Urban Population Growth in Pakistan 1961–1972

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Introduction

The growth of cities is a subject of increasing concern among social scientists and government planners in Pakistan as elsewhere in the developing world. Redistribution of the population from predominantly rural to increasingly urban pattern of residence has far-reaching implications for the demographic, socio-economic, and political character of the nation. Indeed, the process of urbanization as it applies in the Third World nations is generating considerable debate among scholars, for there are important policy implications and divergent views regarding the consequences of urban growth. Advocates of urbanization, who see it as the key which unlocks economic development and modernization [6], are being challenged by others who view cities as neo-colonialistic structures which drain their regional hinterlands of scarce resources [5] and provide a Western life-style for only the elite minority [13]. Meanwhile, government planners and policy makers have embarked upon programmes designed to foster urban growth and in some cases create new urban centres. The Agrovilles Scheme is such a programme under way in Pakistan [12].

It is not the purpose of this paper to attack or defend either side in the debate over government-subsidized urbanization. Well-reasoned arguments must await the availability of hard facts concerning recent determinants and consequences of urbanization in Pakistan, and this paper is an attempt to provide a background for such facts by examining the nature of the urbanization process in Pakistan between 1961 and 1972. Specifically the current study is an evaluation of the ways in which Pakistan's system of urban places changed during the 1960's, an initial attempt to identify some of the determinants of urban growth, and an indication of directions future research might follow to determine more completely causes and consequences of differential urban growth in the nation.

The Urbanization of the Population

Pakistan is still an overwhelmingly rural nation by any measure. Most of nation's inhabitants reside in small nucleated villages with fewer than 5,000 residents. The average village has not yet been electrified, has no sewer system or paved streets, has only an elementary school, and lies within three

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miles of a metalled road. Farm work is carried out by men and draft animals, and produce is hauled to the nearest market town by ox-cart or, possibly, truck. Contact with the outside world is limited to information carried by visitors and information broadcast over the radio. Most villages do not have post offices or telegraph stations. It may seem therefore incongruous to concern ourselves with urban places in a nation where the vast majority of the people have little or no contact with such places, but the situation is changing.

In 1972, the percentage of Pakistan's population living in urban areas was 26.5 (Table 1). The increase of only 4.1 percentage points during the 11-year-and-8-month period following the 1961 census appears deceptively small, but when it is considered that this increase yielded nearly seven million new urban-dwellers, or an urban population growth of 72.1 percent its magnitude assumes a different perspective.

Table 1

Urban Population Growth in Pakistan by Provinces, 1961—1972

Area	Total population		Urban population			Percentage Urban		
	1961	1972	1961	1972	Increase	1961	1972	Change
1	2	3	4	5	6	7	8	9
Pakistan	42,880,377	62,493,865	9,614,004	16,544,608	6,930,604	22.4	26.5	+4.1
N.W.F.P.*	7,578,185	8,337,385	742,922	1,189,214	446,292	9.8	14.3	+4.5
Punjab**	25,581,643	37,743,604	5,475,922	9,257,312	3,781,390	21.4	24.5	+3.1
Sind	8,559,538	14,007,722	3,174,995	5,700,426	2,525,431	37.1	40.7	+3.6
Baluchistan	1,161,011	2,405,154	220,491	397,656	177,165	19.0	16.5	—2.5

Source : [11]

*Excluding Federal Administered Tribal Areas.
**Including Federal Capital Territory.

Of the four provinces, Sind, with its great concentration of people in Karachi, remains the most urbanized. It is followed by the Punjab, Baluchistan, and the North-West Frontier, in that order.

A broader understanding of the process of urbanization in Pakistan between 1961 and 1972 may be gained through an examination of the percentages of urban inhabitants living in agglomerations of different sizes (Table 2). In 1961 slightly over one-third of Pakistan's urban population resided in cities with populations greater than one-half million, but by 1972 the percentage had increased dramatically to one-half the total urban population. This concentration of the urban population into cities of the largest class resulted from two reinforcing factors at work during the 1960's. First, Karachi and to a lesser extent Lahore, which were the only two cities with over 500,000 inhabitants in 1961, experienced substantial population increases. Second, four new cities gained sufficient population by 1972 to be placed in the largest size class. These cities were Lyallpur, Rawalpindi, Multan and Hyderabad, and their individual population growth experiences are discussed later in this paper.

Table 2

Urban Population by Size of City, Pakistan, 1961-1972

City Size	Urban Places		Population		Percent change	Percentage of all Urban in cities of		
	1961	1972	1961	1972	1961-72	1961	1972	Change
1	2	3	4	5	6	7	8	9
500,000 & Over	2	6	3,209,075	8,272,169	157.8	33.4	50.0	+16.6
100,000—499,999	10	14	2,476,492	2,252,257	—9.1	25.8	13.6	—12.2
50,000— 99,999	10	18	702,269	1,275,129	81.6	07.3	7.7	+0.4
25,000— 49,999	30	47	1,100,441	1,666,165	51.4	11.4	10.1	—1.3
10,000— 24,999	78	145	1,149,870	2,161,551	88.0	12.0	13.1	+1.1
Less than 10,000	185	155	975,857	917,337	—6.0	10.2	5.5	—4.5
All Urban	315	385	9,614,004	16,544,608	72.1	100.0	100.0	—

Source: [11]

The precentage of urban population living in cities of the 100,000 to 499,999 size declined sharply during the decade. This was due in part to the reclassification upward of the four cities mentioned above. Urban places of the next three smaller size classes retained roughly their same respective shares of the total urban population and the proportion of Pakistan's urban population living in urban places with less than 10,000 inhabitants declined slightly.

