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AN EXAMINATION OF REGIONAL MIGRATION PATTERNS IN MEXICO:  
NEW AND OLD MEXICAN REGIONS (\*)

INTRODUCTION

A number of studies have divided Mexico into regions (Rodriguez, 1960; Bassols, 1961; Wilkie, 1970; SPP, 1979; Scott, 1982). Wilkie (1970) divided Mexico into seven regions using poverty level indicators for the years 1910-1960. For the present analysis, we consolidated two of Wilkie's regions, the Federal District and the West Central Region, which completely surrounds the district. The reason was to take into account the substantial lowering from 1960 to 1980 of the poverty level in the state of Mexico, the largest state in the West Central Region, to a level much closer to that of the Federal District (SPP, 1985). We term the consolidated district West Central Region. The World Fertility Survey (WFS) of 1976-77 divided Mexico into eight regions for the purpose of studying fertility, contraception, and family formation, relying on previous work by Bassols (1961), which was economic in orientation. The WFS/Bassols regions perhaps have the widest acceptance in Mexico. Rodriguez (1960) evaluated official regions from four federal departments, based on economic, cultural, and demographic indices constructed from 1960 census data. Of these two appeared most appropriate to examine in the present paper: that of the Secretariat of Water Resources, referred to as Rodriguez (I), and that from the Secretariat of Communications and Public Works, called Rodriguez (II).

An important early study of Mexican interregional migration was that of Whetten and Burnight (1956) which used state birth data from 1940 and 1950

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Mexican Censuses to analyze internal migration. The migration measure employed was "net lifetime migration." Some of their conclusions were as follows: the 1950 Mexican net lifetime migration was about half that for the U.S. in 1950; in Mexico, the Federal District had largest amount of net lifetime immigration; the borderlands states also had large net lifetime immigration; there was a large rural to urban migration in the 1950s, although it was difficult to measure and correlation analysis indicated that interstate migration 1940-50 improved population distribution vis-a-vis economic opportunities. A more recent study by Winnie (1981) used simple techniques to study interregional growth rates from 1930 to 1980. Winnie divided Mexico into six regions, which are different from any other regions discussed in the present paper. Using census data, he estimated the change in population for all regions and states by decade from 1930 to 1980.

Partida (1982) constructed a multiregional population projection model which he applied to the female population for two 1970 regions: the Mexico City Metropolitan Zone, consisting of the Federal District and 11 adjoining municipios, and the rest of Mexico. Another study by Partida (1984) analyzed interregional migration flows for eight regions in Mexico for the period 1955-70, based on census data. A regionalization was chosen which does not correspond to any other regionalization discussed in the present paper. Among the simulation results noted were the following: 1) the intensity of migration nationally gradually decreased over the period, 2) the Central South Region, consisting of the Federal District and the State of Mexico, had the highest rates of net immigration. Over 15 years, its net migration balance was positive (i.e., inflowing) in relation to all seven of the other regions, 3) the Central North Region, consisting of Aguascalientes, San Luis Potosi, and Zacatecas, had the highest rates of net outmigration, 4) the strong net outmigration flow from the western states to the borderlands abruptly declined during the period, perhaps due to increases in return migration. This study has some similarity in design to the present one, especially in emphasizing the sizes of migration streams between regions, but differs in its earlier time period and fixed choice of regions.

Another type of study analyzes interstate or interregional migration flows by seeking to establish the socioeconomic influences on such flows. Rogers (1975) did important early studies using regression analysis. A recent study used a LISREL model to analyze interstate migration in Mexico in 1980 (Fukurai et al., 1987). In this paper, various definitions of Mexican regions are examined. Regional migration analyses incorporate important issues regarding the regionalization, interregional migration, and policy. Different regional definitions are, then, investigated in relation to migration patterns for four different periods: 1) 1979-80, 2) 1975-79, 3) prior to 1975, and 4) lifetime. In addition, new regional definitions are generated using clustering techniques, which are then compared to the regions defined by past research. The systematic comparison of different regional definitions delineates unique characteristics of regions relating to migration patterns.

## METHODS

Mexican census data for 1980 are utilized to examine regional differentiation. Regional differentiation here is determined by migration patterns. Past research suggests that migration patterns, including rural to urban exodus, are closely related to structural conditions at both destination and origin of migrants (Danesh, 1985; Portes, Bach, 1985; Fukurai et al., 1987). Intertwined structural variables have included various socioeconomic and demographic conditions of sending and receiving states (1). In the present paper, immigration patterns are measured at the state level. Each of the four different time period migration flows between 32 Mexican states results consists of 992 observations. The 32 x 32 matrix was vectorized for further regional analysis, i.e., a vector of 992 x 1 due to 32 main diagonal blank cells.

In order to examine regional differences in migration patterns, a maximum likelihood hierarchical clustering technique is performed to distinguish regional patterns for in/outmigration. Cluster analysis provides a clustering of states with the greatest similarities within and the greatest dissimilarities existing among different clustered groups (2). This method is similar to Ward's minimum variance method but removes the bias toward equal-sized clusters (see Sarle (1983) for more discussion). Such an empirical analysis delineates regions which will then be used as a comparison with existing regional definitions.

## ANALYSIS

Tables 1 and 2 show interregional migration for two periods based on five previously chosen regional definitions. The main diagonal cell shows intraregional migration among regional states. Several findings are noteworthy. First, the two tables generally show the largest migration taking place within the intraregional states. For example, the North region defined by Wilkie had 419,165 and 35,395 intraregional migrants for lifetime, and the 1979-80 periods, respectively. Migration patterns from/to the North region, on the other hand, are smaller than the total intraregional migrants. Similar results were obtained for prior to 1975 and the 1975-79 time periods. Large intraregional migration suggests that

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(1) For example, Fukurai et al. (1987) shows that migration patterns are related to various socioeconomic and demographic variables, i.e., organization growth, labor market characteristics, income inequality at both sending and receiving states, and locational variables, such as distance among states and adjacency.

