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1. INTRODUCTION

This study is concerned with mobility of chemists among colleges and universities in the academic training phase as well as in the postdoctoral phase of their professional careers. Patterns of mobility are examined in terms of geographic and social dimensions of the academic stratification system, namely, geographic location and prestige structure of universities.

In their studies of the academic community, sociologists have emphasized its hierarchical structure [5,15]. The hierarchy is usually expressed in terms of institutional "quality" or "prestige". It has been maintained that the mobility of scholars in the academic community follows more the endogamous pattern than the stepladder pattern [7]. On the other hand, it has been common practice for demographers to emphasize the geographic location in their studies of population mobility. Many migration models which use the gravity concept have dealt with mathematical formulations of the relationship between migration and distance [17,19]. However, few studies have attempted to study the degree to which a combination of social and geographic views can account for observed patterns of mobility in the academic community. It is the purpose of this paper to examine these two aspects of mobility pattern by applying a statistical model which has been recently used in the analysis of various types of transaction flow data [2,9,16].

Mobility is defined in this study as a change of institutional affiliation. Three types of mobility emerge upon linking such points of career development as baccalaureate graduation, doctorate graduation, and employment: (1) Baccalaureate-to-doctorate mobility, (2) Doctorate-to-employment mobility, and (3) post-doctoral job mobility.

2. DATA AND SAMPLING PROCEDURE

The data for the study are obtained from the American Chemical Society's Directory of Graduate Research which has been published every two years since 1955.

The population to be studied consists of all faculty members affiliated with chemistry departments offering graduate degree programs in institutions of higher education in the United States. The study sample was selected from seven successive editions of directories, from 1955 to 1967, using a single-stage cluster sampling procedure. The alphabetical listing of the latest directory was first subdivided into 80 clusters and a random sample of 20 clusters were selected. Each cluster is a span of alphabetical listing with unique starting and ending points. These 20 spans of alphabetical listing are canvassed in each edition of directories. The sample, then, consists of all chemists included in these 20 spans in the alphabetical listing in at least one edition of the directories. Thus, included in the sample are those who left the profession as well as those

who newly joined the profession during the study period. A total of 1,128 unduplicated individual names were selected following through the seven successive editions of the directory. Of the 1,128 names 244 appear in all seven successive directories and 215 appear only one time.

In order to obtain information about the mobility of chemists, sociometric-type matrices describing the flow of scholars among the 86 institutions were formed for the three types of mobility mentioned above. The 86 institutions were selected based on a criterion that each of them employed at least 15 faculty members and produced 5 or more doctorates in the year 1966-67.

3. METHOD OF ANALYSIS

In a mobility matrix, the diagonal cells represent stayers who did not change their institutional affiliation and off-diagonal cells show movers who changed their institutional affiliation during the period of study. In order not to misinterpret the data, we must use a model that actually describes the phenomena under investigation or is a sufficiently close approximation to it. Blumen and others [3,8] demonstrated that the separation of movers and stayers improved the fitness of their Markov model in their study of the movement of workers among various industrial catagories. Goodman [11] also showed that a "quasi-perfect mobility" model which deals with movers only separating out stayers fits to the actual data much better than the "perfect mobility" model which describes the whole mobility table including stayers. Therefore, in this study an attempt was made to distinguish the movers and the stavers and treated them separately.

The 86 x 86 mobility matrices excluding the diagonal cells were analyzed by examining the departures of the observed frequencies from the expected frequencies of movements. The expected frequencies are derived from a "quasi-perfect mobility" model which assigns zero frequencies along the main diagonal of the matrix and, subject to this constraint, calculates expected values on the assumption of no association between the institution of origin and the institution of destination.

This statistical model was first developed by Savage and Deutsch to analyze international trade data and an iterative technique was used in the maximum likelihood estimation procedure [1,16]. Subsequently Goodman presented a generalization of the model with an alternative iterative procedure [9, 10, 12]. A similar model dealing with incomplete two-dimensional contingency tables was also presented by Bishop and Fienberg [2]. Recently Wagner [18] presented more elaborate discussion on the maximum likelihood estimate for contingency tables with zero diagonal. It is to be noted in this connection that this type of problem can also be handled by a general noniterative procedure presented by Grizzle and others[13].

