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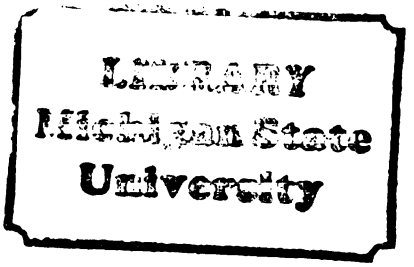

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HIGHLAND RURAL MIGRATION IN NORTHERN CHILE

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HIGHLAND RURAL MIGRATION IN NORTHERN CHILE

By

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ABSTRACT

HIGHLAND RURAL MIGRATION IN NORTHERN CHILE

By

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Despite of an important increase in rural to urban migration research in Latin America, one finds a lack of studies of rural to rural movements. This research of highlander migrants in northern Chile investigates migration strictly within this rural area.

Assumptions focused on (1) rural to urban migration and diffusion of information, (2) stage and stepwise migration and long-distance moves, (3) the attraction of intervening opportunity centers, (4) the distortion of the distance-decay function, and (5) differential migration by sex, age, and marital status.

The results of both structural migration and spatial mobility demonstrate that the rural migration process changes from one of a stepwise function to one of long-distance movements with time. Factor analysis and multiple regression indicate that several variables are important. They are (1) labor force, (2) work hours, and (3) movements within a district.

ACKNOWLEDGMENTS

I would like to express my appreciation to all those who collaborated in the preparation of this dissertation: to Dr. Robert N. Thomas, my faculty adviser in the Geography Department whom I first had the occasion and good fortune to meet in Paipa, Colombia in 1977 and who was instrumental in my decision to attend Michigan State University in 1979. Dr. Thomas lent me long hours of assistance in the painstaking revision of my preliminary drafts for which I will be ever grateful.

The guidance and insight into quantitative geographical methods provided by Dr. Bruce Wm. Pigozzi were an invaluable contribution exceeded only by the patience he showed me in the sometimes heated discussions in which we found ourselves engaged over various points of disagreement and for showing me the importance of detail and precision in conducting an in-depth research project. I do not doubt that I will be a better geographer for the valuable learning experience I had with all those under whom I studied in the Michigan State Geography Department.

DEDICATION

To my entire family for their continual support throughout these past two years in particular my wife, Cecilia, a former student of mine, to whom I am indebted for a large part of this effort and a few helpful suggestions in the manuscript and my dear sons who have patiently learned to wait for the day when Dad will again be available to play with them.

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CHAPTER I

INTRODUCTION

In recent decades, rural-urban internal migration has become a phenomenon of great significance in all developing regions, including Latin America. However, inter regional migration between rural areas has common place prior to the time when rural-to-urban migration became the major internal migration force. The mobility of population within its national boundaries has not received as early attention as international migration, but it has been the subject of increasing study in recent decades. Of all the components of population change, internal migration has been the most difficult to measure and predict.

Internal migrations are geographical population movements while remaining within the same national boundaries. Specifically, they involve a change of community (locality), of usual residence or, more generally, they are movements having a relatively permanent nature from one community to another.[1]

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[1]Juan C. Elizaga, "Internal Migration in Latin America," International Social Science Journal, Vol. 17, No. 2 (1965), 213-231.

The geographer's interests have included (1) internal migration as a factor in population change and hence in measures or estimates of movements; (2) internal migration as the primary factor in population redistribution among regional areas; and (3) differentials in short-distance mobility and migration and the selectivity of migrants types of human flows.

Scope and Content of Internal Migration Research

In the growing literature on the theoretical study of internal migration, the perspective of rural-urban movements changed from a push-and-pull or cause-effect movement,[2] to a progressively complex system in which the effect of changes in one part can be traced through the system.[3] This study investigates the migration histories of migrants in highland northern Chile over a period of time. Therefore, the research reveals the totality of places visited by the migrant population for this given time period. Describing and understanding the entire migration process through time goes beyond the traditional generating center/receiving center approach. To bring order from the large number of individual migrant moves, the investigation collapses the

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[2]R. Herberle, "The Causes of Rural-Urban Migration: A Survey of German Theories," American Journal of Sociology, Vol. 43 (1938), 932-950.

[3]Akin L. Mabogunje, "System Approach to a Theory of Rural-Urban Migration," Geographical Analysis, Vol. 2, No. 1 (1970), 1-16.

numerous migrant movements into major migrant parts, streams, or flows.

Periodic and Rural-Urban Migration

The main objective of periodic migration in which migrants remain away from their original settlements for short periods of two or three years and return continuously, is to obtain better payment than in their permanent homes. These periodic movements of the head of the household generally lead to a massive migration of families, once the first migrants have received sufficient information about job opportunities.

In Chile, the development of the mining industry in some agricultural areas has been responsible for radical changes in population distribution. The mining locations have become a focus not only for those seeking employment, but for family dependents and other subsequent migrants who provide goods and services in the new mining settlements. As a result of these movements the mining companies gain access to a reliable, inexpensive source of labor.[4]

Another form of periodic migration that leads to a definitive rural-urban movement is the farm-to-farm migration associated with the systems of share-cropping. Agriculturalists leave their original communities to farm in

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[4]Kenneth Swindell, "Sierra Leonean Mining Migrants, Their Composition and Origins," Institute of British Geographers-Transactions, Vol. 62 (March 1974), pp. 47-64.

other settlements for a period of years until the soils become exhausted. This process of soil depletion generates a rural-rural migration essentially different from those of rural-urban migrations. It is known, for example, that in many parts of the world the pattern of migration to towns is one of movements from low-order central places to high-order central places. In the case of rural-rural migrations the direction of movement differs and is usually a movement from areas of large population concentrations to sparsely settled areas. The reason for this appears obvious; while a large urban center with industries and a wide range of services and employment opportunities tends to attract more and more people, the rural-rural migrant is attracted to areas where farmland is abundant and where there is demand for labor to develop primary production. Usually such rural destinations are so sparsely settled that the available population is inadequate to exploit fully the local resources.[5]

Migrations from rural to urban areas are generally the most important forms of internal movements, especially in countries experiencing technological change. On the whole, rural-urban migration involves the less fortunate. Many rural migrants are changing their occupations and this fundamental mutation in occupational structure is one of the main results of this change in residence.

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[5]Reuben K. Udo, Migrant Tenant Farmers of Nigeria (Nigeria: African Universities Press, 1975), p. 2.

In rural areas the effect of migration on the generating center varies. It can lead to a better distribution of the land for those who remain, or in some extreme cases, may cause rural depopulation and land abandonment. Between these two extremes lie various stages, such as the adverse effects of unbalanced age and sex-structures and the variation of migration volume with distance and transport facilities.[6] The most seriously affected localities are generally those with adverse physical conditions such as mountain villages and specifically in northern Chile, small towns in desert oases.

Migration, Diffusion, and Modernization

A substantial number of migratory farm workers enter the migrant streams within the rural area each year in order to find work. Most, but by no means all of them, move through the central place hierarchy. These rural to urban movements are facilitated by the diffusion of information between an individual urban center and the surrounding rural area.[7]

In the migrants' predominantly rural environment, we expect communication to be limited among communities, while within settlements the flow of information would be

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[6]John I. Clarke, Population Geography (Oxford: Pergamon Press, 1977), pp. 132-134.

[7]Peter E. Lloyd and Peter Dicken, Location in Space: A Theoretical Approach to Economic Geography (Wheaton & Co., 1977), p. 64.

more rapid and efficient. This availability of information provides the potential migrant with the information on which they can make a more rational choice of a possible destination.[8] This ease of access to information about a migrant receiving center, one's opportunity set, facilitates the migration process.

Migration is an instrument of adjustment and cultural diffusion. Specifically, the internal migrant who moves from one settlement to another brings with him a cultural heritage generated in his previous socio-economic environment. Initially, he may act as a disruptive force in the community he enters. Only by a process of assimilation, which sometimes requires a generation or more, the migrant group and the receiving community finally adjust to each other. Where internal migration process brings about a diffusion of migrants over a wide geographic area, the resulting cultural diffusion may contribute to a reduction of intersectional and interregional differences.[9]

The process of assimilation that affects rural migrants is also a change from a traditional way of life to a more complex and rapidly changing style of life. This

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[8]P. Collier and J. M. Green, "Migration from Rural Areas of Developing Countries: A Socio-Economic Approach," Oxford Bulletin of Economics and Statistics, Vol. 40, No. 1 (1978), p. 26.

[9]Donald J. Bogue, "Internal Migration," The Study of Population: An Inventory Appraisal, edited by Philip M. Hauser and Otis D. Duncan (Chicago, Ill.: University of Chicago Press, 1959), pp. 486-509.

availability to initiate change is confined to a restricted group of migrants who are capable of absorbing the cultural shock of assimilation experienced in migrating from a more traditional rural area into a more modern rural area close to urban centers. Since a social adjustment implies successive adoption of new behavioral patterns, the examination of an economic profile of job types held before migrating from traditional rural areas has shown a consistent shift from farm to nonfarm occupations, though many still depend on seasonal work.[10]

Some types of migrants become involved in a different type of socioeconomic process as a result of their migration. Involvement in the new setting requires adjustment, participation, and eventual or gradual acculturation. According to Germani,[11] these three processes define the degree of the migrant's assimilation into the urban environment.

The Process of Acculturation

Migration accelerates culture change as it transforms the communities of origin through the exodus of the younger members of the community and, more important, through the influx of information and customs of the outside

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[10]Ghulam Mohammad Sandami, Migration and Modernization (Ithaca, N.Y.: Center for Urban Development Research, Cornell University, 1972), p. 7.

[11]Gino Germani, "Migration and Acculturation," Handbook for Social Research in Urban Areas, edited by Philip M. Hauser (Belgium: UNESCO, 1964), pp. 159-168.

world brought back by the returning migrants. The migration transition, the changing nature of the most important link between urban and rural areas, causes and is effected by transformations in the social structure of the migrant areas of origin and destination.[12]

As migrants proceed through the rural-urban hierarchy they undergo the process of acculturation.[13] This process of acquisition and learning of urban behavior takes place as the migrant moves upward within the urban hierarchy.[14] Generally the movement upward in the urban system brings about greater economic mobility which can generate greater social mobility.

Justification of the Study

Migration studies dominate population research in Latin America. The dramatic impact of internal migration upon the regions' urban areas has provided social scientists an important area of investigation. Although geographers have made important contributions to an understanding of the process, Gonzalez points out that they continue to play

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[12]Ronald Skeldon, "The Evolution of Migration Patterns During Urbanization in Peru," The Geographical Review, Vol. 67, No. 4 (1977), 394-411.

[13]Dennis Conway, "Step-Wise Migration: Toward a Clarification of the Mechanism," International Migration Review, Vol. 14, No. 1 (1969), 3-11.

[14]Arthur Conning, "Rural Community Differentiation and the Rate of Rural-Urban Migration in Chile," Rural Sociology, Vol. 36, No. 3 (1971), 296-314.

a minority role in this vital area of research.[15] According to Thomas' bibliography only eight major studies pertaining to Latin America were included in a total of forty-eight investigations on migration.[16]

Since 1971 one of the most important studies on internal migration in Latin America that reflects a multidisciplinary contribution was that by Thomas and Hunter.[17] The second and most detailed research on a specific region in Latin America has been done by Bähr,[18] with special emphasis on interregional migration. In spite of these contributions, rural-rural migration remains a neglected aspect of population movements in Latin America. Current research and government policy are largely concerned with rural-urban migrations, and have tended to give the impression that internal migration in the continent is synonymous with rural-urban migration. A survey of contemporary literature

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[15]Alfonso Gonzalez, "Trends in the Population Research of Latin America," Population Dynamics of Latin America. A Review and Bibliography, edited by Robert N. Thomas (Boston, Mass.: The Conference of Latin Americanist Geographers, 1971), pp. 44-62.

[16]Robert N. Thomas, "Population Bibliography of Latin America," Population Dynamics of Latin America. A Review and Bibliography (Boston, Mass.: The Conference of Latin Americanist Geographers, 1971), pp. 122-200.

[17]Robert N. Thomas and John M. Hunter (Eds.), Internal Migration Systems in the Developing World (Massachusetts: Schenkam Publishing Co., 1980), pp. 1-176.

[18]Jürgen Bähr, "Migration im Groben Norden Chiles," Bonner Geographische Abhandlungen, Heft 50, 1975, pp. 1-286.

on migration confirms that even in the more developed countries of Latin America the research emphasis has focused on rural-urban movements. As a result, the process of rural-rural migration is poorly documented.[19] Indeed, to obtain a true understanding of rural-urban migration it is necessary to comprehend this segment of the migration process as it comprises the total migration system of a given country. It is also an important part of this research problem to verify the stepwise and/or stage migration process as it occurs within the context of the total migration system. This human spatial movement has been described in numerous ways,[20] however, the literature basically ignores the first stage in the process, that of the role played by the rural component.

An objective of this research is to combine the demographic and geographic approaches to migration. While progress has been made by several disciplines (i.e., geography, sociology, anthropology, and demography) toward a general understanding of the social and spatial dimensions of migration, there is still much to be done to integrate these two divergent approaches.[21]

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[19]Udo, op. cit., pp. 1-4.

[20]Conway, op. cit., pp. 3-11.

[21]Edward A. Ackerman, "Geography and Demography," The Study of Population: An Inventory and Appraisal, edited by Philip M. Hauser and Otis D. Duncan (Chicago, Ill.: University of Chicago Press, 1959), pp. 717-727.

The methodological purpose of this research is to analyze the spatial variability in migration to the nearest city. The advantage of a multivariate approach is that it extracts from a volume of data some major dimensions or factors. For the geographer an additional advantage of this model is the opportunity to map and analyze the factor scores for these independently-derived dimensions.[22] The factors extracted from this model were regressed on a migration variable.

The Study Area

The Great North of Chile includes the desert regions of Tarapacá and Antofagasta. Much of the population of the Atacama Desert lives in coastal cities and many population clusters in the northern interior have grown up around mines. The other significant far northern population settlements are scattered highland oases which support small farming communities.[23]

The study area selected for this investigation constitutes two sub-areas from the Regions of Antofagasta and Tarapacá. The first sub-area, known as the administrative

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[22]Stanley D. Brun and Robert N. Thomas, "The Migration System of Tegucigalpa, Honduras," Population Dynamics of Latin America. A Review and Bibliography, edited by Robert N. Thomas (Boston, Mass.: The Conference of Latin Americanist Geographers, 1971), pp. 63-82.

[23]The concept of "community is accepted as an ecological or social organization in which people share a limited territorial space for residence and for sustenance and functions to meet common needs.

unit of Calama, covers more than 60 percent of a vast highland surface and includes the eastern half of the province of Antofagasta. The second subarea is the southeastern highland sector of Tarapacá which comprises three administrative units, Huara, Pozo Almonte, and Pica. Both surfaces cover more than 65,000 square kilometers, approximately 36.4 percent of the total area of these two regions (Figure 1).

For this study, only villages and mining sites with more than fifty persons have been considered, with the exception of those settlements with less than fifty persons that might be intermediate centers for those migrants that try to reach larger villages, towns, or cities (Table 1). Any intermediate center near Tarapacá's border, but in another administrative unit, may draw people from the southeastern part of this region. Since this research deals with the cited administrative units of the highland areas near two urban centers namely: Calama and Chuquicamata, it is assumed that this area is also a geographic unit (Figure 2).

Statement of the Problem

It is the purpose of this study to examine the spatial pattern of rural mobility among highland rural settlements in northern Chile in such a way that a stepwise and/or stage migration thesis will be tested, and to account for the local differences of out-migration volume with respect to migration differentials.

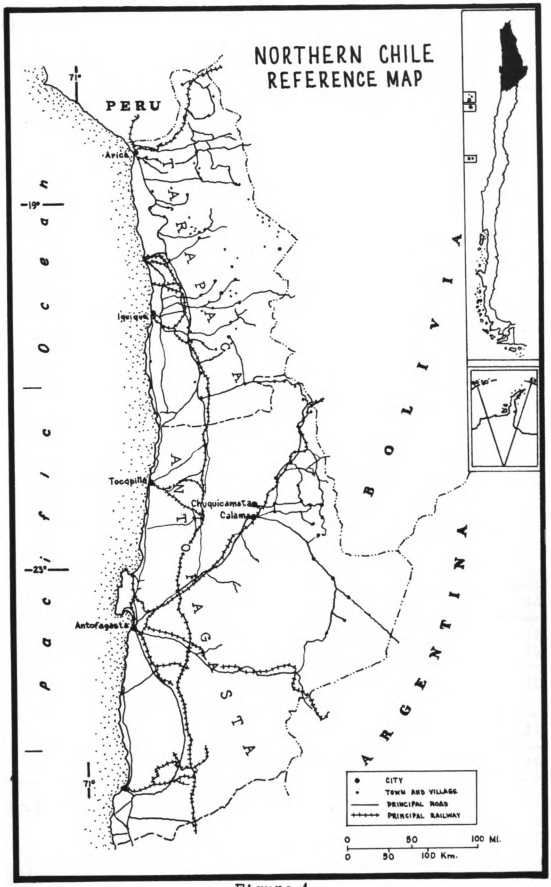
NORTHERN CHILE
REFERENCE MAP
PERU
BOLIVIA
ARGENTINA
Pacific Ocean
Arica
Iquique
Tocopilla
Chuquicamata
Calama
Antofagasta
ATACAMA
ANDES
PUNA DE ATACAMA
CITY
TOWN AND VILLAGE
PRINCIPAL ROAD
PRINCIPAL RAILWAY
0 50 100 Mi.
0 50 100 Km.

Figure 1

Table 1.--Classification of Rural Settlements Per Region, Commune, and District.

Region	Commune	District	Settlement	No.
Antofagasta	Calama	Calama	Ayquina	1
			Caspana	2
			Cupo	3
			Chiu-Chiu	4
			Lasana	5
			San Pedro	6
			Toconce	7
			Turi	8
		Collaguasi	Puquios	9
			Ujina	10
		Ollague	Amincha	11
			Buenaventura	12
			Conchi	13
			Ollague	14
		S.P. de Atacama	Río Grande	15
			Machuca	16
			S.P. de Atacama	17
		Toconao	Talabre	18
			Toconao	19
		Socaire	Peine	20
			Socaire	21
Tarapacá	Huara	Chusmisa	Chusmisa	22
		Cariquima	Villablanca	23
		Tarapacá	Huaviña	24
			Tarapacá	25
	Pozo Almonte	Mamiña	Mamiña	26
	Pica	Pica	Pica	27
		Guatacondo	Guatacondo	28

Source: Instituto Nacional de Estadísticas, Chile.

