Industrial location analysis of Sudan

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INDUSTRIAL LOCATION ANALYSIS OF SUDAN

- by -

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(Graduate Society)

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To

Aba

in

Space, place and time

and

Heirs..., Kintibye,

Abdullahi, Bushra...

ABSTRACT

The present study is a modest attempt to analyse industrial location in Sudan, and to explain existing location patterns and industrial localization. Future industrial location trends are examined in the light of past and present development.

The commitment to non-industrialisation in Sudan during the colonial régime has had a pronounced impact on the post-independence spatial distribution of industry. Thus investment policies and development in the pre-independence period are investigated with reference to the set objectives and prevailing opportunities in Chapter Two. Private capital investment was insignificant compared with the public sector which was undertaking 'commercial plantation' and infrastructural capital outlay. However, business and trade was the domain of private entrepreneurship. Public and private sectors were nonetheless complementary to each other and their activities were co-ordinated in what is termed the 'charter government system'. Structural transformation and economic growth (Chapter Three) is seen as a manifestation of this co-ordination and partnership. Planned non-industrialisation, 'growth through trade', and primary export base are all attributed to the development endeavour of this period. An industrial location theory specific to developing countries is expounded in the Prime Base theory (Chapter Four). Localization of industry according to this theory seems inevitable in many other prime bases of developing countries.

In the second part, Sudan's industrial activity is investigated within the context of contemporary urban and regional develop-

ment. In Chapter Five the spatial organisation of the industrial activity in the Prime Base is analysed in some detail, and the regional distribution and pattern of industry in Sudan is examined in Chapter Six. The emergence of secondary bases is seen as part of the economic process, and could be developed to realise industrial regionalisation.

Chapter Seven is a case study of cotton-seed oil to test existing localization as against the 'theoretical optimum' according to classical location theory. Chapter Eight analyses human and natural resources in relation to regional development and future prospects for industrial location. Some suggestions are offered, and policy issues are raised in the concluding remarks.

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ABBREVIATIONS

A.A.D.A.I.	Arab Authority for Development and Agricultural Investment.
A.F.E.S.D.	Arab Fund for Economic and Social Development.
B.A.E.C.	British Agricultural Export Council.
B.C.G.A.	British Cotton Growing Association.
C.A.S.	Current Agricultural Statistics.
C.B.D.	Central Business District.
C.B.I.	Confederation of British Industry.
c.i.f.	Cost Insurance Freight.
F.A.O.	Food and Agriculture Organisation.
f.o.b.	Free On Board.
G.D.P.	Gross Domestic Product.
I.B.R.D.	International Bank for Reconstruction and Development.
IDCAS	Industrial Development Centre for Arab States.
I.L.O.	International Labour Organisation.
I.S.I.C.	International Standard Industrial Classification.
L.C.C.	London Chamber of Commerce.
M.E.E.D.	Middle East Economic Digest.
SAD	Sudan Archive, Durham.
SICm	Standard Industrial Classification (modified).
U.N.	United Nations.
U.N.E.C.A.	United Nations Economic Commission for Africa.
U.N.I.D.O.	United Nations Industrial Development Organisation.

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GLOSSARY

1. Bahri. Although the English translation of the official name is Khartoum North, the local name of Khartoum Bahri is preferred in this study. Consequently, the widely used shorthand of Bahri is adopted.

2. Basic and non-basic industries. Basic industry refers to those industries that serve nationwide and overseas markets, while non-basic industries are confined to local markets. (p.201)

3. Charter Government. The term refers to the assimilation of the functions of the charter government system whereby a functional division and syndication is made between public and private sectors during colonial regimes. (p.39)

4. Industry. Refers to power driven, mechanical operations for the manufacture of consumer and capital goods as distinct from cottage industry. In this research consideration is confined to establishments of 30 or more workers. (p.7)

5. Prime Base. The centre of gravity of industrial and commercial life as expressed in the diversity and disproportionately large number of factories, workers, capital outlay and value added. In the case of Sudan it refers to the tripartite capital of Khartoum, Omdurman and Bahri. (p.101)

6. Profit on cost to Store. Denotes the practice of calculating profit on basic cost plus an extra profit on costs of transportation, insurance and excise duties to the main depots at the Prime Base. (p.120)

7. One-factory industry. Industries that are established in isolation from other industrial activities. These are generally regional public enterprises that process local raw material. (p.203)

8. Mercedes map. A cartographic device that makes it possible to represent simultaneously data on a percentage scale for three variables in such a way that each variable is observed individually and in relation to the other two variables. (p.207)

9. Shadow-entrepreneurs. A concept coined to describe businessmen and traders who were in command of the distribution channels and foreign trade before the advent of industry. Later, when industry was developed, this credit-worthy group was in a better position to invest in industry. (p.131)

10. Thumb-forefinger growth zone. An area defined by the two tips of Khartoum and Port Sudan, and the broad base of Kosti-Sennar, with 'joints' such as Medani, Hassaheisa, Gedarif and Kassala. This area possesses the essentials of economic growth and is shaped as described. (p.323)

CHAPTER ONE

INTRODUCTION

1.1 Theme and Approach

This thesis deals with a specific problem of industrial development: industrial location. Probing the extensive literature on development inevitably disappoints the student of industrial geography, particularly the striking paucity of published material on industrial location in Sudan. Even the limited academic contributions available are often presented from the perspective of economists with an innate bias against spatial dimensions, and preconceived ideas often blurred by the wholesale adoption of existing industrial location models. The task of planners in 'developing' countries is thus hampered by insufficient knowledge. Their work in facing the challenges of rapid economic change, the problem of urban growth, and widening regional disparities is also impeded by having to cope with everyday details at the local level. Nor are there adequate planning strategies available at national level on which industrial location planning can be based. It is hoped that the present study will fill some of the gaps in knowledge and provide a fresh basis for rational planning strategies by offering a new explanation for the process of polarisation, especially industry, and propounding a conceptual and methodological framework against which relevant Sudanese projects may be tested. The endeavour is by no means easy, and arguably there is too little industry and insufficient industrial diversity in Sudan to warrant a specialised study with such ambitious goals. Indeed industry in most 'developing' countries is of recent origin, and contributes

marginally to the gross domestic product (GDP).* However, industry is neither negative in its spatial impact, nor laggard in growth rate relative to other sectors of the economy, and it presents considerable scope for future development.

The most obvious characteristic of industrial development in many 'developing' countries is the sheer spatial concentration of 'basic' private industry serving the market at the national scale. This fact has often been observed, yet unsatisfactory explanations are frequently proferred in terms of an 'undifferentiated list of "favourable location factors"'[1], (i.e. markets, capital, labour, transportation and land.). The immediate questions to be asked will be related to the mechanisms that underpinned the colonial system with its centralised 'charter government', export-import trade, a centralised service sector, and commodity flow system. In turn, these are related to, and determinants of socio-economic structures, sectoral growth and the whole process of change. Thus the purpose of the first part of this thesis is to couch in essentially spatial terms the aggregate economic process insofar as it shapes the industrial location milieu. These processes as interpreted by an essentially historic approach in Chapters Two and Three, may be questioned by those who prefer strictly economic interpretations.

Historic events are relevant in a variety of ways. For instance, the concomitant growth of industry and urbanisation in Western Europe and North America is an historical development not experienced in 'developing' countries. Instead, urban growth and sectoral development both proceeded in complete isolation from

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*About 10-12 per cent in the case of Sudan(1979).

industrialisation. Thus the identification of this disparity and the processes associated with it, is an integral part of the inquiry into industrial location. In fact, our starting point is that industry in the case of Sudan was retarded by the development policies adopted, and the economic system fostered during the first half of this century. Capital investment looms large in this respect, since a distinct linkage between availability of capital, sectoral priorities, and decision-making invariably contributes to the creation of the economic system and induces specific structural changes. Within this system an exposition of the economic processes and their collective interactions is fundamental, as they all intertwine with the capacity of the production system, and marginal surplus thereof created. Throughout these formative developments, industry was either suppressed, discouraged or appeared less remunerative. The seeds of industrial localization are sown in this disparity, a situation unique to territories we call 'developing' countries, and renders irrelevant classical general location theory. Equally important areas to investigate in our bid to explain industrial localization are the laws that nurse the economic systems and sub-systems. Rejecting the prescribed location factors immediately calls for a new alternative; the Prime Base theory,* to piece together specific economic interactions, socio-economic change, and the accompanying structural and organisational change.

The approach is primarily inter-disciplinary, combining the spatial preoccupation of geographers, the abstraction of economic theory, the insights of economic history and the empiricism of

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* This theory attempts to explain the high degree of industrial localization in the heart land of many 'developing' countries, in the case of Sudan the tripartite capital of Khartoum, Bahri and Omdurman. See Chapter Four for fuller definition.

social-anthropology. Regional planning, development theory and urbanisation are also freely transgressed, though with a keen awareness of the pitfalls of being master of none. Concepts such as 'shadow entrepreneurs', 'new wants', and 'thumb-forefinger growth zones' are introduced to describe socio-economic relations, and gauge their spatial influences. At the same time coefficients depicting the geographical association and location quotients are deployed to aid the industrial location analysis of structures, patterns and distribution. It is hoped that these techniques, in combination with correlation analysis and the historic realities of the whole economic system will go beyond the conventional geographic concern of depicting Man's imprint on the earth's surface to concern with decisions that create distributional mosaics and remould activity patterns. Although unusual in industrial geography, it proved possible to use three variables; employment, paid-up capital, and gross value added at the urban and regional levels in this study. However, this only applies to industries employing 30 or more workers. Naturally, industrial structures are more developed in the Prime Base than anywhere else, where there is diversity of sub-groups and, indeed, the highest degree of industrial concentration. On some of the above variables the Prime Base share may often amount to two-thirds of the country's industry. In terms of profitability margins and transfer cost, the localisation of 'basic' private industry in Sudan is almost inevitable under present conditions and the grip of the past development rhythm. Further, it could deductively be construed that the economic system and structure has a spatial impact on regional inequality and ultimately the concentration of industry in the Prime Base. In the few cases where an industry does not comply with this pattern,

a complementary least-cost model is engaged to measure against locational optimality. The procedure is successfully applied to the cotton-seed industry (Chapter Seven) to portray the hiatus between actual localisation and optimum least-transfer-cost location.

