A SPATIAL ANALYSIS OF THE ECOLOGICAL PATTERNING OF CRIMES IN THE METROPOLIS OF CALCUTTA

BY

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ABSTRACT

In this research, crime was considered as a function of the combination of several interdependent socio-cultural, economic, environmental, and political variables changing over space. Its purpose was to examine the intra-urban patterns of criminal behaviour in Calcutta on the basis of these sets of variables. The questions which this study sought to answer were:

1. What are the principal crime dimensions of Calcutta and what are their structures?

2. Does the ecology of crime conform to the spatial pattern of social areas in the metropolis?

3. Are the principal crime dimensions in Calcutta arrayed in terms of traditional spatial models (concentric zone or sector)?

4. If these dimensions follow the concentric zone model, do they also show a distance-decay function from the centre of the city?

In order to answer the first two questions, first, separate correlation analyses were used to select the significant ecological and crime variables for thirty-one police districts of Calcutta. In the following step, another correlation analysis was employed to retain only those ecological variables which were significantly associated with one or more of the thirteen crime variables. The retained fourteen ecological variables were factor analyzed in the light of the social area analysis. This yielded three orthogonal dimensions representing 78.75 per cent of

the total variance. They were termed economic-cum-family status, traditional social status, and ethnic status. These results contradict the findings of Berry and Rees, which suggest that the dimensions of economic status and family status are discrete in Calcutta. However, this study confirms Singh's findings that the dimension of economic status is not separate from that of family status.

Six of the thirteen crime variables were found to be highly correlated with one another. So, they were not used in the analysis individually but in the form of a composite theft index. When factor analyzed, the eight crime variables produced three orthogonal dimensions which accounted for 69.68 per cent of the total variance. They were identified as professional crime, violent crime, and minor theft dimensions.

A matrix of interrelationships for social area factor scores and crime factor scores was constructed. The professional crime dimension appears to be significantly related to the economic-cum-family status as well as to the ethnic status of the social area constructs. Violent crimes do not show a close statistical relationship with any one of the social area dimensions. Nevertheless, they reveal their affinity with the ethnic status. The minor theft dimension is significantly associated with traditional social status and economic-cum-family status dimensions.

The statistical coherence of the two sets of factor scores was found to be true spatially. However, it was difficult to draw inductive generalizations about the univariate crime areas as three sets of crime spaces emerged from the same number of police districts. This ambiguity was removed by considering each police district as a point in a three-dimensional crime space. The thirty-one points, representing thirty-one police districts, were then grouped into five crime areas following

Ward's hierarchical algorithm.

The analysis in this study, then, centred around questions 3 and 4 mentioned above. The methods employed to determine the spatial patterns of the crime dimensions were analysis of variance and regression analysis. The results indicate that Calcutta is a mosaic of sectors and zones on which crimes are depicted in different ways. Professional and violent crimes support Hoyt's sector hypothesis of spatial differentiation and, thus, reveal a pattern opposite to what is evident in North American cities. Only minor theft follows Burgess' concentric zone model and shows a distance-decay function from the centre of the city.

This research further proves that crime-related theoretical constructs developed in the United States do not hold true in a cross-cultural setting.

ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION

A. The Context of the Present Study

Crime is endemic to all societies, but it varies in its intensity at different times. Since the last world war, it has been on the increase in almost every country, especially since the mid-sixties. India is no exception to this--published statistics show that between 1967 and 1971 cognizable crime increased by 57.10 per cent in absolute quantity and 23.30 per cent according to population-based rates,[1] while population grew by only 27.40 per cent.[2] These trends are illustrated by Figure 1.

Thefts and burglaries comprise the highest proportion of crime in India, while other common crimes include dacoity, robbery, murder, cheating, criminal breach of trust, and offenses against persons, property, State, and morals.[3] However, in the cities most of

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[1] Population-based rates are expressed as the number of crimes occurring per 100,000 population.

[2] Government of India, Bureau of Police Research & Development, Crime in India 1971 (New Delhi: Ministry of Home Affairs, 1974), pp. 1-2.

[3] S. Venugopal Rao, Facets of Crime in India, 2nd revised ed. (Bombay: Allied Publishers Private Limited, 1967), p. 3.

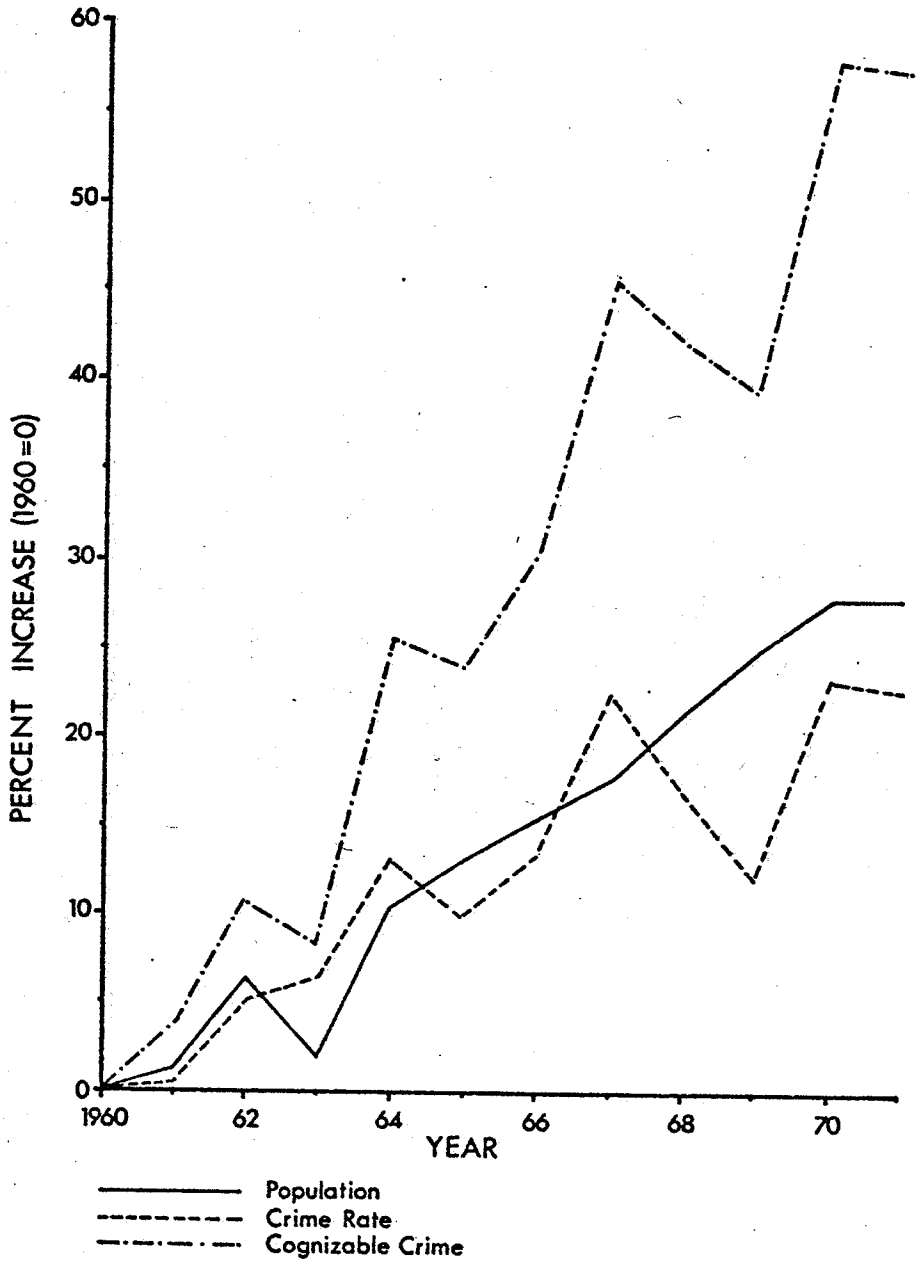

Fig. 1. India: Changes in Population, Crime, and Crime Rate

the crimes are against property, and in the countryside they are against persons.[4] The major cities, however, do not uniformly follow this trend.

Calcutta, well known as a city of turmoil, was not the leading urban centre for crime according to the study by the Ministry of Home Affairs of India in 1974. Delhi and Bombay led over Calcutta in the actual number of occurrences in 1971 (Table 1). Calcutta was seventh in terms of percentage change among the cities over the period 1967-71. In fact, the number of offenses dropped by 14.05 per cent, while the population-based rate fell by 18.50 per cent (from 427.0 per 100,000 population in 1967 to 347.8 in 1971). Despite these drops, a dissection of the figures (Table 2) reveals that these changes were brought about by a reduction in the number of thefts, criminal breaches of trust, and cheating. Contrarily, a very significant increase in violent crimes such as murder, dacoity, and robbery was recorded. In reality, the number of murder cases was far more than that indicated by official records. As Basu pointed out:

> Hundreds of murders . . . remained unrecorded, partly because the people could not feel safe in making any open statement about witnessing murders or arrests lest they themselves might become the victim. The State-mercenaries also became non-functioning as their own lives were made insecure and uncertain by the hit and run policy of the actors of violence.[5]

The growing problem of violent crime had been not only aggravating the day-to-day life of the residents of Calcutta, but

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[4] R. K. Bhardwaj, Urban Development in India (Delhi: National Publishing House, 1974), p. 387.

[5] Sajal Basu, West Bengal - The Violent Years (Calcutta: Prachi Publications, 1974), p. 91.

TABLE 1

Changes in Cognizable Offenses in Various Cities

City	Number of Offenses 1967	1971	% Change
Ahmedabad	2,845	3,060	7.56
Bangalore	5,945	8,961	50.73
Bombay	28,891	25,066	-13.24
Calcutta	13,185	10,911	-14.05
Delhi	16,358	26,933	64.65
Hyderabad	2,795	3,794	35.74
Kanpur	7,093	9,659	36.18
Madras	11,746	7,205	-38.66

Source: Government of India, Bureau of Police Research and Development, Crime in India 1971 (New Delhi: Ministry of Home Affairs, 1974), p. 9.

also badly affecting its economy. Since 1967, when the middle-class backed leftist parties formed the United Front Ministry in the State of West Bengal, crime had been on the increase until 1971, when it reached its climax. This resulted in a total breakdown of administration.[6] Chaos obtained all over the State, and Calcutta, its capital, was known as "the city in turmoil." A few examples illustrate the intensity of this breakdown: "Foreign airlines shifted their offices from Calcutta; business conventions traditionally held in Calcutta were held elsewhere . . . The Central Government's tourist office

[6] Ibid.

TABLE 2

Changes in Selected Types of Crimes in Calcutta

Type of Offense	Number of Offenses		% Change
	1967	1971	
Murder	57	285	401.75
Dacoity	8	40	387.50
Robbery	30	112	273.33
Burglary	752	761	1.20
Thefts	5,928	4,225	-28.76
Criminal breach of trust	550	354	-35.64
Cheating	399	225	-43.61

Sources: Government of India, Central Bureau of Investigation, Crime in India 1968 (New Delhi: Ministry of Home Affairs, 1970), pp. 22-27; Idem, Bureau of Police Research and Development, Crime in India 1971 (New Delhi: Ministry of Home Affairs, 1974), pp. 10-12.

omitted Calcutta from their itineraries."[7]

As a result of the peculiar manifestations of these pathological disorders, the metropolis of Calcutta had earned national and international notoriety as a "city of murders and killings."[8] A number of people still believe that the city has gone to the rack and ruin, and the anomie expressed in its culture portends to disintegrate the entire nation.[9] "In a sense, the story of Calcutta is the story of

[7] Amulya Ganguly, "Tourism in Eastern India," Statesman (Calcutta), 18 June 1974, p. 6.

[8] Narendra Goyal, ed., The City in Turmoil (New Delhi: Gandhi Peace Foundation, 1971), p. 101.

[9] Ibid., p. 4.

India and the story of the so-called Third World in miniature."[10]

This general conviction drew the attention of a group of eminent educationists and social workers of the country who wanted to diagnose the causes of the social malaise and to have an empirical profile of its pattern and structure in the city.[11] The collection of the papers submitted at the National Seminar on Calcutta were published under the title - The City in Turmoil. Unfortunately, the purpose of the conference was not fulfilled, and no systematic study of crime in Calcutta has yet been published. Nevertheless, Basu's study, West Bengal - The Violent Years, needs to be mentioned. The book deals with "intuitive-impressionistic analysis of events" in West Bengal during 1967-71. He showed that the social delinquency and political gangsterism formed a kind of subculture which was rooted in congestive physical composition, economic stress, and low moral standards.[12] However, his work suffers from (a) a lack of field studies in places other than Calcutta and (b) a dependence on limited information based on a very small sample. Further, the review of the literature, as presented in Chapter III, shows the total absence of a spatial analysis of crime in its entirety in India.

In view of these limitations, the present study has been undertaken. This study for the first time attempts to analyze signi-cant correlates and spatial regularities of crimes in the largest and

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[10]Geoffrey Moorhouse, Calcutta (London: Weidenfeld and Nicholson, 1971), p. xv.

[11]Goyal, City in Turmoil, p. 131.

[12]Basu, West Bengal, pp. 107-109.

most talked-about city of India. Because of the lack of required data, this study had to be limited to the analysis of distribution of thirteen types of crimes for the year 1971. For the obvious reasons, no comparison with previous years could be attempted. The basic objectives of this research are discussed in the following section.

B. General Objectives

This research aims at providing an insight into some factors affecting the variance of crime rates among various spatial units in Calcutta. Crime, as a human behaviour, has been considered as a function of the combination of several interdependent socio-cultural, economic, environmental, and political variables varying over space. An effort has been made to investigate the intra-urban patterns of criminal behaviour on the basis of these sets of variables.

To achieve the objective, this research deals with four specific questions:

1. What are the principal crime dimensions in Calcutta, and what are their structures?

2. Does the ecology of crime conform to the spatial pattern of social areas in the metropolis?

3. Are the principal crime dimensions in Calcutta arrayed in terms of traditional spatial models (concentric zone or sector)?

4. If these dimensions follow the concentric zone model, do they also show a distance-decay function from the centre of the city?

C. Study Organization

Chapter II traces the development of the metropolis of Calcutta since its very inception and stresses the emergence of the contemporary social topography. The chapter examines the reasons why the crime problem became so acute in 1971 that it earned the notoriety as a dreadful city.

Chapter III reviews literature on crime-oriented ecological studies together with some crime studies from India. Research in the field of geography of crime is critically evaluated.

Chapter IV is concerned with the methodology, including the research design, the solution of the data problem, and the selection of variables and spatial units of study.

Chapter V is designed to analyze data and interpret the derived results. The emphasis is on the association of crime dimensions with social area factors. Further, the spatial configuration of crime dimensions has been tested with the help of the analysis of variance and the regression analysis.

A summary and an examination of the implications of this research are incorporated in the last chapter. The discussion also includes suggestions for future research.

CHAPTER II

THE METROPOLIS OF CALCUTTA

A. The Role of Calcutta

Calcutta is situated some 130 kilometres inland from the Bay of Bengal on the Hooghly river, the western arm of the Ganges delta. The metropolis has more than three million residents and covers an area of about one hundred square kilometres. This constitutes a part of India's largest conurbation, Greater Calcutta, which crowds nearly seven million people.[1]

Calcutta has long been recognized as the economic capital of the Republic of India,[2] and this has been due to the agglomeration of industries, financial services, and trade functions within it and its conurbation. It draws upon a hinterland which is formed by about one-fourth of the total area of the country (comprising the States of Mizoram, Manipur, Nagaland, Arunachal Pradesh, Tripura, Meghalaya, Assam, Sikkim, West Bengal, Bihar, part of Orissa, and the eastern half

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[1] A. Chandra Sekhar, Census of India 1971, series 1: Paper 1 of 1971 - Supplement, Provisional Population Totals (Delhi: The Manager of Publications, 1971), p. 22.

[2] Narendra Goyal, ed., The City in Turmoil (New Delhi: Gandhi Peace Foundation, 1971), p. ix.

of Uttar Pradesh) besides the Himalayan Kingdoms of Bhutan and Nepal[3] (Figure 2). The hinterland has a population of no less than 150 million people. Surprisingly it is the least urbanized of all major regions of India, containing only 27 of India's 142 cities. (City status in India is given to urban centres having a population of over 100,000). Calcutta, therefore, becomes an extremely attractive city for employment and other "city-related" services, and a large number of immigrants move to this urban centre.

Calcutta has also been the most important focus of education. In fact, India's first English-speaking institution of higher education, Hindu College (now Presidency College) was opened there in 1817. The University of Calcutta came into existence in 1857. The city has long been the centre of political movements and was one of the first cities affected by the early nationalism. Kar summed up its salient features:

> The City of Calcutta occupies a unique position in the whole of India, being the largest centre of human concentration and surpassing all other Indian cities in respect of magnitude, intensity and complexity of urban structure.[4]

Mitra, too, contended that Calcutta is "India's City," and its concern should be partaken by them who desire welfare of India at heart.[5]

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[3]Ashok K. Dutt, "Delineation of the Hinterland of Calcutta Port," The Professional Geographer 23 (January 1971): 22-27.

[4]N. R. Kar, "Urban Characteristics of the City of Calcutta," Indian Population Bulletin 1 (April 1960): 35.

[5]Asok Mitra, Calcutta: India's City (Calcutta: New Age Publishers Private Limited, 1963), p. 29.

Fig. 2. Hinterland of Calcutta

B. Emergence of the Social Topography

The contemporary social topography of Calcutta is primarily the product of three successive phases of the development of British capitalism: mercantile capitalism, industrial capitalism, and monopoly capitalism.[6]

At its very inception, the settlement flourished around a freshwater tank (now the Benoy-Badal-Dinesh bag). The actual expansion of the city did not start until 1757 when the English defeated the ruler of what was then Bengal in the battle of Plassey. Calcutta became the administrative headquarters of British India with a port at hand and a vast prosperous hinterland. These functions brought about a significant change in its land use; the Fort and the maidan, a large park, were laid out in 1758, and the areas surrounding the tank became the English neighbourhood replete with mansions. On the other hand, the Indians, especially the upper caste Hindus and the mercantile castes such as Gandhabanik (spice merchants) and Subarnabanik (bankers and traders in gold), established their own locality to the north of the tank. Many of these residential quarters were characterized by poor huts and cottages. A large number of people from the adjoining rural areas, seriously affected by increasing overpopulation, were attracted to the city because of new employment facilities, services, and enterprises created under the new British administration.

The industrial phase of British capitalism started in Calcutta in the early nineteenth century. Then the city became an important

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[6] A. N. Bose, "Continuing Semi-Colonial Character - The Basic Problem of the Indian Metropolis," Indian Journal of Regional Science 3, no. 1 (1971): 35-38.

focal point for importing and redistributing British manufactured goods, and this replaced the earlier emphasis of the company's trade which was on exporting Indian goods to Britain. As a consequence, there was an overall destruction of rural and handicraft industries. But agriculture was not able to absorb the unemployed industrial labour, and this resulted in an imbalance between agriculture and industry. This process continued until the middle of the century when "the new urbanism based on European incentive" began.[7] The entire country witnessed the germination of modern transportation. In the case of Calcutta, the dock was constructed in the south-western part and between 1857-1900 the city was linked by railways to Delhi, Bombay, Madras, etc. The ruination of village industry coupled with the development of railways gave ample opportunities to the villagers, both in Bengal and outside, for flocking to the city. People from all walks of life came here from south India, Gujarat, Punjab, Rajasthan, and the adjoining provinces. The foreign power fully utilized these additional people for their further economic betterment. Only a fraction of the profit generated from the city and the country as a whole was invested by the British traders in agro-based industries like jute, textiles, and plantations to generate additional profits. All of these developments led to an accelerated change in the appearance of the city. New residential areas for the Indians were opened around the dock in the south-west; in the south, south-east, and east of the maidan. In contrast to these, public buildings and new mansions of imperial

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[7]Robert I. Crane, "Urbanism in India," American Journal of Sociology 60 (March 1955): 470.

splendour flanked the maidan.

The third phase of the British capitalism saw the establishment of discrete ethnic neighbourhoods by the immigrants on the basis of their cultural, economic, and racial traits. These characteristics were carried over by them from their traditional villages.[8] In other words, their rural way of living was perpetuated in the city and, thus, they ruralized the urban area. To mention but a few, the major traditional business communities like the Rajasthanis (often known as Marwaris), Gujaratis, and Sindhis are concentrated in the commercial hub of the city at the east end of the bridge on the Hooghly. The labourers coming from Bihar and Orissa occupying the industrial areas are predominant in the northern, north-eastern, eastern, and south-western reaches. They live either singly or in male "messing groups" of five or more in the overcrowded tenements and bustees (slums).[9] They remain in the city as "outsiders" in the sense that they never get absorbed into the permanent social structures of Calcutta.[10] Naturally, a major share of the city's income goes out of it and is not available for the developmental expenditure in the State of West Bengal, as a whole.[11] The concentration of other major groups have

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[8]Meera Guha, "The Morphology of Calcutta," Geographical Review of India 15 (September 1953): 21; Nirmal K. Bose, "A Social Problem of Calcutta," Man in India 51 (July-September 1971): 179.

[9]Nirmal K. Bose, "Calcutta: A Premature Metropolis," Scientific American 213 (September 1965): 99.

[10]Colin Rosser, Urbanization in India (New York: The Ford Foundation, International Urbanization Survey, 1972), p. 40.

[11]Nirmal K. Bose, "A Social Survey of Calcutta," Science and Culture 31 (December 1965): 598.

been shown in Figure 3. One important point to note is that "there has been no demand on the part of the Bengalis upon others to suppress their own languages in schools or elsewhere."[12] This characteristic, as well as the absence of occupational mobility, has not allowed Calcutta to become a melting pot on the model of American cities.[13] The intensity of these segregated ethnic groups is so strong that it is also manifested on space in terms of the kind of commodities sold in daily markets. For instance,

> In the Muslim- and Christian-dominated localities there is a large concentration of beef-stalls in the markets . . . In Bengali Hindu-dominated localities fish stalls predominate . . . In the 'mixed' localities which consist of Muslims, Christians, and Bengali Hindus, markets have stalls of vegetables and fruits on one side, and fish, meat and beef on the other.[14]

Another aspect of the third phase of the British capitalism was the expansion in the number of household servants. The aristocrats, both natives and sahibs, employed a large number of servants, who came to the city mostly from the adjacent districts of Bengal, Bihar, and Orissa. The tradition of having a servant and thereby maintaining social status is still quite strong even among the middle-class urbanites. The servants live predominantly in slums[15] or in the houses of their masters. Bose went so far as to comment that "Calcutta is a city

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[12]Nirmal K. Bose, Calcutta 1964 - A Social Survey (Bombay: Lalvani Publishing House, 1968), p. 84.

[13]Bose, "A Premature Metropolis," p. 102.

[14]Ashok K. Dutt, "Daily Shopping in Calcutta," Town Planning Review 37 (October 1966): 209.

[15]Dikshit Sinha, "Life in a Calcutta Slum," in Cultural Profile

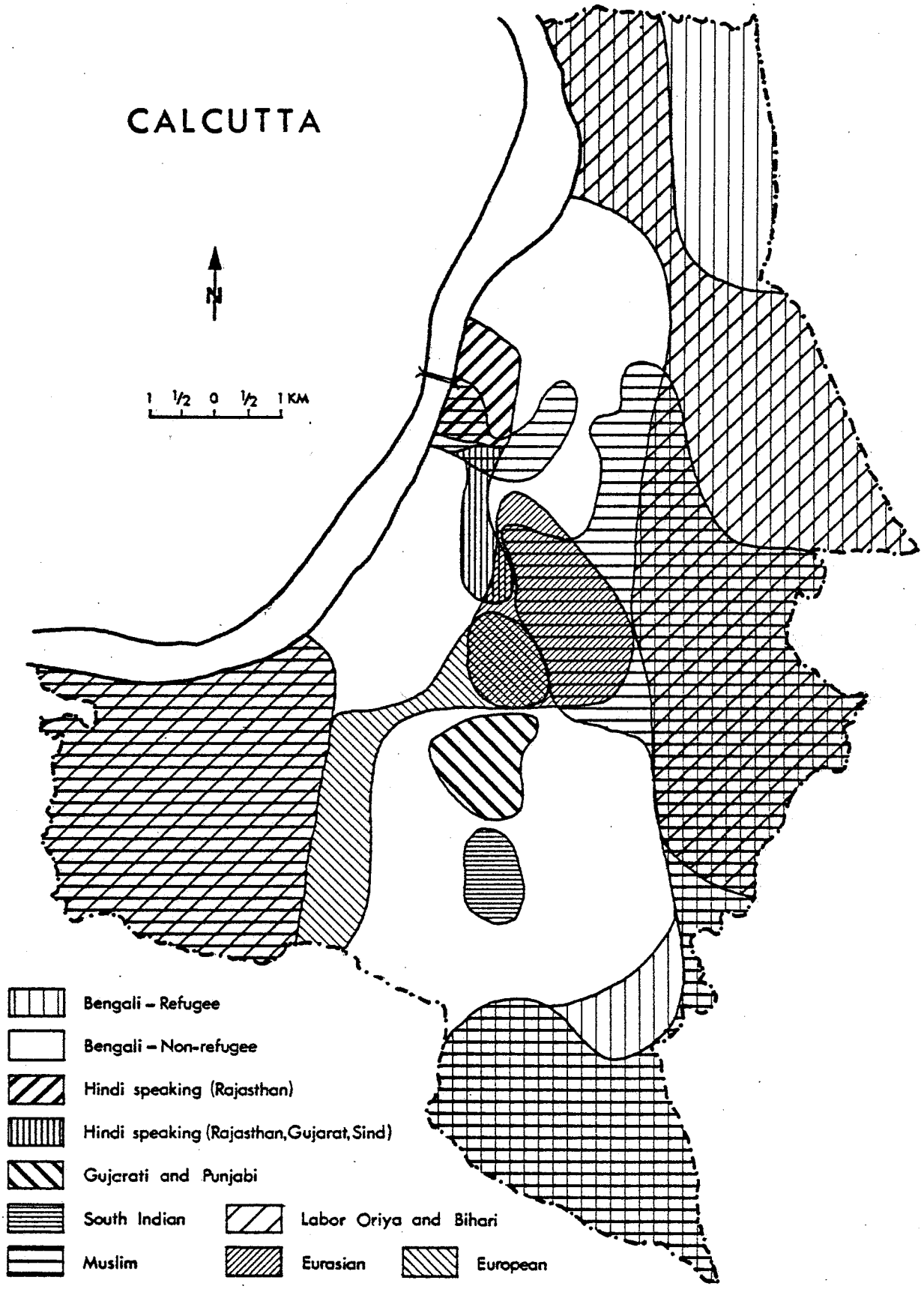

Fig 3. Ethnic Concentrations

of servants and of servant culture."[16]

The phase of British monopoly capitalism came to an end with the advent of independence which was accompanied by the partition of Bengal into West Bengal and East Pakistan (now Bangladesh). There was a considerable movement of people from one country to another. Millions of Hindu refugees poured across the border because of religious strife and political uncertainties in East Pakistan. This migration gained further momentum from the 1964 Indo-Pakistani war. According to the estimates of Bengal Chamber of Commerce, about 4.2 million refugees had moved into West Bengal by July 1970.[17] Calcutta, being the city in the State, received the major share of this additional population. This brought significant changes in the physical appearance of the city.

The immigrants did not have any choice of neighbourhoods for their habitation. They were concerned with cheap accommodation, and they forgot about their own traditional social identity. Some stayed with close relatives who had lived in the city for some time and thereby not only made the older parts of the city overcongested but also diluted "the social preeminence of the upper-caste Bengalis."[18] A vast majority moved into areas around the northern, eastern, and southern extremities which were, before the partition, inhabited by scheduled castes like

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of Calcutta, ed. by Surajit Sinha (Calcutta: The Indian Anthropological Society, 1972), pp. 87-91.

[16]Bose, "Social Survey of Calcutta," p. 595.

[17]Bengal Chamber of Commerce & Industry, West Bengal - An Analytical Study (New Delhi: Oxford & IBH Publishing Co., 1971), pp. 22-23.

[18]Bose, "A Premature Metropolis," p. 98.

Jaliya (fishmongers), Hari, and Dom. Other refugees settled in the formerly Muslim sectors around the outer northern and southern fringes of the city. In fact, these people are distributed all over Calcutta.

Besides these major waves of in-migrants, a regular flow of people into the city had continued through the years. People had flocked into Calcutta from the countryside around it. This continuous in-migration had been due to a (a) the growth of rural population, (b) technological improvements in agriculture causing increasing unemployment in rural areas, (c) other deteriorating economic conditions,[19] and (d) natural hazards like famine, drought (like that of 1966-67 in Bihar), and floods. The rural in-migrants' perceptions of opportunities in the metropolis are based on the hearsay from their relatives or fellow villagers. However, their movement to the city only increases the numbers of unemployed and under-employed.[20] Further they are alien to the new urban environment and are unqualified for city jobs and life-styles. But, in their struggle to survive, they have to join the vast army of working people who are predominantly street vendors with their trays, car washers, and human beasts of burden carrying heavy loads on their heads or pulling carts. Their income is so low that after feeding themselves (as they live a single life in the city in most cases) and sending something home to maintain their families, they have practically nothing left to pay the rent.[21] Thus,

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[19] G. L. Karkal, "Problems of Urban Housing and Slums," The Indian Journal of Social Work 31 (April 1970): 35.

[20] Hugh Tinker, Race and The Third World City. An International Urbanization Survey Report to the Ford Foundation (New York: The Ford Foundation, 1972), p. 43.

[21] Donald Milner, "Calcutta--A City in Despair," Geographical Magazine 41 (October 1968): 40.

they are forced to live in excessively overcrowded tenements and slum districts or become street dwellers.

Slums and pavement-dwelling are persistent phenomena of Calcutta. The slums, characterized by substandard houses such as tin shacks, bamboo huts and straw hovels, accommodate about one-fifth of the total population.[22] As many as 200,000 people curl up at night in the streets.[23] In addition to overcongestion, these slums suffer from almost a total absence of basic civic amenities like drinking water, sewerage, and electricity. They are always

> . . . pervaded with the smell of excrement, and during the monsoon many of the slum alleys are little better than cess-pools: hot-beds of disease as much as of the crime which tends to be fostered in a rootless, predominantly male society.[24]

The prevailing slum culture in the city is largely a synthesis of the culture of the lower class and what Bose called the "economy of scarcity."[25] The effects of alienation and poverty are not counterbalanced by tradition and group norms as they are in the villages. In the slum, "the only structural unit in the social life is the nuclear family and a very weak form of kin relation."[26] But the contingent situation of poverty does not bring about a pleasant husband-wife relationship. Disagreements result in neglect of children, quarrels

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[22] Sinha, "Calcutta Slum," p. 88.

[23] "Every Day St. Valentine's Day," Time (New York), 15 March 1971, p. 31; "Saints Among Us," Time (Canada), 29 December 1975, p. 47.

[24] Milner, "A City in Despair," p. 40.

[25] Bose, "A Premature Metropolis," p. 102.

[26] Sinha, "Calcutta Slum," p. 107.

and vicious fights, followed by desertion by either the husband or the wife. In addition to a large number of disorganized and disintegrated families, the other consequences of the economy of scarcity in slums include "the development of workshyness, lethargy and manual inefficiency."[27] In fact, all these physical and social conditions are such characteristic symptoms of the metropolis that Kar suggested:

> The standard of living and demands, the life-style and cultural behaviour of a large section of uprooted rural folk and of unaccultured urban squatters, slum and pavement dwellers thus create an 'extended village' rather than true urban habitats.[28]

The slums grew up in the city in order to provide accommodation to both the regular immigrants and refugees coming from East Pakistan. The attraction to slums may be itemized as follows:

1. They provide housing at rents that are within the means of the lowest income groups.
2. They act as reception centers for migrants by providing a means of assistance in the adaption to urban life.
3. They provide within the bustee a wide variety of employment in marginal and small-scale enterprises.
4. They provide a means of finding accommodation in proximity to work.
5. Their social and communal organization provides essential social support in unemployment and other occasions of difficulty.

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[27] K. N. Venkatarayappa, Slums (New Delhi: Sterling Publishers (P) Ltd., 1971), p. 50.

[28] N. R. Kar, "Towards A Pathology of Urban Environment in the Developing Countries," in International Geography 1972, ed. by W. Peter Adams and Frederick M. Helleiner (Montreal: University of Toronto Press, 1972), p. 818.

6. They encourage and reward small-scale private entrepreneurship in the field of housing.[29]

The slums of Calcutta, therefore, depict patterns which are quite different from slums of the American cities. There slums are located in the old, central parts of cities vacated by whites and now occupied by blacks. By contrast, those in Calcutta are dispersed and mixed with other types of residences, though they have a definite propensity for being located in the peripheral parts (Figure 4). In many cases, the immigrants simply squat in an open (private/government owned) area and pitch shacks for themselves. In turn, these shacks may be subdivided and rented to the newcomers. Thus, slums are the creation of rural in-migrants at the very beginning of their arrival in the city, and are composed of people of heterogeneous ethnic backgrounds like the Biharis, the Oriyas, and the Bengali Hindus belonging to all four castes.

C. Contemporary Socio-Economic Disorganization

Before the partition of 1947, it is said, the social life of Calcutta was knit "through both love and hate."[30] But, after independence,

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[29]Robert J. Crooks, "Urbanization and Social Change: Transitional Urban Settlements in Developing Countries," Conference Papers (Rehovot Conference on Urbanization and Development in Developing Countries, Rehovot, Israel, 1971), p. 8, cited by Marshall B. Clinard and Daniel J. Abbott, Crime in Developing Countries (New York: John Wiley & Sons, Inc., 1973), p. 138; Colin Rosser, "Housing and Planning Urban Change: The Calcutta Experience," in The City as A Centre of Change in Asia, ed. D. J. Dwyer (Hong Kong: Hong Kong University Press, 1972), p. 186. Literature shows that the researchers found the same results in their studies. Surprisingly the language in both cases is almost identical.

[30]Bose, "Social Problem of Calcutta," p. 179.

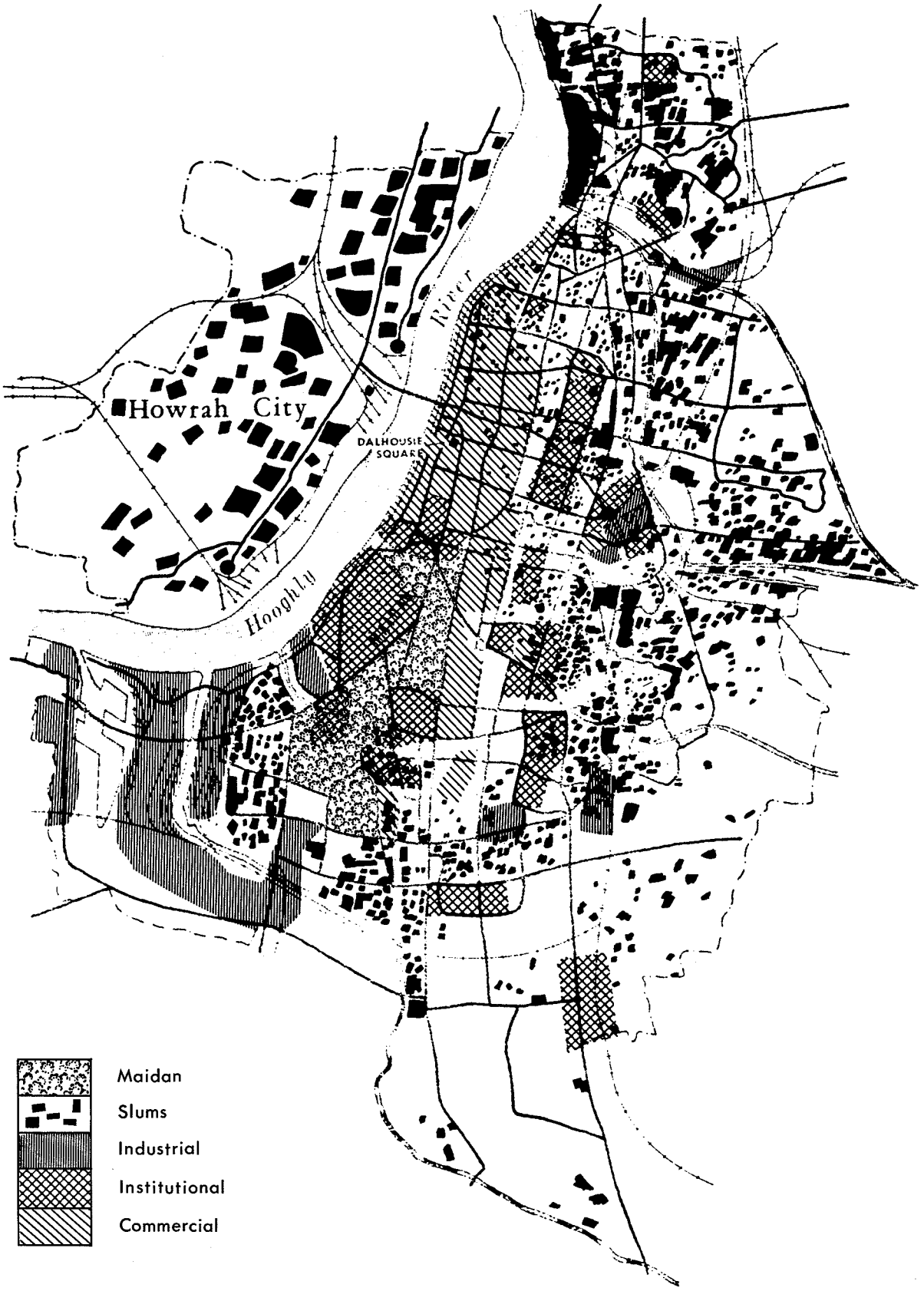

Fig. 4. Generalized Land Use

new social problems cropped up by the re-shuffling of population. The commercial and industrial organizations left by the British became controlled by the government or owned by the non-Bengali capitalists such as the Rajasthanis, Gujaratis, Sindhis, and Punjabis. These capitalists encroached upon the relatively old Bengali residential areas and, as a result, "the inhabitants of ancestral homes discover that they form a minority in the midst of crowds whose faces are foreign to them."[31] They also moved into the formerly European neighbourhoods and the newly built residential areas in the periphery of the city. These areas were once dominated by the Bengalis. Bose stated that the encroachment by the non-Bengalis had upset the Bengalis who had traditionally considered Calcutta as their own city.[32] At the other end of the social scale, the vast majority of the working class is like a parasite on the city.