Because of the small number of cases upon

which the analysis was based, it would be inappropriate to interpret and generalize the results based on larger tables of the order of 86 x 86. The analysis of mobility patterns are based on pooled frequencies, observed and expected, from the larger tables according to a combination of regional and prestige level groupings of institutions. Based on the U.S. Census Regions, five regional groupings are used: New England, Middle Atlantic, Midwest, South and West. Four levels of prestige groupings are used based on the American Council on Education study on quality rating of graduate faculty as reported by Carter [6]. By using these regional and prestige groupings, four basic components of mobility are identified: (1) Intra-regional and same prestige level mobility; (2) Intra-regional and different prestige level mobility; (3) Inter-regional and same prestige level mobility; and (4) Interregional and different prestige level mobility.

In addition to these four components based on the movers, there is the fifth component representing the stayers. Analysis of the stayer component was done using a different model independently of the analysis of the movers. The expected frequencies for the stayers in the diagonal cells were computed based on the "perfect mobility" model which uses the same procedure in ordinary complete two-dimensional contingency table analysis.

4. FINDINGS

4.1 Baccalaureate-to-Doctorate Mobility

Table 1 presents data on the baccalaureateto-doctorate mobility among the 86 institutions. The table shows the four components of mobility with the fifth component below the dividing line and each component is further divided into subcomponents. The figure at the first column corresponding to each component represents the percent of the movers with respect to that component. The second column shows the percentage of the movers which would be expected for each component based on the quasi-perfect mobility model mentioned above. Since the first four components are computed on the same base, these four add up to 100 percent. The fifth component is based on a different base, namely, the total including movers and stayers. The third column in the table presents a crude measure of the extent to which the observed values for each component deviate from those which would be expected. The data are presented in the same manner throughout this paper.

It is shown in Table 1 that 35 percent (addition of first two components) of movers moved within the same region. This percentage is much higher than would be expected. It is also shown that 60 percent (addition of the first and third components) of movers moved to institutions of the same prestige level as their baccalaureate institutions, and this figure is slightly higher than the expected percentage. Within the same region, horizontal mobility with respect to prestige level far

Table 1. Baccalaureate-to-Doctorate Mobility Patterns of Chemists

				D: 00
Com	ponent of	Observed	Expected	(oh Therence
	MODILITY	rercentage	rercentage	(UD-EXD)
Intra-	regional			
(I)	Horizontal	21.7%	11.1%	+10.6%
(-)	Top level	(19.2)	(10.5)	(+8.7)
	Lower lev	rels(2.5)	(0.6)	(+1.9)
()			(••••)	(
(11)	Vertical	13.0	8.3	+4.7
	Upward	(8.6)	(5.8)	(+2.8)
	Downward	(4.4)	(2.5)	(+1.9)
Inter-	regional			
TTT	Horizontal	38.0	43.3	-5.3
()	Top level	(36.7)	(11.7)	(-5.0)
	Lower lev	$alg \left(1 3 \right)$	$\sum_{i=1}^{n} \frac{1}{6}$	(-0.3)
	HOWEL LEV		(1.0)	(=0,))
(IV)	Vertical	27.3	37.2	-9.9
	Upward	(21.7)	(27.8)	(-6.1)
	Downward	(5.6)	(9.4)	(-3.8)
(v)	Stavers	30 /	3 1	+27 3
(•)	Mon level	(22.8)	$(2 \circ)$	(+10 0)
	Lowen level	(2, 0)	20.21	(+7 4)
	TOWEL TEA	ere (1.0)	(0.2)	(+1+4)
	Numb	er of mover	rs 360	
	Numb	er of Staye	ers <u>157</u>	
		Tota	al 517	
	and the second second second			

exceeds expected mobility, while vertical mobility is slightly higher than expected mobility. The stayer component shows that more than 30 percent of the total (movers plus stayers) stayed at the same institution where they received the baccalaureate, and this figure is much higher than would be expected. Thus, the selective tendencies displayed here suggest that the academic stratification system in the baccalaureate-to-doctorate mobility is better represented as a set of regional hierarchies rather than a strict prestige hierarchy.