(2) The maximum likelihood method was derived by W.S. Sarle of SAS Institute Inc. The maximum likelihood formula was obtained from Symons (1981, 37 equation 8) for disjoint clustering. There are currently no other published references on the maximum likelihood method.

## Lifetime interregional migration

From: Region	To: Regions							
Wilkie	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. North	419,165*	374,966	354,685	150,455	66,423	20,016		
2. West	241,263	251,831	239,958	188,693	23,339	22,800		
3. E. Cent.	193,095	185,776	552,225	646,005	240,515	270,688		
4. W. Cent.	91,611	134,476	1,096,452	340,642	91,775	203,202		
5. Gulf	55,477	21,152	163,350	72,863	193,752	107,562		
6. South	10,526	13,803	64,010	65,698	54,236	31,148		
WFS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. N.W.	291,298	135,191	11,926	222,443	80,366	9,675	17,637	2,859
2. North	54,251	234,314	91,597	85,613	102,709	13,959	8,650	2,723
3. N.E.	12,311	283,404	120,314	60,792	65,049	50,696	6,950	2,599
4. West	144,812	131,981	36,148	246,309	315,597	25,182	32,138	4,192
5. Central	79,318	176,118	81,808	583,903	1,814,926	276,278	451,351	33,887
6. Gulf	7,700	16,834	40,596	22,791	171,482	46,356	93,145	20,070
7. PA. S.	9,739	6,430	3,736	20,758	113,374	49,742	31,148	4,494
8. SO. E.	3,386	5,696	2,567	8,966	32,824	40,401	14,417	86,925
RODRIGUEZ (I)	(1)	(2)	(3)	(4)	(5)			
1. Pac. North	229,132	110,936	273,650	18,469	60,941			
2. North	51,627	426,495	387,820	18,838	126,766			
3. Central	159,346	188,714	1,234,262	269,072	1,210,501			
4. South	11,690	16,146	115,722	145,118	167,012			
5. Others	57,648	151,234	1,160,117	404,923	258,344			
RODRIGUEZ (II)	(1)	(2)	(3)	(4)	(5)	(6)		
1. N. West	291,298	118,998	28,119	264,985	21,777	46,218		
2. North	44,044	97,386	69,212	82,903	6,730	22,975		
3. N. East	22,518	145,033	417,998	212,921	17,480	56,733		
4. Central	179,704	141,357	185,676	1,368,902	377,598	1,028,507		
5. South	14,292	7,764	14,874	200,273	201,744	71,868		
6. F.D.	50,958	50,504	101,539	1,020,653	270,891	0		
SCOTT	(1)	(2)	(3)	(4)	(5)	(6)		
1. N. West	229,132	121,001	21,288	189,625	105,619	26,463		
2. North	46,645	150,611	101,722	59,379	117,909	21,295		
3. N. East	17,433	282,708	244,045	39,340	116,524	65,297		
4. West	115,086	99,963	29,269	194,922	269,198	51,710		
5. Central	83,272	189,003	126,150	396,496	2,137,592	837,496		
6. South	17,885	23,400	50,844	40,680	333,294	302,335		

Note: (\*) A main diagonal cells show intraregional migration.

Sources: Wilkie (1970); Secretaria de Programacion y Presupuesto (1969); Rodriguez (1960); Scott (1982).

## 1979-80 Interregional migration

From: Region	To: Regions							
<i>Wilkie</i>	(1)	(2)	(3)	(4)	(5)	(6)		
1. North	35,395*	20,153	27,475	13,491	7,765	2,761		
2. West	25,923	23,454	22,680	18,381	3,037	3,869		
3. E. Cent.	19,542	16,499	43,394	47,866	20,783	21,368		
4. W. Cent.	10,624	13,878	102,419	30,139	10,772	20,375		
5. Gulf	5,935	2,904	16,622	9,240	21,534	10,993		
6. South	1,502	2,538	8,980	8,826	6,454	3,194		
<i>RFS</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. N. W.	26,648	10,109	1,380	17,018	9,876	1,268	2,986	313
2. North	8,631	20,216	11,251	9,703	13,213	1,794	1,242	348
3. N.E.	1,653	18,236	9,714	4,743	7,316	5,807	931	303
4. West	15,981	10,455	3,414	21,866	37,083	3,128	4,559	652
5. Central	8,904	12,681	6,780	34,810	157,614	25,695	38,665	3,049
6. Gulf	1,165	1,534	3,902	2,482	18,435	4,840	8,696	2,164
7. Pac. South	2,088	750	529	2,285	16,194	5,764	3,194	690
8. So. E.	687	413	388	1,091	4,604	5,579	2,297	8,951
<i>RODRIGUEZ (I)</i>	(1)	(2)	(3)	(4)	(5)			
1. Pac. North	20,297	8,851	21,171	2,924	7,133			
2. North	7,501	35,318	29,260	2,667	14,550			
3. Central	20,695	21,428	116,565	29,423	121,392			
4. South	2,375	1,990	14,758	15,337	21,423			
5. Others	6,292	11,445	76,743	34,512	24,725			
<i>RODRIGUEZ (II)</i>	(1)	(2)	(3)	(4)	(5)	(6)		
1. N. West	26,648	8,659	2,830	22,168	3,535	5,758		
2. North	7,082	7,723	8,410	10,497	896	2,866		
3. N. East	3,202	10,935	32,349	21,710	2,556	6,893		
4. Central	21,281	11,383	10,144	133,303	39,615	103,627		
5. South	2,913	777	1,950	25,463	22,437	10,703		
6. F.D.	4,631	2,547	6,045	59,139	20,100	0		
<i>SCOTT</i>	(1)	(2)	(3)	(4)	(5)	(6)		
1. N. West	20,297	8,694	2,110	13,917	11,466	3,892		
2. North	7,334	13,073	12,659	7,278	14,183	2,664		
3. N. East	2,431	18,990	19,277	3,630	12,324	7,833		
4. West	13,560	7,355	2,822	17,464	31,719	7,225		
5. Central	10,085	13,668	10,290	26,461	181,424	74,803		
6. South	3,453	2,184	5,269	4,654	41,581	32,706		