The distribution of urban population among centres of varying size classes has attracted the attention of urban researchers for many years, and several alternative techniques have been devised to measure the concentration of people in cities. Jones [10] has suggested a " coefficient of urban concentration " as equivalent to the Gini Concentration Ratio and the Lorenz Curves. The Gini Concentration Ratio (G_i) may be computed as a measure of inequalities in population distribution among urban size classes as follow :

$$(1)\ G_i = \left(\sum_{i=1}^{n} X_i\, V_{i+1}\right) - \left(\sum_{i=1}^{n} X_{i+1}\, V_i\right)$$

where X_i is the cumulative proportion of urban population, V_i is the cumulative proportion of urban places and n is the number of urban size classes. A measure of the concentration of urban population according to size class of urban places in Pakistan in 1961 and 1972 is shown in Figure 1. The coefficient of urban concentration (G_i) was computed to be 0.7394 for 1961 and 0.7405 for 1972, and the similarity of the Lorenz Curves also suggests that there was little change in the degree of urban concentration during the eleven-year period. Thus, what appears from Table 2 to have been a major shift of urban population towards the nation's largest cities during the 1960's is not supported by the Gini Concentration Ratio. Some of the apparent change in urban concentration evident in Table 2 undoubtedly results from a shift of urban places between size classes,

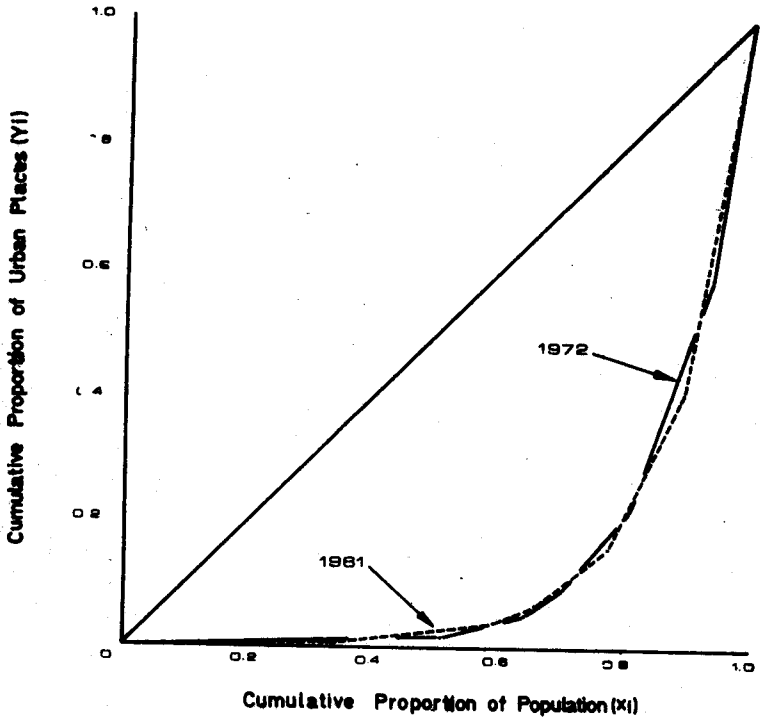

Figure 1

Concentration of Urban Population Size Class of Urban Places, 1961 & 1972

but the fact that the Gini Ratio did not reflect any significant redistribution of Pakistan's urban population towards large urban centres is probably an indication of the ratio's insensitivity to small changes in concentration in a distribution which is already heavily concentrated. An alternative approach to measuring changes in urban population redistribution may be made through an examination of the changing relationship between urban rank and urban population size. Such an approach, which is city-specific, may prove more conclusive.

Urban Rank-Size Relationships

The relationship between urban rank and urban population size has received a great deal of attention from students of urbanization. Basically two types of city size distributions have been described : rank-size and primate. In the rank-size distribution urban centre populations conform generally with the relationship postulated by Zipf [15]:

$$(2)\quad p_i = K/r_i$$

where P is population, r_i is rank, and K is the population of the largest city. In the primate distribution a stratum of small towns and cities is dominated by one or more very large cities, and there is a marked absence of cities of intermediate size [9].

Rank-size regularities have generally been associated with the existence of integrated system of cities in economically advanced societies, and, while considerable subsequent research has been directed toward verification and elaboration of Zipf's equation, there exist diverse opinions as to the significance of the relationship. Duncan [4, p.43] has concluded that

> A careful appraisal of the theoretical significance of the Pareto or the 'rank-size' rule would probably assign it a position midway between two extremes: on the one hand, a merely empirical curiosity, and, on the other, a ' law ' rigorously deduced from an accepted theoretical scheme and verified under fully specified conditions.

The hypothesized relationship between city size distribution and economic development is particularly interesting. Berry [2, p.119] argues that

> The rank-size regularly applies throughout the world for countries which are highly developed with high degrees of urbanization, for large countries, and for countries such as India and China which in addition to being large also have long urban traditions; conversely, ' primate cities or some stated degree of primacy obtains if a country is very small, or has a dual economy '. Moreover, additional studies have recently shown that many distributions with some degree of primacy take on more of rank size form as level of development and degree of urbanization increase.

Berry [3, p.139] further cities a UNESCO report [14] which

> refers to the over-urbanization of Asia economies because of (1) excessive in-migration, and (2) superimposition of limited economic development of a colonial or semi-colonial type, creating dual economic and primate cities which contrast with systems of city in the west .