> They create demands on urban services, contribute powerfully to the dramatic deterioration of the urban environment, but have little stake in the city as such, little concern for civic progress or civic pride, and little interest in the quality of the urban infrastructure or social services.[33]

All these elements have weakened the social cohesion of different neighbourhoods.

The arrival of thousands of refugees in the city brought twofold changes in its social structure, especially among the Bengalis. As has been mentioned on page 17, the superiority of the upper-caste Hindus

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[31] Ibid., p. 180.

[32] Ibid., pp. 179-180.

[33] Rosser, Urbanization in India, p. 41.

living in Calcutta for centuries was lost by the admixture of the majority of the uprooted Hindus belonging to Bhadralok.[34] Secondly, there was a break in hereditary occupational identity,[35] and this was prominent among the refugees. The situation was worse for the in-migrants who joined the ranks of semi-skilled or unskilled labour in industries; they could not keep pace with their counterpart non-Bengali labourers. Consequently, they had had to leave their vocations or were forced to be out of employment. This increased the percentage of un-employment among the middle-class Bengali Hindu families to some thirty compared to fourteen among the non-Bengali families in the city.[36] The rate of unemployment among the Bengalis had been on the increase since the partition, but it accelerated after the mid-sixties as a result of economic recession. The majority of Bengali residents were "thrown into a state of disorientation, anxiety and isolation in the midst of a crowd."[37]

Now turning to the economic conditions prevailing in contemporary Calcutta, it is worth mentioning that its relationship with the rural hinterland had always been characterized by colonial exploitation until

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[34]"Bhadralok . . . are a privileged minority most often drawn from the three highest castes . . ., usually landed or employed in professional or clerical occupations . . ., very well educated . . . and highly skilled in maintaining communal integration through a complex institutional structure that has proved remarkably adaptable." See Marcus F. Franda, Radical Politics in West Bengal (Cambridge, Mass.: The M.I.T. Press, 1971), p. 7.

[35]Bose, "A Premature Metropolis," pp. 97-99.

[36]Goyal, City in Turmoil, p. 50.

[37]Bose, "Social Problem of Calcutta," p. 181.

1947. Unfortunately, as A. N. Bose showed, this trend did not change, at least not by 1971. This is evidenced by the widening gap between the per capita income in the city and that of its rural counterparts.[38] This marked disparity further intensified the in-migration of villagers to Calcutta.

The industrial economy of Calcutta rests primarily on jute and engineering industries. With increasing competition in synthetic fibres and the expanding modernized jute industry in the then East Pakistan, the importance of the traditional jute products shrank rapidly.[39] The introduction of "plan holiday" in the context of Indo-Chinese and Indo-Pakistani wars of 1962 and 1965 respectively and the remarkable failure of monsoon for 1965 and 1966[40] forced the government to bring a drastic change in its decisions as to the purchase of manufactured goods. This severely affected the engineering industry of Calcutta, as it used to depend on government demand.[41] As well, investment in new industries in the private sector was practically out of question.[42] As a result, the volume of industrial employment which was about 40,000 in the city in 1966 dropped to 8,200 in 1967. Except for a small increase in

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[38]Bose, "Continuing Semi-Colonial Character," p. 39.

[39]Ibid., pp. 42-43.

[40]Ashok K. Dutt, "National and Regional Planning," in India: Resources, Potentialities and Planning, Revised ed., ed. Ashok K. Dutt (Dubuque, Iowa: Kendall/Hunt Publishing Company, 1973), p. 120.

[41]Bose, "Continuing Semi-Colonial Character," p. 43.

[42]Richard L. Meier, Developmental Features of Great Cities of Asia II: Japanese, Chinese, and Indian (Berkeley: Institute of Urban & Regional Development, University of California, 1970), p. 58.

employment in this group in 1968, the rate continued to drop due to retrenchment, lockout, and lay-off.[43]

The sharply rising consumer price index for Calcutta during the post-1965 period[44] (Figure 5) further aggravated the deterioration of economic conditions. These setbacks brought immense suffering and ultimate frustration to the vast majority of the Calcuttans.

Because of these intense pressures, the masses took recourse to political demonstrations which, in turn, precipitated the destruction of life and property. To put it differently, the "energy of despair" was changed to "anger of despair" which finally burst into an "explosion of despair."[45] Naturally, the "explosion of despair" took the shape of various activities like murder, robbery, arson, thievery, and burglary. The city experienced a complete breakdown of law and order, and many parts of it, especially "fringed areas of North and Central Calcutta, refugee populated congested areas of the suburb, became inaccessible to any outsider."[46] This process of destruction continued until it reached

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[43]Goyal, City in Turmoil, p. 17.

[44]Government of West Bengal, Economic Review 1972-73 (Alipore, West Bengal: West Bengal Government Press, 1973), pp. 30-35.

[45]The three terms are obtained from Peter C. W. Gutkind, "The Energy of Despair: Social Organization of the Unemployed in Two African Cities: Lagos and Nairobi," Civilisations 17 (Second Quarterly 1967): 186-215; Idem, "From the Energy of Despair to the Anger of Despair: The Transition from Social Circulation to Political Consciousness Among the Urban Poor in Africa," Canadian Journal of African Studies 7, no. 2 (1973): 179-198.

[46]Sajal Basu, West Bengal - The Violent Years (Calcutta: Prachi Publications, 1974), p. 93.

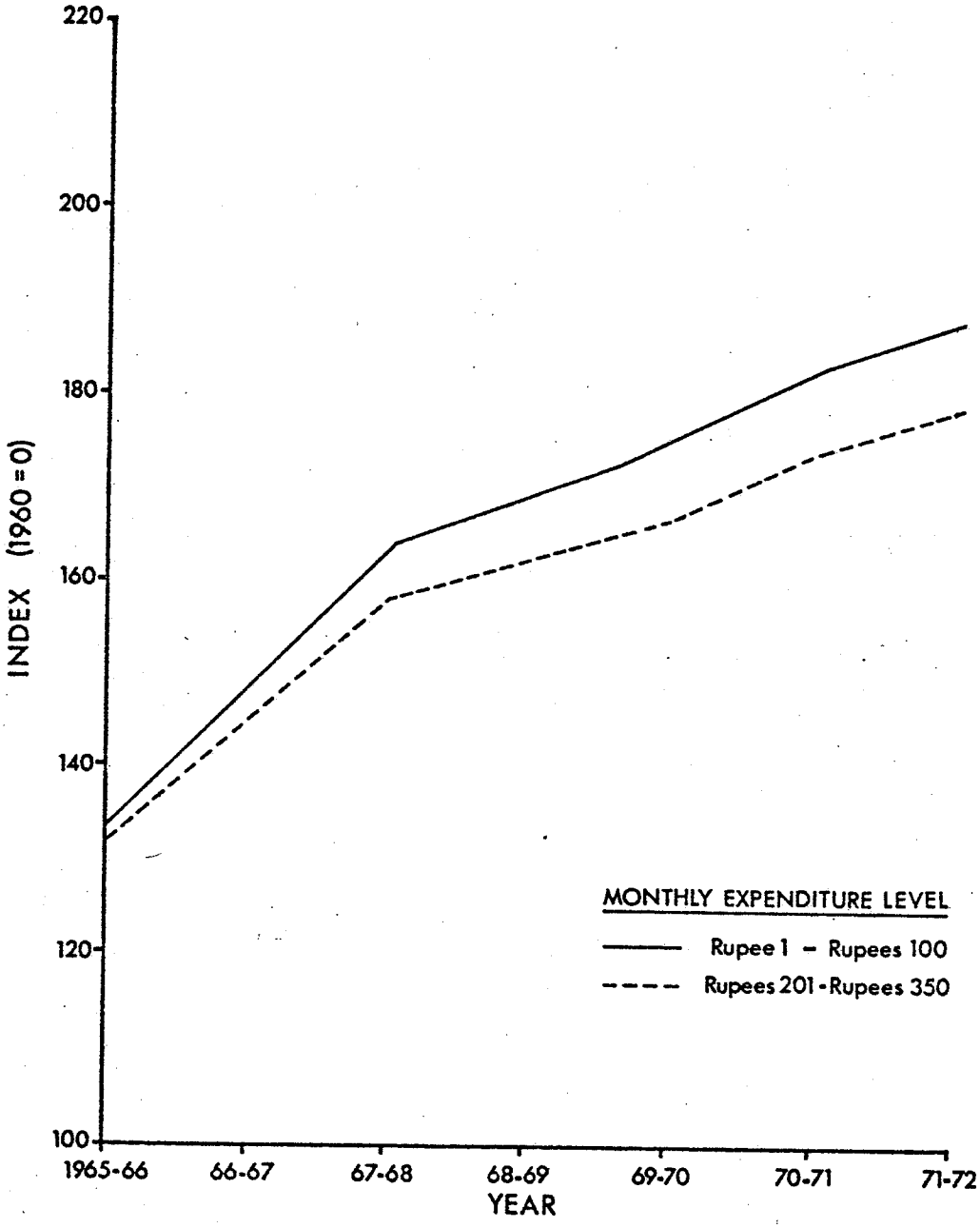

Fig. 5. Consumer Price Index of Calcutta

its peak in August 1971.[47] The federal government took strong measures to control the situation, but failed to restore normalcy in the city. With the overwhelming victory of the Congress (Ruling) party in the State in the general election of March 1972, the problem was solved to a great extent. However, it seems that the vast masses of people are dissatisfied with the status quo.

The above discussion certainly points to the fact that Calcutta had been in the midst of extreme social disorganization and shrinking economy since independence, particularly during the second half of the sixties. Little scope for betterment was left for middle class and enterprising working class. The problems of the city had been of such magnitude that Milner was moved to argue that "the problem of Calcutta is the problem of India in its starkest form--the problem, perhaps, of the world."[48]

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[47] Ibid.

[48] Milner, "A City in Despair," p. 49.

CHAPTER III

EMPIRICAL AND THEORETICAL FRAMEWORK

This chapter reviews the literature on the interrelationship between the social environment and the spatial patterning of crimes in cities. This aim is to be met by examining (A) the descriptive models of intra-urban structure, (B) empirical relationships that seem to exist between delinquency and ecological attributes, (C) the leading theoretical constructs used in delinquency research, (D) the applicability of western models to an Indian city, and (E) the limited contribution made by geographers in this field. It may look like a paradox that the studies of India have been reviewed under section D, but since these studies are in fields other than geography, it was considered logical that these precede the review of recent geographic studies. The inferences drawn from the review of literature are presented in section F. These form the basis for the subsequent analysis in this study.

A. Descriptive Models of Intra-Urban Structure

There are three classical descriptive models of urban structure which generalize the interrelationship between the development of land use and social geography. The first is the concentric zone model, the second is the sector model, and the third is the multiple nuclei model.

Concentric Zone Model

The concentric zone model was formulated by Burgess in the early 1920's based on his intensive study of Chicago.[1] He discovered that the regular processes of urban growth exhibit a differentiation in types of areas, producing successive zones or rings which begin with the central business district. The central business district forms the hub of commercial, social, and civic life. The central business district is surrounded by the zone of transition which is encroached upon by business and light industry and invaded by immigrants belonging to the lower-income groups. As a result, it is characterized by rooming houses and slums, with regions of poverty, degradation, disease, and underworlds of crime and vice. The transitional zone is, then, encircled by the zone of workmen's homes. This zone is inhabited mostly by industrial workers who move here from the zone of transition. In turn, the residential zone contains mostly good single-family dwelling units, occupied by middle-class groups. The last or the outermost zone lies outside the city limits, and has both middle-class and upper-class families.

Sector Model

Hoyt, a land economist, set forth the sector model based on an intensive study of the residential neighbourhoods of 142 American cities in the 1930's.[2] The basic assumption of the model is that from

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[1] Ernest W. Burgess, "The Growth of the City: An Introduction to a Research Project," in The City, reprint ed., ed. by Robert E. Park and Ernest W. Burgess (Chicago: University of Chicago Press, 1967), pp. 50-53.

[2] Homer Hoyt, The Structure and Growth of Residential Neighborhoods in American Cities (Washington, D.C.: U.S. Government Printing Office, 1939).

the central business district residential areas extend in distinctive sectors along major routeways towards the periphery of the city. Once the growth of some socio-economic class had started in some sector, it would continue to grow in that sector for a long time.

Multiple Nuclei Model

Recognizing that a typical city does not necessarily grow around a single centre, that is, the central business district, Harris and Ullman introduced an alternative model of urban growth in 1945.[3] It postulates that cities are marked by a cellular structure, in which various types of land use have grown around several nuclei. These nuclei are the by-products of the interaction of economic forces.

The models discussed above are not independent; as Smith in his study of Calgary stated, they "all have some relevance."[4] This was later supported by other research workers[5] who demonstrated that a city is a mosaic of sectors and zones on which urban characteristics are portrayed differently.

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[3]Chauncy D. Harris and Edward L. Ullman, "The Nature of Cities," Annals of the American Academy of Political and Social Science 242 (November 1945): 7-17.

[4]P. J. Smith, "Calgary: A Study in Urban Pattern," Economic Geography 38 (October 1962): 323.

[5]See, for example, B. J. L. Berry and Philip H. Rees, "The Factorial Ecology of Calcutta," The American Journal of Sociology 74 (March 1969): 469-491; Robert A. Murdie, Factorial Ecology of Metropolitan Toronto, 1951-1961. Research Paper, No. 116 (Chicago: Department of Geography, University of Chicago, 1969), pp. 152-172; B. J. L. Berry and Frank E. Horton, Geographic Perspectives on Urban Systems (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1970), p. 309; H. Singh, "An Analysis of the Spatial Structure of Indian Cities" (Ph.D. dissertation, Rutgers University, 1973), pp. 118-120.

B. Intra-Urban Empirical Research

The early ecological approach to the study of crime was almost totally eclipsed by Lombrosianism or "criminal anthropology" in the late nineteenth century. Its popularity did not last long as it was subjected to a high degree of criticism by sociologists.[6] However, the first systematic study of crime configuration from an ecological point of view was initiated by Shaw and McKay in 1929. They correlated delinquency rates with community structures. Delinquency rates were derived from juvenile court cases; and indicators of physical status (like population change), economic status (such as families on relief, median rentals, home ownership, and employment in domestic and personal services), and population composition (namely, foreign-born residents and Negro heads of families, racial proportion, foreign-born in white population, etc.) were obtained from census reports. During the thirties, they conducted further comparative studies of several American cities. Their findings show a high degree of consistency in the correlation between delinquency rates and community characteristics. These observations were published in Juvenile Delinquency and Urban Areas,[7] the "magnum opus in criminology."[8] These empirical findings, summarized by Wilks, are presented below:

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[6]Terence Morris, The Criminal Area: A Study in Social Ecology (London: Routeledge & Kegan Paul, 1957), pp. 37-70.

[7]Clifford R. Shaw and Henry D. McKay, Juvenile Delinquency and Urban Areas, Rev. ed. (Chicago: University of Chicago Press, 1969).

[8]Ibid., p. XXV.

1. Rates of delinquency and crime vary widely in different neighborhoods within a city, town, or SMSA.

2. The highest crime and delinquency rates generally occur in the low-rent areas located near the center of the city, and the rates decrease with increasing distance from the city center. (This finding is often referred to as the gradient hypothesis, and is most frequently illustrated by computing offender rates for concentric residence zones radiating out from the city center.)

3. High delinquency rate areas tend to maintain their high rates over time, although the population composition of the area may change radically within the same time period.

4. Areas which have high rates of truancy, also have high rates of juvenile court cases and high rates of adult offenders. In addition, if an area has a high rate of male delinquency, it usually has a high rate of female delinquency.

5. The differences in area rates reflect differences in community background. High rate areas are characterized by such things as physical deterioration and declining population.

6. The delinquency rates for particular nationality and ethnic groups show the same general tendency as the entire population; namely, to be high in the central area of the city and low as these groups move toward the outskirts of the city.

7. Delinquents living in areas of high delinquency rates are the most likely to become recidivists, and among all recidivists, they are likely to appear in court several times more often than those from areas with low delinquency rates.

8. In summary, delinquency and crime follow the pattern of the social and physical structure of the city with concentration occurring in disorganized, deteriorated areas.[9]

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[9]The President's Commission on Law Enforcement and Administration of Justice, Task Force Report: Crime and Its Impact - An Assessment, "Ecological Correlates of Crime and Delinquency," by Judith A. Wilks (Washington, D.C.: Government Printing Office, 1967), p. 143.

Shaw and McKay concluded that there should be a strong causal factor responsible for the concentration of crime and delinquency in specific areas in an urban centre. This factor has been termed "social disorganization" by Burgess.[10] Shaw and McKay also believed that "delinquency-producing factors are inherent in the community."[11] Their work has been pioneering in the sense that it has had a widespread effect on ecological studies aiming at explaining the spatial variation in crime rates in cities. Nevertheless, it has been subjected to criticism on the grounds of their methodology and findings, especially those relating to the "universal" gradient pattern of crime and the heritage of "delinquency-producing factors" in community. Among the well known critiques, White,[12] Robison,[13] Lottier,[14] Jonassen,[15] Lander,[16] and Morris[17] are notable. However, Lander's work deserves specific

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[10]Shaw and McKay, Juvenile Delinquency, p. XXV.

[11]Ibid., p. 315.

[12]R. Clyde White, "The Relation of Felonies to Environmental Factors in Indianapolis," Social Forces 10 (May 1932): 498-509.

[13]Sophia M. Robison, Can Delinquency Be Measured? (New York: Columbia University Press, 1936).

[14]Stuart Lottier, "Distribution of Criminal Offenses in Metropolitan Regions," Journal of Criminal Law, Criminology and Police Science 29 (May-June 1938): 37-50.

[15]Christen T. Jonassen, "A Re-Evaluation and Critique of the Logic and Some Methods of Shaw and McKay," American Sociological Review 14 (October 1949): 608-617.

[16]Bernard Lander, Towards an Understanding of Juvenile Delinquency (New York: Columbia University Press, 1954).

[17]Morris, The Criminal Area, pp. 85-91.

attention because his results have served as the basis for several future ecological investigations.

Lander's study of Baltimore is quite significant in the sense that it applied multivariate techniques of analysis to the differential distribution of juvenile delinquency for the first time. The data for his study were obtained from (a) 8,464 delinquent cases for the period 1939-42 and (b) 1940 census for socio-economic conditions. In contrast to the findings of Shaw and McKay, Lander's study showed that the distribution of delinquency was oversimplified by the use of the zonal hypothesis and that nearness to industrial-use zoned areas does not necessarily correlate with delinquency. His study was conducted in several steps:

1. He selected seven variables as representative of the ecological structure of census tracts: education, rent, owner-occupied dwellings, substandard housing, overcrowding, non-whites, and foreign-born in-migrants. The zero-order correlation analysis showed high association between delinquency and each of the variables selected.

2. He employed partial and multiple correlation analyses which proved proportions of owner-occupied dwellings and non-white residents to be significant predictors of delinquency rates.

3. This was further confirmed by an obliquely rotated factor analysis of eight variables including delinquency rate which yielded two factors: the anomic and economic. The first one loaded on high delinquency rate, high percentage of non-whites, and low percentage of owner-occupancy; while the second factor had loadings with percentages of overcrowding and substandard housing and low percentages of median

education and median rent. Based on this, Lander concluded:

> In Baltimore, areas characterized by instability and anomie are frequently the same districts which are also characterized by bad housing, low rentals and over-crowding. But the delinquency is fundamentally related only to the anomie and not to the poor socio-economic conditions of the tract.[18]

He further commented,

> The delinquency rate in a stable community will be low in spite of its being characterized by bad housing, poverty and propinquity to the city center. On the other hand, one would expect a high delinquency rate in an area characterized by normlessness and social instability.[19]

Lander's disavowal of the significance of socio-economic status, "the most concrete and most solidly established of all variables,"[20] drew the immediate attention of sociologists and prompted them to re-examine his findings.

Bordua used data for Detroit for the 1950 period, and compared partial regression coefficients for Detroit and Baltimore.[21] The percentage of owner-occupancy was found to be the best predictor of delinquency. He, then, used factor analysis to extract three orthogonal factors: housing conditions and overcrowding, socio-economic status, and poverty and social disorganization. The results indicated that the delinquency rate had almost equal loadings with the first and the third

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[18] Lander, Juvenile Delinquency, p. 59.

[19] Ibid., p. 89.

[20] Robert A. Gordon, "Issues in the Ecological Study of Delinquency," American Sociological Review 32 (December 1967): 927.

[21] David J. Bordua, "Juvenile Delinquency and 'Anomie': An Attempt at Replication," Social Problems 6 (Winter 1958-59): 230-238.

factors. Overcrowding was also associated with these two factors and, therefore, with delinquency. Thus, his findings are not exactly identical with those of Lander; however, they indirectly support Lander's contention that criminal behaviours are coincident with anomie.

Chilton followed Bordua in examining Lander's findings and studied Indianapolis for 1950.[22] Further, he compared the results of this study with those derived from a re-analysis of Lander's Baltimore and Bordua's Detroit data. He first used zero-order correlation analysis which revealed similarities among most pairs of variables, but there were significant differences for a few pairs, especially in relation to foreign-born residents. This was later confirmed, to some extent, by the results derived from factor analysis and multiple regression analysis of eight variables including the delinquency rate. This led him to conclude "results for three cities are equivocal in respect to the hypothesis that delinquency is closely related to a conditions of anomie."[23] However, Chilton's most serious criticism was that Lander had listed wrongly the signs of the loadings of four of his variables[24] and that the analysis could not claim for an anomie factor closely related to delinquency.

Soon after Lander's demonstration that Shaw and McKay's zonal

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[22]Ronald J. Chilton, "Continuity in Delinquency Area Research: A Comparison of Studies for Baltimore, Detroit and Indianapolis," American Sociological Review 29 (February 1964): 71-83.

[23]Ibid., p. 78.

[24]Ibid., p. 76.

hypothesis oversimplified the pattern of crime distribution in a city, the model of social area analysis was introduced by Tryon[25] and jointly by Shevky and Bell.[26] It aims at differentiating with a high degree of specificity the different subareas of a city on the basis of social attributes. Of these two, Shevky-Bell's method has been well accepted in most studies for distinguishing urban neighbourhoods in terms of three indices--urbanization (or, family status), social rank (or, economic status), and segregation (or, ethnic status). Important works, on social area analysis of crime, discussed in the following pages, include Polk's San Diego, California and Portland, Oregon studies;[27] Schmid's Seattle,[28] Quinney's Lexington, Kentucky;[29] and Willie's Washington, D.C.[30]

Polk's San Diego study was based on data from eighty-four census

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[25]Robert C. Tryon, Identification of Social Areas by Cluster Analysis (Berkeley and Los Angeles: University of California Press, 1955).

[26]Eshref Shevky and Wendell Bell, Social Area Analysis (Stanford: Stanford University Press, 1955).

[27]Kenneth Polk, "Juvenile Delinquency and Social Areas," Social Problems 5 (Winter 1957-58): 214-217; Idem, "Urban Social Areas and Delinquency," Social Problems 14 (Winter 1967): 320-325.

[28]Calvin F. Schmid, "Urban Crime Areas: Part I," American Sociological Review 25 (August 1960): 527-542; Idem, "Urban Crime Areas: Part II," American Sociological Review 25 (October 1960): 655-678.

[29]Richard Quinney, "Crime, Delinquency, and Social Areas," Journal of Research in Crime and Delinquency 1 (July 1964): 149-154.

[30]Charles V. Willie, "The Relative Contribution of Family Status and Economic Status to Juvenile Delinquency," Social Problems 14 (Winter 1967): 326-335.

tracts which yielded the indices of economic, family, and ethnic status after Shevky-Bell model. The zero-order correlation analysis showed that delinquency rates were highest in neighbourhoods characterized by low income status, low family status but by high ethnic status. But when he used partial correlation analysis, the association between delinquency and the indices was reduced. However, in the case of the economic status the association was so low that he concluded that delinquency is not a product of class or economic status.

In studying Portland, Polk did not repeat correlation analysis, but used the analytic scheme of Shevky-Bell. From this investigation he concluded, "At the lowest levels of family status . . . delinquency increases as social class increases . . . in contrast to the decrease that accompanies increases in social class for other levels of familism."[31] Thus, Polk's findings in San Diego and Portland support Lander's view that delinquency is related to "anomie" or social-instability.

Quinney's analysis of the census tracts of Lexington for the period 1960 was based on three crime variables: adult crime rate, juvenile delinquency rate, and juvenile delinquency-adult crime ratio. Following the framework of social area analysis, he extracted three dimensions from the set of social variables. The economic status was represented by education level and percentage of blue collar workers; the family status was indicated by percentage of women in labour force, fertility ratio, and percentage of single-structure housing units; and the racial status was based on percentage of non-white population.

Like Polk, he used the analytic scheme of Shevky-Bell which

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[31] Polk, "Urban Social Areas and Delinquency," p. 323.

revealed the following associations between social area dimensions and crime and delinquency:

1. Crime rates are negatively correlated with economic status and positively correlated with racial status but not correlated with family status.

2. Delinquency rates are negatively correlated with economic status and family status and positively correlated with racial status.

3. The proportion of delinquency to crime (delinquency/crime ratio) is positively correlated with economic status and negatively correlated with family status and racial status.

4. High family status appears to be a deterrent to crime only in areas of low economic status.

5. High family status appears to be a deterrent to delinquency in both high and low economic status areas.[32]

Thus, Quinney's basic findings regarding crime and delinquency also tend to support Lander's hypothesis that economic variables do not make an important contribution to variations in delinquency.

Willie, in his study of ecology of juvenile delinquency in Washington D.C. for the period 1959-62, measured socio-economic status in terms of a composite index score derived from employment, education level, values of owned homes, monthly rentals, and good dwelling units; and family status by the number of children in one-parent families. He demonstrated that socio-economic and family status are jointly important to delinquency rate and that development of delinquent careers is similar in both white and non-white neighbourhoods having many broken homes and low income. Willie's findings, thus, partly support Lander's explana-

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[32] Quinney, "Delinquency and Social Areas," p. 154.

tion of delinquency.

One of the best known comprehensive crime-oriented ecological studies is that of Schmid. His study of Seattle's census tracts rests on two series of crime statistics--"offenses known to the police" for the period 1949-51 and "arrests" for 1950-51--and eighteen 1950 demographic, social, and economic variables. Using the two sets of variables together in a factor analysis, he extracted eight orthogonal factors, the first three of which were labeled low family status, low occupational status, and low family and economic status respectively. Population mobility was the fourth and race was eighth. Six of the eight factors showed association between crime and ecological variables, but factors ranking fifth and sixth were represented entirely by crime and ecological attributes respectively. Then, by computing factor scores for all the factors, he related them to specific areas. In the next step, he compared the resultant crime areas with social areas classified on both the Shevky-Bell and the Tryon typologies. The association between the six dimensions of both typologies and various crime categories conformed to similar forms. The family life dimension of the Tryon typology was highly correlated (negatively) with eighteen out of the total of twenty crime types. Ranking second and third were Tryon's assimilation and Shevky-Bell's urbanization dimensions. Stated otherwise, this means that neighbourhoods distinguished by a high percentage of women in the labour force, low fertility, low proportion of married persons, low proportion of owner-occupied houses, and high proportion of older people had the highest rates of crime incidence. The relationships between crimes and other dimensions were blurred. Unlike Lander,

Schmid was disinclined to expound his conclusions as having any methodological and theoretical implications, rather he advocated an integration between ecological and socio-psychological approaches to the study of crime which, according to him, is "not a simple, precise, homogeneous phenomenon."[33]

The aforesaid studies were selected from the literature on crime in order to show the trend of crime-oriented ecological studies and to reveal important empirical generalizations. There is no unanimity with regard to the underlying causal factors of crime. Some researchers have demonstrated its association in space with social disorganization or anomie, whereas others have stressed economic deprivation. However, the most common observation is that

> Offenses and offenders tend to be concentrated in areas characterized by low income, physical deterioration, mixed land usage, non-traditional family patterns (e.g., homes broken in some manner, and/or high percentages of single males, and/or women employed in the labour force), and racial-ethnic concentrations which appear to produce low neighbourhood cohesion and low integration of the neighbourhood into larger society.[34]

So far as the spatial configuration is concerned, these studies have depicted, in general, a crime gradient with a peak at the centres of cities.

C. Theoretical Constructs Used in Delinquency Research

Before undertaking a detailed analysis of the differential crime rates in the study area, it is imperative that some of the hypo-

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[33] Schmid, "Urban Crime Areas II," p. 675.

[34] President's Commission, Task Force Report, p. 149.

theses popularly used in the study of the ecology of crime must be examined.

The first hypothesis under examination, the principle of differential association, was postulated by Sutherland in 1939 and modified in 1947. Basically, he refuted the contention that crime is simply a product of an abnormal psychology. According to him, crime is a social artifact and, like other types of behaviour, "criminal behaviour is learned"[35] in association with others, depending on the "frequency, duration, priority, and intensity" of the association.[36] Of course, the associations of an individual or a group of individuals are determined by cultural conflict which, in turn, are manifestations of social disorganization. Sutherland did not explicitly clarify the term.[37] It, thus, becomes apparent that the hypothesis is not directly related to the ecology of crime; it only suggests that crime rates will be high if unconventional values dominate an area.

The vagueness of Sutherland's concept of social disorganization was removed by Shaw and McKay.[38] Their Chicago study, discussed in the previous section, revealed that areas having high rates of delinquency around the turn of the century were also high rate areas after a few decades. This led them to believe that tradition plays a vital role in determining criminal behaviour. Most of the delinquents living in

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[35]Edwin H. Sutherland and Donald R. Cressey, Criminology, 8th ed. (New York: J. B. Lippincott Company, 1970), p. 75.

[36]Ibid., p. 76.

[37]Ibid., p. 77.

[38]Shaw and McKay, Juvenile Delinquency, pp. 183-189.

relatively poor sections of an urban area inherit economic, social, and cultural values which are quite different from the values of people living in richer areas.[39] To stress their opinion, they argued that "a prepondarance of those who become delinquent in low-income areas would find their satisfactions in activities other than delinquency" if the delinquency tradition were not already present.[40]

In order to elucidate a more complete understanding of the relative frequency of deviant types, Merton demonstrated that sources of deviance are found in the social structure itself. Basically, his theory of deviance was derived from Durkheim's concept of anomie or the absence of group norms. He emphasized on two elements of social structure, that is, culturally defined goals or aspirations and institutional means or norms for achieving them. The malintegration of these two brings about deviant behaviour. Based on this theory of means-end dilemma, Merton developed four possible modes of adaptation to anomic states:[41]

1. Innovation - stresses the goals and not the means. This may generate "amoral intelligence" in the lower class, and "white collar crime" in the middle class.

2. Ritualism - emphasizes the means and not the goals. Ritualists include those who get involved in embezzelment "at a last stage of their

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[39]Ibid., pp. 315-320.

[40]Ibid., p. 321.

[41]Robert K. Merton, Social Theory and Social Structure, Enlarged ed. (Glencoe, Illinois: The Free Press, 1968), pp. 194-211.

careers."[42]

3. Retreatism - forgets the goal and the mean. It represents vagrancy, drunkenness, etc.

4. Rebellion - guides the individual to develop means to isolate him from the parent situation.

Merton's theory is logically consistent, but it is not based on any empirical research. Nevertheless, its validity lies in the fact that it explains "the [high] association between poverty and crime in our society."[43]

Another theoretical framework for the study of deviance was put forward by Cohen. His concept of delinquent subculture was formed as a consequence of his criticism of Shaw and McKay's "social disorganization" and Merton's "means-ends" schema. Many slum areas were reported to be socially organized although, according to Shaw and McKay, they were supposed to suffer from disorganization.[44] Likewise, Merton's concept could not explain the non-utilitarian aspect of delinquency.[45] Cohen argued that "juvenile delinquency and the delinquent subculture in particular is overwhelmingly concentrated in the male, working-class sector of the juvenile population."[46] The nature of the subculture is

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[42]Daniel Glaser, "The Social Approaches to Crime and Correction," Law and Contemporary Problems 23 (Autumn 1958): 694.

[43]Merton, Social Theory, p. 681.

[44]Albert K. Cohen, Delinquent Boys: The Culture of the Gang (New York: The Free Press, 1955), p. 32.

[45]Ibid., p. 36.

[46]Ibid., p. 37.

non-utilitarian, malicious, negativistic, hedonistic, and autonomous.[47]

Cohen further explained that delinquent subcultures originate when there are problems of adjustment for working class youths. Through social interaction, they become aware of their inferior status which is judged by middle-class ethics. By middle-class ethics, Cohen meant qualities like ambition, individual responsibility, acquisition of skills, postponement of gratification, rationality, manners and courtesy, control of physical aggression and violence, "constructive" use of leisure, and respect for property.[48] His thesis is that when the boys from the working class cannot identify themselves with those who have got these qualities, they either try to imitate them and become "college boys" or refute them violently and become "corner boys." "The hallmark of the delinquent subculture is the explicit and wholesale repudiation of middle-class standards and the adoption of their antithesis."[49]

Dealing with empirical data on the incidence of gang delinquency in the Roxbury section of Boston for 1954-57, Miller offered a theory of crime causation. His "lower class culture milieu" assumes that lower class values are different from middle class norms and are traditional. The lower class community is characterized by six "focal concerns" (values) similar to Cohen's: the desirability of trouble, toughness, smartness, excitement, fate, and autonomy which conjointly generate

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[47]Ibid., pp. 24-31.

[48]Ibid., pp. 88-91.

[49]Ibid., p. 129.

deviance.[50] Miller also averred three basic role adjustments in the lower class culture parallel with Merton's adaptive models: conformity to both goals and norms, ritualism, and rebellion. However, the most important characteristic is that the slum is predominantly composed of "female-based" households which create problems of ambivalence or sex-role identification,[51] and the solution to this problem needs the help of the group or the gang reinforcement. Thus, this hypothesis is specially applicable to slums, the notorious vice areas of a city. Despite its importance in terms of ecological research, there is considerable doubt about whether deviance is indigenous only to lower class culture as Miller had asserted.[52]

Cloward and Ohlin realized that the theories mentioned above are not mutually exclusive; therefore, they attempted to integrate some of them, namely those of Sutherland, Merton, and Cohen. They assumed that "the social milieu affects the nature of the deviant response whatever the motivation and social position (e.g., age, sex, socio-economic level) of the participants in the delinquent subculture." They believed further that "the local cultural and social structure impinges upon and modifies deviant responses from the very onset."[53]

Their theory places stress on the fact that differential

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[50]Walter B. Miller, "Lower Class Culture as a Generating Milieu of Gang Delinquency," Journal of Social Issues 14, no. 3 (1958): 18.

[51]Ibid., pp. 13-15.

[52]Tony G. Poveda, "The Image of the Criminal: A Critique of Crime and Delinquency Theories," Issues in Criminology 5 (Winter 1970): 77.

[53]Richard A. Cloward and Lloyd E. Ohlin, Delinquency and Opportunity (Glencoe, Ill.: The Free Press, 1960), p. 160.

opportunity to culturally valued success-goals is more important than economic differential itself in determining the delinquent behaviour in lower-class urban neighbourhoods.[54] They categorized three types of delinquents arising from this situation on the basis of Merton's adaptive modes.[55] These are:

1. The criminal (stealing) groups who in an organized slum are promoted to a full adult criminal by virtue of acquiring skill. In other words, youthful delinquency is integrated with adult criminality.

2. The conflict (fighting) groups emerge in an area of transiency and instability due to lack of access to legal channels to success-goals and criminal opportunity.

3. The retreatist (addictive) groups are the product of limitations on legal and illegal opportunity. They "become detached from the social structure, abandoning cultural goals and efforts to achieve them by any means."[56]

From the review of the empirical researches and the theoretical constructs, it is evident that they were all conducted and developed in the United States. So, the question arises as to whether these findings and delinquent theories would hold true in an Indian setting, especially in Calcutta--the study area.

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[54] Ibid., p. 86.

[55] Ibid., pp. 20-27, 161-186.

[56] Ibid., p. 186.