Note: (\*) A main diagonal cells show intraregional migration.

Source: Secretaria de Programacion y Presupuesto (1985).

adjacent states were the most likely destination of migrants, independent of the length of migration periods. Secondly, distance is dominant in affecting migration patterns. For example, Wilkie's regions show that the greater the distance from other regions, the fewer migrants from/to other regions and vice versa.

While discrepancies in regional definitions exist (especially, Scott and Rodriguez (11)), Wilkie's regions offer the clearest migration flows showing the distance effect upon migration patterns. Thirdly, while WFS's regional definition has the largest number of Mexican regions, the Central region shows the second largest lifetime intramigration patterns. Scott's Central region shows the highest intraregional migration except for the 1975-79 period. Thus, WFS's and Scott's regions capture the most salient intraregional migration flow in Mexico, i.e., the Central intraregional migration.

An analysis of in- and outmigration patterns shows that the most notable difference between immigration and outmigration patterns are observed in: 1) the South and 2) the Federal District. The South region defined by Wilkie and WFS shows the largest discrepancy in in/outmigration patterns. For example, according to Wilkie's South regional definition, there was a mean stream of 171.3 immigrants as compared to a mean stream of 59.8 outmigrants for lifetime migrants. (Note: mean stream sizes will be referred to in this paper per 100 in- or outmigrants, e.g. the latter stream size refers to 5,980 outmigrants). Also for the South region between 1979 and 1980, a mean of 6.1 outmigrants was observed in contrast to 11.4 immigrants. A similar migration pattern is shown in WFS's definition of Pacific South and South-East regions (i.e., 171.3 and 71.2 immigrants for lifetime immigrants and 11.4 and 7.1 immigrants for 1979-80, as compared to 59.8 and 19.8 for lifetime and 6.1 and 2.0 for 1979-80 outmigrants). The analysis shows that more people are migrating into the Southern regions than there are migrating out of the regions. For the Federal District, on the other hand, the mean for recent outmigrants has exceeded the mean for immigrants. For example for the Rodriguez (11) regions, whereas 335.7 immigrants and 192.1 outmigrants were observed prior to 1975, there were 29.8 immigrants and 41.9 outmigrants for 1979-80. Such a reversal possibly can be attributed to the overall regional development of Mexico, especially the region surrounding the Federal District, and perhaps official governmental decentralization policy. Also the difference among in/outmigration can be explained by intraregional migration patterns, that is migration patterns taking place within regional states.

Table 3 presents an analysis examining mean differences for immigrants among different regions. The statistical *T* test shows the extent to which the mean of immigrants differs among various regional groups. Statistical results of ( $-2 \geq T \text{ value} \leq 2$ ) suggest that the regional differences in immigration are statistically significant, i.e., there are different immigration patterns between regions but similar immigration patterns within regions. Table 3 shows analysis of variance results by using both raw immigration and natural-log transformed immigration variables. The log transformation has been suggested in various research studies

TABLE 3

*Analysis of variance:  
five regional definitions for immigration patterns*

Migration	Wilkie	WFS	Rodriguez		Scott	R <sup>2</sup> (%)
			R(I)	R(II)		
Total migration	-0.07*	-0.94	-2.15	1.35	1.85	0.94
Log <sub>e</sub> **	0.20	-4.13	-4.60	4.79	2.73	6.44
Prior to 1975	-0.43	-0.79	-0.25	1.30	1.94	1.14
Log <sub>e</sub>	-0.63	-3.75	-4.31	4.45	2.69	7.07
1975-1979	-0.54	-2.09	-3.25	3.01	2.83	2.09
Log <sub>e</sub>	0.62	-4.25	-4.31	4.90	2.58	5.38
1979-1980	0.34	-1.28	-1.97	1.47	1.83	0.83
Log <sub>e</sub>	0.88	-4.91	-4.17	4.98	2.90	5.94

*Notes:* (\*) *T* test for  $H_0$ : mean (region 1) = mean (region 2) = ...

(\*\*) Natural log transformation of a migrant variable.

R(I) refers to Rodriguez (I) regions; R(II) to Rodriguez (II) regions.

to capture migration patterns (Lowry, 1964; Rogers, 1968; Fukurai et al., 1987).

According to table 3, Wilkie's regional definition shows the smallest mean differences among regional groups (i.e., absolute *T* values are smaller than 2). Regardless of original regions of interstate migrants, Wilkie's regional definition does not differentiate the amount of immigrants and, thus, does not adequately cluster Mexican states based on the number of interstate immigrants. This finding holds true regardless of raw or log-transformed migration. The WFS regional definition, on the other hand, shows that regional differences are captured by log-transformed immigration patterns, i.e., mean regional differences of immigrants are statistically different from one another. And such significant differences are also found for other regional definitions, e.g., Scott and particularly the Rodriguez regions. One explanation for the salience of Rodriguez's regional definitions is the treatment of the Federal District as an independent region. Immigration to the Federal District is quite different from other defined regions. Therefore, treating the Federal District as an independent region enhanced the value of *T* in showing statistically different means among defined regions.