Although it is absurd to speak about the locational dynamics of industry at the present stage of development in developing countries, there are bound to be some modifications to the spatial milieu of the industrial activity in the not too distant future. The multi-million pounds investment programme adopted by the Sudanese government in 1976 to promote the public industrial enterprise, foreshadows rapid changes which will inevitably affect present industrial localisation. It is anticipated that a 'thumb-forefinger' growth zone will develop to include the Prime Base, the Gezira, and the fertile eastern portion of the country to a point defined by Port Sudan. In this growth zone, industrial inter-linkages and integrated processes will take place. However, this will in more than one way consolidate the pre-eminence and structural diversity of the Prime Base through inter-linkages and scale economies, especially of agglomeration.

1.2 Data Sources

Much of the data used in this study is obtained from official unpublished documents, historical documents, research publications (including U.N. publications), and personal experience in the Ministry of Industry, Sudan.

1.2.1.1 Official Unpublished Documents

(i) The Industrial Survey, Sudan, 1970[2]

The first comprehensive industrial survey conducted in Sudan

was executed by the Industrial Development Centre for Arab States (IDCAS), sponsored and supervised by the Sudan Government in 1969/70. Three volumes resulted from this intensive survey. Volume Two is of special interest to this study. It gives detailed data on classified industries, on variables including the location of industry, numbers of workers, paid-up capital, gross value-added, production cost and wages and salaries. The classification of industries is broadly based on the International Standard Industrial Classification (ISIC). In this thesis slight modifications are introduced, and referred to in the text with the abbreviation (SIC m) to suit the industrial structure of a 'developing' country. For example, Footwear and Leather - including plastic footwear - (Group III) is classified as a separate major group from Standard Textile Industries used in ISIC. To this latter group ginning is added. Some sub-groups are also rearranged such as metal furniture which is annexed to Metals and Electrical Industries (SIC m Group VI).

As expected, the Industrial Survey does not escape obvious shortcomings as it contains some impressions and displays some oversights; these are detailed at appropriate points in the thesis. However, the basic problem related to this study is the neglect of some industries such as cotton ginning and other regional industries. Furthermore, the criterion of '30 and above' workers is only adopted for industries in the Khartoum conurbation. The cut-off limit for regional industries is (100 and over' workers.) This obvious inconsistency is mitigated by including data for regional industries collected by the Statistics Department, 1970, and processed and tabulated by the Ministry of Industry in liaison with IDCAS. Consequently, it is possible to reproduce a uniform

set of data for the whole country's industry. Appropriately, industry in this study refers to power driven, mechanical operations for the manufacture of consumer and capital goods, as distinct from cottage industries.*

(ii) Report on Productivity, Managerial and Technical Development of Vegetable Oil Industries in Sudan, 1970. (3)

This survey was also conducted by IDCAS on behalf of the Sudan government in 1970, and forms the basic source for the case study (Chapter Seven).

(iii) The Second Population Census (Preliminary Results) Sudan, 1973. (4)

For the first time it is possible to conduct an inter-censal comparison, especially on urban growth. However, the figures obtained are mere tabulations as issued by the Statistics Department. As a supplement, The Reconstruction of Provincial Boundaries Project, Local Government, Khartoum, 1974,(5) garners a wealth of statistical information on population and regional resources, based on the Second Population Census.

1.2.1.2 Government Documents

Current and recent government documents are varied and prolific. They include ministerial publications such as annual reports, periodicals and bulletins. Unpublished data collected in the Ministry of Industry include internal memoranda, files and expert reports. Also reports by the Commission for the Evaluation of the Public Industrial Enterprise, 1969,(6) and files on individual

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* Saw milling is excluded because of lack of consistent and reliable data.

public enterprise industries prepared by the Industrial Development Corporation (IDC), form a general background for the analysis of this sector. These are also supplemented by specialised studies prepared by the Committee for the Evaluation of the prospects of Nationalised and Confiscated Enterprises, Sudan, 1970 (Two volumes).(7) The Household Sample Survey, 1967/68, published by the Statistics Department is a basic source, still to be updated.(8) The Annual Reports issued by the Ministry of Planning and Bank of Sudan are established informative sources recurrently referred to. Lastly, various conference papers are consulted especially those related to industrial and economic development. The School of Extra-Mural Studies, University of Khartoum, ranks high in this respect.(9)

1.2.2 Historical Documents

(i) Personal correspondence

The archives of the Durham School of Oriental Studies are stocked with invaluable manuscripts and documents on Sudan, especially the critical period of colonial rule (1898-1955). Private correspondence of the personnel of the Sudan Political Service, particularly 'Wingate's papers' make up indispensable evidence of how the economy of Sudan was planned and managed. This is also supplemented by documents in the Public Record Office, London, and unpublished theses and typescripts.

(ii) Reports, Memoranda and Policy Papers

In addition, there is available a large collection of official reports, memoranda and policy papers. Of specific interest are those related to the Gezira Scheme, internal migration, reports on

the economy by the Intelligence Branch,[10] the Sudan Gazette[11] and Foreign Trade Statistics.[12]

1.2.3 Research Studies

Location theory is a field of great challenge and unflagging interest. As with all social sciences, the problem of continuous change in socio-economic conditions poses serious limitations and invariably renders workable models difficult to come by. However, a handful of general location theories both in economics and geography are explored to evaluate the progressive development of locational thought since the seminal work of Alfred Weber,[13] and the expositions of M. Greenhut,[14] E. Hoover,[15] A. Lösch,[16] W. Izard,[17] and the recent works of P. Haggett,[18] D. Smith[19] and L. Collins.[20] Major texts will be critically reviewed at appropriate places in this study. Studies in related disciplines are extensively consulted. In regional sciences and urban studies J. Friedmann,[21] W. Alonso,[22] A. Pred,[23] and B. Berry[24] are among the most prominent. The Latin America School was closely considered, especially C. Furtado[25] and A. Frank,[26] while A. Lewis,[27] G. Myrdal,[28] J. Galbraith[29] and H. Brookfield[30] served as a general background to development theory. On international trade Bo Södersten[31] and G. Haberler[32] and critically examined. A. Beshai[33] covers broad ground on Sudan's foreign trade, and is considered an important reference.

1.2.4 Publications of U.N. Agencies

Regional, inter-regional and intra-regional studies prepared by specialised U.N. agencies are progressively becoming a virtually inexhaustible source of specialised information. An example specific to Sudan is the I.L.O's study: Growth, Employment and Equity: a

comprehensive strategy for the Sudan, 1976.[34] Similarly, the I.B.R.D. report on The Economic Development and Prospects of the Sudan (Four volumes), 1972.[35] Also the voluminous study of the Arab Fund for Economic and Social Development (AFESD); A Basic Programme for the Development of Agricultural Sector of the Demographic Republic of the Sudan, 1976-1985 (Five volumes).[36] Other publications by United Nations Industrial Development Organisation (UNIDO), and United Nations Economic Commission for Africa (UNECA), include seminars, symposia and workshops on industrial location and industrial development in 'developing' countries. Of particular relevance is the U.N. Manual on Economic Development Projects, 1958,[37] used as a reference for the socio-economic evaluations of productivity of single variables and productivity coefficients.

1.2.5 Personal Experience

As an industrial inspector in the Ministry of Industry, Sudan, the author had the opportunity of encountering many of the teething problems of a nascent private industry, and participated in the onus supervisionary task. This provided a working knowledge of the industrial organisation in Sudan, an insight into many facets of industry in a 'developing' country, and a window on African and Middle Eastern industries through regional and international conferences and seminars. Yet more, this post acted as a lever that facilitated access to invaluable confidential materials. An interesting example is the decoding list of the names of the industries in the Industrial Survey. However, for ethical reasons the names were left undeciphered although inner-perception was gained from this knowledge.

1.3 Statistical Techniques

Statistical techniques are used sparingly. This is possibly a reaction to the feverish adoption of statistics in the geography of the 1970's. The author is a self-confessed sub-optimal practitioner ready to use such techniques where necessary, but always questioning the logic behind their adoption. The development in Chapter Five of 'base-lines' and the concurrent graphic representation of location quotients (L.Q.) and the coefficient of localisations (C.L.) is a case in point. Similarly, the coefficient of specialisation (Cs) which is in much use in industrial location analysis is discarded as inappropriate to developing countries, since one isolated regional industry would give a false impression of specialisation. Coefficients obtained for production factors such as production-capital ratio and employment coefficient are subjected to the product moment correlation coefficient (r) for various industrial groups both at the urban and regional levels (Chapters Five and Six).

1.4 Outline of the Study

This study could conveniently be divided into two closely related parts. The first part is a discussion of the commitment to non-industrialisation in Sudan during the colonial regime (1898-1955), and its post-independence impact on the spatial distribution of industry. Investment policies and development (Chapter Two), are investigated in the light of opportunities and objectives, and the subordinate role ascribed to private capital investment. While the public sector was confined in the main to investment in 'commercial plantations' in the Gezira, business and trade was left to the private initiative. From their complementarity and interaction the

'charter government' model is developed to verify the relationship as reflected in the specialisation inherent in the 'syndication' system. Structural transformation and economic growth (Chapter Three) is a manifestation of this system. Here an outline of the progressive role of the primary export base is considered in detail. Chapter Three also exposes the weaknesses of 'growth through trade'. Planned non-industrialisation is a feature of the colonial economy, and displayed rather strongly in the absence of modern industry from the scene of development through much of half a century. An industrial location theory specific to developing countries is expounded in the Prime Base Theory (Chapter Four). Weaknesses of classical and contemporary industrial location theories are critically reviewed. The historical relevance of specific experiences of ex-colonies is exposed, first in relation to import firms and later incorporated in the Prime Base Theory. Localisation of industry in specific places in Africa, and many developing countries is a reflection of a prolonged process involving the various economic sectors, the economic system, and the spatial arrangement of all this as interpreted by the Prime Base Theory.

Industrial location analysis in the second part is concerned with the urban and regional context of the industrial activity. Some empirical testing and evidence of industrial localisation is provided. In Chapter Five the spatial organisation of the industrial activity in the Prime Base is looked at in some detail. Structural analysis is conducted on 'sectoral structure', 'size structure', and structure of 'input/production'. Industrial concentration within the Prime Base is also considered with special interest in areal variations and specialisation in the tri-partite

Prime Base of Khartoum, Bahri and Omdurman. Industrial location patterns and distribution throughout Sudan are analysed in Chapter Six again within the bounds of regional character and structural configuration of the industry. The existence of secondary bases is an integral part of the economic process and possibly a pre-requisite for further industrial development as shown by the study of selected industrial groups.