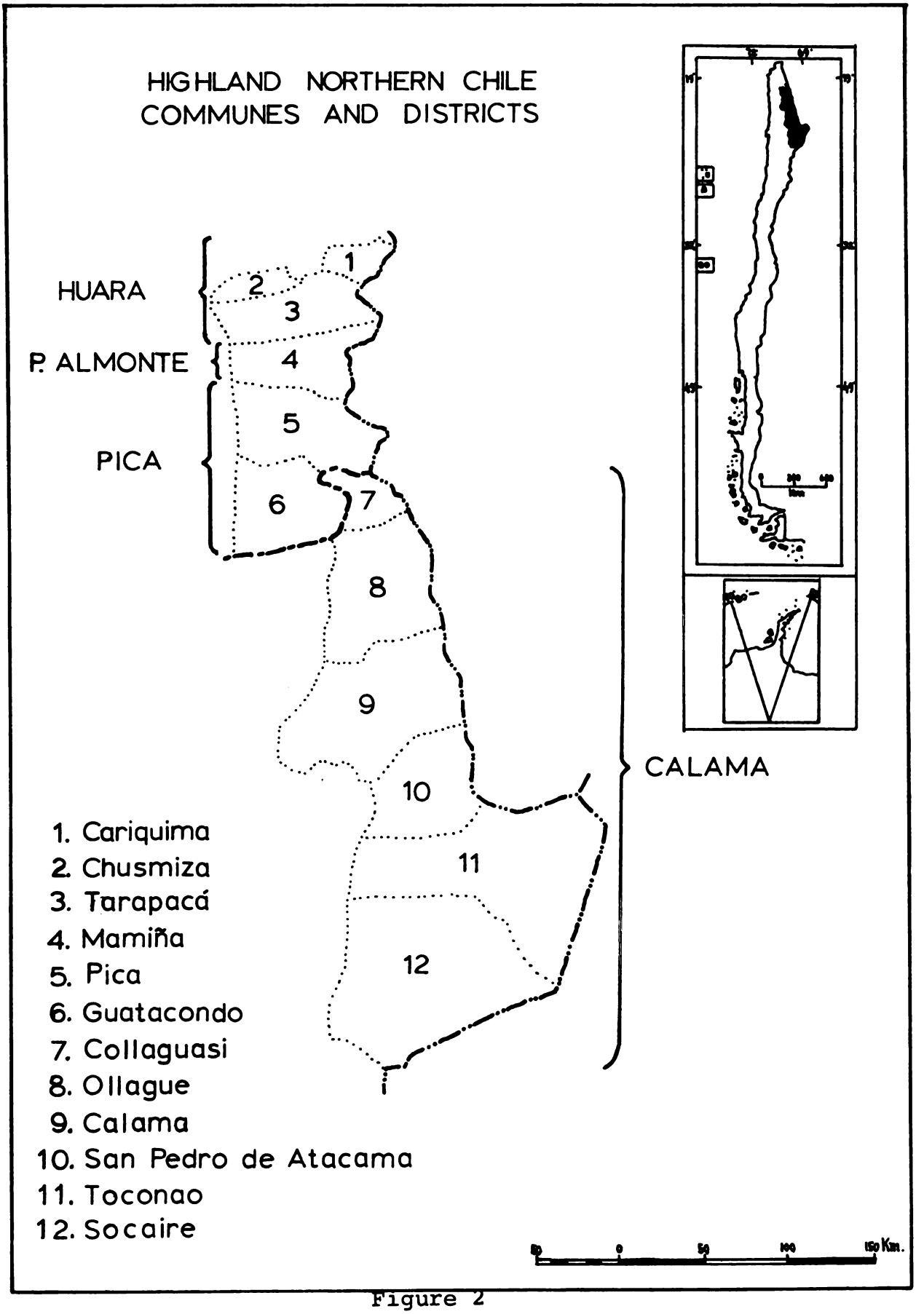
HIGHLAND NORTHERN CHILE
COMMUNES AND DISTRICTS
HUARA
P. ALMONTE
PICA
CALAMA
1
2
3
4
5
6
7
8
9
10
11
12
1. Cariquima
2. Chusmiza
3. Tarapacá
4. Mamiña
5. Pica
6. Guatacondo
7. Collaguasi
8. Ollague
9. Calama
10. San Pedro de Atacama
11. Toconao
12. Socaire
150 Km.

Figure 2

Major Purposes of the Study

It is assumed that a migrant will move to a more accessible rural settlement or small mining location in successive and short distance moves. These same migrants will construct a pattern of spatial mobility according to the number of economic opportunities at those intermediate villages and mining centers. To prove this assumption, a first approach examines the step-wise system at an early stage of the rural migration process before migrants initiate the more extensive movements toward the cities. A second approach examines migrant selectivity such as age, sex, and marital status. Moreover, the investigation reveals the influence of the distance variable upon the selection process.

Hypotheses and Operational Statements

The research focuses upon two main areas of inquiry in migration theory, the mobility process, and the characteristics of migrants. The hypotheses and their specific operational statements follow:

1. Through time the step-wise or stage migration process breaks down and becomes a more direct rural to urban movement.

    a. The distortion in the distance-decay function might be attributed to the rapid development of a country's internal infrastructure.

    b. Direct rural to urban migration may be facilitated by information flows established by previous migrants residing in the major urban centers.

c. The role of intervening opportunities decreases through time as a migrant's awareness space increases.

2. Selectivity of migrants is for the most part affected by the distance obstacle.

   a. Males move longer distances than female migrants.

   b. Young married migrants move shorter distances than older married migrants.

   c. Migrants who move to intermediate centers are found in the 18-29 cohort while migrants found in small villages near major urban centers tend to be older (30-35 years cohort).

Limitations of the Study

This study will not attempt to examine the specific causes of migration in highland northern Chile or the impact of in-migration upon the urban centers. However, it will examine the spatial movements that rural population experience. Although causes and consequences clearly explain migration, they are beyond the scope of this research.

In the following analyses, twenty-eight communities will be considered as settlements affected by rural-rural migration. Selected communities were examined as centers of out-migration that provide migrants to the secondary urban centers Calama-Chuquicamata. There are other highland villages in northern Chile that belong to other communes in which the migration phenomenon may behave in a similar way. But, these communities will not be included in the study area since they are considered as settlements of possible out-migration to other urban centers such as Iquique and Arica.

A third limitation of this research is related to movement within the rural-urban system. Although a complete view of rural-urban migration includes the rural environment as well as the urban destination centers, this study refers only to the rural area.

CHAPTER II

REVIEW OF THE LITERATURE

Distance and Human Interaction

Perhaps one of the most important contributions in geography can be summarized by the concept of "spatial interaction."[24] Most explanations of this concept have contained elements included within a given spatial distribution of places. Gunnar Olsson points out that most explanations of spatial distributions have involved elements included within the broad framework of spatial interaction,[25] for example the diffusion of people among various points. Olsson also considers the implication of the concept of functional distance for the understanding of human behavior in the geographical site.

In part, movement of people is a result of the degree of connectivity within a given system. This connection and subsequent action among centers implies specific

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[24]Edward L. Ullman, "Human Geography and Area Research," Annals, Association of American Geographers, Vol. 43, 1053, pp. 54-66.

[25]Gunnar Olsson, "Distance and Human Interaction: A Review and Bibliography," Bibliography, Series No. 2 (Philadelphia: Regional Science Research Institute, 1965).

complementarity. However, the interchange of migrants between two centers will not totally develop if intervening opportunities are created between them.

A final factor found in a system is distance which generally creates a barrier to human interaction. If the distance between two settlements were too great and too costly to overcome, interaction would not take place in spite of perfect complementarity and absence of intervening opportunities.

Distance Factor

The question of how far migrants travel has been the focus of migration studies in recent decades and has given rise to the formation of many concepts and theories. These studies confirm the earlier generalization presented by Ravenstein in which he recognized the relevance of distance as a factor of migration. He stressed the relationship between distance and the propensity to move by stages in his first "law of migration" where he states that most migration occurs over a short distance and that the number of migrants enumerated in a given center of absortion will decrease as the distance from the center increases.[26]

One of the basic works on migration and distance investigates population movements from one city to another. George Zipf tried to explain urban-urban migration by the

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[26]Edward G. Ravenstein, "The Laws of Migration," Journal of the Royal Statistical Society, Vol. XLVIII, Part II (June 1855), 183.

principle of least effort. According to him, the number of migrants from one city to another is a function of the distance separating the cities, since the effort required to cover greater distances would increase with the distance.[27] Although it appears that Zipf's work is outside the scope of the present study, it seems certain that both rural-rural migration and rural-urban migration has little new to offer but merely confirm these conclusions.

There is also a temporal dimension to a migrant's perception of distance in that today people tend to travel greater distances than in the recent past. This change has come about as a result of several factors such as improved roads and networks of transport, and the greater amount of information which potential migrants have about various destinations. Distance perception by migrants is one of the issues which has been discussed in recent migration studies. Olsson,[28] and Claeson,[29] among others, have pointed out that purely physical distance does not adequately explain interaction intensity between places and should

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[27]George Zipf, Human Behavior and the Principle of Least Effort (Cambridge, Mass.: Addison-Wesley Press, Inc., 1949).

[28]Gunnar Olsson, "Distance and Human Interaction: A Migratory Study," Geografiska Annaler, Vol. 47, Series B, No. 1 (1965), 8-9.

[29]C. F. Claeson, "Distance and Human Interaction: Review and Discussion of a Series of Essays on Geographic Model Building," Geografiska Annaler, Series B, No. 2 (1968), 142-161.

therefore be replaced by a new concept of "functional" or "real distance." Claeson suggests that distance tolerance is a more realistic concept than distance perception, but the problem of quantifying these concepts is yet to be resolved. Olsson refers to this discussion as the information concept of distance and is largely a product of the feed-back effect from earlier migrants.

Migration is selective of individuals with given characteristics. The intensity and pattern of selectivity depend, in some way, on the distance factor. Everett Lee wrote:

> It is also commonly noted that as distance of migration increases, the migrants become an increasingly superior group. At the other extreme, we have the milling-around in restricted areas of persons who, by any definition, are less capable; for example, uneducates slum dwellers often move round and round within a few block radius.[30]

It is proven fact that the friction of distance acts on human movements and that the frequency of these moves decreases with the increasing distance. This distance-movement relationship, known as "distance decay" or inverse distance relationship has been well documented since Ravenstein emitted his "laws of migration."[31]

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[30]Everett Lee, "A Theory of Migration," Demography, Vol. 3, No. 1 (1966), 57.

[31]Ravenstein, op. cit., pp. 167-235.

Intervening Opportunities

Forty years ago Stouffer established the fact that the number of migrants at a given destination would be affected by the number of opportunities available between their places of origin and destinations. The theory assumed that there is little relationship between mobility and distance. Instead, he introduced the concept of intervening opportunities which states that the number of migrants going a given distance is directly proportional to the number of opportunities at that place and inversely proportional to the number of intervening opportunities.[32] Stouffer argued that the volume of migration from one place to another is associated not only with the number of people in the two places, as Zipf assumed,[33] but with the number of opportunities in each place.

By stressing opportunities, Stouffer opened to migration analysis a wide array of sociological characteristics that make a city differentially attractive in addition to its economic characteristics.[34] Although Stouffer did

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[32]Samuel A. Stouffer, "Intervening Opportunities: A Theory Relating Mobility and Distance," American Sociological Review, Vol. 5 (1940), 845-867.

[33]George K. Zipf, "The P_1P_2/D Hypothesis: On the Intensity Movement of Persons," American Sociological Review, Vol. 11 (1946), 677-687.

[34]James J. Zuiches, "Migration Methods and Models: A Demographic Perspective," Internal Migration Systems in the Developing World, edited by Robert N. Thomas and John M. Hunter (Cambridge, Mass.: 1980), pp. 3-16.

not attempt to define "opportunities," and the term has been defined differently among social scientists, it seems clear that for most purposes (particularly where interest is in migration of working-age people) some variable representing employment opportunities would be appropriate.[35]

Under certain conditions, intervening opportunities might help to create interaction between two distant complementary areas. They might act as a bridge for a distant migrant located far from urban centers. A town or settlement closer to a major city may be either an intervening opportunity site or a stop over to a migrant.

Spatial Expression of Sociocultural Transition

If we examine contemporary migration literature, it becomes clear that the stepwise migration process has been broadened to include the spatial manifestation of a social process of adjustment.[36] With rural-urban migration, there is considerable evidence to support the thesis that movements are usually from small villages to medium size towns, and from the latter to larger cities. Almost all the available evidence of the step-by-step process in rural-urban migration has included the cultural adaptation of migrants

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[35]Roger L. Burford, "An Index of Distance as Related to Internal Migration," Southern Economic Journal, Vol. 29 (1962), 77-81.

[36]Dennis Conway, "Step-Wise Migration: Toward a Clarification of the Mechanism," International Migration Review, Vol. 14, No. 1 (1979), 3-14.

and the consequent transformation of their way of life. The acceptance of the stepwise process is well understood. This change of residence views stepwise migration as the spatial expression of a sociocultural transition of an individual moving progressively from a traditional rural area to the modern urban centers.[37]

Step-Wise Migration

It has been established in the general literature on migration that rural-urban movements often take place by steps. Within the step process two particular spatial types of movement must be defined: "stepwise" and "stage" migrations. Thomas and Mulvihill have defined stepwise migration as movement by an individual from a rural area to a major city through a central-place hierarchy. On the other hand, they distinguished stage migration as the spatial movement that emphasizes replacement. Thus, an individual moves from a secondary center to a major city and is replaced in the secondary center by someone from a smaller city, and so on down the hierarchy.[38]

The first theoretical description of the step process was made by Ravenstein who wrote:

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[37]Conway, op. cit., p. 6.

[38]Robert N. Thomas and James L. Mulvihill, "Temporal Attributes of Stage Migration in Guatemala," Internal Migration Systems in the Developing World, edited by Robert N. Thomas and John M. Hunter (Cambridge, Mass.: 1980), pp. 51-61.

> The inhabitants of the country immediately surrounding a town of rapid growth, flock into it; the gaps thus left in the rural population are filled up by migrants from more remote districts, until the attractive force of one of our rapidly growing cities makes its influence felt step by step, to the most remote corner of the kingdom.[39]

According to this thesis, the instigator of the step-by-step process is the city but, in the wake of the consequent pull of the city, rural-rural migrations follow. Here, it is necessary to consider the rural-urban hierarchy in the step migration process. Conway's elaboration of the notion of a series of spatial steps has been fused with the idea of a stepwise progression upward in the urban hierarchy.[40]

After the first discussion by Ravenstein concerning the step process through the rural-urban hierarchy, a few attempts have been made to verify it. Two of the most recent studies in developing countries have been done by Riddell and Harvey,[41] and Thomas and Catau.[42] Both results concluded that the rural migrant living near a primary city by-passes the local secondary center and moves directly to the primary city, while a rural migrant living a great

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[39]Ravenstein, op. cit., p. 199.

[40]Conway, op. cit., pp. 3-14.

[41]J. Barry Riddell and Milton E. Harvey, "The Urban System in the Migration Process: An Evaluation of Step-Wise Mibgration in Sierra Leone," Economic Geography, Vol. 48, No. 3 (1972), 270-283.

[42]Robert N. Thomas and John C. Catau, "Distance and the Incidence of Step-Wise Migration in Guatemala," Proceedings of the Association of American Geographers, Vol. 6 (1974), pp. 113-116.

distance from the primary city is more likely to move to the local secondary center. As a consequence, the effect of distance demonstrates an evident positive association with stage-migration process. However, as the relative accessibility to the large urban center improves, the stage migration process progressively decreases in importance as people move directly to the major urban center from all parts of the study area.

Although the scales of the former studies are quite different from the study area in northern Chile, the effect of distance may reflect similar patterns if the stage migration process is tested. A combination of village case studies and census data analysis would seem to provide the best possibility to better understand the significance of short- versus long-distance movements of rural-urban migrants.[43]

Long-Distance Movement

It was also Ravenstein who stressed the condition in which long-distance movements take place. He indicated that migrants who proceed long-distances generally move to one of the great centers of commerce and industry.[44] From a basic short-distance move, migration evolves through

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[43]Robert V. Kemper, "Rural-Urban Migration in Latin America: A Framework for the Comparative Analysis of Geographical and Temporal Patterns," International Migration Review, Vol. 5, No. 1 (1971), 36-47.

[44]Ravenstein, op. cit., p. 199.

complexity to a long-distance movement. As a complement to the former statement, Skeldon added that the ideal end point of the process of urbanization in a region occurs when migrants from rural settlements at all levels of the hierarchy are engaged in permanent direct long-distance migration.[45]

Before long-distance movement to the primary city occurs a period of migration adjustment is required. During this period, when the migration field of each rural settlement is at its greatest areal extent, both periodic and permanent migration streams prevail.[46]

Long-distance migration does not diffuse uniformity throughout the whole system. Furthermore, its influence can involve an extensive area within the rural-urban hierarchy. Indeed, the real contributor to the decline of rural isolation has not been a gradual spreading out of local contacts but a rapid expansion of long-distance links in which distance itself becomes less relevant. In relation to this phenomenon, Morel has shown that beyond the local region knowledge is generally restricted to towns and cities whose real distance from home is frequently distorted by incomplete information and differently perceived attractiveness.[47]

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[45]Ronald Skeldon, "Evolution of Migration Patterns During Urbanization in Peru," The Geographical Review, Vol. 67, No. 4 (1977), 394-411.

[46]Ibid., p. 407.

[47]A. Morel, "L'espace social d'un village picard," Etudes Rurales, Vol. 45 (1972), pp. 62-80.

The drastic reduction of the rural population is due to the existence of a greater variety of occupations found in distant urban centers. By analyzing the occupational structure of migrants Odgen suggests that the general effect of this factor is to reinforce spatial patterns of long-distance movements.[48]

The relationship between formal education and long-distance migration is rather complex. When education has been introduced and accepted for a long period of time within the rural environment, students who receive an elementary education are forced to leave their homes if they wish to continue their education. This necessitates greater contact with the distant cities and acts to increase population mobility. Even when it is to be expected that the importance of long-distance movements would often be exaggerated,[49] the effect of these flows will be felt not only locally but also in the entire rural-urban system.

Replacement Movements and Selectivity

Migration is essentially selective. Despite some exceptions, for example forced migrations or movements to colonization projects, the vast majority of migrations

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[48]P. E. Ogden, "Migration, Marriage and the Collapse of Traditional Peasant Society in France," The Geographical Impact of Migration, edited by Paul White and Robert Woods (London: Longman Group Limited, 1980), pp. 154-179.

[49]Dorothy S. Thomas, "Research Memorandum on Migration Differentials," Bulletin 43 (New York: Social Science Research Council, 1938).

contain an element of migrant selectivity or differentiation. In this context migrants are not randomly selected from the population of the place of origin. Specific groups of people are likely to react in distinct ways to the differentiation of places;[50] they are likely to value different attributes of places, to have different information available to them, and therefore to react in different manners.

It has been suggested that movement between stages in the life-cycle of a migrant is an important cause of spatial movement, and it can be argued that within each stage there may be less migration. The initial migrant's aspirations should be completed once he has reached the last stages of his life-cycle. In general however, it may be said that selectivity occurs in out-migration from one place to another because there generally are distinct differences between the interests of the individuals comprising various groups within the population. Consequently, such attitudinal differences are manifested in behavioral differences with respect to staying in or leaving the community.[51]

Migration is often selective among potential migrants due to a wide range of demographic attributes of the

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[50]Differentiation of places is related here to the concept of "areal differentiation" introduced by Richard Hartshorne in his book "On the Nature of Geography," published by The Association of American Geographers, Vol. XXIX, 1939.

[51]Paul White and Robert Woods, The Geographical Impact of Migration (London: Longman Groups Limited, 1980), pp. 1-245.

population, but those attributes which appear to engender over-representation of certain population groups differ from place to place and from migration flow to migration flow.

Migration trends consistently reflect the social and economic changes taking place within the system. Since these changes vary from place to place and from time to time, socio-demographic characteristics of the migrants can hardly be expected to remain static.

Intergenerational Movements as Chain Migration

It has been suggested that stage migration may take place across generations with each successive generation moving to a more urbanized place. However, whether this kind of migration is intra-generational and/or intergenerational may not, at first sight, appear to be a crucial distinction.[52] Wendel's migration study of a large sample of individuals in Sweden, was one of the first to define the intergenerational movements of migrants as chain migration. However, Wendel did not point to the conclusion that migration by stages in terms of intergenerational flows was common.[53]

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[52]Conway, op. cit., p. 6.

[53]Bertil Wendel, "A Migration Schema: Theories and Observations," Lund Studies in Geography, Series B, Human Geography, No. 9, 1953, pp. 1-38.