In the following section, new regions based in different magnitudes of interstate migration patterns are presented. Such new regional definitions in turn alter the relative magnitudes of interstate migration flows. The comparison of this new set of regions with the previous ones highlights different intra/interregional migration streams.

## CLUSTER ANALYSIS

Immigration and outmigration flows for different states were clustered to investigate similarities and dissimilarities among states. The empirically created cluster patterns, then, imply a new set of regions from a migration point of view.

Table 4 shows a new set of regional definitions. Such definitions are derived by the use of a maximum likelihood hierarchical clustering technique (3). The number of regions here are fixed at six for both in- and outmigration. An equal number of regions allows the systematic comparison of different sets of regions.

The regions determined by cluster analysis generally do not resemble past regionalization. The cluster analysis of 1979-80 and 1975-79 immigration patterns shows identical sets of new regions, i.e., similar immigration patterns are observed for both periods. By the same token, lifetime and prior to 1975 migration patterns show the same clustered regions.

The two sets of clustered immigration regions are shown in Maps 1 and 2. The following major regions are consistently present: the Federal District/Mexico, Veracruz, the Northwest, and Northeast. Jalisco is a separate region only for prior to 1975 and for lifetime migration. There exist two reciprocal migration streams in Mexico: 1) D.F./Mexico and South/Misc. regions for lifetime and prior to 1975 migration and 2) D.F./Mexico and S. Pacific regions for 1975-80 migration. For example, approximately a total of 2 million people migrated between D.F./Mexico and South/Misc. regions and such migration flows remain the largest in Mexico. After 1975, on the other hand, the region shifts from South/Misc. to the South Pacific region. For example, approximately 300,000 people moved between those regions during the 1975-79 period and 120,000 between 1979-80.

Since both 1979-80 and 1975-79 immigration patterns show an identical set of clustered regions, the magnitude of regional immigration for both periods indicates the same set of values. An important question in comparing regional immigration patterns is whether clustered regions derived from certain periods can be used to identify the unique characteristics of immigration patterns in other periods. Such a longitudinal comparison could help determine the validity of both clustering techniques applied for the present analysis and consistency of regional immigration patterns in Mexico. For example, two sets of clustered regional definitions are found for four immigration periods under investigation: 1) regions for both 1979-80 and 1975-79 and 2) regions for prior to 1975 and lifetime immigration. Corresponding to the clustering differences are totally different sets of immigration observed for short-term (less than five year periods) as opposed to long-term (more than five years) immigration.

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(3) Cluster analysis was performed on a 32 x 32 state inflow/outflow matrix. For the clustering of immigrants, rows (subjects) are fixed as sending states and columns (variables) as receiving states. For the clustering of outmigrants, the matrix was transposed so that receiving states became rows and sending states became columns.

