

THE LOCATION AND STRUCTURE OF MANUFACTURING  
INDUSTRIES IN THIKA

BY

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This thesis is my original work and has not been presented for a degree in any other university.

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## ABSTRACT

The present study investigates the location and structure of manufacturing industries in Thika. Questionnaires and interviews were used to obtain information for the study.

Location was investigated at two levels: first, the factors that motivate entrepreneurs to establish industries in Thika, and second, the factors responsible for the spatial distribution or intra-urban location of industries. With respect to structure, the focus of the investigation was the spatial linkages of manufacturing industries.

The analysis was carried out in three stages. Factor analysis was used to determine the factors that motivate entrepreneurs to establish industries, both in general and by scale of enterprise, in Thika. Multiple regression analysis employing the stepwise selection technique was used to determine the areal association between manufacturing and the quantifiable independent variables. A limited input - output technique was used to examine the spatial linkage characteristics.

The factor analysis revealed that the primary factors motivating entrepreneurs to establish industries in Thika are: (a) availability of land and access to business information, (b) accessibility to supplies of raw materials and (c) availability

## Chapter 1: INTRODUCTION

### Scope of the Study and Definition of Terms Used

This study investigates the location and structure of manufacturing industries in Thika town, employing more than ten persons. Location is investigated at two levels. In the first level, the factors that motivate entrepreneurs to establish industries in Thika are investigated. This involves the examination of a set of economic, infrastructural, government policy and environment-related factors that lure entrepreneurs to choose Thika over other towns in the region or the nation. The second level comprises the analysis of the factors that account for the intra-urban location of industries in the town. In this case specific attributes of the space economy of Thika that entrepreneurs considered as important in influencing their choice of location among the alternative wards in Thika are analysed. These attributes of the space economy include: land prices, presence of industrial or residential estate, presence of electricity, presence of a major highway, presence of railway line or siding, distance from the Central Business District and presence of piped water.

On structure, the spatial relationships of manufacturing industries with the space economy of Thika, of the rest of Kenya, and of the rest of the world

of services.

Variations in managerial perception images were observed between the large scale and small scale industries. The large scale industries considered government support to industry and accessibility to external business information important in their location decisions. Access to the national markets, production cost-saving factor, and environment-related factors were considered important by the small scale industries.

The regression analysis revealed that, in general price of land, presence of a major highway and presence of a railway line were the major factors responsible for the spatial distribution of industries in Thika. The significant variables in the distribution of large scale industries are the presence of a railway line, the price of land, distance from the Central Business District and availability of electricity.

Regarding the areal distribution of small scale industries, the variables considered in the regression analysis were not statistically significant. It was suggested that the factors responsible for the distribution of small scale industries could be personal considerations and markets which were not included in the regression model.

The magnitudes of the spatial relationships of manufacturing industries were indicated by the tech-

nical coefficients. The capital equipment linkages with the rest of the world were stronger than with the local area or the rest of the country. Weak raw material linkages were observed between the manufacturing industries and the local space economy, both in general and by scale of enterprise. Contrary to expectation, however, raw material linkages with the rest of the country were found to be stronger than those with the local and world space economy.

Both in general and by scale of enterprise, the industries exhibited strong market links with the local area, but relatively weak or insignificant links with the rest of the country and the rest of the world.

Finally the study observed a variety of problems resulting from rapid industrial establishment and location in the town. These include water shortages, traffic congestion, overcrowding in vehicles, environmental pollution and health hazards. To overcome these problems, the study emphasized the need for a comprehensive land use plan for Thika, the amendment and enforcement of the existing land use laws and the introduction of an administrative machinery to ensure that these land use laws are obeyed. A "carrot and stick" industrial location policy was also recommended for arresting the problem of polarised distribution of

industries in Thika. Thika also needs a capital goods industry that would provide basic machinery and spare parts for other local industries. Other priority industries that could be developed include those processing locally produced agricultural products such as coffee, tomatoes, vegetables and beans and those catering for such rural needs as fertilisers and agricultural implements. The promotion of these would ensure that forward and backward linkages are forged or intensified in the local economy.

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## CHAPTER OUTLINE

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are considered. The spatial relationships are expressed in terms of capital equipment, raw material and market linkages.

Manufacturing defined: For operational purposes, the study is limited to the economic activity whose function is to process raw or semi-finished materials. Activities whose function is to extract or cultivate raw material or distribute or sell processed goods are excluded. The location of extractive and service industries can be simply explained. The factors determining location of manufacturing are generally more numerous and their interactions are complex and dynamic (Darkoh, 1971: 4).

Time period: The present study is concerned with only a point in time, the year 1986, the time of the field study. This in itself sets constraints upon the usefulness of the results at the practical level, for they can give only a static representation of a dynamic situation. However, the results are useful in the identification of an existing spatial pattern. In view of the usual very slow rate at which basic patterns change in most countries (developed or underdeveloped) and in view of the present inadequacy of information on location and structure of industries in medium - sized towns in Kenya, the investigation is considered worthwhile even within the structure of these limitations.

Choice of variables: Manufacturing can be measured by employment, cost of materials, fuel, power, pay-rolls, value of shipment and value added. This study uses the number of establishments and employment as indices of manufacturing. These are the two components of manufacturing on which information can be obtained at a reasonable level of areal and industry aggregation in Kenya.

Scale of enterprise: The size of establishment or enterprise is defined in terms of employment, that is, the number of persons engaged by the processing units. Two scales of enterprise, small scale and large scale were identified according to the following employment categories.

Small scale - 10 to 49 persons employed.

Large scale - 50 or more persons employed.

Backward and forward linkages: Backward linkages in this study refer to the degree to which an industry uses products from other industries as its inputs. It involves transmission of an effect to an activity further back in the sequence of operations that transform such primary inputs as natural resources into products of final consumption.

Forward linkages reflect the degree to which an industry produces output for use in other industries as inputs. The forward linkage means that an impact of change is transmitted to an activity further along the sequence of operations. According to Hoover

(1971: 216), the activity affected by a forward linkage must be locationally sensitive to the price and supply of its inputs.

Development: In this study, development refers to improvement in the quality and standards of living of the population and creation of economic structures that generate and sustain further production.

Entrepreneur: It refers to the person or group of persons who own the manufacturing enterprise or who make locational decisions.

Establishment: The locally separate individual factory, workshop or household where the process of manufacturing takes place. The establishment is the unit that is located.

Firms: The legal unit that engages in manufacturing. In this study, it is used as the place where manufacturing takes place. The firm is the basic unit used by the Central Bureau of Statistics in compiling industrial statistics. In this study the terms "firm" and "establishment" are used interchangeably.

Growth: It refers to the increase in aggregate numbers of economic structures.

Industrialisation: It refers to the process of adopting industrial techniques and establishing industries in an effort to initiate development.

Industry: The sector of an economy that engages in manufacturing.

Location: The geographical association or spatial

aggregation of firms at particular points in space.

Manufacturing: Conversion or transformation of raw materials or assembly of parts to form finished products. Manufacturing involves changing the utility of goods, hence increasing their value.

Perception: The personal attitude, know-how and confidence that spurs or motivates an entrepreneur to make a decision to establish or locate an industry.

Space economy: For operational purposes, the space economy of Thika is defined a la Friedmann (1966) to mean the economy of Thika in its spatial dimension: described in terms of either a point location, an interacting flow of goods, capital, labour and information or regional constructs. The same notion is implied when this term is used in relation to other areas (for example, Kenya or the world).

Spatial integration: The linkage of industries with the space-economy through capital equipment, raw material and market linkages.

Spatial linkages: The ties or operational contacts that exist between an industry and the space economy.

Spatial market linkage: The sale ties that exist between an industry and the space economy.

Spatial organisation: The structure of the space economy arranged according to certain economic or social purposes either implied or explicitly stated.

Spatial raw material linkage. The purchase ties that exist between the industries and the space economy.

Structure: The nature, organisation and interrelationship of industries. In this study, emphasis on structure is placed on spatial linkages or interrelationships.

#### Organisation of the Study

The study is organized into five chapters. Chapter 1 is the introductory chapter which describes the scope and background to the study. It outlines the purpose, statement of the problem, hypotheses and significance of the study. The study area and the evolution of the spatial structure and distribution of industries are also described. Chapter 2 analyses the factors that motivate entrepreneurs to establish industries in Thika. Chapter 3 discusses the factors responsible for the spatial distribution of industries in Thika. Chapter 4 presents the spatial linkages. Chapter 5 comprises the summary, conclusions and recommendations. The relevant methodologies and review of the literature on the location and structure of industries are provided in the substantive chapters dealing with these aspects (i.e. Chapters 2, 3 and 4).

#### Background to the Study

The notion that industrialisation is a sine qua non for economic development has a world-wide appeal. History demonstrates that industrialisation

led to the economic development of the advanced countries of Europe and North America. The present high levels of productivity, income and standards of living in these advanced countries serve as empirical evidence to support the view that industrialisation is a necessary condition for economic development. More recent evidence is offered by the rapid economic development in Japan<sup>1</sup> and the Soviet Union<sup>2</sup>. These two countries, though late-comers in industrial development, have made remarkable progress in economic development through industrialisation.

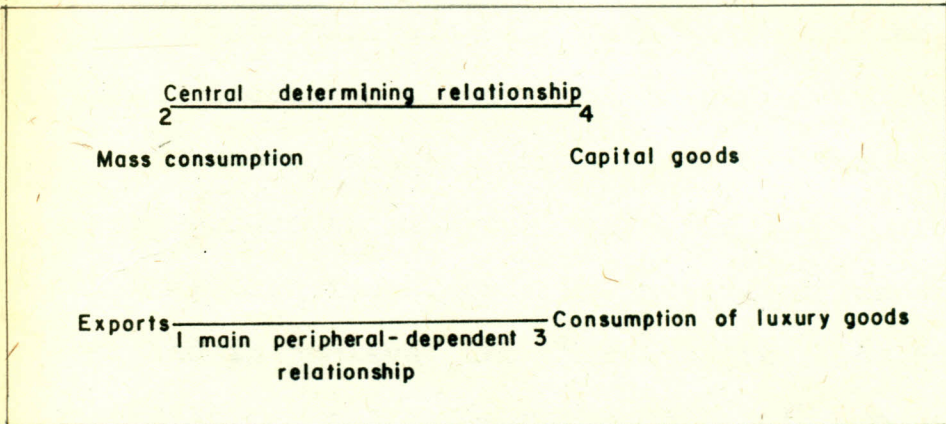
Many Third World countries in Asia, Latin America, and Africa have been influenced by the experience of the industrialised countries. Industrialisation is seen as a way of achieving high rates of economic growth, adequate provision of basic needs and a diversified economy that will give rise to desirable social, psychological and institutional changes (UNIDO, 1979). Consequently, they have adopted development strategies that emphasize industrialisation<sup>3</sup>. These industries, however, have flaws, since they reflect fundamental features of peripheral economies inherited from metropolitan states<sup>4</sup>.

In Africa, peripheral economies exhibit spatial and sectoral characteristics that are incapable of

generating and sustaining integrated development (Darkoh 1973: 9, Seidmann, 1974: 107). Exponents of the dependency school<sup>5</sup> attribute this to the incorporation of Africa into the international capitalistic economy not as equal partners but as dependent or satellite economies. An important limiting factor is the unequal division of labour which assigned to these countries the subservient role of producers of cheap minerals, and agricultural commodities for the highly industrialised countries. As a result, there has been lack of integration of production and consumption in the peripheral African economies.

This lack of integration is explained by a four-sector model of capital accumulation postulated by Samir Amin (Fig. 1.1) (1974). The model sums up the difference between a self-centred economy and a peripheral one. In a self-centred economy, sector 2 (production of mass consumption goods) is linked to sector 4 (production of capital goods intended for use in sector 2). In the peripheral economy, sector 1 (exports) is linked to sector 3 (consumption) of luxury goods. According to this model, therefore, central development is characterised by the dominance of economic activity to satisfy mass consumer needs and the consequent demand for production goods, whereas peripheral systems are dominated

SAMIR AMIN'S FOUR SECTOR MODEL



(Figure 1:1)

Source: Amin (1974:10)

by the production of luxury goods and exports and the consequent lack of importance of internal markets.

Incorporation of African countries into the international capitalistic system has resulted in several structural distortions of their economies. There has been too much emphasis on exports of primary products, minerals and agricultural products and little manufacturing. Productive forces are concentrated in enclaves and there is little or no interrelationships between the different productive sectors. Their economies lack an internally oriented industrial base geared to the satisfaction of local mass demand (Darkoh, 1984).

In East Africa during the colonial period, Kenya was relatively more industrialised than Uganda and Tanzania. It had two types of industries. The first type produced consumer goods such as textiles, beverages, tobacco, foot wear, furniture, paper chemicals, dyes, matches and metal products. The second type of industries engaged in first-stage processing of commodity exports. These included wattle extraction, meat-packing, sisal decortication, coffee curing and tanning of hides and skins.

Kenya's high level of industrial development is attributed to the activities of resident European settlers who exerted considerable influence on state policy and implementation both locally and in Britain

(Langdon, 1981). Compared to Tanzania, British settlers in Kenya were a well-established pressure group in London while Tanzania's settlers were of mixed nationalities without a cohesive force. "The adoption of a common external tariff with other East African territories, (a tariff structure which was conceived in the interests of Kenyan industrialists) and the elimination of all trade barriers among partner states protected Kenyan industries while forestalling for a considerable period of time their establishment in Tanzania" (Rweyemamu, 1973: 116).

Equally important to Kenya's industrial development was the effect of the First World War. During the War, the interruption of international trade and widespread shortages of consumer goods made it clear that Kenya had become overdependent on Britain. This awareness of dependence and vulnerability increased during the economic crisis of the 1930s when foreign demand for Kenya's raw materials declined drastically. This decline affected the settler economy which was based solely on agriculture. In addition, climatic conditions, such as drought and hail, destroyed a lot of settler crops. Diseases, such as rinder pest, east coast fever and black water, added to the calamity by killing domestic animals.

Faced with these problems, the settlers looked for alternative ways to stabilise their economy and concluded that industrialisation was appropriate.

They established small-scale, first-stage processing industries that engaged in coffee curing, sisal decoration, wattle tanning, cheese and butter making. Some settlers abandoned farming and invested in secondary industries. For example, Charles Hurst, a frustrated maize farmer founded the Kenya Breweries.<sup>6</sup>

World War II further underlined the settler economy's dependence on Britain. Widespread shortages of consumer goods imported from Britain forced settlers to establish more local industries. Zwannenberg (1975) argued that it was in response to this state of affairs that the Kenya Industrial Management Board was set up in Nairobi in 1940/1. The Board's function was to stimulate the local manufacture of some goods previously imported from Europe.<sup>7</sup> Swainson further notes that:

Wartime interference with shipping routes had also forced the colony to further import substitution for basic consumer items while utilising local raw materials, for example oils, acids, bricks and chemicals (Swainson, 1980: 112)

After the Second World War, the weakness in the British economy encouraged further establishment of industries in the colonies. Britain emerged from the war not only broke but also heavily in debt. It owed £6,000 million to its creditors (Zezeza, 1985:

146). The British government encouraged companies to establish industries in the colonies and gave them protection by imposing colonial tariff on goods not made by British companies.

The period after the war witnessed the emergence of multinational or transnational corporations (Langdon, 1981). The entry of these corporations in the global economy accelerated the establishment of manufacturing industries in the colonies. These corporations had powers to decide whether to manufacture products at home or in the colonies as was the case before the War or establish industries in the colonies to produce the same goods (Zwannenberg 1975, Zeleza, 1985).

The British Labour Government in its effort to save its weakening economy heavily supported these multinational corporations. It initiated special investment banks like the Commonwealth Development Corporation to assist the multinational firms. Kenya particularly benefited from these policies and many industries were established in Nairobi. Multinational corporations such as the Unilever, the Portland Cement Company, Allsopps Breweries, Jubilee Trust and Wright Biscuits, the Metal Box Company, British Oxygen and Bata set up industries in Kenya.

Finally, after the Second World War, African struggles calling for political and economic reforms in the colonies intensified. In Kenya the Mau Mau

war broke out. This struggle called for the creation of conditions that would allow Africans to grow cash crops, reduce unemployment and increase wages. There is no doubt that economic reforms were imperative. Industrial development was therefore embarked on as part of the economic reforms.

The colonial government organised the Board of Commerce and Industry and the East African Industrial Council to promote industry. The duties of the Board of Commerce and Industry included advising the colonial government on matters affecting commercial and industrial development and reviewing legislations and aspects of customs and excise duty that affected commerce and industry. The East African Industrial Council's responsibility was to advise the government on questions of policy relating to industrial development and to devise procedures on formulation of industrial licences and ordinances.

By 1954, Kenya had a fairly well advanced industrial sector. It consisted of the manufacture of beverages, textiles, foot wear, chemical products furniture and paper products (Table 1.1).

Despite this remarkable move towards industrial development, the industrial structure acquired at independence had certain weak or distorted characteristics. It emphasised first-stage processing of commodity exports and processing of consumer goods notably for the high-income elite. It was biased

Table 1.1: KENYA'S MANUFACTURING SECTOR 1954

Industry	No of Establishments	No of Employees	Gross Product £ sterling
Meat dairy + products	18	2 351	5 221 000
Grain mills	54	2 543	7 091 000
Bakery products	44	1 326	1 161 000
Foods + sugar	10	2 519	1 320 000
Beverages tobacco	37	2 209	4 329 000
Textiles	74	2 477	1 244 000
Foot wear	72	997	720 000
Wood	87	10 194	1 778 000
Furniture	118	1 388	802 000
Paper	48	1 899	1 667 000
Chemical	26	3 970	4 603 000
Metal	49	3 376	2 256 000
Match	51	1 337	937 000
Transport equipment	147	1 684	969 000
<b>Total</b>	<b>835</b>	<b>38 270</b>	<b>34 098 000</b>

Source: Colony and Protectorate of Kenya (1954)

against production of capital goods. It exhibited limited sectoral and spatial linkages and fostered lopsided development.

The factors responsible for this distorted industrial structure can be partly explained by the initial lack of an effective machinery in British colonial administration to promote industry actively in the colonies. This is demonstrated by the performance of two state agencies charged with the responsibility of initiating development in the colonies: the Empire Marketing Board and the Colonial Advisory Committee. The Empire Marketing Board specifically limited its operations in marketing of food-stuffs and raw materials. It gave no assistance to the manufacturing sector. Similarly, the Colonial Advisory Committee virtually ignored industrial development. For example, in 1939, only £23,000 or 0.3 per cent of the colonial budget was allocated to industrial development in the three East African countries (Brett, 1973: 268).

As a colony, Kenya was considered a market for British manufactured goods and a source of raw materials for British industries. Thus, any potentially competitive industries in the colony had to be closely kept at bay else it threatened or endangered this type of relationship. The British colonial administration emphasized settler agricultural development and heavily subsidised it at the expense of the manufactu-

ring industry. It did this by providing the white settlers with the basic infrastructure - roads and railroads, and through the introduction of forced labour. Industries could be established only if they complemented settler agriculture. This partially explains the establishment of agricultural processing industries and consumer goods industries that existed during the colonial days.

After independence, rapid industrialisation became a central concern of the Kenya government. In its First Five Year Development Plan, the Kenya government proposed to build a strong industrial economy (Republic of Kenya, 1966). The objectives were the provision of increasing opportunities for a better life for all Kenyans and the strengthening of the economy by broadening its base in order to reduce the overwhelming dependency on agriculture. It was hoped that industrialisation would not only provide employment for the increasing population and earn scarce foreign exchange for the country, but provide a measure of economic independence and help eliminate underdevelopment.

To realise these objectives, institutions such as the Industrial and Commercial Development Corporation (ICDC), the Development Finance Company of Kenya (DFCK), the Kenya Industrial Estates (KIE) and the Industrial Development Bank (IDB) were charged with the responsibility of promoting indus-

try. Lack of markets and capital were identified as the major handicaps to rapid industrial development. The problem of capital was to be solved by raising capital from exports of agricultural products and through the creation of favourable conditions that facilitated the flow of foreign capital in the form of international aid, loans, and grants. Foreign entrepreneurs and multinational corporations were to be lured to establish consumer goods industries through the provision of infrastructure and introduction of an open-door policy which offered numerous incentives. These incentives included tax subsidies and holidays, permission to repatriate profits, loans, cheap land and subsidised housing facilities.

Lack of markets for manufactured products was to be solved gradually. Rise in income levels among the Kenyan population and the growth of a large middle class with tastes for manufactured products was expected to expand the markets.

As a result of the government policy of encouraging growth in the country, several industries were established in or near major cities and towns. Among these emerging industrial centres, were Nairobi, Mombasa, Nakuru, Eldoret, Kisumu and Thika. The present study aims at investigating the location and structure of industries in Thika. Thika, a medium-sized town provides an appropriate geographi-

cal matrix for assessing the characteristics and impact of Kenya's efforts to promote industries.

The theoretical and conceptual framework for this study is derived from industrial location theory, perception and regional development studies. The utilisation of these concepts to synthesize location and structure of industries is a major contribution of the study. Location theory and perception studies provide the framework for factors of location while regional development studies offer the basis for analysis of spatial linkages. The rest of this chapter presents the purpose and statement of the problem, the statement of hypotheses and the study area.

#### Purpose and Statement of the Problem

Thika has an expanding manufacturing sector. This has resulted in: (a) The clustering of industries in the town, (b) the development of a particular geographical pattern of industries in the town and (c) the anticipation that these industries will be integrated into the space economy through capital equipment linkage, market linkage and raw material linkage.

There is a paucity of studies on Thika's manufacturing sector, hence the need for the present study. The specific questions raised and which constitute the research problem are: (a) What

factors motivate entrepreneurs to establish their firms in Thika?

(b) What factors are responsible for, and to what extent do they explain, the spatial pattern of industries in Thika?

(c) What are the spatial relations of manufacturing industries with the space economy?

The aim of the present study is therefore:

(a) to identify the factors which propel entrepreneurs to establish industries in Thika; (b) to examine the spatial distribution of industries in Thika and its underlying factors and (c) to examine the spatial relationships of industries in Thika with the local space economy, that of Kenya, and of the rest of the world.

#### Statement of Hypotheses

(a) There are significant relations between managerial perception and elements of the space economy of Thika.

(b) Variations in management images reflect different types of scale of organisations.

(c) The spatial distribution of manufacturing industries in Thika in general, and by scale of enterprise, is positively related to elements of the space economy of Thika.

(d) There exists low spatial linkages between Thika's manufacturing industries and the space economy of Kenya, and high linkages between Thika's manu-

facturing industries and the space economy of the rest of the world.

Significance and Justification  
of the Study

Industrialisation in medium and secondary towns and the reduction of rural-urban imbalances in economic development are recurring themes in Kenya's planning policy. This study is significant because it addresses itself to the problem of location and structure of industries in a medium-sized town in Kenya. It provides a framework for determining the factors that motivate entrepreneurs to establish industries in medium-sized towns. The study also forms a basis for discerning the spatial relationships of industries within the space economy. The former is of particular importance to industrial decentralisation efforts while the latter is significant in attempting to bridge the rural-urban imbalances (Republic of Kenya, 1986).

The spatial agglomeration of industrial activities in urban centres at the expense of rural areas is Kenya's major industrial location problem. This problem can only be surmounted if we understand the factors which lure entrepreneurs to establish industries in urban centres at the expense of rural areas. The present study is significant since it examines the factors that motivate entrepreneurs

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to establish industries in urban centres.

The determination of the factors responsible for intra-urban industrial location is significant to urban physical planning. This is because the establishment of a firm in a given part of the town dictates the establishment of other forms of activities within the area such as retailing, warehousing and residential facilities. The firms also become the focus for many journeys to work, hence the control of transport.

Equally important towards the understanding of intra-urban industrial location, is the problem of unbalanced urban growth. Balanced urban growth in Thika can only be realised if the distribution of industries is physically planned within the town. By so doing, jobs will be made available for people to move into.

The study also contributes to the search for a body of theory on industrial location and structure. By using managerial perception, this study enhances attempts to adopt perception techniques in industrial location studies. The technique provides a measure for weighting pecuniary and nonpecuniary factors which have been lacking in the traditional approaches to industrial location.