With these concerns in mind, no discussion of the system of urban places in Pakistan is complete without at least a brief examination of existing rank-size relationships. Table 3 shows the actual populations of Pakistan's 20 largest cities in 1961 and 1972 along with the population they would be expected to have if Zipf's equation perfectly described the city size distribution. It is obvious that in neither case does the rank-size rule describe the distribution very well, although it would appear that expected populations were somewhat closer to actual populations for cities in 1961 than they were in 1972. In both cases the distributions fit reasonably well for the largest six or seven cities and then expected populations become much larger than actual city sizes. The tenth through twentieth cities in 1961 were rather uniformly overpredicted in population by 50 to 60 percent. In 1972 the ninth through twentieth largest cities were overpredicted by roughly 75 to 100 percent. This tendency for the population of smaller cities to be overpredicted by greater amounts in 1972 than in 1961 clearly indicates an increasing concentration of urban population in Karachi and Pakistan's five other largest cities.

The primacy of Karachi has increased during the intercensal period. Ginsburg [7] introduced the term "primacy rate" to measure the degree to which a nation's urban population structure is dominated by one very large city. In comparing data for 104 nations based upon censuses of the 1950's, Ginsburg reported values ranging from a low of 32.1 for Italy to a high of 94.2 for Thailand. The primacy rate was computed as the percentage of the population of a country's four largest cities that is contained in the largest city. Primacy rates for Pakistan were 47.0 in 1961 and 49.2 in 1972 indicating a slight shift toward the urban dominance of Karachi. That the rates are not higher is primarily attributable to the continued large population of Lahore.

In conclusion it may be said that the rank-size relationship clearly demonstrates that Pakistan's urban population is becoming more concentrated in a few of the nation's largest cities. Karachi is increasing its position of primacy slowly, but the six largest cities taken together have experienced a sizeable increase in their share of Pakistan's urban population. There appears to be a dearth of cities of the 100,000 to 250,000 population range, and this fact also contributes to the lack of rank-size conformity.

In the following section the pattern of differential urban growth will be discussed with special reference to the Punjab. An attempt is made to indentify some of the determinants of urban population growth which were at work during the 1961-1972 period.

Urban Growth in the Punjab and some Determinants of Urban Growth

The urban system of the Punjab is the most completely developed provincial system in Pakistan. Table 4 shows the distribution of urban places by size class for the four provinces, and it may be seen that the Punjab contains over one-half of Pakistan's urban places and over half of the nation's urban population. Urban places and population are distributed more broadly by size class in the Punjab than in any other province, and the coefficient of urban concentration (G_I) is 0.6958, indicating that the urban population of the Punjab is somewhat

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Table 3

Rank and Size of Pakistan's 20 Largest Cities, 1961 and 1972

1961					1972				
City	Rank	Actual population	Expected population	% Variation	City	Rank	Actual population	Expected population	% Variation
1	2	3	4	5	6	7	8	9	10
Karachi	1	1,912,598	—	—	Karachi	1	3,498,635	—	—
Lahore	2	1,296,477	956,299	−26.2	Lahore	2	2,165,372	1,749,318	− 19.2
Hyderabad	3	434,537	637,533	+46.7	Lyallpur	3	822,263	1,166,212	+441.8
Lyallpur	4	425,248	478,150	+12.4	Hyderabad	4	628,312	874,659	+ 39.2
Multan	5	358,201	382,520	+ 6.8	Rawalpindi	5	615,392	699,727	+ 13.7
Rawalpindi	6	340,175	318,766	− 6.3	Multan	6	542,195	583,106	+ 7.5
Peshawar	7	281,691	273,228	+24.9	Gujranwala	7	360,519	499,805	+ 38.6
Gujranwala	8	196,154	239,075	+21.9	Peshawar	8	268,366	437,329	+ 63.0
Sialkot	9	164,346	212,511	+29.3	Sialkot	9	203,779	388,737	+ 90.9
Sargodha	10	129,291	191,260	+47.9	Sargodha	10	201,407	349,864	+ 73.7
Quetta	11	106,633	173,873	+63.1	Sukkur	11	158,876	318,058	+100.2
Sukkur	12	103,216	159,383	+54.4	Quetta	12	155,627	291,553	+ 87.3
Jhang	13	94,971	147,123	+54.9	Jhang	13	135,722	269,126	+ 98.3
Bahawalpur	14	84,377	136,614	+61.9	Bahawalpur	14	133,956	249,902	+ 86.6
Mardan	15	77,932	127,507	+63.6	Wah	15	107,671	233,242	+116.6
Sahiwal	16	75,180	119,537	+59.0	Sahiwal	16	106,213	218,665	+105.9
Kasur	17	74,546	112,506	+50.9	Kasur	17	102,531	205,802	+100.7
Okara	18	68,299	106,255	+55.6	Okara	18	101,791	194,369	+ 90.9
Mirpur Khas	19	60,861	100,663	+65.4	Gujrat	19	100,581	184,139	+ 83.1
Gujrat	20	59,608	95,630	+60.4	Sheikhupura	20	82,083	174,932	+113.1

Source: [11]