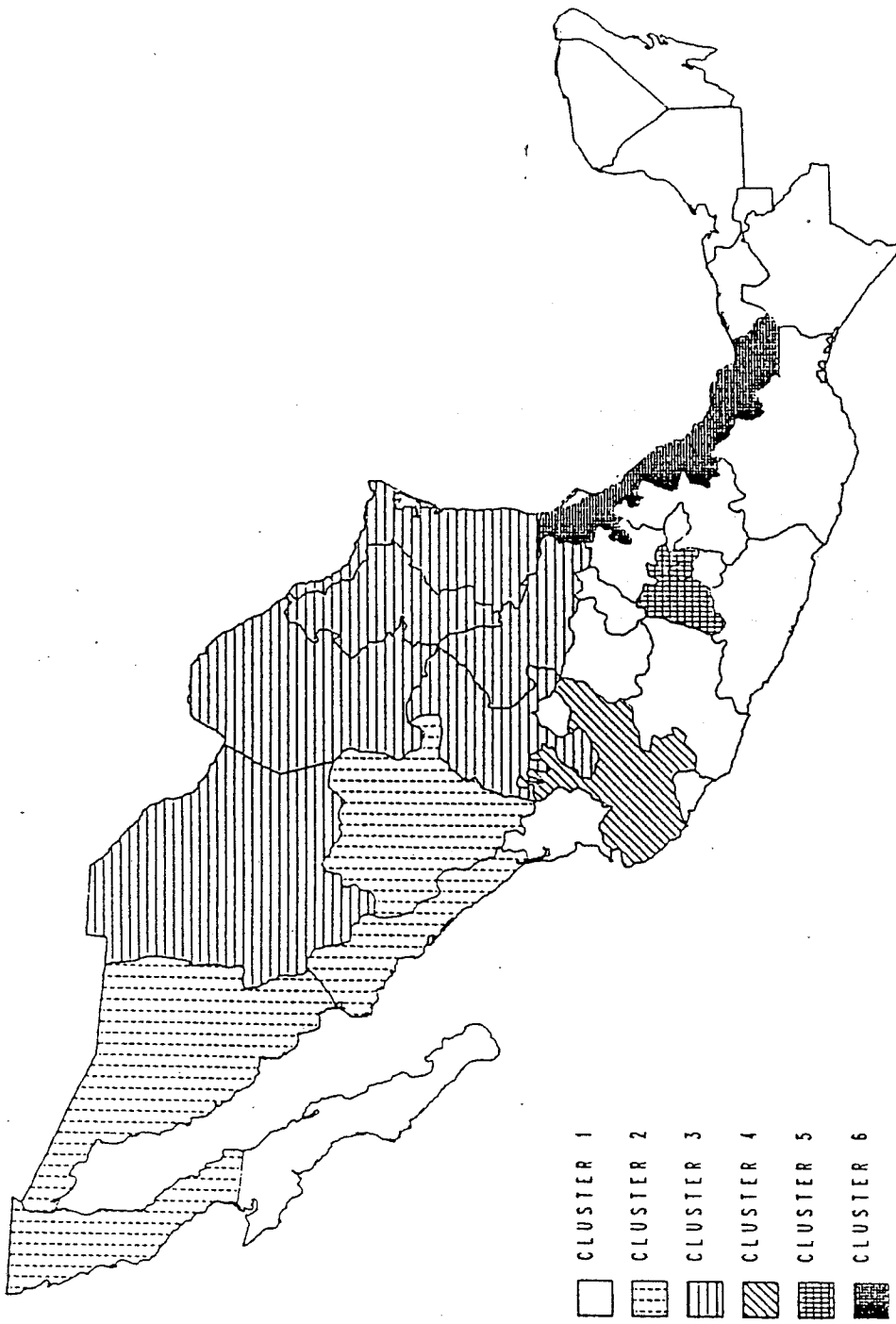


TABLE 4

*Regional definitions*  
cluster analysis based on in/outmigration patterns

State	Lifetime		Prior to 1975		1975-1979		1979-1980	
	In	Out	In	Out	In	Out	In	Out
1. Aguascalientes	1	1	1	1	1	1	1	1
2. Baja California Norte	3	5	2	5	5	4	5	4
3. Baja California Sur	1	1	1	1	1	1	1	1
4. Campeche	1	1	1	1	1	1	1	1
5. Coahuila	4	2	3	2	3	1	3	1
6. Colima	1	1	1	1	1	1	1	1
7. Chiapas	1	1	1	1	1	1	1	1
8. Chihuahua	4	2	3	2	3	1	3	1
9. Distrito Federal	5	6	5	6	6	6	6	6
10. Durango	3	1	2	1	5	1	5	1
11. Guanajuato	1	1	1	1	2	1	2	1
12. Guerrero	1	1	1	1	2	1	2	1
13. Hidalgo	1	1	1	1	2	1	2	1
14. Jalisco	5	5	4	5	5	5	5	5
15. Mexico	6	6	5	3	6	6	6	6
16. Michoacan	1	1	1	1	2	1	2	1
17. Morelos	1	1	1	1	1	1	1	1
18. Nayarit	1	1	1	1	1	1	1	1
19. Nuevo Leon	4	4	3	4	3	3	3	3
20. Oaxaca	1	1	1	1	2	1	2	1
21. Puebla	1	1	1	1	2	1	2	1
22. Queretaro	1	1	1	1	1	1	1	1
23. Quintana Roo	1	3	1	2	1	2	1	2
24. San Luis Potosi	4	1	3	1	3	1	3	1
25. Sinaloa	3	5	2	5	5	4	5	4
26. Sonora	3	5	2	5	5	4	5	4
27. Tabasco	1	2	1	1	1	2	1	1
28. Tamaulipas	4	2	3	2	3	1	3	1
29. Tlaxcala	1	1	1	1	1	1	1	1
30. Veracruz	2	3	6	2	4	2	4	2
31. Yucatan	1	3	1	2	1	2	1	2
32. Zacatecas	4	1	3	1	3	1	3	1

Map 1 - Immigration prior to 1975 some as lifetime migration (Mexican National Census 1980)



Map 2 - Immigration 1975-1979 same as immigration 1979-1980 (Mexican National Census 1980)