By analyzing intergenerational stage movements, Hägerstrand did infer that there is a complex intergenerational flow through the settlement hierarchy that he defined as chain migration. From his survey of a sample of Swedish migration fields, he concluded that:

> The migration pattern observed is not necessarily to be regarded as a kind of "migration by stages" in the meaning that the rural inhabitants are moving individually toward the bigger towns gradually via smaller towns. Just as important may be the alternative, which we could term "chain migration," meaning that young people, born and bred in small urban centres, are turning to bigger centres, to be compensated--sometimes insufficiently, sometimes more than sufficiently--by in-migration from still smaller centres and from rural districts.[54]

Hägerstrand was convinced that the majority of movements are replacement movements. In other words, they arise to fill vacancies, which in many instances are due to deaths or superannuation and dependent on the demands of training and age imposed upon those who will fill the vacancy.[55]

The concept of "chain migration" cited by Hägerstrand is of considerable importance to this research in that intergenerational movements occur through the settlement hierarchy. Nevertheless, the duplicity in the literature when using "chain migration" to refer to the migrational process of

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[54]Torsten Hägerstrand, "Migration and Area. Survey of a Sample of Swedish Fields and Hypothetical Considerations on Their Genesis," Migration in Sweden: A Symposium. Lund Studies in Geography, Series B, Human Geography, No. 13, 1953, pp. 27-158.

[55]Torsten Hägerstrand, "On the Definition of Migration," Population Research Institute, Vol. XI (1969), p. 65.

families and relatives is also useful. In the context of this study the spatial mobility of highlanders in northern Chile might be conceived as MacDonald and MacDonald indicated as the movements of families from their place of birth to intermediate towns or final destination where immigrants instigate a "chain migration" by helping their relatives to move.[56]

Differential Characteristics of Streams

Several studies have suggested the importance of migrant selectivity on the basis of age and sex as well as other socio-economic characteristics that migrants hold at various stages in their life-cycle. One of the most common conclusions to emerge from studies of migrant selectivity is that age is of particular importance in explaining the likelihood of migration. There is a close correlation, but not a direct one, between migration and age; it is suggested that the direct association is between migration and life-cycle stages. Each stage in one's life-cycle is associated with a particular age group and is the link to his or her age.[57] Speare compared the annual probability of migrants by their ages and life-cycle and concluded that both age

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[56] J. MacDonald and L. D. MacDonald, "Chain Migration, Ethnic Neighborhood Formation and Social Networks," Social Research, Vol. 29 (1962), pp. 433-448.

[57] White and Woods, op. cir., p. 14.

and life-cycle have some independent importance so that both should be considered as significant factors of migrant selectivity.[58]

When investigating migration streams we might discover that the predisposition of young people to migrate could be consistently higher than other age groups when the area of origin is rural. In rural areas the predisposition of this age group to migrate is accentuated by lack of occupational opportunities.[59] Bogue has found the same generalization valid in many places and for a long period of time: persons in their late teens, twenties, and even early thirties are much more mobil than younger or older persons. Thus, migration is closely associated with the first commitments and acts of adjustment to adulthood that are made by adolescents as they mature.[60]

It is a proven fact that sex distribution is as a rule, unequal, favoring either men or women according to whether flows come from a "short" or "long" distance.[61]

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[58]Alden Speare, "Home Ownership, Life Cycle Stage, and Residential Mobility," Demography, Vol. 7 (1970), pp. 449-450.

[59]James M. Beshers and Eleanor N. Nishiura, "A Theory of Internal Migration Differentials," Social Forces, Vol. 39, No. 3 (1961), pp. 214-218.

[60]Donald J Bogue, "Internal Migration," The Study of Population: An Inventory Appraisal, edited by Philip M. Hauser and Otis D. Duncan (Chicago, Ill.: University of Chicago Press, 1959), pp. 486-509.

[61]Juan C. Elizaga, "Internal Migration: An Overview," International Migration Review, Vol. 6, No. 2 (1972), pp. 121-126.

The predominance of females among short-journies was initially stressed by Ravenstein.[62] Although he did conclude that men were more migratory over long-distances, this conclusion has been reviewed by Grigg who discovered a drastic reduction of sex differences in migration.[63] Some scholars have further refined the concept and to state that females predominate in well-established, secure migratory movements while, males prevail in those streams directed toward pioneering or frontier regions.[64] We have to accept that sex differences in migration is evidently complex and related to differential employment opportunities and a number of other conditions as well.

The impact that migrants have on their final destination and area of origin is associated with their education and occupational skills. While education may be readily measured in terms of years of schooling, occupational skills are more difficult to determine. Simmons and Cardona classified urban workers to determine whether they differed from non-migrants in social standing or their own

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[62]Ravenstein, op. cit., p. 288.

[63]D. B. Grigg, "E. G. Ravenstein and the 'Laws of Migration,'" Journal of Historical Geography, Vol. 3 (1977), 47-54.

[64]Donald J. Bogue, Principles of Demography (New York: John Wiley & Sons, 1969), p. 765.

occupational skills.[65] However, it is also important to determine the occupational skills a migrant had before he left his original site. There, a complete classification of occupational skills is not as important as the number of hours a rural person utilizes to perform a job.

Much less information is available on migration differentials by marital status than by sex and age, and most discussions of the former are less systematic in their coverage. A considerable difficulty in this connection is the problem of inferring marital status at the time of migration. One of the most recent studies along these lines was conducted by Gupta who measured the marriage-distance relationship.[66] Marital migration normally is a short-distance movement and involves the flow of mostly women. On the contrary, long distance moves associated with marriage are restricted by many factors, such as cultural barriers and cost of movements.[67]

In general, migrants leaving home for the first time do not normally take their wives with them. Rather they go alone to investigate the new location and to arrange

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[65]Alan B. Simmons and Ramiro Cardona G., "Rural-Urban Migration: Who Comes, Who Stays, Who Returns? The Case of Bogotá, Colombia, 1929-1968," International Migration Review, Vol. 6, No. 2 (1972), 166-181.

[66]H. S. Gupta, "Marital Migration in the Rural Chhattisgarh," The Geographical Review, Vol. 39 (1977), 126-133.

[67]Ibid., p. 126.

accommodations before sending for their families. However Udo's study demonstrated that the use of family labor on the farms is an important reason why rural-rural migrants prefer to take along their families since those children who go to school can provide farm labor when needed.[68]

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[68]Reuben K. Udo, Migrant Tenant Farmers of Nigeria (Nigeria: African Universities Press, 1975), p. 41.

CHAPTER III

MIGRATION METHODOLOGY

Although migration philosophies can usually be inferred from the works of migration researchers, unfortunately very few researchers provide us with their philosophical perspective from which we may better understand and judge their research methods.[69] As Harvey pointed out[70] it is also assumed that a philosophical approach is the basic condition to orient a particular methodology in order to build an organized body of thinking.

If the fundamental question in this research is how do migrants decide where to move, perhaps one of the ways to determine the philosophy of migration analysis will be to observe both the needs' structure of the migrants and the scale of the study. On the one hand, highlanders in northern Chile are conditioned by an environment that makes a

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[69]Stephen E. White, "A Philosophical Dichotomy in Migration Research," The Professional Geographer, Vol. 32, No. 1 (1980), pp. 6-7.

[70]David W. Harvey, Explanation in Geography (London: Edward Arnold, 1969).

permanent life based upon a symbiotic farming-herding system and an unstable mining exploitation.[71] On the other hand, there is also a general decision to choose a place of destination given the increasing information within the rural area. Then, it may be acceptable to develop a procedure in which the objective/cognitive philosophical synthesis appears to be the cornerstone.[72]

Demographic Change and Indirect Migration

It is frequently desirable to describe the demographic change that occurs during more than one time period. This approach, utilizing the time perspective enables the researchers to see more clearly what has happened within a given area.

An indirect estimate of net migration may be computed from population figures by using previous censuses to establish an average of annual rate of increase. Employing this rate over the desired number of years provides an expected population. The difference between this expected population and the actual census count is often attributable to migration alone. It should be pointed out that many rural people in Chile have escaped census registration. Therefore, this

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[71]Khairul Bashar Sajjadur Rasheed, "Man and the Desert in Northern Chile" (unpublished Ph.D. dissertation, Columbia University, 1970).

[72]For further explanation of these two philosophical approaches and the ways that each position influences the selection of the independents variables, see Stephen E. White, op. cit., pp. 6-13.

population group to some degree, is always under-registered. We should keep this discrepancy in mind when estimating populations and drawing inferences from these figures. If vital statistics are available for a given area and the population is known, and indirect measurement of net migration is relatively straightforward. The degree of inaccuracy is merely the result of imprecision due to the fact that, for a large number of subjects, it is impossible to determine the exact places of birth and death.

Population Change and Annual Increase Rate

The first analysis undertaken by this research describes the population change by district. Employing three census figures 1952, 1960, and 1970, the average annual increase rates were computed using the following formula:

$$r = \frac{P_1 - P_o}{\frac{1}{2}(P_1 + P_o)} \cdot \frac{1}{n} \cdot k$$

where: P_o = the initial population within the time period,
P_1 = the population at the end of the time period,
n = the time period in years, and
k = a constant, to convert to percentages.

Two computations were made on the basis of the figures for the three years. With unequal time periods as it was in our case, the average of the populations at the

beginning and the end of the period ($\frac{1}{2}(P_1+P_o)$) were calculated thereby eliminated a possible bias.[73]

In computing the average change within a time period, an assumption was made as to the growth over time. Highland rural population experiences a linear growth, or follows an arithmetic progression, i.e., there is a constant increase per unit of time. It is difficult, however, to hypothesize a set of demographic conditions under which population would increase or decrease by arithmetic progression. Nonetheless, a straight line frequently has been used not only to describe population but also to project population.

Average Annual Migration Rate

The averages of annual migration rates were computed in order to determine whether any appreciable net migration could be detected in each rural settlement, and if so, whether it might be in-migration or net out-migration. The average of annual migration rate, m, for the time period 1970-1978 was computed according to the following formula:[74]

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[73]A general formula to compute the annual increase rate has been frequently applied by using the population at the beginning of the intercensal period. These rates are comparable, however, only when the periods are of equal length. For further elaboration on the meaning and the use of this formula, see, Henry S. Shryock and Jacob S. Siegel, The Methods and Materials of Demography, Vol. 2 (U.S. Bureau of the Census, 1975), p. 387.

[74]This same formula has been applied by Ball in his study about migration in Mexico. John M. Ball, Migration and the Rural Municipio in Mexico (Atlanta: Bureau of Business and Economic Research, Georgia State University, 1971).

$$m = \frac{\frac{(P_{s70} + N.I._{70-78}) - P_{se78}}{P_{s70}}}{n} \cdot k$$

where: P_{s70} = the population of a settlement in 1970,
$N.I._{70-78}$ = the total natural increase of a settlement,
P_{se78} = the population estimate of a settlement,
n = the number of years recorded, and
k = a constant, to convert to percentages.

Within each of the twelve districts considered in this research a number of settlements were chosen. Their average annual migration rates were compared with those annual increase rates already computed for each settlement (Table 1, Figure 3). The objective was to find the best correlations between the annual increase rates and the average annual migration rates. In a somewhat similar research conducted in rural Mexico, Stoltman and Ball found a greater correlation between migration rate and population change than between natural increase and population change.[75]

Using the average annual migration rate as a dependent variable in a multiple regression analysis study, I attempted to ascertain the nature of the migration and grouped the subjects involved according to differential characteristics. On the basis of these data I arrived at the most probable explanation of the phenomenon observed.

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[75]Joseph P. Stoltman and John M. Ball, "Migration and the Local Economic Factor in Rural Mexico," Human Organization, Vol. 30, No. 1 (1971), pp. 47-56.

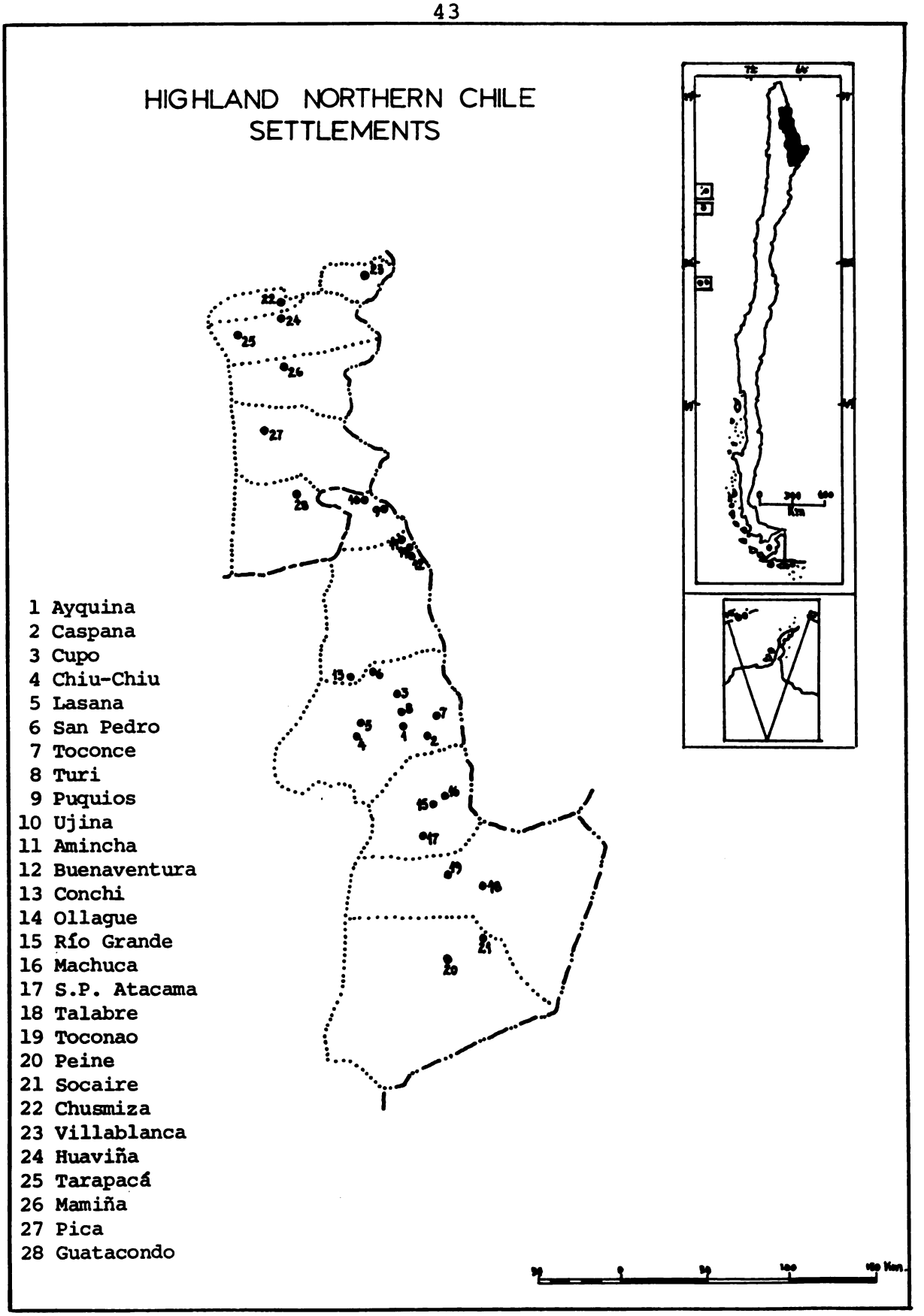
HIGHLAND NORTHERN CHILE
SETTLEMENTS
1 Ayquina
2 Caspana
3 Cupo
4 Chiu-Chiu
5 Lasana
6 San Pedro
7 Toconce
8 Turi
9 Puquios
10 Ujina
11 Amincha
12 Buenaventura
13 Conchi
14 Ollague
15 Río Grande
16 Machuca
17 S.P. Atacama
18 Talabre
19 Toconao
20 Peine
21 Socaire
22 Chusmiza
23 Villablanca
24 Huaviña
25 Tarapacá
26 Mamiña
27 Pica
28 Guatacondo

Figure 3

Data Problem

The basic land units used by the Chilean Institute of Statistics changed among the census periods using in this study. For this reason the original classification of entities or localities has been characterized by misspecifications and erroneous categorizations. Therefore, in order to obtain uniformity among the census categories, some villages were reclassified according to size and region. This assisted in updating census data for the intercensus periods.

A possible source of inaccuracy arises from a discrepancy between the time periods covered to register vital statistics and the time of their occurrence in each village. The author updated vital statistic data from direct field observation.

Structural Migration

In a rural-urban migration system in which the analysis is focused in one subsystem or dimension, the rural component, the study of those migrants who successfully make a movement must be approached from a perspective of structural growth.[76] The lack of a second dimension, the urban

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[76]Here, I refer to the growth process as Boulding has pointed out. The growth process of an aggregate with a complex structure of interrelated parts. Problems of structural growth seem to merge almost imperceptibly into the problems of structural change or development, so that frequently "what grows" is not the over-all size of the structure but the complexity or systematic nature of its parts.

For further details about the principles that control this kind of growth see: K. E. Boulding, "Toward

system, has to be compensated by a thorough analysis of movements and migrant characteristics as well as direction and spatial extension of flows. The meaning of this central analysis is given by the question: What spatial changes does a migrant undergo in the migration process?

Volume and Spatial Effects

The study of direct migration within the rural area has been resolved through the structural analysis of flows. Two matrices of place-of-birth and place-of-residence of migrants that successfully made one or more moves were constructed for 1970 and 1978. A complementary matrix measuring the average number of steps required in moving from place-of-birth to place-of-residence was built to verify the stepwise process.

This structural analysis not only covers volume, direction of movements, and step process but also the relevant characteristics of migrants. Maps of flows and age-sex differentials were plotted to visualize both structure of flows and intrinsic characteristics of migrants.

Differential Migration

Since marriage is one of the most important variables affecting migration, marital status was included in the

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a General Theory of Growth," General Systems, Yearbook of the Society for the Advancement of General Systems Theory, Vol. 1 (1956), pp. 66-75.

analysis.[77] To measure the relationship between it and distance from the urban center, migration of young people who recently married was compared with the migration histories of older married couples. The location of these two migrant groups was mapped and analyzed. For the purpose of this study the variable was divided into two time periods, 1960 and 1970.

Data Problem

The migration data were extracted from questionnaires administered for two time periods: 1970 and 1978. The objectives of the survey were twofold: (a) to gather factual data among a rural population in each settlement not available from census records, and (b) to update the data from the 1970 census (Appendix A).

A classic example of inaccuracy appeared when questionnaires demonstrated typical interviewer biases (behavioral reactions and level of education). In order to preclude this possible source of bias, additional interviews were arranged which used "leave it to the respondents" approach.[78] This method separates the question into a set of separate components which can be answered free from the

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[77]H. S. Gupta, "Marital Migration in the Rural Chhattisgarh," The Geographical Review, Vol. 39, No. 2 (1977), pp. 126-133.

[78]Russell L. Ackoff, Scientific Method: Optimizing Applied Research Decision (New York: John Wiley & Sons, 1962), p. 209.

observer's prejudices. This approach (informal verbal testimony) complemented the previously cited direct approach.

Spatial Mobility

In order to study a migration process affected by physical constraints, economic conditions, and social factors one should employ physical, economic, and social variables. Once the settlements affected by out-migration were detected, the variety of flows, direction of movements and selectivity of participating migrants could be observed. This approach, structural analysis, gave us the spatial dimension of migration based on population characteristics. At this point, further analysis was conducted by using independent variables representing the fundamental philosophical approach: the objective-cognitive dichotomy. The final question can be summarized as follows: What are the variable associations related to the spatial mobility observed?

Factor Analysis and Multiple Regression

The use of regression techniques within the framework of migration analysis has become increasingly important. They provide a method to test variables generated from the literature.[79] However, when migration is evaluated principally on the basis of average figures between time

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[79]Kenneth G. Willis, "Regression Models of Migration," Geografiska Annaler, Vol. 57, Series B (1975), pp. 45-54.

periods, the use of these techniques to predict migration is difficult.

This research has utilized average data classified into twenty-three variables. In order to lessen the complexity, among these, factor analysis was employed to yield a set of orthogonal factors, new independent variables.[80] At this point, a step-wise regression was conducted in order to obtain significant factors. In the statistical process, it proved expedient to reinterpret the results found among the six factors by using a second step-wise regression analysis using twenty-one of the original variables.

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[80]Factor analysis is concerned with defining the patterns of common variation among a set of variables in which the unique variation is ignored.