The industrial location analysis is carried a step further in Chapter Seven, the case study on cotton-seed oil. This was undertaken as a means of testing existing localization as against the theoretical optimum according to least-transfer-cost. Trends of future industrial location are by necessity geared to resources and the dynamic mobilisation of them. Ultimately this means the stage of industrial dynamism in proximity to population change, mineral and agricultural resources, and regional development plans. Chapter Eight discusses these possibilities, and it is hoped that this will enable a certain degree of projection at least for the near future. In a short conclusion (Chapter Nine), the main findings are gathered with some emphasis on the Prime Base Theory and future regional planning.

CHAPTER ONE

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CHAPTER TWO

CAPITAL INVESTMENT POLICIES AND DEVELOPMENT IN SUDAN (1899 - 1955).

2.1 Introduction

In determining what is to be developed in a dependent economy, capital investment is probably the most critical issue to face a colonial régime. To complicate things, capital investment is neither abstract nor static. Decisions on investment are related to the government's perception, development philosophy, prevailing socio-economic doctrines, and zeal. These may be spatially reflected in provisions of plantations, railways, urban centres and administrative headquarters. On the other hand, the capacity of the colonial administration, its political status, and human and natural resources are all fundamental factors punctuating the economic space. Thus the economic policies as determined by the availability or unavailability of investment funds, and the mode, form, and field of investment (private or public, concentrated or dispersed, agricultural or industrial), inevitably contribute to the spatial patterns of structural change and 'modernity' in the dependent territory.

With respect to different economic sectors and priorities, there is a natural tendency for sectoral interaction and inducive mechanisms. The identification of these factors is much needed in location studies, especially in 'developing countries'. However, the generative mechanism is left for the next chapter. Here we are broadly dealing with the initiation of the system in Sudan during the pre-independence period (1899 - 1955). The linkage between investment priorities, decision-making and availability of capital is often neglected in industrial location

studies as the realities of these linkages are either out of reach, deep in historic archives, misinterpreted or simply unfashionable. In this chapter some effort is made to piece together evidence about the period of the dependent economy of Sudan. The whole machinery that bonds together with various forms of investment and development in the diverse fields, is built into the concept of the "charter government model". This refers to the syndication system whereby a functional division is made between public and private sectors when in partnership to facilitate efficient exploitation and harmony. Probably the inexistence of an industrial sector in Sudan during the first half of this century is a manifestation of the very peculiarity of the system, and significantly, of grave consequences for future industrial location.

Furthermore, the major components of this paradigm were laid down sometime during the formative years that ended in the mid-1920's when the Gezira scheme and the last railway extension were completed. From then on development policy became a matter of horizontal expansion and maintenance. Indeed, the varying magnitudes of investment and rate of economic expansion have a distinct spatial pattern as expressed in the spatial frameworks of a dual economy, urban centres and asterisk or fan-shaped railway systems. However, these latter features will only be touched upon at the end of this discussion - further elaboration is reserved for separate treatment.

2.2 Investment Opportunities and Objectives during Co-partner Rule

The Sudan today is considered to be among the twenty five poorest countries in the world measured by per capita income,(1) yet the poverty seems disproportionate to the hugeness of the

country and the diversity of its known resources. In this sense Sudan is sometimes rated differently among these twenty five bottom-of-the-list countries. "Though underdeveloped," reported the Economic Commission for Africa, "the Sudan exhibits different features in some respects, from several similarly placed nations."(2) This view conceals two critical elements: first, the unacceptability of per capita income as a measure of economic well-being; second, the disparity between available resources and the slackness of their mobilisation. It is this last point which is of special interest to this study.

For an appreciable period in modern times (1899 - 1955), the economic policies of Sudan, like many other African countries, were executed and fostered by colonial administration. The synonymity of underdevelopment and colonialism has often been pointed out in development studies.(3) However, the case of Sudan is somewhat complex. Observers of different nationalities, including some Sudanese, have praised the lines along which the social and economic development of Sudan were pursued. The Gezira scheme stands as a testimony to the endeavour of colonial enterprise.

The Anglo-Egyptian Agreement of 1899 made it possible for Britain to retain the upper hand in Sudanese affairs, though the same agreement recognised Egypt as an equal partner. It does not need too much imagination to portray a fair picture of the Sudan's economic situation before the Omdurman defeat (1898). Isolated from the outside world and engaged in a holy war, Sudan remained a country with an agrarian subsistence economy. Conditions were, more or less, comparable to most newly conquered African territories. The essential features thus prevalent were the under-utilization of human and natural resources in the materialistic

modern sense.

The British could barely appreciate the economic values attached to the native system, and a well-formulated stratagem had to be implemented immediately. The end product of the strategy was presupposed - modernisation and development, and the input was also assumed - investment and 'technology'. Thus the most urgent needs were categorical:

> ... more population, more irrigation, more British officials...more schoolmasters and more public buildings... (4)

To be precise, the strategy could be summed up in the words 'capital' and 'technical staff'. The crux of the matter was, however, to what extent capital and technical staff would be forthcoming? The question is more complicated than would at first appear. To begin with, the chances of a European influx was excluded as was pointed out by Rudolf Slatin in 1899:

> The Sudan will not I suppose present a favourable field for European colonisation. The climate excludes great European colonies. Much of it is tropical. (5)

As a matter of fact, all of it is tropical. This excluded too, a 'settler economy' with its ultimate political pressures behind settlers' claims on financial support and trade concessions back home. Development of private plantations and primary processing industry in Kenya, for example, was in some cases a direct result of the lobbying power of people like Lord Delamere and Lord Francis Scott.(6) However, countries do change during colonial rule, even without substantial influx of European immigrants. Capital transference in the hands of private entrepreneurs or in the form of grant-in-aid, loans and grants, could participate in rectifying the chronic needs for capital investment in such areas.

Evidently, there was a strong attraction to public and

private enterprise in the Sudan after the conquest of 1898. The potential for 'economic development' was enormous, as was anticipated by many international agencies, including British ones.(7) In the second half of the nineteenth century, travellers and explorers had featured Sudan as one of the richest countries in the world. Gold and other minerals were said to be in abundance and thirty million acres were estimated to be ready for cotton growing.(8) Nonetheless, any financial advances from Britain to the Sudan were obviously out of the question and were 'certain to meet with absolute refusal'.(9) Many reasons could be cited for this abstention. Firstly, the Sudan did not fall directly within the absolute domain of Britain and the partnership agreement made the future of the country rather dubious. The Sudan could not be treated as a full British dependency with all due obligations. This was repeatedly shown when Sudan was excluded from preferential tariffs granted to British colonies during economic difficulties. Secondly, the economic policies of Britain by the nineteenth century were heading towards lower overseas investment. Whatever capital was forthcoming, however, was channelled on a very selective basis. Thirdly, if Sudan was conquered for the benefit of Egypt as was sometimes alleged, then Egypt should naturally be made responsible for the essential capital requirements in Sudan. Against this presumption, a financial settlement was immediately reached after the formulation of the 1899 Anglo-Egyptian Agreement. Egypt herself was a British protectorate and could do nothing but comply. Thus, Egypt was financing developmental schemes in Sudan until 1912.

After this date it was believed that the Sudan had reached a point where she could support her financial needs from her own revenues. Thereafter the country was run on a policy of financial

'self-reliance' throughout the colonial period with only slight changes that were dictated by needs arising in Britain.

2.3 The Private Capital Controversy: A Brief Review

Reference was made above to the British Government's point of view on issues related to public capital investment in Sudan. Such financial issues were guided by the principle of 'hands off policy'. But had there ever been an agreeable climate for private investment in Sudan? Observations of colonial policies towards private investment show an apparent lack of consistency through the whole colonial period. The suggestion made by J. Stone for example is that Lord Cromer was not keen on private enterprise.(10) The opposite opinion expressed by F. Percy in 1921, reflects the willingness of the Sudan Administration to invite and encourage private foreign capital, "... the Government was far from being niggardly in its dealings with the private enterprise."(11) Though both opinions were formulated on the early experience of the administration, it is quite possible to identify the same two opposing arguments revived in writings about subsequent years of the colonial period.

According to L.A. Fabunmi, investment by the British and other Europeans was one of the objectives for the British control of Sudan.(12) Another recent proponent of the 'anti-capitalists development argument' is A. Abd-al-Raheem.(13) He was able to extend the original views advocated by Stone to cover the whole colonial period, though his interpretation of the forces behind such policies was different from those of Stone. Likewise, A. Gaitskell, whose views are mainly drawn from the Gezira experience, shares a similar opinion based on yet another case.(14)

The main discrepancy with any of the conclusions considered

is the incapacity to draw a clear-cut boundary between the different issues involved in the complex relationship between government and the private sector. Such a relationship is affected by the size and magnitude of the private capital, the field in which it is to be invested and the timing of its advent in relation to internal and external political and economic circumstances. The decision process in most economic matters had in many instances been initiated in Khartoum, appraised in Cairo, and decided upon in London. However, the inconsistency of decisions concerning private capital will be discussed later.

Clearly, there was no preconceived policy to adhere to in dealings with the private investors in the first few years of the new rule. Hence painfully slow deliberation was preferred to hasty action, "we must not go too fast," commented R. Slatin, 1902, in reply to a suggestion raised in a press interview in Britain that the British public should be made acquainted with the possibilities of the Sudan, "We do not want to have a boom in Sudan shares on the market followed by a drop..."(15) The same idea of slow development was consistently repeated by Lord Cromer, who strongly believed in its practicability. Indiscriminately, a line of successors maintained the same conviction. Obviously, the politics of a condominium are bound to be nebulous and a keen balance has to be struck if the hybrid is to be successful. It follows that decisions had to be weighed carefully and sluggishly. However, this could sometimes be very irritating to private entrepreneurs. Such delays were condemned by the British Cotton Growing Association in 1912:

> ...there is great delay in arriving at decisions on commercial matters, and the government apparently do not recognise that commercial men cannot wait indefinitely for decisions on proposals they may have put forward... (16)

This slow-down policy proved to have an adverse effect on the mobility and attraction of private entrepreneurs.