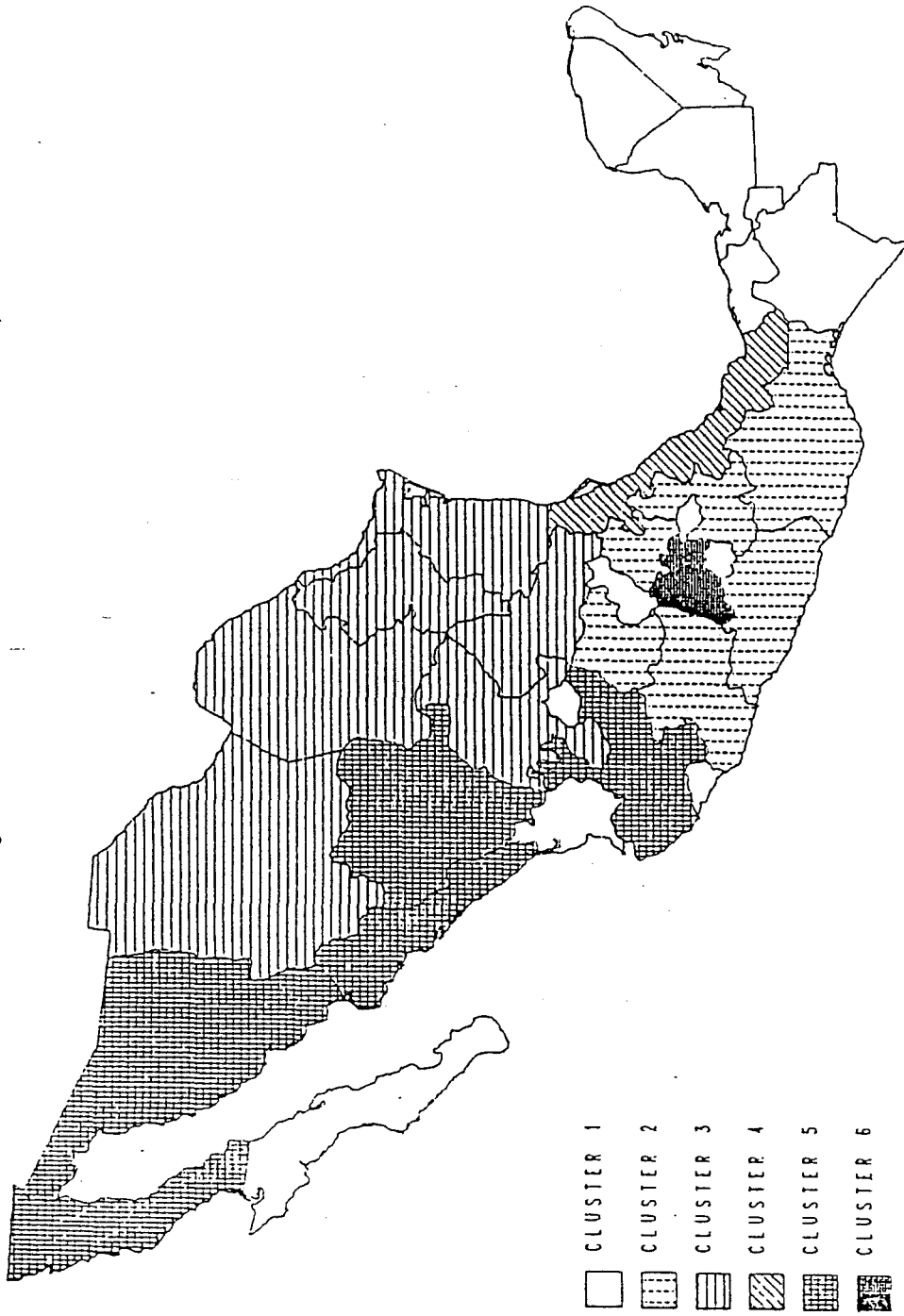


TABLE 5

*Interregional migration flows  
based on clustered immigration regions*

From: Region**	To: Regions **					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>A. Lifetime migration</i>						
1. South/Misc.	653,784*	157,393	105,055	131,984	124,143	522,874
2. Veracruz	199,173	0	6,421	52,125	6,427	78,615
3. N. West	165,655	7,901	259,170	137,675	97,710	67,607
4. N. East	147,427	60,334	142,349	580,743	53,402	122,520
5. Jalisco	173,977	9,805	79,028	87,352	0	91,793
6. D.F./Mex.	1,431,115	193,803	75,616	207,741	109,161	914,735
<i>B. Migration prior to 1975</i>						
1. South/Misc.	326,184*	72,322	45,053	67,480	68,780	214,645
2. Veracruz	112,767	0	2,615	26,931	3,313	32,682
3. N. West	96,050	3,811	149,760	75,985	61,273	32,759
4. N. East	80,725	30,577	80,222	358,375	29,402	57,324
5. Jalisco	99,596	5,349	40,099	55,153	0	47,690
6. D.F./Mex.	941,144	119,028	43,641	138,266	75,457	494,981
<i>C. 1975-1979 migration</i>						
1. South/Misc.	51,608*	57,887	17,173	20,911	32,752	59,079
2. S. Pacific	25,154	36,062	16,518	25,311	26,673	101,922
3. N. East	13,369	21,121	112,976	16,317	44,537	37,165
4. Veracruz	14,436	28,486	10,916	0	3,541	24,253
5. N. West	33,246	37,673	45,780	4,459	92,809	43,432
6. D.F./Mex.	60,540	201,757	37,239	42,609	37,615	46,444
<i>D. 1979-1980 migration</i>						
1. South/Misc.	20,784*	23,941	7,809	8,005	14,496	24,274
2. S. Pacific	12,375	14,831	6,716	10,554	12,865	46,396
3. N. East	6,524	9,026	45,996	6,804	20,259	15,335
4. Veracruz	6,159	11,004	4,670	0	1,608	11,038
5. N. West	13,651	16,296	18,778	1,962	36,714	17,413
6. D.F./Mex.	23,620	75,676	13,923	16,409	13,701	79,121

Notes: (\*) Main diagonal cells show intraregional migration.

(\*\*) For table section A. and B., the clustered immigration regions are those for lifetime and prior to 1975, which are identical and shown in Map 1. For table section C. and D., the clustered immigration regions are those for 1975-1979 and 1979-1980, which are identical and shown in Map 2.

Source: Secretaria de Programacion y Presupuesto (1985).

With respect to individual regional definitions, four sets of clustered regions for four different immigration periods consistently capture the salient immigration pattern of two Mexican states, i.e., Mexico and the Federal District. These two states are shown as an independent cluster throughout four immigration periods under investigation, i.e., for 1979-80, 1975-79, prior to 1975, and lifetime immigration. Also, the state of Veracruz was shown to be an independent cluster for four immigration periods. With respect to the North West regions, two different sets of regional definitions were found for two periods, after and prior to 1975 immigration. The difference between two sets of regions was the inclusion or exclusion of Jalisco.