The present study on Thika partially fills the vacuum in the literature on manufacturing activities in urban centres and medium-sized towns in parti-

cular.<sup>8</sup> There are no studies that utilise urban centres as the study matrix apart from Ogendo (1969) and Norcliffe and Wescott (1981). As we shall later point out (see Chapter 2), these studies have serious limitations. Norcliffe and Wescott (1981) examined the location of industries in Nairobi, the capital city. Their findings were that government policy, concentration of buying power and entrepreneurs' desire to be where things are happening, are the factors responsible for the concentration of industries in Nairobi. These findings cannot, however, be generalised to explain the location of industries in medium-sized towns in Kenya. Ogendo (1969) investigated the location and structure of manufacturing industries in Kenya's main towns. The limitations of this study include: failure to consider entrepreneurs' perception of the space economy of the towns under study. The author does not investigate the factors responsible for intra-urban industrial location and the spatial relationships of manufacturing industries.

The reasons for the selection of Thika as the study matrix include: first, Thika is a significant medium-sized town and a leading manufacturing centre in Kiambu District. Second, there are no studies on Thika's manufacturing sector. Third, in Kenya's Development Plan (Republic of Kenya 1970), Thika is earmarked as one of the growth centres supposed to

serve as counter-magnets, offsetting some of the diseconomies arising from rapid urbanisation and over-concentration of productive activities and facilities in Nairobi.

### The Study Area

Thika (Fig. 1.2), the focus of this study is located in Kiambu District of the Central Province. It is situated in the north-eastern part of the district in the Thika administrative division (Fig.1.3). To the south east, Thika is bordered by Machakos District, and to the north by Muranga District. Its geographic location makes the town a strategic centre for inter-district interaction.

Thika, like several other towns in the interior of Kenya, owes its origin to the advent of colonial rule. The exact date of its foundation is not known. It was probably founded at the turn of the century. Tradition has it that it began as a stop-over point for settlers on their way to Nyeri and Fort Hall (Murang'a). After crossing the Chania river, the settlers used to camp at the interfluvium before proceeding to cross the Thika river. A small settlement gradually evolved from this camping site. Asians who were closely following the settlers set up a few shops to provide the latter with consumer goods. Similarly, Africans in search of jobs as porters also moved into the settlement. The settlement grew con-

FIGURE 1.2 THIKA MUNICIPALITY

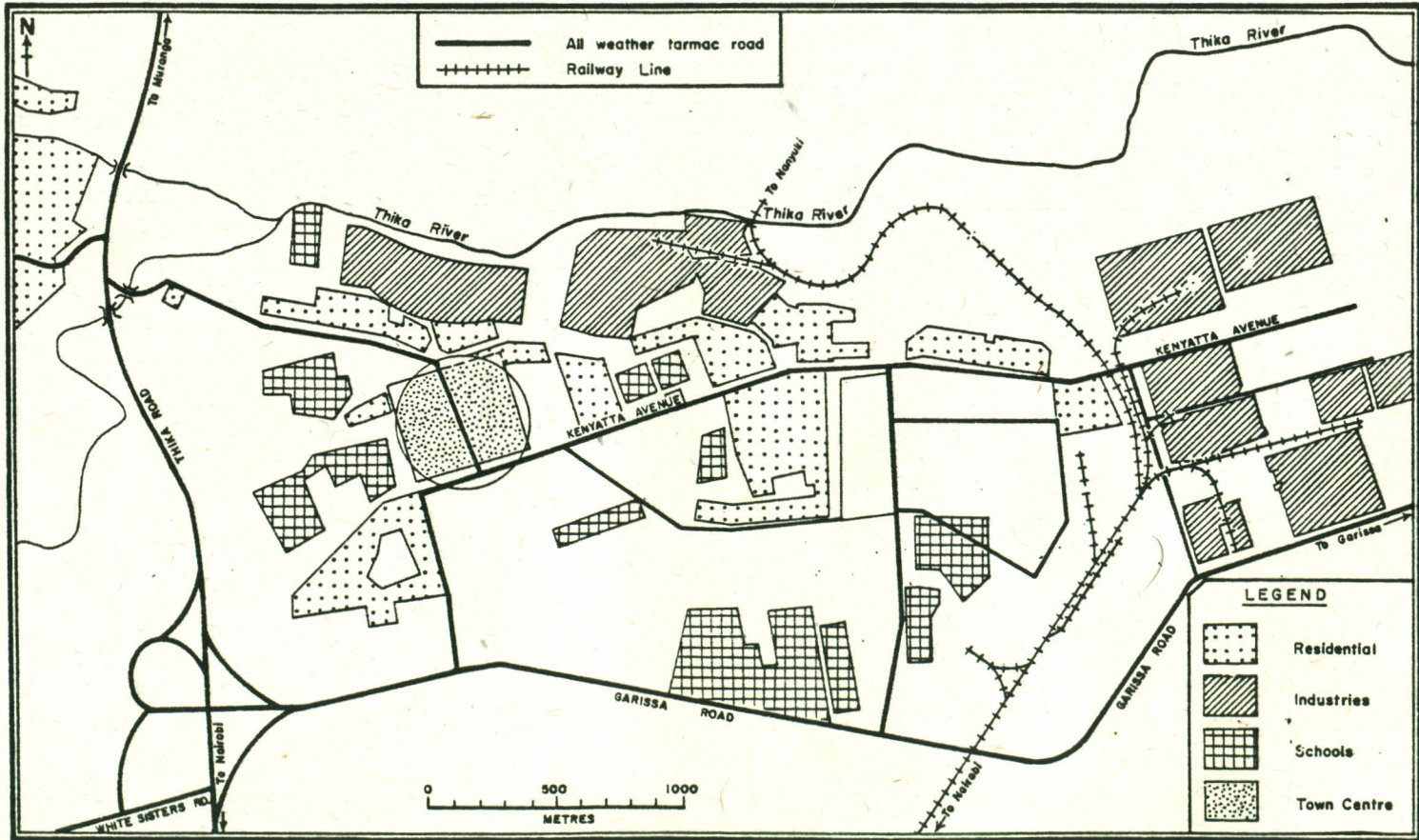
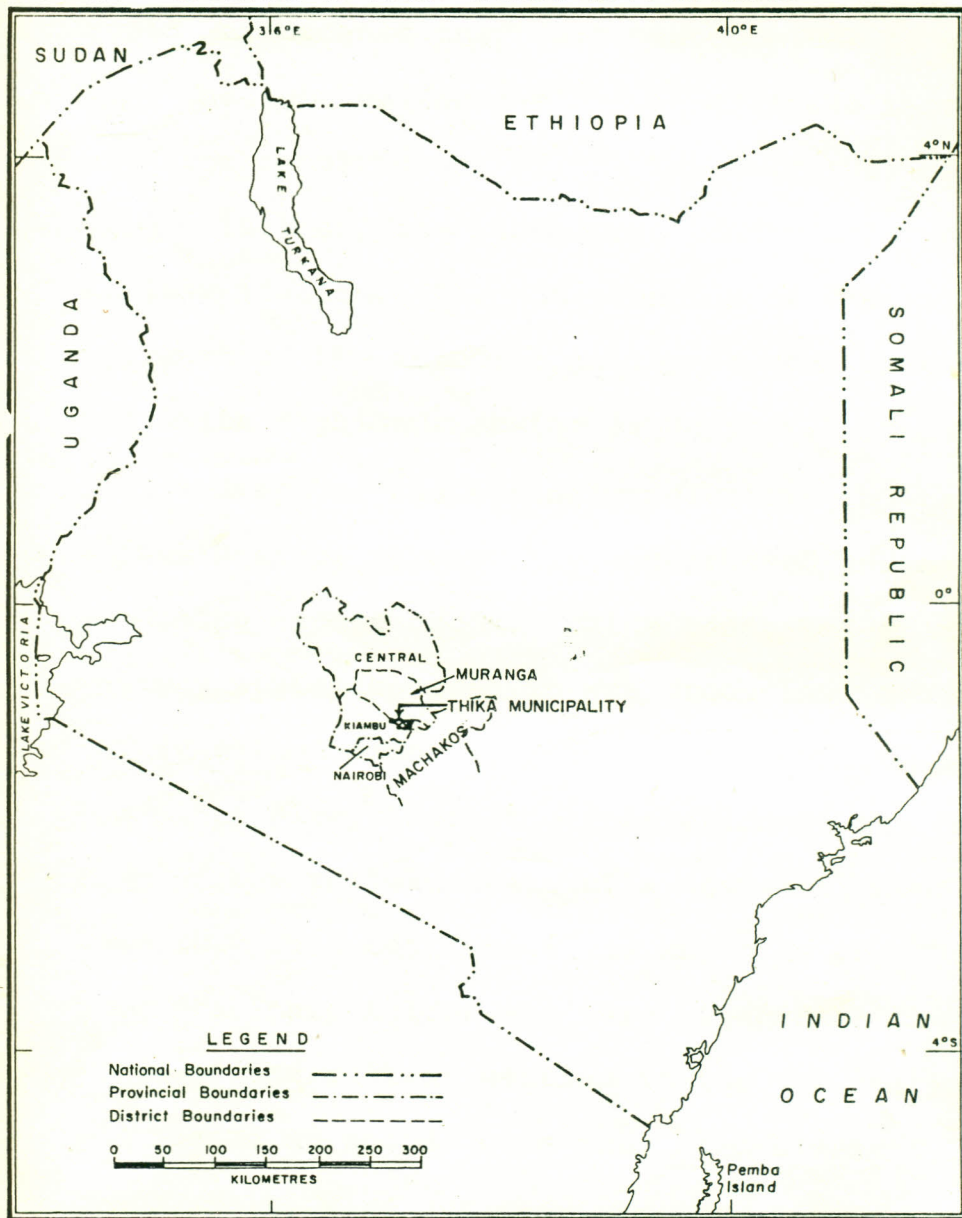


FIGURE 1-3: LOCATION OF THIKA MUNICIPALITY IN KENYA



siderably due also to the diamond and gold mining activities on the banks of Chania and Thika rivers. However, these mines were abandoned during the First World War because they were uneconomical to work on.

The impetus for the growth of Thika increased with the construction of the Thika-Tramway between 1910 - 1911 and the subsequent construction of the railway station. The construction of the railway line was part of the colonial policy to open up and serve the White Highlands as far as Nanyuki.<sup>9</sup> The colonial railroad system was strongly selective in its regional emphasis since it was only constructed in regions producing export crops. Thika benefited from this railway system because it was producing some of the highly valued export crops, namely, coffee, sisal and pineapples. With the completion of the construction of the railway station, a new settlement emerged near it. This settlement was known as the Thika Rail-head Station. Asians who were engaged in the construction of the railway settled in the new settlement and opened up shops where they sold blankets, cloth, beads, salt, wire and ghee.

Africans moved into the settlement gradually. European settler occupation of Africans' lands and the introduction of taxes designed to force Africans to become labourers in European farms and towns aided this migration. While waiting for job recruitment, Africans constructed temporary structures close to

the Asian settlement which were labelled Majengo.

The state of affairs in Thika was appalling. There was no planning machinery to initiate development. The two settlements, Thika Railhead Township and Thika Riverside Township were in different administrative districts. The former was in Kiambu District while the latter was in Fort Hall (Muranga District). Due to lack of an administrative machinery, the Thika settlement had no planning scheme and no survey work was done. Consequently, likely traders and investors were issued with temporary occupation licences. The settlement was also plagued by lack of funds. The town's buildings consisted of a collection of shacks which conformed to no building standards. It was also depressing and unsanitary (Central Province Annual Report, 1920: 26).

The actual growth and expansion of Thika began between 1920 and 1940 when a number of administrative changes elevated the status of the settlement. First, Thika became a sub-district in 1927 and acquired full district status in 1934. Thika town became the District Headquarters. The creation of this new district put the two townships in one administrative unit. Second, the government gazetted Thika as an urban centre and set up an Advisory Committee to run its affairs. This provided Thika with an administrative machinery to initiate physical planning and deve-

lopment.

The Town Council drew a plan for developing the town. The plan stipulated that the town would be developed along the Thika-Nairobi road to economise on further road construction. The Town Council sold new plots by auction and withdrew temporary occupation licences in the Thika Riverside township. Business activities in the township expanded. There were about 55 registered businesses in 1934. These businesses included animal slaughter, grain mills, furniture workshops and repair shops (Central Province Annual Report, 1934).

The town's population grew considerably. For instance, while there was no population recorded in 1920, by 1933, the town's population had risen to 667 Europeans, 24 Goans, 693 Indians and 2,593 Africans (Central Province Annual Report, 1933: 54). Other developments that took place in the town involved the draining of the swamp in the middle of the town, upgrading of roads by using murrum, construction of a dispensary, improving the town's drainage system and the clearing of the Asian slums.

Between 1940 - 1963, Thika acquired the status of a modern town. Business activities continued to expand and Thika became a thriving regional trading centre. To cope with the demands of this trade, the Town Council built a large African market. The Africans sold fire wood, timber, bark, vegetables and

cattle and they bought metal hardware, clothes, blankets and cutlery. The establishment of an African housing scheme enhanced Thika's importance. Situated in the vicinity of the Old East Africa Medical Service Camp, the estate gave Africans easy access to their place of work, to the shops or to the industrial area. Lastly, a large industrial sector developed in Thika.

Thika has grown tremendously between 1963 - 1985. The town's growth rate is estimated at between 7.15 and 8 per cent per annum (Mayor's Annual Report, 1984). At present, its boundaries cover 93 square kilometres and it has a population of 65,000 people. Significant developments have taken place in the town; road, water, and sewerage facilities have been improved. The commercial and industrial sectors have also expanded considerably.

#### The Evolution of Industrial Structure

Colonial penetration into the interior of Kenya changed the existing industrial structure, techniques of production and introduced new tastes for foreign goods. As a result, two principal types of urban-based industries emerged: the agricultural-based industries and the consumer goods industries. They had distinct functional qualities and spatial patterns.

The agricultural - based industries engaged in first-stage processing of commodity exports which

needed preservation. They helped reduce shipping weight, perishability of goods and costs of exports. The main industries in this category were sisal decortication, wattle extraction, hides and skin tanning. Being material-oriented they were situated close to their sources of raw materials. The consumer goods industries catered for the basic needs of the settler population and an emerging African urban elite. These industries produced bread, metal tools, furniture, wearing apparel, sweets and grain flour.

Between 1900 - 1920, there were no major industries in Thika that engaged in processing or fabrication of goods. Only a few Asian - owned small scale enterprises existed. Among these were cart making, furniture and bridge repairs. Asians also controlled animal slaughter and grain milling. The grain mills used water as a source of power and were housed in shacks.

Between 1920 - 1940, European companies established four major manufacturing industries, the East African Tanning Extract, the Kenya Tanning Extract, the Bulleys Tanneries and the Thika Rice Factory. The Wattle Extract Company of Kenya and the Natal Tanning Company of South Africa owned the Kenya Tanning Extract. Messrs Bulleys and Tom Booth of Britain owned the Bulleys Tanneries. All these industries used woodfuel as the source of power for dri-

ving machines.

The Bulleys Tanneries engaged in the processing and preservation of hides and skins for export while the Thika Tanning Extract and the East African Tanning Company engaged in the processing of wattle bark. These industries utilised relatively simple machinery operated by foreign technicians. Africans, employed as ground-crew, assisted in loading and off-loading of wagons and lorries.

The major structural characteristics of manufacturing industries in Thika during this period are:

(a) the industries were raw material - oriented or local resource - based, (b) they were owned by foreigners, (c) they utilised relatively simple technology, (d) they engaged primarily in first-stage processing of commodities for export.

In the period between 1940 - 1963, the structure of manufacturing industries was diversified. Consumer and market - oriented industries relying on imported raw material or semi-processed raw materials were introduced. These industries included the Metal Box Factory, the Kenya Paper Mills, the United Textile Industries and the Thika Cloth Mills. The Kenya Cannery was the only local resource - based industry established during this period. A number of small scale industries that engaged in the production of sweets, maize flour and bread were also established.

The purpose of establishing the consumer and

market - oriented industries was mainly to reduce the overwhelming dependence on imported consumer goods and to meet the needs of an expanding national market. The Kenya Cannery was established in order to create a market for local small-scale growers of pineapples as well as preserve fruit and vegetables for export.

Unlike the first generation of industries, these industries were relatively sophisticated. They utilised machines driven by petroleum fuel. However, like in the previous generation of industries, Africans worked in the factories as attendants with few job opportunities mainly due to their lack of skills.

In this second generation of industries the industrial structure was more diversified. Two discernible categories of industries were consumer and market-oriented industries and the export-oriented industries. These two categories, however, were poorly integrated into the space economy. The market - oriented industries relied on imported raw materials in finished or semi-finished form. For example, the Metal Box Factory, the first major consumer goods industry to be established in Thika relied on imported steel and aluminium plates. The Kenya Paper Mills utilised imported soft wood for the manufacture of paper, while the two clothing factories relied on imported cotton and nylon.

These industries produced goods for direct or final consumption only. They were not producing commodities for further use in other sectors such as agriculture or transport. They made bread, clothes and textiles geared to meet the needs of the urban population rather than the rural areas. The export-oriented industries although locally resource-based, were poorly integrated internally and did not produce commodities for further use as intermediate inputs in other industries. They were strongly linked to the external world rather than to the internal market.

Thika's industrial structure in post-independent Kenya has changed considerably. The first and second generation of industries have been expanded and sophisticated machinery installed. More new industries are being established every year. At present Thika has a considerably large manufacturing sector with both large and small-scale industries. These industries engage in a variety of manufacturing activities. These include:

- (a) fruit and vegetable processing
- (b) bread and confectionery
- (c) animal feeds
- (d) clothing and textiles
- (e) wood and furniture making
- (f) engineering and metal work

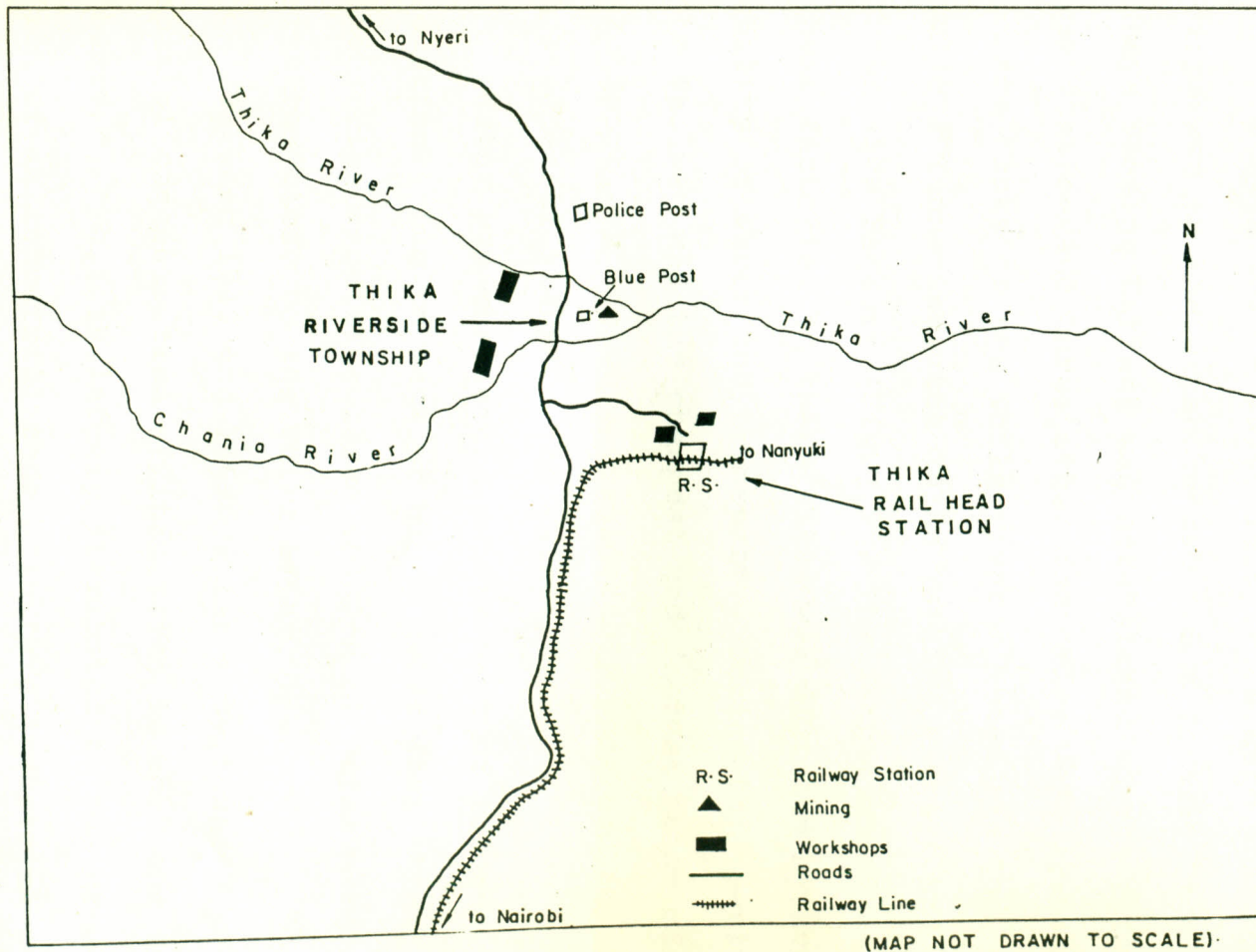
- (g) Paper manufacturing
- (h) Chemical processing
- (i) rubber and synthetic fibres
- (j) leather tanning and wattle extraction, and
- (k) tobacco curing.

The industries have the following structural characteristics: (a) apart from five industries that are export-oriented, other industries are consumer or market oriented, (b) Thika has no basic goods or capital goods industries. Consequently, the industries rely on imported machinery; (c) the consumer goods industries, particularly the metal and chemical based industries, rely on imported raw materials, (d) the export-oriented industries only engage in first-stage processing of agricultural commodities; (e) the industries have weak inter-sectoral or spatial linkages with the space economy of Kenya, particularly with the rural areas. The products produced are largely geared to meet the needs of the urban population.

#### The Evolution of the Spatial Distribution of Industries in Thika

The spatial distribution of industries in Thika has changed considerably over the years. In the period between 1900 - 1920, Thika had only a limited number of workshops which were located in the settlement's commercial centre (Fig.1.4). The establish-

FIGURE 1.4 THE EARLY THIKA SETTLEMENT 1900-1920.



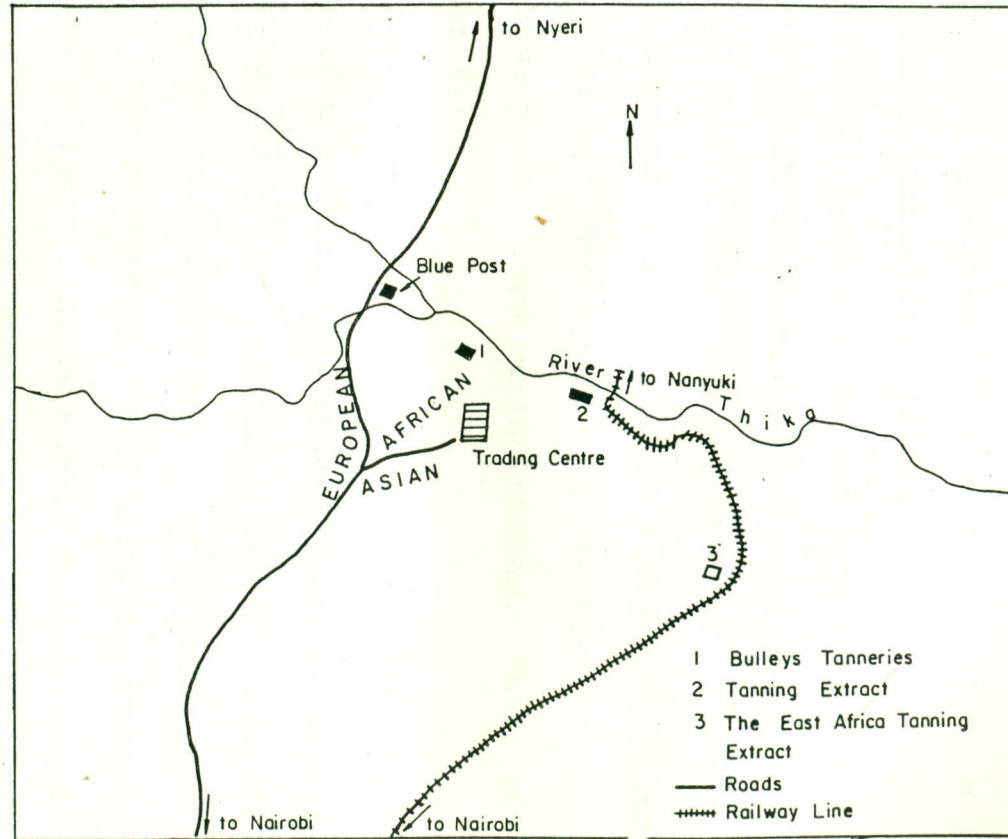
ment of these industries in the town's commercial sector is attributed to the entrepreneurs' desire to be close to the buyers.