2.4 Investment Chances and Policies: Commercial Plantation

The circumstances that animated the whole investment policy towards Sudan and culminated in establishing a general policy towards private enterprise has largely revolved around cotton-growing and land development. For pressing economic reasons Britain's ambitions were aroused by the possibilities of cotton-growing in Sudan.

Britain's most prominent industry, the textile industry, was increasingly becoming vulnerable to the precarious international cotton trade and production:

> The whole nation, [reported the Morning Post in 1904], has become alive to the fact that one of our greatest stable industries is seriously menaced by its dependence on foreign sources of supply for its raw material. (17)

The United States of America was virtually monopolising production; in 1904 she produced 80 per cent of total world consumption.(18) The immense feeling of insecurity entertained by Manchester Chambers and the public at large, was expressed in a passionate speech by King Edward VII in 1904:

> The insufficiency of the supply of raw material upon which the great cotton industry of this country depends, has inspired me with deep concern....I trust the efforts which are being made in various parts of my Empire to increase the area under cultivation may be attended with a large measure of success. (19)

Nonetheless, there is ample evidence to suggest that attempts in the direction of cotton production were turned down before 1910. The British Cotton Growing Association was rebuffed when it approached Lord Cromer on the question of growing cotton in the Sudan; its representatives were bluntly told there was "nothing

they could usefully do" and that "their services were not required."(20) At the same time the only option given to interested land companies was merely land reclamation rather than cultivation.(21) Even this sort of development was only under consideration in 1908:

> The advisability of inviting private enterprise to assist in the last mentioned direction-land reclamation, [commented the Land director] is now under consideration. (22)

There were, of course, practical questions to be solved first. Transportation and communication, sparseness of population and land ownership were all important factors and involve directly or indirectly the sensitive question of Egypt's stake.

Equally important however, was the incapacity of the officials in Khartoum and Cairo to reach agreement on the issue of private capital. This was clearly shown by the lack of coordination and the different attitudes of Khartoum and Cairo. While Wingate showed a great interest in private investment in 1909 his superior, Sir E. Gorst, head of the British residency in Cairo, was clearly against the B.C.G.A's representative, as is evident from a private letter to Wingate:

> ... For the present Lavot, [the head of the B.C.G.A's delegation], should be choked off, and told that his proposal [the Gezira Scheme] is premature....(23)

Yet, only two months later, Wingate's orders to his subordinates in connection with the B.C.G.A's representatives were opposing Cairo's instructions. Hence Lavot and his colleagues,

> ... should receive the most sympathetic treatment from the Sudan Government as it is clear to me that they are actuated not merely by financial consideration but by thoroughly patriotic sentiments. (24)

Apparently the distinction emphasised here between entrepreneurs hunting fortunes and responsible patriotic investors reveals the

fears entertained by many that private investment could upset a delicate situation in Sudan, and interfere with the calculated steps to maintain a free hand for Britain. In a private letter to G.F. Clayton in 1910, Wingate was able to sum up his grievances about investment policies that hampered the advent of capital in the hands of private British Capitalists:

> My general feeling is that we have nothing whatever to conceal in our Sudan arrangements and if our agricultural and other developments have not proceeded at a very great pace, it is for the very good reason that we have been stinted in funds, and as we are endeavouring to interest sound British capital to invest in Sudan, I think the argument that we have not yet been given a fair chance,* is one of the most useful ones to be employed when giving effect to our endeavour. (25)

Clearly, then, the Sudan administration was denied the chance of proceeding with its plans to invite British capital to invest in commercial plantation.

By the end of 1910 the argument of the B.C.G.A. was strongly put again to the British Government:

> It cannot be too strongly emphasised that unless something is done in the immediate future, there is the greatest danger of serious and irreparable injury being inflicted on the cotton trade of Lancashire. It is for these reasons that the council of the British Cotton Growing Association have again turned their attention to the possibilities of the Anglo-Egyptian Sudan, which country, though not entirely British, does fall within the terms of their charter. (26)

Under such pressures the British Government eventually relented. However, a formula had to be worked out whereby the previous reservations about private capital were put into consideration. The compromise reached was to select sound, thoroughly patriotic, private investors who could work under an unorthodox administrative system of state control of economic enterprise.

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* Emphasis of author

Drawing from this very experience, A. Gaitskell suggests that the Sudan Government rejected foreign capitalists where terms were not fair to native tenants and in effect rebuffed much of the expected private capital because of the buffer created by the direct control of means of economic enterprise. He added:

> ... by choosing these objectives [participation of peasants] they immediately affected their relationship to capital investment. They rejected the conception of foreign capitalists developing the country purely for private profit because they had certain political and social aims mixed with their economic ones and were not prepared to have them subordinated or ignored. (27)

In some respects the new economic departure was apparently an adaptation of a socialist experiment on social and economic reforms undertaken by Denmark before 1919. Land holdings in the Gezira were consolidated, rented on nominal annual fees (five piasters per Feddan or the equivalent of five new pence per acre per annum), and redistributed to tenants. An extra ingredient that makes the whole scheme differ from the Danish model, was the invitation of a foreign capitalist third party to manage the scheme in a tripartite partnership. As we will see later this form of liason was in essence a new form of government that draws from the charter government model and leans on certain aspects of the socialist development model. The ultimate goal was efficient exploitation.

Thus, the narrow specialisation (on cotton production) was necessitated, not by economic chance, as was the case in Denmark, but by considerations related to the British textile industry. Whilst the Danish markets were expanding, the cotton trade in Sudan was gauged by fluctuating prices and a traditional market. Hence the Gezira scheme was an end in itself to surmount the grave

danger encroaching upon the most vital industry in Britain and clearly lacks the touch that ought to generate the desirable agro-industrial linkages or create a rich peasantry capable of high consumption or reinvestment. Secondly, the Gezira scheme did not come in to being as a component of an integral socio-economic policy, from the point of view of Sudan, nor did it conform with an overall plan designed to encourage private investment in that country.

Only in this context is it possible to understand the reluctance of Wingate in 1921 to identify himself after retirement with a rubber industry firm. His fears which contradicted his earlier positive attitude towards private capital were that such private investment was bound to harm the British existence in Sudan:

> It is certain that any weakening of the British control in the Sudan would seriously jeopardise the success of the British enterprise. (28)

A new dimension was added to the cotton-growing theme when local private capital was persuaded, after the 1930's depression, to develop riverain pump schemes. The financing was largely through foreign commercial banks in Sudan. Eventually, the whole economic policy to Sudan culminated in the conversion of the country into a grand cotton farm of world magnitude in long staple cotton trade. The mushrooming growth of the private involvement in agricultural development in Sudan could only be seen as an integral part of a well-defined policy towards economic development. Naturally the capital expected to come into Sudan following the construction of the grand project had largely remained an act of hope and only signifies the isolation and inadequacy of the new economic approach.

2.5 Investment Chances and Policies: Infrastructure

2.5.1 Railways

Besides cotton, there were other fundamental opportunities appealing to private enterprise. Transportation facilities were most needed as a precondition for political control and economic development. Nonetheless, it could be said that there was no definite policy for the development of communication before 1905. In fact there was a strong tendency to encourage private enterprise to interest itself in railway building. The following extract from a letter from Wingate to Lord Cromer in 1901 is a clear testimony:

> ... I am sure that any encouragement you can give to private enterprise to construct a railway from Duem to El Obeid will be a step in the right direction... I hope to see Rogers before I leave and will do all I can to encourage private enterprise. (29)

Obviously the direction of railway development was well discussed and agreed upon before this letter was written. In line with this attitude was the concession released to a steamer service company during this early period. Eventually the steamer concession was terminated after the construction of the western railway line in 1912.(30)

The reversal of the railway policy outlined above was quite abrupt and drastic. The Sudan Government should be the main investor and beneficiary. The starting date of this change of mind was 1905. The only evidence available was the fact that the government declined many offers from would-be British, Egyptian, as well as Sudanese private investors who were tempted by previous encouragement.(31) By 1908 the railway policy was completely formulated as seen from correspondence of this period.

The new railway policy was guided by two inter-related considerations; military and strategic, and economic.

2.5.1.1 The Military and Strategic Factor

Two elements of paramount importance from the viewpoint of the military situation were the extensive area of the country and the real threat of the local resentment of foreign rule.(32) In an alarming letter by Wingate in 1908 the security situation and the urgency for improved communication was raised:

> A glance at the huge extent of the Soudan, as compared with the slender military force available for its protection, will show the insecure basis on which our hold over this country rests... To remedy, therefore, the present condition of insecurity, and minimise the risks which are being run, it is evidence that the internal communications should be immediately improved in order to bring the outlying provinces into closer connection with headquarters. To carry out this, considerable expenditure will be necessary in railway extension to the south, east and west..... (33)

In the same letter it was suggested that the British Government should raise the necessary funds for carrying out railway extensions.

From the Imperial strategy stand-point three considerations were vital to the construction of railways. Firstly, to meet pressures exerted by the French on the western frontier. This need was frankly spelled out by Lord Kitchener in 1911:

> The Soudan Government are constructing a railway to El Obied to meet pressure brought on their frontier province of Darfur by recent French action in Wadai. (34)

Secondly, the interest in the eastern frontier created by the Italians and the security of the Blue Nile waters necessitated immediate action. These fears were again disclosed by Lord Kitchener in the above-quoted letter:

> Additional expenditure will shortly be required in other districts, in Eastern Soudan in particular, where the unsettled state of the Abyssinian boundary makes the extension of railways a matter of strategic importance. (35)

Thirdly, a rather ambitious idea on the subject of Imperial defence and strategy was in Wingate's mind. His thesis was that in the event of a blockade of the Suez Canal route (a possibility that could not be overruled given the political unrest in Abyssinia) an overland communication would mitigate the serious implications to Imperial Far Eastern trade.(36)

2.5.1.2 The Economic Factor

It is over simplification to isolate one factor from others in a multi-purpose project such as a railway construction undertaking. Beside the strategic and military purposes, other incentives were clearly seen.

