highest Grade Attained				Seniority at Promotion to Grade 3 by Highest Grade Attained			Seniority at Promotion to Grade 4 by Highest Grade Attained	
	G2	G3	G4	G5	G3	G4	G5	G4	G5
22		100							
21	100	99							
20	98	99							
19	98	99							
18	96	99							
17	94	99							
16	89	98	100	100	100				
15	**78**	96	95	98	99			100	
14	60	90	93	98	99			95	100
13	51	**79**	83	96	98			95	93
12	37	62	**76**	94	97			93	91
11	25	45	56	87	93			85	91
10	18	37	44	**72**	89	100		83	89
9	10	21	32	54	85	98	100	76	87
8	5	12	24	41	76	90	96	73	85
7	4	9	17	32	**65**	88	94	68	80
6	3	6	15	26	51	78	78	**61**	76
5	2	3	10	24	38	**66**	69	**42**	65
4	0	1	10	20	25	46	61	22	54
3	0	0	2	6	12	32	**50**	10	**37**
2	0	0	0	0	6	**20**	28	0	15
1	0	0	0	0	1	0	13	0	11
N	103	161	41	54	161	41	54	41	54

with one exception, a monotonic decrease by highest level attained. More important, the selection chances of stars are higher earlier, at each grade, than those of persons whose careers end at lower grade levels.

Chances of Reaching the Top: Baseline

In Sections IIIA and IIIB we have inquired into an individual's career chances as he approaches each gateway. Now we ask, "What are an individual's chances of reaching the top?" We will first describe such career chances in OLM 2 and then analyze the processes giving rise to such outcomes. And, finally, we will use the star selection preferences to show the differential impact of earlier selection.

To the data already used, we add 641 persons whose careers ended in grade 1 without a promotion, including, of course, "short" careers in the OLM. A new entrant's chances of reaching each grade level are shown in figure 5. Interpreting these data in terms of probabilities, we find a 36% chance of reaching grade 2, a 26% chance to reach grade 3, a 10% chance of being promoted as high as grade 4, and a 5% chance of reaching the top.

The component processes which yield these results may be obtained by considering separately the promotion chances at each gateway. We first observe that only persons reaching grade 4 may be considered for grade 5 and so on. Thus, for example, of the 95 persons reaching G4, 54 of them (or 57%) are also promoted to G5. The data (N's) of tables 12 and 13 and the additional 641 G1 careers therefore show the following career chances:

G1 → G2	G2 → G3	G3 → G4	G4 → G5
36%	71%	37%	57%
(359/1,000)	(256/359)	(95/256)	(54/95)

These chances are more understandable in terms of the MGR profile, as in figure 6. The products of the probabilities—i.e., (.36)(.71) = .26; (.36)(.71)(.37) = .09; and (.36)(.71)(.37)(.57) = .05—yield the chances of moving to each grade level, including the top.

If we inquire into the individual's chances of further promotions if he has already been promoted, the shifts in success rates change considerably

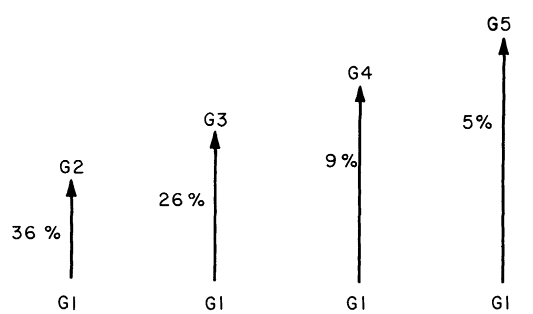


FIG. 5.—Chances of reaching each higher grade, for a new entrant at grade 1

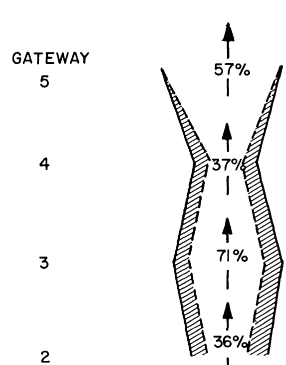


FIG. 6.—Career chances as one progresses

(on the basis of the profile above), depending on his current level. As already noted, an individual first entering the OLM has a 5% chance to reach the top. However, as may be seen in table 14, if he is promoted to G2, he then has a 15% chance to reach the top, and if he is promoted to G3 there is a slight improvement to 21%, or a 1 in 5 chance; but once he passes the Venturi at gateway 4, the chances change dramatically to 57%, or from 1 in 5 to better than even.

Chances of Reaching the Top: Stars

The baseline analysis made no distinction among individuals and thus may be interpreted in terms of population homogeneity. If we take into account the star selection distributions from table 13, the chances improve considerably. To illustrate the logic, we may take a seniority level cutoff point and compute the proportion of staff who continue to move upward in relation to those who have reached their highest grade. For instance, the 95 persons reaching G4 have a 100% chance of being selected to G5 if the move from G3 to G4 was at seniority 1 or 2 (S1 or S2), $\{(.15 \times 54)/[(0 \times 41) + (.15 \times 54)] = 1.0\}$; an 83% chance if the move was $\leq$S3; a 76% chance if $\leq$S4, and a 67% chance if $\leq$S5, all of which are higher than the 57% chance for all persons at G4. We will refer to this comparative viewpoint as the "careerist" perspective.