Between 1920 - 1940, industries were spatially dispersed in the urban centre. One factory, the Kenya Tanning Extract was established at the railway station and three other factories were situated on the banks of the Thika river. These are the Bulleys Tanneries, the Thika Tanning Extract and the Thika Rice Factory (Fig.1.5). The situation of these factories in these sites was dictated by availability of water and transport. During this period, the railway was the cheapest and fastest means of transport. Roads were considerably poor and impassable especially during the rainy season.

Water was the second determinant of industrial location. Due to lack of piped water facilities, industries requiring large volumes of water were situated close to the Thika river.

Between 1940 and 1963, a tendency towards spatial concentration of industries in the town is observed. This is largely attributed to the creation of an industrial zone. In this industrial zone the government provided piped water, roads, electricity and sewerage facilities and extended the railway line. In addition, land was provided at cheaper rates. Industries, therefore, clustered in this zone

FIG. 1.5. INDUSTRIES IN THIKA IN 1920-1940.



(MAP NOT DRAWN TO SCALE).

to take advantage of these infrastructural facilities and amenities (Fig. 1.6).

The industrial zone has been a major centre of industrial attraction. At present it is the core of Thika's industrial activity. Industries radiate from this centre in all directions. On the basis of wards, industries are distributed as follows Kiganda 22, Komu - 5, Market 4, Hospital 0, Kianda 2, Ndururumo 0, Chania 2, Kariminu 3 and Karibaribi 3 (Fig. 1.7).

However this pattern of industrial distribution is changing. Other parts of the town are beginning to have their share of industries. There are two major factors contributing to this change in the distribution of industry. Firstly, the construction of the Thika - Garissa Highway is significantly altering the pattern of industry. Presently, it forms the main centre of attraction for industries. The researcher noted that the spatial distribution of industries is moving towards a more linear pattern along the Thika - Garissa road. Industries situated along the highway include the Leyland Vehicle Assembly firm, the Kenya Fruit Processors, the Kenya Taitex Mills, Polysack, the British American Tobacco and the Bakex Flour Mills. The researcher also observed new industries under construction along the highway. Secondly, the growth of large-

FIG. 1.6: THE DISTRIBUTION OF MANUFACTURING INDUSTRIES IN THIKA IN 1940-1963.

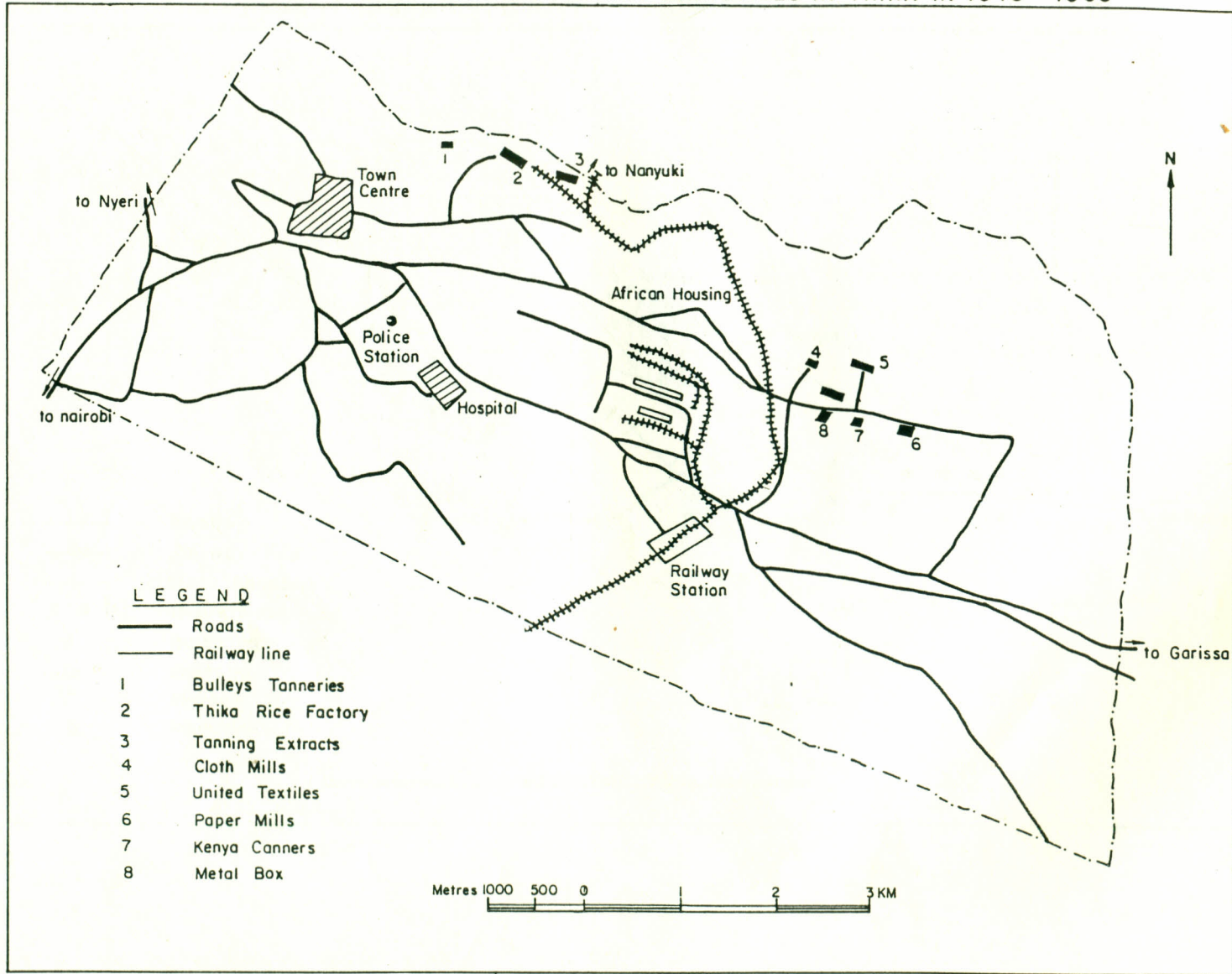
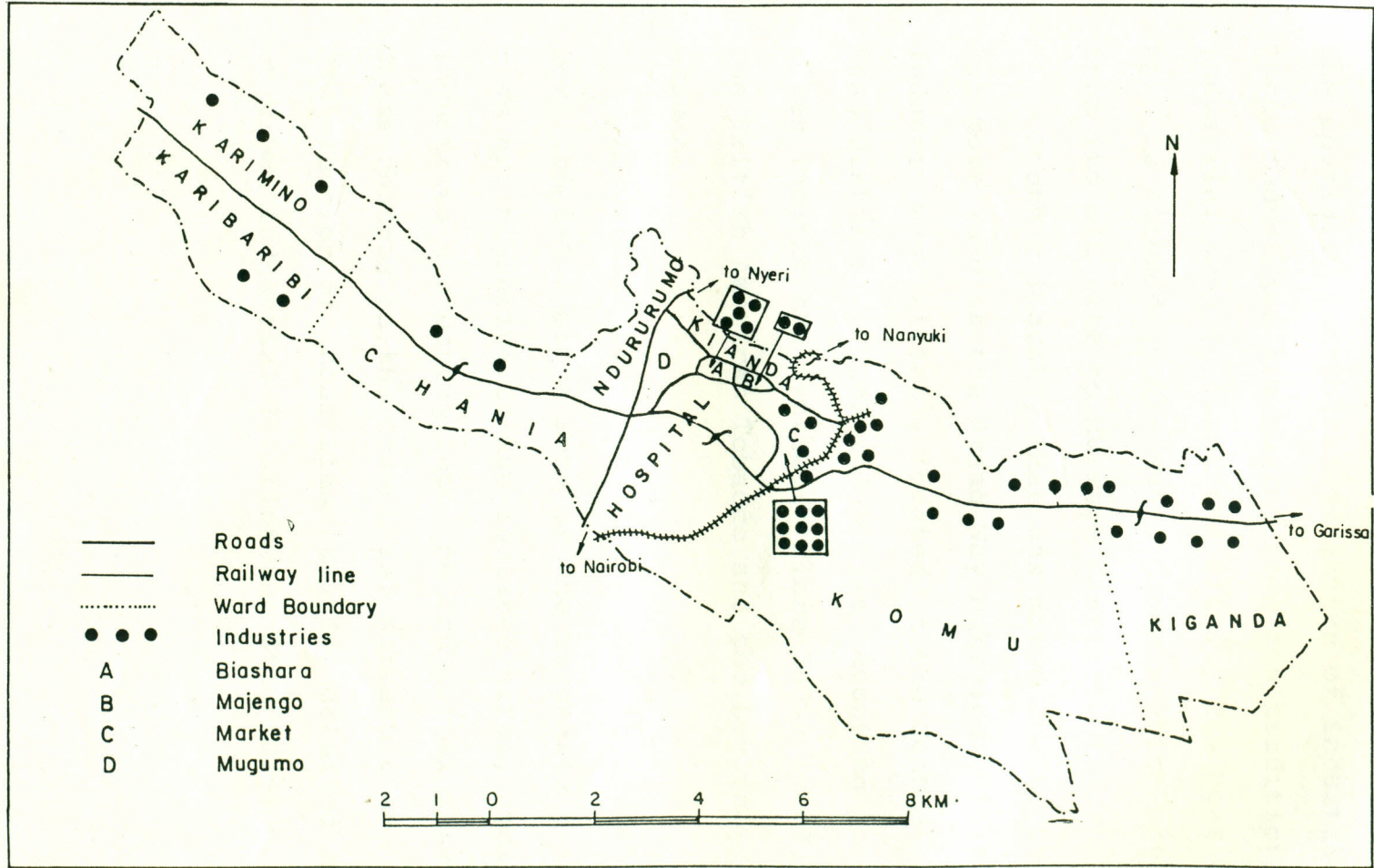


FIGURE 1.7: THE PRESENT DISTRIBUTION OF INDUSTRIES



scale firms with complex machinery, transport facilities and higher demands for land is also altering the spatially concentrated pattern of industries. These industries are moving from the traditional industrial area to dispersed sites. The best example is offered by the Kenya Cannery which moved from its old site to Muranga District.

Another industry that has moved due to the need for more land is the Broad Way Bakeries. This industry was initially located in the Central Business District. Other industries occupying isolated sites include the Synthetic Fibre Industry of Kenya, The British American Tobacco and the Leyland Vehicle Assembly.

Industrial location in the town is becoming more complex. Since some of the large-scale industries are migrating to new isolated sites, small industries are moving into the industrial zone. These changes in the industrial structure and in the distribution of industries call for detailed studies on urban industrial location and structure.

Footnotes

<sup>1</sup> Japan adopted a capitalistic industrial strategy similar to the one adopted by United States and Western Europe. For information on Japan's Industrial Strategy see Schumpeter, E.B. (1940), The Industrialisation of Japan and Manchukuo. New York, Macmillan.

<sup>2</sup> The Soviet Union embarked on a Strategy of planned industrial development; for further discussions on the Soviet Union's Planned Industrial Strategy see: Hamilton, F.E.I. (1970), "Aspects of Spatial Behaviour in Planned economies". Papers - Regional Science Association XXV 86 - 130.

<sup>3</sup> This drive towards industrialisation was also a response to the rapid increase in population, the massive migration from rural to urban areas and the rise in unemployment levels in the cities.

<sup>4</sup> There is a widespread view that colonialism inhibited development in African countries. For more details on the impact of colonialism in Africa see: Mabogunje, A.L. (1976) "Spatial Production Organisation and Integration in Developing Countries the case of Africa". Geoforum Vol. 17, Pergamon Press, Great Britain; Brett, E.A. (1973), Colonialism and Underdevelopment in East Africa: The Politics of Change 1913 - 1939, Heinemann; Darkoh, M.B.K. (1978) "An Introductory Note on Underdevelopment and Industrialisation in Africa During the Colonial Period". Journal of Geographical Association of Tanzania, No. 16. June 1978.

<sup>5</sup> The origin of the dependency school dates from the Economic Commission For Latin America's Critique of Conventional Development Theory. The works of this school form the theory of dependency. The theory advocates that the present high levels of underdevelopment characterising Third World Countries today is due to the relationship that exist between the developed and the underdeveloped countries. Dependency theory postulates three basic propositions: (a) that the existing international economic order is tailored in such a way that the investible surplus in the Third World Countries is drained or siphoned to the advanced countries. This occurs through such operations as the international trade and aid, multinational or transnational investments in the Third World Countries; (b) dependency is a conditioning proce-

ss, that is, the functioning of the Third World Countries is dictated by the functioning of the Metropole. According to Cardoso (1974), a conditioning situation which the economies of one group of countries are conditioned by the development and expansion of others is created. The dominant countries are endowed with technological, commercial, capital and socio-political ordinances over dependent countries and therefore exploit them and extract part of the locally produced surplus; (c) underdevelopment in the Third World Countries occurs due to the unequal exchange of goods. According to Arghiri Emmanuel, unequal exchange is due to the unequal rewarding of factors of production particularly labour. Wage differentials between the developed and underdeveloped countries are too big. For further information on dependency school see Gunder Frank (1970) "The Development of Underdevelopment" in Imperialism and Underdevelopment, ed. by Robert, I.R. Monthly Review Press; Emmanuel, A. (1972) Unequal Exchange: A Study of Imperialism of Trade. Monthly Review Press. Rodney, W. (1976) How Europe Underdeveloped Africa. Tanzania Publishing House, Dar-es-salaam.

6

For a detailed account of the story of Charles Hurst, see, Kenya Breweries (n.d.) Sixty Years of Kenya Breweries, Kenya Breweries, Nairobi.

7

Emphasis was placed on import substituting industries. These were generally to accomplish the following: reduce dependency on the mother country, save foreign exchange, raise employment opportunities, decrease dependency on foreign markets by processing domestically produced raw materials rather than exporting them unprocessed.

8

Ogendo (1972), Nixon (1973) and Wescott (1979) provide general overviews of the factors of industrial location. They enumerate the factors of location but they do not go into the underlying factors that lead entrepreneurs to choose sites in urban areas. Nixon (1973) and Ogendo (1972) discuss the general characteristics and factors of industrial location using the nation as the study matrix. The failure to make a quantitative assessment of the factors of location is their major weakness. See Ogendo, R (1972) Industrial Geography of Kenya, East Africa Publishing House. Nairobi, Nixon, F.I. (1973) Economic Integration and Industrial Location: an East African Case Study. Longman London. Wescott, C (1979) using a political economy approach observed that the government plays a significant role in the location decisions through

three broad categories of government incentives. These are: direct government equity and loan investment in the firms, fiscal and regulatory policies particularly in the area of foreign trade related incentives and disincentives, provision of housing, infrastructure and roads either at no cost or at subsidized cost to the establishment concerned. See Wescott (1979) "The Political Economy of Industrial Location in Kenya." PHD Thesis, Boston University.

9

White Highlands is the name given to Kenya's Central Highlands which were considered suitable for white settlement.

## Chapter 2: FACTORS MOTIVATING ENTREPRENEURS TO ESTABLISH INDUSTRIES IN THIKA

This chapter discusses the factors that motivate entrepreneurs to establish industries in Thika. It examines the managerial perception of Thika's space economy. The use of managerial perception to investigate the factors that motivate entrepreneurs to establish industries is based on the notion that managers use information selectively (Taylor, 1982). This implies that decision makers receive information selectively and weight it according to their firms' production requirement before reaching a decision to establish an industry. Therefore, in order to understand the factors that motivate entrepreneurs to establish industries in a given point in space, understanding managerial perception is important as a basis for analysis. In Thika, firm managers are actively engaged in decision-making processes and are well qualified to assess Thika's space economy. In addition, the chapter will compare different types of managerial perception of Thika's space economy between managers of small scale and large scale industries.

### Review of the Literature

This section provides the empirical and theoretical perspective of the study by reviewing the literature on industrial location. Classical industrial location theory formulated within the framework of

economic assumptions has to a large extent failed to explain industrial location.<sup>1</sup> It stipulates that a firm's location is determined by its contacts with other organisations for acquisition of inputs and disposal of outputs. Consequently, a firm's best location point is where minimum costs of production are experienced and maximum benefits accrued. The classical industrial location theories are exemplified in the works of Weber (1929), Losch (1954) and Smith (1971).

McDermott and Taylor (1976) argue that the treatment of the firm and industrialists as a "black box" or an unknown constant in the relationship between environment and behaviour is the major limiting factor in the classical approaches to location. Simon (1957) and Pred (1967) further note that the classical theory assumes rationality and objectivity on the part of the management or the firms' decision makers. They also note that the notion of bounded rationality and the mental powers of economic man are a departure from reality. They therefore call for a theory that incorporates realistic human behaviour on location decisions. Similarly, Steed (1976), observes that the major constraint on classical location theory is lack of realism. This is because in reality there is uncertainty involved and sub-optimal behaviour reflected in industrial location decision.

North (1976) shares similar views with Steed and Simon. He recommends that locational change should be viewed in the context of interdependence between a firm and its environment. This is because a firm's management reacts and adjusts to environmental conditions.

Industrial geographers in search of a general body of theory that incorporates realistic human behaviour are utilising approaches to location that work from within the firm. This is done by the incorporation of human behavioural techniques in location decision studies. These studies attempt to measure the reactions of decision makers to the information received or accepted from the environment (Walker, 1975). Industrial geographers are therefore shifting their attention from economics to psychology to derive techniques for measuring managerial attitudes or perception of location decision makers. Psychological theories on human behaviour are offering industrial geographers techniques for measuring managerial attitudes.<sup>2</sup>

By using attitude scaling techniques, geographers have attempted to identify aggregate perception images that have significant implications for the spatial behaviour of groups. The mental mapping technique is a popular representation of attitude scaling technique adopted from psychology.<sup>3</sup> This technique has, however, a number of limitations. McDemott and Taylor (1976) point out that in

the mental mapping technique, no attempts are made to depict the scale to which respondents organise spatial information attitudes. The technique does not reveal any information concerning the items which respondents use to evaluate the stimulus, and it does not show the way in which the items interact to produce an aggregate image upon which evaluation rests. Due to these limitations, attitude scaling techniques are being widely used in geographical research instead of mental mapping techniques. This is because attitude scaling techniques have distinct advantages over mental mapping techniques. These advantages include the ability to define the evaluation activity and to indicate the state of a stimulus as perceived by respondents (Lemon, 1973).

Though perception studies are at their infancy, there are a number of studies in industrial geography that have adopted perception techniques. These include the works of Stafford (1976), North (1976), McDemott and Taylor (1976), Taylor (1982), Rees (1976) and Bar, et al (1978). These studies have come up with findings on firm's location decisions.

Stafford (1976), using managers' responses found that, the most important factors of industrial location in the South-Eastern Ohio, U.S.A. were labour, personal contacts and information. The nature and quality of information, especially personal contacts

was identified as the most important factor of industrial location. Transport facilities and market accessibility variables were considered less important than expected.

North (1976) observed that firms are actively engaged in decision-making process affecting different types of location. Transfer decisions were made by either young or small-scale firms run by entrepreneurs or recently created members of the group. Branch take-over decisions were made by medium or large-scale companies enjoying high growth and profitability rates. Extensions were made by large-scale companies that employ capital - intensive techniques. Lastly, factory closures occurred either in old publicly owned firms or in large companies having low growth and profitability.

McDermott and Taylor (1976), investigated the perception levels of industrialists in New Zealand. Sixteen items considered relevant in influencing location decisions were presented to managers to react to. The findings were that: (a) the type of industry has little influence upon attitudes to the factors of location; and (b) differences emerged from different types of management organisations. Managers of older large multiplant firms regarded professional services in the secondary towns as unsatisfactory while single firms were satisfied with professional services in the small towns. Simi-

larly, the larger long-established and professionally managed firms appreciated the market potential of big towns.

Taylor (1982) notes that managerial attitudes vary with spatial scales. He points out that markets and transport costs are perceived at an interregional scale, while service and supply items are perceived at a regional scale. Barr, et al (1978) observe that the nature of manufacturers' perception is not significantly associated with the size of aggregate industrial linkage. They observed significant variations in perception images between manufacturers in Canadian cities of Calgary and Edmonton. Positive attitudes towards aggregate and specific industrial milieux and the size of firms were found in Calgary. In Edmonton such a relationship could not be discerned.

These studies provide a basis for the use of managerial perception technique. The present study utilises the perception technique to investigate the factors that motivate entrepreneurs to establish industries in Thika. In so far as this author is aware, no studies on industry have ever been attempted in Kenya utilising the perception approach.

Moreover, studies that utilise the urban centres as the study matrix are few and far between. The only exceptions are perhaps the works of Ogendo

(1969), Dosio (1974), and Norcliffe and Wescott (1981). These studies, however, have serious limitations.

Ogendo (1969) outlines the following as the principal factors responsible for the location of industries in urban centres:

easier availability of capital managerial and other skills amongst many other factors of production; (b) a variety of industrial raw materials both primary and secondary types; (c) excellent and indeed desirable development of industrial linkage or interdependence (d) existence of a sure market with favourable and varied categories of income groups endowed with considerable and differing buying capacities; a better set of infrastructural facilities resulting in relatively fairer industrial structure in certain cases; and (f) a strong force exerted by personal consideration (Ogendo 1969: 840).

Ogendo's study does not go beyond the elementary enumeration of the above factors of industrial location. The weight that each factor exerts on a given location decision is not given. The author disregards the individual differences that exist between the six towns covered in his study. While availability of capital and managerial skills may be significant factors of location in Nairobi and Mombasa, they might be insignificant in medium-sized towns such as Thika, Eldoret and Kisumu.

Norcliffe and Wescott (1981) investigated the location of industries in Kenya. They pointed out that the concentration of manufac-

turing firms in Nairobi is due to the centralisation of economic decision makers, civil servants, government departments, commercial enterprises and contacts between the public and private sector in the city. Two issues related to industrial location emerged in their study. The first is that, the government's policy of centralising economic and social institutions in the capital city has a direct influence on industrial location. The second is that, there is a relationship between urbanisation and a firm's location decision.

Dosio (1974) has examined the problems associated with the concentration of industries in a single town. He proposes that the factors for the concentration of industries in Thika are land, topography, geology and social factors. Like Ogendo, Norcliffe and Wescott, Dosio, however, does not examine industrial location from a perception perspective and therefore gives little inkling into how entrepreneurs view the urban landscape of Thika or how their location decisions are influenced by urban environmental conditions.

#### Data Collection

Data for use in the investigation of factors that motivate entrepreneurs to establish industries in Thika were obtained by the use of a questionnaire (Appendix A). The researcher considered the

space economy of Thika as consisting of a set of economic, infrastructural, government policy and environmental related conditions that lure entrepreneurs to establish industries. The firms were considered as administrative and productive organisations making decisions in response to the above conditions in the space economy. This implies that a firm's decision to locate in Thika is a response to the conditions of the space economy of Thika. For a manufacturer to respond to the stimulus to establish an industry in Thika, he engages in a process of organised decision making. This involves the evaluation of the above conditions (Fig. 2.1).

The researcher identified the space economy of Thika in terms of 27 variables (Table 2.1). These variables were derived from industrial location studies and were considered relevant in influencing location decision in a given space. They included labour, transport, markets, raw materials, infrastructure, land, water energy, government policy, environmental and business information.