Firstly, the development of natural resources was equally as important as these strategic factors. Thus railway construction was essential too for bringing into reach the produce of the west and the fertile east. Over and above that was the indispensability of transport facilities for the commercial production of cotton in the Gezira.(37) The existence of the military railway (Halfa - Halfaya, 1898 - 1899) proved valuable experience to the government in its dealings with the Zeidab private cotton scheme (1904) and other cotton estates.

Secondly, the railway development was anticipated to vitalise trade and expand revenue:

> ... no very great expansion of revenue can henceforth be expected without preliminary development of the railway system. (38)

On yet another level, it was hoped that the Sudan's transport facilities would diffuse British trade and commerce in many directions in the heart of Africa.(39) The remunerative nature of the railway, accrueing from freight rates and fares, was also crucial and proved to be of considerable significance to the ever-perturbing revenue problem.

The immense delicacy of the situation so far disclosed, which underlined railway extension in Sudan, makes it fairly obvious that the involvement of private enterprises in railway development was considered inexpedient. Thus it is naive to assume that this policy of rejection "was simply part of a general attitude of suspicion with which the Sudan Government viewed private enterprise..." (40) The railway policy involved the very existence of Britain in Sudan, the strategy of the Empire's trade and commerce in new markets, and income from transfer charges that would partially help discharge any liabilities on the part of the colonial co-partners. The sticky political circumstances that tied together Britain and Turkey in Egypt and Britain and Egypt in Sudan necessitated utmost sagacity and expedient lobby to exclude Turkey's interference and deny Egypt's stake in the Sudan. However, the openness of the argument presented by Lord Kitchener to the British Government in 1911 is unparalleled in the politics of the co-partnership in its dealings with Sudan:

> ... the present circumstances and the political status of the Soudan preclude the possibility of borrowing money on the credit of that Government alone. There are strong objections to the guarantee of a loan by the Egyptian Government, which would need the sanction of the Porte. In the present circumstances of the Islamic world, it would not be expedient to give Turkey any pretext for interference in the Soudan. Further, an Egyptian guarantee would not only increase Egypt's stake in the Soudan, but afford ground for what I believe to be the only valid criticism

> of the Nationalist party against British administration, namely, that the revenues of Egypt are employed to develop a country where the British flag flies. (41)

Under these pressures the British Government sanctioned guaranteed loans for the financing of the Gezira on the conditions described above. Similarly, loans were provided by the British Treasury for railway extension to the west in 1912 after the first phase was completed prior to 1907 with the financial aid of Egypt. The final railway ventures in the 1920's were, however, dealt with in a manner complying with the 'syndication plan' applied with 'success' to the cotton industry. In fact the eastern line was initiated by both economic and strategic consideration. From a strategic point of view it was first thought to be prudent to encourage private enterprise to undertake the eastern railway project as a disguise for the real objectives suggested by Wingate in 1911:

> Of one thing I am quite sure [commented Wingate], and that is that it would be folly to take the Newcombe project (Sudan-Abyssinia Railway) at the present stage - the only way would be to get private enterprise interested in it and with Abyssinia in its present stage, the less we say about railway projects the better. (42)

Hence the compromise reached later by the formulation and financing of the Kassala Railway Co. by a guaranteed loan from the British Treasury could only be seen as part of the new formula reached for the development of the Gezira scheme. The main feature of the concerted public-private effort and involvement, one may add, was a discretion designed to facilitate gaining a larger stake in Sudan and calculated to covertly achieve some political targets. Yet the same incentives acted adversely against railway extension in certain directions where political interaction was undesirable. For example, private investors had approached the Foreign Office

for concessions in 1920 for railway lines over southern Sudan but they were deferred even though the private entrepreneurs suggested a joint venture in line with the prevailing public-private syndication and cooperation.(43) In fact, when the railway line had to be extended southwards to Jebalein (about 455 Km south Khartoum) for military purposes in 1942, the government would not accept the idea and hurriedly dismantled the line in 1944.(44) On the other hand major roads were constructed to link the southern region with Uganda and British East Africa. The 'possibility of linking up the Sudan with Uganda, B.E.A. (British East Africa), Somaliland...and making it one big Governor-Generalship quite distinct from Egypt' (45) was well thought of. One of the ironies of railway building in Sudan was that no attempt was ever made to connect Egypt and the Sudan although Egypt was responsible for the larger share of railway building finance in Sudan. The railway network seems to have granted the optimum requirements for the British Government in 1929. The country as a colony had witnessed no further extensions after that date.(46)

2.5.2 Road Transportation

Road building was considered by the Sudan Government as only supplementary to railways. The gneral outline was to develop feeder lines in areas not served by railway. This would guarantee two things: firstly, it would reach distant districts for tapping their resources and channel distributive trade.(47) Secondly, it would avoid the competition of motor vehicles with railways. A compromise had to be made to bring these two goals together.

The government realised that motor transport by its very nature lies within the domain of private business. Hence private enterprise entering this field had to be contained within some

bounds so as not to jeopardise the British enterprise or weaken the British control. Nothing could be more serious to the slow progress policy than diffusion of ideas and fast mobility, and nothing could be more conducive to potential unrest than all-weather roads. Consequently, all offers by private capital to build metallic roads were declined.(48) The official justification in 1929 for this rejection apparently looks sound. The argument rests mainly on the cost and uncompetitiveness of roads compared with railways at that time.

> The list of Sudan products contains very few that could stand the cost of mechanical transport, and until it can be shown that it pays better to make roads than railways, or until haulage costs are cut down by one means or another, no great increase in the carriage of goods by motor vehicles can be looked for. (49)

Evidently, the government was desperately covering the real intentions behind this argument. As a matter of fact it was the competitiveness of road transport rather than the suggested inability to stand costs which motivated the policy against roads. This was emphatically disclosed in the Sudan Government's Railways Annual Report of 1931:

> ... the railways will have to face a very serious loss of revenue unless strong action is taken by the Government to prevent or control motor competition between the points already served by the Railways. Motor transport parallel to the railway serves no public interest and merely transfers to the pockets of, at present, irresponsible motor drivers and traders' money which should go into the revenue of the Government railway. (50)

Clearly the dry-weather dirt roads which were developing against many odds were in fact creating all sorts of problems for the public revenue!

The government was compelled to lower the freight rates on the western line in 1934 to stay in the competition created by road traffic.(51) Such a move was only feasible because the govern-

ment could increase royalties on some commodities. In the same year the government was compelled to pass a resolution to prohibit competition with the railways.(52) No better proof of the unfounded assumptions already made by the government could be attained. Indeed, no change of policy towards road building was ever attempted. The result was that not a single metallic road other than town avenues and streets, was built during the pre-independence period.

2.6 Investment Chances and Policies: Business and Trade

Having made this analysis of British plantation and transport policy, one is confronted with Fabunmi's judgement which attributes great significance to the part played by private capital in Sudan. From what has been said, however, Fabunmi's argument is only valid insofar as trade and commerce is concerned. As a matter of fact, there is ample evidence of the involvement and commitment of British capital in this field during the period in question. Trade and commerce were undoubtedly more attractive than other forms of private enterprise for several reasons. Firstly, the export-import firms normally expanded their margin of profit if services were run on a social-cost basis rather than on profit maximization as was the case in Sudan. Secondly, there is no problem with capital-raising for private business, and the risk involved in trading companies is much less than in many other forms of private enterprise. The short gestation period and the lucrative quick turnover, coupled with an oligopoly status, would marginalise the risk element. At the same time, the banking short-loan system was tailored to such undertakings. Thirdly, because of the diversity and complexity of import-export trade, (wholesale and retail) and the numerous agencies involved, direct

government management costs would be exceedingly high if not totally impractical. After all, any such step would completely wreck whatever was left of the laissez-faire doctrine and bluntly shade the whole colonialism argument with suspicion and doubt. No wonder, then, that trade and commerce was left to private enterprise.

Whatever the intentions were, 'free trade' would obviously jeopardise British interests even more when a third party, i.e. Egypt, had as much ambition in this direction and theoretically as much right. Withstanding this right and aware of the free trade obligations defined by a series of international trade agreements and the Anglo-French convention of 1898, the British had to work out a neat solution to attain the upper hand in the commodity flow system and money transactions. This was vital to Britain in both directions of export and import and was becoming increasingly so after World War I, the 1921/22 recession and the 1930's depression. Britain was becoming more dependent on the raw materials and to a lesser degree on the markets of the dependencies. At the same time, Britain was evidently becoming more vulnerable to international trade competition. This was reflected in the high unemployment that reached 2.2 million in 1927,(53) and evinced by the very many drastic measures taken which culminated in the passing of many laws such as the Trade Facilities Act, 1921, and the 1929 Act, and the setting up on the Colonial Aid Programme, the Imperial Preference and Empire Marketing Board, and Colonial Development Advisory Committee 1929, etc. The imposition of all these measures meant better organisation and reorientation of the colonial machinery.

A grave need for closed trading which would link Sudan with Britain and the Empire was only natural. The formula was not

difficult to reach, and would not be too far from the experience already gained by the syndication system already in practice. The function of the commercial bodies would then be to co-ordinate the market needs of Sudan with Britain's industrial ones and ultimately secure as many orders as possible in the hands of British industrialists. To complement that would obviously be to direct Sudan's produce to the mother country. What was then needed was a selected number of powerful British firms that could be described as patriotic and sound British capitalists. The dominant rôle in Sudan trade was given to Sudan Mercantile Ltd., Gellatly Hankey & Co. Ltd., Bauxhaul, and Mitchell Cotts., all of which were British companies. Stressing the rôle of these as well as Egyptian firms, the Finance Department reported in 1953 that:

> Private capital here [in Sudan] favours trading activities in the main. There are a small number of powerful British and Egyptian firms at the head of this group....(54)

It should be emphasised that there were only two Egyptian trading agencies coping with the main trading interests which were predominantly agricultural and animal export and cheap consumer goods imports. Both spheres of trade were of little practical interest to Britain. At the same time Britain could use these concessions as an extra bargaining card as she did in the 1936 Anglo-Egyptian Trade Agreement. Egypt was theoretically given an equal trading chance in Sudan, but obviously the fields of trading activities were implicitly limited.