An alternative view of the same proportions may also be taken; namely, that of the manager making selections. At G5, we observe 54 selections. Thus, if we ask for a prediction of who will be selected, the selections of persons who moved from G3 to G4 at S1 or S2 will all be correct but will supply only 15% of the selections; at S1–S3, 83% of the selections will be correct, supplying almost half of the selections necessary to fill 54 vacancies; at S1–S4 76%, or 3 out of 4 of the selections, will be correct, filling 70% of the vacancies; and to fill all 54 vacancies it is necessary to go up to S6 where the proportion of correct decisions is 67%, or 2 out of 3. Similarly, at G4 all 95 vacancies may be filled by persons moving from G2 to G3 within a S1–S5 selection band, with almost 3 out of 5 correct decisions

TABLE 14

CHANGES IN CAREER CHANCES AS ONE PROGRESSES

Current Grade	Chances of Promotion to Grade (%)			
	G5	G4	G3	G2
G1	5	10	26	36
G2	15	26	71	
G3	21	37		
G4	57			

(56%). At G3, on the other hand, the proportion correct is 80%, or 4 out of 5 selection decisions made by filling the 256 vacancies, with persons moving earlier from G1 to G2 at S1–13. These updated heterogeneity based decision rules may be assessed against the homogeneity or random selection rule, as shown in table 15.

The percentage shifts seem to be reasonable improvements in our knowledge of individual career predictions. Most significant, the greatest improvement is at the Venturi (gateway 4) where the most difficult career discrimination occurs. Thus, it is at this structural pressure point that we obtain our greatest gain in predictive leverage. We stress "predictive," since we are referring to decisions made about individuals at gateway 3 in order to predict their passage at gateway 4.

The consequence of earlier movement at these same seniority levels is also considerable from the careerist perspective. We obtain the results shown in table 16, with the chances of the homogeneous population denoted in parentheses.

If an individual is selected during the waiting times depicted by a, b, and c in table 16 the chances for an entrant to reach the top change by over 100%, from 5% to 11%. The individual's chances for reaching G4 improve

TABLE 15

COMPARISON OF ALTERNATIVE DECISION RULES PER GATEWAY

Gateway	Correct Decisions (%): Homogeneous Decision Rule	Correct Decisions (%): Heterogeneous Decision Rule	Δ Improvement	Δ (%)
5	57	67	10	18
4	37	56	19	51
3	71	80	9	13
2	36	36	0	0

TABLE 16

IMPACT ON CAREER CHANCES GIVEN EARLY SELECTION

Current Grade Conditional on Earlier Selection	Promotion Chances to Grade (%): G5	G4	G3	G2
G1	11 (5)[a,b,c]	16 (9)[a,b]	29 (26)[a]	36 (36)
G2	30 (15)[a,b,c]	45 (26)[a,b]	80 (71)[a]	
G3	38 (21)[b,c]	56 (37)[b]		
G4	67 (57)[c]			

[a] G1 → G2 at ≤ S13.
[b] G2 → G3 at ≤ S5.
[c] G3 → G4 at ≤ S6.

by 67% from just under 1 in 10 to just over 1.5 in 10, almost entirely on the basis of selection into the prior grade at $\leq$S5. Another example may be seen in row 3 where the individual's chances improve by over 50% from 37% to 56% for reaching G4 and by over 80% for reaching G5, from 21% to 38%. These gains are substantial, indicating the power of earlier movement and pinpointing the gateway and timing where it counts the most. In other words, a great amount of leverage for promotion from G3 to G4, the toughest passage in the hierarchy, is gained by those preparing and moving earlier one grade before—at the G2–G3 passageway.

D. Cohorts

The final theoretical relationship between careers and OLMs that we will examine pertains to cohort size effects. We distinguish between two types of such effects, the first of which pertains to the impact of a new cohort's entrance on the careers of individuals already in the OLM. These effects are generally viewed in terms of growth. Lateral recruitment cohorts could also be treated but since the bulk of recruits generally enter at the bottom of an OLM, we will limit our discussion accordingly. Also, with no lateral recruitment possible at the bottom, the number of recruits entering at grade 1, R_1, will equal the available vacancies there, and hence,

$$R_1 = \sum_{l=1}^{K} n_l(p_{lo} + m_l r) \ . \qquad (7)$$

The fraction or share of recruits due to growth is simply $(\Sigma^K{}_{l=1} n_l m_l r)/R_1$. Hence, if exits are stable, R_1 is directly related to growth: decreases in growth (e.g., small cohorts) decrease promotion chances and increases in growth (e.g., large cohorts) increase them. More extensive analyses of growth and grade ratio/vacancy chain effects were presented in Section IIIA, and this first type of cohort effect is largely subsumed under the growth element of the earlier discussion.