CHAPTER IV

ANALYSIS OF MIGRATION IN HIGHLAND COMMUNITIES

Population Change and Indirect Migration

Frequently, it is desirable to describe the population change occurring within a region over more than one time period. The absolute change is obtained by subtracting the population at the earlier date from that at the later date. The percent of change is obtained by dividing the absolute change by the population at the earlier date. When the average amount of change is required, a simple division of the total change by the number of years should be sufficient; however, an initial approximation to population data in Chile indicated that the time periods were not of equal duration. With unequal periods and decreasing population the longer period tends to have the highest approximate rate. The elimination of this bias yielded an accurate comparison between the two time periods.

There was a clear tendency for population change in highland northern Chile to decrease between the first intercensus period 1952-1960, and the second intercensus period 1960-1970. The average annual population change between

1952 and 1960 was positive in those districts most remote from Calama and Chuquicamata such as Tarapacá, Mamiña, Pica, and Collaguasi; while those districts in near proximity to the urban centers experienced a negative population change (Figure 4). There was one exception to this general pattern, that of Socaire district, which showed an annual negative change of -4.12 percent. In terms of absolute values, population change in Socaire was greater than in the Calama district, San Pedro de Atacama district, and Toconao district, areas located closer to the urban centers than Socaire.

While the average annual population change between the intercensus period 1952-1960 indicated some positive values, the figure for 1960-1970 show a clear decrease. The twelve districts of this highland region also have experienced a downward trend that ranged between -0.59 and -7.58 percent (Table 2). If we observe the location of these districts according to the average annual population change values, it is possible to note that absolute higher negative values correspond to districts located closer to the urban centers than those with lower negative values (Figure 5). Here again there is an exception. Between the time period 1952-1960 and 1960 and 1970, the district of Collaguasi changed from one of the highest absolute positive population growth rates to one of the highest absolute negative growth rates. These demographic fluctuations are

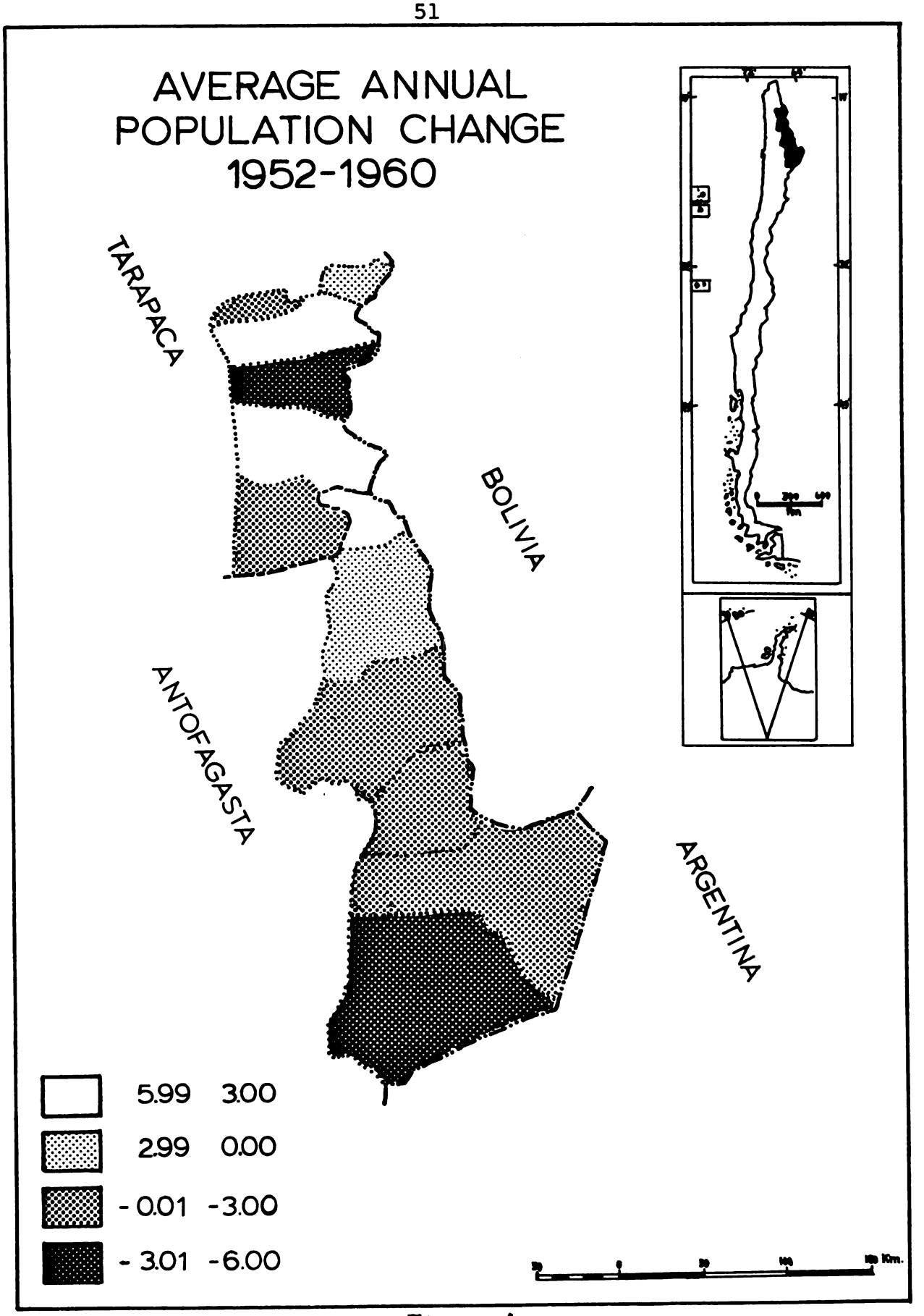
AVERAGE ANNUAL
POPULATION CHANGE
1952-1960
TARAPACA
BOLIVIA
ANTOFAGASTA
ARGENTINA
5.99 3.00
2.99 0.00
- 0.01 -3.00
- 3.01 -6.00
Km.

Figure 4

Table 2.--Average Annual Population Change 1952-1960, 1960-1970.

Districts	Population			Population Change	
	1952	1960	1970	1952-1960	1960-1970
Chusmiza	376	308	170	-2.48	-5.77
Cariquima	528	555	543	+0.62	-0.22
Tarapacá	858	1161	744	+3.75	-4.37
Mamiña	732	558	474	-3.37	-1.62
Pica	1213	1947	1302	+5.80	-3.97
Guatacondo	211	203	170	-0.48	-1.76
Calama*	2052	1784	1251	-1.74	-3.51
Collaguasi	95	140	63	+4.78	-7.58
Ollague	1250	1293	1055	+0.42	-2.02
S.P. Atacama	1208	1131	755	-0.82	-3.98
Toconao	738	693	533	-0.78	-2.61
Socaire	798	572	539	-4.12	-0.59

*The district of Calama includes both Calama and Chuquicamata. Since this study considers rural population, the figures for both cities were not added.

Source: Instituto Nacional de Estadísticas, Chile.

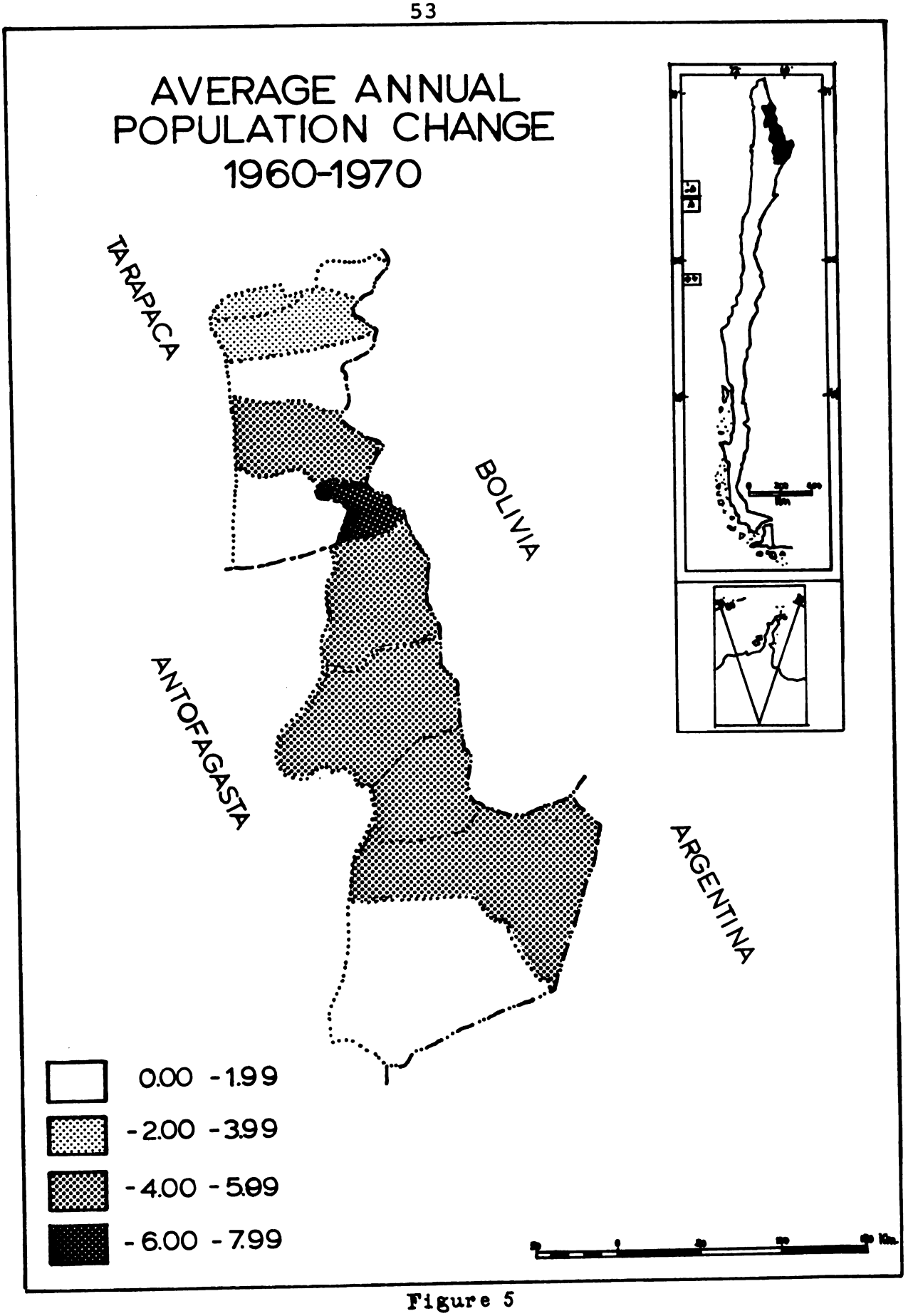
AVERAGE ANNUAL
POPULATION CHANGE
1960-1970
TARAPACA
BOLIVIA
ANTOFAGASTA
ARGENTINA
0.00 - 1.99
- 2.00 - 3.99
- 4.00 - 5.99
- 6.00 - 7.99

Figure 5

primarily a result of market changes in the sulphur mining operations.[81]

The average annual population change estimates for each settlement demonstrates a realistic and precise definition of intercensus variations (Table 3). Between 1952 and 1960 two groups of settlements share the highest positive values of annual change. The first group is comprised of Chusmiza, Tarapacá, and Pica, with 1.17, 4.68, and 6.62 annual percent change respectively. The second group composed of Puquios, Conchi, Lasana, and Chiu-Chiu, indicate average annual population fluctuated between 13.99 and 2.91 percent. The main difference between these two groups is based upon distance among the cities and the influence of one or two of the towns within the group. The group of towns of the Tarapacá region is more removed from Calama-Chuquicamata than the group of settlements associated with the Antofagasta region. Within the cluster of towns in the first group, Pica has the largest population and is the major intervening opportunity. On the contrary, the second group is divided into two subgroups. The first, which is closer to the cities, maintains values which suggest a positive influence of in-migration. The second subgroup represents mining operations and services. Their high average annual population changes confirm the existence of a migratory influence.

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[81]William E. Rudolph, "Sulphur in Chile," The Geographical Review, Vol. 42 (1952), 562-590.

Table 3.--Average Annual Population Change 1952-1960, 1960-1970.

	Entities	1952-1960	1960-1970
1	Ayquina	+0.24	-6.08
2	Caspana	-0.05	+2.00
3	Cupo	-4.41	-7.54
4	Chiu-Chiu	+2.91	-0.33
5	Lasana	+5.56	+0.12
6	San Pedro	+0.67	+4.59
7	Toconce	+1.39	-0.80
8	Turi	-2.01	+0.84
9	Puquios	+13.99	-7.85
10	Ujina	-1.78	+1.42
11	Amincha	+9.08	+3.45
12	Buenaventura	-0.70	-7.63
13	Conchi	+9.05	+3.36
14	Ollague	-4.64	-3.45
15	Río Grande	-1.64	-3.94
16	Machuca	-2.67	-7.39
17	S.P. Atacama	-2.42	-1.00
18	Talabre	-3.24	-3.79
19	Toconao	+0.33	-0.61
20	Peine	-3.45	-0.57
21	Socaire	-2.11	-2.24
22	Chusmiza	+1.17	-4.93
23	Villablanca	-0.91	-0.79
24	Huaviña	-1.04	-1.14
25	Tarapacá	+4.68	-5.38
26	Mamiña	-2.05	-2.28
27	Pica	+6.62	-4.20
28	Guatacondo	-3.02	+0.96

Source: Instituto Nacional de Estadísticas, Chile.

During the 1960-1970 intercensus period the general trend depicts a more radical effect of negative average values of annual population change. By comparing these intercensus figures, it should be noted that only seven settlements show positive values and several are close to 1 percent. Conchi, Amincha, and San Pedro present the highest values (3.36, 3.45, and 4.59 respectively). These three settlements are mining and/or service centers in which agriculture does not play an important role. The influence of the railway that connects Bolivia to Chile might be a contributing factor to the mobility of people within these areas. Furthermore, the construction of a dam in Conchi has attracted workers to this area. However, while some settlements such as Conchi and San Pedro still maintain a high positive annual population change, others within the same area such as Puquios have shifted from high positive values to the absolute lowest. This is attributable to the unstable mining operations seen in these areas. The negative effects have been more generalized for the most remote settlements. As an example, Villablanca and Peine contributed values equal to -0.79 and -0.57 respectively, while an inverse relationship is seen in those settlements at intermediate distances to the city (Ayquina, Cupo, Machuca, and Río Grande) whose annual population change figures for 1960-1970 fluctuated between -7.54 and -4.00 percent.

Only by analyzing the average annual population change for the two time periods it is possible to postulate

a definitive trend due to migration. Although fluctuations might be, in part, due to a natural increase, the other two components of change in the total population, immigration and emigration, most likely exerted a pronounced effect on the population change of the Chilean highland settlements.

To verify the association between population change and migration in each settlement the average annual population change due to migration[82] was compared with the average annual population change between 1970 and 1978 (Table 4 and Figure 6). A simple linear correlation analysis was used to show the extent of association. A correlation of 0.93 (0.1% significance level) was obtained between migration rate and population change inferring that population change statistics do indeed indicate migration among highland rural populations in northern Chile. The coefficient of determination (the amount of variation in one variable that is explained by the variation in another variable) is 0.87. In other words, 87 percent of the variation in population change is explained by migration. Likewise, the positive correlation between the variables allow us to view the migration rate as a crucial factor in explaining population change.

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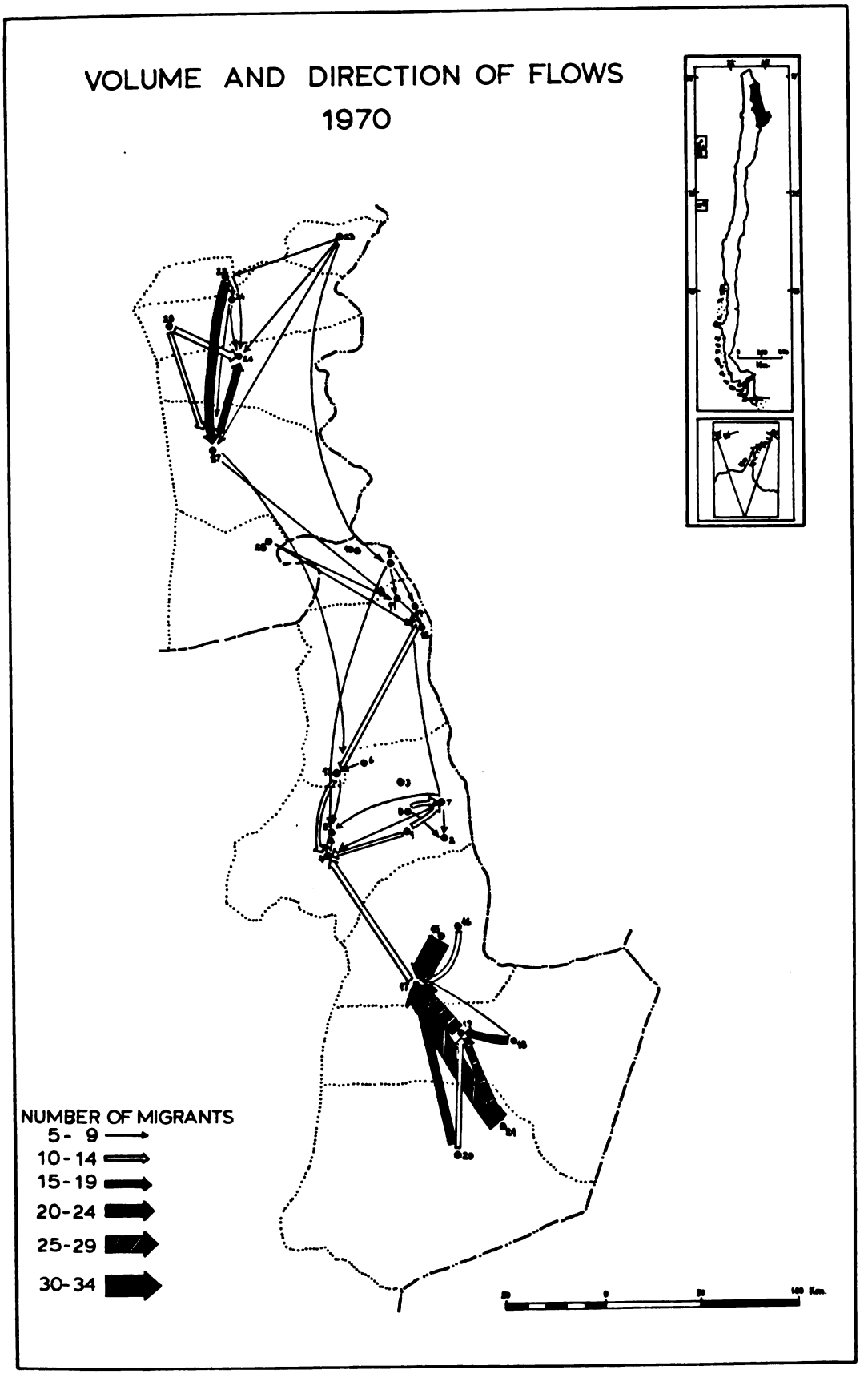
[82]Stoltman and Ball point out that a more realistic label for the average annual net migration rate would probably be "average annual population change due to migration." Joseph P. Stoltman and John M. Ball, "Migration and the Local Economic Factor in Rural Mexico," Human Organization, Journal of the Society for Applied Anthropology, Vol. 30, No. 1 (1971), 47-56.

Table 4.--Average Annual Population Change and Average Annual Net Migration Rate 1970-1978.