The general patterns revealed above may not characterize each region and each prestige level considered separately. In order to investigate this possibility, each region and each prestige level is separately considered. The data in Table 2 reveal that the general tendencies observed above exist in every region, although the sizes of the differences between observed and expected percentages vary from one region to another. For example, the first row shows that the intraregional, horizontal mobility tendency is weakest in the South and the Middle Atlantic, but they will have more mobility than expected in this respect. The intraregional, vertical mobility shown in the second row also exceeds the expected mobility with the exception of New England where it is balanced. On the other hand, the percentage differences for interregional mobility are all negative in sign, with the lone exception of the South. But the plus sign appears only in horizontal mobility. In other words, the South is sending its baccalaureate graduates to institutions of the same prestige level in other regions for their doctorate slightly more often than would be expected, while interregional, vertical mobility is still far less than the expected mobility. The tendency to remain at the same institution is strongest in the

Table 2. Analysis of Regional Differences in Baccalaureate-to- Doctorate Mobility Patterns

Component o	f	Ne	w Eng	rland	Midd	ile A	tlantic]	Midwe	st		South			West	
Mobility		Ob	Ехр	Dif	ОЪ	Exp	Dif	<u>0</u> Ъ	Exp	Dif	Ob	Ехр	Dif	Ob	Exp	Dif
Intra-regiona (I) Horizon (II) Vertica	<u>1</u> tal 1	24.5 2.0	12.5 2.0	+12.0 0.0	10.5 11.8	5.0 6.8	+5.5 +5.0	32 .1 19 . 3	19.4 14.3	+12.7 +5.0	3.4 10.4	1.4 5.1	+2.0 +5.3	30.9 14.7	11.8 8.7	+19.1 +6.0
Inter-regiona (III) Horizon (IV) Vertica	<u>1</u> ital 1	63.3 10.2	63.9 21.6	-0.6 -11.4	40.8 36.9	43.8 44.4	-3.0 -7.5	32.1 16.5	40.1 26.2	-8.0 -9.7	22.4 63.8	21.4 72.1	+1.0 -8.3	39•7 14•7	51.9 27.6	-12.2 -12.9
(V) Stayers		33.8	7.8	+26.0	31.5	1.8	+29.7	34.3	2,8	+31.5	8.7	0.2	+8.5	26.9	4.3	+22.6
Number Number	of m of s Tota	overa tayei 1	s 49 cs 25 74			76 <u>35</u> 111			109 <u>57</u> 166			58 <u>15</u> 73			68 25 93	

Table 3. Analysis of Prestige Level Differences in Baccalaureate-to-Doctorate Mobility Patterns

Com	ponent of	Lev	rel 1 (High)		Level	. 2		Leve]	. 3	Leve	14 (I	iow)
M	obility	ОЪ	Exp	Dif	Ob	Exp	Dif	Ob	Exp	Dif	Ob	Exp	Dif
Intra-1 (I) (II)	<u>regional</u> Horizontal Vertical	30.4 5.7	16.7 3.5	+13.7 +2.2	11.3 28.3	1.9 20.4	+9.4 +7.9	4.1 30.6	0.8 18.2	+3.3 +12.4	3.2 12.9	1.3 7.7	+1.9 +5.2
Inter-1 (III) (IV)	regional Horizontal Vertical	58 . 1 5.8	66.5 13.3	-8.4 -7.5	5.7 54.7	7.0 70.7	-1. 3 -16.0	2.0 63.3	2.8 78.2	-0.8 -14.9	3.2 80.7	1.3 89.7	+1.9 -9.0
(V)	Stayers	34.2	4.3	+29.9	29.3	0.8	+28.5	21.0	0.3	+20.7	11.4	0.8	+10.6
	Number of m Number of s Tota	overs tayers l	227 <u>118</u> 345			53 22 75	,	*****	49 <u>13</u> 62	,		31 	