The second type of cohort size effect is the more commonly defined one, affecting the individuals within the cohort itself. Moreover, it is of a different nature from growth and therefore will be the primary focus of this section. We will first view this second type of cohort effect analytically, specifying four career acceleration mechanisms. Then we will examine the mechanisms empirically for cohorts entering OLM 2 from 1934 to 1960.

Four Career Acceleration Principles

First principle.—The career advantages of being in a small cohort may be specified using equation (1), which we reiterate here:

$$\bar{p}_{ij}(s, t) = \frac{v_j(t)\lambda_{ji}(s)}{n_i(s, t)} \ . \qquad (1)$$

The managerial preferences regarding experience or seniority (λ's) are assumed fixed and a cohort entering at grade 1 during any year, $n_1(s, t)$, is uniquely denoted thereafter by its seniority level, s.[16] The reciprocal nature of cohort and growth effects may be observed directly from equation (1). Just as growth increases the number of vacancies available, thereby increasing promotion, the equivalent effect, in terms of ratio of vacancies to labor supply, may be obtained without growth by a decrease in cohort size.[17] Thus, for any two cohorts experiencing the same sequence of vacancies—whether the vacancies are increasing, fixed, decreasing, or oscillating—the smaller cohort will have more chances of promotion at each seniority level and will therefore move earlier. This is consistent with Keyfitz's eighth finding.

Second principle.—Keyfitz (1973, 1977) points out that the mode of career acceleration explained above will remain with the individual throughout his life since the cohorts maintain their relative size as they move forward in age and time. This insight holds more generally, regardless of the proportion of the cohort selected to move. Consider the career paths of individuals in two cohorts. At grade 2, within any seniority level, a small cohort is represented in higher relative proportions and will therefore continue to be selected at higher rates at grade 3 and so on. In short, for small cohorts the underlying structure depicted in equation (1) will accelerate the career chances at the onset of the career and this relative acceleration will continue at each higher level.

Third principle.—If we follow a cohort over time, "exits" (up by promotion or out of an organization) will decrease the cohort size, increasing the stayer's promotion chances. The small cohort's higher promotion chances thus act to make it yet smaller, adding to the initial advantage of its members. Equally advantageous, higher exit rates from the organization within a small cohort will reduce it and further accelerate the stayer's career chances. Of course, higher exit rates from any cohort are to the advantage of the stayer, but they are especially so for small cohorts because they add to an already existing advantage.

To demonstrate this point regarding "exits," let $a = p_{ij}(s, t)$, $b = p'_{ij}/(1 - p'_{ij})$, and $c = p'_{io}/(1 - p'_{io})$, where p'_{ij} is the probability of being promoted within 10 years and p'_{io} is the probability of leaving within 10

[16] Once moves to higher grades occur, OLM length of service must be used (see Konda et al. [1981]).

[17] The relative shifts necessary to obtain equivalent cohort and growth effects may be specified by combining eqq. (1) and (3) and defining the following new term: $S_{li}(s) = n_l/n_i(s)$. In other words, we now make the grade ratios cohort specific. The equation is

$$p_{i\,i+1}(s) = \sum_{l=i+1}^{K} S_{li}(s)(p_{lo} + m_l r)\lambda_{i+1,i}(s) .$$

years. The effect, in terms of change in promotion chances, Δ, of "exits" up by promotion and out of the OLM are as follows:

$$\Delta_{\text{up}} = p_{ij}(s, t) \frac{p'_{ij}}{(1 - p'_{ij})} = ab \, ; \tag{8}$$

$$\Delta_{\text{out}} = p_{ij}(s, t) \frac{p'_{io}}{(1 - p'_{io})} = ac \, . \tag{9}$$

Also, denote a small cohort and a large one by the subscripts s and l, respectively. Since small cohorts have greater promotion chances, as established in the first and second principles above, it holds not only that $a_s > a_l$, but also that $b_s > b_l$. Thus, we have the product $a_s b_s > a_l b_l$, demonstrating the compound or feedback effect on current promotion chances which higher, earlier promotion chances yield. As for actual exits from OLM, we will treat $c_s = c_l$ to consider the effect of equal exit probabilities. Since $a_s > a_l$, the result is $a_s c_s > a_l c_l$. In short, equal exit probabilities give still another advantage to the members of smaller cohorts.

Fourth principle.—We also observe a distinct cohort effect linked to the star halo. The first three principles noted above assume fixed managerial preferences based only on seniority. Yet, in the star analysis above we found that considerably more predictive leverage regarding selection chances could be obtained by also using the length of waiting time in prior grade. Individuals with "early prior selection" had substantially better career chances. Initial earlier movement due to a cohort effect may therefore result in a subsequent effect in the form of individual recognition as an "early mover" and, in relative terms at that level, as a probable star. To the previously noted advantages of being in a small cohort, we can add the creation of a star effect, yielding yet further acceleration. Not only does the member of a small cohort have accelerated chances at the onset of his career, but also (1) this relative acceleration will continue at each higher level and (2) because of the cohort induced star effect, each acceleration, including the initial one, will serve to further accelerate his chances. In other words, in addition to the initial acceleration and its continuance throughout the work life, we have a piggy-back star effect. Moreover, part of the star characteristic attributed to the individuals in these cases should instead be attributed to a cohort effect. It is easy to understand how the creation of a star in the form of a cohort effect might become attached to or identified with the person, for cohorts are not directly observable, only individual stars are. The "brightness" attributed to the star is therefore not a product of the individual's genius alone but is, in part, and perhaps in large part, a reflection of the underlying social process or social structure. Thus, to the three earlier structural effects—grade ratios, vacancy chains, and managerial preferences—we add a fourth: cohorts.