An attitude scale was constructed using twenty seven location variables. The establishment of a firm in Thika was considered as the stimulus with reference to which managers were required to rate the items. The twenty seven items were presented

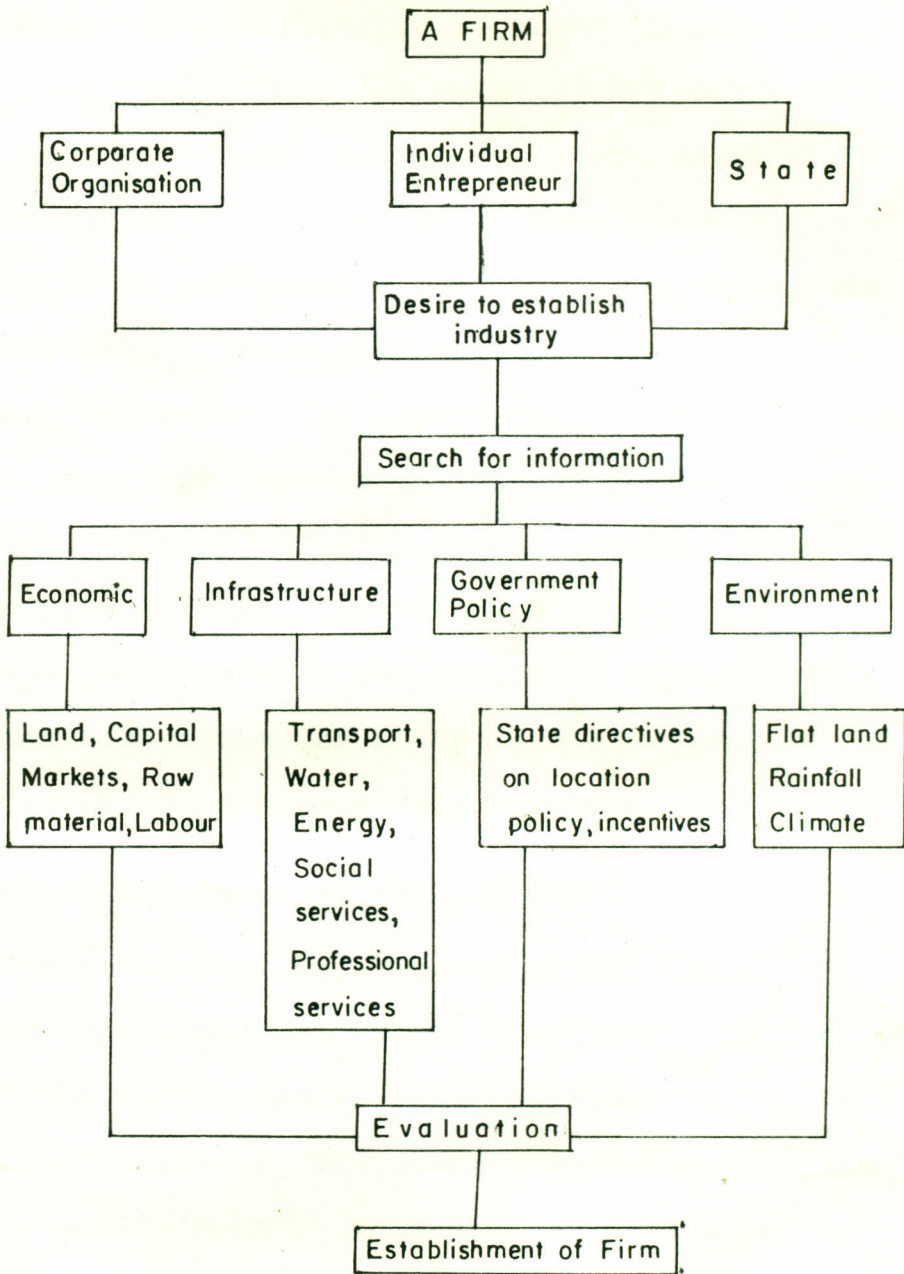


Fig-2:1 A Model for Location Decision  
Adapted from North (1976)

in tabular form in a questionnaire (Appendix B). The firm managers were required to react to each location variable by indicating its level of influence on the firms location decision. The managers rated each item according to its degree of importance or non-importance in influencing a decision to establish a firm in Thika. The rating categories were:

(a) very important, (b) important, (c) not important and (d) not very important. The respondents using the given categories underscored each item's level of importance in the location decision.

The questionnaire was tested in a pilot study and then distributed to sixty firm managers. Fifty seven positive responses were obtained.

#### Limitations in Data Collection

The researcher experienced difficulties in booking appointments to visit the firms. In most cases, the firm managers would not respond to the researcher's letter requesting permission to visit their establishments. This problem was solved by the researcher visiting the firms and discussing the purpose of the questionnaire with the managers before administering it.

A problem was experienced in trying to locate the firm managers. This was because not all firm managers were based in Thika. A number of them were based in Nairobi. This added extra costs and

Table 2.1 INDUSTRIAL LOCATION VARIABLES

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V01	Availability of cheap non-skilled labour
V02	Availability of skilled labour
V03	Low labour costs
V04	Efficient transport to and from other centres
V05	Low transport costs
V06	Access to the national market
V07	Access to the International market
V08	Availability of land for expansion
V09	Low land prices and rents
V10	Availability of health services
V11	Availability of educational services
V12	Availability of housing services
V13	Access to supplies of raw materials from rest of the country
V14	Access to supplies of raw materials from international markets
V15	Access to supplies of raw materials from the local area
V16	Availability of legal services
V17	Availability of banking services
V18	Availability of government loans
V19	Availability of energy
V20	Availability of water
V21	Distance from the capital city
V22	Local authority incentives
V23	General environmental features - climate
V24	Presence of flat land
V25	Access to external business information
V26	Access to internal business information
V27	Local market potential

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time spent on the field study.

### Data Analysis and Interpretation

This section presents the analysis of perception scores in order to determine the factors that motivate entrepreneurs to establish industries in Thika. The first stage in the analysis involved the scoring of all the response categories on a ten - point scale. The scores were as follows: very important 10, important 7, not important 4, and not very important 1. This was followed by the determination of factors that motivate entrepreneurs to establish industries in Thika by use of Factor Analysis.<sup>4</sup> The factor analysis technique was used to collapse the twenty seven location variables into more concrete factors that explain why entrepreneurs choose to establish industries in Thika. The model used was generated by the Statistical Package for social Scientists (SPSS).

Simple correlation coefficients were utilised as the initial estimates (Appendix C). Nine factors with eigen-values greater than (0.5) were obtained (Appendix D). The nine factors obtained were subjected to orthogonal rotation employing the varimax criterion. The varimax rotated matrix obtained is presented in (Appendix E).

To derive the cut-off point for determining the significant factor loadings from non significant loadings a mean absolute deviation of all the loadings was computed. The computation was carried out in the following way. For each factor the difference between the highest and the lowest loading is computed.

$$d = |x_1 - x_2|$$

where  $1 < i < 9$

$d$  = absolute difference between the loadings

$x_1$  = the highest loading in factor

$x_2$  = the lowest leading in factor

The results obtained were summed up.

$$\begin{aligned} \sum_{i=1}^9 d &= 0.70904 (d_1) + 0.67256 (d_2) + 0.7035 (d_3) + \\ & 0.6544 (d_4) + 0.5672 (d_5) + 0.75441 (d_6) + \\ & 0.9294 (d_7) + 0.72471 (d_8) + 0.42171 (d_9) = \\ \sum_{i=1}^9 d &= 6.13456 \end{aligned}$$

This was followed by the computation of absolute mean deviation

$$I = \frac{\sum d}{n}$$

where  $I$  = mean absolute deviation

$\sum_{i=1}^9 d_i$	=	sum of differences
n	=	number of factors
I	=	6.13456/9
I	=	0.68161

0.68161 was used as the cut-off point for determining significant loadings from non significant loadings. By the use of 0.68161 cut off point the nine factors were reduced to five. Four factors 2,4, 5, and 9 were eliminated (Appendix E). The number of variables loading on each factor were reduced (Table 2.1).

An examination of Table 2.2 reveals the following results: Two location variables availability of land (0.83632) and access to external business information (0.74126) loaded highly on FACTOR 1. This factor was interpreted as Resource and Information. Land availability in this case is viewed as a resource. Smith (1971) notes that land availability is a significant factor of industrial location. This is because modern firms require not only the land occupied by the physical plant but also land for storage of materials, finished products, car parks and for future expansion. The unprecedented growth of major cities like Nairobi in developing countries has made land not only scarce but very expensive. These high land prices have made capital investments in

Table 2.2 FACTOR ANALYSIS RESULTS

Managerial Perception Image of  
Industrial Location Variables  
Motivating Entrepreneurs to  
Establish Industries in Thika

Factor	Location Variable(s)	Loading
Resource, Information:	availability of land	0.83632
	access to external business information	0.74126
Internal raw material linkage	accessibility to supplies of raw mate- rials from rest of the country	0.71014
Transport	low transport costs	0.76125
Cheap non skilled labour	availability of cheap non skilled labour	0.93136
Services	availability of housing services	0.73011

Source field data: 1986.

these cities expensive. Consequently investors are looking for alternative sites within the city environs. Thika has a lot of undeveloped land which other towns within the vicinity of Nairobi such as Kiambu, Ruiru and Juja do not have. This is due to the presence of a large unsettled area to the East of the town.

Accessibility to external business information loaded significantly on FACTOR 1 (0.74126). Business information consists of information on markets, labour supplies, energy availability and sources of inputs. Thus entrepreneurs making decisions to establish their firms consider sites from which business information will be easily tapped.

Alonso (1964) supports the role of accessibility to business information in decision making in developing countries. He notes that inadequate amount of information involves elements of uncertainty and greatly hinders the establishment of firms in distant location.

Accessibility to supplies of raw materials from the rest of the country (0.71014) loaded very highly on FACTOR 3. This factor was defined as Internal Raw Material Linkage. Apart from the Kenya Cannery which is locally resource based other industries rely on raw material from the rest of the country and the outside world. This implies that an entrepreneur making a decision to locate a firm in Thika gives

great consideration to how accessible the source of raw materials are to his firms.

Low transport cost loaded significantly on FACTOR 6. This factor was named as Low Transport Cost. Low transport cost is a traditional industrial location factor in location theory. The cost of transferring finished products is perceived as a major factor contributing to the establishment of firms in Thika. There are, however, studies that tend to query the role of low transport cost in location decisions. These studies argue that availability of transportation is more important in influencing a decision to establish a firm rather than the transportation costs per se. The case of low transport costs influencing a firm's decision to locate is, however, true for Thika. Thika's accessibility to sources of raw materials and markets minimises transport costs between the firms and their sources of raw materials and markets.

Availability of cheap, unskilled labour loaded significantly on Factor 7 (0.9313). This factor was defined as Cheap Unskilled Labour Availability. This suggests that entrepreneurs are concerned with local competition for cheap supply of labour. This finding however differs from Ogendo's (1969:840) finding that firms are established in towns because of "easier availability of capital, managerial and other skills of production." The present study

notes that availability of unskilled rather than skilled labour is more important in location decisions. The firms require to a large extent unskilled labour to assist in the production line. The government's directive on creation of job opportunities requires that firms create employment. To meet this requirement, the firms prefer unskilled labour to skilled labour since the former is cheaper than the latter.

Factor 8 was interpreted as Service Availability. Availability of housing services loaded highly on this factor (0.73011). Housing availability is significant in a location decision since lack of housing facilities forces a firm to incur extra costs by providing houses or transport for its employees. In the case of Thika, the Municipal Council makes an effort to provide housing for low income earners who are the majority of the factory workers. This is being done through the following housing schemes: Pilot Housing Scheme, Makongeni-Kamenu Scheme and the Kiandutu Upgrading Component Scheme.

The analysis shows that the factors motivating entrepreneurs to establish industries in Thika are: (a) Resource and information; (b) Raw material linkage (c) Transport availability and (d) Service availability.

Managerial Perception Image of Large Scale Firms

The analysis of large scale managerial perception image was done in order to derive the factors that motivate large scale entrepreneurs to establish their firms in Thika. The managerial perception scores of large scale firms were isolated. A factor analysis of the managerial perception scores of large scale firms was carried out. A total of eleven factors were generated (Appendix F). These eleven factors had eigen-values greater than one and accounted for a 100 percent of the original variance in the managerial attitudes to location variables. The factors obtained were subjected to an orthogonal rotation employing the varimax criterion. The varimax rotated matrix obtained is presented in (Appendix G).

To obtain the cut-off point for the significant loadings, a similar procedure for computing the mean absolute deviations between the loadings was used. 0.76629 was adopted as the cut-off point for deriving significant loadings from non-significant loadings on each factor. By the use of 0.76629 cut-off point for significant loadings the eleven factors were reduced to six (Table 2.3). FACTORS 2,5,6,9,11 were eliminated. The remaining FACTORS 1,3,4,7,8 and 10 were adopted as the factors that motivate entrepreneurs to establish their firms in Thika.

Table 2.3 FACTOR ANALYSIS RESULTS

Managerial Perception Image of  
Large Scale Firms on Factors  
Motivating Large Scale Entrepreneurs  
to Establish Industries in Thika.

Factor	Location Variable	Loading
Government support to Industry	availability of government loans	0.82854
	availability of energy	0.85980
Transport	efficient transport to and from other centres	0.81997
Cheap non-skilled labour	availability of cheap non skilled labour	0.89453
Internal business information	Accessibility to internal business information	0.95274
External business information	Accessibility to external business information	0.79130
Service Availability	Availability of health services.	0.82459

Source: field data 1986

Factor 1 was defined as Government Support to Industry. The location variables that loaded highly on this factor included availability of government loans (0.82854) and of energy (0.85980). The large scale managers felt that government support through the provision of loans and grants and the provision of energy (electricity) were significant factors of industrial location in Thika. The Kenya government in attempts to promote industry and correct regional imbalances in industrial development, has laid down incentives to encourage industrial development. These incentives include loans, grants and provision of infrastructure - roads, railway energy and water.

Apart from these two variables other location variables had loadings below the cut-off point. It was expected that local authority incentives, a form of government support to industry, would load significantly on this factor. The low loadings on this location variables indicate that the local authority has no influence on the location decision of industries. This reflects the traditional highly centralised (top-down) nature of industrial location and development policy in Kenya. The other location variables that loaded moderately on Factor 1 are availability of banking services (0.65380), availability of water (0.42877) and local market potential.

The loadings on local market potential were however unexpected. This is due to the assurance

that the government gives to prospective industrialists. The government in luring entrepreneurs to a particular point, promises to assist them in the marketing of their products through price controls, certification of marketing standards and through monopolies.

Factor 2 was interpreted as Efficient Transport. Efficient transport to and from other towns loaded significantly on this factor 0.81997. Thika has a good transport network linking it with various major markets and sources of raw materials. This accessibility contributes to the minimisation of transport costs of manufactured goods and raw materials. The transport by road and railway considerably reduces the geographical isolation of plants located at Thika. Low transport costs (0.52272) and access to raw material supplies from international markets (0.64822) loaded moderately on this factor.

Availability of cheap non-skilled labour loaded significantly on FACTOR 4. This factor was defined as Cheap Unskilled Labour. It was expected that availability of skilled labour would load higher than the availability of cheap non-skilled labour. This difference in loadings is attributed to the fact that industries utilise sophisticated machinery and only require unskilled labourers. This situation is well explained by one manager's comment:

We have a sophisticated juice extracting machine. It can load clean, extract and pack juice. However, it only needs one technician to operate. The other workers needed are assistants to perform odd jobs in the production line such as checking whether cans have been sealed properly. Such workers do not require skills.<sup>4</sup>

Low labour costs, although closely associated with this labour factor had no significant loadings. This implies that it is not considered as a significant factor that motivates entrepreneurs to establish industries in Thika. This variable although considered important by classical theories of industrial location was not significant to Thika. This can be attributed to the government legislation on minimum wages and the centralisation of Trade Unions that call for uniform wages. This offsets the spatial differences in wages that attract industries.

Factor 4 was interpreted as Accessibility to Internal Business Information. Business information is a vital factor of industrial location. Firms are particularly concerned with flows of business information. They would like to have access to where decisions on industrial policies take place.

Access to external business information (0.95274) loaded significantly on Factor 5. This factor was named as Availability of External

Business Information. Large scale firms are concerned about external business affairs such as, cost of machinery, changes in production techniques and world trade conditions. This is particularly true since they are highly dependent on external markets for their sources of machinery and raw materials.

Factor 6 was defined as Availability of Services. Availability of health services had significantly high loadings. Other service-related factors had considerably lower loadings than expected.

From this analysis we can conclude that the important factors that motivate large-scale entrepreneurs to establish industries in Thika are: (a) government support to industry, (b) efficient transport (c) availability of unskilled labour, (d) accessibility to internal business information, (e) accessibility to external business information and (f) availability of services.

#### Managerial Perception Image of Small Scale Firms

The small scale managerial responses were isolated and a factor analysis test carried out. A total of 11 new factors were generated (Appendix H). These factors explained 100 per cent of the original variance in the managerial attitude towards the location variable. An orthogonal rotation employing the varimax criterion was utilised. The

varimax rotated matrix obtained is presented in Appendix I. 0.62708 was adopted as the criteria for determining significant loadings from non significant ones. The cut-off point was derived by the use of the same procedure utilised in step one. The eleven factors were reduced to six factors (Table 2.4). These are factors 2,5,8,9,10 and 11. The other factors 1,3,4,5,6 and 7 were eliminated. This is because they had low loadings.

Availability of energy had significantly high loadings (0.66744). This implies that small scale entrepreneurs are particularly concerned with availability of energy. In contrast to the large scale firms availability of energy loaded on Government Support to Industry and was closely associated with availability of government loans and banking services. In this case it was associated with efficient transport to and from other centres and low transport costs. Due to this association the factor is interpreted as Production Cost-Saving Factor.

Access to the national market loaded significantly on FACTOR 5 (0.66513). This implies that Thika's accessibility to the national market is a significant factor that attracts small scale entrepreneurs. It was closely associated with distance from Nairobi. Although this variable has not loaded significantly on any other factor, it appears

Table 2.4 FACTOR ANALYSIS RESULTS

Managerial Perception Image of Small Scale Firms on Factors Motivating Small Scale Entrepreneurs to Establish Industries in Thika.

Factor	Location Variables	Loading
Production-cost Saving Factor	Availability of energy	0.66744
Market access	Access to national market	0.66513
Cheap non-skilled labour	Availability of cheap non skilled labour	0.68929
Service Availability	Availability of education services	0.71964
Internal business information	Availability of internal business information	0.66908
Environment	Presence of flat land	0.61404

Source: field data 1986.

that it is quite important to **small** scale entrepreneurs. This is because the small scale entrepreneurs rely on Nairobi for raw materials and machinery. It was also expected that local market potential would load significantly on this factor. However, this was not the case. Again this could be due to the government policy on market.

Availability of cheap non-skilled labour loaded significantly on FACTOR 8. This factor was interpreted as Availability of Cheap Non-skilled Labour. The small scale entrepreneurs prefer to employ unskilled labourers and train them on the job rather than employ skilled labour that is expensive.

FACTOR 9 was defined as Availability of Services. Availability of education services loaded significantly on this factor. Other service related factors had significantly low loadings on this factor.

Availability of internal business information loaded significantly on FACTOR 10 (0.66908). This factor was defined as Access to Internal Business Information. This implies that small scale entrepreneurs prefer to establish their industries in locations where business information can be easily tapped.

Presence of flat land loaded significantly on FACTOR 11. This factor was interpreted as Environment-Related Factor. It was however, expected that other environment-related factors would load significantly on this factor. But this was not the case.

From the analysis, it is observed that the significant factors that attract small scale entrepreneurs to establish industries in Thika are:

(a) production cost-saving factor, (b) access to national markets (c) availability of services, (d) labour (e) availability of internal business information and (f) environmental factors.

#### Summary of Findings

A summary of the findings appears in Table 2.5 . The table shows that a variety of factors motivate entrepreneurs to establish industries in Thika. They include resource and information, internal raw material linkage, transport, cheap non-skilled labour, availability of services, government support to industry, internal business information, external business information, production cost-saving factor, access to national market and environment-related factors.

A comparison between the large scale and small scale managerial perception of location variables reveals that, availability of cheap non-skilled labour, availability of services and internal business information are considered important in location decision by both categories of firms. The location factors unique to small scale entrepreneurs include production cost-saving factor, access to national market and environment-related factor. The

Table 2.5 A SUMMARY OF FACTORS MOTIVATING ENTREPRENEURS TO ESTABLISH INDUSTRIES IN THIKA

FACTORS	ALL FIRMS	LARGE SCALE FIRMS	SMALL SCALE FIRMS
Resource and Information	x	-	-
Internal raw material linkage	x	-	-
Transport	x		
Availability of Cheap non skilled labour	x	x	x
Availability of services	x	x	x
Government Support to Industry	-	x	
Accessibility to internal business information	-	x	x
Accessibility to external business information	-	x	-
Production cost saving factor	-	-	x
Access to national market	-	-	x
Environment related factor	-	-	x

Source: Field data 1986

location factors unique to large scale firms' location decision include government support to industry and accessibility to external business information.

This study reveals that variation in managerial attitude occurs between specific location variables. Large scale firms considered government support to industry as significant in their location decision. This can be attributed to the high risks involved in large scale production. Small scale industries on the other hand start off as small family businesses and the risk margins are lower than those of large scale firms. The large scale firms also view accessibility to external business information as significant in location decision. This is attributed to the fact that large scale firms have more links with the external world than the small scale industries.

The small scale industries consider production cost-saving factors important in their location decision than do the large scale industries. This is because large scale firms have the benefits of large scale economies of production which the small scale firms do not have. Accessibility to national markets is considered important by small scale firms. Unlike the large scale firms that have marketing advantages and can afford heavy advertising, small scale firms have limited market advantages. Thus they would like to be as close to the national market as possible.

The next chapter outlines the factors responsible for the spatial distribution of industries in Thika town. The chapter comprises a review of the literature, methods of data collection, data analysis and interpretation and the summary of the findings.

FOOTNOTES

1

For a detailed account of the critique of industrial location theory see: Massey, D. (1973) "Towards a Critique of Industrial Location Theory." In Antipode Vol.5 No.3 pp. 33 - 38; Pred, A. (1967) "Behaviour and Location" Part I Lund Studies in Geography Series B. 27

2

For more information on psychological theories on human behaviour see Lemon, N. (1973) Attitudes and their Measurement. Batsford. London

3

For further information on the mental mapping technique see: Gould, P.R. and Rodney, W. (1974) Mental Maps, Penguin Publishers, Great Britain.

4

This information was given on 20/3/1986 by one of the managers of the fruit and vegetable industry J.K. Wachira.

### Chapter 3: THE SPATIAL DISTRIBUTION OF INDUSTRIES IN THIKA

After a manufacturer chooses to establish his firm in Thika, the next decision is where to locate his factory in the town. This is the decision concerning the choice of alternative sites within the city or town. Although, in general, firm owners who were interviewed considered this question to be far less important than their choice of Thika over other towns in the region or nation, they conceded that a number of variables strongly influenced the choice of location among the alternative wards of Thika. These variables include land prices, presence of industrial or residential estates, presence of electricity, presence of a major highway, presence of a railway siding, distance from the Central Business District and presence of piped water. This chapter describes the spatial distribution of industries in Thika and establishes the significance of these related factors.

#### Review of the Literature

There is a dearth of information on intra-urban location of manufacturing, especially in developing countries. Studies on cities and urban centres in developing countries (and in Kenya in particular), pay meagre attention to the organisation of industrial

space in these centres. They mainly concentrate on residential facilities and cultural problems and the organisation and distribution of services. As yet, there are no studies on intra-urban location of industries in Kenya. The studies by Ogendo (1969) Wescott (1980), and Wescott and Norcliffe (1980) referred to in Chapter 2 do not deal with intra-urban location and therefore ignore intra-city or intra-urban spatial organisation of industries. This section will therefore review literature from the developed countries.