Table 4. Analysis of Trends in Baccalaureate-to-Doctorate Mobility Patterns

Component of	0	ld Cohort*			foung Cohor	-t**
Mobility	Observe d	Expected	Difference	Observed	Expected	Difference
Intra-regional (I) Horizontal Top level Lower levels	24.4% (23.7) (0.7)	12.2% (11.5) (0.7)	+12.2% (+12.2) (0.0)	19.6% (15.7) (3.9)	10.3% (9.8) (0.5)	+9.3 (+5.9) (+3.4)
(II) Vertical Upward Downward	12.8 (10.3) (2.5)	9.0 (7.1) (1.9)	+3.8 (+3.2) (+0.6)	13.2 (7.4) (5.8)	7.8 (4.9) (2.9)	+5.4 (+2.5) (+2.9)
Inter-regional (III) Horizontal Top level Lower levels	34.6 (32.7) (1.9)	43.6 (42.3) (1.3)	-9.0 (-9.6) (+0.6)	40.7 (39.7) (1.0)	43.1 (41.2) (1.9)	-2.4 (-1.5) (-0.9)
(IV) Vertical Üpward Downward	28.2 (22.4) (5.8)	35.2 (28.2) (7.0)	-7.0 (-5.8) (-1.2)	26.5 (21.1) (5.4)	38.8 (27.5) (11.3)	-12.3 (-6.4) (-5.9)
(V) Stayers Top level Lower levels	39.3 (30.4) (8.9)	3.1 (2.9) (0.2)	+36.2 (+27.5) (+8.7)	21.5 (15.4) (6.1)	3.0 (2.8) (0.2)	+18.5 (+12.6) (+5.9)
Number of Nubmer of Tot	movers stayers al	156 <u>101</u> 257			204 <u>56</u> 260	
*Received bachelon	r's degree	before 1950	**Rece	ived bachelor	s degree in	n 1950 or after

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Midwest where the "Big Ten" schools are located, and it is weakest in the South which has few prestigious doctorate producing institutions.

The data presented in Table 3 indicate that, at each prestige level of baccalaureate institutions, the movement to doctoral institutions tend to be oriented toward both the same region and the same prestige level. These tendencies are consistent with the ones observed above. The patterns of mobility at the lowest prestige level are similar to those observed for the South in Table 2. Examining the third row, it appears that institutions in the lower prestige levels tend to send their baccalaureate graduates to the same prestige level but in different regions. This interregional, horizontal mobility at the lowest level is, in fact, slightly more than would be expected but this is not the case at higher prestige levels. The rate of remaining in the same region and prestige level tends to be lower at lower prestige levels. The rate of remaining at the same institution also becomes lower as the prestige level decreases.

In order to investigate possible trends in the baccalaureate-to-doctorate mobility patterns, the young and old scholars are analyzed separately. The results of this investigation are presented in Table 4. The data reveal that both the young and the old cohort do not deviate from the general mobility pattern oriented toward the same region and the same prestige level. There is some indication that the regionalistic orientation is gradually decreasing. The intraregional and horizonal tendencies are somewhat weaker for the young cohort. The tendency of remaining at the same institution is less profound for the young cohort than for the old cohort.

4.2 Doctorate-to-Employment Mobility

An analysis of mobility patterns from the institution of doctorate training to the institution of employment is presented in Table 5. Of those who were not inbred into their doctoral institutions, 14 percent obtained positions in the same region and the same prestige level as their doctoral institutions. This observed percentage is somewhat higher than the expected percentage. Twenty-one percent of them moved to institutions of different prestige levels in the same region, and it is also higher than the expected percentage. Here again the tendency toward intraregional mobility is apparent and it is consistent with the tendency observed in the mobility from the institution of baccalaureate training to the institution of doctorate training. Examining the first and the third components together, it is found that the horizontal mobility with respect to the prestige level accounts for 39 percent of the total movers. This observed percentage is only slightly higher than the expected percentage. Thus, regionalistic tendencies appear to be stronger than the selective prestige level tendencies.