Tests of the Acceleration Principles

The empirical investigation of cohort effects will once again focus on OLM 2. The initial data, shown in table 17, provide the career outcomes 10 years after entrance for cohorts from 1934 to 1960. The top of the table presents the entire cohort's distribution; the bottom gives the distribution for stayers only. Aggregating cohorts into small (S), N = 30–49, medium (M), N = 50–79, and large (L), N = 80+ (see the three right-hand columns), we find that 27% of the individuals in small cohorts have reached G2, 15% of those from medium sized cohorts have done so, and 20% of those from large cohorts, that is, $S > L > M$. The acceleration principle from G1 to G2 is supported for small cohorts. However, the large cohort's advantage over a medium one is surprising. The relation is not monotone but parabolic, with staff in small and large cohorts moving faster than those in medium sized ones.

Second, from table 17 (the last three columns, row 3) we observe that the small cohorts also have the largest exit rate, 30%, with medium and large cohorts at 22%–23%. Recall from equation (9) and the third cohort acceleration principle, that equal exits generate more acceleration for smaller cohorts. Thus, here we find an even greater impact for, as in the "exit" by promotion case where there is a compound advantage with both $a_s > a_l$ and $b_s > b_l$, here we also find a compound advantage: $c_s > c_l$. Thus once again there is an even further advantage for the stayers in small cohorts. The effects of exits from the OLM may be seen by comparing rows 1 and 4 of the last three columns. There we find the following shifts in promotion outcomes—S 27% → 38%, M 15% → 20%, L 20% → 25%, or a 2 to 1 (11% to 5%) advantage for the small cohort staff, supporting the third cohort acceleration principle.

Third, we wish to point out that being in a small cohort is not a sufficient condition for accelerated mobility, as may be observed in the 1942 cohort's performance with only 4% reaching G2 in 10 years. This is the worst case of all 18 cohorts and these data suggest that even in the set of small cohorts we may find a bad apple or dud. Or, more to the point, the acceleration effect assumes an equal talent distribution in order for the selections on experience (λ's) to hold. And these data indicate that the 1942 cohort, which had no differences in age distribution or military leaves from surrounding cohorts, simply did not have its share of talented individuals. Hence, small cohorts are not always blessed with accelerated careers.

The second set of data we will examine concerns individuals from the 1934–60 cohorts who reach the highest grade. Since G5 is the highest grade in this OLM, we may treat all individuals reaching it as if they had completed their careers in upward mobility whether or not they had left the firm by 1970, the last year for which we have data. Table 18 gives the mean

TABLE 17

CAREER OUTCOMES 10 YEARS AFTER ENTRANCE BY COHORT SIZE AND YEAR OF ENTRY

Grade	*S* 1934	*S* 1935	*L* 1937	*S* 1939	*L* 1940	*M* 1941	*S* 1942	*S* 1946	*S* 1947	*L* 1948	*M* 1949	*M* 1950	*M* 1951	*S* 1952	*L* 1954	*M* 1955	*L* 1956	*L* 1957	*S* 1960	Σ Small	Σ Medium	Σ Large
Distribution of entire cohort:																						
G2 (%)	23	26	8	33	15	13	4	23	34	28	22	11	20	27	9	11	25	22	51	27	15	29
G1 (%)	47	36	75	40	55	72	49	56	34	54	53	56	61	55	59	65	55	56	26	43	62	58
Out (%)	30	38	17	27	30	15	47	21	32	18	25	33	19	18	32	24	20	22	23	30	23	22
N	40	39	105	33	115	62	47	43	41	82	59	63	54	33	85	71	288	190	35	311	309	865
Average *N*	...	...	...	...	...	. .	...	...	...	...	...	...	...	...	...	...	...	...	...	39	62	144
Cohorts *N*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	5	6
Distribution of stayers only:																						
G2 (%)	32	42	9	46	21	15	8	29	50	34	30	17	25	33	14	14	32	28	67	38	20	25
G1 (%)	68	58	91	54	79	85	92	71	50	66	70	83	75	67	86	86	68	72	33	62	80	75
N	28	24	87	24	81	53	25	34	28	67	44	42	44	27	58	54	230	149	27	217	237	672
Average *N*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	27	47	112

NOTE.—*S* = small (N = 30–49); *M* = medium (N = 50–79); *L* = large (N = 80+).