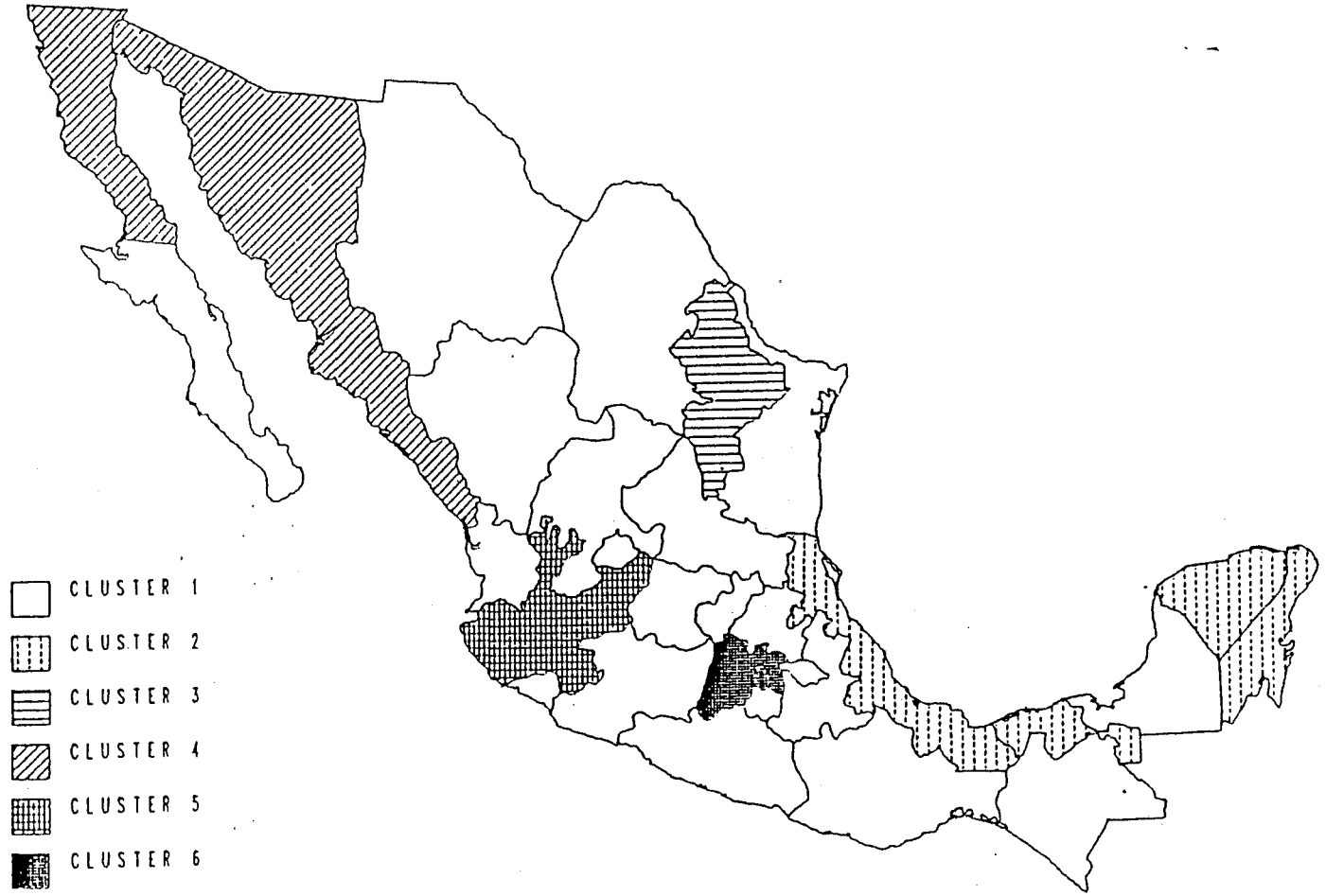
Mean stream sizes for in- and outmigration were determined based on the two sets of clustered immigration regions. Again, intraregional patterns for 1979-80 and 1975-79 periods show highly similar results because of the same regional definition. By the same token, the same patterns of mean stream sizes for intraregional immigration patterns are found for lifetime immigration and immigration prior to 1975.

Several findings are noteworthy. First, when the first regional definition (after 1975) was applied to examine intraregional patterns for long-term immigration (prior to 1975 and lifetime), high migration mobility was observed for the former region. In other words, for the short-time immigration period, the clustered regional definitions capture homogeneous regional states within which immigrants are highly immobile. Secondly, individual states become more salient for representing independent regions, i.e., Veracruz and Jalisco. For example, Jalisco was one of North West regional states for short-term migration patterns. However, for long-term migration patterns, it became an independent immigration region.

Clustered outmigration regions were determined based on patterns of outmigration for the four time periods. In this case, there were four different sets of clustered regions: 1) prior to 1975 and lifetime migration, the Federal District/Mexico, Nuevo Leon, the Northwest (including Jalisco), three N.E. border states plus Veracruz plus Yucatan and Quintana Roo, and a remainder region and the latter, consisting of 18 states is largely rural and agricultural, and 2) for 1975-79 and 1979-80 outmigration, the Federal District/Mexico, Nuevo Leon, Jalisco, Veracruz plus Yucatan and Quintana Roo (Tabasco included for 1975-79), and a remainder region. The remainder region is larger than before 1975, and now consists of 21 states (Chihuahua, Coahuila, and Tamaulipas are added), which are largely rural and agricultural with the exception of the three added border states. Map 3 shows the clustered regions for 1975-79.

Examination of interregional outmigration clusters shows that individual states become more salient for representing independent regions, i.e., Jalisco, Nuevo Leon, Mexico, and the Federal District. For example, out of six regions which characterized outmigration prior to 1975, three independent states are shown to represent individual regions, i.e., Mexico, Nuevo Leon, and the Federal District. Such one-state regions were more salient than for immigration regions.

Map 3 - Outmigration 1975-1979 (Mexican National Census 1980)



Secondly, Jalisco is a distinct region for long-term immigration, particularly prior to 1975 and lifetime migration. However, in terms of short-term outmigration, Jalisco also played a distinctive role in shipping migrants out of its independent region. Thus, Jalisco played two sets of intermediate roles, i.e., the destination of long-term immigration and the origin state of a recent outburst of short-term outmigration.