Entities	Population Change	Migration Rate
1 Ayquina	-4.47	-5.35
2 Caspana	+1.66	+1.42
3 Cupo	-6.66	-6.57
4 Chiu-Chiu	+2.37	+2.11
5 Lasana	+2.09	+1.75
6 San Pedro	-0.85	-1.37
7 Toconce	+0.88	-0.65
8 Turi	-2.43	-3.22
9 Puquios	-9.90	-7.43
10 Ujina	-0.86	-0.83
11 Amincha	+0.74	+0.51
12 Buenaventura	-0.16	-0.48
13 Conchi	+6.03	+6.62
14 Ollague	-0.21	-0.31
15 Río Grande	-9.33	-7.89
16 Machuca	-10.93	-8.69
17 S.P. Atacama	+3.10	+2.26
18 Talabre	-6.37	-6.25
19 Toconao	+1.36	+0.52
20 Peine	-1.38	-2.04
21 Socaire	-2.92	-3.62
22 Chusmiza	-5.90	-5.90
23 Villablanca	-0.34	-2.06
24 Huaviña	-0.30	-1.82
25 Tarapacá	-5.57	-5.57
26 Mamiña	+0.97	+0.23
27 Pica	+0.90	+0.44
28 Guatacondo	-0.53	-2.18

Source: Instituto Nacional de Estadísticas, Chile. Field work 1970-1978.


VOLUME AND DIRECTION OF FLOWS
1970
NUMBER OF MIGRANTS
5- 9
10-14
15-19
20-24
25-29
30-34

Structural Migration

In order to understand a migration system for a specific place and time period it is pre-supposed that not only is the volume of flow important but the direction of the movements as well. In this context, the process of data disaggregation related to migration has to be based upon the detailed measurement of the steps within a migratory flow, thereby furthering our understanding of the structural changes observed in the context of any migration system through time. Moreover, the analysis, of the step-migration process is understood through the interpretation of the differential characteristics of the migrants.

The analysis of structural migration among highland communities in northern Chile has been divided in two time periods: those which occurred immediately prior to, or during 1970, and those which were observed directly preceeding and including the year 1978. Both cases are part of a unique process characterized by a rural to rural movement.

The migration flows for the time period 1970 are characterized by direct movement toward intermediate towns (Table 5). From the total net in-migration of 772 subjects, 49.30 percent is directed toward intermediate centers of attraction. Six towns maintain a stable pull over the rest of the settlements. Thus, Mamiña and Pica serve as sources of attraction within the rural highland areas of Tarapacá. On the other hand, situated within the influence of the

Table 5.--Place-of-Birth and Place-of-Residence Matrix. Migration Flows, 1970.

Place of Birth \ Place of Res.	Ayquina	Caspana	Cupo	Chiu-Chiu	Lasana	S.Pedro	Toconce	Turi	Puquios	Ujina	Aminche	Buenaven.	Conchi	Ollague	R.Grande	Machuca	S.P.Atacam.	Talabre	Toconao	Peine	Socaire	Chusmiza	Villabl.	Huavina	Tarapaca	Mamina	Pica	Guatacon.		
Ayquina		1	2	10	4	2	12	4			1		3																39	
Caspana	1			2	1		2								2														8	
Cupo	3	4		4	3	3	1	4	1	1	2		3	1															30	
Chiu-Chiu					8																								8	
Lasana				8																									8	
S.Pedro	1	3	1	3	3			3	1	3			8																26	
Toconce	7	8	2	7	5			4					3	8															44	
Turi	3	5	3	4	1		14						3																33	
Puquios	1		1	7	2	3					6	6	5	7															38	
Ujina	1			2	1	3					3	1	2	1															14	
Aminche	1		1	2	3	4			1			9	3	1															25	
Buenaven.	2			3	2	2							13	3															25	
Conchi				12	7																								19	
Ollague	2			4	5	2						2	12																27	
R.Grande		4														4	31												39	
Machuca		3					1								2		14												20	
S.P.Atacam.		1		12	6										2														21	
Talabre																	6		15										21	
Toconao				2	1												23												26	
Peine				2													17	1	14		1								35	
Socaire				2													26	1	19										48	
Chusmiza				3	1								1										2	5	3	7	19		41	
Villabl.				1							6											5		1	1	6	7		27	
Huavina				1	2						3		2									2	1		1	8	6	1	27	
Tarapaca											3		1	1								3	1	1		12	13	4	39	
Mamina											2		1	1								3					15	3	25	
Pica											6		8													18			32	772
Guatacon.				1		1				4	8	6	1	2													4		27	
	22	29	10	92	55	20	30	15	3	8	40	24	69	25	6	4	117	2	48	0	1	13	4	7	5	51	64	8	1544	
																												772		

Antofagasta to Bolivia railway, Amincha and Conchi draw population from the neighboring mining settlements and the smaller villages. Finally, Toconao and San Pedro de Atacama of the southern Calama area, generate a continuous influx of migrants. In contrast, the total net out-migration within the highland communities was of a similar magnitude. On the basis of this figure, Tarapacá, Chusmiza, Puquios, Río Grande, Peine, and Socaire, among others, demonstrated the highest out-migration. If we note the location of these settlements, (Figure 3) it is apparent that the attraction is influenced by short distance moves. The local influence is significant when it is possible to measure this attraction in terms of the percentage of movements within local areas in relation to long distance moves.[83] A 45.30 percent of the total movements are local flows.

With respect to direction, by selecting the greatest flows among settlements, we see a clear tendency toward the intermediate centers. Furthermore, the other villages (Chiu-Chiu and Lasana) indicate an area of attraction that is self-explanatory since they represent the last step needed to reach the city. Being the closest villages to Calama and Chuquicamata and sharing similar functions as the first six intermediate centers mentioned above, the differences among them are based on the intensity of flow or volume of

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[83]Movements within local areas shall be understood to mean migratory flow between the two settlements in the closest proximity to one another.

migration. It is a foregone conclusion that this volume of migrants is not directly proportional to the population of the centers of destination but to their number of functions and distanced to the city (Table 6). Thus, San Pedro de Atacama and Chiu-Chiu demonstrate a greater attraction than their counterparts. However, it should be pointed out that the flow map for 1970 reflects only movements greater than five. The resulting analysis of the 1970 matrix indicates the fundamental importance of small volumes. Here again, the short-distance move dominates. As we will observe around 1978, time period long-distance flows do not appear in a generalized form. Moreover, as the migrants initiated short-distance moves their awareness of other opportunities were progressively broadened. Two variables can support this contention namely, illiteracy and transportation mode. Since 1970, the percentage of illiteracy for those settlements affected by out-migration toward intermediate centers has decreased from 43.6 to 21.7 percent. Accordingly, the importance of the transportation variable has increased in importance thereby augmenting the outflow of information flow about the better economic opportunities.

Migration Flows

At the outset, it might be advisable to ascertain how migrants move among settlements, or what is the relevant itinerary of successive movements. By comparing the average number of steps, up to and including 1970, with those in 1970, the general trend has been marked by a large number

Table 6.--Intermediate Settlements* 1970.

Settlements	Population 1970	Net In-Migration	Distance To Calama Km.	Number of Functions
Mamiña	271	51	402	5
Pica	1074	64	393	10
Amincha	343	40	223	5
Conchi	126	69	82	3
Toconao	425	48	144	5
S.P. Atacama	546	117	103	10
Chiu-Chiu	148	92	38	5
Lasana	164	55	46	4

*"Intermediate settlements" refers to those settlements located between the most rural communities and the cities. They are synonymous to intervening opportunity centers.

Source: Instituto Nacional de Estadísticas, Chile Field Work, 1970.

of steps (Table 7). Furthermore, the absence of long-distance moves, in 1978, was becoming apparent around 1970. These movements were characterized by periodic flows among settlements located near the cities. If we compare the number of steps from one village to another between 1970 and 1978, we see that the migration flows characterized by two, three, and four steps were more prevalent in 1970 than in 1978. In contrast, one step moves were more numerous in 1978 than in 1970.

The analysis of migration flows in 1978 has revealed a small but ever-decreasing influence of the intermediate centers (Figure 7). From the total net in-migration of 677 subjects, 45 percent were attracted to intermediate centers. On the other hand, the short distance movements were less pronounced compared to the migration flow of 1970; however, these types of moves reveal a similar pattern within the study area (Table 8). The real change in the evolution of migration flow between 1970 and 1978 is related to long-distance movements. The first migrants from Villablanca and Huaviña (the most remote points) that reached Chiu-Chiu and Lasana in 1970 followed a course of four steps. An increasing number of migrants were later to travel the same distance in fewer steps, two. This group is comprised largely of family members of the initial group of migrants. If we compare the number of steps, it is clear that a greater number of flows in 1970 required more steps than was the case in 1978 (Table 9). Almost the same effect was

Table 7.--Average Number of Steps 1970.

Place of Birth \ Place of Res.	Ayquina	Caspana	Cupo	Chiu-Chiu	Lasana	S.Pedro	Toconce	Turi	Puquios	Ujina	Aminche	Buenaven.	Conchi	Ollague	R.Grande	Machuca	S.P.Atacam.	Talabre	Toconao	Peine	Socaire	Chuquiza	Villabl.	Huaviña	Tarapacá	Mamiña	Pica	Guatacon.
Ayquina		1	1	1	1	2	1	1			2		2															
Caspana	1			1	2		1								1													
Cupo	1	2		2	2	1	1	1	2	3	3		2	3														
Chiu-Chiu					1																							
Lasana				1																								
S.Pedro	2	2	1	3	2			2	1	2			1															
Toconce	1	2	1	2	3			1					2	2														
Turi	1	2	1	2	2		1						1															
Puquios	2		3	5	4	3					1	1	3	1														
Ujina	2			4	4	3					1	2	3	1														
Aminche	2		2	4	3	3			1			1	2	1														
Buenaven.	2			4	3	3					X		2	1														
Conchi				2	1																							
Ollague	2			4	3	2						1	2															
R.Grande		1														1	2											
Machuca		2					1								1		3											
S.P.Atacam.		2		1	1										1													
Talabre																	2		1									
Toconao				2	3												1											
Peine				3													2	1	1		1							
Socaire				3													2	3	1									
Chuquiza				4	4								2										1	1	2	3	3	
Villabl.				4							2		X									1		1	2	2	3	
Huaviña				4	4						3		3									1	1		1	2	3	3
Tarapacá				X	X						3		4	3								1	1	1		1	2	3
Mamiña				X	X						2		3	2								1					1	2
Pica											1		2	X												1		
Guatacon.				4	X	3				2	2	2	3	1													1	

Steps	N. of Flows
1	67
2	54
3	33
4	13
5	1

X = absent movements in comparison with 1978.

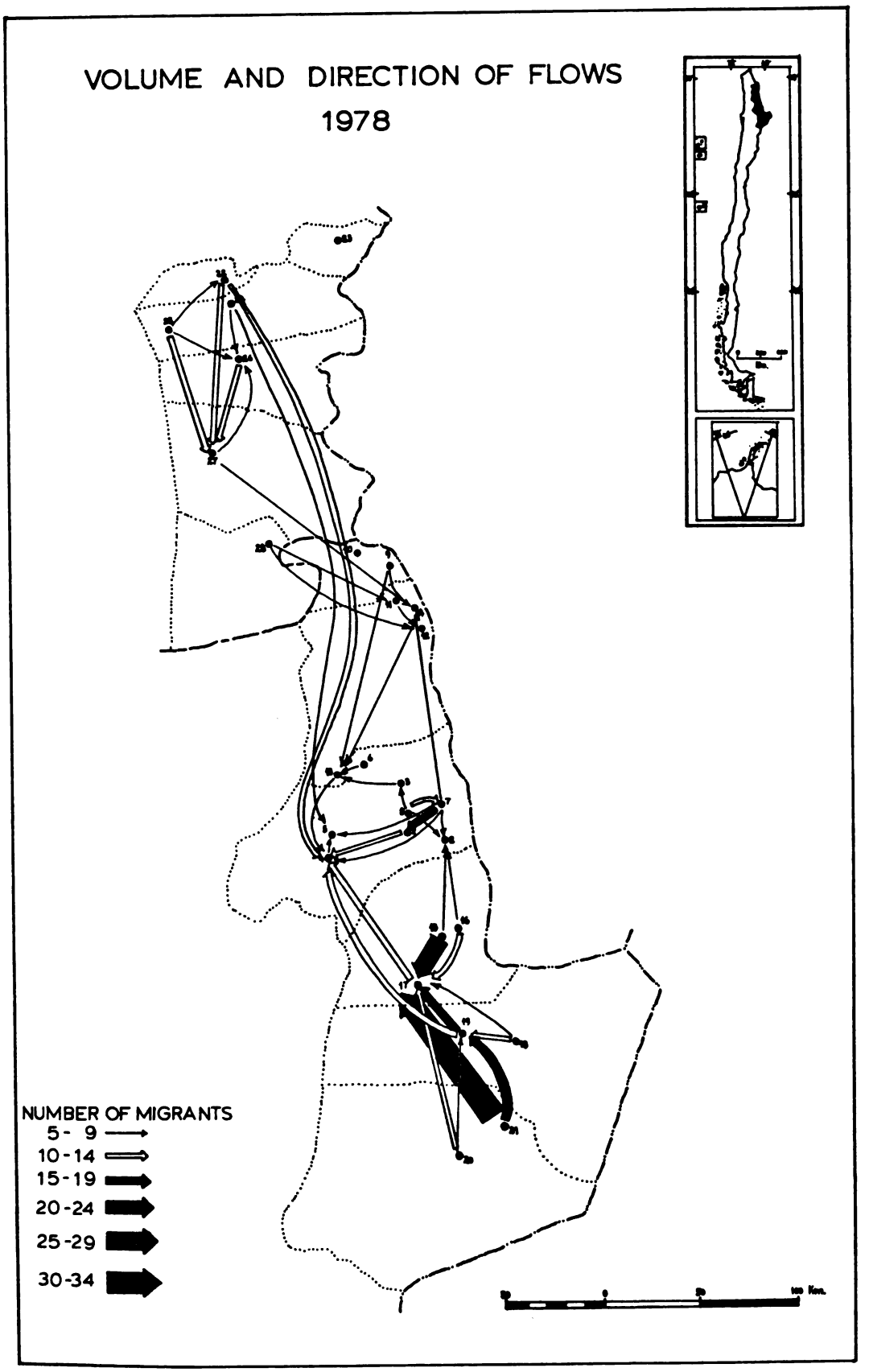
VOLUME AND DIRECTION OF FLOWS
1978
NUMBER OF MIGRANTS
5- 9
10-14
15-19
20-24
25-29
30-34

Table 8.--Place-of-Birth and Place-of-Residence Matrix. Migration Flows, 1978.

Place of Birth \ Place of Res.	Ayquina	Caspana	Cupo	Chiu-Chiu	Lasana	S.Pedro	Toconce	Turi	Puquios	Ujina	Aminche	Buenaven.	Conchi	Ollague	R.Grande	Machuca	S.P.Atacam.	Talabre	Toconao	Peine	Socaire	Chusmiza	Villabl.	Huaviña	Tarapacá	Mamiña	Pica	Guatacon.		
Ayquina		1	3	8	4	2	18	2			1		4																43	
Caspana	2			1	1		3								3														10	
Cupo	4	5		2	4	1	2	3	2	1	3		5	2															34	
Chiu-Chiu					5																								5	
Lasana				4																									4	
S.Pedro	1	3	1	1	2			4	2	4			7																25	
Toconce	3	12	3	6	8			2					4	6															44	
Turi	2	4	5	2	1		10						3																27	
Puquios	1		1	1	2	4					4	3	5	6															27	
Ujina	1			2	1	1					2	1	1	1															10	
Aminche	1		1	1	1	3			1			7	1	1															17	
Buenaven.	2			2	1	2					8		4	1															20	
Conchi				7	3																								10	
Ollague	2			2	1	2							8																15	
R.Grande		8													2	4	27												39	
Machuca		6					1								2		11												20	
S.P.Atacam.		3		3	9												8		11										15	
Talabre																	15												19	
Toconao				11	2												12	2	8		2								28	
Peine				1													31	1	17										25	
Socaire				2																		2	1	4	3	2	12		51	
Chusmiza				13	4								1									4		1	1	3	4		41	
Villabl.				4	3						1		2									3	1		1	6	3	1	24	
Huaviña				3	5						1			1								6	2	1		8	12	1	38	
Tarapacá				2	3						2			1								2					13	1	22	
Mamiña				2	2						1			1												8			17	
Pica										4	1	6		8													2		24	677
Guatacon.				1	1						8			2																
	19	42	14	81	63	15	34	11	5	9	32	17	45	29	5	4	104	3	36	0	2	15	5	6	5	27	46	3	1344	

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Table 9.--Average Number of Steps 1978.

Place of Birth \ Place of Res.	Ayquina	Caspana	Cupo	Chiu-Chiu	Lasana	S.Pedro	Toconce	Turi	Puquios	Ujina	Aminche	Buenaven.	Conchi	Ollague	R.Grande	Machuca	S.P.Atacam.	Talabre	Toconao	Peine	Socaire	Chusmiza	Villabl.	Huaviña	Tarapacá	Mamiña	Pica	Guatacon.
Ayquina		1	1	1	1	1	1	1			1		1															
Caspana	1			1	1		1								1													
Cupo	1	1		1	1	1	1	1	2	3	2		2	2														
Chiu-Chiu				1																								
Lasana			1																									
S.Pedro	1	2	1	1	1			1	2	3			1															
Toconce	1	1	1	1	1			1					1	2														
Turi	1	1	1	1	1		1						1															
Puquios	2		2	3	2	2					1	1	2	1														
Ujina	2			3	3	2					1	1	3	1														
Aminche	2		2	3	2	2			1			1	1	1														
Buenaven.	2			2	3	2					1		2	1														
Conchi				1	1																							
Ollague	2			1	1	1						X	1															
R.Grande		1														1	1											
Machuca		2					1								1		2											
S.P.Atacam.		1		1	1												2		1									
Talabre																	1											
Toconao				1	2												1	1	1		1							
Peine				2													1	1	1									
Socaire				2													2						1		1			
Chusmiza				2	2								2									1		1	2	2	3	
Villabl.				2	2						1		2									1	1		1	2	2	3
Huaviña				2	2						1		X									1	1	1		1	1	3
Tarapacá				2	2						2		X	3								1					1	2
Mamiña				2	2						1		X	2												1		
Pica											1		X	1													1	
Guatacon.				4	4	X				2	1	2	X	1														

Steps	No of Flows
1	103
2	51
3	12
4	2
5	0

X = absent movements in comparison with 1970.

felt in the most remote southern villages of this study area. Peine and Socaire experienced increasing out-migration that was not significant in terms of volume but was important when the distance traveled is considered. Apparently, these outflows were less pronounced in terms of distance than in the case of those from the most remote northern area; nevertheless, they were not local movements as was clearly seen in 1970. In fact, migration from these distant towns, as was the case in the far northern areas, indicates the obvious influence of both better roads and improved privately owned transportation. These conditions, initially generated by both the media and "word of mouth," increased reports of opportunities within the city areas and surrounding towns. However, it is important to point out that the migration pattern of the southern Calama area (San Pedro de Atacama, Toconao, Socaire, and Peine) was more stable in terms of short distance migration than the northern study area (Chusmiza, Villablanca, Huaviña, Tarapacá, Mamiña, and Pica). Both San Pedro de Atacama and Toconao played increasingly stronger roles as intervening opportunities than did the towns of Pica and Mamiña. In light of this fact, the southern study area presents a more compact migration field than the northern area. As seen in the latter analysis, the attraction of the secondary towns as intervening opportunities increased in direct proportion to the distance from Calama and Chuquicamata.

Of the total 1544 in-migrants registered in 1970 and 1978, approximately 288 migrant family heads were interviewed for their migration histories. For this research, it was crucial to determine the migrants' places of residence prior to their most recent moves. The data were divided into two categories according to the year of migration: (a) those who moved before 1970, and (b) those who moved between 1970 and 1978. For each of highland's twenty-eight communities, the number of migrant family heads were recorded and their migration histories classified according to the number of steps completed before reaching the settlements. The interviews of 1970 demonstrated that distance has had a positive association with stage-migration process. As the distance from the city increased, the migrants reported a greater number of steps before reaching villages close to the cities than did the migrants whose places of birth fell within a shorter distance (Table 7 and 9). Moreover, migrants from the intervening opportunity villages were replaced by new migrants from the smaller remote settlements and communities located at higher altitudes (Table 5 and 8).