TABLE 18

MEAN NUMBER OF YEARS IN GRADE BEFORE MOVING UPWARD BY COHORT SIZE FOR INDIVIDUALS REACHING GRADE 5

	MEAN YEARS IN ORIGIN GRADE BEFORE MOVING				
COHORT SIZE	G1 → G2	G2 → G3	G3 → G4	G4 → G5	N
Small	8.7	4.6	4.8	2.8	16
Medium	11.4	4.9	5.2	3.1	11
Large.	10.4	4.7	4.5	3.1	22

NOTE.—Small: N = 30–49; medium: N = 50–79; large: N = 80 +.

waiting time in prior grade before being promoted to each grade for those individuals who reached G5. Summation of waiting times in each grade yields the mean time to reach G5. For small cohorts, it is 21 years; for large ones, 23 years; and for medium-sized ones, 25 years, or once again $S > L > M$ in terms of career acceleration. As for time to stardom, the earlier results at the G2 level continue all the way to the top. Hence, we find support for the second cohort acceleration principle—that the accelerated career mobility will continue throughout the work life for individuals in small cohorts.

"Turtles" and "Hares"

Finally, we examine cohorts entering in 1934–50, which had at least 20 years of exposure prior to 1970, in order to view the proportion of staff moving upward by cohort size. These data are provided in table 19. Interestingly, the acceleration principles do not appear to carry over in terms of proportion of staff eventually reaching either the first promotion, G2, or the top, G5. The proportions are almost identical. Thus, for this OLM the cohort accelerators work in terms of speedier career mobility, with all of its associated recognition, but the relative turtles eventually also get there. Also, that portion of the advantage gained by small cohorts in reaching G2 earlier, which came from higher exit rates at G1, means a lower possible ceiling on the percentage of cohort staff who may eventually get there.

With completed careers predominant in only 4 small cohorts, 2 large ones, and 1 medium-sized one, we caution against generalizing about the equality of percentages at G5. At G2, however, the conclusion is in for this set of cohort careers. The G5 results, if supported with more data in the future, would indicate that the careers of both turtles and hares will show no final differences in proportions reaching the top based on cohort size effects. On the other hand, if subsequent analysis points to cohort differences, then both career acceleration and final career outcomes will differ because of cohort effects.

TABLE 19

PERCENTAGE OF COHORT EVER REACHING GRADES 2 AND 5 BY COHORT SIZE AND YEAR OF ENTRY

	S 1934	*S* 1935	*L* 1937	*S* 1939	*L* 1940	*M* 1941	*S* 1942	*S* 1946	*S* 1947	*L* 1948	*M* 1949	*M* 1950	Σ Small	Σ Medium	Σ Large
G5	10	15	11	9	5	15	0	0	7	6	3	0	7	6	7
G2	65	54	72	70	59	73	51	77	61	67	61	57	63	64	66
Out by 1971	100	97	93	97	97	79	89	26	34	26	31	37	73	49	76
N	40	39	105	33	115	62	47	43	41	82	59	63	243	184	302

IV. SAMPLING BIAS: RETROSPECTIVE AND PANEL DATA

Thus far, we have specified and empirically confirmed four structural effects on individual careers, as well as the importance of early movement for subsequent career chances. In this section we discuss briefly the implications of these findings for the design of samples to be used for analyzing careers.

Much current work on careers is based on data gathered from a one-point panel or retrospective sample. A panel sample is taken when a cross section of individuals at time t is followed forward across time, while a retrospective sample results from observing a cross section of individuals at time t and tracing them backward through time. Hence, in a panel, no data are available on careers of subsequent entrants after the time of sampling; and in a retrospective sample, no information is available on individuals who left before the time of sampling. The result of these sampling plans is a time series of observations on careers but effectively only one observation (at the sampling point) of the labor market within which these careers form.

A somewhat analogous methodological problem was pointed out earlier by Duncan (1966) when he addressed intergenerational career mobility. Duncan showed that the occupational distribution at any point in time is a weighted aggregation of birth cohorts; hence, redistributions over time include both intracohort and intercohort shifts. He further stated that it is "a basic fallacy to suppose . . . that the father-son mobility table provides in effect two 'samples in time' " (1966, p. 62).

Labor markets are indeed a mixture of intracohort and intercohort processes, and table 20 shows this mixture for the OLM in organization 2, which we analyzed in Section III. Intracohort distributions are given in each row in the % → columns and intercohort or OLM grade distributions are given under the column headings % ↓. There are obvious variations in the OLM grade distributions by cohort. And, from the analysis in Section III, it is clear that these differences stem from much more than cohort effects and individual variation. We would argue that cohort effects, as well as effects from individual heterogeneity, take place through the OLM structures and that to evaluate cohort variations properly, for example, it is important to understand the other microstructures which operate alongside cohort effects.