D. Ecological Studies in India

Most studies concerned with intra-urban crime in India have been non-empirical with little or no evidence of theory formulation. Long before the publication of Shaw and McKay's work,[57] Haikerwal gave an impetus to criminological research.[58] He gathered data from different prisons, police stations, criminal tribe settlements, reformatory homes, aftercare homes, and juvenile courts in various parts of India. From the analysis, he concluded that crime in the country was then less violent and organized compared to that in the west, and that it was predominantly a product of economic stress and social strain.

Two more studies, one on Bombay and the second one on Calcutta, deserve mention.[59] They are representatives of the type of researches conducted in the particular field in India. Sabnis presented the results of an investigation into socio-economic and legal determinants of juvenile delinquency in the city of Bombay. He selected three samples of 110 delinquent case-records in each of the sampling years 1945-46, 1950-51, and 1955-56; and one sample consisting of 110 alleged delinquents for the year 1958-59. For the first three samples, forty-seven types of

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[57] Shaw and McKay, Juvenile Delinquency.

[58] Bejoy S. Haikerwal, Economic and Social Aspects of Crime in India (London: George Allen & Unwin Ltd., 1934).

[59] M. S. Sabnis, "An Abstract of a Study on Impact of Social Change on Certain Types of Delinquency," paper presented at the Conferences of Social Work, Bombay, n.d., cited by Sushil Chandra, Sociology of Deviation in India (Calcutta: Allied Publishers Private Ltd., 1967), pp. 59-67; K. P. Chattopadhyay, "Pattern of Juvenile Delinquency in Calcutta," International Journal of Comparative Sociology 3 (September 1962): 221-228.

information on personal, health, legal, and environmental (including employment, education, home conditions, reasons for in-migration to the city, leisure and recreation) conditions were obtained from the records, while the fourth sample was based on a 105-point questionnaire. In the next step, Sabnis applied Chi-square tests to his collected data in order to determine associations between numbers of delinquents and different attributes under consideration.

The analysis extracted facts about the ecological conditions prevailing in the city vis-a-vis delinquents and their habits. Among these some of the most important are:

1. Unsatisfactory physical conditions and lack of facilities for education, recreation, health, etc. forced the youngsters to accept delinquency as a part of their lives.

2. In-migration to the city was linked with the rise in crime rates.

3. Property delinquency maintained the highest rate of occurrence over time. But the commision of offenses against Prohibition Law was on the increase. The prohibition delinquents, through frequent contact with the illegal elements, became ultimately regular delinquents whose common habits were assault, burglary, dacoity, and smuggling.

Chattopadhyay's study of "Pattern of Juvenile Delinquency in Calcutta" was partly based on the earlier work of Mukhopadhyay, whose premise was one thousand case records of some of the years before 1951.[60] He observed that delinquency was linked with dire poverty,

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[60]Chattopadhyay, "Juvenile Delinquency in Calcutta," p. 221.

total lack of education, extremely unhygienic living conditions, and homes broken by the desertion of the father. In most cases, delinquents were involved in minor theft and blackmarketting of rice (as people did not have sufficient quantities of rice which was then rationed). With the abolition of rationing in mid-1954, blackmarketting of rice had practically disappeared by 1955, but there was a sharp rise in the number of thefts from the dock areas where valuable imported goods were stored in warehouses. However, sexual offenses were significantly low in Calcutta.

The second part of Chattopadhyay's study is the product of the 1956 survey of a clum area located in one of the oldest parts of Calcutta. He demonstrated that uncertain economic and extremely poor living conditions and the absence of community relationships were the primary agents of delinquency. The conflict of ideas in terms of realization of deprivation of rights also led to the development of juvenile delinquents coming from the slum. To stress this cultural conflict, he further argued:

> Among the educated section of our populace, the adolescent college and high school students have shown symptoms of disregard of cultural sanctions--not indeed by stealing,--but by acts of "Vandalism" which is one form of disregard of property rights, some times genuine and sometimes judged to be so in the light of political views and propaganda.[61]

Srivastava's work on the cities of Lucknow and Kanpur is perhaps the only study which used the concentric zone hypothesis to explain delinquency patterns.[62] His study was based on a random sample of three

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[61] Ibid., p. 228.

[62] Shankar S. Srivastava, Juvenile Vagrancy: A Socio-Ecological Study of Juvenile Vagrants in the Cities of Kanpur and Lucknow (Bombay: Asia Publishing House, 1963).

hundred vagrants from both streets and slums, with an average age of 13.7 years. He interviewed both their gangs and families for an appraisal of their values, attitudes, and delinquent behaviour. The family background of the vagrants was characterized by a high proportion of broken homes, drinking, gambling, and unusual sex relationships on the part of the parents. Most of the families had irregular income. This economy of scarcity was at the root of their poor living conditions (constantly unsanitary, congested, and suffocating) and the zero-level of education. About 60 per cent of the vagrants lived in rented houses with no masonry roofs and walls, and 22 per cent had no home at all. The vagrants were thus deprived of the expected physiological, psychological, and social needs.[63] Therefore, they sought their own satisfaction in an unwholesome way. Their behaviour was a manifestation of traits like impertinence and untruthfulness, sexual malpractices, gambling, intoxication, stealing, and juvenile trade in stolen goods. In the long run, this sort of experience became a part and parcel of their subculture.

The ecological part of this study revealed that areas of concentration of vagrants were also significant for high crime rates. These areas were "characterized by their high intensity of population, extra rapid mobility and deteriorating neighbourhoods."[64] In both cities, the incidence of crime showed a progressive decline towards the periphery from the central business zone. Srivastava showed also the association of the vagrants' types of activities with the physical characteristics

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[63] Ibid., p. 7.

[64] Ibid., p. 193.

of various parts of the cities which were divided into the following four zones:

1. Open field zones: These include river and canal banks, parks, playgrounds, and open spaces. Here gambling is the most important activity.

2. Periodical zones: These are notorious as vagrancy resorts. Vagrants are attracted by weekly or bi-weekly markets. Shop-lifting, pilfering, and trade in stolen goods are their primary activities.

3. Zones around the railway premises: These are known for activities like gambling, begging, picking pockets, stealing, and sexual malpractices.

4. Permanent market zones: These are notable for pilfering, pocket-picking, shop-lifting, and idling around.[65]

E. Contemporary Geographic Research on Crime

Although crime is essentially a part of human behaviour, "the geographical study of crime has proceeded somewhat intermittently, both in time and in space."[66] The emergence of professional specialization in the geography of crime is quite recent. Owing to the outbursts of urban blacks in the form of riots and civil disorders in the United States in the sixties, crime was recognized as a major public issue. Crimes of Violence, published by the National Commission on the Causes and Prevention of Violence, suggested a few variables associated with

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[65] Ibid., pp. 219-249.

[66] Keith D. Harries, The Geography of Crime and Justice (New York: McGraw-Hill Book Company, 1974), p. 9.

crime such as space and location; distance and access to space; scale; and high residential densities, poor physical condition and low general quality of the urban environment.[67] These variables are spatially oriented; therefore, they drew considerable attention from geographers and made them aware that they should incorporate crime into the domain of social geography, as they had already done with other socio-cultural phenomena like language, religion, and poverty. This brought about a significant change in the discipline, and since the beginning of the current decade geographers have been contributing to the criminological literature by focusing their attention on criminal behaviour either following ecological concepts or utilizing their numerical skills acquired from the discipline's quantitative revolution during the sixties. The salient feature about their research is that it has leaned more towards adult crime rather than juvenile delinquency, just the reverse of the past ecological studies.

Geographers have looked at criminal behaviour in a number of ways. Some followed the ecological approach and provided the link between patterns of crimes and patterns of social variables in urban areas. For example, Downey and Hunt put emphasis on the selection of crime rate in their study of Worcester, Massachusetts. On the basis of area- and population-based crime rates, they correlated crime factors with social factors.[68] Similarly, Harries discussed intra-metropolitan

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[67] National Commission on the Causes and Prevention of Violence, Crimes of Violence, by D. J. Mulvihill and M. M. Tumin, vol. 12 (Washington, D.C.: Government Printing Office, 1969), p. 698.

[68] George T. Downey and Richard G. Hunt, "The Spatial Structure of Intraurban Criminal Behavior," paper presented at the annual meeting of the Association of American Geographers, Kansas City, Kansas, April 1972.

differences in crime rates in the United States. He found the relationship between his "general crime" and "violent crime" dimensions and nine social dimensions using the stepwise regression model.[69] The most elaborate study in this group was completed by Pyle and his colleagues.[70] In the first part of the study, they used the canonical analysis technique to determine the significant patterns of associations between components of crime and their possible determinants, first for Summit county and then for the city of Akron. But the uniqueness of the research lies in the aggregation of origin and destination locations of the criminals by census tracts so that one can understand the spatial behaviour of criminals.

Another major thrust of contemporary research in the geography of crime has been toward the formulation of spatial behavioural models. Among the important ones, the model of aggregate criminal behaviour combining opportunities for a crime with the efficiency of police in a city may be mentioned. It gives "a measure of realtive desirability of a location for a specific crime."[71] The eco-space model was suggested by Haring on the basis of constructs like crowding, distance travelled

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[69]Harries, Geography of Crime, pp. 38-59.

[70]Gerald F. Pyle et al., The Spatial Dynamics of Crime. Research Paper, No. 159 (Chicago: Department of Geography, University of Chicago, 1974).

[71]George F. Rengart, "Spatial Aspects of Criminal Behavior: A Suggested Approach," paper presented at the annual meeting of the Association of American Geographers, East Lakes Division, Indiana, Pennsylvania, October 1972.

by the offender, and the density of crime,[72] while the spatial diffusion and migration models were advanced by Lee for studying the behaviour of offenders' movement.[73] Others directed their efforts to the test of hypothesized relationships between the residences of female burglars and the locations of burglary,[74] or between the frequency of robbery trips and the distance from the residence of the offender.[75]

In contradistinction to the above approaches, proponents of the "perception" concept also showed a great deal of research interest in the field of the geography of crime. Both Springer[76] and Ley[77] examined the perception of crime and the behavioural responses of residents in a neighbourhood. Contrarily, criminals' perception of potential

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[72]L. Lloyd Haring and Marilyn Haring, "Spatial Aspects of the Behavioral Environment of Juvenile Delinquents," paper presented at the annual meeting of the Association of American Geographers, Kansas City, Kansas, April 1972.

[73]Yuk Lee; Yee Leung; and Lionel Lyles, "Two Conceptual Approaches and An Empirical Analysis of the Origin Node of Violent Crimes," Proceedings of the Association of American Geographers 6 (1974): 157-161.

[74]George F. Rengart, "The Journey to Crime: An Empirical Analysis of Spatially Constrained Female Mobility," paper presented at the annual meeting of the Association of American Geographers, Milwaukee, Wisconsin, April 1975.

[75]Donald L. Capone and Woodrow W. Nichols, Jr., "Crime and Distance: An Analysis of Offender Behavior in Space," paper presented at the annual meeting of the Association of American Geographers, Milwaukee, Wisconsin, April 1975.

[76]Larry M. Spring, "Crime Anxiety and Behavior in Space," paper presented at a local meeting of the Canadian Association of Geographers, Vancouver, British Columbia, November 1972.

[77]David Ley, "The Meaning of Space in an Inner City Context," paper presented at a local meeting of the Canadian Association of Geographers, Vancouver, British Columbia, November 1972.

targets was studied by Catau and Ingalls.[78]

Stephenson and Smith attempted to develop methodology for a better understanding of some aspects of crime. Stephenson used centrography as an alternative technique for studying two-dimensional criminal activity in space,[79] and Smith concentrated on incidence of crime as a territorial indicator of social well-being.[80]

F. Inferences About Previous Studies

A review of the literature cited in the previous section shows that despite geographers' attempts to unravel the complex web of criminal spatial behaviour, at least one issue involving spatial configuration of urban crime is still unexplored. When the studies in section B are reviewed, it becomes apparent that the spatial framework of the great bulk of researches on crime has been provided by the zonal model only. There is a void in criminological literature about the sectoriality of crime in a city. "Remarkably little curiosity has been displayed concerning spatial regularities other than gradients and about the

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[78] John C. Catau and Gerald L. Ingalls, "The Geography of Urban Crime: Some Methodological Considerations," paper presented at the annual meeting of the Association of American Geographers, East Lakes Division, Indiana, Pennsylvania, October 1972.

[79] Larry K. Stephenson, "Cartographical Applications to Intra-Urban Criminal Distributions: Problems and Promises," paper presented at the annual meeting of the Association of American Geographers, Kansas City, Kansas, April 1972; Idem, "Spatial Dispersion of Intra-Urban Juvenile Delinquency," The Journal of Geography 73 (March 1974): 20-26.

[80] David M. Smith, Crime Rates as Territorial Social Indicators: The Case of the United States. Occasional Paper, No. 1 (London: Department of Geography, Queen Mary College, University of London, 1974).

spatial deviations of deviance."[81]

The review provides further evidence of the total absence of a spatial analysis of crime in its entirety in India. As revealed in Chapter I, there is a crying need for a comprehensive analysis of crime in the study area, focusing on its spatial aspects which may have far-reaching policy implications.

In consideration of the aforesaid points, the present research is undertaken in a cross-cultural setting. Unlike most studies following the ecological approach, this study in the first place views crime in the light of the social area concept, and it is accompanied by a systematic effort to provide evidence for certain spatial formulations.

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[81] P. Scott, "The Spatial Analysis of Crime and Delinquency," Australian Geographical Studies 10 (April 1972): 8.

CHAPTER IV

THE ANALYTICAL APPROACH

A. Data: Nature and Problems

Two sets of data are utilized in this study--predictor set and criterion set. The former consists of incidence of crimes, and the latter includes ecological correlates of the study area. Access to the first type of information was possible through the cooperation of the Calcutta Police Commissioner.[1] These data for 1971 were available in the form of raw numbers by offense reported to the police under the police district. In the analysis and discussion of crime, "offense reported to the police" has been used as the best and the most reliable index of the amount of crime committed.[2]

The data of the second category were mostly available from the published sources. Census of India 1971 provided basically tabulation of a variety of data, by census wards, related to population,

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[1]The author gratefully acknowledges the aid of Dr. N. R. Kar of the Government of West Bengal, India, who made the crime data available.

[2]International Association of Chiefs of Police, Committee on Uniform Crime Records, A Guide for Preparing Annual Police Reports, Revised ed. (Washington, D.C.: International Association of Chiefs of Police, 1935), p. 11; Calvin F. Schmid, "Urban Crime Areas: Part I," American Sociological Review 25 (August 1960): 527.

literacy, number of households, and employment structure of the residents.[3] The 1971 ward data regarding population by age structure, religious affiliation, marital status; residential and non-residential houses; and houses made of temporary materials were not available. These data were at hand for wards in 1961,[4] and for the city as a whole in 1961 and 1971. Where data considered to be potentially relevant to an understanding of crime rates were available for wards in 1961 but not 1971, their use in the analysis was dictated by indications of likelihood that they did not alter in distribution in the decade. Their city-wide proportions were compared (Table 3), and eleven out of thirteen were found to be almost identical in both the censuses. However, there did not arise any basis of comparison between two sets of data on housing characteristics because the 1971 definition of a census house "differs radically" from the 1961 definition.[5] And the feasibility of calculating the percentages of the non-Bengalis and the married males was eliminated at once inasmuch as the 1971 figures were not at hand.

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[3]Bhaskar Ghose, Census of India 1971, series 22: West Bengal, part IIA: General Population Tables (Delhi: The Manager of Publications, 1972), pp. 29-31, 356-373.

[4]B. Ray, Census 1961 - West Bengal, District Census Handbook - Calcutta, vol. 2 (Calcutta: The Superintendent, Government Printing, 1966), pp. 361-384, 421-425, 447-451; J. C. Sengupta, Census of India 1961, vol. 16. West Bengal and Sikkim, part IV (i). Report and Main Tables on Housing and Establishments (Delhi: The Manager of Publications, 1964), pp. 166-169, 212-216, 668-673.

[5]Bhaskar Ghose, Census of India 1971, series 22: West Bengal, part IV: Housing Report and Tables (Delhi: The Manager of Publications, 1972), p. 27.

TABLE 3

Comparison Between 1961 and 1971 Characteristics

Characteristic	1961	1971
Population density[a]	30,479.10	31,748.06
Sex ratio	162.79	156.79
% Male (15-39)	32.08	29.90
% Hindu	83.94	83.10
% Scheduled castes and scheduled tribes	4.40	3.83
% Literacy, total population	59.26	60.28
% Literacy, male	39.35	39.10
% Workers, total population	40.26	36.90
% Women workers	2.32	2.20
% Workers engaged in manufacturing	10.54	10.31
% Workers engaged in trade and commerce	9.70	10.76
% Workers engaged in services	14.05	9.77
% Population living in one room	56.24	54.16

[a]Based on areas of 95.62 and 98.79 square kilometres in 1961 and 1971 respectively.

Because of the semi-static nature of half of the information at two points in time, it was assumed that the characteristics for which no data were available in 1971 would follow the general tendency. Two arguments might be put forward in support of this a priori assumption. First, the majority of the people in Calcutta belong to the middle and the low income groups, and here "the rate of unemployment is higher and the waste of human resources is . . . greater, than in any other urban

centre in India."[6] For the obvious reason, their residential mobility is restricted. The situation was further aggravated by the intensity of the economic recession during the second half of the 1960's,[7] as seen in Table 3 by the drop in numbers of the total workers and the workers employed in services. This was the effect of several economic setbacks, as discussed in Chapter II. One example would suffice here; about 50,000 jobs disappeared from the city in 1969 when it witnessed the abolition of the "managing agency" system.[8]

Secondly, a lot of development designed to remove the physical bottlenecks (an extremely insufficient number of housing units, wretched housing conditions, inadequate transit facilities, poor water supply and drainage systems, etc.) choking the city could bring about a change in the internal movement of people. But that hardly took place. Reference may be made to an impressive all-round start on a 20-year development plan for Greater Calcutta,[9] but "the government at various levels concerned found it virtually impossible to put the plan fully into practice."[10] In fact, plans simply piled up in government files and "in spite of the tons of papers consumed either in bemoaning the city's sad

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[6]Harold Lubell, Calcutta: Its Urban Development and Employment Prospects (Geneva: International Labour Office, 1974), p. 5.

[7]Narendra Goyal, ed., The City in Turmoil (New Delhi: Gandhi Peace Foundation, 1971), p. 17.

[8]Lubell, Calcutta, pp. 24-25.

[9]Government of West Bengal, Development and Planning (Town and Country Planning) Department, Calcutta Metropolitan Planning Organization, Basic Development Plan for the Calcutta Metropolitan District, 1966-1986. Calcutta, 1966.

[10]Lubell, Calcutta, p. V.

plight or in drawing up blueprints by the dozen, hardly any purposeful action has been taken in all these years to stem the rot at the roots."[11] Against this background, some of the 1961 data were assumed to constitute a reasonable estimate of the corresponding 1971 values. These were used to reinforce analytical results, rather than being included *per se* in any statistical model.

B. The Variables

The twenty-two independent variables forming the predictor set were selected to manifest the commission of crime in the internal structure and organization of the study area. Availability of data was the prime factor in their selection. For lack of sufficient data, a number of variables considered to be relevant to the crime rate had to be discarded. For example, figures for per capita income are not available. An indirect method had to be used for determining which spatial units are affected by low income. It is true that residents living in blighted areas or slums are poorer than those living in other parts of an urban area. It would, therefore, be valid to conclude that higher the percentage of poor housing conditions in a unit area, the lower would be the average income. Selection from the available variables was based on the theoretical consideration of different viewpoints of crime causation and the anticipation that directly or indirectly, individually or collectively, these variables may be related to the crime configuration of the city at one point in time.

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[11] Bengal Chamber of Commerce & Industry, *West Bengal - An Analytical Study* (New Delhi: Oxford & IBH Publishing Co., 1971), p. 64.

The independent variables under consideration are organized under four categories: (1) socio-cultural, (2) economic, (3) environmental, and (4) political. However, the categories remain subjective; for example, the number of undergraduate colleges in a unit area could be included within the economic or socio-cultural category rather than political. The variables selected are listed in Table 4.

The inclusion of the political variables in the analysis and their association with the incidence of crime needs some explanation. Students in India, especially in Calcutta, become more prone to support the extremist political groups because of the ever-growing frustration caused by large-scale unemployment and "rejection of the status quo,"[12] and also "extremely poor living conditions."[13] Above all, Calcutta's strong political tradition, coupled with the overwhelming victory of the Communist party in the State of West Bengal in the 1967 general election, stirred up their consciousness.[14] In reality, they are continuing the tradition of the colonial era which might be described as "The circumstance that robberies and murders are being committed by young men of respectable extraction, students at schools and colleges, is indeed an amazing phenomenon, the occurrence of which in most countries would hardly be credible."[15] The significant peculiarity of deviant

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[12]Philip G. Altbach, ed., Turmoil and Transition: Higher Education and Student Politics in India (New York: Basic Books, Inc., 1968), p. 52.

[13]Ibid., p. 56.

[14]Myron Weiner, "Urbanization and Political Protest," Civilisations 17 (First Quarterly 1967): 45; Ranajit Roy, The Agony of West Bengal, 3rd ed. (Calcutta: New Age Publishers Private Limited, 1973), pp. 104-111.

[15]Sedition Committee, Report (Calcutta: The Superintendent,

TABLE 4

Ecological Variables Initially Considered

Socio-Cultural

1. Population change, 1961-1971
2. Density of population, 1971
3. Sex ratio, 1971
4. % Male (15-39), 1961
5. % Married male, 1961
6. % Hindu, 1961
7. % Non-Bengali, 1961
8. % Scheduled castes and scheduled tribes, 1961
9. % Literacy, total population, 1971
10. % Literacy, male, 1971.

Economic

11. % Workers, total population, 1971
12. % Women workers, 1971
13. % Workers engaged in manufacturing, 1971
14. % Workers engaged in trade and commerce, 1971
15. % Workers engaged in services, 1971
16. % Rented households living in census houses, 1961

Environmental

17. % Population living in one room, 1961
18. % Occupied census houses used as dwellings, 1961
19. % Occupied census houses used as factories, workshops and worksheds, 1961
20. % Dwellings made of walls with temporary materials, 1961[a]

Political

21. Distance of centres of graduate studies from centre of police district
22. Number of undergraduate colleges in police district per 10,000 population

[a]Grass, leaves, reeds/bamboo, timber, and mud.

behaviour was observed by Bose even after independence in India.[16]

Three centres of graduate studies having purely Faculty of Arts or a combination of Arts, Science, and Technology were considered here. They act as the nerve centres of students' political life, and thus "whenever there is any disturbance in Calcutta, it will be at once reflected . . . in front of the University building--that is always the case."[17] It is well accepted, at least in an Indian setting, that Arts faculty students have insecure occupational futures,[18] and naturally get more involved in unrest and violence than the science or porfessional students.

Distances between institutions has hardly been used as a variable in criminological research. In our analysis, neither the average distance of the aforesaid centres from the centre of spatial units nor the shortest distance between any of these institutions and the centre of a unit was taken into account. In order to have the behavioural impact of these academic centres over the units of study (Table 5), it is being assumed that incidence of crime is proportional to

$$\frac{1}{3}\left(\frac{1}{d_C}+\frac{1}{d_J}+\frac{1}{d_R}\right)$$

Government Printing, 1918), pp. 26-27, cited by Nirmal K. Bose, "Social and Cultural Life of Calcutta," Geographical Review of India 20 (December 1958): 24.

[16]G. Bose, "Delinquency in India," in Searchlights on Delinquency, ed. K. R. Eissler (New York: International Universities Press, Inc., 1949), p. 432.

[17]S. N. Sen, "Inaugural Address" at the 1970 Seminar on Cultural Profile of Calcutta, in Cultural Profile of Calcutta, ed. Surajit Sinha (Calcutta: The Indian Anthropological Society, 1972), p. 2.

[18]Myron Weiner, The Politics of Scarcity (Chicago: University

TABLE 5

Police Districts of Calcutta

Number	Notation used by Police	Name of Police District
1	M	Cossipore
2	N	Chitpur
3	A	Shyampukur
4	B	Jorabagan
5	C	Burtola
6	D	Burrabazar
7	E	Jorasanko
8	F	Amharst Street
9	G	Hare Street
10	H	Bowbazar
11	I	Muchipara
12	J	Taltala
13	K	Park Street
14	L	Hastings
15	01	Manicktala
16	02	Ultadanga
17	P3	Narkeldanga
18	P2	Phoolbagan
19	P1	Beliaghata
20	Q	Entally
21	R	Beniapukur
22	Y	Karaya
23	S	Ballygunj
24	T	Bhawanipur
25	U	Tollygunj
26	V2	New Alipur
27	V1	Alipur
28	W	Watgunj
29	SP	South Port
30	X	Garden Reach
31	Z	Ekbalpur
32	NP	North Port

where d_C, d_J, and d_R represent the distances of centres of units of study from Calcutta University, Jadavpur University, and Rabindra Bharati University respectively (Figure 6).

The number of undergraduate colleges was considered as a substitute for number of undergraduate students in each unit, because the information about the student enrollment was not available. "Undergraduate students . . ., constitute a captive audience par excellence for political manipulations because they have not yet assumed their major responsibilities of work and family, and so are freer to respond to suggestion."[19] In Calcutta, especially during 1970-71, they (undergraduates) were politically so violent that they were beyond police control until the Congress (Ruling) party returned to power in the State in March 1972.[20]

Now turning our attention to the criterion set correlates (Table 6), the original intention was to use an opportunity structure as a base for rates of crimes against property. (This idea was developed by Lottier in his study of chain store burglaries in the Detroit metropolitan region[21] and later expounded by Boggs.[22] She demonstrated that it is more satisfactory for crimes against property

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of Chicago Press, 1962), pp. 194-197; Yugandhar, Profile of A Student Movement (Guntur: Sandipani Publications, 1970), p. 2.

[19]Aileen D. Ross, Student Unrest in India: A Comparative Approach (Montreal: McGill-Queen's University Press, 1969), pp. 254-255.

[20]Lubell, Calcutta, pp. 93-94.

[21]Stuart Lottier, "Distribution of Criminal Offenses in Metropolitan Regions," Journal of Criminal Law, Criminology and Police Science 29 (May-June 1938): 37-50.

[22]Sarah Boggs, "Urban Crime Patterns," American Sociological Review 30 (December 1965): 899-900.

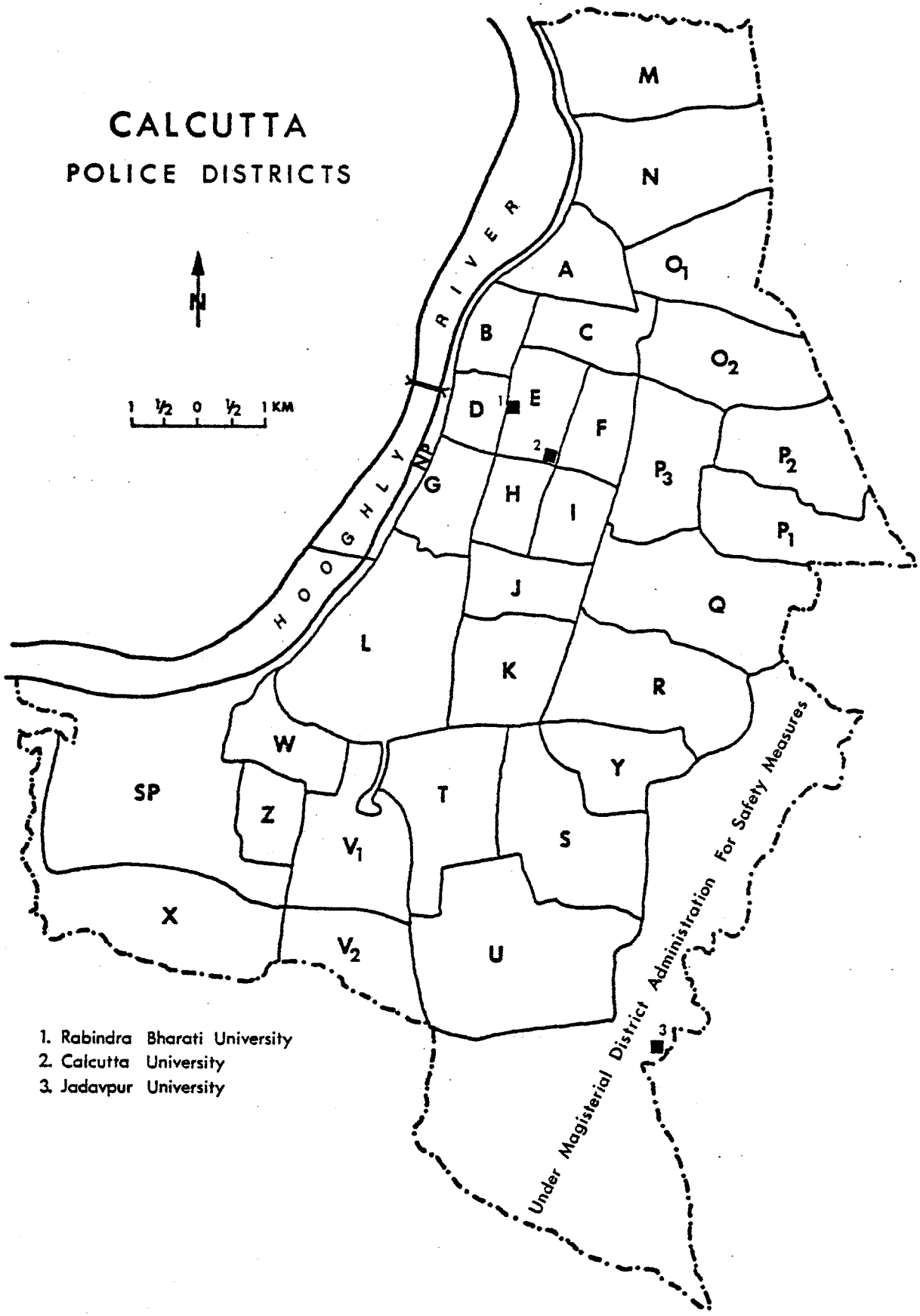

Fig. 6. Location of Police Districts

TABLE 6

Crime Variables[a] Considered

1. Murder	8. Cycle theft
2. Dacoity	9. Pocket picking
3. Robbery	10. Theft by servant
4. Snatching	11. Other theft
5. Burglary	12. Cheating
6. Car theft	13. Crininal breach of trust
7. Car parts theft	

[a]For definitions, see Appendix B.

because what is at risk is wealth not people). But the lack of data made it necessary to use the traditional population-based rates for all types of crimes. In the analysis, rates of crimes were calculated per 10,000 population.

C. Spatial Unit of Study

The thirty-two police districts (locally called thanas) covering about six-sevenths of the Calcutta corporation area are the spatial units used in this analysis.[23] Police districts do not conform to census ward boundaries. These districts are, in turn, subdivided into smaller census wards. Census wards would have been the ideal units of study, but crime data would then have to be redistributed over the

[23]Part of the Calcutta port makes up the whole of the North Port police district and, because of its atypical attributes, it was excluded from the analysis.

census wards falling under a police district with an assumption of a uniformity in its occurrence. This type of aggregating crime data was pioneered by Shaw and McKay in their study of delinquency in the Chicago area.[24] Later on other researchers followed their lead. Lander, for example, combined census tracts to form concentric zones in his study of Baltimore.[25] This aggregation of crime data may be justified because census tracts in the United States were fixed on the basis of demographic and cultural homogeneity.[26] Nevertheless, as mentioned on page 35, Lander found that this resulted in a "considerable oversimplification of the actual pattern of the spatial distribution" of delinquency.[27] Lander, therefore, used census tracts in his final analysis. However, the validity of a census tract's being homogeneous had been questioned earlier (before Lander's work was published) by Mayer[28] and Foley.[29] They categorically stated that the census tracts had lost their homogeneity in the United States. The census wards in Calcutta are not

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[24]Clifford R. Shaw and Henry D. McKay, Juvenile Delinquency in Urban Areas, Revised ed. (Chicago: University of Chicago Press, 1969).

[25]Bernard Lander, Towards An Understanding of Juvenile Delinquency (New York: Columbia University Press, 1954).

[26]Pauline V. Young, Scientific Social Surveys and Research (New York: Prentice-Hall, Inc., 1955), pp. 440-443.

[27]Lander, Juvenile Delinquency, p. 25.

[28]Harold M. Mayer, "What We Need to Know About the Internal Structure of Cities and Metropolitan Area," in Needed Urban and Metropolitan Research, ed. Donald J. Bogue (Chicago: University of Chicago Press, 1953), p. 12.

[29]Donald L. Foley, "Census Tracts and Urban Research," Journal of the American Statistical Association 48 (December 1953): 733-742.

homogeneous in a social, economic, or demographic sense.[30] Consequently, the analysis of crimes in the city which was based on an assumption of a uniformity in their commission would portray a distorted picture.

Calcutta has a multiplicity of functional bodies whose administrative boundaries present, to use Ostrom's term, "a crazy-quilt pattern."[31] The Calcutta Police is one such administrative entity which has drawn its own boundaries to define the "police districts." The department has a fundamental role to play not only in solving crime but also in preventing crime through some decisive planning. Therefore, this explanatory study of crime had to use the police districts as spatial units. And the data relating to the ecological characteristics were aggregated to fit in the spatial unit of the study, that is, the police district.

D. Analytical Procedures

The two sets of data were subjected to various analytical procedures which are presented in Figure 7. From the twenty-two ecological variables, nineteen were retained on the basis of the product-moment correlation coefficients significant at 0.05 level (variable Nos. 1, 19, and 22 in Table 4 were discarded). The application of the same procedure to the crime variables resulted in the acceptance of all of them. Further, the selected nineteen ecological and thirteen crime

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[30] A. Bopegamage, "A Methodological Problem in Indian Urban Sociological Research," Sociology and Social Research 50 (January 1966): 237.

[31] V. Ostrom, C. M. Tiebout, and W. Warren, "The Organization of Government in Metropolitan Areas: A Theoretical Inquiry," in Regional Development and Planning, ed. John Friedmann and William Alonso (Cambridge, Mass.: The M.I.T. Press, 1964), p. 542.

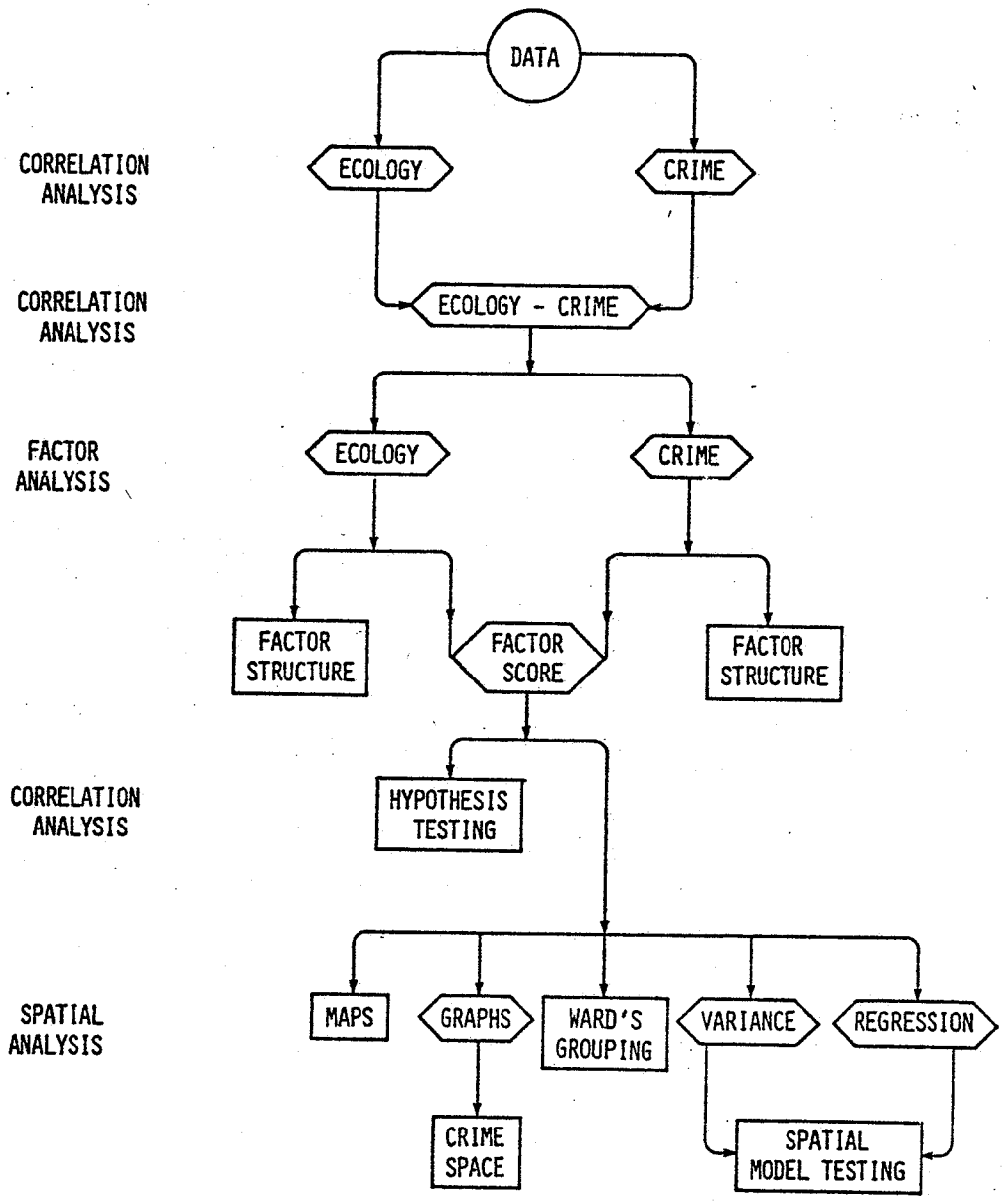

Fig. 7. Research Design

variables were then jointly evaluated in terms of the same correlation coefficients. Seven ecological variables (Nos. 2, 6, 8, 9, 12, 13, and 17) indicated non-significant correlations with the crime variables. So, five of them (Nos. 6, 9, 12, 13, and 17) were eliminated from the list, thus leaving finally fourteen variables. But the other two variables were used for different reasons; density of population (variable No. 2) was kept as the other studies on crime had demonstrated close relationships between the two. Schmitt, for instance, found in his study of Honolulu that the two measures of density, that is, population per net acre and percentage of housing units with more than 1.51 persons per room, are a basic underlying cause of crime.[32] Likewise, Bordua's study of the Detroit area, discussed in Chapter III, revealed also that overcrowding is even more crucial than anomie in determining delinquency.[33] Moreover, as Doxiadis stated "the degree of . . . exposure to criminal action depends on how close people live to each other."[34]

The percentage of scheduled castes and scheduled tribes (variable No. 8) was considered as an indication of physical deterioration, congestion and, above all, depression[35] which account for incidence of

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[32]Robert C. Schmitt, "Density, Delinquency, and Crime in Honolulu," Sociology and Social Research 41 (March-April 1957): 274-276.