Table 4

Pakistan : Urban Population by Size of City, by Provinces, 1972

City Size	Punjab*			Sind			NWFP**			Baluchistan			Pakistan**		
	No. of Places	Population		No. of Places	Population		No. of Places	Population		No. of Places	Population		No. of Places	Population	
		Number	%		Number	%		Number	%		Number	%		Number	%
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
500,000 and over	4	4,145,222	45.2	2	4,126,947	72.4	0	0	0	0	0	0	6	8,272,169	50.2
100,000—499,999	10	1,554,170	16.9	1	158,876	2.8	2	383,584	32.3	1	155,627	39.1	14	2,252,257	13.7
50,000—99,999	10	655,236	7.1	5	361,932	6.4	3	180,643	15.2	0	0	0	18	1,197,811	7.3
25,000—49,999	30	1,051,336	11.5	9	324,299	5.7	7	262,888	22.1	1	27,642	7.0	47	1,666,165	10.1
10,000—24,999	92	1,167,490	14.9	26	393,275	6.9	20	289,294	24.3	7	111,492	28.0	145	2,161,551	13.1
Under 10,000	57	406,540	4.4	57	335,097	5.9	14	72,805	6.1	27	102,895	25.9	155	917,337	5.6
Total	203	9,179,994	100.0	100	5,700,426	100.0	46	1,189,214	100.0	36	397,656	100.0	385	16,467,290	100.0

Source : [11]

* Excluding Federal Capital Territory.

** Excluding Federally Administered Tribal Areas.

less concentrated than that of Pakistan as a whole. It was decided therefore to limit the detailed analysis of urban growth in the 1960's to the Punjab. While patterns and determinants of urban growth in the Punjab may not be representative of the other three provinces, the writer felt that a more meaningful analysis could be made by examining growth relationships in a relatively homogeneous, well-developed urban system than by attempting to extend analysis to the diverse whole of Pakistan.

The growth in population of an urban centre between two points in time results from a combination of three possible factors: net natural increase, net in-migration, and annexation of populated territory. Unfortunately, detailed data which would permit estimation of the relative contribution of each of these three factors are not currently available for the period of interest in the Punjab. While it is not currently possible to estimate the three components of urban growth, it is possible with the adoption of certain simplifying assumptions to comment on the relative growth of places.

The population of Pakistan increased 45.7 percent between 1961 and 1972. If it is assumed that international migration played a relatively minor role in that increase, then the figure is essentially natural increase. If it is further assumed that urban areas experienced rates of natural increase roughly equivalent to the nation as a whole, then urban places which experienced intercensal growth of lessthan 45.7 percent probably saw a net out-migration of population during the 1960's.[1] At the other extreme it has already been pointed out that the total urban population of Pakistan increased 72.1 per cent for the period 1961 to 1972. It may be assumed therefore that cities which experienced growth in excess of 72.1 percent were clearly recipients of net in-migrants or annexed populated territory, or both.[2] There remains a class of cities which increased in population between 45.7 and 72.1 percent. Little may be said of the specifics of growth in the case of these places, although it seems likely that most of their growth resulted from natural increase with migration contributing a small net positive or negative component. Figure 2 displays the spatial distribution of urban centres by size and by rates of growth in the Punjab. The pattern is characterized by definite clusters of rapid, moderate, and slow growth centres. Such clustering implies the existence of certain determinants of urban growth. It is these determinants and their relative importance that the remainder of this paper seeks to discover.

The increase in the proportion of Pakistan's urban population living in cities larger than 500,000 noted earlier would seem to suggest that city size ought to be considered as a determinant of urban growth. Further, if urban places are grouped according to 1961 population size classes, there appears to have been a tendency for the larger size classes to have experienced higher average rates of growth (Table 5). It is hypothesized therefore that the larger an urban centre's

[1]It is possible, although not likely, that an urban centre with a growth rate of less than 45.7 percent could have had its boundaries redefined resulting in a loss of population between 1961 and 1972. It is further assumed that the rate of natural increase in rural areas was higher than that implied by overall increase as net out-migration from rural areas apparently occurred over the 11-year period.

[2]Records of territorial annexation by municipal areas are generally not available from any centralized source.