In table 20 we also observe considerable variation in intracohort distributions. Similarly, the earlier analyses suggested that the OLM structures of grade ratios, vacancy chains, and managerial preferences and the growth and exit processes which trigger these structures are important in determining cohort distributions, in addition to the effects from both individual stars (heterogeneity) and cohort size. Clearly, from our analyses in Section III and from the foregoing observations regarding both intracohort and intercohort variations, we expect inferences about labor markets from a

TABLE 20

JOINT OLM-COHORT DISTRIBUTIONS: PERCENTAGE OF 1970 OLM STAFF BY GRADE AND ENTRY COHORT AND PERCENTAGE OF ENTRY COHORT BY GRADE OR OUTSIDE IN 1970

COHORT (Year)	YEARS IN OLM	COHORT SIZE	EXITS			GRADE 1			GRADE 2			GRADE 3			GRADE 4			GRADE 5		
			N	%↓	%→	*N*	%↓	%→	*N*	%↓	%→	*N*	%↓	%→	*N*	%↓	%→	*N*	%↓	%→
1935.........	35	39	38	5	97	0	0	0	0	0	0	0	0	0	0	0	0	1	4	3
1937.........	33	105	98	12	93	0	0	0	0	0	0	1	1	1	1	4	1	5	21	5
1939.........	31	33	32	4	97	0	0	0	0	0	0	0	0	0	1	4	3	0	0	0
1940.........	30	115	111	14	96	0	0	0	0	0	0	1	1	1	2	7	2	1	4	1
1941.........	29	62	49	6	79	0	0	0	3	1	5	1	1	2	3	11	5	6	25	10
1942.........	28	47	42	5	89	0	0	0	0	0	0	5	3	11	0	0	0	0	0	0
1946.........	24	43	32	4	26	0	0	0	4	1	9	22	13	51	6	21	14	0	0	0
1947.........	23	41	14	2	34	2	0	5	12	3	29	8	5	20	2	7	5	3	13	7
1948.........	22	82	21	3	26	6	1	7	18	4	22	24	14	29	8	29	10	5	21	6
1949.........	21	59	19	2	32	5	1	6	11	3	19	18	11	31	4	14	7	2	8	3
1950.........	20	63	25	3	40	4	0	6	20	5	32	14	8	22	0	0	0	0	0	0
1951.........	19	54	16	2	30	7	1	13	18	4	33	13	8	24	0	0	0	0	0	0
1952.........	18	33	9	1	27	3	0	9	12	3	36	8	5	24	0	0	0	1	4	3
1954.........	16	85	29	4	34	11	1	13	28	7	33	17	10	20	0	0	0	0	0	0
1955.........	15	71	21	3	30	18	2	25	24	6	34	7	4	10	1	4	1	0	0	0
1956.........	14	288	76	10	26	52	5	18	136	32	47	24	14	8	0	0	0	0	0	0
1957.........	13	190	44	6	23	63	6	33	77	18	41	6	4	3	0	0	0	0	0	0
1960.........	10	35	8	1	23	9	1	26	18	4	51	0	0	0	0	0	0	0	0	0
1961.........	9	36	6	1	17	17	2	47	12	3	33	1	1	3	0	0	0	0	0	0
1962.........	8	44	2	0	5	33	3	75	9	2	20	0	0	0	0	0	0	0	0	0
1963.........	7	69	17	2	25	47	4	68	5	1	7	0	0	0	0	0	0	0	0	0
1964.........	6	125	14	2	11	96	9	77	15	4	12	0	0	0	0	0	0	0	0	0
1965.........	5	137	14	2	10	121	11	88	2	0	1	0	0	0	0	0	0	0	0	0
1966.........	4	247	27	3	11	220	21	89	0	0	0	0	0	0	0	0	0	0	0	0
1967.........	3	131	16	2	12	115	11	88	0	0	0	0	0	0	0	0	0	0	0	0
1968.........	2	130	6	1	5	124	12	95	0	0	0	0	0	0	0	0	0	0	0	0
1969.........	1	114	0	0	0	114	11	100	0	0	0	0	0	0	0	0	0	0	0	0
Total......			786			1,067			424			170			28			24		

one-point sample to be biased and, more significantly, because of the strong labor market effect on careers, we expect inferences about careers themselves to be biased. Hence, we conclude that one-point samples give rise to some potentially serious methodological problems not only for the study of intergenerational mobility processes, as pointed out by Duncan (1966), but also for intragenerational career research.

With regard to intergenerational data, Duncan (1966, p. 62) concluded that we could reinterpret the father-son data in terms of intracohort changes: "Instead of thinking of . . . father's occupation as conveying information about a 'generation of fathers,' think of it as describing the origin statuses of sons." In our view, this suggestion correctly utilizes the father-son data obtained from a one-point sample, but at the same time it underscores rather than solves the intragenerational career problem we raise, namely, the labor market-career issue. The one-point sample potentially offers much information (e.g., the full career stream) on the heterogeneity of labor supply at the time of the sample, but in terms of labor market sampling, we remain at square one.

To give further empirical bases for the foregoing conclusion, we directly examine the biases produced at the second promotion gateway (G2 → G3) in OLM 2 from both retrospective and panel data. The retrospective data refer to the entire 1970 OLM population above grade 2, whose careers are then traced backward in time for the grade 2–3 promotion. The panel data pertain to the entire 1960 grade 2 population, which is followed until 1970. We will estimate the promotion parameters, $p_{ij}(s) = [n_{ij}(s)]/[n_i(s)]$, and the managerial selection parameters, $\lambda_{ji}(s) = [n_{ij}(s)]/n_{ij}$, from these one-point samples and compare the estimates to the true or observed parameters for both 10 and 20 years. To examine the nature of bias, we will take as observed the number of persons at risk for the $p_{ij}(s)$ parameter and the number of vacancies for the $\lambda_{ji}(s)$ parameter.[18] The results are shown in table 21.