Under the same 'label' - patriotic, sound British capitalists - and in conformity with the general policy, there evolved other undertakings such as the Sudan Light and Power Co. Ltd., WadMedani Light and Power Co. Ltd., and the printing and publishing

agency, MacCorquodale and Co. (Sudan). In all these companies the government was a shareholder and the main financier. The companies were operating on behalf of the government; on a similar basis, though on a smaller scale, as the other commercial undertakings in Sudan.

2.7 The Charter Government Model

The administrative control of the government over economic enterprise, especially cotton plantation and transportation, has tempted some writers to think that economic development of Sudan during the colonial period was designed to ameliorate the economic problems through a nationalisation policy of one form or another. According to Abd-al-Raheem:

> ... a policy of nationalisation was adopted throughout without even the merits or disadvantages of nationalisation being discussed. (55)

Enough has been said to show the magnitude of the administrative control and administrative alliance with selected private capital. But does this control amount to a fully-fledged nationalisation policy? Whatever the stand is, the many contradictions that coloured the system would not lend themselves to a simple conclusion.

The hypothesis which is needed here must first of all resolve the inherent heterogeneity of aspirations and interests of the co-partners. This conflict ought to regenerate its own chain reaction. The Sudan's situation was by no means the ideal for the British expansion and enterprise, and the fact that the British were not having a free hand in their dealings in Sudan meant that the economic line adopted universally in formal dependencies could not successfully be transplanted.

The British enterprise in Sudan had to resort to practices of informal trade domination as she did through charter companies in India, Canada and Latin America. This time, however, the key to the British enterprise system had at its convenience the experience of modern charter government which was legalised by changes in International Law in the mid-1880's. The essence of this form of government was the right granted to charter companies to trade, administer and finance a territory under Imperial licence.(56) The immediate function was to back commercial expansion and later facilitate proper annexation.(57) Any attempt to evaluate charter government is obviously beyond the scope of this study. Nonetheless, the significant similarity between this form of government and the British Administration in Sudan is worth depicting. Firstly, an important function of the charter government was to "form a buffer between the Imperial Government and Foreign States which reduce the risks of international friction and war."(58) The Sudan Government with its inherent 'chartered government' elements could obviate the Anglo-French Friction in Fashoda in 1899. More significant was the permanent need for such a buffer between the co-existing British and Egyptian interests. Secondly, the Sudan Government, as we have seen earlier, had to depend on its own resources for financing economic schemes and administration. It is easy to see the resemblance in this respect with the modern charter. It was noticed by Lord Lugard in 1921 that modern charter,

> ... started as an administration, the expenses of which were to be met from commercial profits - in theory to be exercised without monopoly. (59)

As far as monopolies were concerned, the British Administration in Sudan had apparently rejected the idea by refusing to grant concessions for some interested private investors on long-term lease

basis. But that was only one form of monopoly. Oligopoly was at least the common practice by the various syndicates. The Sudan markets and produce were virtually a monopoly to Britain, the Empire and Egypt. Thirdly, in the charter government there is a clear distinction between the administrative and commercial bodies. The best economic results would be attained by an independent specialised business management while the prestige of the administration could be maintained. The British Administration in Sudan, more than any other government, had to maintain a balance between these two objectives.

The administration was expected to maintain a workable relationship between the different parties while, at the same time, it was also excessively committed to British enterprise. On this consideration the charter government model was progressively implemented especially after 1906. By that time the rush for mineral exploration created by London mining syndicates under the auspices of the Foreign Office, was attended with little success.(60)*

Once this hypothesis is verified, one can understand the natural development of the private-public relationship. The model was successful in creating a system that harnessed differences between public and private investment and drew both in one and the same direction.

But an extreme and striking illustration of the failure of this form of government is provided by:

(a) its incapacity to regenerate the economic structure. This came about as a result of neutralising the positive effect of investment.

(b) the rigid institution that created an adverse climate for the natural process of development, as it largely shut-off the flow of capital and consigned whatever was available to very narrow

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* A critical view is given in Chapter 8.

> fieldsof investment. All this was under strict guidance to comply with the very objective of the economic model.

Underlining the pros and cons of the charter government model is the fabric of spatial organisation. It is not the shape of the railway or the degree of connectivity that matters as much as freightage charge policies and cost differentials between export commodities and imported goods. The charter government had a definite role of promoting export-import trade, yet had the obligation of raising capital whether jointly with government, or privately. By creating a modern sector and drawing the traditional sector into international trade, a dual economy was fostered. The resources of one were the seeds of existence for the other. Inequity of incomes and standards further projected the mal-distribution or utilization of resources, thus paving the road for in-migration. Furthermore, the centrality inherent in the administrative side of the charter government was reinforced by commercial headquarters. Likewise, the administrative urban hierarchy was supported by the commercial collection and distribution channels of export-import trade. Since the rewards for the selected firms of the charter government were in the form of high profit margins, and since wealth is security for raising more capital, the cumulative effect is paramount. In turn, taxes, transfer and surcharges from these selected firms, was a substantial proportion of the government revenue. Within the spatial context, these transactions were performed at the most convenient point for government and commerce - in the capital city, or Prime Base.

In conclusion, the need for understanding the distinctive impact of capital investment policies in this framework is of considerable importance. Firstly, because industry was directly affected on the decision-making level, secondly, the performance

of commercial plantation, infrastructure and business and trade was considerably influenced by the new paradigm. The fact remains that, under the circumstances, the running of these sectors necessitated their own rules and created their own institutions which should be the starting point of industrial location analysis in 'developing' countries. How much influence these institutions have had on economic development and industrial location is the theme of the subsequent two chapters.

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CHAPTER THREE

STRUCTURAL TRANSFORMATION AND ECONOMIC GROWTH BEFORE 1956

3.1 Introduction

The preceding chapter has suggested from the charter government model that capital investment was restricted in character and magnitude between 1899 and 1955. Despite that, a profound structural transformation of the Sudanese economy took place during the colonial rule this century, especially in the direction of 'systematic' agriculture, public utilities and social services. However, the same charter government contained the very elements that arrested the pace of economic growth and perpetuated a state of economic impoverishment. This chapter seeks to explain the anomalies of the model through an exposition of the economic processes and interactions.

At the heart of this process was the promotion of the export-import trade through an initial, though restricted, capital outlay and a strict management by the colonial administration of the money supply and expenditure. In the absence of the application of technology to the productive factors, two hypotheses are in order: Firstly, the productive system would only create a marginal surplus, concentrated in the hands of a dominant group or groups, at a prominent location, i.e. the tripartite capital of Khartoum, Omdurman and Khartoum Bahri - the Prime Base.* Secondly, industrial ventures were either suppressed, discouraged, or appeared less remunerative through the biases of the economic system.

3.2 The Formation of a Primary Export Base: Phase I

The first economic steps taken by the new colonial government

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* In this chapter a broad identification of the processes that led to polarisation is considered. However, a full discussion of the term Prime Base and the forces behind it is given in Chapter 4.

in Sudan in 1898 were to engender a reversal of policy by switching from the closed subsistence economy managed by the National government (1882-1898) to an open export economy. The objectives were simple: to re-instate the country as a producer of primary materials in order to meet management and public spending costs, while, at the same time, providing cheap raw materials and soft markets for the colonial co-partners within the framework of the Smithian model of free trade, and the Ricardian theory of comparative advantage.

The lack of transport and harbour facilities were the main practical obstacles to an immediate 'grafting' of the Sudan's economy to international trade. Egypt was obliged to finance such schemes on the premise that an undeveloped Sudan would only be a worthless possession, a continuous burden on her finances, and a threat to her security and water supply.(1) The Egyptian advances were forthcoming in the form of annual contributions to balance an estimated deficit in Sudan's budget, a redeemable government credit, and an over-draft with the National Bank of Egypt (a total of £E9.02 million).(2) Of all capital advances 85.1 per cent were allocated to transportation and communication and harbour facilities.

Meanwhile, Egypt was increasingly becoming the master of the export-import trade of Sudan, and in good years prior to 1925 she was handling, on average, more than 65 per cent of Sudan's trade.(3) Egypt's task was to revitalise trade through channels only too well known to her from previous Turko-Egyptian experience in Sudan (1820-1882), and through agents well acquainted with Sudanese produce, Sudanese traders and trade centres. The bulk of export trade continued to be collected natural products mainly gum Arabic, and wild game produce such as ostrich feathers and ivory.(4) Towards the mid-1925's this picture was increasingly changing in favour of agricultural production, the outcome of cultivation and animal

husbandry. The new list of exports included sesame, dura (sorghum vulgare) animals, hides and skins, and cotton. The production of the latter was promoted along the main Nile by the provision of credit facilities from the Sudan Government, (interest rate at $7\frac{1}{2}$ per cent, redeemable over three years,(5) and in the Gezira as a rain crop through financial rewards.(6)

Before the completion of the Red Sea railway line in 1906, export was trans-shipped through the Nile Valley - Halfa route. Clearly, diverting trade to the Red Sea would challenge Egypt's control over Sudanese produce and for that reason she was adamantly critical of the new railway line. But the British influence in Egypt, and the British argument were too strong: it was a question of creating trade that could never flourish without an outlet to the Red Sea and the world.(7)

In strict secrecy however, the British were preparing their master plan for agricultural development in Sudan - the grand cotton project - and watched with some unease the unrestricted trade links between Egypt and Sudan.(8) In Britain's view Egypt's financial involvement in Sudan, though critical, should not exceed the limit of providing for infrastructual development. Any contribution towards other economic sectors would further her claim on Sudan as was explicit in the argument of Lord Kitchener quoted above, and in the manner the National Bank of Egypt was dealt with. On the one hand, money from this financial institution was most welcome for railway building. Writing privately in 1910, Wingate expressed his eagerness to receive Egyptian money:

> I had heard a good deal before I left Cairo about the negotiations for the National Bank Loan for the completion of the railway to El Obeid and am very glad it has been finally arranged. (9)

But when loans for the promotion of the projected Gezira Scheme were

in question, the request of the National Bank of Egypt to make advances was tactfully declined,as was disclosed by Wingate in 1913:

> Of course I should like to see the arrangement in the hands of the Bank of England, and I think Lord Kitchener's plan, of more or less saddling the British Government with the final decision and thus relieving us of the onus of refusing the National Bank of Egypt's request, is sound. (10)

One month later everything fell into its right place; nothing was granted to the National Bank.(11)

Significantly, all Egyptian advances and subvention were stopped when the Gezira loan was authorised by the British Treasury in 1913. It was anticipated that Sudan should pay her own way from export proceeds and trade. Apparently all the pre-requisites to steer the export economy along a different course were well in hand. By then the Egyptian dominance over Sudanese trade was gradually slackening and giving way to direct trading with Britain and Europe.(12) It so happened however, that this trend and the scheduled start of the cotton scheme were instantly halted by the First World War, and soon the economy relapsed into the previous pattern of export of surplus food and raw materials to Egypt. One practice that was never to be resorted to again was external or deficit financing.