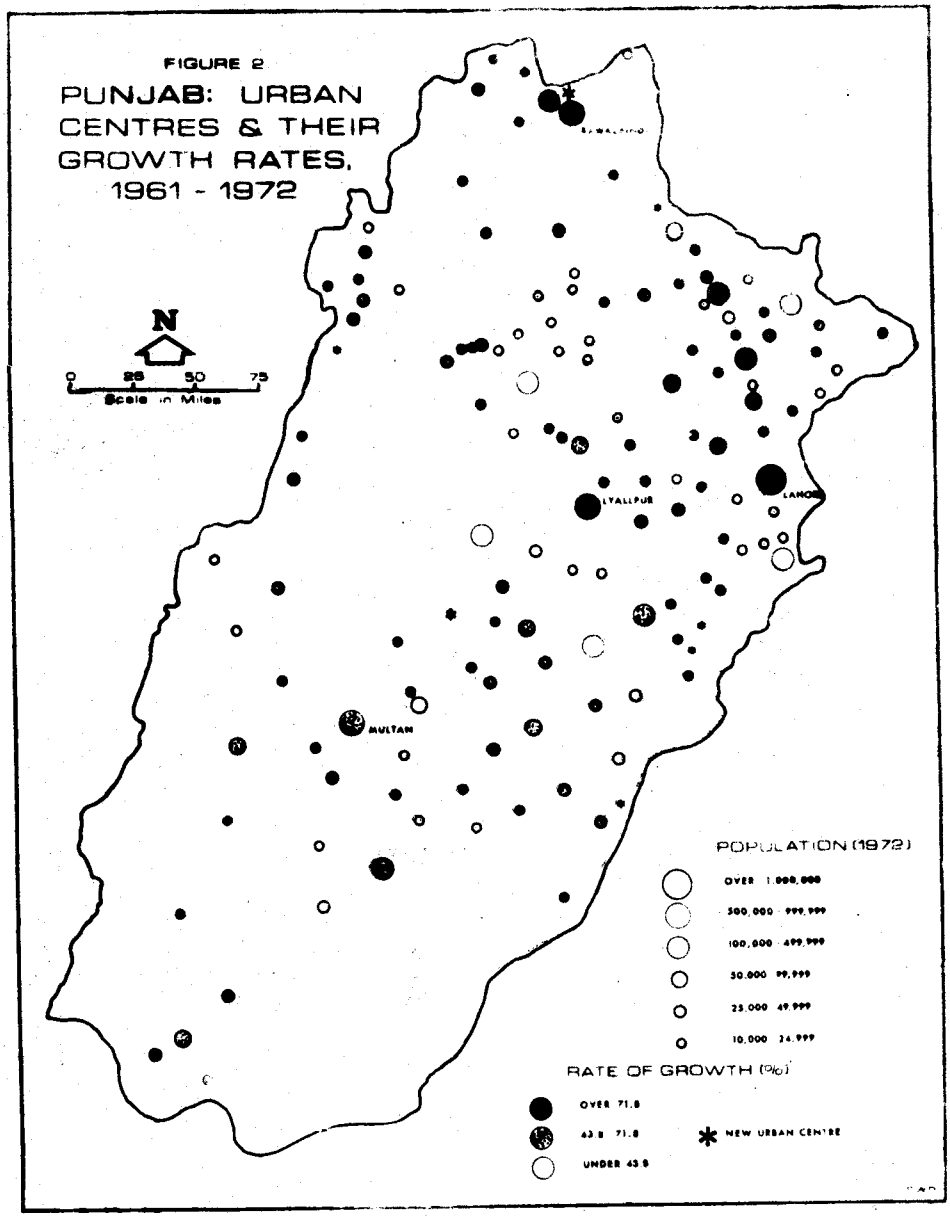


FIGURE 2
PUNJAB: URBAN CENTRES & THEIR GROWTH RATES, 1961 - 1972
N
0 25 50 75
Scale in Miles
LYALLPUR
LAHORE
MULTAN
POPULATION (1972)
OVER 1,000,000
500,000 - 999,999
100,000 - 499,999
50,000 - 99,999
25,000 - 49,999
10,000 - 24,999
RATE OF GROWTH (%)
OVER 71.8
43.8 - 71.8
UNDER 43.8
NEW URBAN CENTRE

Table 5

Average Growth by City Size Class, Pakistan and Punjab Province, 1961-1972

City size 1961	Pakistan		Punjab	
	Number of Centres 1961	Average Growth 1961-1972	Number of Centres (1961)	Average Growth (1961-1972)
1	2	3	4	5
500,000 and over	2	75.0	1	67.01
100,000-499,999	10	55.6	6	64.9
50,000-99,999	10	44.0	7	47.4
25,000-49,999	30	56.6	19	63.9
10,000-24,999	78	61.8	49	55.7

Source : [11]

population was in 1961, the higher was its rate of population increase between 1961 and 1972. In other words, 1961 population will serve as the first independent variable, and it is expected to have a direct relationship with the rate of urban centre growth.

A second explanatory variable attempts to account for what migration researchers describe as " push " factors in rural-urban migration. In Pakistan, as in many other predominantly agricultural nations, rising rural population densities lead to an increase in unemployment and under-employment among the rural population. Such employment problems are considered to be a major factor in the decision of many rural residents to migrate to cities and towns. Rural population densities in the Punjab exceed 500 persons per square mile in certain areas (Figure 3). In the canal-irrigated area, bounded roughly by the Chenab and Jhelum rivers in the west and the Sutlej in the southeast, rural population densities everywhere exceed 200 persons per square mile. Comparison of Figures 2 and 3 suggests that there exists some spatial association between the cluster of rapidly growing centres around Lyallpur and Gujranwala and the extremely high rural population density in that area. The second independent variable, a measure of rural population pressure, is the average rural population density per square mile in the tehsil containing the urban centre in question. It is hypothesized that the higher the average rural population density in the tehsil, the greater the likelihood that rural residents will be " pushed " from agriculture and the higher will be the rate of growth of urban centres in that tehsil. This hypothesis assumes an overly simplistic notion of migration directly from rural areas to urban centres within the same tehsil, but a more sophisticated model awaits more complete data describing the process by which people move from rural areas to urban centres.