Between 1970 and 1978, as the relative accessibility to the intervening opportunity centers and towns close to Calama and Chuquicamata improved, the stage migration process progressively decreased. Long-distance migrants reduced both the number of steps and time required to reach villages near those cities. The replacement effect, which was an

important characteristic in the intervening opportunity villages in 1970, had decreased by 1978.

Migration by Sex and Age

There is a general agreement in the Latin American migration literature that, just as in other parts of the world, migration is highly selective with regard to age and sex. This research analyses data within a time period of sufficient length (1970-1978) to obtain a meaningful comparison between what is occurring at present with that of ten years ago. With the exception of those males between 25-29 years who in 1978 conducted long-distance moves, middle-aged females (30-34 years of age) exceeded the other age groups as principal migrants (Table 11). This table also shows the movements by sex with respect to short- or long-distance migration. In this regard, in 1970, short-distance migration was sufficiently more important for females than for males (56.1%); whereas long-distance migration proved more predominant in 1978 with 58.2 percent of male migrants. It is predominantly the people of median age group (30-34) who are more prone to move than the older people, hence the process shifts toward younger ages (25-29 and 18-24). In 1978, males between the ages 25-29 began to undertake more long-distance moves. However, there are some figures corresponding to the ages 45-54 that might suggest return migration or short-distance movements. These changes in residence may occur when migrants seek out health care

Table 10.--Percentage Distribution of Age by Short-Distance or Long-Distance and Sex, 1970, 1978.

Age Group	Migrant by Distance and Age							
	1970				1978			
	Short-Dist.		Long-Dist.		Short-Dist.		Long-Dist.	
	Male	Female	Male	Female	Male	Female	Male	Female
18 - 24	12.3	16.1	14.2	13.3	13.5	15.1	14.5	12.5
25 - 29	8.0	11.1	10.6	9.0	11.5	12.5	17.8	8.1
30 - 34	13.5	19.6	15.5	14.6	12.1	16.5	16.1	14.3
35 - 44	7.0	8.0	11.0	8.5	6.0	7.5	7.0	5.5
Total Aged 18-44 Years	40.8	54.7	51.3	45.4	43.1	51.6	55.4	40.4
45 - 54	2.1	1.1	1.0	0.9	1.7	1.3	2.0	1.0
55 - 64	1.0	0.3	0.8	0.6	1.0	1.0	0.8	0.4
65 & over	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
Total Aged 45 and Over	3.1	1.4	1.8	1.5	2.7	2.6	2.8	1.4
Total	43.9	56.1	53.1	46.9	45.8	54.2	58.2	41.8
Grand Total	100.0		100.0		100.0		100.0	
Number of Cases	394		378		281		395	

Source: Field work, 1970, 1978.

facilities or attempt to strengthen family ties within those areas dominated by intervening opportunity centers (Figure 8).

Migration by Marital Status

Since young married couples generally do not wish to separate, they usually migrate together. And, to increase their possibility to obtain employment, they usually migrate to nearby areas for which they have reliable reports of economics opportunities. On the other hand, for those older married workers (those married around 1960), the migration pattern is rather complex. One group has moved from the most remote northern communities toward towns such as Chiu-Chiu and Lasana. The second group initiated short-distance moves to both Toconao and San Pedro de Atacama from the most remote southern communities such as Socaire and Peine.

Of the entire group of older married (1960) inmigrants living in the intervening opportunity towns, more than 40 percent were encountered in Chiu-Chiu and Lasana; whereas the percentage decreased considerably as the distance from these two villages increased in the direction of the most remote centers. In the same context, the difference in number of older married males and females migrants is evidenced between agricultural towns and mining towns (Mamiña, Pica, and Amincha-Conchi, respectively). Younger married (1970) inmigrants showed the most positive correlation to

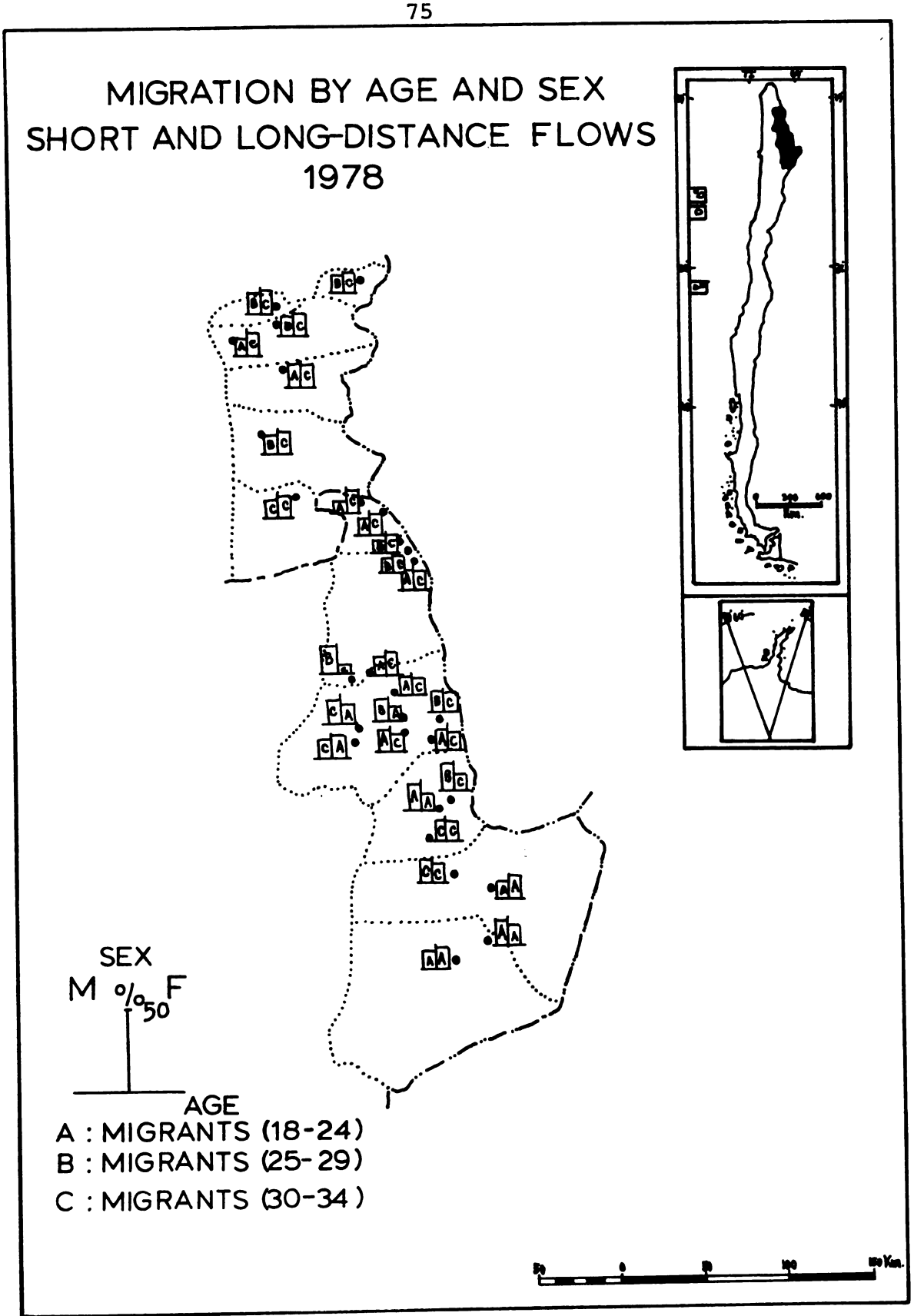
MIGRATION BY AGE AND SEX
SHORT AND LONG-DISTANCE FLOWS
1978
SEX
M %50 F
AGE
A : MIGRANTS (18-24)
B : MIGRANTS (25-29)
C : MIGRANTS (30-34)

Figure 8

distance among the intervening opportunity centers. The relative attraction of the two most important towns, Pica and San Pedro de Atacama, is demonstrated in that more than 50 percent of the number is constituted by young married persons of both sexes (Table 12). This phenomenon must be interpreted, then, as a dual process: migration toward intervening opportunity centers and migration to towns closer to the cities. Within the intervening opportunity locations (Pica and Mamiña, Toconao and San Pedro de Atacama) the highest number of male migrants were those married around 1970. Female migrants were characterized by marriage of longer duration (before or in 1960). The latter group, in which short-distance movements predominated, is associated with repeatedly short-distance moves. To obtain better opportunities as miners in sulphur mines, as share-croppers in villages close to Calama, or as unskilled workers in railway stations, these married people of the same age had left their wives behind in their home towns or in intervening opportunity centers.

A new trend begins to take shape for those migrants who returned to their places of origin. They took their families with them to initiate a new movement toward towns closer to the city than their original villages. Chiu-Chiu and Lasana have received new migrants from Huaviña and Chusmiza in 1978. This group is comprised of older couples and their children ranging from 10 to 14 years of age. The wives remained in Mamiña or Pica while their husbands worked

Table 11.--Migration by Marital Status 1960, 1970.

Intervening Opportunity Centers	In-Migrants Married in 1960		In-Migrants Married in 1970	
	Male	Female	Male	Female
Mamiña	4.0	13.0	3.0	6.5
Pica	5.5	14.5	18.0	26.0
Amincha	6.6	2.0	1.5	0.0
Conchi	19.5	0.5	12.0	0.0
Toconao	12.0	11.3	18.5	18.0
S.P. Atacama	9.9	14.5	25.0	25.5
Chiu-Chiu	24.0	23.2	12.0	14.0
Lasana	18.5	21.0	10.0	10.0
TOTAL	100.0	100.0	100.0	100.0

Source: Field work, 1970.

in the mines. At the later date, the entire family then moved to agriculturally prosperous areas.

In conclusion, migration of couples or families consisted of a multi-staged process. First, young couples moved to intervening opportunity centers in short-distance flows. Thereafter, males left their wives and children behind for short periods (4 or 5 months) while working in the mines. Finally, their families joined them in the new setting to complete the family migration (Figure 9).

Spatial Mobility

I have pointed out that the phiolosophical approach to northern Chilean migration phenomenon reflects the objective/cognitive dichotomy.[84] This position has been determined by the structure of needs among the migrants and the spatial range of the study. On the one hand, the mobility decisions are associated first with needs for survival and safety, and secondly, to advance oneself socio-economically. At the same time, periodic migration characteristic of short-distance moves, have begun to shift toward longer distance movements. Furthermore, internal migration in northern Chile is bringing about a change in migrant occupations. Former agriculturalists leave their

[84]The objective/cognitive dichotomy reflects the rational-man/satisficer dichotomy. According to the assumption of economic rationality a migrant selects the most beneficial potential destination available. The satisficer assumption is one of bounded rationality, which suggests finding a course of action that is good enough for the situation as the migrant comprehends it.

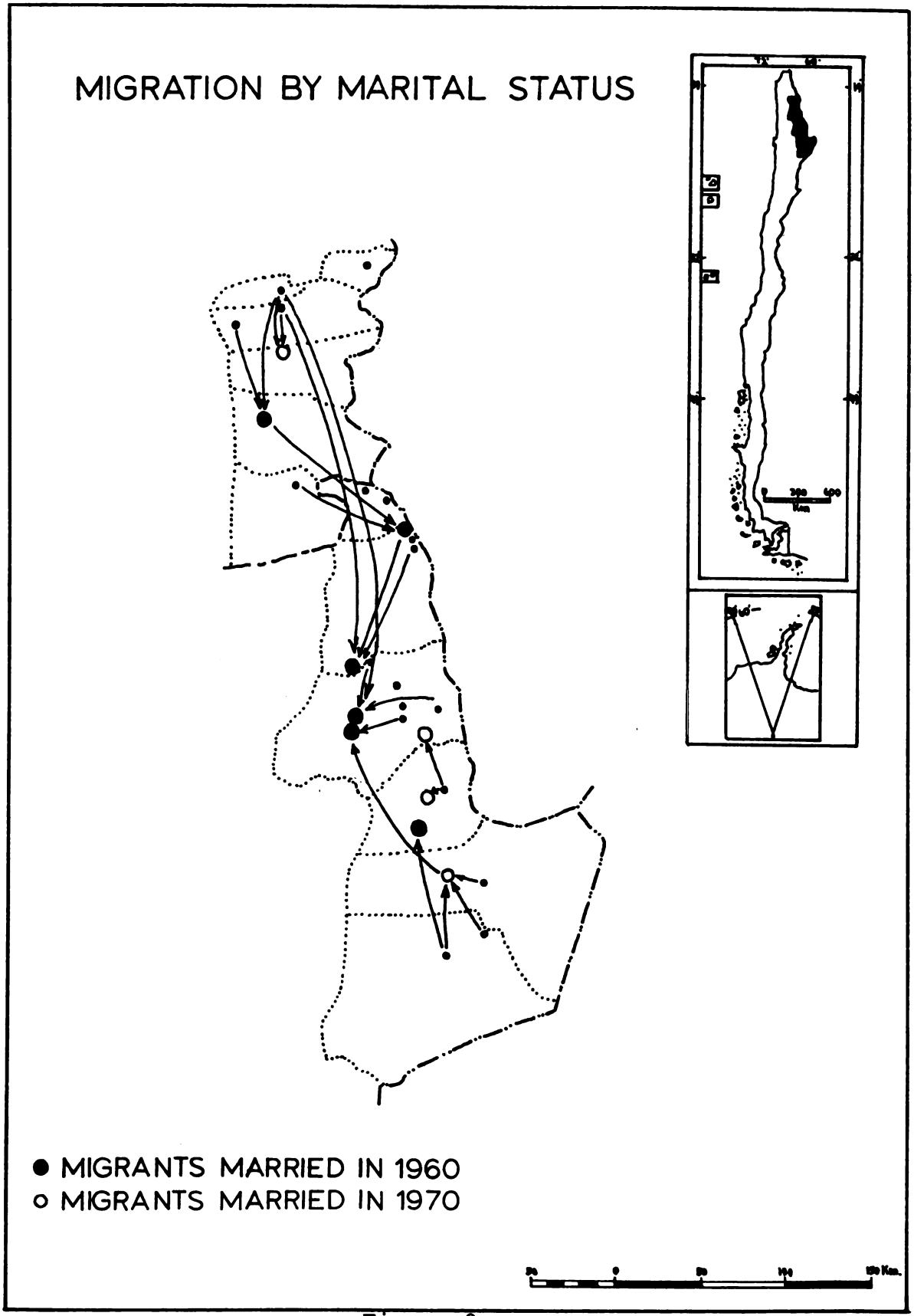
MIGRATION BY MARITAL STATUS
● MIGRANTS MARRIED IN 1960
o MIGRANTS MARRIED IN 1970

Figure 9

their farms to take up work in one of the mining communities of the region.

Based on the objective/cognitive dichotomy, twenty-two variables were selected which represent both socio-economic and physical characteristics in the study area (Appendix B). The data were obtained for two dates, 1970 and 1978. In order to obtain an easier manipulation of the variables, data from seventeen variables were averaged for the 1970-1978 time period. The original labels of these variables were as follows:

1. Labor force rate
2. Index of market volume
3. Mobility coefficient
4. Illiteracy rate
5. Uninhabited houses rate
6. Average hours worked per day
7. Percentage of return migrants
8. Percentage of active population in agriculture
9. Percentage of active population in mining
10. Percentage of active population in small factories
11. Percentage of active population in services
12. Percentage of local movements
13. Percentage of districtal movements
14. Percentage of communal movements
15. Percentage of movements to the city
16. Travel time
17. Number of trucks (main transportation mode).

In addition, five other variables were considered, and from these only two were recorded in 1970: non-owner operator rate, and mean farm size, and one for 1978: number of services. The last two are absolute values: travel distance (Km), and altitude (meters above sea level). The dependent variable was computed from the average annual migration rate between 1970 and 1978.

It has been established under the first hypothesis that, in time, the stepwise or stage migration process breaks down and becomes a more direct rural to urban movement. Operationally, this assumption has been expanded by postulating that there is a distortion in the distance-decay function, that long-distance moves may be facilitated by information flow accompanying the return migrants, and that the role of intervening opportunities might tend to decrease in time as a migrant's awareness space increases. Under this general assumption and associated operational statements, the structural analysis has revealed nothing new and has tended to confirm these migration trends. In addition, this analysis has identified the associations between long-distance migration, the level of information, changes in the structure of flows (from migration with replacement to long-distance moves), and improvements in both roads and transportation modes. Furthermore, the structural analysis found an association between intervening opportunity centers and attraction of labor force via short-distance moves. It has to be kept in mind that the volume of migrants is directly proportional to the number of functions (services) within the intermediate centers and the distance to the cities, Calama and Chuquicamata, which also act as centers of attraction for the migrant labor force.

To verify the associations cited, the set of twenty-two variables was subjected to factor analysis in order to observe the independent variation within the set. As a

result, six factors with eigenvalues greater than 1.00 account for 82.0 percent of the total variance. However, the communality of ACTIVAGR exceeded 1.0 after six iterations.

Six orthogonal factors were extracted and rotated using varimax rotation.[85] By observing the loadings in these factors (Table 12), it was possible to group the underlying elements that, in order to facilitate the analysis, were descriptively labeled as follows:

Factor 1: Labor Force
Factor 2: Communal movements and distance
Factor 3: Primary activities and environmental constraint
Factor 4: Mobility and level of information
Factor 5: Intervening opportunity effects
Factor 6: Movements to the city.

The spatial distribution of the factor scores (Table 13) proves useful in the analysis (Figure 10 through Figure 15).

Factor scores for the first factor showed that those settlements which had high scores gave indications of a high labor force (LABORF), high number of work hours (WORKHOUR), and a very low percentages of uninhabited houses (HOUSES). Migrants from these same towns showed very little movement within the desert (DISMOV). Conchi, Amincha, Chiu-Chiu, and Lasana had the highest scores. This factor is labelled Labor Force (Figure 10).

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[85]Varimax rotation tries to minimize the number of variables that go highly on a given factor.

Table 12.--Orthogonal Factors and Loadings.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
LABORF	.90333	-.22992	.09390	-.06264	.03496	.10863
HOUSES	-.62185	-.10662	.12559	-.00482	-.11639	-.01442
NONNOWN	.09273	-.07360	-.75972	-.15235	-.22911	.26121
RETURNMI	.08021	.38996	-.12786	.13001	.58335	.46724
ACTIVAGR	-.29066	-.00551	-.77434	-.56225	.02068	-.03953
ACTIVMIN	.14690	-.00767	.70033	-.13911	-.15978	-.04571
ACTIVFAC	.03943	.16167	-.03074	.06402	.77630	.17437
ACTIVSER	.22478	-.01010	.33163	.78301	.03454	.03465
LOCMOV	-.13712	-.72512	.22850	-.03574	-.31224	-.27871
DISTMOV	-.61488	.00853	.26283	-.22176	.14798	-.15981
COMMOV	.28243	.84675	-.16825	.02669	.04520	-.19193
CITYMOV	.44190	.07485	-.35430	.21948	.15267	.73936
AGRECO	.42378	-.10791	-.41542	.06745	.22971	.09875
ALTITUDE	-.27924	-.28413	.61672	-.05359	-.35172	-.05547
TRAVTI	-.26786	.88316	.19570	-.02905	.06869	.07747
MOBILITY	-.07256	.19258	-.14421	.56354	.19986	.51189
WORKHOUSE	.85119	.02476	.29373	.31390	.09449	-.06436
SERVICNU	.59059	.06462	.06438	.39711	.51153	-.13516
NTRUCKS	.49937	.02455	-.23373	.33864	.66121	-.20569
TRAVDI	-.22868	.92410	.10534	.07026	.05920	.09861
MARKET	.68383	-.09843	.25549	.33109	.24824	.22060
ILLITER	-.26638	-.03464	.27198	-.75026	-.26551	-.16757

Table 13.--Rural Settlements and Factor Scores.