[33]David J. Bordua, "Juvenile Delinquency and 'Anomie': An Attempt at Replication," Social Problems 6 (Winter 1958-1959): 230-238.

[34]C. A. Doxiadis, "Human Settlements and Crimes," Ekistics 39 (February 1975): 73.

[35]Surinder K. Mehta, "Patterns of Residence in Poona, India, by Caste and Religion: 1822-1965," Demography 6 (November 1969): 473-491; Noel P. Gist, "The Ecology of Bangalore, India: An East-West Comparison," Social Forces 35 (May 1957): 356-365.

crime. It may be argued here that scheduled castes in urban areas are now in a better position than ever before. But Bhatt's recent empirical work reveals that there is no difference in inequality between castes in urban and rural areas.[36] And the disparity in the socio-economic sphere (that is, education, income, occupation, and status) between castes is highest in West Bengal, out of the four states he considered.[37]

The following procedural phase was involved in factor analyzing the fourteen ecological and the thirteen crime variables separately.[38] Six of the crime variables were found to be highly correlated with each other (Table 7). To avoid the problem of multicollinearity which lends instability to the factor analysis model,[39] they were not employed in the analysis individually, but in the form of a composite theft index developed after Bell.[40]

Briefly, the steps undertaken in the factor analysis were as follows: (a) transference of raw data into an m x n (m variables and n observations) matrix; (b) replacement of data matrix by a standard

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[36] Anil Bhatt, Caste, Class and Politics: An Empirical Profile of Social Stratification in Modern India (Delhi: Monohar Book Service, 1975), p. 54.

[37] Ibid., p. 61.

[38] The Analysis was undertaken at the University of Manitoba's computing centre using a program called BMDP4M. For details, see W. J. Dixon, ed., Biomedical Computer Programs, P-Series (Los Angeles: University of California Press, July 1973).

[39] R. J. Rummel, Applied Factor Analysis (Evanston, Ill.: Northwestern University Press, 1970), p. 105.

[40] The composite theft index developed

$$= \frac{1}{6} \sum [C(I-L)]$$

where C = conversion factor $= \frac{100}{\text{range of rate for a particular variable}}$

I = police district rate for a particular variable

L = lower limit of police district rate for a particular variable

TABLE 7

Correlation Coefficients Among Some Crime Variables

No.	Name of Crime Variable	6	8	9	11	12	13
6	Car theft	-					
8	Cycle theft	.9244	-				
9	Pocket-picking	.9208	.9804	-			
11	Other theft	.9004	.9758	.9589	-		
12	Cheating	.9233	.9609	.9755	.9498	-	
13	Criminal breach of trust	.8622	.9103	.9422	.9035	.9546	-

score matrix Z; (c) development of an m x m symmetric correlation matrix; (d) performance of a principal axis analysis rendering a factor loading matrix m x r with eigenvalues ≥ 1 (where r represents factors);[41] (e) Varimax Orthogonal rotation of factors yielding uncorrelated reference factors; and (f) computation of n x r factor scores.

The method of factor analysis was applied for two reasons. First, it is based on the concept of parsimony,[42] that is, it reduces a complex set of variables to a smaller number of factors or dimensions with a minimum loss of information. In addition, grouping of the spatial units on the basis of similar factor attributes entirely rested

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See Wendell Bell, "Social Areas: Typology of Urban Neighborhoods," in Community Structure and Analysis, ed. Marvin B. Sussman (New York: Thomas Y. Crowell Company, 1959), pp. 90-92.

[41] Rummel, Factor Analysis, pp. 355, 359.

[42] Ibid., p. 29.

on the factor scores. Secondly, the particular problem of determining the spatial configuration of crime dimensions was solved by using uncorrelated factor scores as inputs in both the variance and the regression analyses. A fuller discussion of these methods is given in section E of Chapter V.

CHAPTER V

THE ANALYSIS

A. Basic Social Area Dimensions and Their Structures

The basic dimensions or factors of social area were obtained from the correlation matrix of the fourteen variables. The factor loadings show the association of the factors with the variables, and the factor scores represent the relative degree of association of the factors to the thirty-one police districts. Factor scores for the spatial units have been shown in Figures 9, 11, and 13 in order to portray the implications of different factors on space. The distribution of factor scores (Table 26) is not divided on the basis of some arbitrary cut-off points as have been followed in most studies to date. For each dimension, scores are plotted against their respective ranks to identify the natural breaks (commonly known as the scree test). These breaks then provide the intervals for grouping the spatial units. The clusters of units thus derived are numerically more coherent than those based on external considerations.

As has been mentioned on page 76, factors with eigenvalues of 1.0 or more were retained for this analysis. Table 8 illustrates the percentage of the total variance accounted for by each of the three factors thus identified.

TABLE 8

Proportion of Total Variance Explained by Social Area Factors

Factor	Eigenvalue	Percentage of Total Variance Accounted For	Cumulative Percentage of Total Variance
I	6.643	43.31	43.31
II	3.301	23.57	66.88
III	1.663	11.87	78.75

Social Area Factor I

Factor I, explaining forty-three per cent of the total variance, reflects jointly Shevky and Bell's economic status and family status (Table 9). Significant loadings for the economic status are indicated by a high percentage of male literates, a high percentage of workers, and a high proportion of rented households, whereas the familism dimension is scored by a high sex ratio, a high percentage of males between 15 and 39 years of age, a high percentage of married males, and a high proportion of non-Bengalis. The latter dimension also shows a very low percentage of slum-dwellers (high negative loadings) and low percentage of houses used as dwellings (high negative loadings).

The derived factor structure confirms Singh's results for the study of Calcutta in which he established that the dimensions of family status and economic status are blended together.[1] The results of these analyses contradict the findings of Berry and Rees which indicate

[1]Harbans Singh, "An Analysis of the Spatial Structure of Indian Cities" (Ph.D. dissertation, Rutgers University, 1973), pp. 126-127.

TABLE 9

Social Area Factor I Loadings

Variable	Factor Loading
Sex ratio	0.954
% Male literacy	0.938
% Workers, total population	0.934
% Male (15-39)	0.928
% Rented households living in census houses	0.913
% Married male	0.803
% Non-Bengali	0.738
% Dwellings made of walls with temporary materials	-0.731
% Occupied census houses used as dwellings	-0.625

that the dimensions of familism and economic status in Calcutta are discrete.[2]

Figure 8 indicates a primate pattern[3] of rank-size distribution of factor scores on this factor; the fall-off in score among the first few spatial units below Hare Street is sharper than the fall-off predicted by the idealized rank-size relationships. It further locates three important break of slope points in their distribution. Based on these values, the spatial differentiation of the dimension is summarized in Figure 9. The Hare Street police district which covers the central

[2]Brian J. L. Berry and Philip H. Rees, "The Factorial Ecology of Calcutta," The American Journal of Sociology 74 (March 1969): 445-491.

[3]Peter Haggett, Geography - A Modern Synthesis, 2nd ed. (New York: Harper & Row, Publishers, Inc., 1975), pp. 359-361.

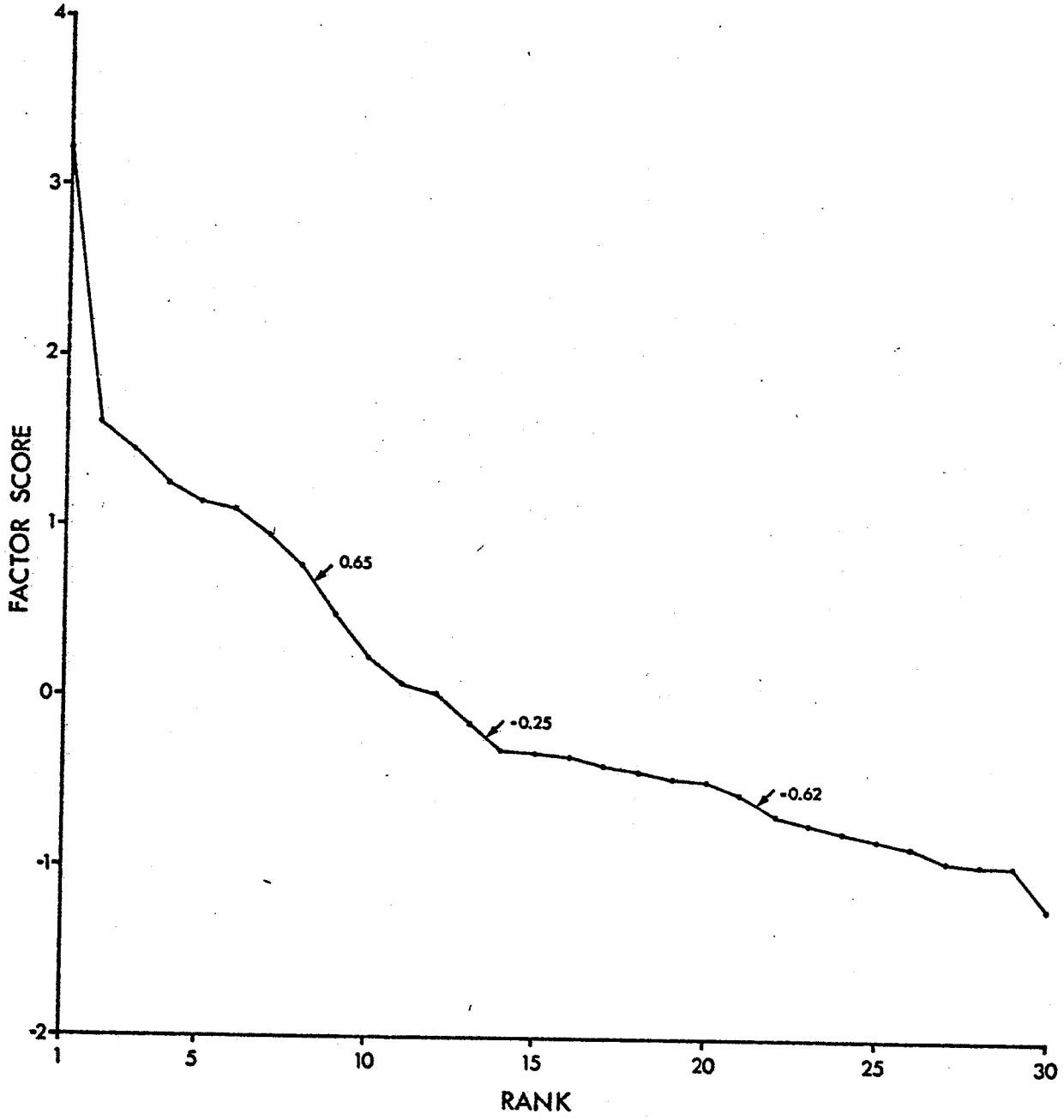

Fig. 8. Social Area Factor I: Factor Score vs. Rank

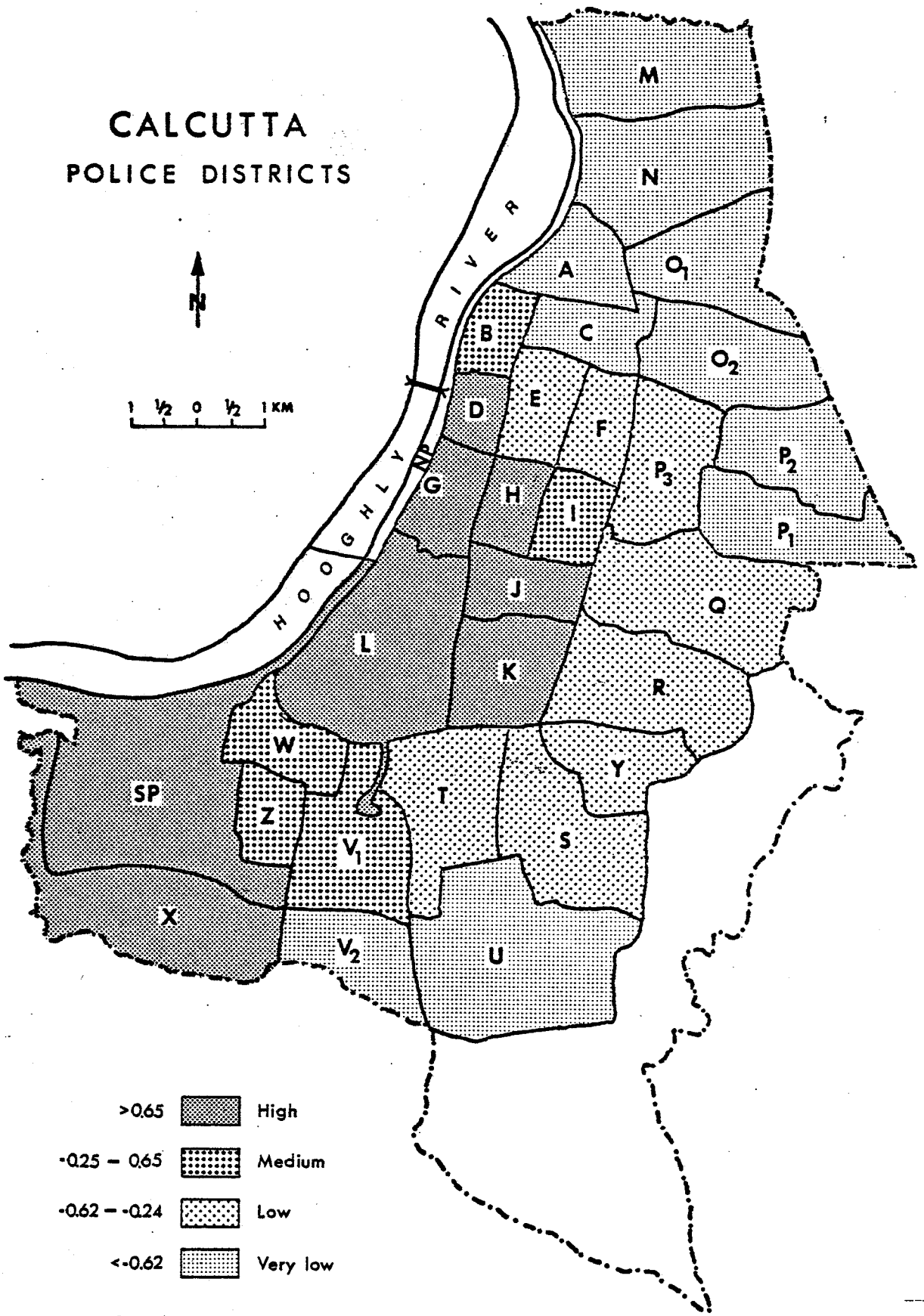

Fig. 9. Social Area Factor Score I: Distribution of Factor Scores

business district loads highest on Factor I. Other units marked out by high positive scores are Burrabazar, the commercial hub of the city; Bowbazar and Taltala, long-established middle-class neighbourhoods; and Hastings and Park Street, which are characterized by institutional functions as well as exceptionally high-quality residential areas (formerly the European quarter, contemporarily replaced to a great extent by modern skyscrapers). The other two spatial units belonging to this category are South Port and Garden Reach which are located in the south-west sector of the city. They have all the necessary traits of this dimension except that these police districts load insufficiently on the percentage of male literacy. The ratio of literates without any education level[4] to the total literates in the city is 48.84. This percentage rises to 64.37 in South Port and 60.36 in Garden Reach, thereby providing the explanation for low values.

Conversely, police districts at the lower end of the continuum are mainly concentrated in the peripheral parts of the city. They include Cossipore, Chitpur, Manicktala, and Ultadanga in the north and north-east; and Tollygunj and New Alipur in the south. The boundary of the New Alipur police district includes not only the commonly accepted residential area of New Alipur but also the surrounding slums and industries. Therefore, it is not surprising that this police district loads low on this social area dimension.

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[4]Means those "who can read and write but have not passed any written examination at least at the primary/junior Basic standard." See B. Roy, Census 1961 - West Bengal, District Census Handbook - Calcutta, vol. 2 (Calcutta: The Superintendent, Government Printing, 1966), p. 69.

Social Area Factor II

Factor II is indicative of the traditional attributes of social status in Calcutta. It expresses a strong orientation toward a high population density, proximity to the centres of graduate studies, and a high proportion of workers in trade and commerce (Table 10). The other elements representing this dimension are a low percentage of very low-quality dwellings (slums) and a low proportion of scheduled castes and scheduled tribes. An identical dimension was established by Singh in his wardwise analysis of the spatial structure of Calcutta.[5]

TABLE 10

Social Area Factor II Loadings

Variable	Factor Loading
Density of population	0.909
Distance of centres of graduate studies	0.904
% Workers in trade and commerce	0.851
% Dwellings made of walls with temporary materials	-0.526
% Scheduled castes and scheduled tribes	-0.502

Figure 10 shows that the police districts of Jorasanko and Burrabazar dominate the factor score distribution and that the natural cut-off points occur at values 1.00, 0.00, and -0.50. When the scores are mapped on the basis of these values, a distinct spatial pattern is revealed (Figure 11). It gives a general impression that the traditional

[5]Singh, Spatial Structure of Indian Cities, pp. 69-71.

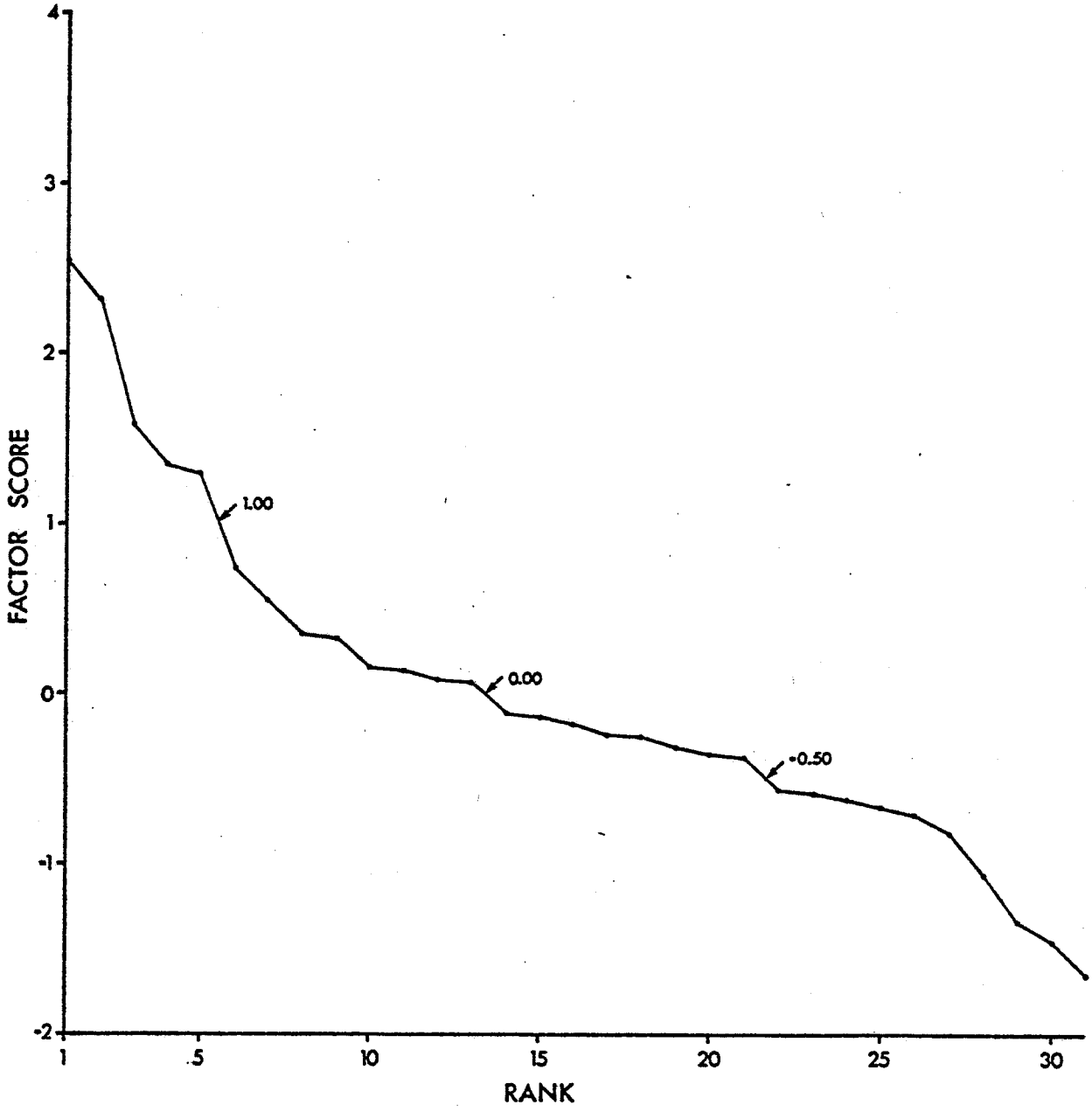

Fig. 10. Social Area Factor II: Factor Score vs. Rank

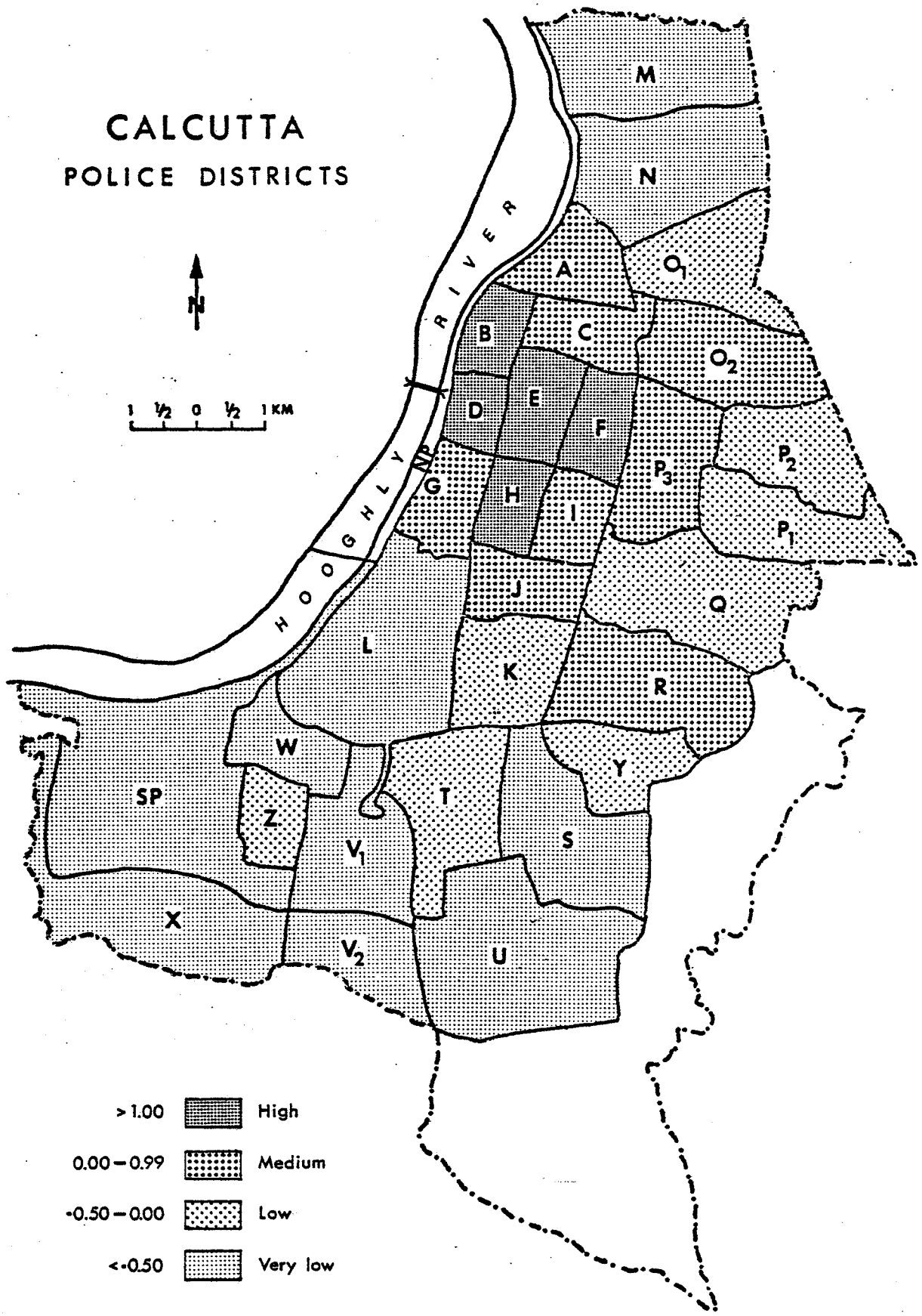

Fig. 11. Social Area Factor II: Distribution of Factor Scores

social status dimension has followed more or less a concentric fashion. High positive factor scores are anchored in the police districts of Bowbazar, Jorabagan,and Amharst Street besides the two police districts mentioned above. They are all located in the traditional high-caste area in the north-central part of the city. On the contrary, high negative factor scores characterize spatial units, especially in the north, south, and southwest, which are relatively recent annexations to the city and dominant in industry and/or transport and storage functions.

It seems reasonable to mention here that in Calcutta trade and commerce communities like the Gandhabanik and Subarnabanik, as discussed in Chapter II, and some Brahmins (especially those among the Rajasthani traders) belong to the upper portion of the caste hierarchy. By engaging themselves in trade and commerce for generations, they have earned fortune and thereby achieved social status. They have been living in the older and socially integrated section of the city in the north for a long time, and they witnessed the establishment of centres of graduate studies like the University of Calcutta and the Rabindra Bharati University. Following the partition of 1947, however, the nature of this area was altered as more and more people belonging to different caste groups moved in. This in-migration diluted the pre-eminence of the wealthy upper caste groups.[6] For this reason, this section of the city is characterized by relatively few low-quality dwelling units and a low

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[6]Nirmal K. Bose, "Calcutta: A Premature Metropolis," Scientific American 213 (September 1965): 90-102.

proportion of scheduled caste and scheduled tribe people.

Social Area Factor III

Factor III is termed ethnic or segregation status, and is defined by variables like percentage of workers in service, percentage of scheduled castes and scheduled tribes, and percentage of houses used as dwellings (Table 11).

TABLE 11

Social Area Factor III Loadings

Variable	Factor Loading
% Workers in service	-0.737
% Scheduled castes and tribes	0.680
% Houses used as dwellings	0.489

The factor scores of the different police districts of the city on this dimension are mapped in Figure 13, employing three natural breaks (0.85, -0.45, and -0.75) derived from a rank-size distribution graph (Figure 12). High positive scores characterize spatial units like South Port, Ekbalpur, and Garden Reach in the southwest; and Entally in the east. The high scores of South Port and Garden Reach can be explained by their dominance in industrial, as well as transport and storage functions, whereas Ekbalpur and Entally owe their high scores to overcongestion (slums) which is seen in most parts of these police districts.

At this point it is appropriate to explain the relationship between scheduled castes and scheduled tribes and the housing conditions observed in the aforesaid police districts. People belonging to scheduled

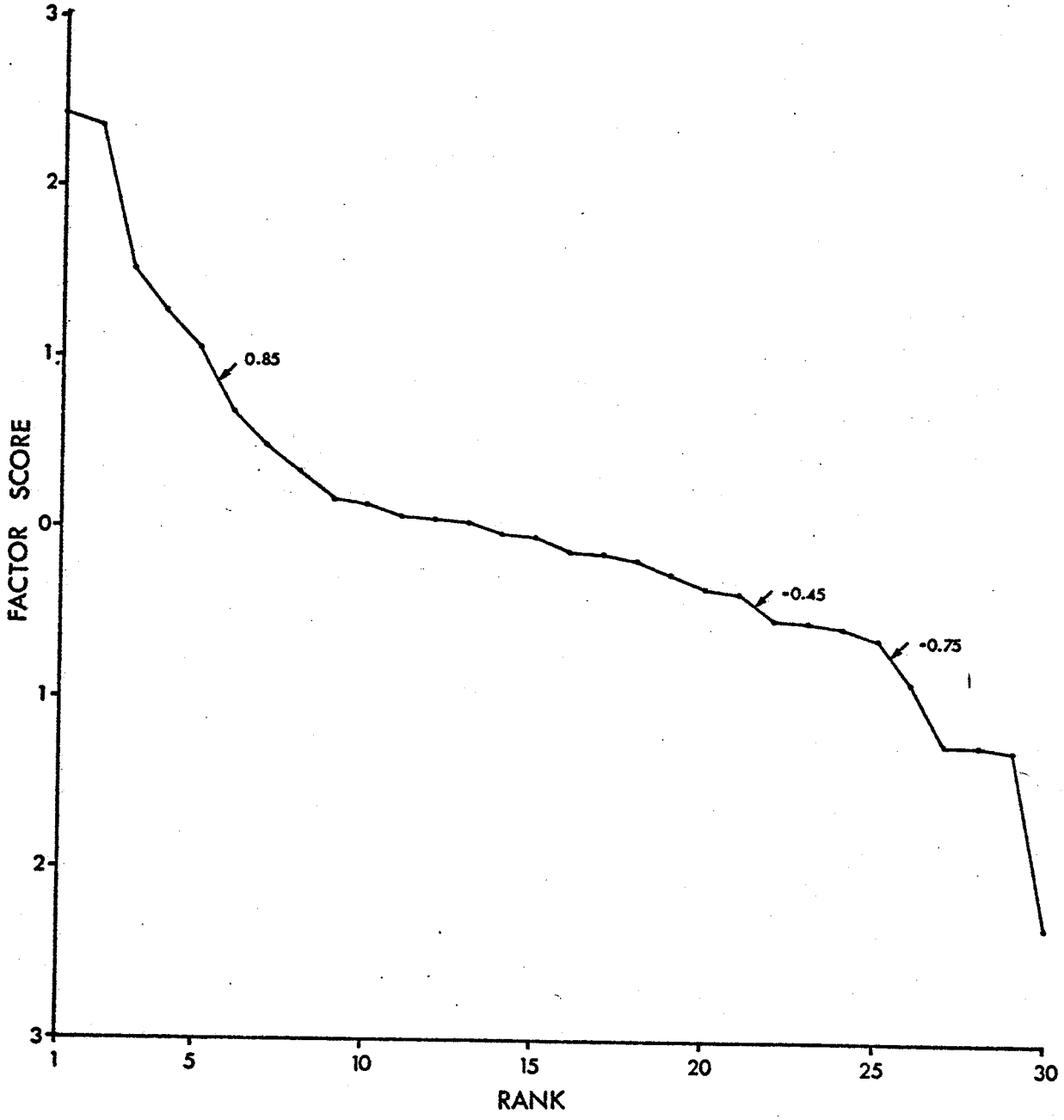

Fig. 12. Social Area Factor III: Factor Score vs. Rank

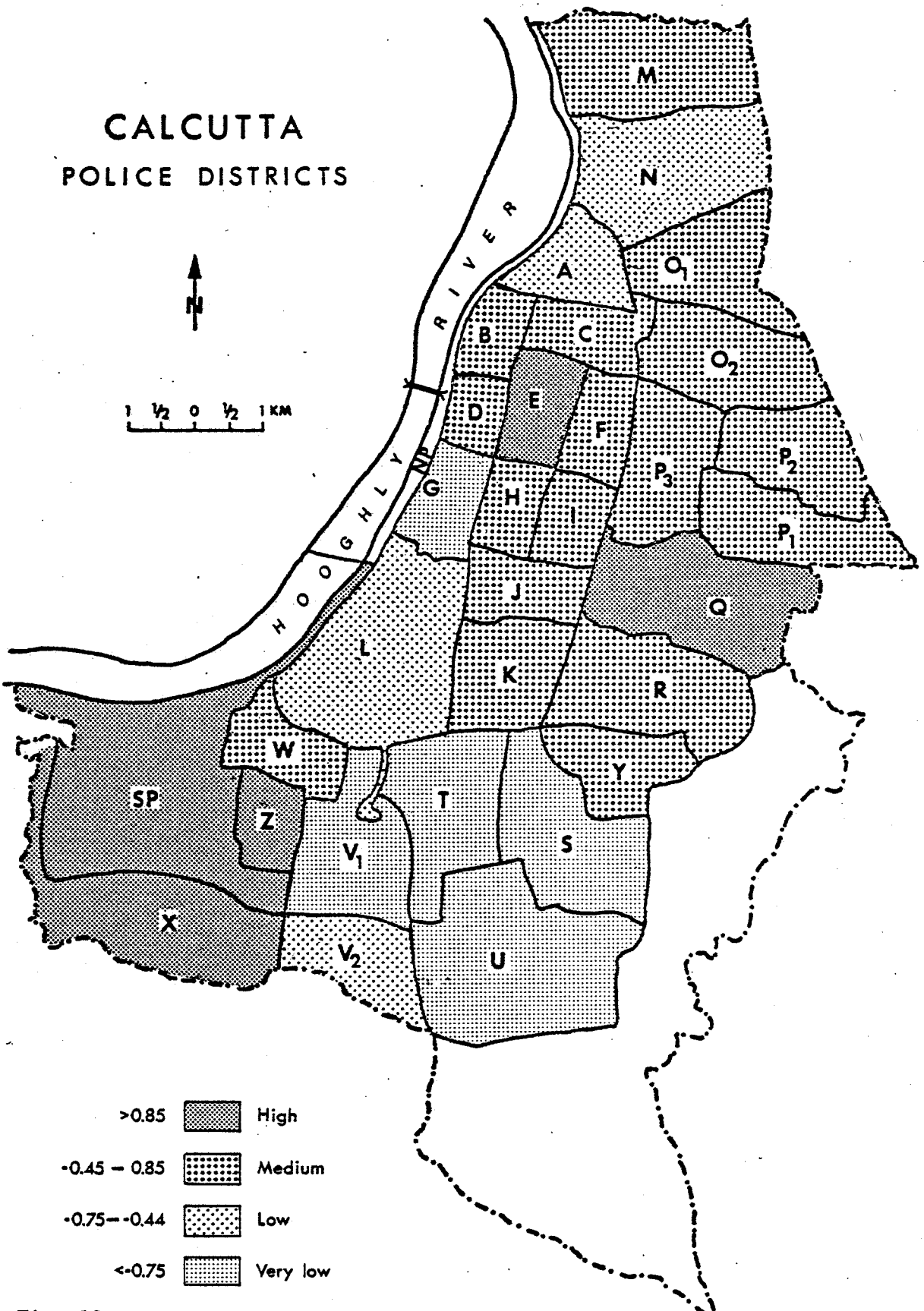

Fig. 13. Social Area Factor III: Distribution of Factor Scores

castes and scheduled tribes, because of their low literacy rates and low income from generation to generation, could not compete for the traditionally old neighborhoods in the central part of the city which have been dominated by the upper caste people. As a result, they (scheduled caste and scheduled tribe people) could only find accommodation in the periphery. This is reflected by a large number of poor houses on the outskirts of the city. The same pattern was noticed also by Chatterjee in his study of Howrah, the twin city of Calcutta (Figure 4). "The influence of the caste system is reflected in the usual concentration of the higher castes in the central areas of good residential localities, while the lower caste groups, usually, occupy the fringe."[7]

The explanation for the distribution of scheduled castes and scheduled tribes is given on page 17. However, the police district of Jorasanko is an exceptional case which also loads heavily on the traditional social status. After 1947, the vast influx of scheduled caste refugees moved to Calcutta. As they were mostly agricultural labourers before, they were unable to obtain employment in big industries located in the periphery, and they had to move into this relatively old spatial unit and its surrounding areas. Ultimately they found employment in trade and commerce, newly established small-scale industries or simply in households as servants. This situation has generated competition between various social groups in this area.[8]

High negative scores characterize the police districts of Hare

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[7]Amiya B. Chatterjee, Howrah: A Study in Social Geography (Calcutta: U. Chatterjee, 1967), p. 159.