The role of agricultural production in the growth of urban centres may be treated in a slightly different way by considering the negative impact of high productivity on urban growth. Income differentials between relatively

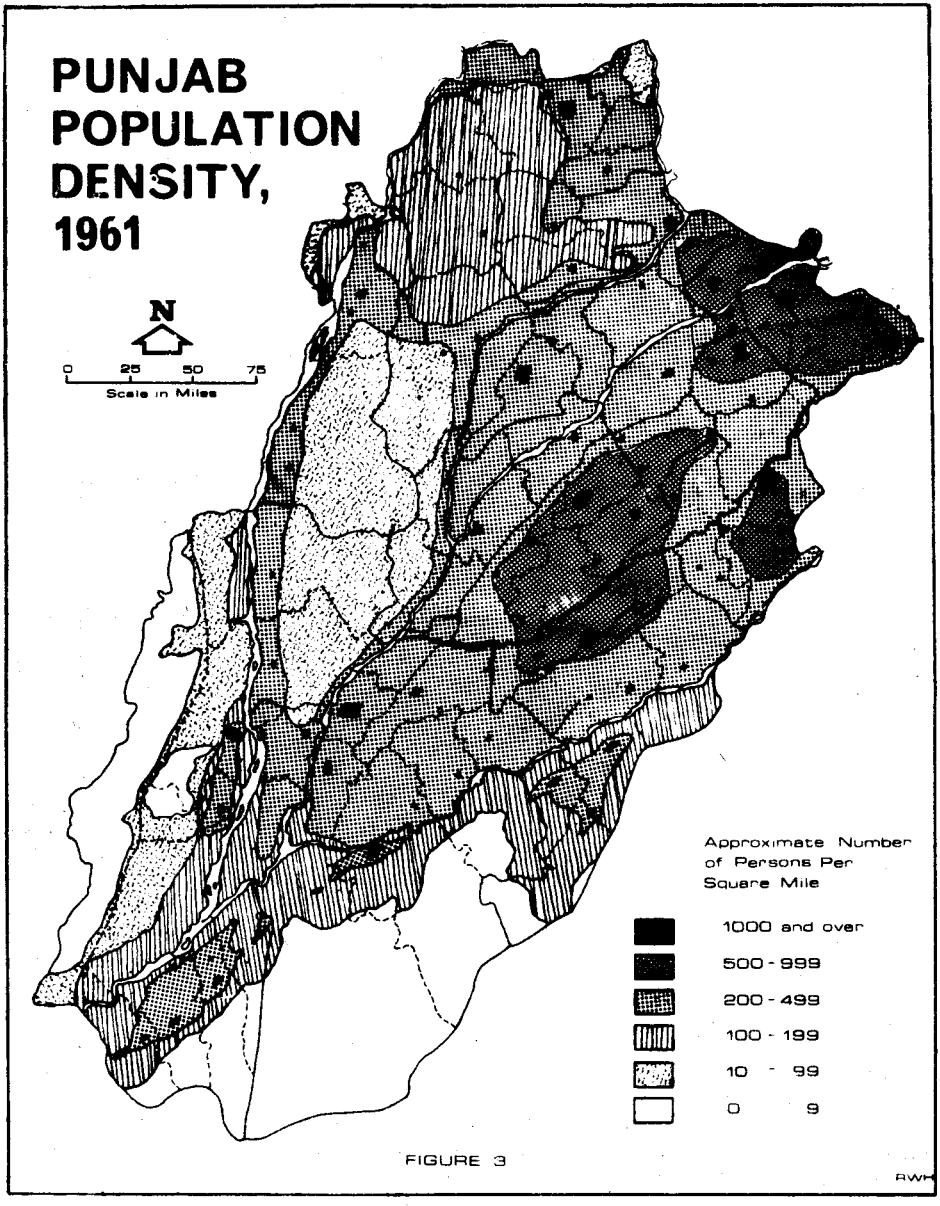

PUNJAB
POPULATION
DENSITY,
1961
N
0 25 50 75
Scale in Miles
Approximate Number
of Persons Per
Square Mile
1000 and over
500 - 999
200 - 499
100 - 199
10 - 99
0 9
RWH

FIGURE 3

poor and relatively rich areas of a nation have often been cited as factors motivating internal migration. Rural residents of marginally productive agricultural districts such as the *barani* region of Pakistan, have been shown to demonstrate a higher propensity to be life-time migrants to large urban centres [8] than rural residents from more productive agricultural areas. Following such reasoning, it may be hypothesized that the growth rate of urban centres is inversely related to the agricultural productivity of the district in which they are located. The variable selected to measure agricultural productivity is the per capita value of production of the aggregate of seven major crops grown in the Punjab in 1969.

Manufacturing jobs, or the opportunities to obtain such employment have often been considered to provide the attractive force necessary to " pull " migrants to a particular destination. Ideally, an independent variable such as the increase in manufacturing employment for each urban centre should be used to test this hypothesized relationship, but such data are not available for Pakistan. The smallest administrative unit at which manufacturing data are available is the district, and the variable selected as a proxy for manufacturing employment in this study is the per capita value added by manufacturing in each district in 1969-70. While districts usually contain more than one urban centre, and it is highly unrealistic to assume the effects of manufacturing to be equally distributed among the various urban centres of a given district, the frequently cited importance of manufacturing as a key factor in urban growth strongly suggests inclusion of such a variable in the equation.

Two final variables have been selected to test the relationship between urban growth and surface transportation facilities. The network of metalled highways and the network of railroads as they existed in 1972 are shown in Figure 4. It may be noted that all urban centres of 20,000 or more population in the Punjab were connected to either the metalled highway network or the railroad network but not necessarily to both networks. It is hypothesized that the greater the degree of connectivity of an urban centre to these two networks, the higher its rate of population growth during the 1961-72 period. Connectivity in this case is measured simply as the number of different links leaving or entering an urban centre.