Logan (1966) observes that industrial location theory in its traditional form has been developed with reference to location at the micro-level and has concentrated on the location decision of a firm largely ignoring city-wide patterns. He also notes that manufacturing theory ignores site rents in location decisions and the changes that occur with scale. It does not give any real indication of the range of changes that take place in input proportions with a change in location. Logan further notes that the factors responsible for intra-urban industrial location are the scale of enterprise and cost of land. On the latter, he observes that variations in land prices between the central area of Sydney and its suburbs have considerable influence on the firms' location decisions. He particularly notes that large firms with extensive space needs are currently being

forced to areas further out, to the city periphery.

Moses (1962) and Muth (1969) observe that spatial differences in industrial wages play a significant role in urban industrial location. They postulate that workers' communication costs will be discounted in some way in the wage rates. They argue that if market conditions are such as to equalise all local wage rates at any major site, it means that there is a definite positive relationship at that job site between the going wage rate offered and the geographic extent of the surrounding labour shed; that is, the distance over which the marginal worker must commute. Therefore, in a city where all employment is assumed to be at the core, the basic central wage will be established in relation to the cost of commuting from the edge of the city to the central focus of employment. As such, if workers have the option of working either at the centre or at home the minimum wage that will lure them to work at the centre or at home is the minimum wage less the money of commuting from home to the centre.

Scott (1982) points out the remarkable failure of literature on urban industrial location to develop a coherent overview of the spatial dynamic of labour supply and demand and the associated geographical pattern of industrial wage rates in urban centres. He argues that wage rates vary across the metropolis

and these variations have significant impacts on rates of profits. He, however, notes that these variations in wage rates are becoming less significant due to the activities of industrial trade unions. The trade unions have reduced considerably variations in industrial wages. Similarly, problems of unemployment have eroded the strength of labour related factors.

The cost of land is significant in urban industrial location. High industrial land prices at the core of the city repel industries while low industrial land prices at the periphery of the city attract them (Scott, 1982). The attractiveness of peripheral locations is augmented by the fact that more land is usually available at the periphery than in the town centre. With more land, firms can build warehouses, car parks and residential estates. Hamer (1973) further notes that land and construction costs have a significant role to play in urban industrial location. He says that, even if firms at inner city locations intensify their use of land by utilising multi-storey buildings relative to a given site, high land prices still represent an unattractive attribute of core locations.

The Distribution of Industries in Thika in 1986

The intra-urban industrial distribution in Thika reflects a polarised pattern (Fig.1.7). Industries are spatially concentrated towards the eastern side of the Central Business District. The areas to the west, north and south of the Central Business District have a dispersed pattern of industries. Table 3.1 depicts the intra-urban distribution of industries on the basis of wards. The distribution is indicated by the number of establishments and employment in manufacturing. The Table reveals that manufacturing industries are concentrated in Kiganda Ward, which has a total of 22 establishments and 4,550 employees. It is followed by Market Ward with 14 establishments and 2,887 employees. Lesser concentrations are found in Komu, Biashara, Kariminu, Karibaribi, Kianda, and Chania.

On the basis of the scale of enterprise, large scale industries are more spatially polarised than the small scale industries. The large scale industries are found in four municipal wards. Kiganda leads both in number of establishments and employment in manufacturing. Out of the 30 large scale industries surveyed only 10 are located outside Kiganda. Five of these are situated in Komu, three in Market ward and two in Kianda ward.

Table 3.1. INTRA-URBAN DISTRIBUTION OF THE NUMBER OF ESTABLISHMENTS AND EMPLOYMENT BY SCALE OF ENTERPRISE.

WARD NAME	NO OF FIRMS	EMPLOYEES	NO OF LARGE SCALE FIRMS	EMPLOYEES	NO OF SMALL SCALE FIRMS	EMPLOYEES
Kiganda	22	4,550	20	4,146	2	404
Komu	5	1,034	5	1,034	0	0
Market Hospital	14	2,887	3	612	11	2,275
Majengo	2	413	0	0	2	413
Biashara	4	827	0	0	4	827
Mugumo	0	0	0	0	0	0
Kianda	2	421	2	421	0	0
Ndururumo	0	0	0	0	0	0
Chania	2	413	0	0	2	413
Kariminu	3	620	0	0	3	620
Karibaribi	3	620	0	0	3	620
Total	57	11,785	30	6,213	27	5,572

Source: Field Data 1986

The small scale industries on the other hand are more spatially dispersed. They are distributed in seven wards. Market ward has the largest share of establishments in Thika. It has 11 establishments with a total of 2,275 employees. It is followed by Biashara, Kariminu, Karibaribi, Chania and Majengo.

#### Factors Underlying the Spatial Pattern

At the outset, it must be stated that there is no single factor capable of completely explaining the spatial pattern. The existing pattern is the composite effect of several variables - historical economic and non-economic - of varying influences across time and space. To attain complete understanding of their areal interrelationships is out of the question, but one can sort out what seems likely to be the dominant factors and examine their relative significance.

From the interviews conducted of entrepreneurs' perception of the space economy of Thika and the historical analysis in the introductory chapter dealing with the evolution of industries in Thika, it would seem that the following elements of the space economy of Thika are the major forces affecting the areal distribution of manufacturing in the town: (a) the supply of piped water; (b) the supply of electricity; (c) the presence of a major highway; (d) the presence of a railway line,

(e) the price of land; (f) the presence of an industrial or residential estate; and (g) the distance from the Central Business District. These variables were designated as the independent variables. The number of establishments in a given municipal ward was designated the dependent variable. For the latter, the researcher counted and recorded the number of firms or establishments in each ward. The independent variables such as the supply of piped water, supply of electricity, presence of a major highway, presence of a railway line and presence of a residential or industrial estate reflect the provision of urban infrastructure in the twelve wards. These were considered as binary variables whose presence or absence were indicated by a score of 1 and 0 respectively.

The importance of urban infrastructure must be underlined. According to Smith (1971) the advantages afforded by urban infrastructure and amenities may be of a rather intangible nature but they often express themselves directly through the reduced costs of certain specific inputs. In deciding to locate at a particular ward in the town, therefore, the entrepreneur considers the availability of essential services such as water, electricity, roads and railway sidings leading to the proposed site. Within the town, the installation of some of these services

is handled by the municipal council or town council at nominal fees. If these services are missing from the proposed site, an entrepreneur considers the time lag and the necessary costs of their installation.

Where industrial estates exist, they constitute a strong incentive to industry because they capture the otherwise volatile external economies of agglomeration (Smith 1971: 448). They save a great deal of effort, trouble and expense in erecting a factory. In addition, they realise considerable economies of scale in construction of factory buildings and the installation of public utilities and services. Therefore, an entrepreneur who chooses to locate in an industrial estate gains by escaping the intangible costs.

The price of land was measured by the use of the average unit price of land per plot in a given ward.<sup>1</sup> The price of land in the town depends on the location of a particular plot within the town. The plots of land in or near the Central Business District have a higher land value than those plots that are in other areas of the town. In deciding where to locate a factory in the town an entrepreneur considers the price of land and tends to accept the area where land is plenty and cheap.

Distance from the Central Business District was indicated by the average distance in (kilometres) of each ward from the Central Business District.<sup>2</sup>

Ideally the Central Business District would be the most appropriate site to locate a factory within the town. This is because it is easily accessible, well served with infrastructure, auditing firms, banks, warehouses, and wholesale and retail shops. Therefore an entrepreneur choosing a site within the town considers its relative position to the Central Business District. This variable has been widely used to illustrate the distance - decay function in the examination of the spatial distribution of industries in urban centres.

#### Data Analysis and Interpretation

A regression model employing the forward selection procedure was utilised to validate the hypothesis that, the spatial distribution of manufacturing industries in Thika in general, and by scale of enterprise, is positively related to the elements of the space economy of Thika described above. This hypothesis is validated at three levels. The first level involves the examination of the spatial distribution of all industries. The second one consists of investigation of the spatial distribution of large scale industries. The third level comprises the examination of the spatial distribution of small scale industries.

The multiple regression forward selection procedure starts by regressing the variables with the

highest zero order correlations against the dependent variable (Shaw and Wheeler, 1985: 240). The other predictor variables with significant contribution to the variation in the dependent variable are added to the regression equation sequentially. Whenever a new variable is added to the equation, a change in R square ( $r^2$ ) value is observed. This change in  $r^2$  indicates the new variables contribution to the variation in the dependent variable. The significance of the change in  $r^2$  value is determined by the use of the F - ratio. If the computed F value is greater than the critical F value the change is considered significant. The process of adding the predictor variables into the model is halted when the improvement in the  $r^2$  is not significant. When this condition occurs the remaining variables yet to be examined are excluded from further consideration. The multiple regression model used to validate the above hypothesis is

$$Y = \beta_0 + \beta_1 \times_1 + \beta_2 \times_2 + \beta_3 \times_3 + \beta_4 \times_4 + \beta_5 \times_5 + \beta_6 \times_6 + \beta_7 \times_7 + e.$$

where

Y is the dependent variable (number of establishments in a ward).

$\beta_0$  = regression constant.

$\beta_1 - \beta_7$  = Partial regression coefficients

$x_1-x_7$  = the independent variables

e = error term

### ALL INDUSTRIES

The results of the multiple regression forward selection procedure for the general case, all industries, are presented in Table 3.2. From this Table it is observed that the price of land is the first variable entered in the regression equation. This indicates that the price of land is the most significant predictor in the spatial distribution of industries. The price of land, however, influences the spatial distribution of industries negatively. This implies that the high land prices repel industries. The  $r^2$  value reveals that the price of land explains 45 per cent of the variation in the spatial distribution of industries.

Similar findings on the effects of land prices have been documented by Hamer (1973), Scott (1982) and Logan (1966). Hamer (1982) observes that high land prices at the core of Boston city repel industries. Scott (1982) further notes that low land prices at the city periphery attract industries while high land prices at the core dispel industries. Logan (1966), as we noted earlier, also emphasised the importance of variations in land prices between the central area of Sydney and its suburbs.

The presence of a major highway was the next

Table 3.2 MULTIPLE REGRESSION FORWARD SELECTION PROCEDURE RESULTS FOR ALL INDUSTRIES

VARIABLE	REGRESSION CONSTANT	PARTIAL REGRESSI- ON COEFFICIENT	MULTIPLE R	R SQUARE	CHANGE IN R SQUARE	% PERCENTAGE EXPLANATION	SIGNIFICANCE LEVEL
PL	17.69402	-0.67095	0.67095	0.45017	0.45	45	Yes
H	14.06402	7.92729	0.80279	0.64447	0.19	19	Yes
RA	7.77844	8.57913	0.91783	0.84242	0.20	20	Yes
RE	6.767123	3.57534	0.93868	0.88111	0.04	4	NO

Source: Field Data 1986

- PL price of land
- H presence of a major highway
- RA presence of a railway siding or line
- RE presence of a residential estate

variable introduced into the regression model. From the  $r^2$  value it can be observed that the two variables explain 64 per cent of the variation in the spatial distribution of industries in Thika. The change in  $r^2$  value indicates that the presence of a major highway contributes 19 per cent to the variation. It is also observed from the partial regression coefficients that the presence of a major highway is positively related to the spatial distribution of industries. This implies that major highways in the urban centre attract industries. The presence of a major highway in a ward is important to intra-urban industrial location because it facilitates the transportation of raw materials, finished products and workers to and from the factory.

The next variable introduced into the regression model is the presence of a railway line or sidings. From the table it is observed that the three variables, price of land, presence of a major highway and presence of a railway siding account for 84 per cent of the variation in the spatial distribution of industries in Thika. The presence of a railway line or siding explains 20 per cent of the variation in the spatial distribution of industries. From the partial regression coefficients, it is observed that the railway line has a positive influence on the spatial distribution of industries. This implies that the presence of a railway line, like the presence of

a major highway attracts industries.

The presence of a residential or industrial estate was the next variable introduced in the regression model. Together with the others previously discussed they explain 88 per cent of the variation in the spatial distribution of industries in the town. The contribution of the presence of an industrial or residential estate is, however, not significant compared to the other variables. It explains only 4 per cent of the variation.

In summary, the regression model indicates that three variables, price of land, presence of a major highway and presence of a railway siding, in that order, are the most significant variables explaining the spatial distribution of industries in Thika.

#### Large Scale Industries

Table 3.3 presents the results of the multiple regression forward selection procedure for large scale industries. From the Table it is observed that the first variable regressed against the dependent variable is the presence of a railway line or siding. From the partial regression coefficients it is observed that, the presence of a railway line has a positively significant influence on the spatial distribution of large scale industries in Thika. This variable explains 37 per cent of the variation in the spatial distribution of large scale industries in Thika.

Table 3.3 MULTIPLE REGRESSION FORWARD SELECTION PROCEDURE RESULTS FOR THE LARGE SCALE INDUSTRIES.

VARIABLE	REGRESSION CONSTANT	PARTIAL REGRESSION COEFFICIENT	MULTIPLE R	R - SQUARE	CHANGE IN R SQUARE	% PERCENTAGE EXPLANATION	SIGNIFICANCE LEVEL (0.05)
RA	1 .0000	9.0000	0.6098	0.37190	0.37	37	Yes
PL	10.3288	-0.0001	0.8242	0.6794	0.30	30	Yes
CBD	10.3927	0.9083	0.8987	0.8076	0.12	12	Yes
EL	7 .90019	5.7488	0.9658	0.9328	0.12	12	Yes
WA	9. 27311	-2-2795	0.9697	0.9404	0.00	-	NO

Source: Field data 1986

RA - presence of railway line or siding  
 PL - price of land  
 CBD - Distance from Central Business District

EL - Availability of electricity  
 WA - Availability of piped water

Price of land is the next variable introduced in the regression model. The partial regression coefficient is negative. This indicates that the price of land has an inverse relationship with the spatial distribution of large scale industries. That is, high land prices in certain municipal wards dispel large scale industries. These wards include, Ndururuma, Mugumo and Biashara. The  $r^2$  value indicates that the presence of a railway line and the price of land account for 67 per cent of the variation in the spatial distribution of large scale industries. The change in the  $r^2$  value depicts that the contribution of the price of land to the variation in the dependent variable is 30 per cent.

Distance from the Central Business District is the next variable introduced into the regression model. The three variables together account for 80 per cent of the variation. Distance from the Central Business District accounts for 12 per cent of the variation. The partial regression coefficient (0.90838) which is positive implies that the further the distance from the Central Business District the more the number of large scale industries. This is because large scale industries require a lot of land for building purposes. This is usually not available in areas close to the Central Business District. In the latter, land is not only scarce but also

expensive.

The fourth variable introduced into the regression model is availability of electricity. Together, these four variables account for 93 per cent of the variation in the distribution of industries. The supply of electricity contributes 12 per cent of the variation. The partial regression coefficient indicates that the presence of electricity has a positive influence on the spatial distribution of large scale industries. This implies that wards that are well supplied with electricity are more likely to attract large scale industries than those without. Electricity is important in manufacturing since it is used in lighting as well as a source of power for running the engines.

The last variable introduced into the regression model is supply of piped water. The variable was, however, not significant perhaps because of its ubiquity. Water is available in almost all the wards in Thika. In summary, the most significant variables affecting the distribution of large scale industries in Thika in order of magnitude are the presence of a railway line or siding, the price of land, distance from the CBD and presence of electricity.

#### Small Scale Industries

Table 3.4 presents the results of the multiple regression forward selection procedure for the small

Table 3.4 MULTIPLE REGRESSION FORWARD SELECTION PROCEDURE RESULTS FOR THE SMALL SCALE INDUSTRIES

VARIABLE	REGRESSION CONSTANT	PARTIAL REGRES- SION COEFFICIE- NT	MULTIPLE R	R SQUARE	CHANGE IN R SQUARE	% PERCENTAGE EXPLANATION	SIGNIFICANCE AT 0.05 LEVEL
RE	3.2857	-2.4857	0.41184	0.16961	0.16	16	NO
WA	2.0000	3.0000	0.56109	0.31482	0.14	14	NO
PL	4.8856	0.0005	0.62784	0.39418	0.07	7	NO
CBD	2.62963	0.65290	0.69484	0.48408	0.08	8	NO

RE - Presence of Residential or Industrial estate  
 WA - Presence of piped water  
 PL - Price of land  
 CBD - Distance from the Central Business District

scale industries. From the Table, it is observed that the variables entered in the regression are not significant. Thus the hypothesis of a positive relationship between the spatial distribution of industries and the space economy is rejected.

Small scale industries are not significantly affected by the price of land or the presence of railway sidings. They are found in the Central Business District and in the outskirts of the town. Fifteen small scale industries are within the Central Business District, comprising Biashara and Market wards. Twelve small scale industries are located outside the Central Business District.

The small scale industries in the Central Business District occupy old buildings which are cheap to rent. These industries do not require a lot of floor space hence they can be accommodated in such buildings. The small scale industrialists do not consider the presence of railroads. This is because their sources of raw materials and markets tend to be local. It is for these reasons that the three factors that were important for large scale industries, the price of land, the presence of a railroad and the presence of electricity do not appear significant for small scale industries.

Those small scale industries that are located outside the Central Business District also do not

show the three major factors to be significant. The price of land in these areas is insignificant because the small scale industries are located in private lands. The particular entrepreneur first bought the land for its intrinsic value before making a decision on the type of land use. Thus it was after the acquisition of the land that the owners decided to establish small scale industries such as fruit and vegetable, fibre, saw milling and textile firms. To these entrepreneurs who wanted to make use of their land, presence or absence of electricity or piped water and railroad were not the most important factors, since these were generally available or could be easily provided in the town.

Similarly, the coffee curing small scale industries started after the acquisition of coffee farms by the owners. The farmers subsequently decided to set aside pieces of land in order to establish coffee curing factories. In such cases, the price of land was an insignificant factor in the decision to establish coffee curing factories. The presence or absence of railroads or electricity was not significant enough to affect the decision to establish the factory that would serve the coffee farmers.

Unlike the large scale industries small scale industries are not overly constrained by the attributes of the space-economy of Thika, such as price of land or railroads. They tend to rely more on

individual initiatives, risk taking and desire to make efficient use of the limited resources that are available. Their sources of raw materials and target markets tend to be local rather than long distance. In terms of infrastructure, small scale enterprises are less demanding, and their entrepreneurs worry less about the provision of special facilities than the owners of the large scale firms.

#### Summary of the Findings

From the above analysis, it is observed that the locational factors that influence the general spatial distribution of manufacturing industries in Thika are: the price of land, the presence of a major highway and the presence of a railway line. The price of land has a negative influence on the spatial distribution of industries. This implies that the higher the price of land the fewer the industries. The wards with high land prices are Mugumo and Ndururumo. Biashara, despite its high land prices, has some industries. These are mainly small scale industries with minimal land requirements. They offset the high land prices in the town centre by occupying the towns' old buildings which are relatively cheap.

The presence of a major highway and railroad indicate the role of transport in intra-urban industrial location. Transport availability is important since it facilitates the transportation of raw

materials, finished products and factory workers.

The factors considered important in the spatial distribution of large scale industries are, the presence of a railway line, price of land, supply of electricity and distance from the Central Business District. The large scale industries consider the presence of the railway siding significant due to the bulkiness of their raw materials and finished products. It is cheaper to transport the bulky goods by rail rather than by road. Due to their large land requirements the large scale industries are more concerned about land prices.

The distance from the Central Business District influences the spatial distribution of large scale industries partly because of the unattractive conditions of the Central Business District in view of the high land prices and lack of building space. It may also be due to the firms' large land requirements and the municipal regulations, which discourage industries at the town centre.

The supply of electricity is important to intra-urban location of large scale firms. This is due to the firms' large requirements of electricity. Electricity is used for lighting as well as a source of power for running the machines.

The analysis showed that the intra-urban location of small scale industries is not influenced by the variables considered. The researcher intuitive-

ly suspects that the location of small scale industries within Thika may be due also to personal considerations which were not included in the regression model.

FOOTNOTES

1

Information on the average unit price of land per plot in each ward was provided by Thika Municipal Town Planning Department.

2

Information on each ward's average distance from the Central Business District was provided by the Thika Municipal Town Planning Department.

Chapter 4: THE SPATIAL LINKAGES OF MANUFACTURING  
INDUSTRIES IN THIKA

Chapter three has presented the factors responsible for the spatial distribution of industries in Thika. This chapter outlines the spatial linkages of manufacturing industries in Thika. It examines the backward and forward linkages between Thika's manufacturing industries and the local, national and international space economies. These backward and forward relationships are expressed as capital equipment linkages, raw material linkages and market linkages. They establish the extent to which industries are integrated into the space economy.

Review of the Literature

The resurgence of regional development studies has forced industrial geographers to diversify their approaches to the structure of industries. This involves a shift from examining industrial structure as indicated by aggregate number of industries, employment and types of products to the examination of spatial relationships of industries with the space economy. Regional development studies stipulate that the spatial aggregation of manufacturing industries in urban centres transmit development to poor peripheral areas. Some researchers claim that the effects of rapid industrial development under limiting conditions of capital and planning resources are

best realised if industries are concentrated in particularly advantageous locations in the space economy. This argument was first propounded by Myrdal (1957) and Hirschman (1958) and later elaborated by Friedmann (1966, 1972).

One of the supposed benefits of the concentration of industrial development in urban centres is that, growth impulses generated in these centres will trickle down or spread out to the less advantageous rural hinterlands. Myrdal (1957) points out that "spread effects" stimulate development in the surrounding hinterland. Hirschmann (1958) proposes that development taking place in the centres starts motions which induce or retard development in the hinterland. For development to occur in the hinterland, he adds, trickle down effects working through interregional trade and transfer of capital, must be in operation. Friedmann (1966, 1972) notes that developments taking place in the centre spread to the periphery through discontinuous but cumulative process of innovation.

Myrdal (1957), Hirschmann (1958) and Friedmann (1966, 1972) point out that integrated regional development takes place through a system of interactions. A strategy that seeks to promote integrated regional development, therefore, should initiate projects that have strong "spread effects" or "trickle down effects"

in the growth centres. The manufacturing sector is a major stimulant to development in the periphery. That is, industries have stronger multiplier effects than other sectors such as transport or agriculture (Bosier 1978). According to Erickson (1974) leading firms in growth centres induce economic development in the hinterland by exerting growth generating forces which are transferred through industrial linkage.

Barr and Fairbain (1978) examined inter-industry linkages in Alberta, Canada. They observed that the province has a weakly - developed regional industrial complex. They noted that in the assembly and light manufacturing industries supply ties with extra regional producers are much stronger than those within the province. The food and beverage industries have strong backward linkages. This is because manufacturers in these industries rely heavily on semi-processed goods and packaging materials (paper, paper board, plastics and glass). Although the petro-chemical industry makes significant local purchases of packaging materials, it exhibits weak backward manufacturing linkages. This is particularly due to the purchases of chemical - based and related materials from producers outside Alberta.

The non-food and general manufactures rely on sub-components produced in Central Canada and foreign industrial regions. The wood, paper and allied

industries rely heavily on lumber and paper from other provinces. Similarly, enterprises engaged in primary metal engineering and transport purchase most manufactured inputs outside the province. The authors further observe that "Alberta's industrial economy functions as part of a wider Canadian or World manufacturing and that local producers are mainly at the end of the production chain, the prior links of which are not found primarily in Alberta" (Barr and Fairbain 1978: 124).

Taylor (1978) examined the material linkages between Auckland manufacturers and the consumers of their products elsewhere in New Zealand in order to assess the impact of the spatial competition within the country's space economy as well as determine how far it affects different types of industry and of organisation. The author pointed out that organisation type rather than the type of industry was an important determinant of the spatial arrangement of manufacturers' sales linkages. He noted that complex organisations are more frequently involved in inter-regional trade and interregional competition within New Zealand.

Mc Dermott (1974) investigated the market linkages and the spatial monopoly of manufacturing industries in New Zealand. This study revealed that local sales linkages in five of New Zealand's secondary population

centres (Whangarei, Napier, Wanganui, Nelson, and Timaru) were stronger than expected. This suggests limited imperfect spatial competition whereby firms exercise an element of monopolistic control over their immediately adjacent markets. He also noted that the strength of local sale linkage varies from centre to centre indicating variability in spatial monopoly from place to place.