	1	2	3	4	5	6
1	.3464	-.3965	-.9766	-.6236	-1.0784	.0824
2	.4752	-.6316	-.8560	-1.5205	.3333	-2.1659
3	-1.9587	-1.4214	-.6618	.2551	.2392	-1.2343
4	1.2510	-1.4263	-1.3478	.1387	-.3306	1.1814
5	1.4696	-.9413	-3.8301	-.0287	-.7953	1.2735
6	-.6080	-.4622	-1.2916	1.0751	-1.2224	.1295
7	1.5951	-.0131	3.2335	.4778	-1.1598	.0414
8	-.3683	-.8339	1.1206	-.0919	-.3133	-.1870
9	-2.8209	-.4976	-4.2006	1.0852	.3351	-1.8492
10	-.2321	-.2605	3.5454	2.1328	-.3515	-.3587
11	1.7938	.4122	-.2496	-1.6206	-.8555	-1.9019
12	.0847	-.3374	5.3680	-.1250	-.2960	1.7222
13	2.3451	.1519	.6313	1.1065	-1.2190	.6498
14	.2352	-.4980	4.7259	2.0813	-.1348	1.1414
15	-1.0275	-.6432	-.1631	-.5342	.5733	-.5101
16	-.7035	-.4156	-.4789	-1.3772	-.1275	-.6242
17	.8484	-.7881	-1.4172	.4854	2.2556	-.7508
18	-1.6171	-.9472	-1.4158	-1.2564	.3823	-1.4919
19	-.4302	-.8979	.9846	.1458	2.8440	1.4045
20	-1.8545	-.8863	-3.7457	-1.7377	1.9993	-1.3278
21	1.0396	.3574	2.3823	-.1168	-.9557	2.6250
22	1.1737	2.2842	2.9412	.8121	-.9462	3.7179
23	-.2992	1.6184	.4456	-.7962	-.4876	.9145
24	-.5088	1.5771	-.6555	-.9613	-.1925	.1193
25	-1.1441	1.5307	-1.8965	-.0763	-.1608	.0505
26	-.4985	1.2652	-1.3133	1.1831	-.1064	-.9314
27	1.0299	1.7156	-1.0585	.8968	2.4849	-2.0479
28	.2667	1.3381	-.5016	-1.1291	-.6026	.1340

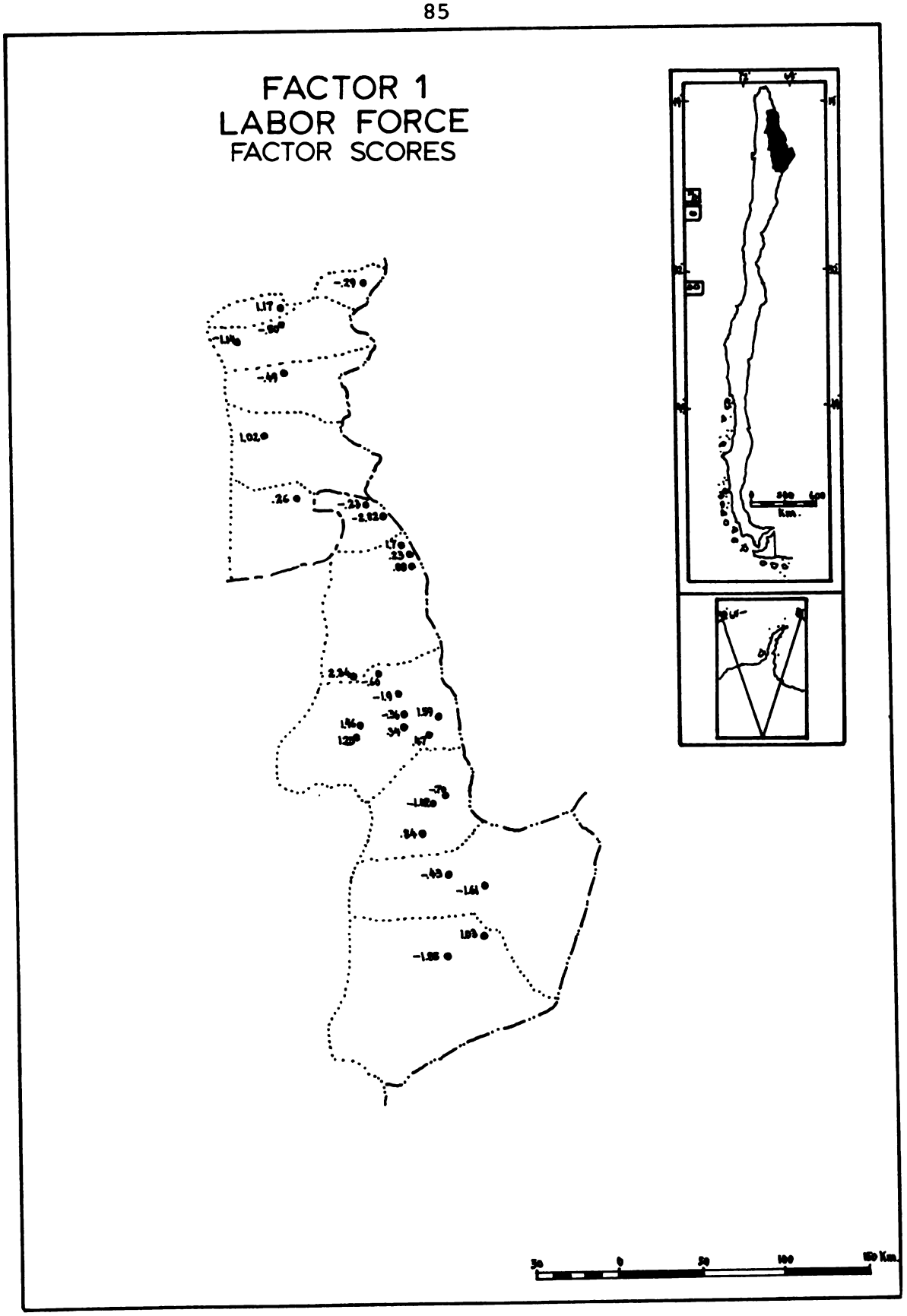

Figure 10

The second factor showed the highest factor loadings in communal movements, travel time, and travel distance. Factor scores indicate that those settlements located at the greater distances from the cities were highly correlated with high communal movements. These most remote northern settlements yielded the highest positive scores (Figure 11).

The highest factor loadings on factor 3 were seen in the non-owner operator rate (NONOWN), the active population engaged in agriculture (ACTIVGR), the active population engaged in mining (ACTIVMIN), and altitude (ALTITUDE). High positive scores are found in the most remote areas as well as at the highest altitudes of the mountain range. Since this factor consists of variables suggesting the primary activities linked to certain physical conditions (sulphur mines around volcano areas, agriculture with large amount of water) and, since the scores are most significant at higher altitudes, it was labeled "the primary activities and environmental constraint" (Figure 12).

The fourth dimension, labeled "mobility and level of information," is comprised of the active population in services (ACTIVSER), a mobility coefficient (MOBILITY), and illiteracy rate (ILLITER). High positive values were found along the railway routes leading to the mining sites and Conchi. On the other hand, negative scores indicate no clear or defined pattern (Figure 13).

Loading highest on factor five were the return migrants (RETURMI), the active population in small factories

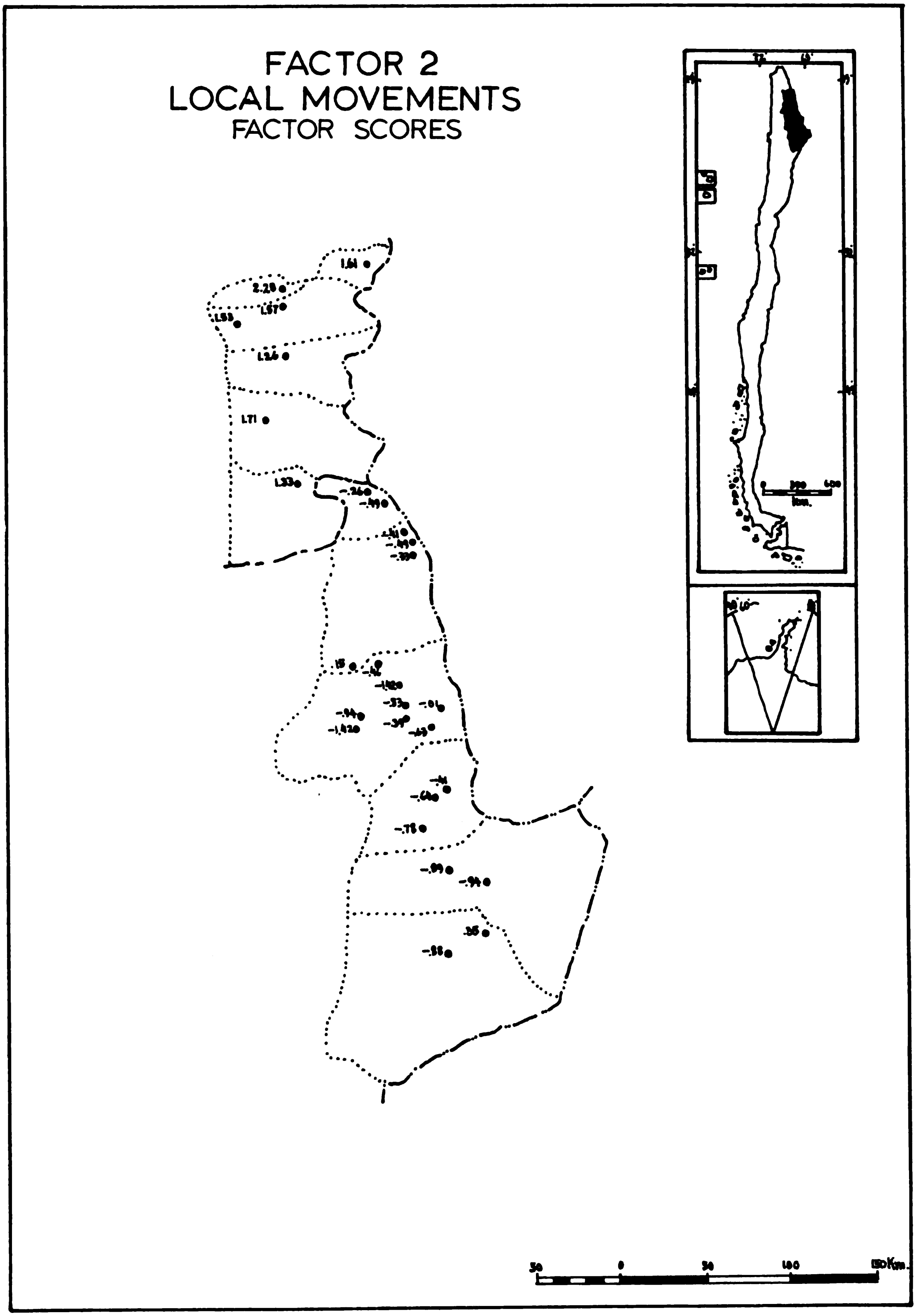

Figure 11

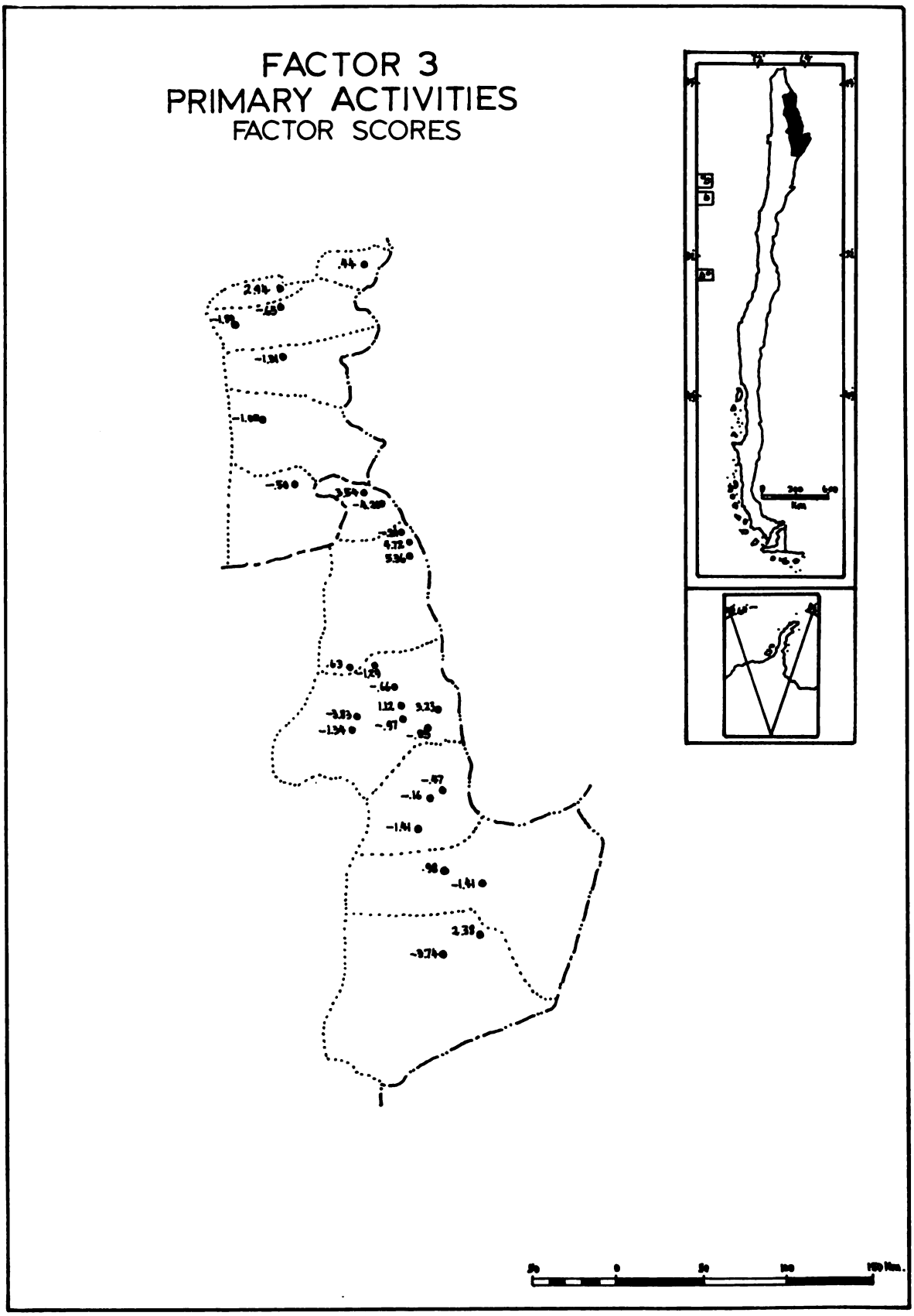

Figure 12

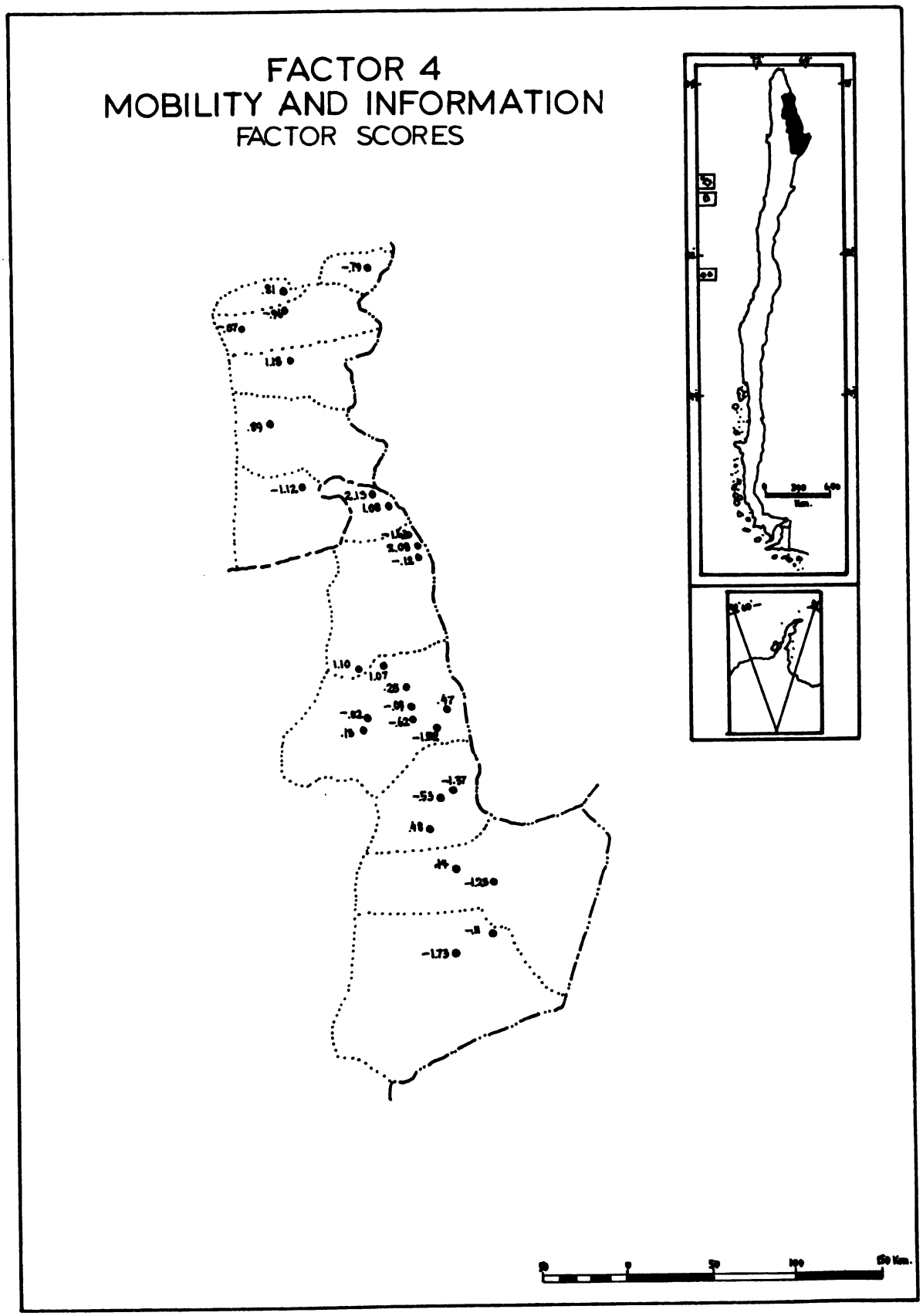

Figure 13

(ACTIVFAC), and the number of trucks (NTRUCKS). The highest scores were found in those settlements considered to be the intervening opportunity centers most distant from the city with the exception of Lasana and Chiu-Chiu, whose loading level where negative and low. For these reasons, this factor has been labeled "the intervening opportunities effects" (Figure 14).

The highest loading on factor 6 was movement to the cities (CITYMOV). The highest positive scores were assigned to Chiu-Chiu, Lasana, Toconao, Socaire, and Ollague. The lowest scores were located around the intervening opportunity centers. This factor was labeled according to the highest loading: "movements to the city" (Figure 15).