Table 6

Punjab Urban Centres with Populations of 20,000 or More, 1972

Urban Centre	Map Reference (Figure 4)	1972 Population	Percentage Growth 1961-72
1	2	3	4
Lahore	1	2,165,372	67.01
Lyallpur	2	822,263	93.4
Rawalpindi	3	615,392	80.9
Multan	4	542,195	51.4
Gujranwala	5	360,519	83.8

—Continued

Table 6—*Continued*

1	2	3	4
Sialkot	6	203,779	24.0
Sargodha	7	201,407	55.8
Jhang	8	135,722	42.9
Bahawalpur	9	133,956	58.8
Wah	10	107,671	190.7
Sahiwal	11	106,213	41.3
Kasur	12	102,531	37.5
Okara	13	101,791	49.0
Gujrat	14	100,581	68.7
Sheikhupura	15	82,083	97.2
Rahimyar Khan	16	74,407	65.5
D.G. Khan	17	71,429	51.6
Jhelum	18	70,130	33.4
Chiniot	19	69,124	46.8
Khanewal	20	67,615	37.7
Hafizabad	21	61,413	77.6
Burewala	22	56,894	66.2
Kamalia	23	52,000	47.5
Kamoke	24	50,139	99.6
Bahawalnagar	25	49,948	37.6
Khanpur	26	49,345	56.8
Mianwali	27	48,320	53.9
Jaranwala	28	46,523	72.6
Ahmadpur East	29	43,394	33.8
Khushab	30	43,393	74.6
Chishtian	31	43,083	65.4
Gojra	32	41,025	38.3
Wazirabad	33	40,011	36.1
Pakpattan	34	39,040	38.6

—*Continued*

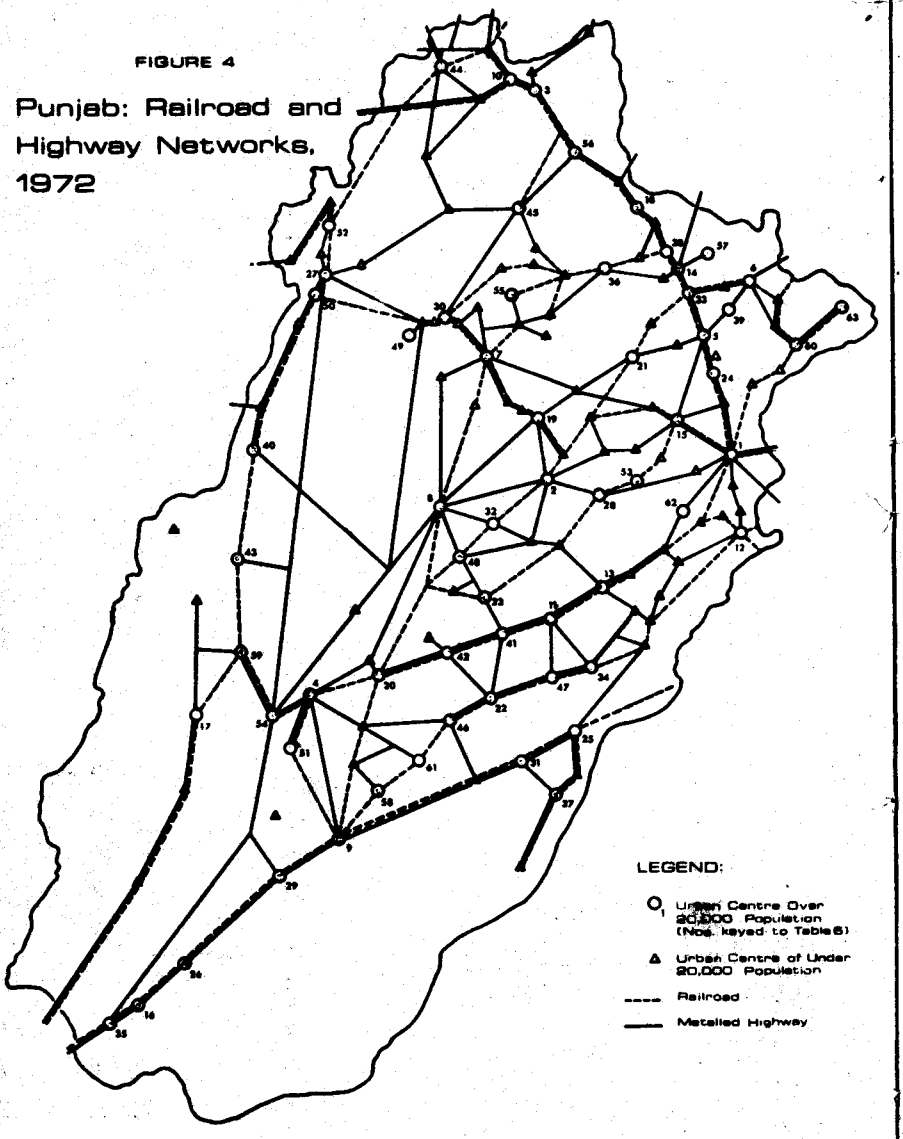
Table 6—*Continued*

1	2	3	4
Sadiqabad	35	37,225	132.6
Mandi Bahauddin	36	36,014	61.5
Haroonabad	37	35,487	57.2
Lalamusa	38	34,991	54.6
Daska	39	34,637	69.7
Bhakkar	40	34,621	58.9
Chichawatni	41	33,540	56.9
Mian Channu	42	32,185	61.8
Leiah	43	31,129	58.8
Campbellpur	44	29,279	53.4
Chakwal	45	29,174	73.2
Vehari	46	28,247	83.3
Arifwala	47	28,072	51.3
Toba Tek Singh	48	28,034	57.1
Mitha Tiwana	49	26,388	64.4
Kundian Pucca	50	25,638	77.6
Shujaabad	51	25,596	52.2
Daud Khel	52	25,519	45.6
Nankana Sahib	53	25,486	48.7
Muzaffargarh	54	24,896	72.0
Bhera	55	24,174	34.4
Gujarkhan	56	24,145	109.4
Jalalpur Jattan	57	23,471	38.2
Kakor Pacca	58	22,864	35.5
Kot Addu	59	22,409	71.0
Narowal	60	22,086	37.0
Mailsi	61	22,661	59.1
Bhai Pheru	62	20,248	84.1
Shakargarh	63	20,146	121.3