In the retrospective data, the $\hat{p}_{ij}$'s overestimate staff flows in nine of 10

TABLE 21

BIASES IN PARAMETER ESTIMATES STEMMING FROM ONE-POINT SAMPLES (% Errors)

	Retrospective Data		Panel or Prospective Data	
	10 Year	20 Year	10 Year	20 Year
$\lambda_{ji}(s)$	16	13	49	48
$p_{ij}(s)$	45	32	24	30

NOTE.—10-year period = 1960–69; 20-year period = 1950–69.

[18] In other words, $\hat{\lambda}_{ji}(s)v_j = \bar{n}_{ij}(s)$ and $n_i(s)\hat{p}_{ij}(s) = \bar{n}_{ij}(s)$.

seniority levels for the 10-year period and in all 10 seniority levels for the 20-year period. The errors, 45% and 32%, respectively, are quite large, indicating that potentially serious data problems exist in the use of retrospective data to form estimates of origin-to-destination flows. The retrospective selection estimates, $\hat{\lambda}_{ji}(s)$, appear much more reasonable, although a 13%–16% error in data is substantial. The data requirements for the estimates of the two parameters are quite different, with the $p_{ij}(s)$ parameter needing both the persons selected or moving upward $[n_{ij}(s)]$ and those at risk $[n_i(s)]$ and the $\lambda_{ji}(s)$ parameter needing only the persons selected $[n_{ij}(s)]$. The missing exits from grade 2 in retrospective data, though quite small (.02/year), have a substantial impact on the p_{ij} estimate since the population at risk is not adequately represented.[19]

Prospective or panel data, on the other hand, produce extremely large selection biases (48%–49%) as well as quite large promotion biases (24%–30%). At 10 years the error for p_{ij}'s is cut in half, from 45% to 24%, when one uses panel rather than retrospective data, but 24% is still a very large data error from which to begin testing.

Another view of the sampling bias is obtained if we reverse the requirements, taking the true parameters, and use the sample data to estimate the vacancies and populations at risk.[20] The results of this procedure are given in table 22 for the 10-year period. Once again, the errors are quite large (20%–50%), indicating the importance of sampling from labor markets as well as career streams.

The implications of these data biases extend beyond the area of labor. To the extent that labor markets exemplify structures or processes, then in order to explain individual behavior which is contingent on such processes, we must sample from the structures. Such a conclusion seems quite elementary, but it is not often heeded in social science research. The result is that individual variation is treated at length, but the underlying structures are not identified.

TABLE 22

BIASES IN STATE VARIABLES STEMMING FROM ONE-POINT SAMPLES (% Errors)

	Retrospective Data	Panel or Prospective Data
v_j	19	50
n_i	32	42

[19] The same would hold true for the λ_{ji} estimates only if persons promoted to grade 3 left the OLM and these leavers were different from the stayers.

[20] In other words $\Sigma_s \hat{v}_j \lambda_{ji}(s) = \bar{n}_{ij}$ and $\Sigma_s \hat{n}_i(s) p_{ij}(s) = \bar{n}_{ij}$.

V. CONCLUSION

In this paper we have attempted to tie together elements of labor, organizations, and demographic theory. The organizations-labor merger is increasingly recognized as an important avenue by which to bring theoretical balance into labor theory by treating both supply and demand sides of the process. Moreover, though Spilerman (1977) and Stolzenberg (1978) work from a somewhat more aggregate level in their empirical work, the present focus on organizations is complementary to the aggregate level. Focusing on organizations permits analysts to examine and test career/labor market processes more directly at the points where decisions are made and more fully to delineate microstructures which will aid in interpreting the more aggregate models.

A theoretical link with demography has been established by directly tying the modeling to Keyfitz's (1973) work in organizational demography in which he uses stable population theory. The two strands of research have been shown to be extremely consistent for the most part; where they are not so, the present modeling has been able to specify the conditions under which the results from stable population theory hold, thereby making the two consistent.

We have demonstrated, analytically and empirically, four structural effects on career chances and career outcomes—grade ratios, vacancy chains, managerial selection preferences, and cohort size—along with two triggering mechanisms—growth and exit rates. In addition, the importance of early movement has been shown from two perspectives—from the person's own career, in terms of improved promotion chances and from that of the manager making the selections, in terms of more accurate predictions of individuals selected. The more specific results—analytical and empirical—are summarized below.

Analytical

1. The usual view of organizations as hierarchical pyramids (e.g., percentage distribution at each grade level) is not the best way to see one's career prospects; grade ratios are the key.

2. The simple grade ratio (grade above to grade below) is transformed into a multiple grade ratio (MGR) by vacancy chains.