[8]S. C. Chakraborty, "Delineation of Planning Areas: An Experiment on Calcutta 1961," Geographical Review of India 34 (March 1972): 18.

Street and Alipore. The police district of Hare Street ranks first among the thirty-one spatial units in the economic-cum-family status dimension. Both these police districts are the administrative foci of the city. In addition to these, the police districts of New Alipur, Tollygunj, Ballygunj, and Bhawanipur record high negative scores. The first three units are noted for a high incidence of the service-oriented social class and relatively high-quality residential neighborhoods, while Bhawanipur is traditionally the oldest area in the south of the city.

B. Basic Crime Dimensions and Their Structures

The basic dimensions of crime were also investigated through an analysis of factor loadings and factor scores (Table 27). The distributions of factor scores are shown in Figures 15, 17, and 19. The four clusters of factor scores shown in each of these figures were determined using scree tests, as in the case of the social area dimensions. In order to avoid duplication, the salient features of police districts will not be repeated unless they become essential to an examination of crime.

For eight crime variables in thirty-one police districts, the correlation matrix was factor analyzed. Three dimensions were extracted. Table 12 illustrates the percentage of the total variance accounted for by each of the three dimensions thus identified.

Crime Factor I

This factor, accounting for thirty-one per cent of the total

TABLE 12

Proportion of Total Variance Explained by Crime Factors

Factor	Eigenvalue	Percentage of Total Variance Accounted For	Cumulative Percentage of Total Variance
I	2.494	31.17	31.17
II	1.929	24.11	55.28
III	1.152	14.40	69.68

variance is termed professional crime[9] and includes different theft indicators (Table 13). The highest loading is registered by the rate of theft by servant at 0.81, while the lowest one is associated with the rate of car parts theft.

TABLE 13

Crime Factor I Loadings

Variable	Factor Loading
Theft by servant	0.811
Composite theft index	0.781
Burglary	0.772
Car parts theft	0.614

[9]Sutherland introduced the term "professional" in criminology, but it has been subjected to criticism on the ground that it does not convey with it the characteristics of a true profession. By true profession, Horton and Leslie mean "formal, systematic training, formal procedures for admission, systematic self-regulation of the profession, etc." As a substitute for the term "professional," the expression "career" was suggested by Reckless. Nevertheless, the very word "professional" is of common use in criminological literature. See Edwin H. Sutherland, The Professional Thief (Chicago: University of Chicago Press, 1937); Paul B. Horton and Gerald R. Leslie, The Sociology of Social Problems, 4th ed. (New York: Appleton-Century-Crofts, Educational Division, Meredith Corporation, 1970), p. 143; and Walter C. Reckless, ed., The Crime Problem, 5th ed. (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1973), pp. 249-285.

The distributional pattern of this dimension is examined through the cartographic portrayal of factor scores which is based on three cut-off points of 0.82, -0.20, and -0.50. Figure 14 illustrates that the police district of Hare Street dominates the factor score distribution and loads higher than expected on the basis of rank-size rule. The unit presents exactly the same pattern as was observed in case of the spatial distribution of factor scores on social area Factor I. Figure 15 shows that the other high-scoring areas are New Alipur, Park Street, and Garden Reach, which are totally or partially characterized by high income group residential areas. Eleven police districts are medium-scoring, and their distribution is random. All of them, except the police district of South Port, have a few features in common: high density, relatively high proportion of people engaged in trade and commerce as well as in services, and low percentage of unemployment.

At the other end of the scale, police districts having very low scores on this dimension are clustered around the industrial areas in the north, north-east, and east or, in Ekbalpur, in the south-west. These areas are characterized by a very high proportion of slums (Figure 4). The only other unit belonging to this group is Hastings, which is basically composed of the fort and the maidan. As opportunity for professional crime is limited in these police districts because of their physical composition, they all load very low on this dimension.

Crime Factor II

The second important dimension which accounts for twenty-four per cent of the total variance is called violent crime. It is defined by rates of murder, robbery, and dacoity all of which have positive

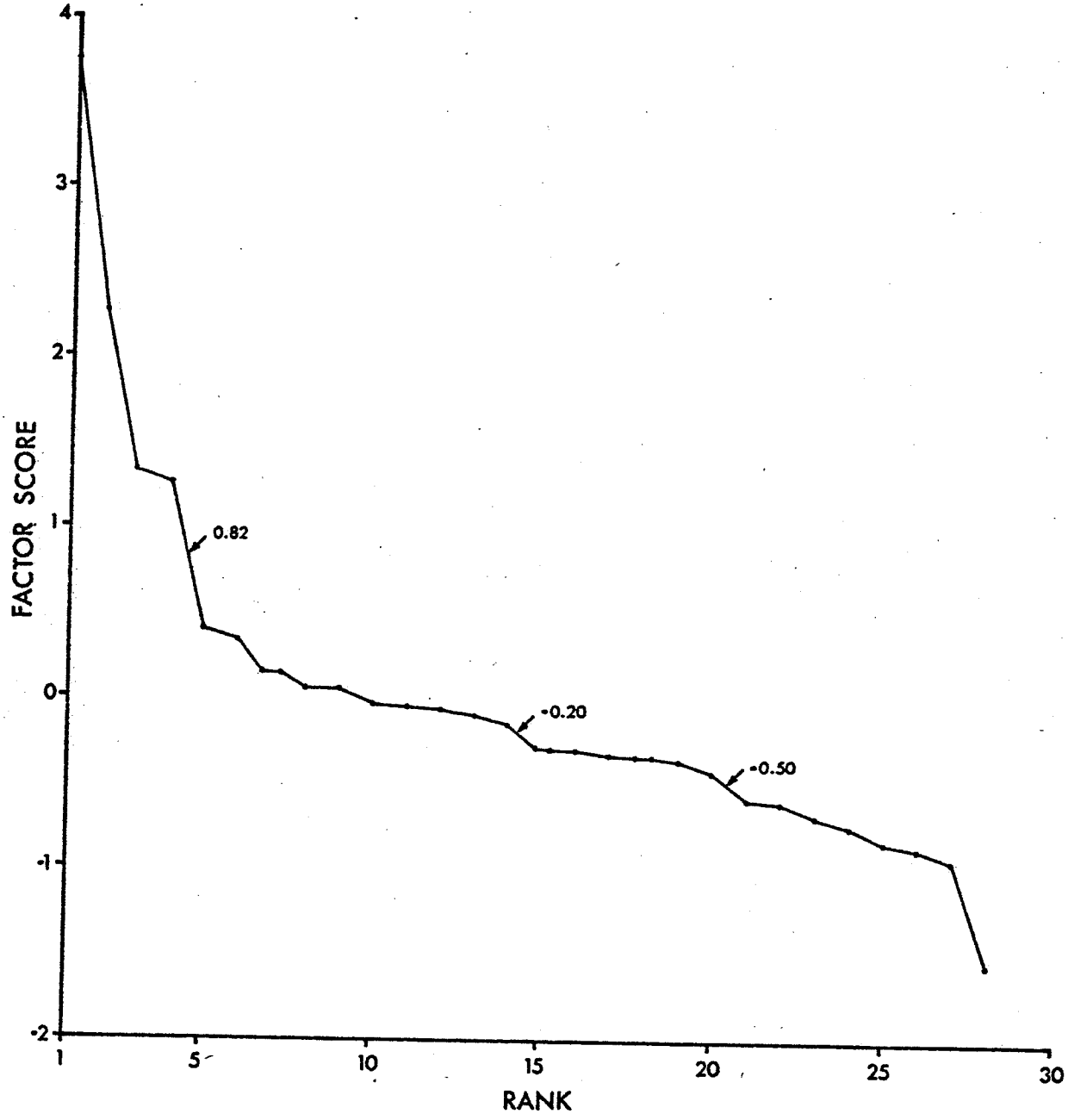

Fig. 14. Crime Factor I: Factor Score vs. Rank

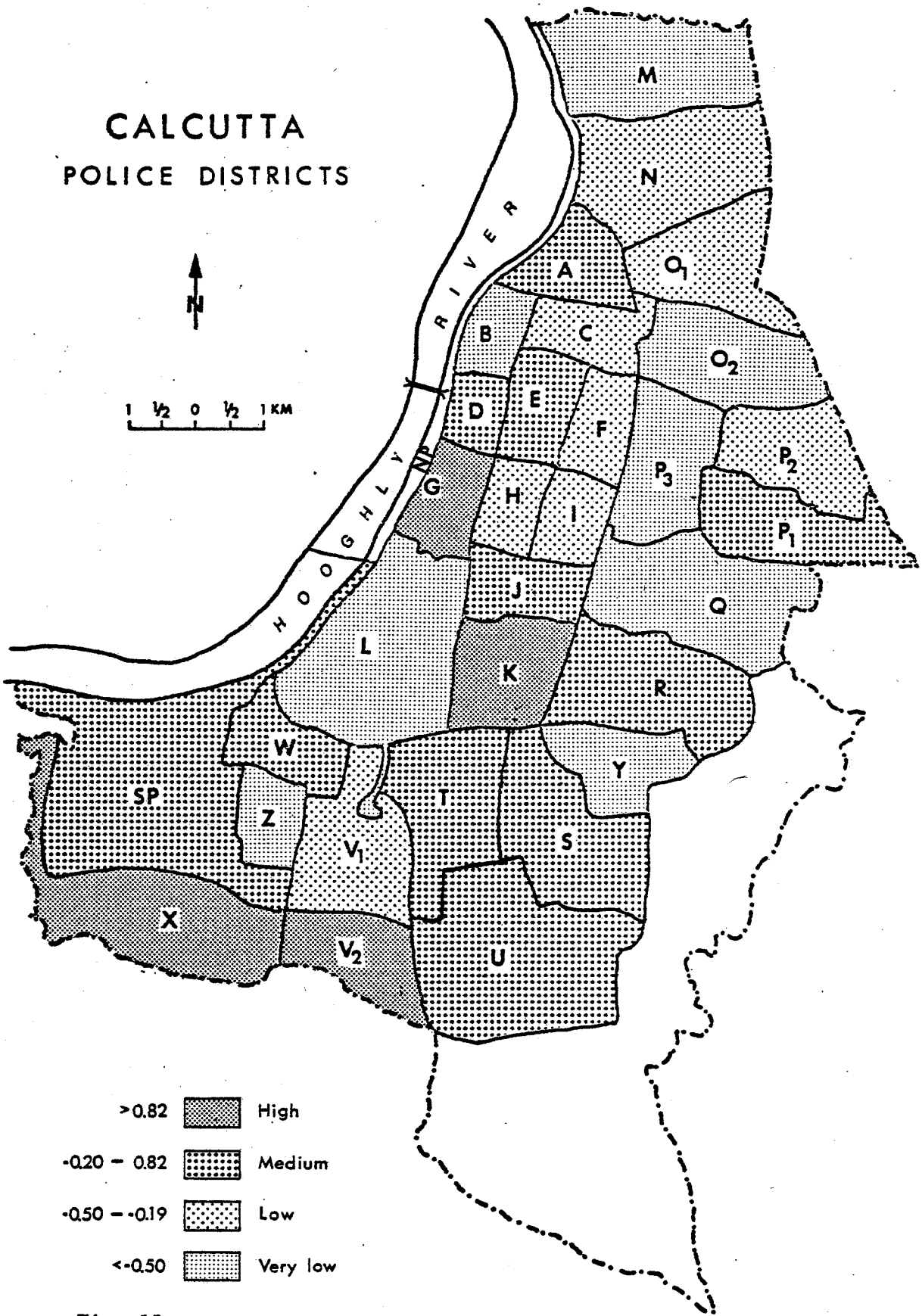

Fig. 15. Crime Factor I: Distribution of Factor Scores

loadings of more than 0.67 (Table 14).

TABLE 14

Crime Factor II Loadings

Variable	Factor Loading
Murder	0.800
Robbery	0.697
Dacoity	0.674

Three cut-off points were obtained at 0.50, -0.40, and -1.10 from a factor score-rank distribution (Figure 16). Based on these values, the spatial differentiation of violent crime is portrayed in Figure 17. The factor scores for this dimension are seen to be the inverse of those presented in Figure 15 (ten police districts do not follow this trned). To put it differently, police districts notorious for professional crimes are least affected by violent crimes. As expected, four out of the five districts scoring high on this dimension are located in the peripheral parts of the city. These are Cossipore in the north; Phoolbagan and Beliaghata in the east; and Garden Reach in the south-west. The exceptional unit is the police district of Shyampukur. Its exception may be attributed to a combination of a relatively low percentage of married males (37.65), a low percentage of employment (34.88), and a high percentage of males aged 15 to 39 (37.65). These elements have been found to be significant in explaining violence in other parts of the world.[10] In addition to these, the "readjustment

[10] Samuel E. Wallace, "Patterns of Violence in San Juan," in The Crime Problem, ed. Walter C. Reckless (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1973), pp. 209-212.

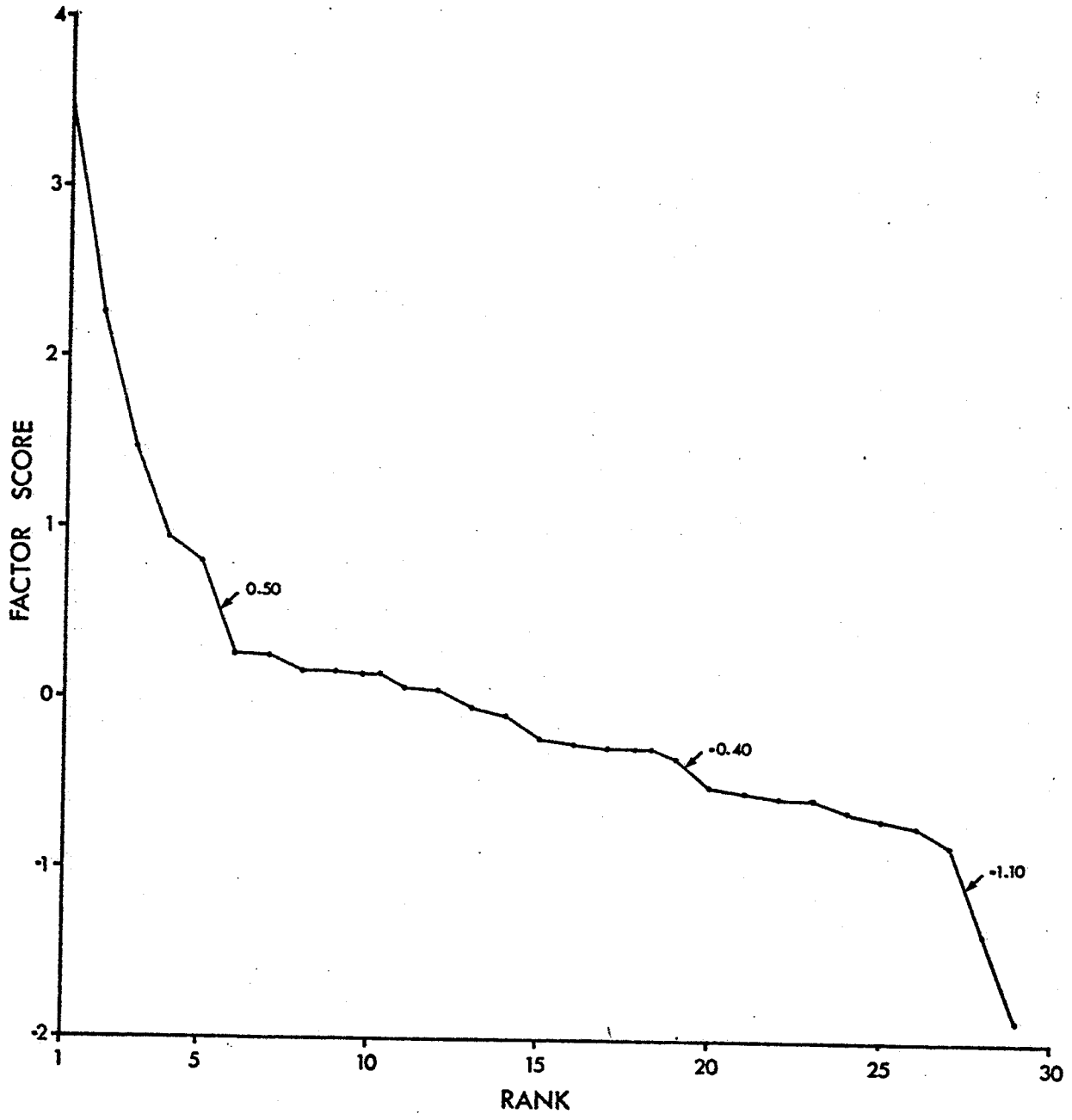

Fig. 16. Crime Factor II: Factor Score vs. Rank

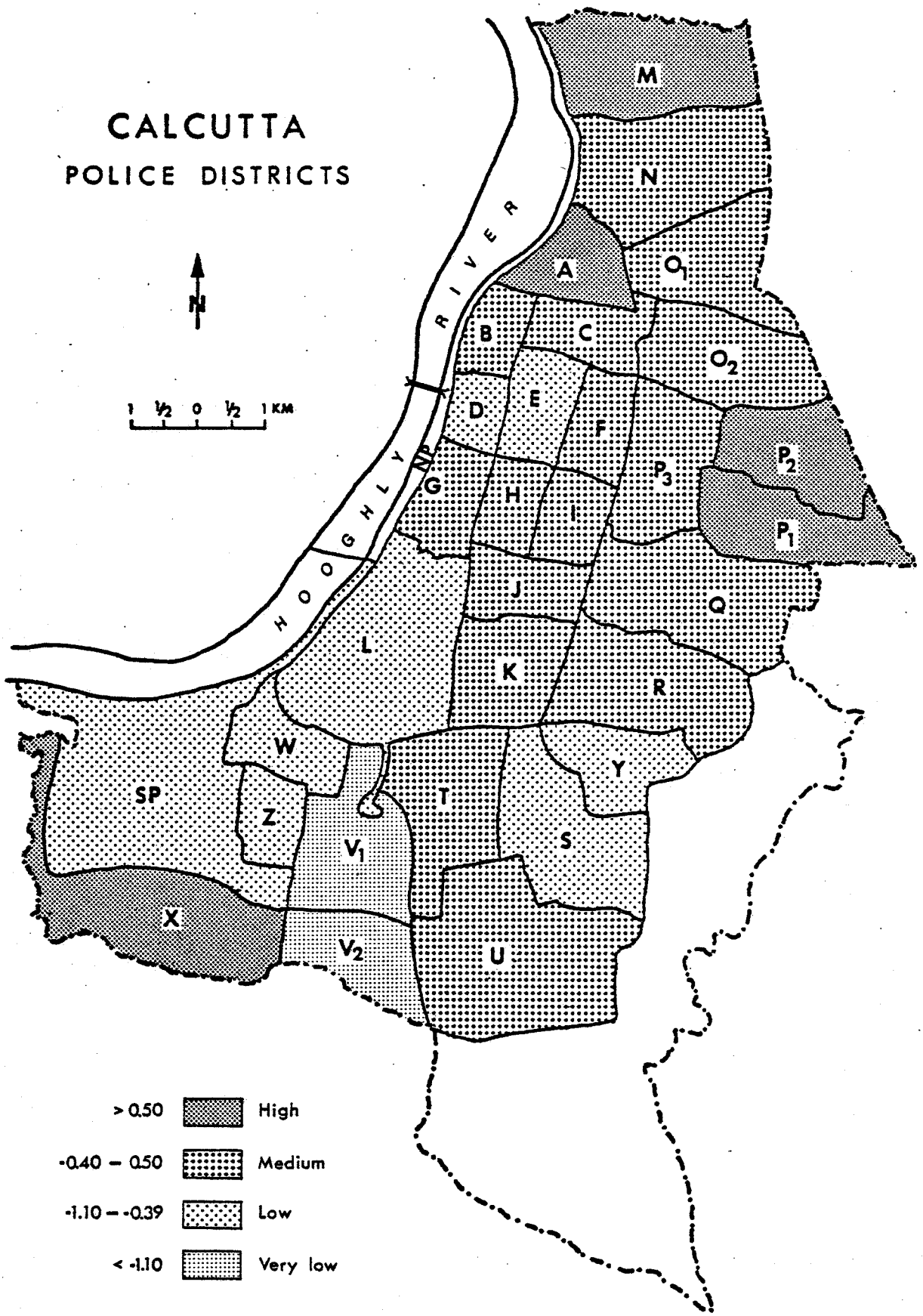

Fig. 17. Crime Factor II: Distribution of Factor Scores

to the processes of selective explusions of social groups" adds momentum to the incidence of violent crimes in this part of the city.[11]

Crime Factor III

The last important crime dimension is identified as minor theft and is practically a one-variable factor. The variable of snatching has a very high loading of 0.910 on this factor.

When factor scores on this dimension are plotted against their corresponding ranks, the natural breaks are found to occur at 1.00, -0.25, and -1.50 (Figure 18). The cartographic analysis, on the basis of these breaks, depicts high positive scores scattered mostly in police districts surrounding the core of the city (Figure 19). The highest ranking units are Burtola, Jorasanko, Muchipara, Hastings, and Park Street. The intensity of this crime dimension in the first two areas may be explained by a high density of population, relatively low percentage of workers, and low percentage of workers in services. The situation in Muchipara is explained in terms of its having one of the busiest railway terminuses in India. Ten other police districts also having positive scores on this dimension correspond with the movement of a massive influx of daily commuters[12] as well as the internal short-distance movement of residents by overcrowded buses and trains. The high incidence of this type of crime in Hastings may be ascribed to the fact that it offers the great central green of the maidan which attracts

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[11]Chakraborty, "Delineation of Planning Areas," p. 18.

[12]Ashok K. Dutt, "An Analysis of Commutation to the Metropolis of Calcutta," The National Geographical Journal of India 10 (September-December 1964): 202.

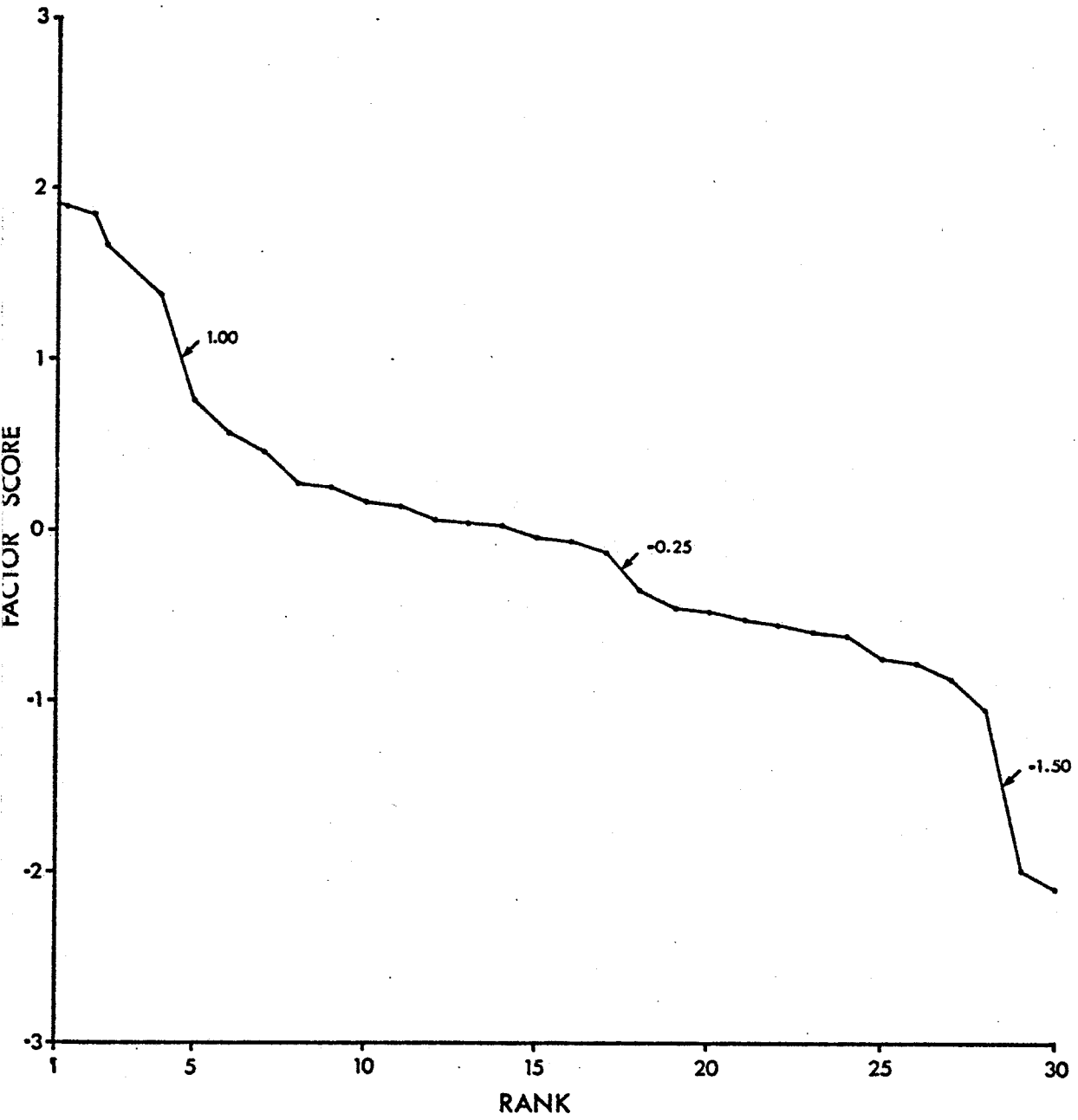

Fig. 18. Crime Factor III: Factor Score vs. Rank

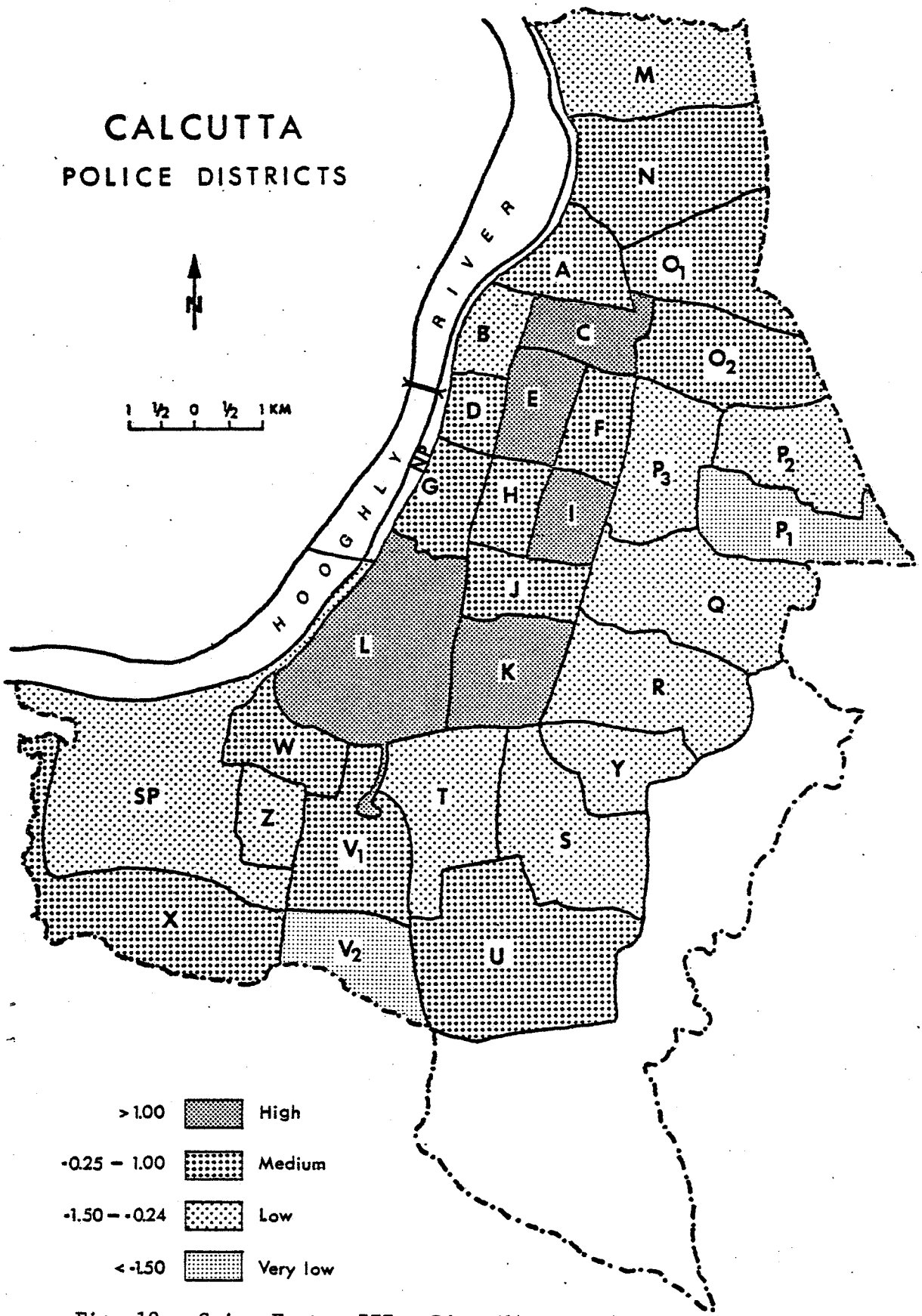

Fig. 19. Crime Factor III: Distribution of Factor Scores

thousands of people. Its impact is also reflected on the high occurrence of this crime in the police district of Park Street which flanks the maidan and accommodates a vast majority of economically well-off people (including the transient foreign tourists). Another interesting feature emerges from the map; Cossipore and Beliaghata which are highly affected by violent crimes are high negative scorers on this factor.

In fact, the spatial differentiation of these factor scores can be generalized with the observation that minor theft declines in its intensity with the increasing distance from the core of the city. A rigorous evaluation of this spatial form is presented in section E of this chapter.

C. The Relation of Social Area Factors to Crime Factors

The relationship between social area factors and crime dimensions is shown in Table 15. It portrays zero-order product-moment correlations between the three social area factors presented in column 1 and the three crime factors shown in the top row. Among all the significant correlations, the professional crime dimension exhibits the highest (positive) relationship with the economic-cum-family status. This reflects the obvious fact that police districts characterized by high economic status and familial organization witness this particular crime most. Contrarily, this crime is negatively correlated with the spatial units noted for a relatively high proportion of scheduled castes and scheduled tribes, and also for vast stretches of physically decrepit slums. The four police districts of Hare Street, New Alipur, Park Street, and Garden Reach record high scores on the professional crime dimension.

TABLE 15

Interrelations of Social Area Factor Scores and Crime Factor Scores

Social Area Factor	Crime Factor		
	Professional	Violent	Minor Theft
Economic-cum-family status	0.5317 (0.001)	-0.0379	0.3185 (0.040)
Traditional social status	-0.1154	-0.1240	0.3579 (0.024)
Ethnic status	-0.2999 (0.051)	0.2573 (0.081)	-0.0260

Note: Significance levels of lower than 0.010 are included. Figures within parentheses indicate the levels of significance.

Reference has already been made on page 83 as to why New Alipur police district loads negatively on the economic-cum family status dimension. To understand further the implications of these two dimensions on space, the professional crime factor scores are plotted against the economic-cum-family status factor scores (Figure 20). It illustrates that six police districts load positively on two factors, and they are Hare Street (administrative and business hub of the city); Burrabazar (the most important focus of business); Taltala, Park Street, and Watgunj (former European quarters; now either replaced by high-rise buildings or used as spacious, bungalow-type residences); and Garden Reach (a relatively new residential area, also used for industries). On the other hand, fifteen police districts load negatively on these factors. All of them, excepting Bhawanipur and Tollygunj, fall under the upper two categories of the ethnic status factor scores, as represented in Figure 13.

The violent crime factor has low negative relationships with

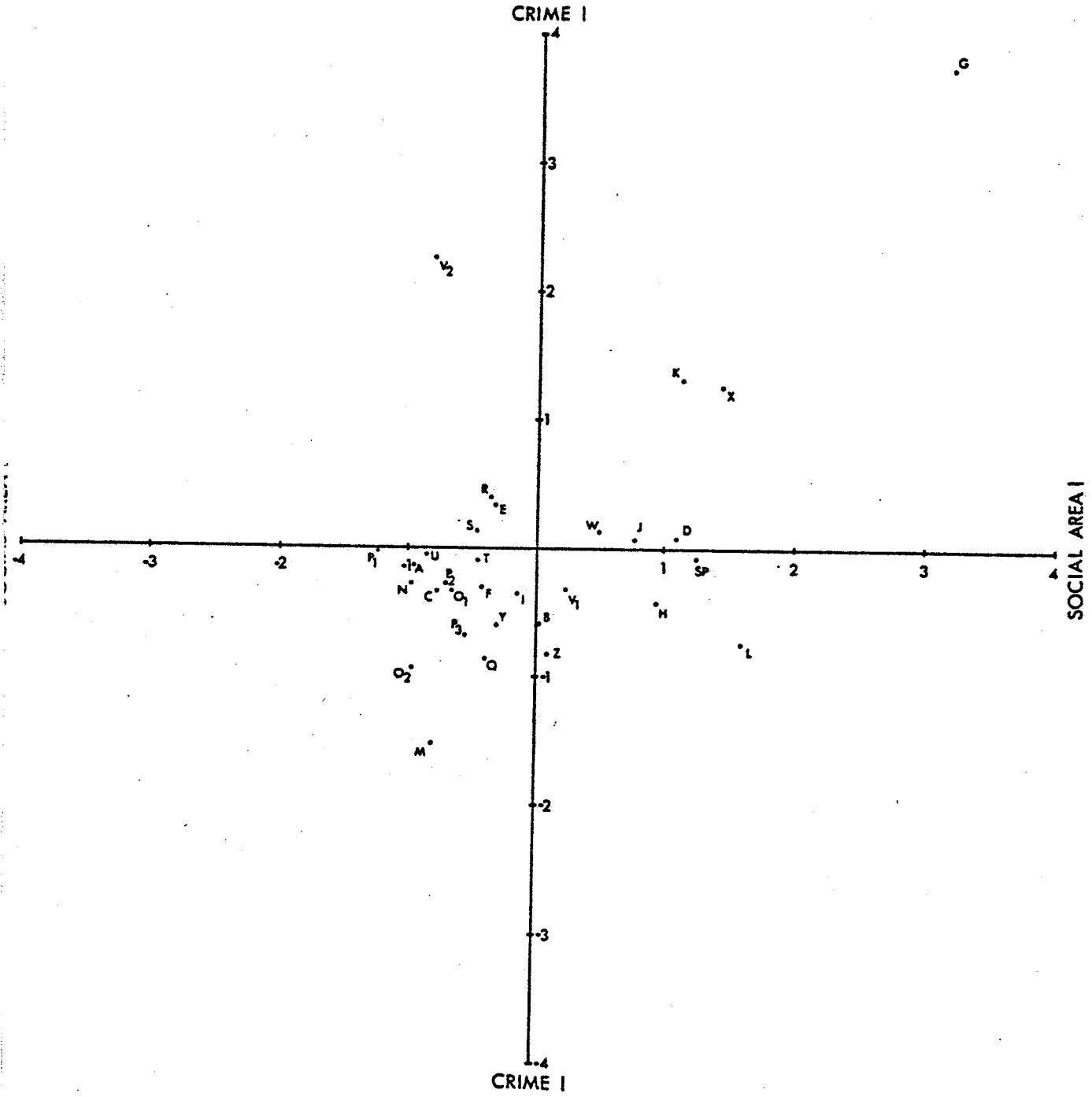

Fig. 20. Social Area-Crime Space: Social Area Factor I vs. Crime Factor I

social area I and II dimensions. But the ethnic or segregation status evokes relatively strong positive correlation with violent crime, and it approaches significance. Therefore, it can be inferred that violent crime is intense in areas with a high degree of spatial segregation. In order to further our understanding about this sort of loose relationship between the two, violent crime factor scores are plotted against segregation status factor scores (Figure 21). Only four police districts (Garden Reach, Beliaghata, Ultadanga, and Jorabagan) are found to have positive scores for both. Garden Reach and Beliaghata having the first and the second violent crime scores show the second and the tenth (from the top) scores on segregation status dimension respectively. Ultadanga and Jorabagan have very low positive values for both dimensions. Nine police districts are found between the axis for violent crime and segregation status, with positive scores for the first and negative scores for the second axis. Contrarily, ten police districts witness negative scores for violent crime dimension but positive scores for segregation status. Thus, the findings demonstrate that the social area pattern's relation to violent crime in Calcutta differs sufficiently from that of the major U.S. cities. Glaser has described the U.S. pattern as: "We have always had our highest violence rates in those sections of our major cities which have been the segregated settlements of povertous migrants . . . ."[13]

Relationships of almost equal strength exist between the minor theft dimension and the social area Factor I as well as between the

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[13]Daniel Glaser, "Violence and the City," in Crime in the City, ed. Daniel Glaser (New York: Harper & Row, Publishers, 1970), p. 202.