Another feature of the data presented in Table 5 appears in the second and the fourth components. Although the intraregional, vertical mobility as a whole exceeds the expected mobility, the upward mobility (decomposition of the intraregional, vertical mobility) shows the negative deviation from

Table	5.	Doctorate-to-Employment Mobility
		Patterns of Chemists

Соту	ponent of	Observed	Expected	Difference
M	obility	Percentage	Percentage	(OD-EXP)
Intra-	regional			
(I)	Horizontal	13.6%	8.8%	+4.8%
	Top level	(12.8)	(8.0)	(+ 4.8)
	Lower lev	rels (0.8)	(0. 8)	(0.0)
(11)	Vertical	20.8	12.3	+8.5
	Upward	(1.5)	(1.9)	(-0.4)
	Downward	(19.3)	(10.4)	(+8.9)
Inter-	regional			
(III)	Horizontal	25,1	27,2	-2,1
	Top level	[(23.0)	(24.8)	(-1.8)
	Lower lev	rels (2.1)	(2.4)	(-0.3)
(IV)	Vertical	40.5	51.7	-11.2
	Upward	(3.2)	(6.2)	(-3.0)
	Downward	(37.3)	(45.5)	(-8.2)
(V) [·]	Stayers	10.3	1.3	+9.0
• •	Top level	L (6.2)	(1.1)	(+5.1)
	Lower lev	rels (4.1)	(0.2)	(+3.9)
•	Numb	per of moves	rs 617	
	Numb	per of staye	ers <u>71</u>	
			688	

the expected mobility. This tendency toward downward mobility may be considered as normal, since new doctorates tend to move down from the prestige level of their doctoral institutions during their early careers [5, P. 181]. In fact, 57 percent, examining the first column, of the movement was downward mobility, while 39 percent remained at the same prestige level and only four percent moved upward. The fifth component in Table 5 indicates institutional inbreeding patterns. One out of ten scholars held positions at the same institution where he received his doctorate. This rate of institutional inbreeding is much higher than would be expected.

An analysis of regional differences in the doctorate to employment mobility is presented in Table 6. First of all, a comparison of the second and the third components of each region indicates that selective regional tendencies are stronger than selective prestige level tendencies for each region. In all five regions, the observed percentage of the movers who remained in that region but moved to a different prestige level exceeds the expected percentage in this component. On the other hand, the observed percentage of movers who moved to a different region but remained in the same prestige level is lower than the expected percentage in all regions with two exceptions -New England and the West. Although the general patterns are similar in each region, there emerge some regional peculiarities. For example, the South retained 67 percent of its doctorate graduates who are not inbred into their doctoral institutions, while New England retained only 21 percent in this respect. The South also had the highest rate of inbreeding (18%) and the lowest rate of inbreeding is found in New England. Thus, the data suggest that the regions with predominantly lower prestige institutions tend to have higher inbreeding rates and stronger intraregional tendencies.

Table 6. Analysis of Regional Differences in Doctorate-to-Employment Mobility Patterns

Co	mponent of	New	Engl	and	Midd	ile A	tlantic]	Midwes	t		South	1		West	
	Mobility	ОЪ	Exp	Dif	<u>0b</u>	Exp	Dif	Ob	Exp	Dif	Ob	Exp	Dif	Ob	Exp	Dif
$\frac{\text{Intra}}{(I)}$	<u>-regional</u> Horizontal Vertical	13.3 7.5	5.6 4.1	+7•7 +3•4	6.5 16.3	4.6 9.9	+1.9 +6.4	18.1 23.3	14.2 16.9	+3.9 +6.4	10.9 56.5	4.4 20.4	+6.5 +36.1	10.9 18.2	5.0 9.5	+5•9 +8•7
Inter (III) (IV)	<u>-regional</u> Horizontal Vertical	35.8 43.4	33.4 56.9	+2.4 -13.5	27.2 50.0	30.1 55.4	-2.9 -5.4	18.5 40.1	21.9 47.0	-3.4 -6.9	8.7 23.9	23.5 51.7	-14.8 -27.8	33.6 37.3	31.8 53.7	+1.8 -16.4
(V)	Stayers	5.5	1.0	+ 4•5	16.4	1.0	+15.4	8.1	1.4	+6.7	17.8	0.9	+16.9	11.3	1.5	+9.8
	Number of n Number of s Tota	novers stayers 1	120 7 127	Të ngarta Manta dhe		92 <u>18</u> 110			249 22 271			46 10 56			110 <u>14</u> 1.24	