3.3 The Primary Export Base: Phase II

The inauguration of the Gezira Scheme mid-way through the life span of the colonial co-partnership, in 1925, marked the second phase of developing primary exports, and necessitated an organisational overhaul stretching over the political, administrative and productive systems. Limiting our discussion to the latter, it is noticeable that the Gezira Scheme involved capital and technology

on a scale unprecedented in Sudan. But the extent to which that capital and technology was productive of growth and structural change was probably disproportionately insignificant. The machinery imported to produce cement, build the masonry walls of Sennar Dam and cut deep into the Gezira clays was briefly commissioned and ended with the completion of the scheme. What emerged in contrast to the first phase was a more secure system for primary production - capable only of horizontal expansion - and a free hand to the British, enabling them to sell and buy cotton through the British Cotton Growing Association. The British share of Sudan's export trade rose from 42.3 per cent in 1920 to 66.7 per cent in 1925, to 77.1 per cent in 1929. Conversely, export to Egypt was progressively diminishing from 45.8 per cent to 13.7 per cent and 9.6 per cent for corresponding years.(13)

Although the Gezira Scheme was designed with expansion in mind in order to minimise future overhead costs, the area under cultivation was only sluggishly expanding after the peak of 1930/31.(14) Neither the meagre capital resources, nor the 1929 Nile Waters Agreement would allow any spectacular development. Until such time as these constraints were alleviated, there could not be much hope for cotton expansion. However, Egypt's plans to build a dam on the White Nile were seen in Sudan in 1914 as a new source of money supply:

> ... the construction of the dam [Jebel Auliya] will mean a claim on the part of the Sudan Government for a very considerable sum for compensation to the inhabitants. (15)

Equally important was the new storage capacity of about three milliard cubic metres of 'untimely' water which would raise water to levels that would permit lift irrigation on the White Nile. A new source of financing and a new technology - water pumps - were

simultaneously injected into the economy in 1936. The outcome was the White Nile Livelihood Schemes, for cotton production. These were run by a government board on a similar tenancy system as that of the Gezira. On the White Nile banks too, private pump schemes for cotton were developed with a high growth rate after the Second World War.

As for the informal sector, the counterpart of 'systematic' agriculture, the process of development was less homogeneous and entailed no new technology nor capital influx, though in itself it was adequately commercialised, especially the production of gum Arabic, sesame, sorghum (sorghum vulgare) and groundnuts. Labour, land, and water were the major factors of production. As population was continuously increasing, and land was abundant, variability and timing of rain was the most crucial constraint on expansion. Other factors were prices, proximity of cultivated land to transport facilities, taxes and royalties, elasticity of demand, the degree of absorption into the cash economy, and availability of credit facilities.

Two distinguishing elements appear to underly the various systems of production so far described. In theory, one would expect inter-regional income differentials proportionate to capital invested, technology applied, type and volume of produce, means of watering, and productivity in general. Although no serious attempt was made to weigh these variations, they were probably rather minimal. Profitability of the whole productive system relied heavily on the low priced labour factor rather than technological change and raising of productivity. This led to the marginalisation of returns accruing to the labouring community.

The Gezira tenants, allegedly the highest paid peasants in

the country, were living on an annual cash income averaging LS 17 per tenant for the years 1955/65,[16] in addition to a subsistence crop grown in rotation with cotton. One cause for this low income is probably the unjust sharing of the production cost between the tripartite partners i.e. the Sudan Plantation Syndicate, the tenants, and the Government. Tenants were held responsible for more than 67 per cent of the total operation costs, including some 40 per cent of a joint account - marketing, transport, ginning, insurance etc., and the whole of the actual in-the-field production costs such as sowing, ploughing, cleaning, spraying, fertilisation, pulling cotton stalks.

Probably more detrimental to income differentials was the parcelling out of income between the various production factors, i.e. labour, land and capital. The bulk of income from the Gezira was partly repatriated as dividends to shareholders in Britain and partly transferred to the central treasury at Khartoum as an indispensable part of the public revenue. The financing of the White Nile pump schemes was altogether different. This was achieved through the commercial banks, whose income was expanding steadily after the depression of the 1930's and the boom years shortly after the Second World War. For these commercial institutions, borrowing from the Bank of Egypt and head offices in Europe at an interest rate of three per cent was also becoming readily available. The banks would normally make short term credit and collect their money after crop sales at an interest rate of up to seven per cent.[17] The other beneficiary to whom advances were made, was a small group of 'Notables' spearheaded by the two religious leaders of the Ansar and Khatmiyya sects, in addition to or in coordination with land owners, tribal leaders, and commercial entrepreneurs. The sharing of the proceeds was similar to that of

the Gezira whereby the tenant gets a percentage for his labour from net profit through shouldering a larger proportion of cost including 50 per cent of the joint account and all 'in-the-field labour'. Unlike the Gezira, the owner, whether alone or in partnership gets the other half of net proceeds. By virtue of its location at Khartoum or affiliation to the Khartoum institutions, this group immediately transferred money to the Prime Base in the form of interest repayments, commercial undertakings, consumer goods and in real estate and savings. A substantial part of the proceeds would also be repatriated outside the country through commercial banks as profits and borrowing repayments.

The next main subsystem involved a systematic transferrance of money from the rain-fed agricultural regions and grazing land to the Prime Base through a chain of hierarchies centralised at Khartoum in the hands of the export-import companies and commercial entrepreneurs. The commercialisation of the rural segment of the community involved the provision of goods in credit to provincial traders who in turn supplied consumer goods to village shop keepers. The margins of profit tend to increase towards the Prime Base. The lowest link in this chain assumed the function of creditors to agriculturalists at a high margin of profit. When the produce had been harvested it would be appropriated by this tiny group and transferred to catchment areas. Whether the produce was sold by auction or otherwise, middlemen, provincial traders and company agents would buy to secure the vast margin between local prices and Khartoum or overseas prices. Commercial banks were also involved as the whole trade had a short gestation period and a high margin of profit. Again, those who were categorised by the banks as credit-worthy would be able to purchase large volumes of

the produce and reap vast profits, and consequently money would move along a similar channel as described for consumer goods. This perpetually reinforces the prominence of Khartoum as the centre of financial transaction and commercial activities.

From this general survey it is evident that an unrestricted process of polarisation was taking place with the ultimate outcome of enriching the Prime Base to the detriment of all other regions. However, the same process was by no means isolated from the management of public finance and by-laws, the overall size of export-import trade and income from trade, and the policies that confined development to agriculture and trade. This is the theme of the next sub-sections.

3.4 The Fiscal System and Monetary Base

The financial limitations and dearth of capital in Sudan loomed large in the discussion on investment, and indeed have had an ever-lasting influence over the monetary base and fiscal policy, especially after the commitment to financial self-reliance in 1913. With respect to this obligation, the government followed a consistent economic line whereby it became directly involved in the productive sector, monitoring foreign trade and shaping demand through public finance, taxes, and price stabilisation programmes. It is our task in this sub-section to unravel the spatial connotations that such policies would create.

It was anticipated by the administration that that mobilisation of domestic resources within the charter government model would increase the national income and permit the growth of public revenue. But increase and growth in this form of economy were both dependent variables much affected by the underlying investment stringencies and uncertainty of production and prices. In attempting to minimise

the negative effect of these forces a restrictive fiscal policy was introduced to equilibrate the erratic changes of prices and production, in a bid to make good the deficits of bad years. It follows that public expenditure and private investment were both continually being restrained. Public revenue was consequently maintained at a level that would frequently permit accumulation of money to be passed to the various statutory reserve funds, and private investment was confined, in the main, to agriculture and foreign trade. Profits were either repatriated, recycled in the same economic fields or invested in unproductive transactions such as real estate, lending, hoardings, or otherwise directly consumed.

Most of the attributes characterising these economic processes directly emanate from the concepts of a balanced budget, reserve funds, and self-sufficiency, and were widely accepted fiscal dogma throughout British Tropical Africa. The guidelines were aptly described by E.A. Brett in 1973:

> Britain's central concern in this area [fiscal policy] was to ensure colonial self-sufficiency and balanced budgets. The first objective of any administration was to pay for all its services out of recurrent revenue; having once achieved this, to ensure that it maintained sufficient reserves to meet contingencies arising out of economic failures of any sort. (18)

The theoretical base of such fiscal policies was probably the relic of mercantilism. This was a doctrine with a prime concern to procure a favourable balance of trade through expansion of exports and protectionism, and to pile up as much precious bullion as possible to finance the essentials (the army and later, in neomercantilism, the productive sector), and save the balance as a war-chest.(19)

The strict observance of these monetary 'rituals' by Sudan administration was well documented in the various issues of official reports and publications. The adoption of a fiscal system which

does not err on the side of severity and control over state expenditure was adopted by the Sudan administration in 1902 as a practical policy,(20) and in fact has changed but little since then. The same measures designed to reduce public expenditure and close the account without deficit were successfully implemented during the First World War. In subsequent cycles of good production and/or prices, the drive was for improving the position of reserve funds:

> Revenue remained buoyant and provided budget surpluses which enabled the policy of strengthening the underlying reserve position to be continued. (21)

It appears that the maxim of sound finance, and the success of the whole operation was attained when Sir John Maffey's term of tenure ended as Governor-General in 1932:

> [He] has the satisfaction of knowing that he has left behind him a peaceful country and a balanced budget. (22)

Indeed the need to dip into reserves had occasionally recurred and was acknowledged as being contrary to sound finance, but it should be emphasised that such course of action was an integral part of the whole process, and to suggest that that was a deviation from the orthodox 'balanced budget', as A.A. Beshai did, is plainly a misapprehension of the main theme.(23)

In view of the importance of reserve funds as an equilibrating factor within the fiscal system, it is necessary to sketch other functions that relate to the two broad types of reserve funds.