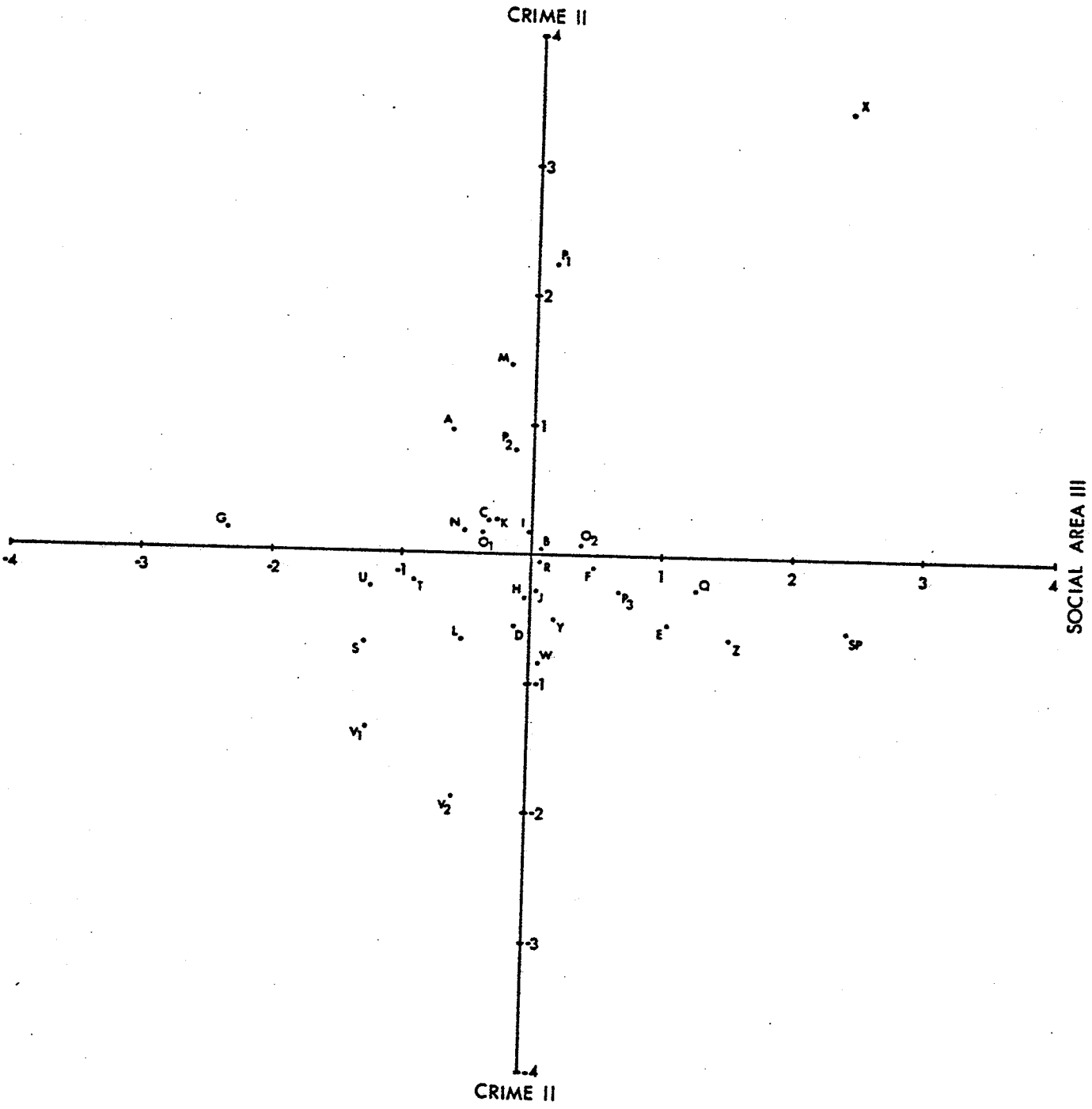

Fig. 21. Social Area-Crime Space: Social Area Factor III vs. Crime Factor II

minor theft dimension and the social area Factor II (Table 15). To investigate the spatial implications of these dimensions, the minor theft factor scores are plotted against these two social area factor scores separately (Figures 22 and 23).

A close inspection of the graphs reveals that fifteen police districts out of a total of thirty-one record positive scores on the minor theft dimension. Eight of them have factor scores of less than 0.50 and show various social area influences. Of them, Burrabazar, Hare Street, and Bowbazar indicate that factor scores on social area I and II dimensions are both positive, but one is sufficiently stronger than the other. Contrarily, Chitpur, Manicktala, and Tollygunj show negative scores on both of the social area dimensions. Shyampukur and Amharst Street police districts depict the influence of the social area dimensions on minor theft somewhat differently; the factor score on one dimension is positive and it is negative on the other.

Another interesting point emerges from the analysis of factor scores: police districts having scores of more than 0.50 on the minor theft factor are loaded with either (a) high economic-cum-family status factor scores (above 0.50) and negative factor scores on traditional social status or, (b) high traditional social status factor scores (also above 0.50) and very low positive or negative scores on the other (Table 16).

These findings suggest that the intensity of minor theft crime depends on the richness of a neighbourhood which may be expressed in terms of economic-cum-family status or traditional social status. For obvious reasons, the six police districts ranking first to sixth on

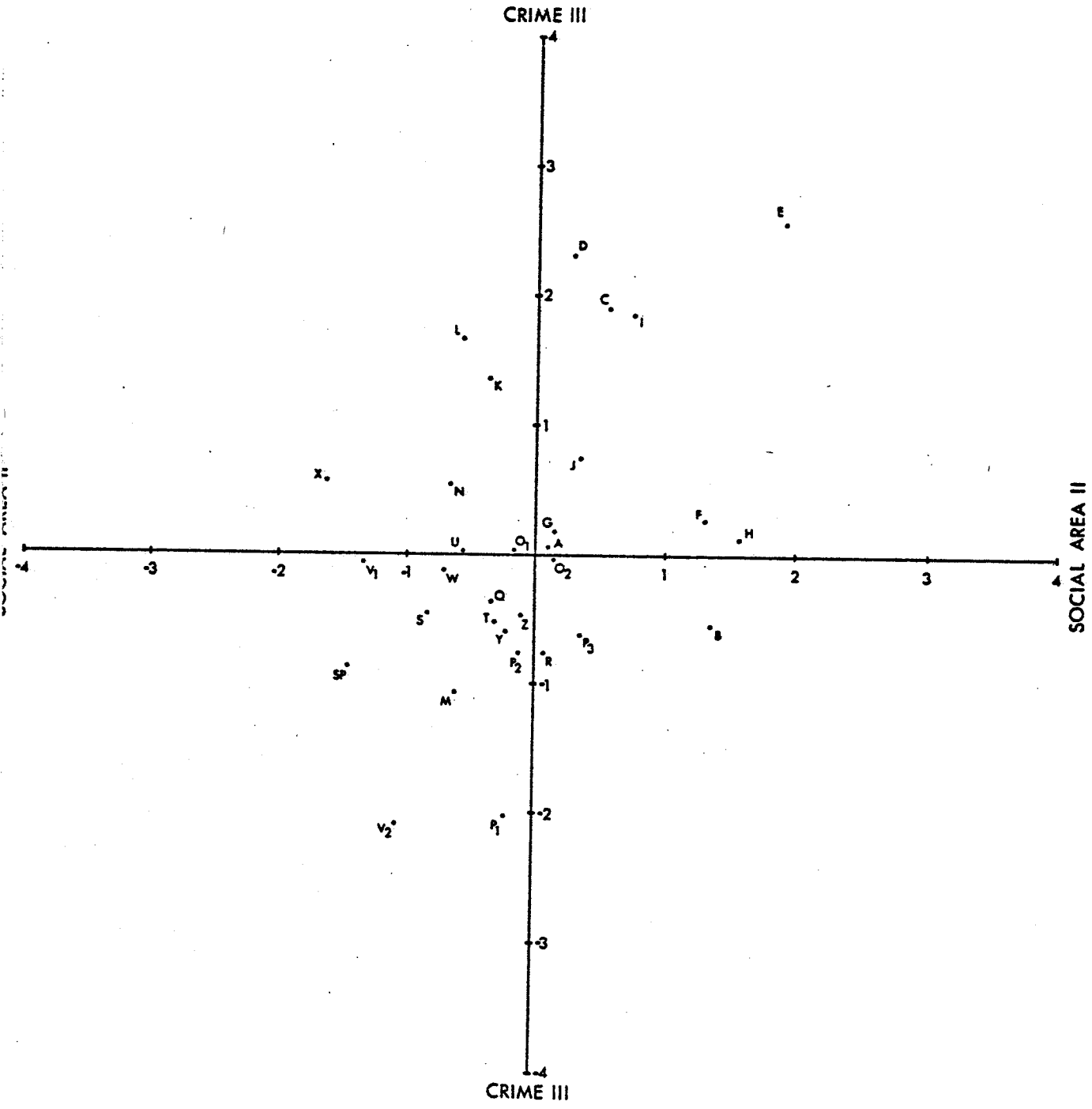

Fig. 22. Social Area-Crime Space: Social Area Factor II vs. Crime Factor III

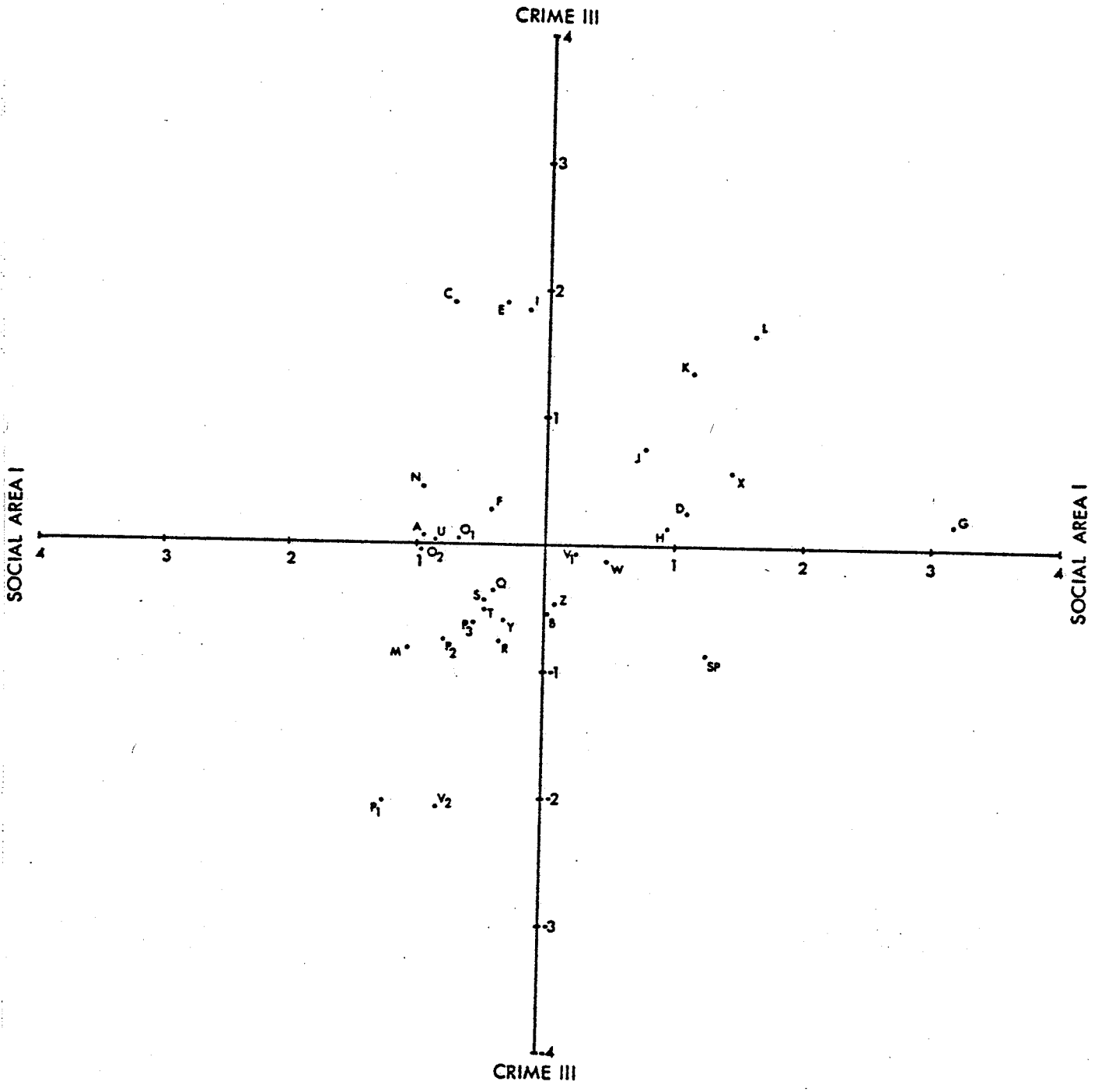

Fig. 23. Social Area-Crime Space: Social Area Factor I vs. Crime Factor III

TABLE 16

Regularities in the Distribution of Minor Theft Factor Scores

Dimension	Police District						
	C	E	I	L	K	J	X
Minor theft	1.90	1.90	1.85	1.67	1.37	0.75	0.57
Economic-cum-family status	-0.72	-0.32	-0.16	1.60	1.13	0.78	1.44
Traditional social status	0.55	2.56	0.73	-0.59	-0.39	0.32	-1.63

C - Burtola I - Muchipara K - Park Street X - Garden Reach
E - Jorasanko L - Hastings J - Taltala

this crime dimension (Burtola, Jorasanko, Muchipara, Hastings, Park Street, and Taltala) form a contiguous group in the central part of the city. But the police districts characterized by mild manifestations of these two social area dimensions are less disturbed by minor theft.

D. Crime Space and Crime Areas

Geographers have long been interested in deriving regions for the purpose of making inductive generalizations.[14] The basis for identifying these regions has been the similarity of the spatial characteristics. Therefore, this section aims at aggregating the thirty-one police districts of Calcutta into what has been called crime areas.

[14] See, for example, Maurice G. Kendall, "The Geographical Distribution of Crop Productivity in England," Journal of the Royal Statistical Society, series A, 102, part I (1939): 21-62; Margaret J. Hagood; N. Danilevsky; and C. O. Beum, "An Examination of the Use of Factor Analysis in the Problem of Subregional Delineation," Rural Sociology 6 (September 1941): 216-233; E. W. Gilbert, "The Idea of the Region," Geography, 45 (July 1960): 157-175.

The term "crime area" is preferred here over the expression "delinquency area," as this analysis deals with varieties of crimes. The latter term was first used by Shaw in Chicago "to describe those parts of the great city which seem to throw up criminals and delinquents with the same ease with which they produce instances of poverty, overcrowding and disease."[15] His primary consideration was with the area where the delinquents used to reside.

In this analysis, crime area indicates the area of crime incidence and is considered as a subset of crime space, which is derived when a particular crime dimension is plotted against another dimension. As there are three crime dimensions, it is possible to develop three separate crime spaces. These are shown in Figures 24 to 26. Consequently, three sets of crime areas would evolve for the same number of police districts. But this made the aggregation of the police districts difficult. This problem was removed by considering each spatial unit as a point in a three dimensional Cartesian crime space. The thirty-one points, representing thirty-one police districts, were then grouped into a smaller number of crime areas on the basis of their adjacency to one another in crime space, that is, their likeness in terms of characteristics of variation expressed by different dimensions.

Numerous methods have been used by geographers to form discrete regions following the location of spatial units in a multi-

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[15] Terence Morris, The Criminal Area (London: Routeledge & Kegan Paul Ltd., 1957), p. 19.

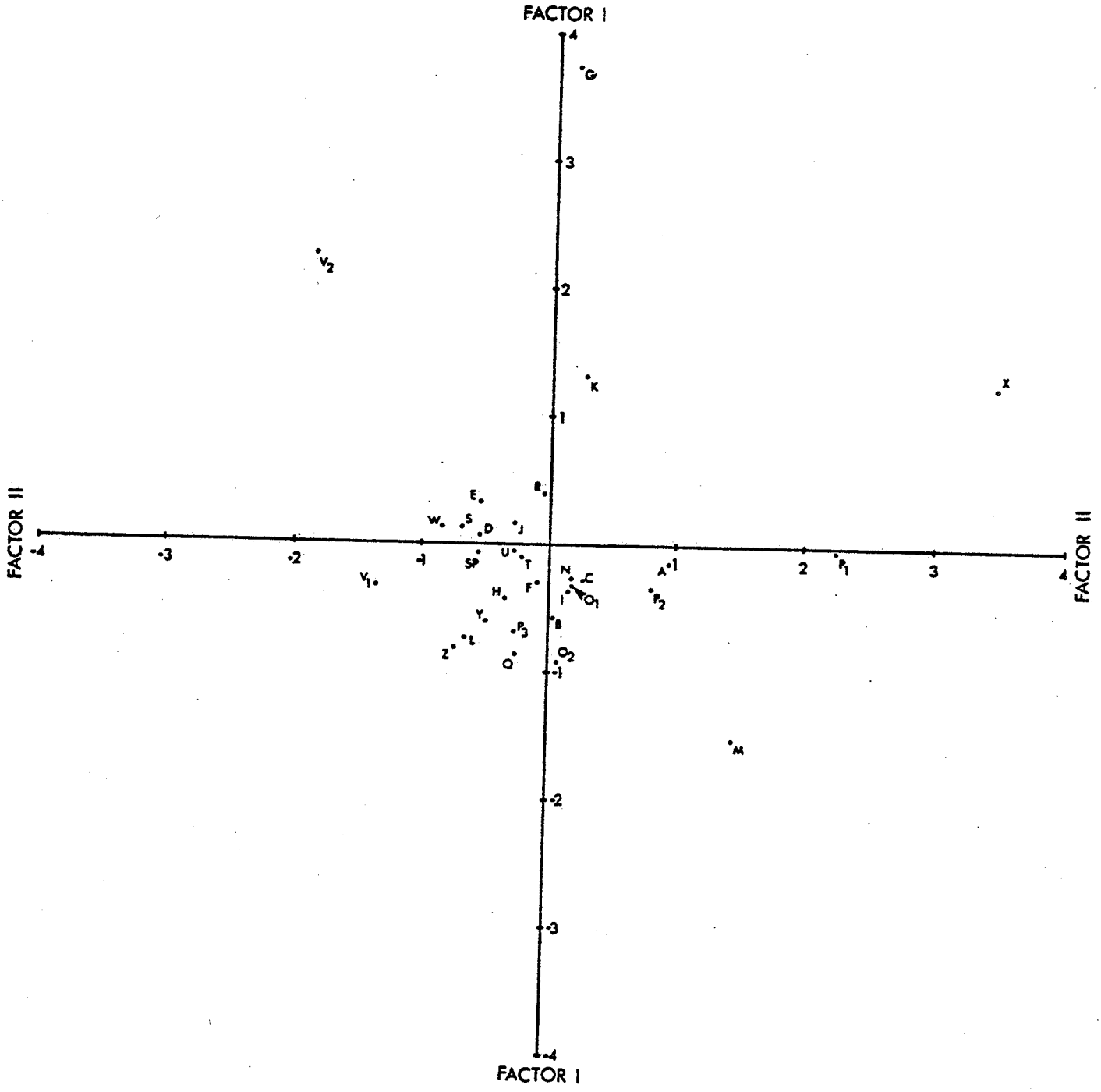

Fig. 24. Crime Space: Factor I vs. Factor II

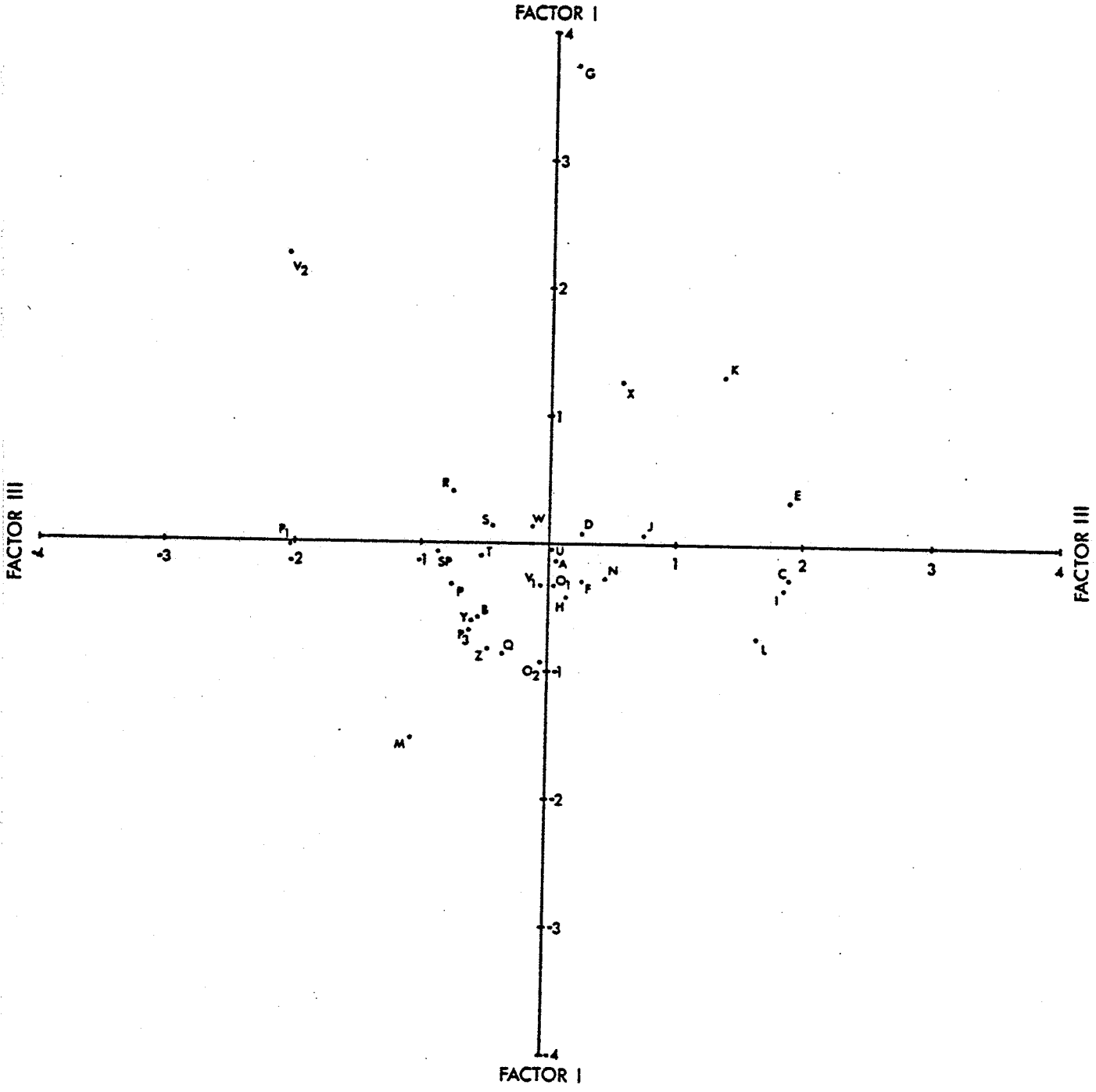

Fig. 25. Crime Space: Factor I vs. Factor III

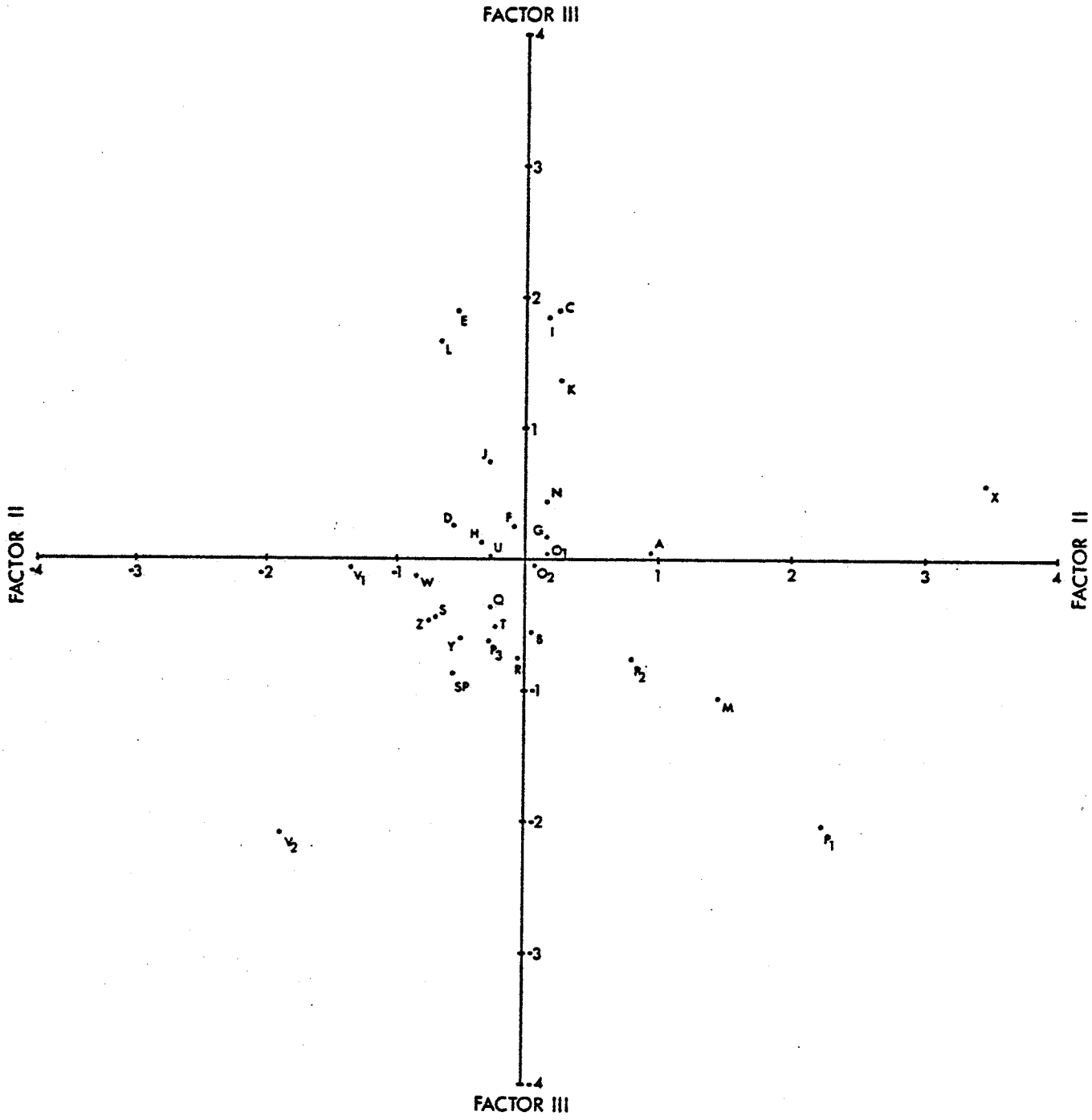

Fig. 26. Crime Space: Factor II vs. Factor III

dimensional space.[16] In this study Ward's hierarchical grouping technique[17] was used because this method tends to "maximize the average inter-group distance while minimizing the average intra-group distance."[18] Figure 27 illustrates the clustering dendogram developed following a cluster analysis routine.[19] Police districts are indicated along the horizontal axis and distance coefficients along the vertical axis. Here the coefficient value "is twice the increase in the error sum" of squares (ESS).[20] The dendogram shows that each spatial unit acts as a single-member group at the early stage when ESS is zero. In successive steps, several emerging groups are fused until two broad groups are formed, and the ESS increases to its maximum (Table 28). One of these two groups is a combination of twenty-nine police districts (out of a total of thirty-one). Naturally, this group would portray an overgeneralized picture about the crime characteristics of the police districts. To reduce this ambiguity, an attempt was made to have small-sized groups so that inductive generalizations could be made. This necessitated the

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[16] For a review of the grouping methods, see Mrinal K. Dutta, "Multivariate Grouping Algorithms in Geographic Research: An Overview," Oriental Geographer 17 (July 1973): 77-93.

[17] Joe H. Ward, Jr., "Hierarchical Grouping to Optimize An Objective Function," Journal of the American Statistical Association 58 (March 1963): 236-244.

[18] Donald J. Veldman, Fortran Programming for the Behavioral Sciences (New York: Holt, Rinehart and Winston, 1967), p. 309.

[19] A computer program, called CLUSTAN 1C, written by David Wishart, University College, London (July 1975) was used at the University of Manitoba computer centre.

[20] The ESS is defined as the sum of the distances from each point to the centroid of its parent group. At every step of this hierarchical method, the two groups whose fusion produces the least increase in the ESS are linked. See Brian Everitt, Cluster Analysis (London: Heinemann Educational Books Ltd., 1974), p. 17.

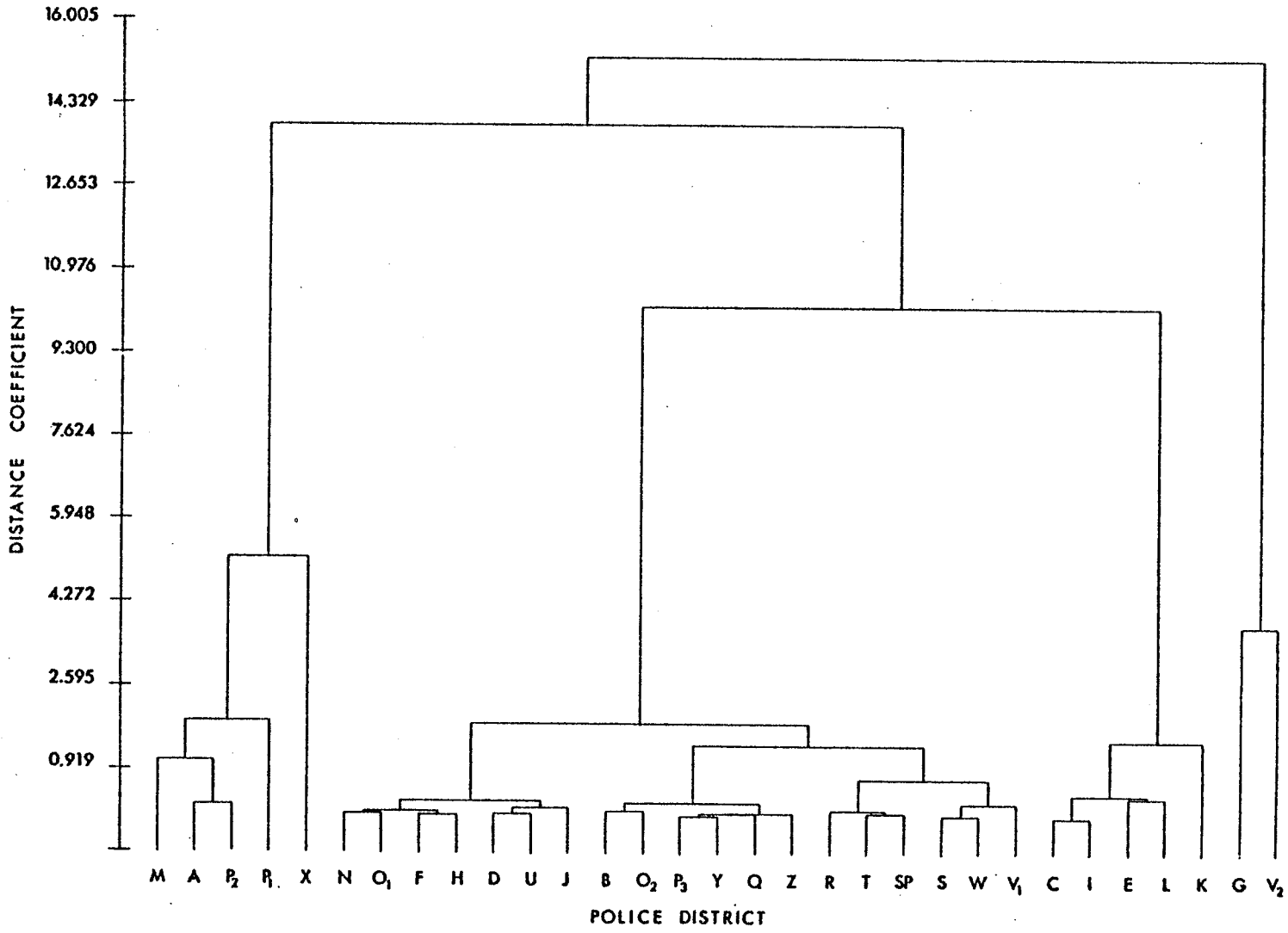

Fig. 27. Hierarchical Grouping

establishment of a level of grouping.

In order to obtain such groupings, police districts are plotted against the successive levels of grouping (Figure 28). This indicates a "standstill" between the 10.264 and 5.199 values of distance coefficient, and five groups of police districts emerge at 5.199. These spatial clusters present a meaningful picture of the levels of crime dimensions, as shown in Table 17. In this table, Crime Factor I (professional), Factor II (violent), and Factor III (minor theft) scores are represented by their respective ranks from the top. The factor scores are also shown by their position (high, medium, low, or very low) in the univariate clusters for separate factors (Figures 15, 17, and 19). On the basis of these features, the police districts are distinguished as high violent crime area, mixed with high intensity crime area, high minor theft crime area, high professional crime area, and mixed crime area. These are shown in Figure 29.

E. Quantitative Evaluation of the Spatial Pattern of Crime Dimensions

Spatial configuration of crime has been measured in most cases by gradients.[21] Some analytical modification of the gradient method was incorporated by Pyle and his associates, who used the simple linear regression technique in order to find the spatial distribution of crime types.[22] All of these investigations indicated that crime within a city

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[21]Clifford R. Shaw and Henry D. McKay, Juvenile Delinquency and Urban Areas, Rev. ed. (Chicago: University of Chicago Press, 1969); Calvin F. Schmid, "Urban Crime Areas, Part II," American Sociological Review 25 (October 1960): 664-666; Lois B. DeFleur, "Ecological Variables in the Cross-Cultural Study of Delinquency," Social Forces 45 (June 1967): 567-568.