Studies by Onyemelukwe (1976) in Nigeria and Darkoh (1971, 1973) in Ghana show that manufacturing industries have poorly developed industrial linkages. Onyemelukwe observes that five out of six cotton mills in Nigeria depended on external sources for their raw materials. He attributes the heavy reliance on imported grey cloth to the short supply and high price of local produce. He also observes that the manufacturing firms had no interfactory linkages. Darkoh observes that industries in the Central Region of Ghana had relatively weak linkages with the rest of Ghana. In none of the nine sectors of manufacturing was the Central Region dependent appreciably on inputs from the rest of Ghana. Its linkages are with itself and the rest of the world (Darkoh 1973: 11). This linkage characteristics partially reflect the low degrees of industrialisation and polarised distribution of industries between rural and urban areas and between the broad geographical regions.

Darkoh (1973) and Onyemelukwe (1976) are of the opinion that industries with limited interregional and intersectoral flows are symptomatic of underdevelopment and cannot sustain development in rural areas. Masette-Kuuya (1980) shares similar views in his study of Tanzania. He observes that the absence of linkages or the existence of few linkages between industries is a major structural distortion that plagues the import substitution industrial strategy in Tanzania. This distortion hinders the generation of chains of reactions that would increase production in the whole economy.

In Kenya, Ikiara (1984) observes that limited interdependencies exist between the productive sectors, particularly in the demand and supply of intermediate inputs. This is because the greatest share of output is geared towards final demand such as consumption and export markets. He attributes this condition to the government policy of protection which favours industries that are inward looking and discriminates against outward looking industries.

Mureithi and Sharma (1984) studied intersectoral relationships in the Kenyan economy. They examined the interdependence between agricultural and non-agricultural sectors. The study revealed that agriculture uses more inputs from the manufacturing sector than from any other sector besides its own.

The coefficient of inputs purchased from the manufacturing sector is 0.04. The food processing industries use farm inputs to the extent of an input coefficient of 0.29. The agro-based and other manufacturing sectors have small input coefficients, (0.03) and (0.02) respectively. The food processing industries rely more heavily on agriculture for their raw materials than the other two manufacturing sectors. The overall manufacturing sector including food processing and agro-based industries derives more inputs from agriculture (0.33) than they supply to agriculture (0.06). This indicates that manufacturing is more heavily dependent on agriculture than agriculture on manufacturing. The authors attribute the low levels of interdependence between agriculture and other non-farm sectors to the large traditional non-monetised subsectors in agriculture which do not interact with the rest of the sectors in the economy.

From the foregoing discussion, it is clear that intersectoral and spatial linkages have a significant role to play in regional development. But in Kenya apart from the works of Ikiara (1984) and Mureithi and Sharma (1984) there is little literature on intersectoral and spatial linkages of manufacturing industries. This chapter contributes to fill this gap by investigating the spatial linkages of

manufacturing industries in Thika.

#### Data Collection

The data used in analysing the spatial linkages of manufacturing industries were obtained from the field. The data relate to the year 1986 and were collected from 49 large and small scale firms.<sup>2</sup> Firm managers were asked to indicate the value in Kenya shillings of: (a) capital equipment purchased from the local area (Thika town), rest of Kenya and rest of the world; (b) the proportion of raw material purchased from the local area, rest of the country and the rest of the world; and (c) the proportion of the firms output sold in the local area rest of the country and rest of the world.

#### Data Analysis and Interpretation

The hypothesis examined in this section is: there exists low spatial linkages between Thika's manufacturing industries and the space economy of Thika and of the rest of Kenya, and high linkages between Thika's manufacturing industries and the space economy of the rest of the world.

In order to validate this hypothesis, the manufacturing firms are visualised as the propulsive sectors that trigger off chains of interactive mechanisms with the space economy in the following ways: (a) purchases of capital equipment, (b) purchases of raw mate-

rials, and (c) sales of their products to the space economy. These systems of flows existing between the manufacturing industries and the space economy are best illustrated by the use of an interregional input - output model.<sup>3</sup> The construction of an interregional input - output model requires massive data and involves a lot of time and money. Due to these constraints, the researcher adopted a limited model where linkages were expressed as follows:

(a) Raw material linkage (RL)

$$RL = \frac{x_{ij}}{x_1}$$

where

RL is the raw material linkage

$x_{ij}$  represents the proportion of raw material purchased from region j

$x_1$  is the gross output of a given industry

(b) market linkage (ML)

$$ML = \frac{x_{ij}}{x_1}$$

where

ML is the market linkage

$x_{ij}$  represents the proportion of sales in a given region; for industry i

$x_1$  is the gross output in a given industry

The technical coefficients RL, ML are expressed as a percentage.

For operational purposes, the manufacturing industries are grouped into the following categories:

- (a) Fruit and vegetable
- (b) Bread and confectionery
- (c) Grain milling
- (d) Animal feeds
- (e) Leather tanning
- (f) Clothing and textiles
- (g) furniture and fixtures
- (h) fibres, plastic and rubber
- (i) Engineering and metal products
- (j) Paper and paper products
- (k) Vegetable chemicals

#### Capital Equipment Linkage

Table 4.1 shows the manufacturing industries sources of capital equipment.<sup>4</sup> From the table it is observed that all the manufacturing firms, both large scale and small scale, purchase their capital equipment from outside Thika. The large scale firms purchase their capital equipment from outside the country. This situation is attributed to the lack of capital goods industry in the country. Small scale industries engaged in clothing and textile manufacture, grain milling, furniture and fixtures, however, purchase their machinery from the rest of the country. Their equipment were mainly derived from Nairobi. The overwhelming dependency on the outside world for

Table 4.1 SOURCES OF CAPITAL EQUIPMENT

INDUSTRY	LOCAL AREA	REST OF THE COUNTRY	REST OF THE WORLD
Fruit and vegetable	NONE	NONE	ALL
Bread and confectionery	NONE	NONE	ALL
Grain milling	NONE	SM	LS
Animal feeds	NONE	NONE	ALL
Leather tanning	NONE	NONE	ALL
Clothing and textile	NONE	SM	LS
Furniture and fixtures	NONE	SM	LS
Fibres plastic and rubber	NONE	NONE	ALL
Engineering + metal products	NONE	NONE	ALL
Paper products	NONE	NONE	ALL
Vegetable chemicals	NONE	NONE	ALL

Source: Field Data 1986

SM - Small Scale

LS - Large Scale

capital equipment is attributed to the low levels of technical knowledge and the lack of metallic minerals such as iron and coal that form the basis of capital goods industries.

#### Raw Material Spatial Linkages

Table 4.2 shows the raw material spatial linkages of manufacturing firms in Thika. The Table reveals that only four types of industries have strong raw material linkages or backward linkages with the local economy. These are the fruit and vegetable, bread and confectionery, furniture and fixtures and vegetable chemicals (Fig. 4.1). These industries rely on the local economy for their raw materials. The fruit and vegetable industry purchases 83 percent of raw material from Thika. This comprises pineapples, passion fruits, oranges and macademia nuts. The bread and confectionery industry obtains its flour from the Bakex flour mills in Thika. The wood, furniture and fixture industry depends on local saw mills for its sources of raw materials. The vegetable chemical industry derives wattle bark from the local area. This bark is brought to the factory by dealers who purchase it from wattle farmers in the town's hinterland (Fig. 4.2).

Industries with strong backward linkages with the rest of the country include: the grain milling, the leather tanning, the paper and paper products

Table 4.2 RAW MATERIAL SPATIAL LINKAGES

Table of Technical Coefficients

INDUSTRY	LOCAL AREA	REST OF COUNTRY	REST OF WORLD
Fruit and vegetable	0.8318	0.0458	0.1329
Bread and confectionery	0.5498	0.4644	0.0000
Grain milling	0.0261	0.8697	0.1302
Animal feeds	0.0886	0.7511	0.1749
Leather tanning	0.1112	0.8931	0.0000
Clothing and textile	0.0000	0.7671	0.2736
Furniture and fixtures	0.5788	0.4048	0.0000
Fibres plastics and rubber	0.0000	0.4627	0.5373
Engineering and metal products	0.0000	0.0000	0.9986
Paper, and paper products	0.2685	0.7492	0.0000
Vegetable chemicals	0.7161	0.2867	0.0000

FIGURE 4-1: RAW MATERIAL SPATIAL LINKAGES:THE FRUIT AND VEGETABLE INDUSTRY.

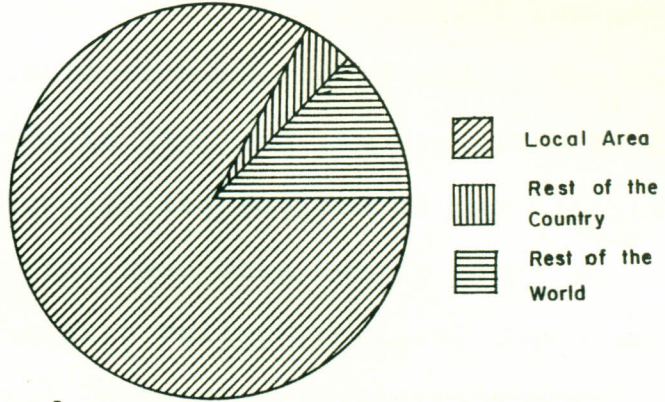
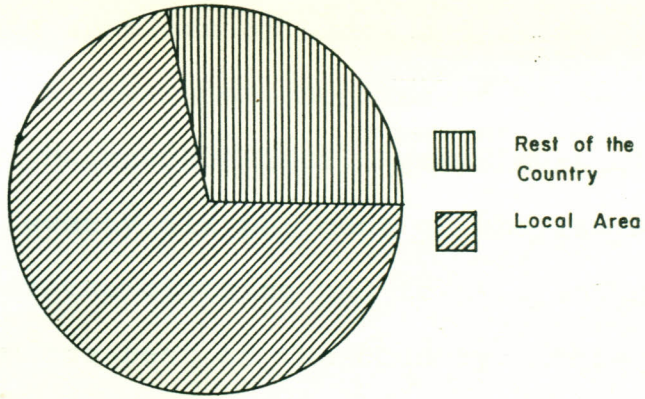


FIGURE 4-2: RAW MATERIAL LINKAGES:THE VEGETABLE CHEMICAL INDUSTRY.



and the clothing and textile industries. These industries obtain large amounts of their raw materials from the rest of the country. The grain milling industry obtains wheat from the Rift Valley province. This is because, wheat, the principal raw material, is not available from the local area. The animal feeds industry is also heavily dependent on the rest of the country for its sources of raw materials. It purchases cotton seed cake, whole maize and wheat germ from the Rift Valley Province, Unga Flour Mills in Nairobi and Yatta Flour Mills in Mombasa. The leather tanning industry depends heavily on the rest of the country for its raw material. This is due to the inadequate supplies of hides and skins from the local area. It relies on supplies of hides and skins from Kajiado, Machakos, Kitui, Nyeri, Murang'a and Kirinyaga. Seventy six per cent of the raw material requirement of the clothing and textile industry is obtained from the rest of the country. This is because cotton, the main raw material is not grown in the local area. It is produced in the Eastern and Western provinces of Kenya. The paper and paper product industry obtains scrap paper from the capital city, Nairobi and paper from Webuye Paper Mills.

Weak backward linkages with the local economy or that of the rest of Kenya are exhibited by the fibres, plastics and rubber, and the engineering and metal products industries. These two groups

of industries obtain their raw materials from producers outside Kenya. The former purchases 53 per cent of its raw materials from external sources while the latter obtains 99 per cent. Their raw materials are mainly polypropylene, natural rubber, Carbon N660, Jute, tin plates, lacquer, steel rolls, aluminium plates and vehicle components. These are generally not locally available.

Thus, industries with strong local raw material linkages are the fruit and vegetable, the bread and confectionery, the wood, furniture and fixtures and the vegetable chemical industry. The industries are locally resource based and have strong backward linkages with the local economy. Industries with relatively weak spatial raw material linkages with the local area include the grain milling, animal feeds, leather tanning, clothing and textile, fibres, plastics and rubber, engineering and metal products and paper and paper products. These industries exhibit strong linkages with the rest of the country and the rest of the world.

#### Market Spatial Linkages

The market spatial linkages of manufacturing firms in Thika are depicted in (Table 4.3). Industries with strong local market or forward linkages include the bread and confectionery, the grain milling, wood, furniture and fixtures, the fibres, plastics and rubber, the paper and paper products. These

Table 4.3 MARKET SPATIAL LINKAGES

Table of Technical Coefficients

INDUSTRY	LOCAL AREA	REST OF COUNTRY	REST OF THE WORLD
Fruit and vegetable	0.0675	0.0935	0.8449
Bread and confectionery	0.6974	0.3026	0.0000
Grain milling	0.7611	0.2389	0.0000
Animal feeds	0.4481	0.5577	0.0000
Leather tanning	0.0241	0.3000	0.6800
Clothing and textiles	0.0000	1.0000	0.0000
Furniture and fixtures	0.7366	0.2634	0.0000
Fibres, plastics rubber	0.8433	0.1621	0.0000
Engineering, metal products	0.4884	0.5246	0.0000
Paper, paper products	0.7805	0.2195	0.0000
Vegetable chemicals	0.0186	0.3668	0.6793

Source: Field data 1986

industries heavily depend on the local area as the market for their finished products. This implies that these industries produce goods for local consumption. The bread and confectionery industry sells 69 per cent of its output to the local area. This forward linkage is attributed to the highly perishable nature of its products: bread and cakes. The grain milling industry sells 76 per cent of its output to the local area. It sells to local bread manufacturers and retail shops. The wood, furniture and fixtures industry produces goods for local consumption. It sells 74 per cent of its output to the local area. The fibre, plastics and rubber industry exhibits strong market linkages with the local area. Eighty four per cent of its output (gunny bags, carton boxes and ropes) is utilised as packaging materials (Fig. 4.3).

Forward linkages with the rest of the country are generally poorly developed. This implies that the industries do not utilise the rest of the country as a market for their finished goods. The only industries that are strongly linked with the rest of the country are the animal feeds industry, the clothing and textile and the engineering and metal products industries. The animal feeds industry sells its products to Murang'a, Machakos, and Kitui. The Muttu products Company especially sells its end

FIGURE 4.3: MARKET SPATIAL LINKAGES: THE FIBRE PLASTICS AND RUBBER INDUSTRY

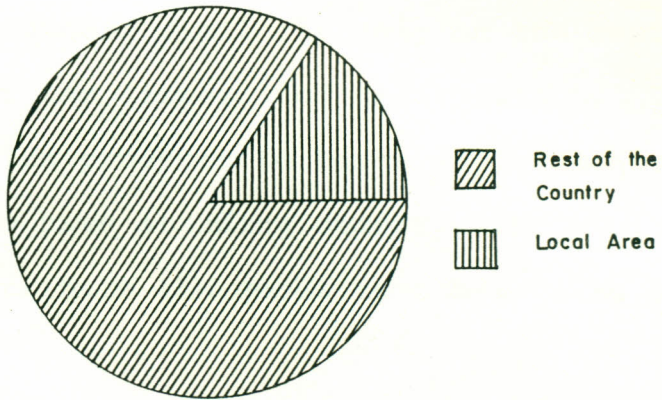
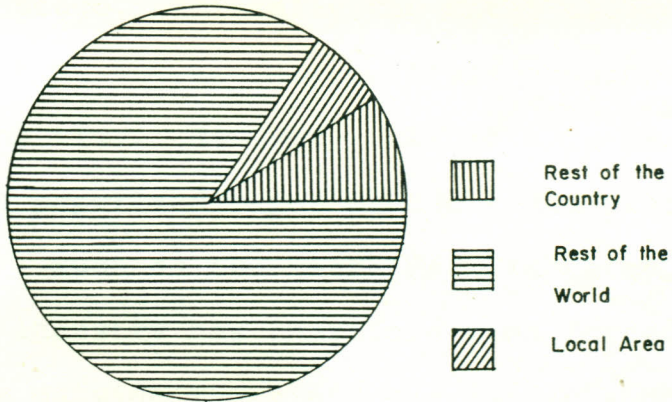


FIGURE 4.4: MARKET SPATIAL LINKAGE: THE FRUIT AND VEGETABLE INDUSTRY



product to Muranga's mainly because it is owned by Muranga Coffee Growers Union which set up the industry in order to provide its members with cheap animal feeds. In this way coffee farmers in Muranga benefit from an industry in Thika. The clothing and textile producers similarly rely on the rest of the country for the disposal of their output. The industry sends its products to large wholesale buyers in Nairobi who have standing orders. The wholesalers then redistribute the goods to other parts of the country.

The engineering and metal products industry, as far as market spatial linkages are concerned is in a transition stage. Initially the metal products industry was set up to provide the fruit canning industry with canning tins. However, this role is being taken over by the paper and paper products and plastic industries such as the Tetra Pack Industry in Nairobi. The industry has therefore been forced to look for markets outside Thika and has become a successful supplier of canning tins to the Kenya Meat Commission and the East African Industries.

The Leyland Motor Company was never meant to have Thika as its market target. The factory, however, supplies customers in Nairobi and other parts of Kenya with locally assembled vehicles.

Apart from the fruit and vegetable, leather tanning and the vegetable chemical industries that have

strong external linkages with the rest of the world, the other industries have no external raw material linkages. The Kenya Cannery, the Kenya Fruit Processors and the Kenya Nut industries produce goods for export. The Kenya Cannery exports its fruit to Britain and the United States while the Kenya Fruit Processors sells to Switzerland. The Kenya Nut company exports its products to Japan (Fig. 4.4).

The leather tanning industry exports most of its leather. The fact that the large shoe manufacturers in Kenya such as the Bata Shoe Company and the Tiger Shoe Company have their own tanning facilities partially accounts for the tanning industry's focus on exports. The vegetable chemical industry produces tannin for export. It sells 67 per cent of its output to the world markets.

In summary the manufacturing industries in Thika with strong market linkages with the local economy are the bread, confectionery, grain milling, furniture fixtures, fibres plastics and rubber, paper and paper products. Strong market linkages with the rest of country are exhibited by the animal feeds industry, clothing and textiles and engineering and metal products. The fruit and vegetable, the leather tanning and the chemical products have strong external linkages.

Raw Material Spatial Linkages of  
Large Scale Firms

Table 4.4 reveals that apart from four large industries raw material spatial linkages of large scale industries with the local area are poorly developed. This implies that the majority of the large scale industries rely on sources outside Thika for their supply of raw materials. The locally resource - based large scale industries include the fruit and vegetable, the bread and confectionery, furniture and fixtures and vegetable chemicals. Large scale industries with strong raw material linkages with the rest of the country include the grain milling, the animal feeds, the leather tanning, clothing and textiles, paper and paper products industries. Strong market linkages with the rest of the world are exhibited by the fibre, plastic and rubber, and the engineering and metal products. Most of the large scale industries in Thika have no linkages with the rest of the world. The table further reveals that the large scale industries are more dependent on the rest of the country than they are on the local area. This suggests that Thika has no basic raw materials to support her large scale industries.

The Raw Material Spatial Linkages  
of Small Scale Firms

Table 4.5 depicts the raw material spatial linkages of small scale firms. The Table reveals that

Table 4.4. RAW MATERIAL SPATIAL LINKAGES OF LARGE SCALE INDUSTRIES

INDUSTRY	LOCAL AREA	REST OF COUNTRY	REST OF WORLD
Fruit and vegetable	0.7661	0.0907	0.1432
Bread and confectionery	0.8413	0.1677	0.0000
Grain milling	0.1254	0.8609	0.0000
Animal feeds	0.0000	0.8718	0.2231
Leather tanning	0.2319	0.7790	0.0000
Clothing and textile	0.0000	0.8039	0.2576
Furniture fixtures	0.5788	0.4376	0.0000
Fibre, plastic and rubber	0.0000	0.3954	0.6102
Engineering, metal products	0.0000	0.0000	0.9981
Paper products	0.2685	0.7492	0.0000
Vegetable chemicals	0.7161	0.2867	0.0000

Source: Field Data 1986

Table 4.5 RAW MATERIAL SPATIAL LINKAGES OF SMALL SCALE FIRMS

Table of Technical Coefficients

INDUSTRY	LOCAL AREAL	REST OF COUNTRY	REST OF THE WORLD
Fruit and vegetable	0.3689	0.6321	0.0000
Bread and confectionery	0.0311	0.9789	0.0000
Grain milling	0.4295	0.5800	0.0000
Animal feeds	0.3915	0.6185	0.0000
Leather tanning	0.4522	0.5478	0.0000
Clothing and textiles	0.0000	0.9972	0.0000
Furniture fixtures	0.6452	0.3548	0.0000
Engineering metal products	0.0000	0.7072	0.3035

Source: Field Data 1986

small scale industries have poorly developed raw material linkages with the local economy. Small scale industries that exhibit fairly strong linkages with the local economy are the grain milling, the leather tanning and the furniture fixtures. Like the large scale industries, the small scale industries exhibit strong linkages with the rest of country. The small scale industries have poor linkages with the rest of the world. Apart from the small scale metal and engineering firms which depend on supplies from the rest of the world, the others have no linkages with supplies outside Kenya.

In summary, the small scale industry is heavily dependent on the rest of the country for its raw material supplies. Its linkages with the local area and the rest of the world are poorly developed.

Market Spatial Linkages of Large  
Scale Industries in Thika

Table 4.6 shows the market spatial linkages of large scale firms in Thika. Large scale industries with strong market linkages with local area are: the bread and confectionery, grain milling, furniture fixtures, fibres plastic and rubber and the paper and paper products industries. The market linkages with the rest of the country are, however, poorly developed. Large scale industries with

Table 4.6 MARKET SPATIAL LINKAGES OF LARGE SCALE INDUSTRIES

Table of Technical Coefficient

INDUSTRY	LOCAL AREA	REST OF COUNTRY	REST OF THE WORLD
Fruit and vegetable	0.0419	0.1839	0.7742
Bread and confectionery	0.7329	0.3664	0.0000
Grain milling	0.7563	0.2436	0.0000
Animal feeds	0.2214	0.7808	0.0000
Leather tanning	0.1641	0.2999	0.6800
Clothing and textile	0.0000	1.0000	0.0000
Furniture fixtures	0.7366	0.2767	0.0000
Fibres, plastics and rubber	0.8433	0.1621	0.0000
Paper and paper products	0.7805	0.4773	0.0000
Vegetable chemicals	0.0186	0.3668	0.6793
Engineering, metal products	0.5227	0.4773	0.0000

Source: Field Data 1986

strong market linkages with the rest of the country include the animal feeds, the clothing and textiles and the engineering and metal products. Similarly market linkages with the rest of the world are poorly developed. Industries with strong linkages with the rest of the world include the fruit and vegetable, the leather tanning, and the vegetable chemical industries.

#### Market Spatial Linkages of Small Scale Industries

Table 4.7 reveals that small scale industries have a fairly strong market spatial linkages with the local area. The bread and confectionery, grain milling, leather tanning, clothing and textiles, furniture fixtures and engineering and metal products utilise the local area as the market for their output. The small scale industries have also made considerable efforts in marketing their goods in the rest of the country. However, their market linkages are low apart from the animal feeds industry which sells 99 per cent of its output to the rest of the country. The market linkages with the rest of the world are insignificant. The small scale industries produce mainly for domestic consumption.

#### Summary of the Findings

The examination of the capital equipment linkages reveals that manufacturing industries in Thika

Table 4.7 MARKET SPATIAL LINKAGES OF SMALL SCALE INDUSTRIES

Table of Technical Coefficients

INDUSTRY	LOCAL AREA	REST OF COUNTRY	REST OF THE WORLD
Fruit and vegetable	0.2419	0.4839	0.2742
Bread and confectionery	0.6646	0.3353	0.0000
Grain milling	0.7329	0.3664	0.0000
Animal feeds	0.0000	0.9956	0.0000
Leather tanning	0.5425	0.4575	0.0000
Clothing textiles	0.6422	0.3578	0.0000
Furniture fixtures	0.7421	0.2579	0.0000
Engineering metal products	0.7533	0.2367	0.0000

strongly depended on the rest of the world for their sources of capital equipment. The spatial raw material linkages with the local area and the outside world both in general and by scale of enterprise were generally weak. The weak linkages with the local area reflect the lack of a raw material basis for Thika's manufacturing sector. The raw material linkages with the rest of the country are, however, strong. This implies that Thika's manufacturing sector heavily depends on the rest of the country. The market linkages with the local economy in general and by scale of enterprise were considerably strong but were generally poor with the rest of the country and the rest of the world. The strong market linkage with the local area indicates that, the manufacturing industries are local market oriented. The weak market linkage with the rest of the country indicates that the industries do not produce commodities for use in the other parts of the country particularly the rural areas.