A homogenous migration pattern shows that clustering regional definitions performed an excellent job of grouping states with similar outregional migration patterns, particularly for the North West region. Another striking finding is that of high intraregional migration among the Central region i.e., the Federal District and Mexico. The migration between those two states is much higher than the outmigration to any other states. This pattern remains the same for four different outmigration periods.

#### DISCUSSION

The maps of clustered regions for immigration and outmigration reveal a remarkable consistency over time. However, the regions determined by cluster analysis generally do not resemble past regional definitions. Rodriguez (II) defined the Federal District as a one state region. This is similar to the Federal District/Mexico region in the present study. Wilkie's six-state borderlands region is not corroborated by present cluster analysis. The borderlands is always split into a least two clusters. For WFS regional definitions, no WFS region is the same as any region obtained from our clustering. There is rough correspondence between some small cluster regions and larger WFS regions. WFS has a large seven-state Central Region, which includes the Federal District. Rodriguez (I)'s NW Region is similar to the NW Region in the present study. Otherwise, there is little similarity between her government-defined regions and any cluster regions. In the Rodriguez regions, the second and third major metropolitan areas cannot be differentiated. Rodriguez's second NW Region is again similar, but less so because Nayarit is included. Scott's NW Region is similar to NW cluster regions. Otherwise there is very little correspondence with the present clusters. Scott identifies a Central Region consisting of seven states, which includes the Federal District. Partida (1984) includes Federal District/Mexico as a separate region. Otherwise there is little correspondence with the present regions. The other very large cities of Guadalajara and Monterey are "lost" in fourstate regions.

Based on the above points, the following general conclusions can be made regarding clustered regions. First, the states of Jalisco and Nuevo Leon, including Mexico's second and third largest cities, are often distinguished as separate one-state cluster regions. Such one-state regions have not been identified in prior studies. Nuevo Leon and Jalisco are generally included with four or more states in other studies. Second, outmigration creates a cluster corresponding roughly

to the rural/agricultural area of Mexico. This also is different from any prior study. This cluster is consistent with the huge rural-to-urban outmigration which characterized Mexico beginning in 1930. Third, the separation of the central metropolis into the Federal District/Mexico cluster is logical given the large volumes of flow both into and out of this region. In other studies, only Partida and Wilkie, prior to our modification, separated the central metropolis into a small one- or two-state region.

Fourth, the borderlands region appears not to be a useful concept for analyzing internal migration. All of the clusters divide the borderlands region between Sonora and Chihuahua. A major reason for such a division may be the geographic barrier of a large mountain range and the transportation flows of north-south axis. Fifth, there is strong historical consistency for both in- and outmigration patterns. Similarities in regions appearing in all cluster maps are the following: the Federal District/Mexico, Veracruz as a separate one-state cluster, and the Northwest region cluster. Sixth, there is not a match between cluster regions, reflecting historical patterns, and Cabrera's (1982) policy-based migration regions. Lastly, other findings of the regional in/outmigration analysis suggest the following: 1) distinct in/outmigration patterns for both short and long-term migration patterns, 2) a unique role played by Jalisco as mediating long-term inflows prior to 1975 and recent outburst of outmigration from the state, and 3) the Central region consisting of Mexico and the Federal District has its own distinct regional characteristics for both in/outmigration patterns. In particular, intraregional migration among those federal entities exceeds any other interregional migration patterns.

## CONCLUSIONS

The present paper examined Mexican regional migration patterns. Different regional definitions are utilized to examine in/outmigration patterns in four different periods: 1) 1979-80, 2) 1975-79, 3) prior to 1975, and 4) lifetime. Five regional definitions previously were used to delineate state level Mexican regions: 1) Wilkie (1970), 2) World Fertility Survey (SPP, 1976-77), 3) Rodriguez with two regional definitions (1960), and 4) Scott (1982). These regional definitions were compared with new regions created by a maximum likelihood clustering technique. Previously defined regions do not compare with the empirically delineated regions developed by the cluster analysis.

A cluster analysis of in/outmigration patterns suggests the following: 1) distinct in/outmigration patterns for both short and long-term migration patterns, 2) a Central region consisting of Mexico and the Federal District having its own distinct regional characteristics for both in/outmigration patterns, particularly, intraregional migration among those two states exceeds any other interregional migration patterns, and 3) the unique role played by Jalisco in mediating long-term inflows prior to 1975 and since 1975, outmigration from the same state.



Comparing new regional definitions with the previous definitions, two important differences are suggested: 1) previous research rarely identified the Central region consisting of Mexico and the Federal District and 2) a possibly misleading use of net migration for interregional migration analysis since immigration and outmigration phenomena show distinct patterns of geographic mobility at the state level, and such regional differences are consistent for the four migration periods. Past research paid little attention neither to distinct migration patterns in Mexico and the Federal District as a single region nor to different mobility patterns between immigration and outmigration. A careful analysis accounting for both distinct migration patterns in the Central region and different patterns in in/outmigration are necessary to obtain an understanding of regional migration patterns in Mexico.

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#### SUMMARY

This paper examines regional migration patterns in Mexico. Different regional definitions are used to examine four in- and outmigration periods in Mexico: 1979-80, 1975-79, prior to 1975, and lifetime. Five regional definitions were utilized to delineate Mexican regions at the state level: 1) Wilkie (1970), 2) World Fertility Survey (1976), 3) Rodriguez (1960), consisting of two government regional definitions, and 4) Scott (1982). These regional definitions are compared with regions created by a maximum likelihood clustering technique. The new regions differ from the previous five regions. Clustered regions based on immigration and outmigration patterns are discussed. The results show different clustering patterns for in- and outmigration and point out that the use of net migration can be misleading since such an analysis pays little attention to different immigration and outmigration patterns. The results are substantially consistent for the four migration periods.