[22]Gerald F. Pyle et al., The Spatial Dynamics of Crime. Research

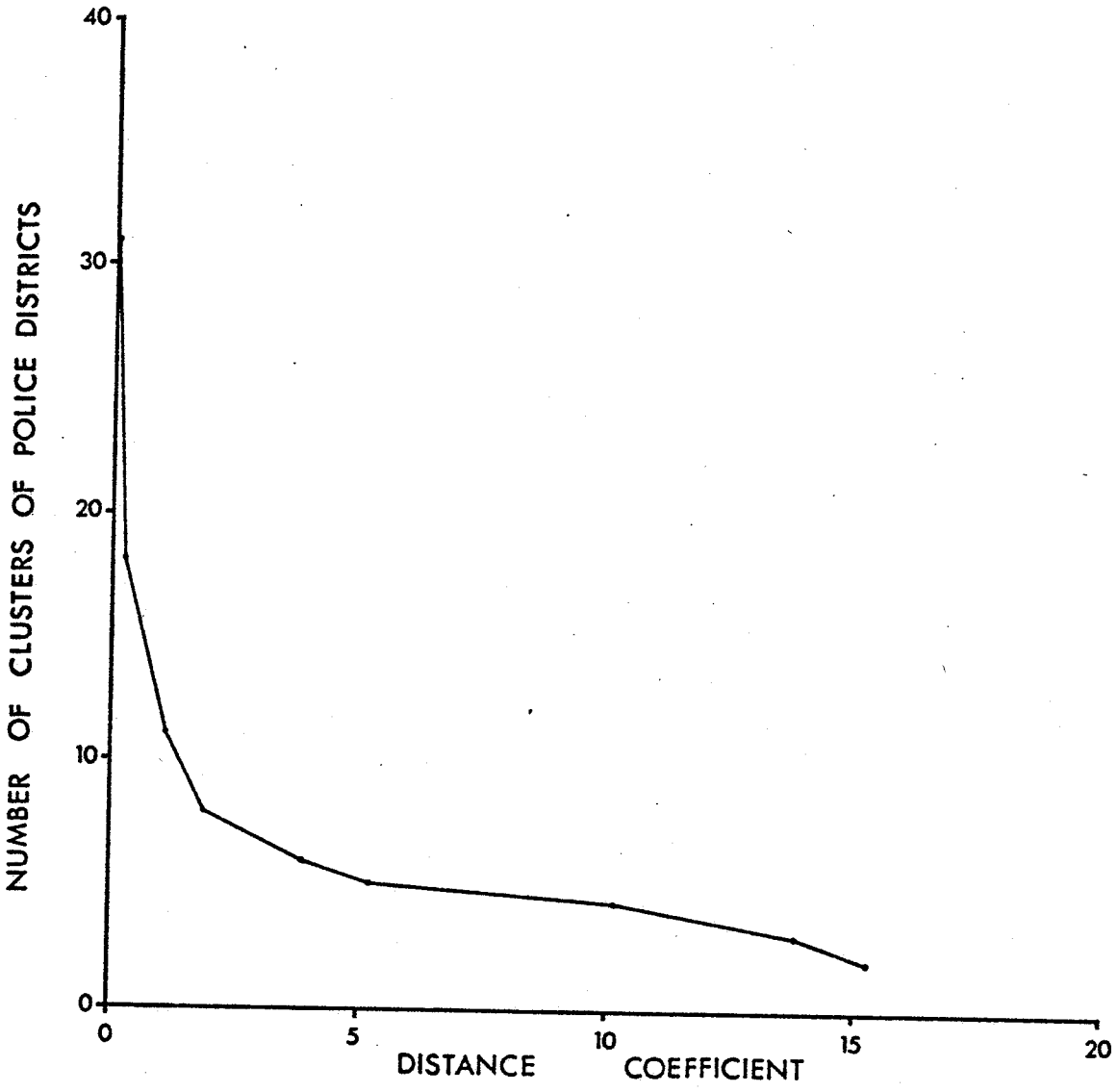

Fig. 28. Number of Clusters of Police Districts vs. Distance Coefficients

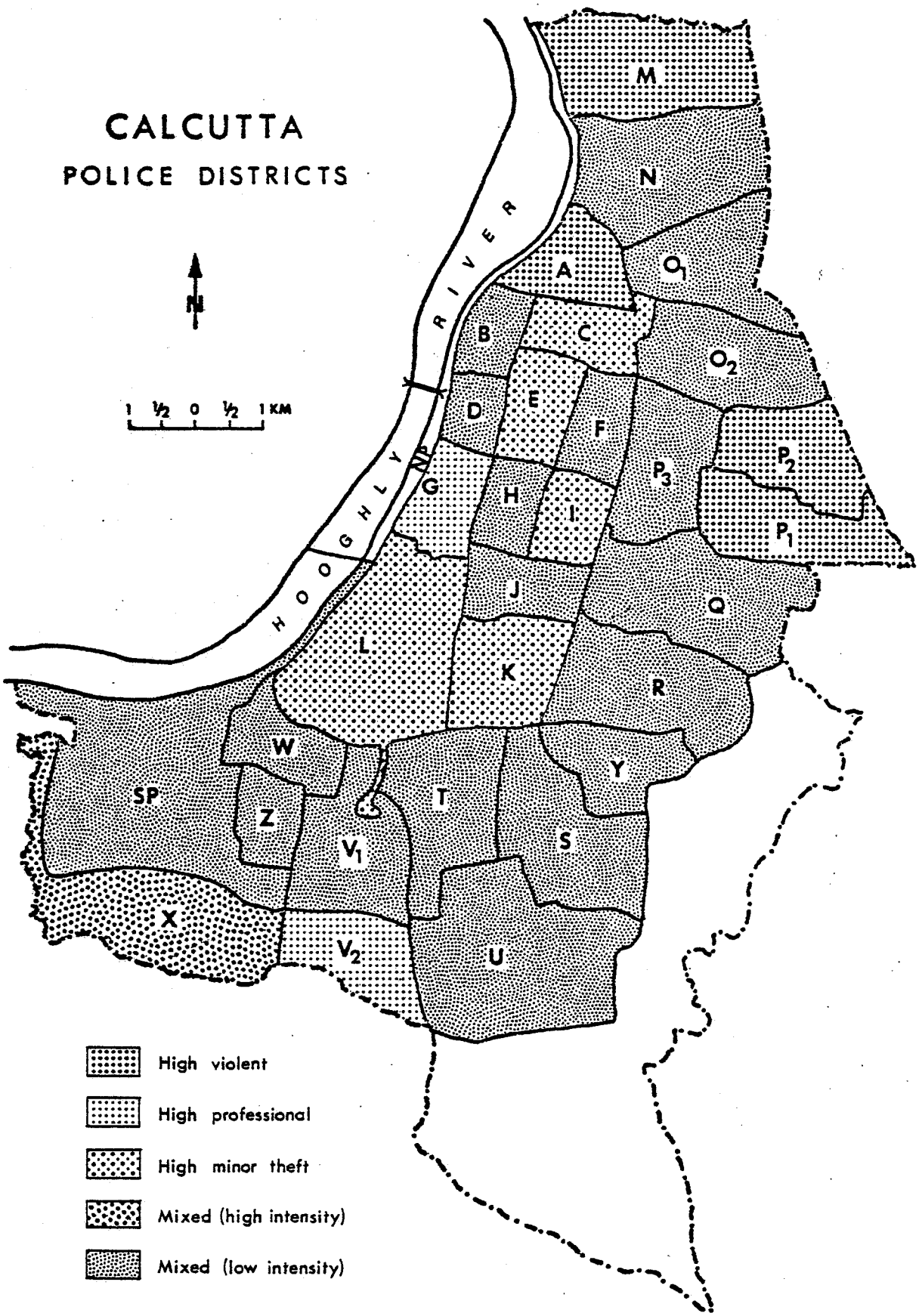

Fig. 29. Crime Areas

TABLE 17

Characteristics of the Crime Areas

Group	Name	Police District	Professional Crime	Violent Crime	Minor Theft
I	High violent	M	VL (28)	H (3)	VL (28)
		A	L (14)	H (4)	M (12)
		P2	L (18)	H (5)	L (25)
		P1	M (10)	H (2)	VL (29)
II	Mixed with high intensity	X	H (4)	H (1)	H (6)
III	Mixed	N	L (15)	M (8)	H (7)
		01	L (18)	M (9)	M (13)
		F	L (16)	M (14)	H (8)
		H	L (20)	M (19)	H (11)
		D	M (8)	L (22)	M (9)
		U	M (11)	M (17)	M (14)
		J	M (9)	M (18)	H (5)
		B	VL (21)	M (12)	L (22)
		02	VL (27)	M (11)	M (15)
		P3	VL (23)	M (18)	L (24)
		Y	VL (22)	L (20)	L (23)
		Q	VL (26)	M (16)	L (18)
		Z	VL (25)	L (26)	L (20)
		R	H (5)	M (13)	L (26)
		T	M (13)	M (15)	L (21)
		SP	M (12)	L (23)	L (27)
		S	M (7)	L (25)	L (19)
		W	M (7)	L (27)	M (17)
		V1	L (17)	VL (28)	M (16)

TABLE 17--Continued

Group	Name	Police District	Professional Crime	Violent Crime	Minor Theft
IV	High minor theft	C	L (15)	M (7)	H (1)
		I	L (19)	M (10)	H (2)
		E	M (6)	L (21)	H (1)
		L	VL (24)	L (24)	H (3)
		K	H (3)	M (6)	H (4)
V	High professional	G	H (1)	M (10)	M (10)
		V2	H (2)	VL (29)	VL (30)

Notes: Figures in parentheses indicate ranks; the higher the number the lower is the rank.

Letters H, M, L, and VL mean high, medium, low, and very low positions respectively on univariate clusters.

is a concentric phenomenon. Practically no systematic work has been done to measure the sectorial orientation of crime on space. Therefore, the present study not only examines the crime dimensions in Calcutta by concentric zones but also analyses the distribution of crimes by sectors. The methods employed here are analysis of variance and regression analysis.

Analysis of Variance

A two-way analysis of variance was used in the present study to establish whether certain crime dimensions in Calcutta are distributed concentrically or sectorially. Although its application to criminological research is new, it has already been used in social area analysis.[23]

Paper, No. 159 (Chicago: Department of Geography, University of Chicago, 1974), pp. 129-141.

[23]See, for example, Theodore R. Anderson and Janice A. Egeland,

The spatial units for the analysis of variance were constructed in the following manner. The reference point for drawing zones and sectors is the centre of the Benoy-Badal-Dinesh bag which has always been considered as the core of the city.[24] Four concentric zones circumscribe this point on a police district map of Calcutta (Figure 30), and each zone is two kilometres in width. They are labelled CZ1, CZ2, CZ3, and CZ4 from west to east. Within each zone, sub-areas are marked off in terms of four sectors S1, S2, S3, and S4 from north to south. The sector lines are drawn at an angle of 50° each at the reference point in order to cover maximum area under the police districts. Thus, sixteen cells are obtained, and their distribution is shown in the figure. However, fourteen cells were included in the analysis. The two other cells, which are a part of both the outermost zone (CZ4) and sectors S2 and S3, had to be excluded because these cells lie practically beyond the city limit.

"Spatial Aspects of Social Area Analysis," American Sociological Review 26 (June 1961): 392-398; Dennis C. McElrath, "The Social Areas of Rome: A Comparative Analysis," American Sociological Review 27 (June 1962): 376-391; Robert A. Murdie, Factorial Ecology of Metropolitan Toronto, 1951-1961. Research Paper, No. 116 (Chicago: Department of Geography, University of Chicago, 1969), pp. 152-166; Philip H. Rees, "Concepts of Social Space: Toward An Urban Social Geography" in Geographic Perspectives on Urban Systems, by Brian J. L. Berry and Frank E. Horton (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970), pp. 369-375; D. W. G. Timms, The Urban Mosaic. Towards A Theory of Residential Differentiation (Cambridge, England: University Press, 1971), pp. 211-249; Singh, "Spatial Structure of Indian Cities," pp. 65-67, 92-95, 118-119.

[24] N. R. Kar, "Urban Characteristics of the City of Calcutta," Indian Population Bulletin 1 (April 1960): 55; Dutt, "Commutation to the Metropolis of Calcutta," 202; Mira Das, "The Central Business District of Calcutta," in Selected Papers, vol. 3. Population and Settlement Geography, Political and Historical Geography, ed. S. P. Chatterjee and S. P. Dasgupta (Calcutta: National Committee for Geography, 1971), pp. 79-80.

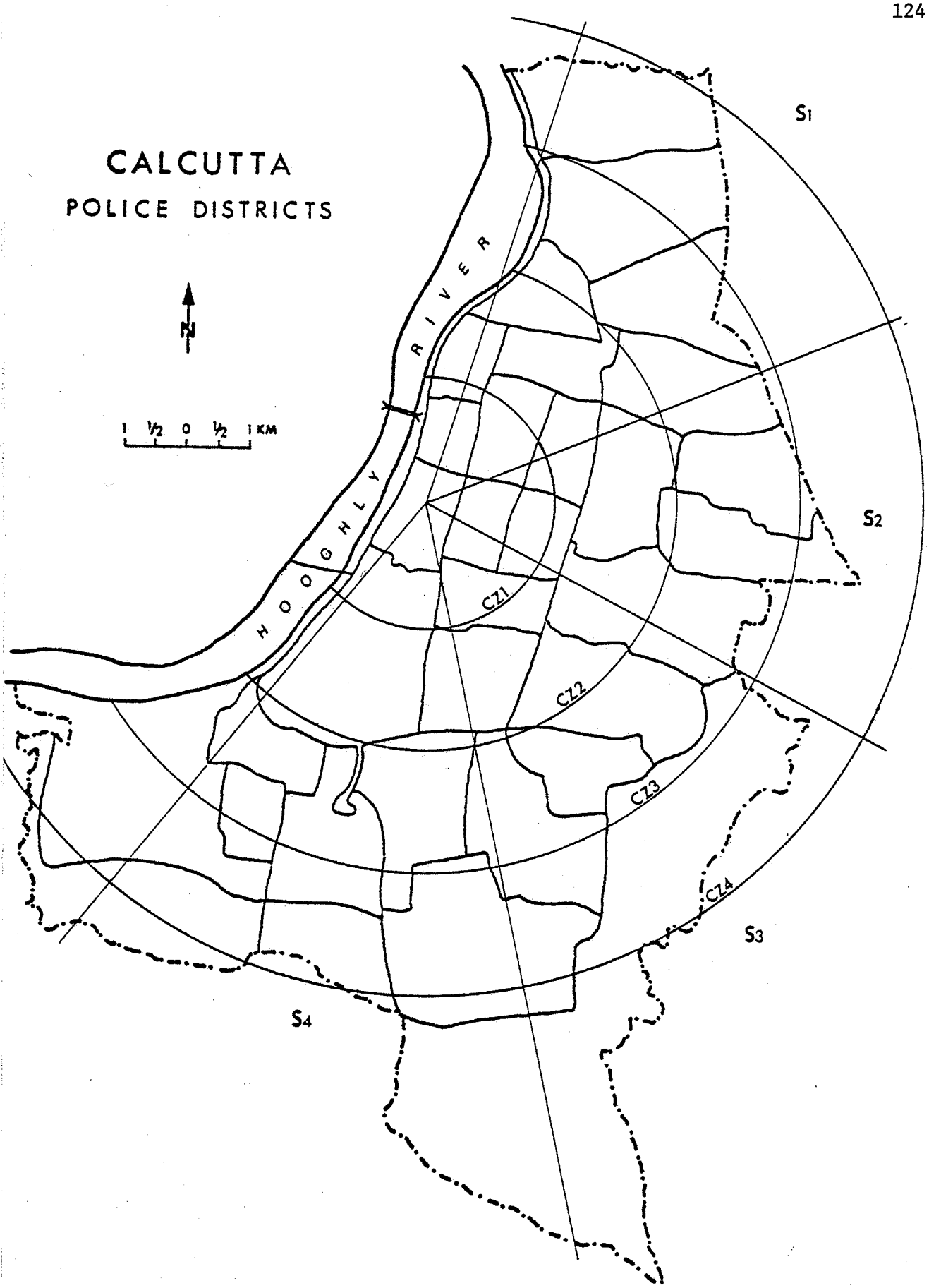

Fig. 30. Concentric Zones and Sectors of 50°

As the factor scores were calculated for police districts, the next task was to obtain the factor scores for the newly derived cells. Figure 30 shows the distribution of these cells as well as that of police districts. If a cell covered more than half of a police district's area, it was assigned the same factor score as that of the police district. Owing to the configuration of the police district boundaries, no major problem arose in the allocation of the factor scores. The same method for the allocation of scores was repeated for all the crime dimensions. In each of these analyses, the individual crime factor was considered as the dependent variable and both sectors and zones as independent variables. Table 18 presents an analysis of variance for the fourteen cells under consideration.[25]

The said table clearly indicates that minor theft is characterized by a relatively large F ratio for the zone effect, and this value is significant at 0.004 level. The only conclusion drawn is that this crime dimension is a strong concentric phenomenon in Calcutta. Professional crime has an F statistic for the sector effect of 1.904, which is about twice the value of the ratio for zones. Similarly, the violent crime dimension has the highest F ratio for sectors, but the difference between this and the ratio for zones is not sufficient. Furthermore, the sectoral ratios for both these crime dimensions are significant at relatively high levels. These results suggest that professional and violent crimes follow a sectoral orientation in the city, but this align-

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[25]Program SPSS (2nd edition, 1975) written by Norman H. Nie was run at the University of Manitoba Computer Centre for all the analyses of variance.

TABLE 18

Analysis of Variance for Different Crime Dimensions
(Number of Cells: 14)

Source of Variation	Sum of Squares	Degree of Freedom	Variance Estimate	F	Significance Level of F
		Professional Crime			
Main effects	4.198	6	0.700	1.524	0.212
Sector	2.622	3	0.874	1.904	0.155
Zone	1.357	3	0.452	0.985	0.999
Residual	11.014	24	0.459		
Total	15.211	30	0.507		
		Violent Crime			
Main effects	6.857	6	1.143	1.195	0.342
Sector	5.208	3	1.736	1.815	0.170
Zone	4.370	3	1.457	1.523	0.233
Residual	22.954	24	0.956		
Total	29.811	30	0.994		
		Minor Theft			
Main effects	13.264	6	2.211	3.316	0.016
Sector	2.469	3	0.823	1.235	0.319
Zone	11.558	3	3.853	5.780	0.004
Residual	15.998	24	0.667		
Total	29.261	30	0.975		

ment is less strong than that for the zonal distribution of minor theft.

In order to re-examine the above findings, a slight adjustment was made to the number of cells. The outermost zone (CZ4) in sectors S1 and S4 was dropped because in the earlier analyses, two adjacent sectors S2 and S3 had already been discarded. The inclusion of S1 and S4 would only have distorted the results. An examination of the F ratios in Table 19 shows practically the same trend of different crime dimensions in terms of sectoral or zonal orientation. Minor theft is found to have strong concentric variation, while professional and violent crimes show their sectoral distribution in the city. However, this time the respective F ratios of these two dimensions for sector effect become more pronounced than those for other effects. Also, their levels of significance are sufficiently improved.[26]

It could be argued that the arbitrary establishment of sectors and zones affects the results. In order to validate the above findings, the city is further divided into seven sectors of 30° intervals, and they are identified as Sa, Sb, Sc, Sd, Se, Sf, and Sg (Figure 31). But the concentric four zones are retained as they sufficiently overlap the police districts. However, the outermost zone was excluded from this analysis, as it covers only two sectors (Sf and Sg) in full. Thus, a total of twenty-one cells representing twenty-six police districts formed the basis for further analysis of variance. The results derived

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[26]Improvement in the results may be ascribed to the fact that this time there was no gap; a total of (4x3) or 12 cells were considered. First time, out of (4x4) or 16 cells, two cells (S2, CZ4) and (S3, CZ4) had no data and, obviously, the results were not as significant as on this occasion. See George W. Snedecor and William G. Cochran, Statistical Methods, 6th ed. (Ames, Iowa: Iowa University Press, 1967), p. 317.

TABLE 19

Analysis of Variance for Different Crime Dimensions
(Number of Cells: 12)

Source of Variation	Sum of Squares	Degree of Freedom	Variance Estimate	F	Significance Level of F
		Professional Crime			
Main effects	1.786	5	0.357	1.955	0.129
Sector	1.647	3	0.549	3.006	0.054
Zone	0.276	2	0.138	0.755	0.999
Residual	3.653	20	0.183		
Total	5.439	25	0.218		
		Violent Crime			
Main effects	4.572	5	0.914	2.592	0.057
Sector	4.100	3	1.367	3.874	0.024
Zone	1.207	2	0.603	1.710	0.205
Residual	7.055	20	0.353		
Total	11.627	25	0.465		
		Minor Theft			
Main effects	10.731	5	2.146	3.632	0.017
Sector	2.431	3	0.810	1.371	0.280
Zone	8.469	2	4.234	7.166	0.005
Residual	11.818	20	0.591		
Total	22.549	25	0.902		

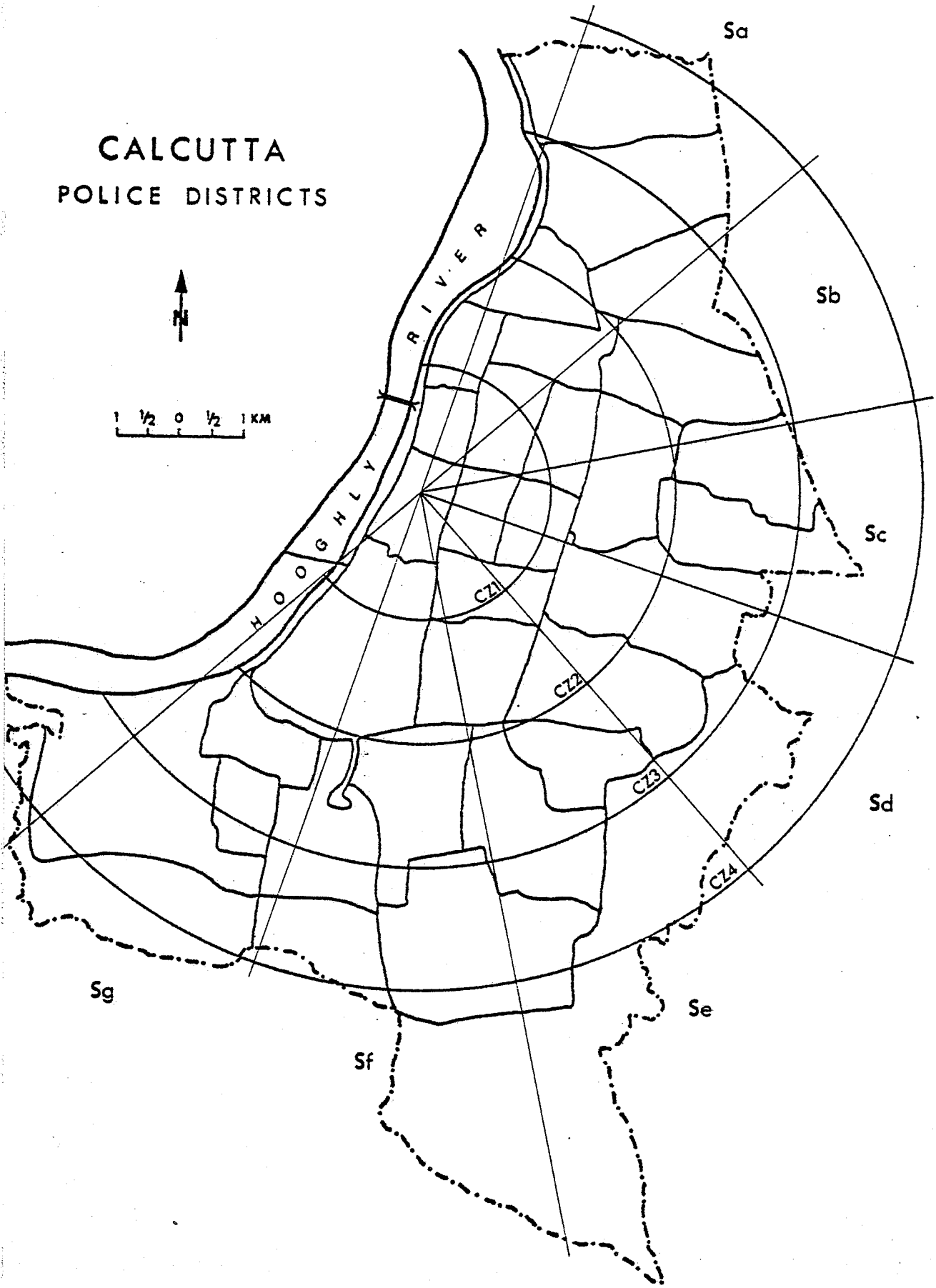

Fig. 31. Concentric Zones and Sectors of 30°

(Table 20) depict also the strong concentric pattern of the distribution of minor thefts and less strong sectoral pattern with respect to professional and violent crimes.[27] The analyses, then, basically show that the results have not been altered by the change in angles of sectors (from 50° to 30°). This increases the reliability of earlier findings. These were again tested by regression analysis which also answers the last important question raised in the present research, that is, whether distance-decay functions are followed by the crime dimensions in Calcutta.

Regression Analysis

The simple linear regression technique[28] was used in order to test the effect of distance (from the city centre) on the distribution of crimes. The distance was measured in kilometres from the city centre to the centre of each police district. The factor scores for each crime dimension for these police districts provided the other values required for this analysis. Table 21 indicates the correlation coefficients between these two elements for various crimes. The high negative correlation between distance and factor scores for minor theft suggests a strong concentric pattern for this crime. Professional crime reveals a weak relationship between the increasing distance from the city centre

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[27] The decreased significance of the sectoral orientation of these two crime dimensions may be explained by the fact that "too many sectors may conceal rather than reveal the patterns" of any social aspect on geographic space. See R. J. Johnston, "On Spatial Patterns in the Residential Structure of Cities," The Canadian Geographer 14 (Winter 1970): 365.

[28] University of Manitoba Statistical Package Program 14 was used.

TABLE 20

Analysis of Variance for Different Crime Dimensions
(Number of Cells: 21)

Source of Variation	Sum of Squares	Degree of Freedom	Variance Estimate	F	Significance Level of F
		Professional Crime			
Main effects	3.063	8	0.383	1.326	0.296
Sector	2.375	6	0.396	1.370	0.282
Zone	0.534	2	0.267	0.924	0.999
Residual	4.910	17	0.289		
Total	7.973	25	0.319		
		Violent Crime			
Main effects	3.870	8	0.484	1.129	0.393
Sector	3.496	6	0.583	1.360	0.286
Zone	0.306	2	0.153	0.357	0.999
Residual	7.286	17	0.429		
Total	11.156	25	0.446		
		Minor Theft			
Main effects	12.247	8	1.531	3.292	0.019
Sector	4.780	6	0.797	1.713	0.178
Zone	6.372	2	3.186	6.851	0.007
Residual	7.906	17	0.465		
Total	20.153	25	0.806		

TABLE 21

Interrelationships of Crime Factor Scores and Distance from City Centre

Crime	Correlation Coefficient
Professional crime	-0.14
Violent crime	0.15
Minor theft	-0.52[a]

[a]Significance level exceeds 1% level.

and the falling crime rate. Violent crime displays a weak positive relationship with the increase in distance. Because of the weak relationship displayed, no firm conclusion can be drawn about their distributional patterns.

In an attempt to explain the effect of distance on crime rates, regression slopes for different crime dimensions have been presented in Figures 32 to 34. Figures 32 and 34 indicate that professional crime ($\beta = -0.06$) and minor theft ($\beta = -0.24$) decrease with the increasing distance. In contrast to these, the gradient for violent crime (Figure 33) depicts that the rate of its occurrence increases ($\beta = 0.07$) in the peripheral parts.

The above findings were further tested on most of the sectors,[29] as shown in Figures 30 and 31. Factor scores for each crime dimension for the police districts within a sector were regressed on distance separating the city centre from the centres of these districts. Minor

[29]In all, a total of six sectors, three of 50° interval and three of 30° interval, were selected at random for this purpose. They are S2, S3, and S4 in Figure 30 and Sc, Se, and Sg in Figure 31.

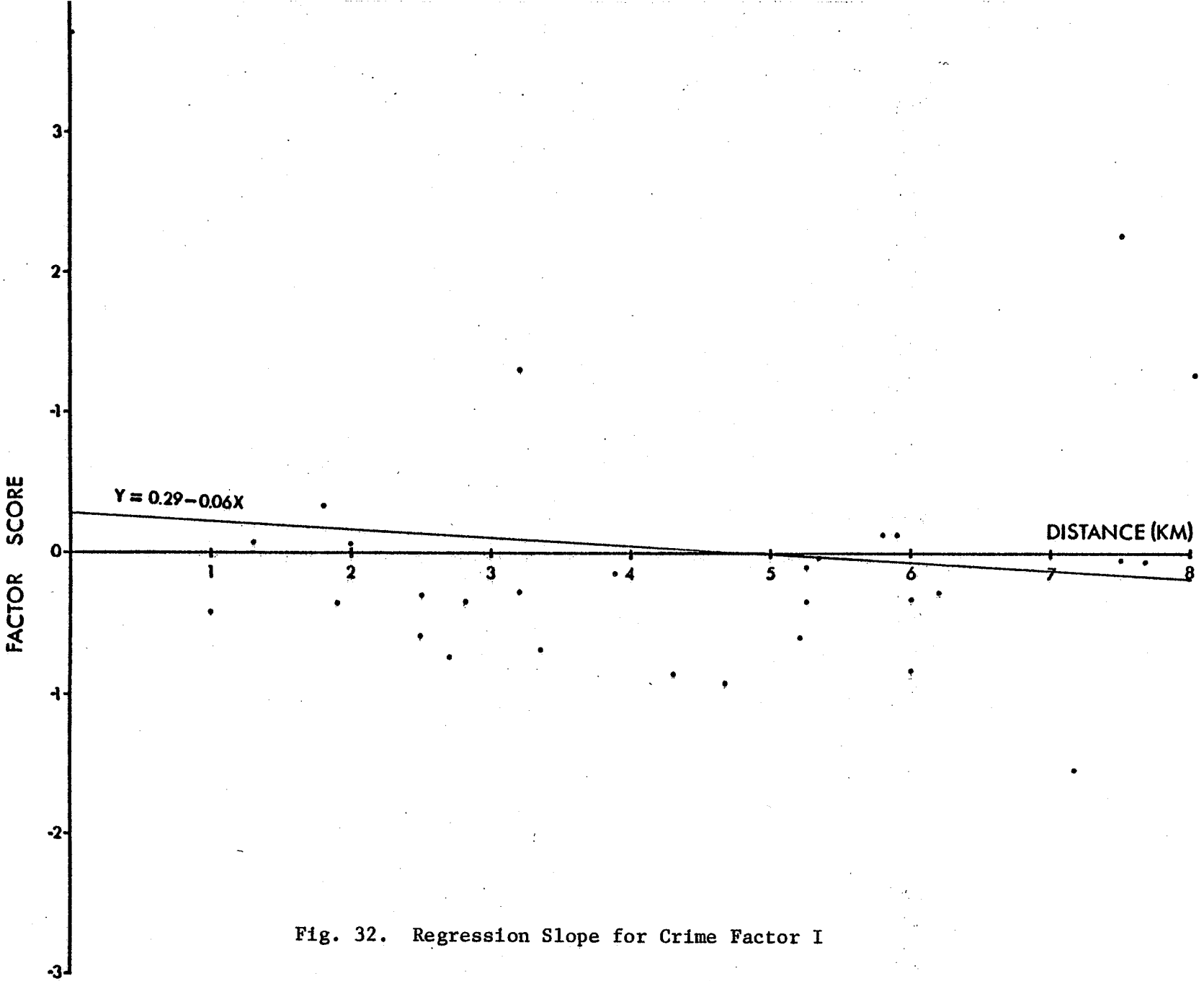

Fig. 32. Regression Slope for Crime Factor I

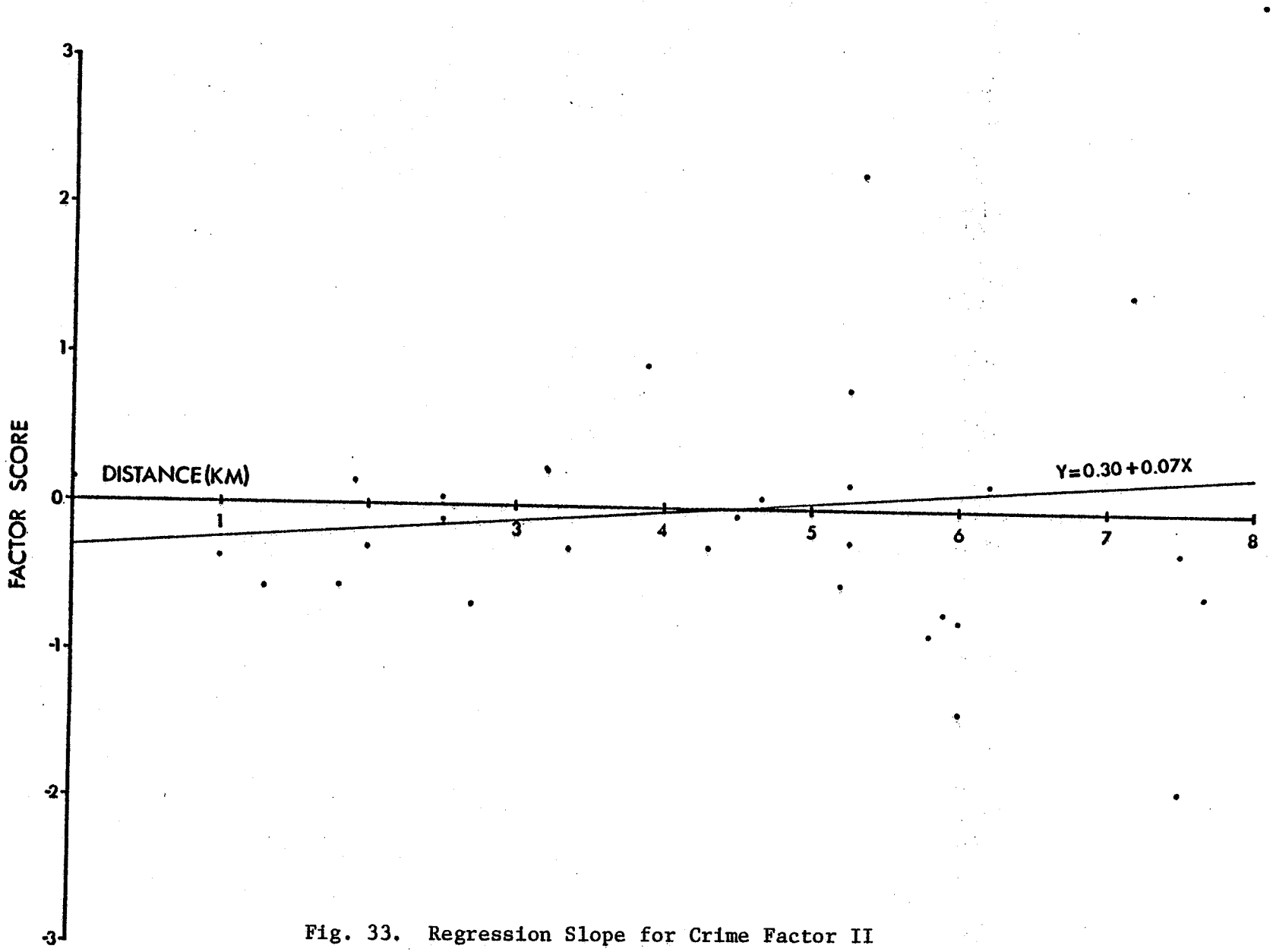

Fig. 33. Regression Slope for Crime Factor II

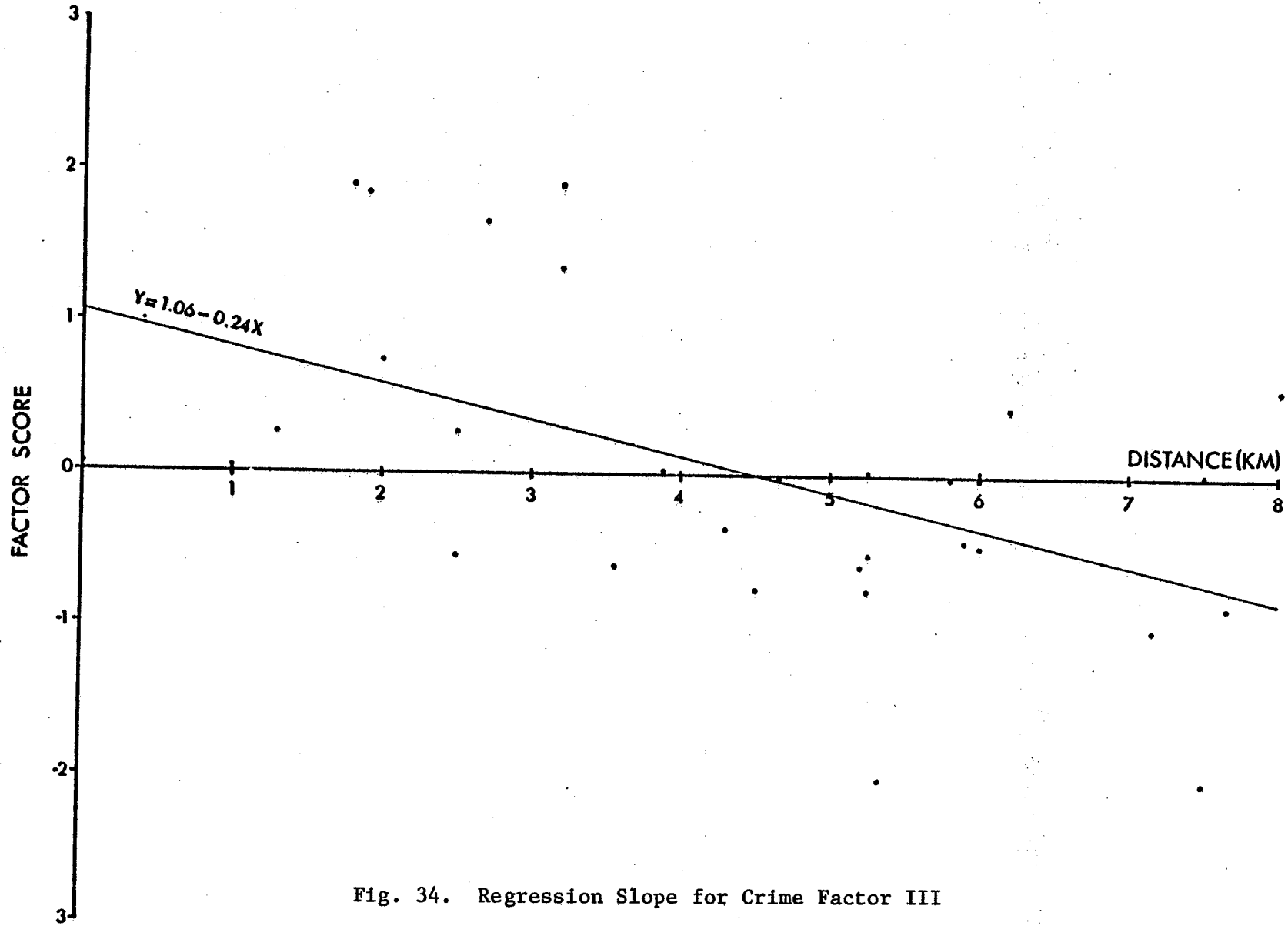

Fig. 34. Regression Slope for Crime Factor III

theft dimension indicates significant correlations (at 0.05 level) with distance in two of the six sectors considered (Table 22). Of the remainder, two cases are just below the 0.10 significance level. Gradients (for minor theft) are calculated for all these six sectors, and each of them has a negative value (Figure 35). These gradients are in agreement with earlier results which also indicated a negative slope for minor theft. This, then, supports the fact that minor theft decreases in intensity with increasing distance from the city centre.

TABLE 22

Interrelationships of Crime Factor Scores and Distance from City Centre in Sectors

Sector	Correlation Coefficient		
	Professional Crime	Violent Crime	Minor Theft
S2	0.12	0.67	-0.76[a]
S3	-0.06	-0.35	-0.61
S4	0.34	0.23	-0.66[a]
Sc	0.45	0.78	0.76
Se	-0.39	-0.58	-0.78
Sg	0.69	0.54	-0.69

[a]Significant at 0.05 level.