Table 7. Analysis of Prestige Level Differences in Doctorate-to-Employment Mobility

Comp	onent of	Lev	el 1 (High)		Level	2	Leve	ls 3 &	4 (Low)	
1	Mobility	Ob	Exp	Dif	0Ъ	Exp	Dif	ОЪ	Exp	Dif	
<u>Intra-</u> (I) (II)	<u>regional</u> Horizontal Vertical	15.3 18.5	9.5 11.2	+5.8 +7.3	1.5 27.7	4.6 18.5	-3.1 +9.2	11.4 40.0	5.1 20.0	+6.3 +20.0	
Inter- (III) (IV)	<u>regional</u> Horizontal Vertical	27•5 38•7	29.6 49.7	-2.1 -11.0	16.9 53.9	15.4 61.5	+1.5 -7.6	5•7 42•9	12.0 62.9	-6.3 -20.0	
(V)	Stayers	7.7	1.4	+6.3	17.7	0.6	+17.1	28,8	0.6	+28.2	
	Number of mo Number of st Tota	overs ayers 1	517 <u>43</u> 560			65 <u>14</u> 79	·		35 <u>14</u> 49		

Table 8. Analysis of Trends in Doctorate-to-Employment Mobility Patterns

Compo	nent of	0	ld Cohort*		Yo	ung Cohort*	f
M	obility	Observed	Expected	Difference	Observed	Expected	Difference
Intra-r (I)	<u>egional</u> Horizontal Top level Lower levels	16.1 (15.5) (0.6)	10.0 (9.0) (1.0)	+6.1 (+6.5) (-0.4)	11.1 (10.1) (1.0)	7.5 (6.8) (0.7)	+3.6 (+3.3) (+0.3)
(11)	Vertical Top level Lower levels	22.3 (4.2) (18.1)	12.9 (1.9) (11.0)	+9.4 (+2.3) (+7.1)	19.2 (1.6) (17.6)	11.7 (1.9) (9.8)	+7.5 (-0.3) (+7.8)
Inter-r (III)	egional Horizontal Top level Lower levels	22.9 (21.6) (1.3)	28.1 (26.1) (2.0)	-5.2 (-4.5) (-0.7)	27.4 (24.4) (3.0)	26.4 (23.4) (3.0)	+1.0 (+1.0) (0.0)
(11)	Vertical Upward Downward	38.7 (3.5) (35.2)	49.0 (5.1) (43.9)	-10.3 (-1.6) (-8.7)	42.3 (2.9) (39.4)	54.4 (7.2) (47.2)	-12.1 (-4.3) (-7.8)
(7)	Stayers Top level Lower levels	15.3 (10.1) (5.2)	1.9 { 1.8) { 0.1}	+13.4 (+ 8 .3) (+5.1)	4.7 (1.9) (2.8)	0.6 (0.3) (0.3)	+4.1 (+1.6) (+2.5)
	Number of movers Number of stayers Total		310 <u>56</u> 366		· · · · · · ·	307 <u>15</u> 322	

*Received the Doctorate before 1955 **Received the Doctorate in 1955 or after

Prestige level differences in mobility patterns of doctorates who obtained positions in another institution of higher education are examined in Table 7. Stronger intraregional than intraprestige level tendencies are consistently displayed in each prestige level. Apart from these general tendencies the data show that institutions in the lower prestige levels tend to retain their graduates more in their own institutions and send more to institutions in the same region than institutions in the higher prestige levels. The rate of inbreeding is eight percent at the highest prestige level, while the rate is more than three times higher (29%) at the lowest level.