FOOTNOTES

1

See definition of backward and forward linkages in Chapter 1.

2

The total number of firms that responded was fifty seven. However, only forty nine respondents furnished useful information for analytical purposes.

3

Input - output model provides a convenient framework for measuring inter industry and interregional flows of current inputs and outputs among the various sectors and regions of the economy. It was first developed almost seventy years ago by W.W. Leontief at Havard and was subsequently applied by him and others to the American economy. More recently, it has been applied to a number of developed nations such as Great Britain, Japan and Norway. Mainly because of data and other technical difficulties it has not been applied to a large number of under-developed countries. Kenya applied the input - output model in 1976. But, as yet, it has not produced an interregional input - output model. For an excellent introduction to input - output, see Leontief W.W. (1966). Input - output Economics. Oxford University Press. New York.

4

Firm managers were reluctant to provide information on the value of capital equipment purchased. It was therefore impossible to calculate the technical coefficients for capital equipment linkages. The researcher thus had to rely on the only data given concerning the sources of purchase which are tabulated in Table 4.1 .

## Chapter V: SUMMARY REMARKS AND CONCLUSION

This chapter will first comment briefly on the limitations of the study and suggest possible lines for future research. It will next proceed on to a summary of the findings and their implications for planning and conclude.

### The Limitations of the Study and Suggestions for Future Research

The present study was hampered by lack of sufficient data. In some instances the managers failed to divulge information, for example, on the costs of capital equipment. For this reason, technical coefficients to indicate the strength of capital equipment linkages were not computed. They were only described.

It would have been useful to utilise value added as a measure of manufacturing in addition to or in place of number of establishments and employment. Value added reflects the input of both labour and capital in the manufacturing process and is considered important for comparing the relative or economic importance of manufacturing among industries and geographic areas (Darkoh 1971: 203). However, the difficulty of obtaining information at an appropriate level of areal aggregation made it impossible for the researcher to use it.

The study could also have illustrated the spa-

tial linkages on the basis of districts or provinces since this would have given a clearer picture of the flow of raw materials and the manufactured products within the space economy of Kenya. Lack of sales records showing such a pattern, however, made it impossible.

Furthermore, it would have been useful if adequate data were available to enable an examination of areal changes between overlapping time periods. Also, the examination of variables accounting for intra-urban industrial location would have been enhanced by the incorporation of market and personal considerations. However, difficulties of measurement and lack of adequate data hindered their inclusion in the regression model. Finally this research could have been expanded by comparing Thika with another medium-sized town or examining the problems of Industrial development in the town (which are briefly highlighted in the following section). The lack of time and funds made it impracticable.

In the light of some of these points, future research could follow the following lines: (a) the study could be repeated for the same area after some time span, say five years or ten years in order to observe any intrinsic changes in location and structure; (b) for purposes of comparison, similar research could be carried out in other medium-sized towns such as Nakuru, Eldoret and Kisumu;

(c) research is also needed on the structure and location of small scale industries employing 1-10 persons which have not been covered in this study and (d) more detailed investigation could be carried out on the problems of industrialisation in this medium-sized town.

#### Summary of the Findings

This study set out to do three things, namely: to examine the factors that motivate entrepreneurs to establish industries in Thika, to investigate the factors that account for the spatial distribution of industries and to identify their spatial linkages. The data for the analysis were obtained by the use of questionnaires administered to factory managers.

The information obtained was analysed in three stages. The first stage involved the use of factor analysis to derive the factors that lure entrepreneurs to establish industries in Thika. The second comprised the determination of the significant variables that account for the distribution of industries in Thika by the use of multiple regression, employing stepwise selection technique. The third stage consisted of the computation of technical coefficients to indicate the magnitudes of the spatial linkages. The results obtained were interpreted and presented in chapters two, three and four.

With regard to the factors that attract entrepreneurs to establish industries in Thika, two hypotheses were validated. The first hypothesis which sought to identify the factors that motivate entre-

preneurs to establish industries in Thika was accepted. It was noted that the significant factors that motivate entrepreneurs to establish industries in Thika are: availability of land and business information, accessibility to raw materials, transport costs, cheap non-skilled labour and social services.

The second hypothesis that variations in management images reflect different types of scales of organisation was also accepted. Variations in management images between large scale and small scale industries were observed. The large scale entrepreneurs perceived government support to industry, availability of skilled labour, availability of services, accessibility to internal and external business information important in their location decisions. The small scale industries; on the other hand, considered production cost-saving factor, access to the national market, accessibility to internal business information, availability of services, cheap non-skilled labour and environment-related factors as important in their location decisions.

The hypothesis that, the spatial distribution of manufacturing industries in Thika in general and by scale of enterprise, is positively related to the elements of the space economy of Thika was validated at three levels. At the first level the hypothesis was accepted. The price of land, the presence of a

major highway, the presence of a railway line or siding were the significant factors responsible for the distribution of industries in general. Similarly, the second hypothesis was accepted. The presence of a railway line or siding, price of land, supply of electricity and distance from the Central Business District accounted for the distribution of large scale industries. The hypothesis was however rejected at the third level. This indicated that the spatial distribution of small scale industries is not influenced by the variables considered in the analysis. The distribution of small scale industries is largely due to personal considerations and market-related factors that were not included in the regression model.

The hypothesis that, there exists low spatial linkages between Thika's manufacturing industries and the space economy of Thika and of the rest of Kenya, and high linkages between the industries and the space economy of the rest of the world, was only partially validated. The industries exhibited strong capital equipment linkages with the rest of the world than with the local area or rest of the country. Raw material linkages with the local area were considerably weak. The fruit and vegetable, bread and confectionery, furniture and fixtures and the vegetable chemical industries were the only industries with

strong linkages with the local area. Raw material linkages with the rest of the country were fairly well developed. Industries that exhibited strong links with the rest of the country are grain milling, animal feeds, leather tanning, clothing and textiles, paper and paper products. Contrary to what was expected, the manufacturing industries had weak raw material linkages with the rest of the world. The fibres, plastics and rubber, and the engineering and metal products industries were the only industries with strong external raw material linkages.

Unlike the raw material linkages, market linkages with the local area were fairly well developed. The bread and confectionery, grain milling, furniture and fixtures, fibres, plastics and rubber, and the paper products industries had strong market links with the local area. Market links with the rest of the country were generally weak. The only industries with strong market linkages with the rest of the country were the animal feeds, the engineering and metal products industries. Similarly, the market links with the rest of the world were weak. The fruit and vegetable, the leather tanning and the vegetable chemical industries were the only ones with appreciable links with the rest of the world.

Implications of the Study for  
Planning Purposes

From the analysis it can be observed that Thika offers attractive conditions that lure entrepreneurs to establish industries. This has led to the increase in the number of manufacturing industries within the town. At the time of independence in 1963 the town had only eight major manufacturing firms. During the period of the field study (1986), the number of industries had increased to sixty.

Mounting diseconomies arising from urbanisation and rapid establishment and polarised distribution of industries in the town are discernible today. These include, traffic congestion, water shortages, lack of housing, congestion in schools, hospitals and other facilities such as banks. These diseconomies are indicative of strain in the town's infrastructure.

The existing services and infrastructure, the researcher noted, were inadequate and poorly maintained. The major streets leading to the factories were unkempt. Particularly, the Factory Road which links the industrial area with the town centre is filled with potholes and the sides are worn out by erosion. In addition, most of the factory managers noted that the municipal water supply was inadequate. The water problems are most acute during the dry season. The managers also conceded that their new

employees are experiencing difficulties in acquiring houses and in finding places for their school-going children. Thus, there is an urgent need not only to improve the existing infrastructure and services but also to expand them.

To meet the costs of maintaining and expanding these facilities the industries can be made to pay a special tax for all the services provided by the local authority, in addition to the user rates paid. Through such taxes the local authority will be able to provide infrastructure without waiting for funds from the Central Government.

The spatial concentration of industries in some parts of the town is a remarkable feature in the intra-urban industrial location. These spatial concentrations are mainly due to the price of land, the presence of a major highway and the presence of a railway line or siding. These industrial clusters occur as the industries try to take advantage of the above resources.

The researcher noted that there is a bias in the provision of infrastructure within the town. There is a tendency to build more streets, sewerage and drainage facilities as well as supply electricity and piped water to leading industrial wards. Kiganda and Market wards are well served with infrastructure while wards without major industries such as Kariminu, Chania and Karibaribi are not.

There are problems associated with Thika's spatial concentration of industries. The existing concentrations pose constraints to land use planning and the provision of infrastructure. In addition, they cause congestion and are a health hazard.

The spatial concentrations of industries at certain parts of the town affect the journeys to work within the town. The town's journeys to work are directed towards the industrial area. This has resulted in traffic jams along the Factory Road in the morning when people report to work and in the evenings when people leave from work. It has also resulted in overcrowding in the vehicles.

The polarised distribution of industries within the town has also led to imbalance in the intra-urban distribution of population. This is because the residential facilities and other commercial activities tend to be established close to the industrial estates to meet the needs of the factory workers. About half of Thika's population is concentrated in estates neighbouring the industries. These are the Makongeni Housing Estate, United Textile Industries Residential Estate, Pilot Housing Scheme, Kamenu Phase 1-4, Kimathi and Ziwani Estates. These estates are at an average distance of 1-2 kilometres from the industrial area.

Although land prices in the industrial area

have been deliberately kept low to lure industrialists, other urban activities seem to be taking advantage of this bonanza. Among these are the activities of real estate. Residential areas such as Makongeni Estate, Pilot Housing Scheme and the United Textile Industries Residential Estate have been set up by realtors close to the industrial areas, taking advantage of the cheap land prices.

This juxtapositioning of industries against the residential estates is a health hazard about which residents have complained. Complaints have been made concerning environmental pollution caused by effluent discharges and excessive noise from the factories. During the time of the research, the author witnessed a mass protest organised by the residents of Makongeni Estates against air pollution by a chemical manufacturing firm. This mass protest indicates that the urban residents are conscious of the health hazards posed by the industries. Another industry that is a threat to health is the tanning factory. This industry is accused of polluting the Thika river by discharging untreated effluent into the river and emitting offensive smells.

The possibilities of industrial accidents occurring and affecting the urban residents cannot be ruled out. The most common accidents are gas leakages and fires. The Bhopal industrial disaster

in India in 1986, which involved the leakage of a deadly gas - Methyl Isocyanate Gas (MIG) - from a pesticide factory is the best example. Similarly, the conflagration which caused the destruction of the steel rolling mill in March 1987 in Ruiru, a small industrial town situated a few kilometres from Thika, serves to indicate the likelihood of such industrial accidents occurring in a rapidly developing industrial town such as Thika.

Another disturbing fact about the current pattern of distribution is the unregulated and haphazard pattern of industrial location. Factories are located close to each other without regard to the nature of their products or waste emitted. Food manufacturing firms and animal feeds industries are situated close to industries manufacturing or utilising dangerous chemicals. Examples include the establishment of the Kel Chemical Company and Allied Rubber Company within the vicinity of the Kenya Fruit Processors, the Kenya Nut Company, Kenblest Bakeries, the Kenya National Trading and Cereal Board, the Muttu Products and Muus Kenya Ltd. The possibilities of effluent discharges from the chemical industry polluting the human food and animal feeds products cannot be ruled out. As yet, the municipal authorities in Thika have no industrial location and land use policy for the city.

In view of these problems the researcher recom-

mends that a comprehensive industrial location and land use planning policy be formulated and enforced in Thika. Industrial, residential and commercial activity zones should be redefined. Strict measures governing land use within the town should be enforced. This would involve amending the current municipal and urban statutes to ensure that authorities have absolute control of land use policy. An effective machinery needs to be set up to ensure that urban land use laws and regulations are scrupulously obeyed. In the industrial area, separate zones can be set apart for the various types of manufacturing activities.

Land use planning in the town can also be enhanced by the use of a "carrot and stick" policy especially in the planning for intra-urban industrial location. The municipal council would provide incentives in certain areas and impose heavy taxes on the overcrowded ones or on areas close to residential estates.

To control environmental pollution and industrial accidents, it is recommended that land use planners should not only emphasize economic variables in their planning process but should also take into account environmental health-related variables. They should incorporate variables such as the position and condition of rivers, underground water levels, direction of the wind, air and water pollution levels. In addition the local authority should ensure that buildings and equipment have the right specifications to

ensure that necessary precautionary measures against accidents are taken. A centre for monitoring air and water pollution levels should also be established. Such a centre can be extremely useful in alerting the public and the industries on the changes in pollution levels. In the case of accidents, it can inform the urban residents on precautionary measures to be taken. The industries can be made to pay a special pollution tax. In so doing, funds for monitoring and controlling pollution levels will be made available.

One notable deficiency in the structure of industry in Thika is the existence of weak capital linkages with the local area as observed in chapter four. To overcome this problem, Thika needs a capital goods industry that will provide basic machinery and spare parts for other industries. To accomplish this Kenya can take advantage of the Preferential Trade Area to obtain metallic minerals such as iron and coal from Tanzania, Zambia and Zimbabwe for use in the capital industry.

Future industries in Thika should be more locally resource based. They should engage in the processing of local agricultural products such as coffee, tomatoes, vegetables and beans. This will in turn promote trade and backward linkages within the local economy.

The existence of strong raw materials and weak market links between the industries and the rest

of the country indicates a trade imbalance in exchange relations between the industries and the rest of the country. This indicates that the industries are more dependent on the rest of the country for their supplies of raw materials but provide nothing in return. The imbalance in exchange relations emphasizes the trade imbalances that exist between the urban centres and their hinterlands which are essentially rural. To arrest this problem industries that cater for rural needs, particularly, those involved in the processing of local raw materials should be promoted. This also calls for the establishment of industries that will produce fertilisers, agricultural tools and other implements.

In conclusion, Thika is a rapidly developing medium-sized industrial town. However, there are certain aspects that should be looked into to ensure that a firm and regulated structural and spatial pattern of industries is established. This involves the formulation of a comprehensive physical plan and industrial location policy to redress the problem of uncontrolled intra-urban location of industries, the improvement and expansion of the service infrastructure to encourage further industrialisation and the development of an internally linked network of productive activities to foster strong backward and **for-**ward linkages in the space economy.

APPENDIX A. INDUSTRIES VISITED

1. Kenya Fruit Processors Ltd.
2. Kenya Nut Company Ltd.
3. Kenya Cannery
4. Kenjoy Fruit Processors
5. Metal Box Kenya Ltd.
6. Leyland Vehicle Assembly
7. United Textile Industries
8. Thika Cloth Mills
9. Yuken Textile Industry
10. Mwacheta Fabrics
11. Popular Industries
12. Kenya Taitex Cloth Mills
13. Kenya Paper Mills
14. Polysack Kenya Ltd.
15. Thika Rubber Industry
16. Allied Rubber Industry
17. Mwangi Rubber Industry
18. Kenya Synthetic Fibre Industry \*
19. Kim Stylex
20. Kenblest Bakeries
21. Broadway Bakeries
22. Viran Confectioners
23. Thika Confectionery works
24. Thika Flour Mills
25. Midland Flour Mills
26. Rafiki Flour Mills

27. Munene Industries
28. Kamau Workshop
29. Thika Saw Mills
30. Gatura Workshops
31. Ready Timber Workshop
32. Bulleys Tanneries
33. Thika Tanning Extract
34. Thika Hides and Skins
35. Kiharu Workshop
36. Kensack Fibre Industry
37. Booths Kenya Limited
38. Kenknit Fabrics
39. Deeps Kenya Limited
40. Muus Kenya Limited
41. Muttu Products
42. Kel Chemicals \*
43. Runyua Coffee Factory \*
44. Ndarugu Coffee Factory \*
45. Chania Coffee Factory \*
46. Bupco Textile Industry
47. Thika General Workshop
48. Thika Bakeries
49. Mangu Investment Coffee Factory \*
50. L.N. Kamau's Coffee Factory \*
51. Kabaki Coffee Factory \*
52. Gakai Coffee Factory \*
53. British American Tobacco \*

54. Bob Harries Coffee Factory \*
55. Kijito Engineering Works
56. Bakex Flour Mills
57. Thika Leather Works \*

\* The information furnished by these industries was not useful in the analysis of the spatial linkages.

APPENDIX B: QUESTIONNAIRE

This questionnaire seeks to obtain information on: factors that influenced your decision to locate in Thika, plant organisation, the geographical distribution of sources of capital equipment, raw materials and markets for your final products.

The information obtained will be strictly used for research purposes and will not be divulged in a manner likely to prejudice a firm's operations. For this reason a firm's identification will be based on the following firm categories.

- (i) Fruit and vegetable processing
- (ii) Bread and confectionery processing and grain milling
- (iii) Furniture, saw milling and furniture fixtures
- (iv) Textile and apparel
- (v) Edible fats and oils
- (vi) Tobacco and cigarette processing
- (vii) Engineering and metal works
- (viii) Footwear and leather tanning

1.0. IDENTIFICATION. (tick where appropriate)

1.1. This firm is a,

1. Fruit and vegetable processing

2. Grain milling, Bread and confectionery

- 3. Furniture, saw milling and furniture fixtures
- 4. Textiles and apparel
- 5. Edible fats and oils
- 6. Tobacco and cigarette processing
- 7. Synathetic fibre and rubber industries
- 8. Engineering and metal works
- 9. Chemical and paint industries
- 10. Footwear and Leather Tanning

1.2. When did this firm begin to operate?

1.3. This firm is a,

Privately owned firm

A joint venture between the Kenya

Government and a foreign Company

A branch plant of non-Kenyan company

Other specify \_\_\_\_\_

2.0. LOCATION

2.1. Below is a list of factors which influence decisions to establish a firm. Consider your decision to establish this firm, and please indicate the level of importance of each factor that influenced your decision to establish your firm in Thika, by indicating very important, (VI) important, (I) not important, (NI) not very important, (NVI)



Rainfall  
Temperature  
Access to internal business information  
Access to external business information

VI	I	NI	NVI

2.2. From the above list rank in order of importance the factors that influenced your decision to locate in Thika.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

3.0. SITE FACTORS

3.1. Approximately, what is the distance from the site of your firm to the town centre?

At the town centre

0 - 2 km

3 - 5 km

6 - 8 km

more than 9 km

3.2. From the list below, rank in order of importance the factors which you specifically considered important when choosing the site to establish your firm.

- Nearness to a residential unit
- Availability of land for expansion
- Cost of land
- Presence of a railway line
- Presence of a major street
- Accessibility to a source of water
- Nearness to the town centre
- Presence of electricity
- Nearness to other firms


4.0. LABOUR

4.1. How many people, on the average do you employ permanently in this firm?

- Between 1 - 50
- " 50 - 100
- " 100 - 150
- " 200 - 250
- " 250 - 500
- " 500 - 750
- " 750 - 1000
- " 1000 and above


4.2. How many people, on the average do you employ on casual basis?

- Between 1 - 50
- " 50 - 100
- " 150 - 200
- " 250 - 500
- " 500 - 750


Between 750 - 1000

" 1000 and above

4.3. Are you faced with the problem of shortage of skilled labour?

Yes \_\_\_\_\_

No \_\_\_\_\_

4.4. Do you have a training programme for your employees?

Yes \_\_\_\_\_

No \_\_\_\_\_

If yes, describe the training programme fully:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4.5. If no, where are they trained?

Government Industrial Training Institutes

Village Polytechnics

University

Other (please specify)

\_\_\_\_\_  
\_\_\_\_\_

4.6. What is your average labour costs (KSh) in a year? .....

5.0. INFORMATION

5.1. Does your firm use the following sources of business information ?

Annual trade reports	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
The Kenya Gazette	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
International Journals	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Daily Newspapers	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Personal contacts	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Economic surveys	Yes	<input type="checkbox"/>		<input type="checkbox"/>
Other (please specify)		_____		

5.2. What are the main difficulties your firm experiences in receiving

(i) Internal business information

\_\_\_\_\_

\_\_\_\_\_

(ii) External business information

\_\_\_\_\_

\_\_\_\_\_

6.0. EQUIPMENT

6.1. What is the total cost of this firm's equipment (KSh)

Between 0 - 50 thousand	<input type="checkbox"/>
" 50 - 150 "	<input type="checkbox"/>
" 150 - 300 "	<input type="checkbox"/>
" 300 - 450 "	<input type="checkbox"/>
" 450 - 600 "	<input type="checkbox"/>
" 600 - 1 million	<input type="checkbox"/>
" 1 million - 20 million	<input type="checkbox"/>
" 20 " - 40 "	<input type="checkbox"/>
" 60 " and above	<input type="checkbox"/>

6.2. Considering the total capital expenditure on firm's equipment, estimate approximately, the cost in (KSh) of equipment purchases from:

	KShs.
Thika	<input type="text"/>
Nairobi	<input type="text"/>
Mombasa	<input type="text"/>
Outside Kenya	<input type="text"/>
Other specify _____	

6.3. Give the main reasons for purchasing capital equipment outside Thika,

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7.0. PRODUCTS

7.1. List the types of products that you produce in this firm.

- 1.
- 2.
- 3.
- 4.
- 5.

7.2. Estimate the annual sales turn over in 1985 in (Kenya Shillings) between:

- 0 - 10 thousand
- 10 - 25 thousand
- 50 - 75 thousand

- 75 - 100 thousand
- 100 - 200 thousand
- 200 - 500 thousand
- 500 - 1 million
- 1 m - 5 million
- 5 m - 10 million
- 10m and above

8.0. GEOGRAPHICAL DISTRIBUTION OF SALES

8.1. Indicate the geographical distribution of sales (in KSh) of your products by the following market regions:

Market Region	Sales 1985 (KSh)
Thika Municipality	.....
Nairobi	.....
Mombasa	.....
Western Regions	.....
Eastern Regions	.....
Outside Kenya	.....
Other - (please specify)	.....

8.2. What are the main problems that prevent your firm from realising maximum sales in?

Thika Municipality, \_\_\_\_\_  
\_\_\_\_\_

Nairobi \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Mombasa \_\_\_\_\_

Western Region \_\_\_\_\_

Eastern Region \_\_\_\_\_

International Markets \_\_\_\_\_

9.0. RELATIONSHIP WITH OTHER FIRMS IN THIKA

9.1. Do you sell any of your products to other manufacturing firms in Thika?

Yes \_\_\_\_\_

No \_\_\_\_\_

9.2. If yes, fill in the following table:

FIRMS NAME	PRODUCT(S)	COST IN (KSH)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

9.3. If you are a subsidiary firm, do you sell any of your products to other parent company firms?

Yes \_\_\_\_\_

No \_\_\_\_\_

If yes, fill the table below:

PRODUCT(S)	COST (KSH)
1.	
2.	
3.	
4.	
5.	
6.	

9.4. Does your firm advertise your products?

Yes \_\_\_\_\_

No \_\_\_\_\_

If yes, what is the approximate cost (in KSh) used in advertisement?

---

9.5. For advertisement, does your firm utilise;

Outside agencies

Parent Company services

Salesmen within the plant

Other - (please specify \_\_\_\_\_)

10.2 GEOGRAPHICAL DISTRIBUTION OF SOURCES OF RAW MATERIALS

(Excludes water and electricity)

10.1. List the raw materials utilised in production in 1985.

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

10.2. Indicate the geographical distribution of the sources of raw materials by notifying the total costs of raw materials purchased from the following source regions:

SOURCE REGION	COST 1985 (KSH)
1. Thika Municipality	
2. Nairobi	
3. Central	
4. Western	
5. Eastern	
6. Mombasa	
7. International Markets	

10.3. Give reasons that prevent your firm from purchasing raw materials from:

Thika Municipality \_\_\_\_\_

\_\_\_\_\_

Nairobi \_\_\_\_\_

\_\_\_\_\_

Central \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Western \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Eastern \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Mombasa \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

International Market \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

10.4. Do you purchase any of your raw materials from other firms in Thika?

Yes \_\_\_\_\_

No \_\_\_\_\_

If yes, fill the table below:

Raw material Packaging materials included	Firms Name	Cost in (KSH)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

10.5. If you are a subsidiary firm, do you purchase any of your raw materials from other parent company firms?

Yes \_\_\_\_\_

No \_\_\_\_\_

If yes, fill the table below:

Raw material (Packaging and Machinery included)	Cost (KSH)
1.	
2.	
3.	
4.	
5.	
6.	