In contrast to minor theft, professional and violent crimes show no significant relationship with distance. Furthermore, when regression slopes for each of these two dimensions for various sectors are plotted (Figures 36 and 37), they do not show a consistent trend. Commenting on the spatial distribution of economic status in Toronto in 1951, Johnston, with the help of a graph, concluded that the economic

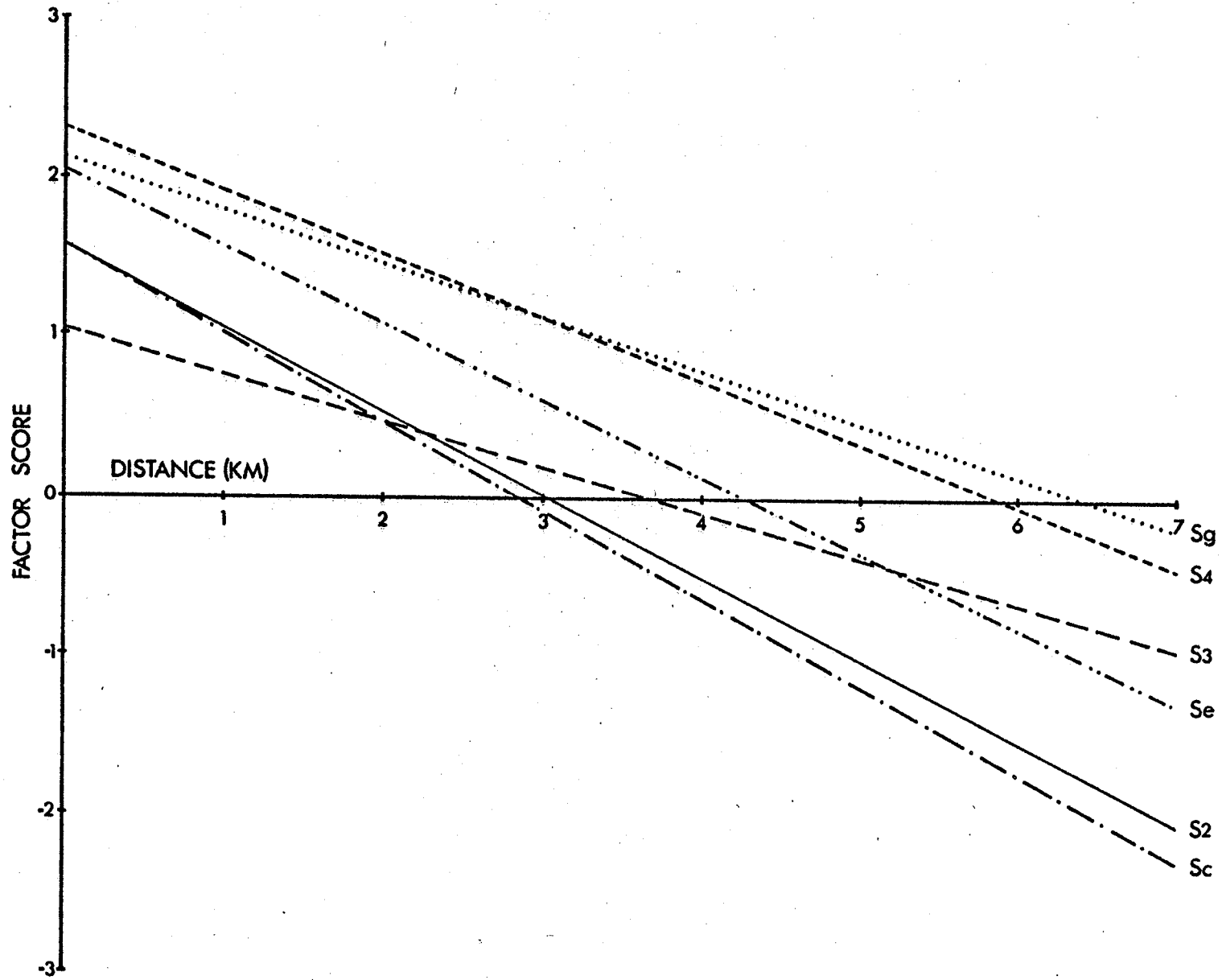

Fig. 35. Sectoral Regression Slopes for Crime Factor III

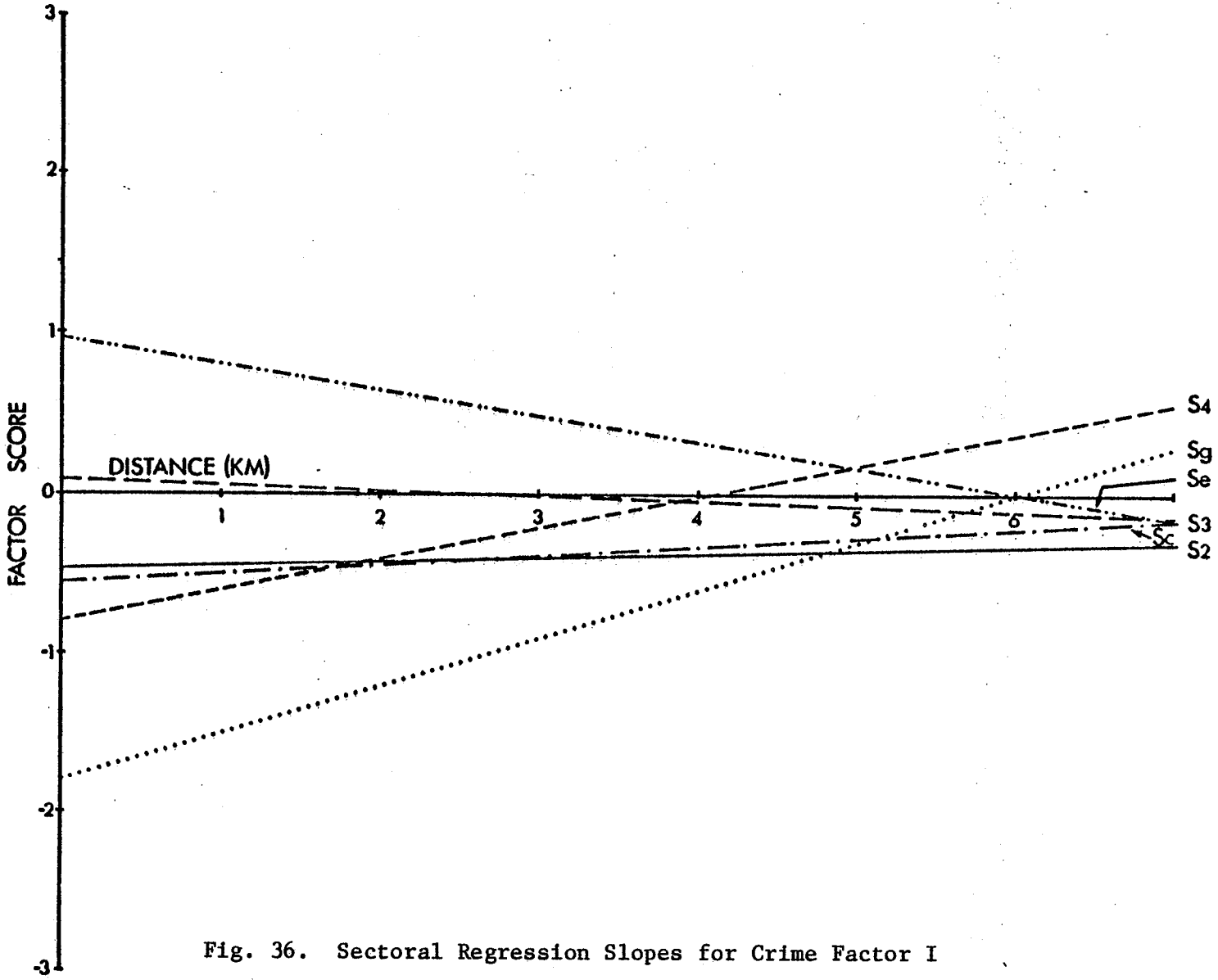

Fig. 36. Sectoral Regression Slopes for Crime Factor I

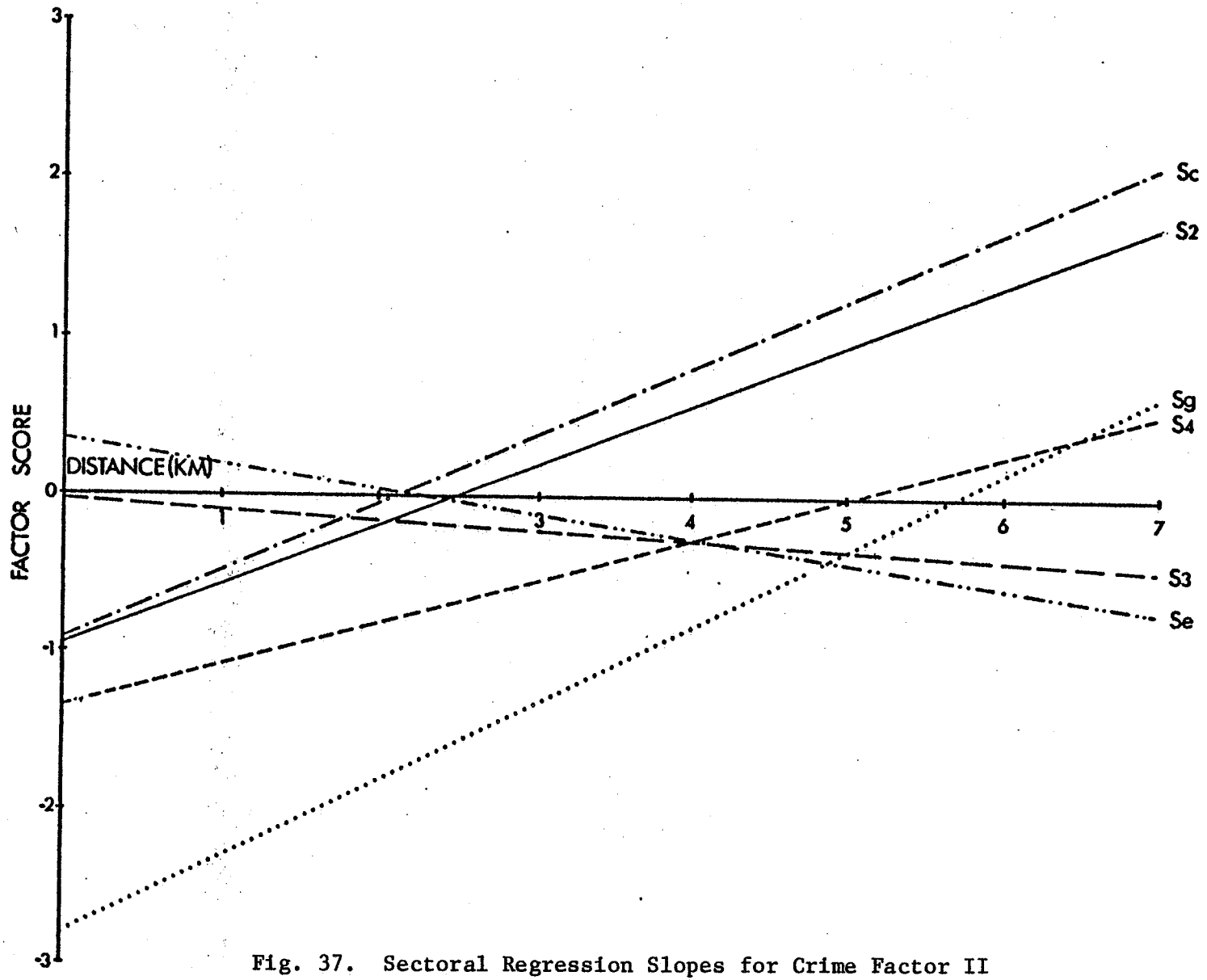

Fig. 37. Sectoral Regression Slopes for Crime Factor II

status was sectorially distributed. The graph had depicted the zones on the x-axis and the mean status ranking on the y-axis. The lines on this graph showed a lot of fluctuation and, in the absence of any consistency in slope, Johnston arrived at the above mentioned conclusion.[30] Figures 36 and 37 show a similar lack of consistency in the distribution of professional and violent crimes. But a conclusion similar to Johnston's, that is, the presence of sectoriality, was not entirely supported by the regression analysis. However, in the light of the strong support for the sectorial distribution of these two dimensions by the analysis of variance and the concentricity of minor theft which is favoured by the analysis of variance and the regression analysis, this study concludes that minor theft is concentrically patterned while the others are sectorially oriented in Calcutta.

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[30] Johnston, "Residential Structure of Cities," pp. 363-364.

CHAPTER VI

SUMMARY AND IMPLICATIONS

A. Summary

In this research, crime was considered as a function of the combination of several interdependent socio-cultural, economic, environmental, and political variables changing over space. Its purpose was to examine the intra-urban patterns of criminal behaviour in Calcutta on the basis of these sets of variables. The questions which this study sought to answer are:

1. What are the principal crime dimensions of Calcutta and what are their structures?

2. Does the ecology of crime conform to the spatial pattern of social areas in the metropolis?

3. Are the principal crime dimensions in Calcutta arrayed in terms of traditional spatial models (concentric zone or sector)?

4. If these dimensions follow the concentric zone model, do they also show a distance-decay function from the centre of the city?

The major findings of this study are listed below:

1. The social area differentiation of Calcutta can be described in terms of three basic dimensions, termed economic-cum-family status, traditional social status, and ethnic or segregation

status. These results contradict the findings of Berry and Rees, which suggest that the dimensions of economic status and family status are discrete in Calcutta.[1] However, this study confirms Singh's findings that the dimension of economic status is not separate from that of family status. Further, the present research establishes a dimension of traditional social status which was also evident in Singh's study of Indian cities.[2] Thus, a well-known fact of Indian society is reiterated here: traditional social status plays an important role in Indian society even in a city as large as Calcutta.

2. There are three principal crime dimensions in the metropolis: professional crime, violent crime, and minor theft.

3. The professional crime dimension is significantly predictable from the economic-cum-family status as well as from the ethnic status of the social area constructs.

4. Violent crimes do not show a close statistical relationship with any one of the social area dimensions. Nevertheless, they reveal their affinity with ethnic status.

5. Minor theft factor scores are significantly related to traditional social status and economic-cum-family status dimensions.

6. On the basis of homogeneity in intensity of occurrence, five crime areas are identified in Calcutta.

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[1]Brian J. L. Berry and Philip H. Rees, "The Factorial Ecology of Calcutta," The American Journal of Sociology 74 (March 1969): 445-491.

[2]Harbans Singh, "An Analysis of the Spatial Structure of Indian Cities," (Ph.D. dissertation, Rutgers University, 1973).

(a) High professional crime areas are characterized by business functions and high-income group residences. These areas occupy both the central part of the city and the periphery.

(b) Four police districts in the peripheral parts comprise the high violent crime areas. These areas are noted for relatively low percentages of married males, low percentages of employment, and high percentages of males aged 15 to 39. A large proportion of these police districts is occupied by slums and industries.

(c) High minor theft areas cover the central part of the city and the part flanking the vast central green of the maidan. These areas are characterized by high density of population, relatively low percentages of population in services, massive flows of daily commuters to the city and a large percentage of economically well-off people (including the transient international tourists).

(d) The mixed crime area with high intensity is a one-member cluster (that is, one police district). This area is marked by high-income group residences, open space and flow of daily commuters, a relatively low percentage of unemployment, a high percentage of males between 15 and 39, and a high proportion of non-Bengalis.

(e) Mixed areas cover about two-thirds of the total number of police districts. They are affected by various types of crimes and, as expected, the intensity of any one of them is not significantly high. They are character-

ized by average social area characteristics.

7. Unlike the findings of most studies on American cities, this investigation demonstrated that Calcutta is a mosaic of sectors and zones on which urban crimes are depicted in different ways.

(a) Only minor theft follows Burgess' concentric zone model and shows a distance-decay function from the centre of the city.

(b) Professional and violent crimes support Hoyt's sector hypothesis of spatial differentiation.

B. Implications

An attempt is made here to discuss the implications of the spatial patterning of crimes in Calcutta. They are described under two headings: theoretical implications and policy implications.

Theoretical Implications

The pattern of slum development in the metropolis is quite different from that in an American city.[3] A slum in an American city is a zone which is adjacent to, or centres around, the central business district. This is the area of the poorest housing, and it is occupied by the lowest income groups. They are unstable localities characterized by anomie. On the other hand, the areas surrounding the central business district in Calcutta are not characterized by physical deterioration and social disorganization. Here slums are not spatially contiguous (Figure 4). Furthermore, they are not even socially united because of the heterogeneousness of the socio-cultural backgrounds of in-migrants who create

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[3] For a detailed discussion of the matter, see pages 19 to 21 above.

the slums. Most of these people do not make significant contributions to the gross production of the city. They live hand-to-mouth and never become absorbed into the community life. They carry with them their old values, and they cannot define what Cloward and Ohlin called "success goals" in middle-class ways.

As discussed in Chapter III, Cloward and Ohlin integrated delinquency theories of Sutherland, Merton, and Cohen, and argued that differential opportunity to the (middle-class) culturally valued success goals is the key element in defining delinquent behaviour, especially violent behaviour. According to this concept, most parts of Calcutta should have been affected by violent crimes, as people living in slums would develop "conflict subcultures." But that that was not so is evident from the analysis. Consequently, the theoretical construct of Cloward and Ohlin is not applicable to the socio-cultural conditions of Calcutta. Similarly, a study on the crime patterns in Cordoba, Argentina by DeFleur demonstrated the non-applicability of the Cloward and Ohlin construct.[4] Based on these two studies, it can be concluded that generalizations developed in the United States may not hold true in cross-cultural settings. However, for the sake of specificity and clarity, in-depth studies, including recognition of the residential location of the offenders, should be undertaken in the developing areas of the world. (The lack of information prevented the exploration of this aspect in this study).

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[4]Lois B. DeFleur, "Ecological Variables in the Cross-Cultural Study of Delinquency," Social Forces 45 (June 1967): 568-570.

Policy Implications

This is the first major effort to delineate spatial groups of crimes in an Indian city on the basis of a multivariate grouping technique. The city of Calcutta was divided into five crime areas (Figure 29) which hopefully should form the spatial basis for long-term crime-control planning. However, this study does not recommend specific measures for solving crimes; it appeals to the "higher authorities" to recognize the fact that a number of "background studies" are required before meaningful policies can be formulated. The social scientists working on Calcutta could fill this gap only if various types of data pertaining to crime were made available to them.

Another outstanding problem faced by researchers is the multiplicity of spatial units used by the government departments. No two maps are alike, and a fair amount of time has to be invested on cartographic manipulation before any useful maps are produced. Therefore, to add to the aforesaid appeal, all government agencies should use more or less the same spatial units in their enumeration.

APPENDIX A

NOTES ON THE FIGURES

NOTES ON THE FIGURES

Figure 1 is based on a chart, in Government of India, Bureau of Police Research & Development, Crime in India 1971 (New Delhi: Ministry of Home Affairs, 1974), p. 2.

Figure 2 is after Ashok K. Dutt, "Delineation of the Hinterland of Calcutta Port," The Professional Geographer 33 (January 1971): 23.

Figure 3 is based on Nirmal K. Bose, Calcutta 1964 - A Social Survey (Bombay: Lalvani Publishing House, 1968), p. 98.

Figure 4 is reproduced from Brian J. L. Berry and Philip H. Rees, "The Factorial Ecology of Calcutta," The American Journal of Sociology 74 (March 1969): 450.

Figure 5 is based on Chart 15, in Government of West Bengal, Economic Review 1972-73 (Alipore, West Bengal: West Bengal Government Press, 1973), p. 35. Surprisingly it does not show the monthly expenditure levels between Rupees 201-300 and above Rupees 350.

Figure 6 is redrawn from an original map provided by the Office of the Calcutta Police Commissioner. Extra information has been plotted on the redrawn map.

APPENDIX B

DEFINITIONS OF CRIMES

DEFINITIONS OF CRIMES[a]

1. Murder. Murder has been defined by the Indian Penal Code, Sec. 300 as culpable homicide "if the act by which the death is caused is done with the intention of causing death, or 2ndly.--If it is done with the intention of causing such bodily injury as the offender knows to be likely to cause the death of the person to whom the harm is caused, or 3rdly.--If it is done with the intention of causing bodily injury to any person and the bodily injury intended to be inflicted is sufficient in the ordinary course of nature to cause death, or 4thly.--If the person committing the act knows that it is so imminently dangerous that it must, in all probability, cause death, or such bodily injury as is likely to cause death, and commits such act without any excuse for incurring the risk of causing death or such injury as aforesaid."

2. Dacoity. Dacoity needs the following elements under the Indian Penal Code, Sec. 391: "When five or more persons conjointly commit or attempt to commit a robbery or where the whole number of persons conjointly committing or attempting to commit a robbery, and persons present and aiding such commission or attempt, amount to five or more, every person so committing, attempting or aiding, is said to commit 'dacoity.'"

3. Robbery. Robbery has been defined by the Indian Penal Code, Sec. 390, as "In all robbery there is either theft or extortion. Theft is "robbery" if, in order to the committing of the theft, or in committing the theft, or in carrying away or attempting to carry away property obtained by the theft, the offender, for that end, voluntarily causes or attempts to cause to any person death or hurt or wrongful restraint, or fear of instant death or of instant hurt, or of instant wrongful restraint.

   Extortion is "robbery" if the offender, at the time of committing the extortion, is in the presence of the person put in fear, and commits the extortion by putting that person in fear of instant death, or instant hurt, or of instant wrongful restraint to that person, or to some other person, and, by so putting in

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[a]The offenses defined in the present study are derived from two sources: (a) the customary usage according to the Indian Police, and (b) B. J. Divan and M. R. Vakil, The Indian Penal Code, 24th ed. (Bombay: The Bombay Law Reporter (Private) Ltd., 1967), pp. 238-354 passim.

fear, induces the person so put in fear then and there to deliver up the thing extorted."

4. Snatching. An attempt to seize or the act of seizing valuable things like money, purse, or ornaments before it passes. It involves no use of force.

5. Burglary. An act of breaking and entering, especially the dwelling house of another, with the intention of committing a felony therein, whether the felonious purpose be accomplished or not.

6. Car theft. An intention of taking dishonestly or actually removing a car "out of the possession of any person without that person's consent."

7. Car parts theft. An intention of taking dishonestly or actually removing parts of a car "out of the possession of any person without that person's consent."

8. Cycle theft. An intention of taking dishonestly or actually removing a cycle "out of the possession of any person without that person's consent."

9. Pocket picking. An intention of taking dishonestly or actually removing contents from another person's pocket or the like with the help of sharp implements like blade or scissors, or simply with fingers.

10. Theft by servant. When a person, being appointed as a servant, "commits theft in respect of any property in the possession of his master or employer" then it is said to be a theft by servant.

11. Other theft. When a theft is different from what has been mentioned above is treated under this term.

12. Cheating. Cheating should have the following ingredients under the Indian Penal Code, Sec. 415: "Whoever, by deceiving any person, fraudulently or dishonestly induces the person so deceived to deliver any property to any person, or to consent that any person shall retain any property, or intentionally induces the person so deceived to do or omit to do anything which he would not do or omit if he were not so deceived, and which act or omission causes or is likely to cause damage or harm to that person in body, mind, reputation or property, is said to 'cheat.'"

13. Criminal breach of trust. Criminal breach of trust needs the following elements by the Indian Penal Code, Sec. 405: "Whoever, being in any manner entrusted with property, or with any dominion over property, dishonestly misappropriates or converts to his own use that property, or dishonestly uses or disposes of that property in violation of any direction of law prescribing the mode in which such trust is to be discharged, or of any legal contract, express or implied, which he has made touching the discharge of such trust, or wilfully suffers any other person so to do, commits 'criminal breach of trust.'"

APPENDIX C

SUPPLEMENTARY TABLES

TABLE 23

Ecological Variables Initially Considered
Correlation Matrix

Variable Number	1	2	3	4	5	6
1	1.0000					
2	0.2973	1.0000				
3	-0.0063	-0.0238	1.0000			
4	0.1378	0.1639	0.8666	1.0000		
5	-0.1255	-0.1991	0.6699	0.6767	1.0000	
6	-0.0956	0.0500	-0.2951	-0.3652	-0.3523	1.0000
7	0.1225	0.2695	0.6174	0.7214	0.6038	-0.5338
8	-0.2986	-0.3238	0.1445	0.0654	0.3419	0.0520
9	0.0912	0.2158	-0.3476	-0.3132	-0.4164	0.4943
10	-0.0954	0.0696	0.8894	0.8655	0.7916	-0.4406
11	-0.0861	0.0332	0.9037	0.9047	0.6887	-0.3555
12	-0.0341	-0.2801	-0.5966	-0.5673	-0.5349	0.3021
13	-0.1418	-0.1619	-0.2964	-0.3435	-0.3127	-0.0615
14	0.1614	0.6752	0.2563	0.2970	-0.1001	0.0287
15	0.0941	-0.1983	-0.3228	-0.2448	-0.3324	0.3228
16	0.0373	0.0849	0.8616	0.8413	0.7451	-0.5281
17	0.0124	-0.0309	0.3977	0.3397	0.5330	-0.3564
18	-0.0191	0.2267	-0.6733	-0.5653	-0.2678	-0.1267
19	-0.1159	0.1400	-0.1322	-0.2315	-0.4086	0.3970
20	-0.0347	-0.4586	-0.6838	-0.7738	-0.4535	0.2931
21	-0.0202	0.7995	0.0968	0.2457	-0.1298	-0.0657
22	-0.1694	0.0863	-0.0223	0.0313	-0.0143	0.0292

TABLE 23--Continued

Variable Number	7	8	9	10	11	12
1						
2						
3						
4						
5						
6						
7	1.0000					
8	0.0628	1.0000				
9	-0.5961	-0.5315	1.0000			
10	0.7707	0.3391	-0.5511	1.0000		
11	0.5879	0.2042	-0.2695	0.8886	1.0000	
12	-0.5751	-0.1547	0.4710	-0.7278	-0.4660	1.0000
13	-0.2759	0.1987	-0.2086	-0.2983	-0.3738	0.0118
14	0.2928	-0.6599	0.3394	0.1219	0.1889	-0.2722
15	-0.3978	-0.2784	0.5375	-0.4551	-0.1841	0.7710
16	0.7845	0.1809	-0.5211	0.9252	0.8212	-0.7607
17	0.5374	0.4260	-0.6321	0.5370	0.2764	-0.6557
18	-0.4669	0.3330	-0.0255	-0.4717	-0.5149	0.3478
19	-0.2455	-0.1958	0.2393	-0.2647	-0.2392	-0.0585
20	-0.6324	0.1275	0.0983	-0.6844	-0.7312	0.5161
21	0.3434	-0.2970	0.1056	0.1983	0.1744	-0.3171
22	-0.2448	0.0983	0.3703	-0.0323	0.2131	0.2411

TABLE 23--Continued

Variable Number	13	14	15	16	17	18
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13	1.0000					
14	-0.2434	1.0000				
15	-0.2618	-0.0954	1.0000			
16	-0.2836	0.2428	-0.5477	1.0000		
17	0.1694	0.0242	-0.7252	0.6383	1.0000	
18	0.3808	-0.6751	0.0368	-0.4791	-0.0680	1.0000
19	0.1166	0.3161	-0.1723	-0.1646	-0.0529	-0.2206
20	0.3189	-0.5898	0.2881	-0.7198	-0.3613	0.5534
21	-0.1172	0.7310	-0.1942	0.1921	0.0807	-0.3540
22	-0.0412	-0.0468	0.2138	-0.1231	-0.3445	0.1563

TABLE 23--Continued

Variable Number	19	20	21	22
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19	1.0000			
20	0.0335	1.0000		
21	0.2001	-0.5542	1.0000	
22	0.0982	-0.0920	0.0769	1.0000

TABLE 24

Crime Variables--Correlation Matrix

Variable Number	1	2	3	4	5	6	7
1	1.0000						
2	0.4606	1.0000					
3	0.3136	0.3710	1.0000				
4	-0.0024	-0.0384	0.0589	1.0000			
5	0.1318	0.4508	0.3062	-0.0889	1.0000		
6	-0.0997	0.3639	0.0204	0.1805	0.3632	1.0000	
7	-0.2495	0.0020	-0.2319	-0.1297	0.3126	0.3236	1.0000
8	0.0155	0.4858	0.1552	0.0981	0.4760	0.9244	0.3693
9	0.0314	0.4999	0.1398	0.2022	0.4103	0.9208	0.2737
10	0.0407	0.2296	0.4787	0.3464	0.6122	0.5118	0.3016
11	-0.0024	0.4494	0.1651	0.0866	0.5150	0.9004	0.3454
12	0.0030	0.4627	0.0566	0.1476	0.3766	0.9233	0.2743
13	-0.0594	0.3792	-0.0195	0.3741	0.3864	0.8622	0.2692

TABLE 24--Continued

Variable Number	8	9	10	11	12	13
1						
2						
3						
4						
5						
6						
7						
8	1.0000					
9	0.9805	1.0000				
10	0.5249	0.5006	1.0000			
11	0.9758	0.9589	0.5797	1.0000		
12	0.9610	0.9755	0.4943	0.9499	1.0000	
13	0.9103	0.9422	0.4613	0.9035	0.9546	1.0000

TABLE 25

Ecological and Crime Variables--Correlation Matrix

Crime Variable Number \ Ecological Variable Number	2	3	4	5	6	7	8	9	10
1	-0.1835	-0.0790	-0.2185	-0.0311	0.3099	-0.3495	0.0711	0.1767	-0.1696
2	-0.2318	0.2193	0.0240	-0.0384	0.2276	-0.1025	0.1142	0.0759	0.0426
3	-0.2109	0.2572	0.1210	0.2329	-0.1122	0.0249	0.3646	-0.1687	0.2508
4	0.2520	0.2050	0.2892	-0.0134	-0.0315	-0.0188	-0.2442	0.2951	0.2085
5	-0.1725	0.2833	0.0397	0.1126	0.0153	0.0179	0.2958	-0.1304	0.2219
6	-0.2174	0.6953	0.5847	0.3497	-0.1376	0.3219	-0.2131	-0.0638	0.4543
7	-0.1915	0.1167	0.0534	0.0086	0.1237	-0.0528	0.0215	0.0012	0.0170
8	-0.1999	0.7831	0.6005	0.4061	-0.0705	0.3784	-0.0015	-0.2473	0.5800
9	-0.1356	0.7774	0.5936	0.3782	-0.0535	0.3826	-0.0957	-0.1683	0.5662
10	-0.1481	0.4307	0.3745	0.4176	-0.2753	0.2942	0.1303	-0.1338	0.4220
11	-0.2618	0.7943	0.5977	0.4809	-0.1006	0.4297	0.0880	-0.3047	0.6363
12	-0.1219	0.7460	0.6069	0.3669	-0.0597	0.4385	-0.1194	-0.1988	0.5543
13	0.0314	0.7269	0.5852	0.3709	-0.0337	0.5275	-0.1609	-0.1708	0.5720

TABLE 25--Continued

Crime Variable Number \ Ecological Variable Number	11	12	13	14	15	16	17	18	20	21
1	-0.2409	-0.1054	0.3799	-0.1606	-0.1704	-0.2172	-0.0140	0.0738	0.1500	-0.1323
2	0.0716	-0.0241	0.2272	0.0560	-0.0655	0.0101	-0.0147	-0.3247	-0.0062	-0.1265
3	0.2728	-0.1137	0.1622	-0.1642	-0.2945	0.2555	0.2966	0.0810	0.1916	-0.1350
4	0.3279	-0.2296	-0.2448	0.3971	0.0079	0.1692	-0.1813	-0.2253	-0.3705	0.5208
5	0.2134	0.0123	0.0567	-0.0241	-0.1036	0.1695	0.1512	-0.2129	-0.1521	0.0245
6	0.6195	-0.0916	-0.2730	0.3511	0.1033	0.4581	-0.0132	-0.7561	-0.4582	0.0544
7	0.1133	0.2835	-0.2771	-0.0343	0.5345	-0.1004	-0.1654	-0.2180	0.0816	-0.1357
8	0.6436	-0.2842	-0.2052	0.2792	-0.0920	0.5380	0.1431	-0.7784	-0.4452	0.0351
9	0.6317	-0.3209	-0.2240	0.3694	-0.0950	0.5328	0.0906	-0.8265	-0.4630	0.1129
10	0.5097	-0.0234	-0.2456	0.0384	0.0844	0.3785	0.0637	-0.2824	-0.3994	0.1066
11	0.6725	-0.2835	-0.2504	0.1885	-0.0802	0.5621	0.1509	-0.7402	-0.4308	0.0044
12	0.5994	-0.3061	-0.2599	0.3807	-0.0562	0.5373	0.0884	-0.8433	-0.4592	0.1405
13	0.5744	-0.3710	-0.2988	0.5036	-0.1004	0.5530	0.1575	-0.9136	-0.5172	0.2879

TABLE 26

Social Area Factor Scores for Police Districts

Police District	Factor I	Factor II	Factor III
Cossipore	-0.811	-0.615	-0.186
Chitpur	-0.968	-0.677	-0.510
Shyampukur	-0.948	0.088	-0.616
Jorabagan	0.014	1.352	0.084
Burtola	-0.725	0.554	-0.329
Burrabazar	1.101	2.307	-0.120
Jorasanko	-0.322	2.562	1.051
Amharst Street	-0.421	1.299	0.488
Hare Street	3.187	0.139	-2.333
Bowbazar	0.938	1.582	-0.031
Muchipara	-0.159	0.731	-0.015
Taltala	0.777	0.316	0.029
Park Street	1.128	-0.392	-0.266
Hastings	1.601	-0.595	-0.521
Manicktala	-0.678	-0.177	-0.381
Ultadanga	-0.978	0.125	0.316
Narkeldanga	-0.546	0.326	0.687
Phoolbagan	-0.790	-0.134	-0.125
Beliaghata	-1.222	-0.240	0.138
Entally	-0.399	-0.354	1.277
Beniapukur	-0.355	0.073	0.058
Karaya	-0.315	-0.233	0.188
Ballygunj	-0.471	-0.825	-1.287
Bhawanipur	-0.462	-0.315	-0.903
Tollygunj	-0.859	-0.571	-1.242
New Alipur	-0.811	-1.080	-0.568
Alipur	0.221	-1.342	-1.250
Watgunj	0.493	-0.707	0.063
South Port	1.252	-1.458	2.410
Garden Reach	1.439	-1.629	2.374
Ekbalpur	0.086	-0.113	1.517

TABLE 27

Crime Factor Scores for Police Districts

Police District	Factor I	Factor II	Factor III
Cossipore	-1.525	1.463	-1.066
Chitpur	-0.292	0.179	0.439
Shyampukur	-0.144	0.948	0.053
Jorabagan	-0.594	0.040	-0.550
Burtola	-0.289	0.250	1.896
Burrabazar	0.081	-0.559	0.260
Jorasanko	0.326	-0.536	1.903
Amharst Street	-0.303	-0.103	0.268
Hare Street	3.741	0.156	0.187
Bowbazar	-0.412	-0.341	0.125
Muchipara	-0.349	0.158	1.854
Taltala	0.066	-0.288	0.749
Park Street	1.315	0.265	1.371
Hastings	-0.731	-0.667	1.669
Manicktala	-0.326	0.167	0.030
Ultadanga	-0.920	0.082	-0.043
Narkeldanga	-0.687	-0.289	-0.607
Phoolbagan	-0.334	0.801	-0.760
Beliaghata	-0.021	2.236	-2.019
Entally	-0.863	-0.264	-0.374
Beniapukur	0.396	-0.054	-0.768
Karaya	-0.599	-0.503	-0.597
Ballygunj	0.133	-0.700	-0.438
Bhawanipur	-0.096	-0.213	-0.524
Tollygunj	-0.049	-0.278	0.007
New Alipur	2.272	-1.889	-2.089
Alipur	-0.322	-1.362	-0.067
Watgunj	0.133	-0.836	-0.119
South Port	-0.062	-0.566	-0.883
Garden Reach	1.265	3.437	0.570
Ekbalpur	-0.812	-0.735	-0.479

TABLE 28

Fusion Summary of Hierarchical Groupings

Step	Number of Groups of Police Districts	Fuse Police Districts		Distance Coefficient
1	30	C	I	0.005
2	29	P3	Y	0.018
3	28	F	H	0.030
4	27	S	W	0.041
5	26	P3	Q	0.053
6	25	D	U	0.054
7	24	N	01	0.057
8	23	P3	Z	0.080
9	22	T	SP	0.085
10	21	N	F	0.107
11	20	B	02	0.122
12	19	R	T	0.153
13	18	D	J	0.178
14	17	A	P2	0.240
15	16	S	V1	0.269
16	15	B	P3	0.273
17	14	N	D	0.311
18	13	E	L	0.397
19	12	C	E	0.447
20	11	R	S	0.751
21	10	M	A	1.115
22	9	B	R	1.443
23	8	C	K	1.552

TABLE 28--Continued

Step	Number of Groups of Police Districts	Fuse Police Districts		Distance Coefficient
24	7	N	B	1.859
25	6	M	P1	1.908
26	5	G	V2	3.841
27	4	M	X	5.199
28	3	N	C	10.265
29	2	M	N	13.921
30	1	M	G	15.243

Note: "Coefficient value is twice the increase in the error sum caused by fusion." See David Wishart, CLUSTAN IC User Manual (London: Computer Centre, University College, 1975), p. 38.

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