An Analysis of mobility patterns for the young and old cohorts is given in Table 8. The results show that the general tendencies toward intraregional and intraprestige level mobility are consistent in both young and old cohorts. Although the differences between the corresponding percentages for the two cohorts on each component are quite small, there is some indication that the tendency toward intraregional mobility is more prominent for the old cohort than for the young. The rate of inbreeding is much higher for the old cohort (15%) than for the young (5%). While there is more downward mobility than upward mobility in both cohorts, the old cohort shows more upward mobility than the young cohort. These slight differences between the young and old cohorts may reflect the development of postdoctoral careers of scholars. At earlier stages of their careers, scholars are more willing to accept jobs at lower prestige institutions than their doctoral institutions and more willing to move to other regions. As their professional experiences increase, they tend to move upward to more prestigious institutions and many of them return to their Alma Mater.

4.3 Postdoctoral Job Mobility

In order to obtain information about postdoctoral job mobility, six origin-destination matrices were formulated for each of the six biennial periods. Although it is possible to analyze each of these matrices separately, all six matrices were combined due to insufficient number of cases in each matrix. Thus the fifth component is not considered in this section. The total number of moves identified among the 86 institutions during the entire 12 year period adds up to only 83.

Analysis of job mobility patterns during the 1955-1967 period is presented in Table 9. The positive differences in the first two components indicate excess intraregional mobility and the positive sign in the first and third component reflect excess horizontal mobility with respect to prestige level. About the same magnitude of differences between the observed and expected percentage in the second and the third components suggest that selective prestige level tendencies are as strong as selective regional tendencies in the job mobility.

Regional differences in the job mobility patterns are analyzed in Table 10. Although the small number of cases in each region do not allow any detailed observations, selective prestige level tendencies seems to be stronger than regionalistic tendencies in all regions except for the Middle Atlantic. Those who were employed in the Middle Table 9. Postdoctoral Job Mobility Patterns

Com	ponent of	Observed	Expected	Difference
1	Mobility	Percentage	Percentag	e (Ob-Exp)
Intra-1	regional			
(I)	Horizontal Top level Lower lev	8.4% (4.8) vels (3.6)	7.5% (5.5) (2.0)	+0.9% (-0.7) (+1.6)
(11)	Vertical Upward Downward	21.7 (4.8) (16.9)	13.9 (4.5) (9.4)	+7.8 (+0.3) (+7.5)
Inter-	regional			
(III)	Horizontal Top level Lower lev	1 33.7 1 (28.9) rels (4.8)	26.1 (20.7) (5.4)	+7.6 (+8.2) (-0.6)
(IV)	Vertical Upward Downward	36.2 (9.6) (26.6)	52.5 (18.3) (34.2)	-16.3 (-8.7) (-7.6)
-	Numbe	er of moves	83	

Atlantic seem to prefer to move to a different prestige level in that region rather than moving to the same prestige level in other regions.

Prestige level differences are considered in Table 11. Institutions in lower prestige levels are more strongly oriented toward intraregional mobility than institutions at the highest level. Scholars in higher prestige level institutions tend to move to institutions in the same prestige level in other regions.

An attempt is made in Table 12 to investigate any possible trends in job mobility by carrying out separate analysis for the 1955-1961 and 1961-1967 periods. The corresponding percentages for the two periods are quite similar. Thus, there seems to be no marked change in the job mobility patterns.

5. SUMMARY AND CONCLUSIONS

The results reported in Tables 1 through 12 suggest the following conclusions about interinstitutional mobility patterns of chemists at various stages of their careers:

(1). The mobility from baccalaureate to doctorate training was characterized by stronger tendencies toward regionalism than toward prestige level homogeneity. It appeared that for their doctoral study, students tended to stay at the same institution or move to institutions of the same prestige level in the same region. Consequently, interregional and interprestige level mobilities were less than would be expected based on the quasiperfect mobility model. The regionalistic tendencies seem to be stronger for the institutions at the lower prestige level.

(2). The mobility from the doctoral institution to the institutuion of employment was also oriented toward stronger regionalistic tendencies than selective prestige level tendencies. Thus, the academic stratification system in doctorateto-employment mobility can be said to be a set of regional hierarchies rather than a rigid prestige hierarchy. It was noted that downward mobility was more common, especially at earlier stages of postdoctoral careers. Institutions at the lower prestige level had a relatively higher rate of inbreeding and a stronger regionalistic orientation.