10.6. In purchasing raw materials, do you utilise the services of:

Firm employees

External agencies

Parent Company

Other (please specify \_\_\_\_\_)

11.0. RELATIONSHIP WITH THE SERVICE INDUSTRY

11.1. Does your firm utilise any of these services?

	Yes	No
Legal	<input type="checkbox"/>	<input type="checkbox"/>
Banking	<input type="checkbox"/>	<input type="checkbox"/>
Accounting & Auditing	<input type="checkbox"/>	<input type="checkbox"/>
Postal	<input type="checkbox"/>	<input type="checkbox"/>

	Yes	No
Residential	<input type="checkbox"/>	<input type="checkbox"/>
Health	<input type="checkbox"/>	<input type="checkbox"/>
Education	<input type="checkbox"/>	<input type="checkbox"/>
Transport	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify) _____		

11.2. Please indicate the total cost (KSh) your firm paid for each of these services in 1985.

SERVICE TYPE	COST (KSH)
Legal	
Banking	
Accounting/Auditing	
Postal	
Residential	
Health	
Education	
Transport	

11.3. If your firm possesses any of these services, please indicate the service type(s) your firm possesses and the amount of capital spent in providing for each of the service type named:







APPENDIX D - EIGENVALUES ALL INDUSTRIES

VARIABLE	COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
V01	0.90542	1	4.92522	32.3	32.2
V02	0.52506	2	2.30429	15.1	47.2
V03	0.74685	3	2.10223	13.7	61.0
V04	0.30277	4	1.42682	9.3	70.3
V05	0.88108	5	1.16232	7.6	77.9
V06	0.60502	6	1.12816	7.4	85.3
V07	0.55579	7	0.89482	5.8	91.1
V08	0.87047	8	0.76769	5.0	96.1
V09	0.60333	9	0.58994	3.9	100.0
V10	0.20156				
V11	0.49785				
V12	0.64486				
V13	0.60589				
V14	0.45789				
V15	0.80571				
V16	0.62297				
V17	0.56816				
V18	0.54004				
V19	0.48505				
V20	0.47188				
V21	0.24171				
V22	0.53483				
V23	0.49917				
V24	0.44153				
V25	0.61458				
V26	0.77008				
V27	0.50281				

## APPENDIX E - VARIMAX ROTATED MATRIX ALL INDUSTRIES

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
V01	-0.04021	0.12675	-0.08166	0.02544	0.08808	0.06695	0.98136	0.08933	0.07660
V02	0.13894	0.67033	0.06659	-0.07565	0.07062	0.07489	0.14659	-0.04817	-0.06145
V03	0.35230	0.05599	0.24253	0.26120	0.47215	-0.25823	0.15054	0.21150	-0.36748
V04	0.00356	-0.14649	0.06297	-0.18067	0.48820	0.14482	0.04979	0.11463	0.06780
V05	0.11233	-0.09199	-0.12110	0.00409	0.19474	0.76125	0.12407	0.02102	0.10981
V06	0.57590	0.14234	0.19543	-0.26302	0.24733	-0.12371	-0.02578	-0.20361	0.16347
V07	0.28107	0.30105	0.20540	0.28984	-0.11443	0.40753	-0.14681	-0.20615	-0.12936
V08	0.83632	0.20886	-0.08229	0.07426	0.23754	0.07206	0.08219	-0.20720	0.06180
V09	0.25164	0.09189	-0.54542	-0.14711	-0.18991	0.04718	0.33052	-0.04682	0.25040
V10	0.08011	-0.06463	-0.01377	-0.03009	0.03009	0.00516	0.01535	0.03671	0.43375
V11	-0.28221	0.04496	0.21113	0.11803	-0.13282	0.02239	0.12871	0.56469	-0.06396
V12	0.17659	-0.12550	0.16429	0.01418	-0.11783	0.10727	0.02180	0.73011	-0.10862
V13	0.12228	0.03900	0.71014	-0.18451	-0.11221	0.00684	-0.01238	0.19072	-0.04131
V14	0.16256	0.03034	0.03928	-0.13336	0.58076	0.21037	-0.09340	-0.12120	-0.07913
V15	-0.18188	-0.45668	0.36225	0.29885	-0.10580	0.25828	-0.04934	0.49155	0.14685
V16	-0.55603	-0.06922	0.08489	0.16918	-0.14741	0.07458	-0.06386	0.48761	-0.06359
V17	0.02015	0.19798	0.23776	0.65849	-0.10282	-0.12722	-0.03623	-0.02111	0.09948
V18	-0.05752	0.63786	-0.16891	0.20786	-0.08607	-0.13686	-0.02776	0.15665	0.08171
V19	0.24025	0.47686	0.01409	0.19878	-0.09997	-0.34514	0.00429	0.06293	0.16471
V20	0.15958	0.41065	-0.06160	0.09405	0.01604	0.07050	0.19539	0.01876	0.47051
V21	0.13094	0.13636	-0.03758	-0.14711	0.35943	-0.19001	0.04154	-0.11774	-0.04509
V22	-0.29463	-0.15346	0.00660	0.50979	-0.23125	-0.07955	-0.03319	-0.08365	0.31087
V23	0.00918	0.00377	0.58848	0.22335	0.20166	-0.08806	-0.00189	-0.20913	0.10351
V24	0.10160	0.50581	0.38801	-0.02232	0.04257	0.01573	-0.00450	0.00540	-0.14900
V25	0.74126	-0.00463	0.05263	-0.10302	-0.08503	0.17869	-0.06469	-0.07734	0.04882
V26	0.63988	0.25634	0.01842	-0.34601	0.27326	-0.05353	-0.02501	-0.20162	0.23671
V27	-0.20184	0.06560	-0.12229	0.62942	-0.15170	0.06859	0.06227	0.12209	-0.01204

APPENDIX F - FACTOR MATRIX LARGE SCALE INDUSTRIES

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
V01	0.15680	0.37703	-0.47798	0.08759	-0.31571	0.08486	-0.24555	0.33981	-0.05206
V02	0.50613	-0.01635	-0.12598	0.09920	-0.42678	0.05591	0.39927	0.20725	0.10550
V03	0.44712	-0.03198	0.10111	0.52416	0.13198	-0.44618	-0.09528	-0.07863	0.00125
V04	-0.17545	0.44710	-0.08124	0.60176	0.31767	0.24565	0.13118	0.02219	0.04813
V05	-0.29730	0.54754	0.01815	0.19840	-0.10396	0.41769	0.02621	0.03396	0.11044
V06	0.22042	0.12103	0.28243	-0.26795	0.25638	-0.32934	0.31650	0.45636	0.27668
V07	0.08943	-0.06989	0.23048	-0.21158	-0.28718	0.32999	0.42675	-0.21791	-0.04053
V08	0.33906	0.41494	-0.10161	0.12795	0.21645	-0.12389	0.30114	-0.09241	-0.29535
V09	-0.10929	0.32243	-0.52060	-0.28527	0.07615	0.00721	-0.19118	0.23739	-0.24051
V10	0.01551	0.35860	-0.31072	-0.31622	0.04695	-0.18194	-0.03946	-0.24625	0.53226
V11	0.51837	0.39582	0.28461	0.03492	-0.20837	-0.02457	-0.15872	0.07567	-0.04746
V12	-0.30454	-0.61676	-0.05469	-0.22158	-0.02736	0.26230	0.04848	-0.01088	-0.17209
V13	0.52073	0.00442	0.55114	-0.16497	-0.03779	0.22423	-0.02159	-0.11943	0.09945
V14	-0.23971	0.01578	0.05964	0.58304	-0.11375	0.16542	0.07505	-0.22474	0.11326
V15	-0.03625	0.41857	0.49577	0.03819	0.41786	0.30307	-0.28280	-0.00698	0.19345
V16	0.19645	0.15832	0.33559	0.07887	0.03991	0.16565	-0.15654	0.18134	-0.18692
V17	0.63882	-0.25254	-0.08310	-0.05798	0.22520	0.12503	-0.25508	-0.20815	0.10376
V18	0.72077	-0.05273	-0.35230	0.04878	-0.04878	0.29572	-0.02293	-0.12934	-0.14352
V19	0.70510	-0.02745	-0.25667	-0.15278	0.21656	0.08207	0.00923	-0.28847	-0.25550
V20	0.39403	0.31677	-0.34372	-0.24809	0.06946	0.26489	0.06942	0.18182	0.16404
V21	0.01603	-0.1183	-0.12955	0.47260	-0.23774	-0.17581	0.21616	-0.09166	0.08742
V22	0.26113	-0.44755	0.05416	0.23144	0.49379	-0.01334	0.11294	0.33831	-0.16531
V23	0.29773	-0.30837	0.22720	0.10306	-0.07009	0.06002	-0.28742	-0.07678	0.24438
V24	0.54625	-0.16401	0.36615	0.13765	-0.30402	0.07785	-0.00746	0.35540	0.06327
V25	-0.06708	0.32665	0.35208	-0.27852	0.23930	0.06564	0.45638	-0.11456	-0.10071
V26	0.21378	0.52468	0.29979	-0.15670	-0.26739	-0.43002	-0.10484	-0.28091	-0.28232
V27	0.38176	-0.08415	-0.51719	0.12798	0.21047	-0.01365	0.21382	-0.12305	0.30463

CONTD. APPENDIX F - FACTOR MATRIX LARGE SCALE  
INDUSTRIES

	FACTOR 10	FACTOR 11
V01	0.44330	-0.02369
V02	-0.05128	0.07694
V03	0.18056	-0.08347
V04	0.04813	0.18814
V05	-0.11742	-0.02667
V06	-0.08223	0.12949
V07	0.05442	-0.11883
V08	0.29503	0.14821
V09	0.04035	-0.17680
V10	0.05947	0.14038
V11	0.14453	-0.22574
V12	0.36544	0.22473
V13	0.24207	-0.05428
V14	0.02097	0.22399
V15	0.09990	-0.11466
V16	-0.39468	0.17592
V17	-0.04285	-0.07182
V18	-0.17785	0.03811
V19	-0.13235	-0.01031
V20	-0.18235	0.05964
V21	-0.17701	-0.42200
V22	-0.00139	-0.05326
V23	0.10258	0.06622
V24	0.06664	0.12717
V25	0.16262	-0.19619
V26	-0.08329	0.28742
V27	0.12617	0.06621

## APPENDIX G - VARIMAX ROTATED MATRIX LARGE SCALE INDUSTRIES

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
V01	0.02777	0.01513	0.11243	0.89453	0.02019	0.17270	0.04681	-0.14363	-0.07692
V02	0.20999	0.14797	-0.00162	0.10392	-0.01674	0.75898	0.00289	-0.03097	0.07790
V03	0.13937	0.30750	0.09729	0.00196	0.67929	-0.00614	0.16520	-0.09822	-0.03185
V04	-0.01477	-0.19056	0.81997	0.12606	0.17922	-0.11051	-0.05820	0.11834	0.17717
V05	-0.17115	-0.08721	0.52272	0.21018	-0.42200	-0.08442	0.00847	0.12402	0.27139
V06	-0.20818	0.05004	-0.29320	-0.13582	0.35225	0.28200	-0.04945	0.27893	0.53686
V07	0.07724	0.18020	-0.03599	-0.17383	-0.40228	0.28139	0.00443	0.43682	-0.19692
V08	0.28052	-0.10495	0.26307	0.22688	0.41315	0.12259	0.29432	0.42732	-0.01728
V09	0.11162	-0.46108	-0.18490	0.58591	-0.08399	-0.17968	-0.01955	-0.00351	0.07950
V10	0.04460	-0.06775	-0.04652	0.08171	-0.07635	-0.06505	0.13490	-0.00198	0.05940
V11	0.12983	0.47265	-0.06840	0.36580	0.05080	0.04718	0.33355	0.20164	0.25325
V12	-0.10910	-0.00992	-0.10203	-0.11222	-0.11389	0.05125	-0.32211	-0.05490	-0.59291
V13	0.18405	0.73282	-0.10653	-0.05420	-0.04059	0.03580	0.10753	0.34721	0.07347
V14	-0.15333	0.06522	0.64822	-0.18717	-0.03343	0.04839	0.00805	-0.16150	-0.17287
V15	-0.10835	0.39729	0.27336	0.05723	-0.04577	-0.55266	-0.04456	0.29445	0.41695
V16	0.11279	0.12162	0.11037	-0.10046	-0.07321	0.00288	0.19104	-0.07931	0.50896
V17	0.65380	0.37577	-0.18320	-0.06679	0.13303	-0.10236	-0.12357	-0.13090	0.02893
V18	0.82854	0.11130	0.02615	0.13070	-0.04186	0.26438	0.00263	-0.11386	0.05273
V19	0.85982	0.02139	-0.15304	-0.00291	0.12833	0.03505	0.12296	-0.10040	0.02093
V20	0.42877	-0.08282	-0.02377	0.27990	-0.16425	0.21628	-0.10031	0.07383	0.39908
V21	-0.02466	-0.08065	0.11761	-0.04675	0.04618	0.16343	-0.06211	-0.05514	-0.07345
V22	0.19528	0.03270	-0.07033	-0.15318	0.53792	0.04237	-0.45893	0.01159	0.11045
V23	0.09575	0.55845	-0.05175	-0.12425	0.06752	-0.00727	-0.06395	-0.25506	-0.06054
V24	0.03546	0.59346	-0.07283	0.05991	0.12116	0.48063	0.02391	-0.08531	0.20599
V25	-0.10124	-0.02933	-0.01429	-0.09221	-0.04228	-0.09870	0.07131	0.79130	0.07693
V26	0.00372	0.05005	-0.05181	0.00077	0.05150	0.01572	0.95274	0.10138	0.14741
V27	0.45058	-0.04507	0.11476	0.04660	0.28386	0.22646	-0.27534	-0.03205	-0.12612

CONTD. APPENDIX G - VARIMAX ROTATED MATRIX LARGE  
SCALE INDUSTRIES

	FACTOR 10	FACTOR 11
V01	0.11178	-0.00039
V02	0.02418	0.16942
V03	-0.02950	0.36532
V04	-0.03767	0.02580
V05	0.04872	0.10325
V06	0.21081	-0.17524
V07	-0.09430	0.03129
V08	0.05216	-0.05574
V09	0.06113	-0.07383
V10	0.82459	-0.04745
V11	-0.07805	0.22569
V12	-0.20348	-0.51045
V13	-0.05471	-0.10662
V14	-0.02242	0.13450
V15	0.03712	-0.10836
V16	-0.34567	-0.11871
V17	0.08070	-0.00262
V18	-0.05437	0.05040
V19	-0.00071	-0.02126
V20	-0.28476	-0.11238
V21	-0.04264	0.73078
V22	-0.37124	-0.08254
V23	0.01045	-0.03054
V24	-0.26019	-0.04165
V25	0.02174	-0.04242
V26	0.04753	-0.02970
V27	0.45145	0.07931

APPENDIX H - FACTOR MATRIX SMALL SCALE INDUSTRIES

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
V01	-0.01970	0.10669	-0.15066	0.19749	-0.31268	0.30796	0.00858	0.27470	-0.29718
V02	-0.24308	0.05017	0.10263	0.12000	-0.01301	0.02826	0.41600	0.14487	-0.35464
V03	0.20652	0.05217	0.16381	0.31244	0.09814	0.13670	-0.24226	0.07223	-0.35589
V04	0.22013	-0.27302	0.10991	0.10355	-0.23350	0.05359	0.17597	-0.01666	-0.05001
V05	0.04762	0.32370	0.30556	-0.07118	-0.23899	0.03945	0.14348	-0.02765	-0.14334
V06	0.16213	-0.16293	0.17104	-0.03205	0.32290	0.25653	0.22147	0.10646	-0.08332
V07	-0.01505	0.07496	0.43518	0.02881	0.22704	-0.09624	0.03991	0.32753	0.14647
V08	-0.03489	0.40505	0.10221	0.07303	0.18472	0.13162	-0.11766	0.03565	0.26296
V09	-0.38327	0.09879	0.09211	-0.11280	-0.13926	0.18408	0.08412	-0.09578	0.06572
V10	0.12687	-0.07266	0.03640	-0.29875	-0.00705	-0.39955	0.23302	-0.04359	0.13277
V11	0.08450	-0.08559	-0.00567	0.07832	0.20145	0.38356	0.31977	-0.13064	0.13110
V12	0.28987	0.21430	0.08771	-0.29165	0.00785	0.13395	0.29522	0.18692	-0.04604
V13	0.23208	-0.23624	0.25066	-0.01235	0.01049	0.01131	-0.15744	0.14614	0.08110
V14	0.03557	-0.03158	0.23296	0.38380	0.02748	0.10193	-0.11789	-0.40601	0.10115
V15	0.36303	0.07599	-0.05264	0.09800	0.19165	-0.17645	0.21376	-0.05893	-0.15053
V16	0.07095	-0.15740	-0.19000	0.34803	-0.16584	-0.13907	0.22860	-0.15365	0.00528
V17	0.16919	0.27224	-0.20625	-0.03062	0.10777	-0.11612	0.06503	-0.24480	-0.37224
V18	-0.34043	-0.07325	-0.02721	-0.04687	0.31828	0.02144	0.23066	-0.04191	-0.10300
V19	-0.14743	-0.02222	-0.29150	0.29050	0.20786	-0.13128	-0.00024	0.26597	0.03656
V20	-0.06082	0.05353	-0.26939	0.23019	-0.36965	0.09944	0.24800	0.11887	0.27350
V21	0.09656	-0.21129	-0.24776	-0.22864	0.08655	0.35973	0.09891	0.14276	0.20433
V22	0.14836	0.25111	-0.30408	-0.21466	-0.20689	-0.07425	-0.07176	0.00981	-0.06471
V23	0.35271	0.07451	-0.02369	0.20804	-0.10791	-0.04279	0.15207	-0.07826	0.31518
V24	-0.08292	-0.02975	0.09734	0.21523	0.17881	-0.42066	0.15480	0.40099	0.05006
V25	-0.01805	0.29281	0.12742	0.09032	0.15220	0.05657	0.03516	0.07973	0.19601
V26	-0.19988	-0.00515	0.19986	-0.00957	-0.11231	-0.10614	0.27525	-0.39875	0.00943
V27	0.02246	0.41168	-0.10508	0.13402	0.20801	0.00881	0.08252	-0.04216	0.21535

CONTD. APPENDIX H - FACTOR MATRIX SMALL SCALE  
INDUSTRIES

	FACTOR 10	FACTOR 11
V01	0.11760	-0.26015
V02	0.29479	-0.00405
V03	0.04777	-0.28723
V04	-0.27576	-0.28578
V05	-0.07637	0.09567
V06	-0.25261	0.28546
V07	-0.16116	0.02307
V08	-0.17209	0.04045
V09	-0.10613	-0.03728
V10	0.28666	-0.06092
V11	0.39298	-0.21923
V12	-0.08874	0.04331
V13	0.33166	0.06532
V14	0.02146	0.15747
V15	-0.03542	0.00490
V16	-0.27113	-0.11006
V17	-0.04873	0.07786
V18	-0.19315	-0.28659
V19	0.15854	0.39668
V20	0.04012	-0.18730
V21	-0.13872	0.16752
V22	0.08680	-0.09191
V23	0.05417	0.19027
V24	-0.12304	-0.01844
V25	0.32404	-0.27514
V26	0.10026	0.38491
V27	-0.16867	-0.03959

## APPENDIX I - VARIMAX ROTATED MATRIX SMALL SCALE INDUSTRIES

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9
V01	-0.04746	-0.10772	0.02904	0.04088	-0.03068	0.10156	-0.01039	0.68929	-0.03236
V02	-0.17157	-0.02405	0.04877	-0.04788	-0.05469	-0.25218	0.12434	0.39514	0.31286
V03	-0.05709	0.15771	-0.32028	-0.09137	-0.06250	-0.01906	0.18622	0.17538	0.09418
V04	-0.20858	0.35877	-0.05752	0.40837	0.14252	0.00011	-0.03489	-0.04178	-0.00606
V05	0.15282	0.37857	0.00863	-0.08706	-0.00461	0.07959	0.09728	0.25311	-0.07833
V06	0.01485	0.00137	-0.06163	-0.07478	0.66513	-0.03590	0.05884	0.03371	0.03726
V07	0.09946	0.25497	0.02072	-0.01486	0.04559	0.14671	-0.30186	0.09065	-0.16504
V08	0.56083	0.00831	-0.08147	-0.11259	0.04953	0.02647	-0.07436	-0.03723	-0.02647
V09	0.14954	0.16190	0.00589	0.00549	-0.05583	-0.28431	-0.24146	0.10484	-0.01057
V10	-0.21881	0.02991	0.31659	-0.06697	-0.16086	0.16760	0.10215	-0.32282	0.15356
V11	-0.01856	0.01225	-0.03742	0.04714	0.08623	-0.01839	-0.01894	-0.01384	0.71964
V12	0.13928	0.26852	0.36236	-0.06876	0.29218	0.12286	0.14633	0.10288	0.08796
V13	-0.26492	-0.00920	-0.08020	-0.24176	0.04383	0.35210	-0.16872	-0.04826	0.16097
V14	0.08383	0.01344	-0.60031	0.04016	0.00929	0.15069	0.00961	-0.04298	0.06886
V15	-0.00066	-0.00322	0.01679	0.09589	0.13656	0.12268	0.45506	-0.09424	0.08028
V16	-0.06454	-0.01373	-0.13848	0.58328	0.00094	-0.04253	0.13617	-0.04321	-0.07238
V17	0.05946	0.00857	0.02514	-0.03491	-0.03226	-0.05510	0.58546	0.06930	-0.08885
V18	0.03645	0.00459	0.02849	0.06451	0.09301	-0.58904	0.02609	-0.15960	0.12285
V19	0.03827	-0.66744	-0.00784	-0.01237	0.05290	0.05868	0.02138	0.16730	-0.02987
V20	0.11957	-0.03914	0.16746	0.51310	-0.20384	0.07151	-0.21083	0.18440	0.18261
V21	0.02090	-0.12874	0.26287	0.08743	0.44418	0.03837	-0.19974	-0.00850	0.05742
V22	0.05205	0.05263	0.34070	0.01725	-0.25929	0.12595	0.18468	0.07368	-0.08013
V23	0.15097	-0.05402	-0.05397	0.24101	0.06812	0.47460	0.06342	-0.05106	0.11121
V24	0.02564	-0.22598	0.06894	0.08964	0.03218	-0.06904	-0.01154	-0.10141	-0.10897
V25	0.26527	0.02734	0.01297	-0.14350	-0.24115	0.03626	-0.05716	-0.03981	0.41335
V26	-0.06340	0.02194	-0.19514	-0.03219	0.00772	0.01324	0.06742	0.02489	0.01598
V27	0.52971	-0.06608	0.00973	0.09714	0.00043	-0.02443	0.14129	-0.08762	0.05271

CONTD. APPENDIX I - VARIMAX ROTATED MATRIX SMALL-  
SCALE INDUSTRIES

	FACTOR 10	FACTOR 11
V01	-0.05276	-0.06883
V02	0.18714	0.29741
V03	-0.49666	0.09578
V04	-0.15102	0.07889
V05	0.20769	0.13247
V06	0.02690	0.07616
V07	0.03216	0.43234
V08	-0.05150	0.02593
V09	0.23033	-0.09648
V10	0.23753	0.17099
V11	-0.00392	-0.13037
V12	0.02067	0.08061
V13	-0.11204	0.09782
V14	0.15209	-0.08604
V15	-0.05098	0.15071
V16	0.02222	0.06074
V17	0.04474	-0.12436
V18	-0.01196	0.08738
V19	0.04562	0.14755
V20	0.01068	-0.00632
V21	-0.03447	-0.29452
V22	-0.07868	-0.20058
V23	0.13464	0.03552
V24	-0.07466	0.61404
V25	-0.11445	0.15289
V26	0.66908	0.00168
V27	-0.01741	0.03862

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