One of the most revealing results obtained from this partial analysis is related to the role of intervening opportunity centers in the migration process. These centers attract migrants seeking employment from nearby rural areas. The influence of these intermediate rural centers is expressed in three variables: return migrants, active population in small factories, and number of trucks (the main transportation mode within the rural area). The potential importance of this finding lies in the attraction of people from urban areas back to rural areas and the indirect control of rural migration toward urban areas. It has been stated that the influence of these intermediate settlements is expressed in terms of both the highest return migration and the highest percentage of active population in small factories. Therefore,

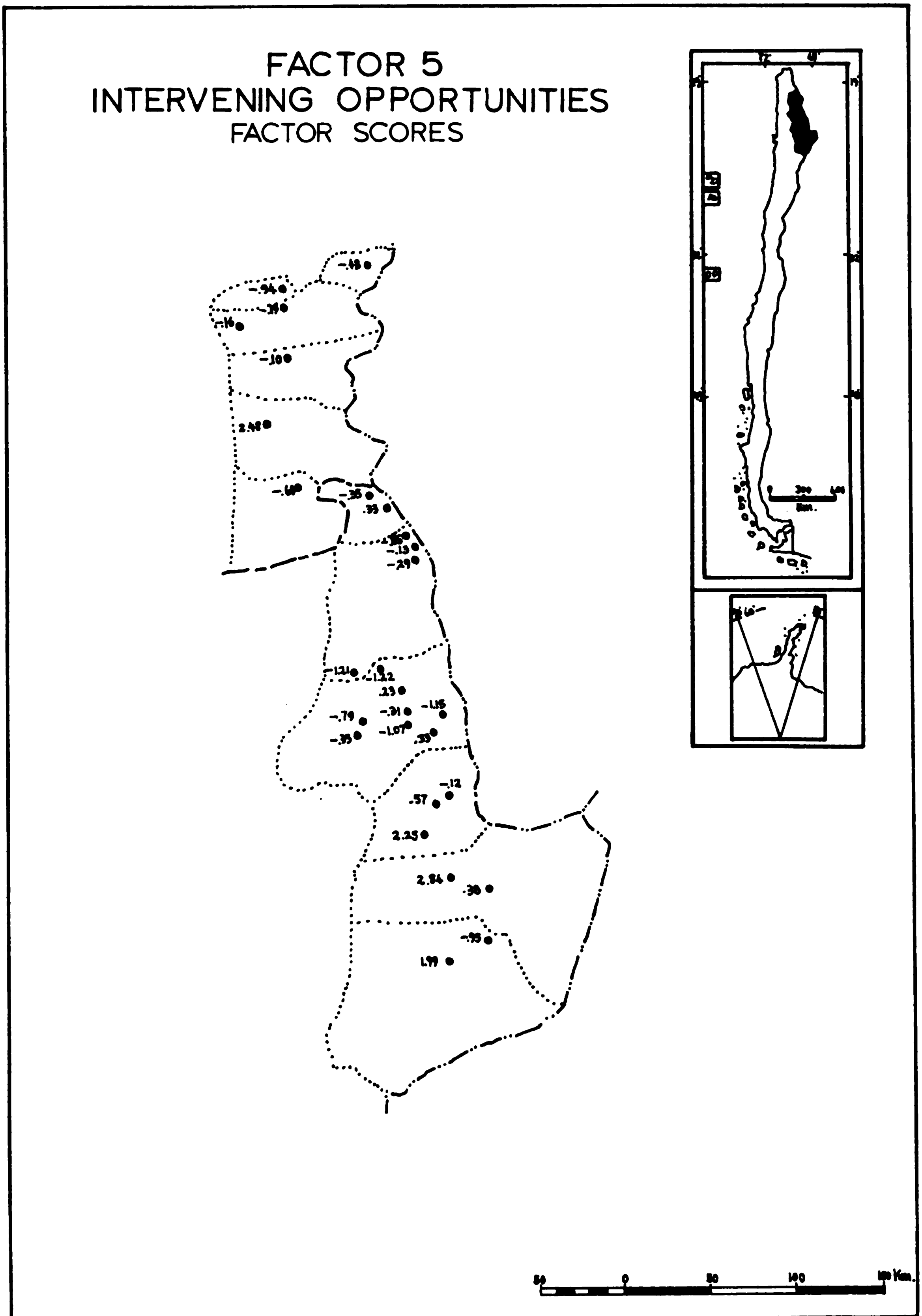

Figure 14

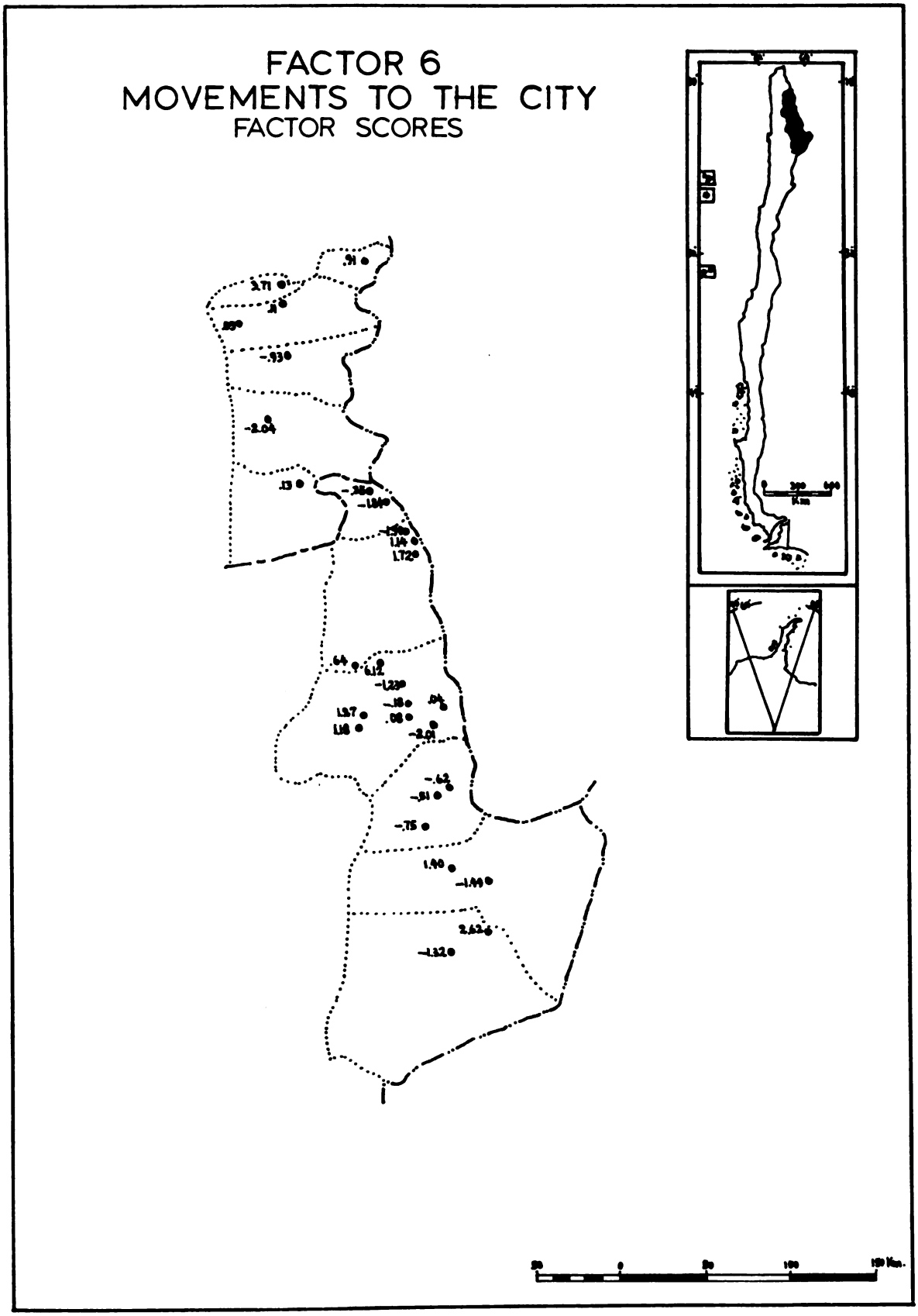

Figure 15

one of the possible solutions for curtailing rural to urban migration might be the reinforcement of these small factories within the intermediate settlements. Since the nature of activities in these small factories is primarily agricultural, their expansion and perhaps their extension toward other settlements, will reduce an already increasing migration toward urban areas. On the other hand, an increase in truck transportation will not serve to increase rural-urban migration but rather to create contacts between complementary areas (markets in urban areas, and small industrial sector based on agricultural production in rural areas).

After obtaining six orthogonal factors a multiple regression analysis was performed with the average annual migration rate (MIGRAT) as the dependent variable having six factor score vectors as the independent variables. By using stepwise process the six factors entered as follows: (1) Labor Force (FAC 1), (2) Communal Movements and Distance (FAC 2), (3) Intervening Opportunity Effects (FAC 5), (4) Mobility and Level of Information (FAC 4), (5) Primary Activities and Environmental Constraint (FAC 3), and (6) Movements to the City (FAC 6). Multiple regression analysis demonstrated that only the first of the factors (FAC 1) was significant. If we accept a 5 percent margin of error (95% confidence level), this factor presents an alpha (α) value smaller than 0.005. However, if we carry the operation further, the second factor entered in the stepwise process showed a F significance equal to 0.233 which indicates an

insignificant factor similar to the remaining factors. The b value for the significant factor was 2.30 and the constant (a) -2.08 (Table 14). From this result it is evident that the most important composite variable is Labor Force (FAC 1). It might be logical to infer a pronounced association between migration and labor force characteristics and that, in fact, migration is related to the economic conditions within the rural area, specifically, within the intervening opportunity centers as intermediate settlements between the most remote rural communities and the cities. It must be kept in mind that Labor Force (FAC 1) is comprised not only of the labor force as a variable with highest loading (+0.90) but also of two other variables with high loadings (average hours worked per day, and market volume). It should be acceptable to extend the association of migration to these two variables.

It has been postulated that the volume of migrants is directly proportional to the number of functions (services) within the intermediate centers including those rural centers close to Calama and Chuquicamata. These centers have the highest averages of working hours and the highest indices of market volume (regional market). Therefore, it is possible to assume an association between labor force and migration by considering the importance of the latter two variables. All of the variables are associated to the migration flows which first developed toward the intervening

Table 14.--Stepwise Multiple Regression With Six Orthogonal Factors.

Multiple R	.7442	Anova	DF	Sum Squares	Mean Sq.	F
R Square	.5538	Regression	6.	196.331	32.722	4.344
Std Dev	2.7447	Residual	21.	158.199	7.533	Sig. .005
Adj R Square	.4263	Coeff of Variability		131.3Pct		

Variable	B	S.E. B	F	Sig.	Beta	Elasticity
FAC 1	2.309	.481	23.043	.000	.79242	.00461
FAC 2	-.638	.519	1.508	.233	-.18590	-.00052
FAC 5	.515	.521	.977	.334	.15920	-.00098
FAC 4	.690	.530	1.695	.207	.20360	.00141
FAC 3	-.158	.275	.331	.571	-.10447	-.00184
FAC 6	-.214	.466	.211	.651	-.08429	-.00071
Constant	-2.086	.519	16.175	.001		

centers and consequently led to the initiation of long-distance moves.

To verify the degree of influence exercised by the variables included in the first factor as well as the influence of other variables, a second multiple regression analysis was performed by incorporating the twenty-one original variables. One variable (ACTIVAGR) was removed from the original set in order to preclude extreme multicollinearity. The stepwise process indicated that three variables to be significant: (1) average hours worker per day (WORKHOUR), (2) percentage of uninhabited houses (HOUSES), and (3) movement within the district (DISTMOV). The significance level for each of these variables were 0.000, 0.001, and 0.010, respectively, at 95 percent confidence level. The contant was -2.01 and the b values were 1.05 (0.209)*, -0.05 (0.013)*, and -0.06 (0.021)*, respectively. Labor Force was not included within the significant variables (Table 15). However, its influence is closely related to the first significant variable: average hours worked per day (WORKHOUR). Therefore, it is possible to assume multicollinearity between these two economic variables. Furthermore, the inverse association between migration and movement within a district (short-distance moves) indicates that long-distance migration predominates within the highland rural area in northern Chile.

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*Standard Errors of the b values.

Table 15.--Stepwise Multiple Regression With Twenty-One Original Variables.

Variable	B	STD Error B	T Significance	Beta Elasticity
WORKHOUR	1.0545861	.20947350	5.0344607 .000	.5043788 -1.68737
HOUSES	-.52416959E-01	.13268976E-01	-3.9503394 .001	-.3744593 .76619
DISTMOV	-.58967321E-01	.21205514E-01	-2.7807542 .010	-.2442084 .95609
(CONSTANT)	-2.0173811	1.3414654	-1.5038638 .146	

CHAPTER V

CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This research has examined two aspects of the migrant population in the rural highlands of northern Chile. It has identified the changes within the stepwise and stage migration processes that occur in the area and points out migrant selectivity within the process. However, it should be kept in mind that the main objectives of this research were not to determine the causation of migration within the rural highlands, but rather to observe the spatial movements of the migrants as well as to test several hypothesis relating to migrant selectivity.

Hypotheses and Operational Statements

The operational statement of the first hypothesis indicates that short-distance, multiple stage migration shifts to one of long-distance direct migration. Several reasons account for this occurrence. The decrease is due primarily to improved information flows throughout the study area. These flows are enhanced by linkages that former

migrants maintain with their home areas. Furthermore, periodic and return migrants may serve as important carriers of positive information about the potential receiving centers. These contentions are supported by the following statistical association. There is a positive correlation (0.57) between periodic and return migrants and migration to the city. This contention appears to negate the distance variable which is implicit in the stage migration process, since most periodic and return migration involves those cities at great distance from receiving centers. Moreover, this belief is supported by the relationship between low illiteracy rate and a number of functions performed in a given town (-0.54). This assumes that those towns which have a greater number of functions and a highly literate population have people whose awareness space is greater than their opposite numbers. Therefore, this relationship assumes an improved communication system within the migration network, and as mentioned before, assists in breaking down the stage migration system.

The operational statements of the second hypothesis were based on migrant selectivity in which males move longer distances than female migrants. Males make the long-distance move from their home area to a town before their spouses and children. After the male family head becomes settled, their families generally follow. This reinforces the contention that males indeed move via a stepwise process whereas women and children by-pass the intervening centers and move

directly to those settlements close to the cities. However, both sexes provide about an equal number of migrants to nearby towns, movements that for the most part are of a short distance. Once these short-distance moves were completed however, males migrate longer distances than females. Nevertheless, these appear to be governed by time of occurrence. It is quite possible that this action infers that stage migration is operative where replacement via short distance moves is occurring.

For the entire time period 1970-1978, age also has proved to influence the migration act. Generally, migrants within the 30-34 cohort move longer distances than younger migrants (18-29). However, today younger migrants appear to be more mobile than young people of former years.

With reference to migrant selectivity by marital status, older married migrants move longer distances than young married migrants. More than 40 percent of the older population moved from the most remote areas to Chiu-Chiu and Lasana, towns close to Calama and Chuquicamata. On the contrary, young married persons who comprise approximately 50 percent of the migrants, moved shorter distances usually to one of the nearby intervening opportunity centers.

Relationship of Labor Force to Migration

Multiple regression analysis was employed to test the first hypothesis of this study. One factor, labor force proved significant in developing an association with the

migration rate. Within this factor, three variables (labor force, average hours worked per day, and percentage of uninhabited houses) yielded results contradictory to those expected. Normally, an area with out-migration should have low rates of population in the labor force, low average hours worked per day, and a high percentage of uninhabited houses. The reverse pattern observed in the study area has a possible explanation at its roots, the traditional way of life. Nomadic pastoralism keeps periodic migrants out of town for days and sometimes weeks. This ancient transhumance activity makes the rural population highly mobile and renders even the best population register (interview) inadequate. Furthermore, the concept of community cohesion within these settlements is extremely strong. Rural dwellers moved back and forth among communities to help relatives and friends in various activities such as agricultural labor, house construction, or other manual tasks. This periodic phenomenon may mask the high rates of unemployment. It also could inflate employment statistics as well as the number of hours worked.

Another possibility exists in that the surplus labor that formerly existed in these communities of high out-migration, has moved to other places. This outflow of labor creates a better relationship between jobs and workers for those who remain. Furthermore, this process also may bring about an increase in the number of hours worked per laborer.

In addition, the unreliability of the housing variable could affect its positive association with the migration rate. During the time of religious festivals both rural and urban dwellers spend several weeks within the settlements and occupy the houses that otherwise remain empty. In retrospect, the author realizes that in both instances, the data were collected during the times of religious activities in the study area.

It is important to keep in mind that periodic migration gives rise to increased information about both economic and social advantages. This form of migration occurs primarily among those settlements which exhibit high rates of population in the labor force and whose population generally works long hours. Therefore, the concept of high periodic migration must be considered when attempting to understand the migration process. On the case of this study, increasing movement toward the cities does not occur in those settlements with fewer job opportunities and lower rate of persons in the labor force but in those rural centers with high percentage of persons in labor force where workers spend long hours at their jobs.

When a multiple regression analysis was conducted with the original twenty-one variables, it was ascertained that it is not labor force but work hours which is the most important variable. The result of this analysis compels me to conclude that the two variables act in conjunction with each other to account for the association of these two

significant variables to the migration rate. The presence of one of these variables readily suggests the existence of the other variable since both of them are indicative of a common economic effect: employment.

Application of Underlying Dimensions

Future research might stress the importance of findings that deal with the orthogonal factors and some of their underlying dimensions. For example, rate of labor force and average hours worked per day necessarily constitute important variables in observing the effect of migration between rural and urban areas. On the basis of these two economic variables, future migration studies might investigate these effects with greater precision.

Furthermore, the study area is composed of two economic activities, agriculture and mining. Both are related to the environmental constraints of altitude and distance. In order to obtain greater precision in future studies it may be useful to refine these physical variables, since they may well influence the migration process.

In addition, the Antofagasta to Bolivia railway has been shown to be directly associated with movements to Calama. Some mining sites and railway stations located along this transportation route were affected by this linkage in that supply a greater number of migrants than originally expected. Further investigations might wish to determine the relationship between accessibility to the rail line and migrant flows.

Data Quality to Predict Migration

In conclusion, future research might also consider the importance of data quality. Data averages could induce error. Also, if one wishes to predict migration, the data should allow for a time component. More reliable data would enable the researcher to better understand the changes within the migration system among several time periods.

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APPENDICES

APPENDIX A

QUESTIONNAIRE, 1970-1978

APPENDIX A

QUESTIONNAIRE, 1970-1978

Lugar Encuestado:_____Fecha:___ ___ _____

Encuestado:_____(Posición en el grupo familiar).

Composición del Grupo Familiar y Edades () :

Esposo	Esposa	hijos		Otros		Total
		Hombres	Mujeres			
( )	( )					

Lugar de Origen:	Lugares Intermedios: 1	2	3	4	5	6
Esposo:	//( )	( )	( )	( )	( )	( )
Esposa:	//( )	( )	( )	( )	( )	( )
Hijos :	//( )	( )	( )	( )	( )	( )
	//( )	( )	( )	( )	( )	( )
	//( )	( )	( )	( )	( )	( )
	//( )	( )	( )	( )	( )	( )
Otros :	//( )	( )	( )	( )	( )	( )
	//( )	( )	( )	( )	( )	( )

Actividades que desarrollan: ponga () el lugar y no. de horas

Esposo:	/ (	) no.
Esposa:	/ (	) no.
Hijos :	/ (	) no.

/ ( ) no.

/ ( ) no.

Otros : / ( ) no.

/ ( ) no.

Emigrados Temporales:

No.	Sexo	Salidas al mes	Duración	Lugar(es)	Causas

Emigrados Definitivos:

No.	Sexo	Año de salida	Edad	Lugar	Causas

APPENDIX B

VARIABLES

APPENDIX B

VARIABLES

MIGRAT	:	Annual migration rate
LABORF	:	Labor force rate
HOUSES	:	Uninhabited houses rate
NONOWN	:	Non-owner operator rate
RETURNMI	:	Percentage of return migrants
ACTIVAGR	:	Percentage of active population in agriculture
ACTIVMIN	:	Percentage of active population in mines
ACTIVFAC	:	Percentage of active population in small tories
ACTIVSER	:	Percentage of active population in services
LOCMOV	:	Percentage of local movements
DISTMOV	:	Percentage of districtal movements
COMMOV	:	Percentage of communal movements
CITYMOV	:	Percentage of movements to the city
AGRECO	:	Mean farm size
ALTITUDE	:	Altitude in meters (a.s.l.)
TRAVTI	:	Travel time
MOBILITY	:	Mobility coefficient
WORKHOUR	:	Average of daily working hours
SERVICNU	:	Number of services in each settlement

NTRUCKS : Number of trucks (main transport mode)

TRAVDI : Travel distance (Km)

MARKET : Index of market volume

ILLITER : Illiteracy rate