Table 10. Analysis of Regional Differences in Postdoctoral Job Mobility Patterns

Component of	New	Engla	and	Mid	ldle A	tlantic	M	idwest		Se	outh		V	lest	
Mobility	0Ъ	Exp	Dif	Оъ	Exp) Dif	ОЪ	Exp	Dif	Ob	Exp	Dif	Ob	Exp	Dif
Intra-regional					_										
(I) Horizontal (II) Vertical	9.1 18.2	7.3 0.9	+1.8 +17.3	5.6 33.3	3.9 10.6	+1.7 +22.7	14. 14.	8 11.9 8 22.2	+2.9 -7.4	0.0 21.4	4.3 14.3	-4.3 +7.1	7.7 23.1	9.2 11.5	-1.5 +11.6
Inter-regional															
(III) Horizontal	54.5	33.6	+20.9	16.7	38.3	-21.6	33.	3 21.1	+12.2	28.6	20.0	+8.6	46.1	30.8	+15.3
(IV) Vertical	18,2	58.2	-40.0	44.4	47.2	-2.8	37•	1 44.8	-7.7	50.0	61.4	-11.4	23.1	48.5	-25.4
Number of moves		11			18			27			14			13	

 Table 11.
 Analysis of Prestige Level Differences in Postdoctoral Job Mobility Patterns

Compo	nent of	Lev	el 1 ((High)	Low	Lower levels				
Mo	bility	Ob	Exp	Dif	Ob	Exp	Dif			
Intra	-regional									
(I)	Horizontal	7.8	9.0	-1.8	9.4	5.0	+4.4			
(ÌI)	Vertical	17.6	12.0	+5.6	28.1	16.5	+11.6			
Inter	-regional									
(III)	Horizontal	47.1	33.9	+13.2	12.5	13.8	-1.3			
(IV)	Vertical	27.5	45.1	-17.6	50.0	64.7	-14.7			
Num	ber of move:	3	51			32				

(3). The postdoctoral job mobility patterns were characterized by about equally strong tendencies of regionalism and prestige homogeneity. The regionalistic tendencies were relatively stronger for institutions at the lower prestige levels and the tendencies toward homogeneous prestige were more operative for institutions at the higher prestige levels. Thus, scholars in the institutions at the higher levels tended to move to institutions of the same prestige level in other regions, while those in the institutions at a lower prestige level tended to move within that region.

A fairly strong tendency toward intra-regional mobility has been reported in some studies of mobility of scientific manpower [14]. From an economist's viewpoint Brown [4] describes the academic market place as a series of submarkets partially isolated from each other by geography and other characteristics. These views are consistent with the findings of this study. Although mobility exerts a significant influence in equalizing the distribution of talent, both quantitatively and qualitatively, there exists a consistent tendency toward regionalistic stratification of those doctoral trained chemists who are employed in the academic setting. Implications of these regionalistic tendencies in institutional mobility in various phases of career development of scholars would be the persistence of regional inequalities in the quality of higher education. Regional tendencies would impose restrictions on the development of institutions at the lower spectrum of quality and newly emerging universities. Regions where higher education is comparatively less effective are likely to remain so if migration is allowed to be the primary equilibrium force.

As to the question whether the regionalistic tendency might be decreasing, this study did not

Table 12. Analysis of Trends in Postdoctoral Job Mobility Patterns

Component of		1955-61 Period			1961-67 Period		
Mobility		Ob	Exp	Dif	Ob	Exp	Dif
Intra-regional							
(I)	Horizontal	9.5	6.6	+2.9	7.7	7.0	+0.7
(11)	Vertical	27.6	18.9	+8.7	19.2	13.0	+6.2
Inter-regional							
(III)	Horizontal	23.8	21.4	+2.4	39.5	32.8	+6.7
(IV)	Vertical	39.1	53.1	-14.0	33.6	47.2	-13.6
Number of moves			29			54	

provide any substantial evidence. Further efforts to investigate trends in these patterns over time would be relevant. Finally, it should be pointed out that the small number of cases has imposed certain limitations to the findings in this study. It is hoped that the findings of this study will stimulate a larger study along these lines.

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