Source : [11]

FIGURE 4

Punjab: Railroad and Highway Networks, 1972



In summary, the hypotheses to be tested in this investigation of urban growth in the Punjab province between 1961 and 1972 are that the population growth rate (P) of an urban centre is :

(*a*) directly proportional to the 1961 population (U) of the urban centre;
(*b*) directly proportional to the 1961 rural population density (D) of the tehsil in which the centre is located;
(*c*) inversely proportional to the per capita value of major agricultural crops (A) produced in the district in which the centre is located;
(*d*) directly proportional to the per capita value of manufacturing value added (M) in the district in which the centre is located;
(*e*) directly proportional to the number of metalled highway links (H) tying the urban centre to the road network; and
(*f*) directly proportional to the number of railroad links (R) tying the urban centre to the railroad network.

The hypotheses were tested in a multiple-regression equation with data from the 63 Punjab urban centres with 1972 populations of 20,000 or greater (Table 6). The following equation[3] was obtained:

$$(3)\quad P = 63.2 - 0.08A + 0.23^{*}M$$
$$(-1.73)\quad (3.51)$$
$$R^2 = 0.23$$
$$F = 2.73 \qquad D = 2.01$$

Only the regression coefficient associated with manufacturing value added (M_i) was significant at the 5% level of confidence. (Asterisk indicates significance at 5% and T-statistics in parentheses). The regression coefficient for agricultural production value was significant at 10%, but other coefficients were not significantly different from zero. In order to determine the effect of intercorrelation among the independent variables, a series of two-variable linear regression was made using each independent variable in turn. The results presented in Table 7 indicate substantially no difference from the results of the multiple regression. The relatively poor performance of these variables to account for differences in growth in the Punjab is underscored by the fact that only 23 percent of the variation in growth rates was associated with the six independent variables and of that amount 17.6% was attributable to the manufacturing variable.

Table 7

Two-Variable Linear Regression Results

Independent Variable	Constant	Regression Coefficient	r	F
1	2	3	4	5
P_i	62.42	.005	.03	.07
D_i	62.88	-.0002	-.001	.0001
A_i	75.28	-.08	-.21	2.86
M_i	48.32	.23	.42	12.92
H_i	65.38	-1.16	-.04	0.11
R_i	58.92	1.40	.08	0.42

[3]Regression coefficients for variables U, D, M, and R proved to be statistically insignificant. They have been deleted from the equation in the interest of clarity.

The hypothesized relationships between urban growth and such factors as population size, rural population density and transportation network position were not supported by the experience of the Punjab urban centres between 1961 and 1972. It must be concluded therefore that either the variables selected were inadequate measures of the relationships under investigation, or additional unconsidered factors were more important determinants of urban population growth.

Summary, Conclusions and Directions for Further Research

The primary purpose of this paper has been to describe changes which occurred in Pakistan's urban population distribution between 1961 and 1972. It has been noted that the share of the nation's total urban population living in cities larger than 500,000 increased from 33.4 percent to 50.1 percent, and, while some of this increase is accounted for by a larger number of cities of that size, there was a definite trend toward concentration in Pakistan's largest cities.

Discussion of the concentration of Pakistan's urban population in terms of rank-size relationships indicates that the primacy of Karachi increased slightly during the 1961-72 period. The rank-size relationship does not describe well the distribution of cities in Pakistan due to the concentration of urban population in six large cities and the small number of centres in the 100,000 to 250,000 population range.

Finally, an attempt was made to identify some of the determinants of differential urban growth among urban centres in the Punjab. Seven variables were considered as logical determinants, but only two of the seven demonstrated any statistically significant relationship to population growth rates. Manufacturing and, to a lesser extent, agricultural productivity appear to influence the growth of urban centres in the Punjab, but together they account for less than 25 percent of the differences in growth rates.

Two directions for future research into the determinants of urban growth are indicated by the results of the regression analysis. First, it may be possible to identify independent variables which are more accurate measures of the factors supporting urban growth discussed in this study. This seems particularly true in the case of transportation network variables, where other researchers have developed sophisticated graph theoretic measures of network connectivity and node accessibility. It would be highly desirable to obtain independent variables which measure changes in relationships. Instead of the stock variables used in this analysis, it may be possible to develop flow variables but for the most part such variables are currently unavailable. A second logical extension of this research is the identification of additional determinants of urban growth. Elements of urban infrastructure, economic base or community leadership might prove to be fruitful explanatory variables. It is also worthwhile considering the possible effects of metropolitanization and satellite development in the vicinity of Pakistan's largest cities. No doubt the population growth of any given urban centre is in part a reflection of purely local conditions, but there exist common factors in the matrix of social, physical, economic and political conditions among urban centres which foster or retard population growth. Before the process of urbanization can be used as a planning tool by government, it is necessary to understand the function of such common factors as determinants of urban growth.

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