3. We may specify separately five processes affecting an individual's career chances—grade ratios, vacancy chains, exit rates, allocation of new jobs, and growth rate—and from these predict the relative ordering of career chances at each promotion gateway. (*a*) We specify the conditions under which growth will have the greatest impact at the top and bottom or will have equal impact at all levels, clarifying one of the results from stable population theory: (1) if exits increase or decrease monotonically across

grade levels, then the relative impact of growth on promotion chances is also monotonic, but the inverse of the exit rate; (2) if exits are equal across grade levels, then growth effects on promotion chances are also equal; (3) if exits are not monotonic or equal, equation (3) specifies the effects of growth on promotion chances. (*b*) The percentage change in promotion probability at each promotion gateway per percentage change in growth rate is shown. (*c*) Unless the grade distribution changes, equivalent increments or decrements in growth rate will have equal impact on promotion chances (clarifying one of the results from stable population theory). (*d*) When the multiple grade ratio decreases monotonically and exits increase monotonically, growth will act to equalize the promotion chances across levels.

4. If external recruitment fills a fixed proportion of vacancies, l, such selections are equivalent to a decrease by l in exits, growth, and vacancies coming down from higher grades, all of which, of course, reduce promotion chances.

5. *Acceleration* principles for small cohorts: (*a*) if two cohorts experience the same sequence of vacancies, the smaller cohort will have larger promotion chances at each seniority level and will therefore move earlier; (*b*) the career acceleration at the first gateway is then repeated at all subsequent higher gateways; (*c*) equal exit rates yield greater changes in promotion chances for small cohorts; and (*d*) a cohort induced star effect or halo generates yet further acceleration beyond that already existing for members of small cohorts.

Empirical[21]

1. Given grade ratios, exits, growth rate, and allocation of new jobs, the ordering of career chances can be predicted for the career progress from the bottom to the top of an OLM (three OLMs). (Using only grade ratios, seven of eight predictions were correct.)

2. Pyramidal promotion chances (i.e., declining promotion chances as one rises in the firm) occur in the managerial OLMs of only one of three organizations, the military; in the other two organizations, one public and one private, as one moves upward, career chances accelerate at certain middle and upper levels, depending on the grade ratios.

3. If exits increase or decrease monotonically across grade levels, the relative impact of growth on promotion chances is also monotonic, but the inverse of the exit rate (two OLMs).

4. Growth effects far outweigh mortality effects (mortality is 4% of growth) (one OLM).

5. Unless an organization's labor market is growing very fast ($\simeq$10%) or the organization is a new one with a young labor force, we generally

[21] For most items in the following list, the number of OLMs on which the finding rests is given in parentheses.

expect exit effects to be equal to or greater than those of growth (three OLMs).

6. Two OLMs with the same structure but different growth rates (3%–10%) may be expected to have extremely large differences in promotion chances (20%–70%) (three OLMs).

7. If one's career chances are accelerating at a given growth rate, r, as one rises in the organization, they will accelerate even further for a higher growth rate, r', or if they are decelerating, they will decelerate more; that is, the impact of growth is to widen promotion differences across grade levels (three OLMs).

8. Shifts in exits do not appear plausible as a mechanism for reversing a Venturi effect upon career chances; however, under certain growth conditions, rather small shifts in grade ratios may do so (three OLMs).

9. About half of the staff who reach the top experience career acceleration at each higher gateway (i.e., as an individual rises higher in the organization, his waiting time for the next promotion is shorter). This is due to the joint structures of multiple grade ratios and managerial preferences. The managerial preference structure implies a pure monotonic accelerator—the higher an individual rises in the organization, the earlier are his best selection chances. A Venturi decreases an individual's career chances. When the two structures of multiple grade ratios and managerial preferences reinforce one another, over 90% of the individuals experience accelerated career movement, but when the two structures oppose one another, this percentage is cut by almost half, to 54% (one OLM).

10. Individuals attaining higher grade levels in their careers have moved faster than others at each lower grade (one OLM).

11. Individuals whose careers end at higher grades stay in the organization longer or have longer careers (one OLM).

12. The selection chances of stars are higher earlier at each grade than the chances of those whose careers end at lower grade levels (one OLM).

13. Use of information on early movers led to improvements of 10%–50% in predictions of individuals to be selected. Most significant, the greatest improvement is at the Venturi where the most difficult career discrimination occurs—or from the individual's viewpoint, the gateway and timing in the career where early movement counts the most is pinpointed (one OLM).

14. Individuals in small cohorts have earlier career movement not only at the first promotion gateway, but throughout their careers (one OLM).

15. Small cohorts also have the highest exit rate, generating a compound promotion advantage for the stayers (one OLM).

16. Small cohorts are not always blessed with accelerated careers; the cohort acceleration effect assumes an equal talent distribution across cohorts (one OLM).

17. The ranking on career acceleration by cohort size—both at the first

promotion gateway and on reaching the top—is small > large > medium, which is a surprise.

18. The cohort acceleration principles do not appear to carry over in terms of proportion of staff eventually passing the first promotion gateway or reaching the top; the proportions are approximately the same (one OLM).

19. Sampling errors from both one-point retrospective and panel data appear quite large (generally above 20%), indicating the importance of sampling from labor markets as well as from individual career streams; or, more generally, that when individual behavior is contingent on social structures it is important to sample from these structures.

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