3.4.1 Government reserve fund

In the hands of the central treasury, reserve funds, constituted in effect, excess money over recurrent expenditure collected through taxes (direct and indirect), in addition to returns on

government's share in agricultural schemes. In one respect, reserve funds could thus be operated as a damper on the internal price structure whenever an inflationary gap appears on the horizon as a result of good yields and/or good prices. Tax increases of more than 100 per cent were quite common during such times, (the First World War, after the 1921 recession, after the 1930's depression, during the Second World War and lastly during the 'Korean boom' (1951)).(24) Incomes were continally being checked by syphoning newly won money through various monetary devices into reserve funds.

Probably the most conspicuous of all reserve funding was the Price Stabilisation Scheme conducted as a counter inflationary measure during the Second World War. An official agency, the United Kingdom Commercial Agency, was made responsible for conducting Sudan's export trade; buying internally at low prices and selling, in theory, at the ruling inflationary price overseas. The difference would be passed to a price stabilisation account with the function of subsidising the price of some imports. But the scheme did not function in this way. Firstly, it should be stressed that when sanctioning this scheme the government was only referring to a small fraction of Sudan's produce (about one tenth of export by value) that would freely be sold at the ruling prices. Thus cotton, cotton-seed, livestock, and hides and skins that constituted up to 90 per cent of exports by value at the time, were sold, on behalf of Sudan, by the aforesaid agency to Britain and Egypt at artificially low prices:

> It was decided to let the purchaser have the benefit of the Sudan's low-priced economy as in the case of sales of cotton to the United Kingdom and of animals to the Middle East Forces. (25)

As long as the gains to the producer and trader were fixed, the margin of profit from export trade would have in no way impaired the anti-inflationary measures adopted. Any extra money would have been similarly passed to reserve funds. But the foreign administration opted to sacrifice Sudan's legitimate right in the interests of the co-partners, and literally robbed the country of millions of pounds in the name of price stabilisation.

Another function of the reserve funds was to safeguard foreign investment and ensure prompt credit repayments. In the case of Sudan this was carried a step further. Reserve funds could freely be called upon by the mother country whenever they exceeded a certain margin. The beginning of the Second World War witnessed an inexplicable drain of Sudanese reserve currency. More than £E3.3 million were passed to the British Treasury to redeem 35-year loans which should have been mature in 1959. And in 1940 Sudan was made responsible for financing the occupation army! a sum of nearly £E6 million.(26) In 1942 another £E0.44 million was paid prematurely for buildings taken over from the Plantation Syndicates. The companies were to pay an annual rent for the same buildings. Lastly, a sum of £E0.3 million was also advanced as a war-time gift to British and Indian governments in recognition of their services in Sudan.(27)

This appalling dissipation of reserves had deprived the country of valuable capital and eliminated the chances of productive re-investment and economic growth in the period that followed the Second World War.

3.4.2 Producers' reserve funds

Producers' reserve funds were sanctioned in the mid-1930's as equalisation devices to cushion the effect of seasonal variations

of production and/or prices on real income, and to repay outstanding debts incurred in the depression years and any such debts in subsequent seasons. Towards the end of foreign rule in 1955, the Gezira Tenants Reserve Fund, the most important of all such funds, was kept at the statutory ceiling of £E.3 million. This figure is considered to be very low in comparison with reserves of marketing boards in other African countries.(28) The economic value of the Gezira Tenants Reserve Fund was also questioned by Beshai on the ground that payments were frequently made when they were least needed and could only embellish the system that thrived on dissipation of occasional trade gains on imported consumer goods.(29)

As seen thus far, to implement the principles of mercantilism in a dependent economy was an easy task. With a free hand and a silenced opposition, the administration could freely raise taxes, reduce expenditure, give price concessions to the foreign purchaser, manipulate people's demand and keep it in harmony with a changeable income. This was the fiscal stability that precluded inflationary gaps and re-investment, and muddled the country into a spiral of spending on foreign consumer goods. As a consolidating factor, the banking system was tightly geared to the Egyptian system, and local currency in circulation was readily convertible into foreign exchange, and credit was conducted with the seasonal peak coinciding with the growing season. Deficit financing was avoided at all cost.

However, the price to be paid was the confinement of the whole economy in a position of no real progress. The outcome of similar encounters in Latin America was pin-pointed by C. Furtado (1964):

> ... the cost of avoiding inflation and external disequilibrium is high: stagnation, or at least, a restricted rate of growth. (30)

It is logical to expect that restricted public expenditure and growth would have serious consequences on a variety of developmental aspects. Foremost was the curbing of spending on administration, public utilities and social overhead costs. Centralisation of government, adopted without exception in African dependencies, was a direct outcome. In some parts, including Sudan, political 'devolution' in varying degrees was granted whereby native rule was incorporated into the colonial administrative machinery participating in judicial matters, maintenance of law and order, and in tax collection etc. Tribal heads and surrogates thus enjoyed both social distinction and materialistic rewards in the sense that the wealth of this group was multiplying and its chances of betterment were furthered through the biases of the educational and administrative systems that favoured its heirs.

With the expansion of exports, imports, population and education, the central government expanded in sheer number of personnel and offices thus consolidating the rôle of the central departments in Khartoum. Furthermore, the bureaucracy had to accommodate school and college leavers who were progressively multiplying and swamping the government departments of the Prime Base.

On the other hand, the trading community as described within the context of the charter government model depicted the same centrality concept and formed a powerful ally with the central government, and constituted a solid pressure group by virtue of its contribution to the central treasury. As early as 1908 a chamber of commerce was initiated and had considerable weight in matters of profit margins and prices, tax rates, money in circulation, wages and salaries and more significantly on the service sector, which was tailored to suit the requirements of its members.

The interaction of all these groups created the impulse that characterised the Prime Base with its formidable power to polarise and perpetuate. Thus the understanding of the build-up to a mercantile economy is fundamental to any explanation of industrial location in Sudan and similar countries.

3.5 Growth Through Trade

In the preceding discussion we have examined 'balanced budget' and 'reserve funds' as two fiscal devices to mitigate capital shortage and induce development and structural change. One further component deemed necessary by the colonial administration for the realisation of these objectives was self-sufficiency within the framework of the British Empire. For Sudan, that meant in practice, the break-away from autarky which the country enjoyed during the brief self-rule (1882-1898). But the call for 'self-sufficiency' reduced the country to a state of perpetual insufficiency whereby importable consumer goods gradually replaced home-made articles, created new ones, and activated new desires, tastes and wants. In its entirety, this affected spending patterns, earning growth rate, and the capacity to invest and develop. Since expansion of imports is indicative of export growth it is often assumed that the quality of life is up-graded through trade. In the meantime, it suffices to mention that the policy guide-lines were deeply seated in the concepts of comparative advantage and gains from specialisation.

Let us explore the argument embodied in the international trade thesis. In its simplest model, it could be ascertained that any two trading partners could gain from trade and specialisation. This was the classic foundation laid by D. Ricardo and later incorporated in the exposition of John Stuart Mill.(31) However, the explicit conclusions on terms of trade and development were formal-

ised by R. Torrens.(32) His advocacy was that industrialised nations would in the long run suffer a deterioration of the terms of trade (i.e. the ratio of export and import price indices), because of the diminishing returns of agriculture and the decrease of marginal productivity of the production factors in the primary producing countries; whereas industrialised countries progressively cut back on production costs with an increase in marginal productivity. These views were taken up by J.M. Keynes early this century with some emphasis on the law of diminishing returns in primary production and population growth in Western Europe, and the consequential deterioration of the terms of trade for the latter.(33) The critical assumption here was the decrease in returns to scale in agriculture and consistent returns to scale in industry. There was a clear neglect of key factors such as demand and technological progress. Whereas technical progress in agriculture would alter the situation, inelasticity of demand would halt consistent returns to scale in industry.

On the other side of the fence a fresh line of inquiry has been exemplified in the Singer-Prebisch thesis.(34) The assertion is that the terms of trade go against the 'developing' countries and that growth through trade could only lead to a dead-end. It seems that the British trade figures (1870's to 1930's) on which the Singer-Prebisch thesis was based were insufficient evidence. Nevertheless, the Singer-Prebisch case sheds some light on the negative effect of trade in 'developing' countries and underlines the urgency to industrialise.

Yet, there are those who could see the weaknesses of both approaches and hold, in their own right, a moderate position. G. Haberler, for instance, sees no point in the suspicious attitude towards trade and is convinced that trade is vital for the develop-

ment of 'less developed' countries.(35) He maintained that only broad generalisations could be made with regard to short run variability, otherwise it is neither possible to prove secular tendencies in the terms of trade nor meaningful to extrapolate into the future.

By making some qualifications, dropping a few postulates, and formulating fresh ones, Bo Södersten was able to build a model that gives much support to the basic argument of Singer-Prebisch.(36) He first of all vindicated the static nature of comparative advantage, and to reach Singer-Prebisch's findings he maintained that three conditions ought to prevail: first, growth should be confined to the export sector; second, elasticities of supply and demand should remain low; third, growth of demand should also be low. Provided that these conditions were met it could be said with some confidence that terms of trade would show a general tendency to deteriorate.

Turning our attention to the case of Sudan, the most elaborate exposition of export performance and terms of trade have been furnished by Beshai.(37) He forcibly argued that the Sudan's terms of trade were favourable and showed no sign of secular deterioration. He concluded that in most cases demand for Sudan produce was income-elastic and internationally, the country was strongly competitive. He was also convinced that export instability had created no serious problem to the economic development of Sudan.(38) Yet he was not unaware of the failures of the Sudanese economy, an economy whose growth, according to him, was rather slow, giving the impression that 'the country has been sleepy'.(39) He attributed this to the inability to realise a more significant carry-over from external trade to internal development because of domestically based obstacles. The rural credit system, the sheil,

was singled out as the major factor to blame together with the government's inability to interfere with the market imperfections. The supporting evidence presented by Beshai leans heavily on the commodity terms of trade for the period from 1945 through 1968, in addition to what he called 'abnormal periods' of war, economic recession or boom.

Many objections could be levied against the findings of Beshai on technical as well as factual grounds. First, the commodity terms of trade* as a statistical index is void of any inference to gains in real terms to the extent that its improvement does not necessarily make a nation better-off if the contribution of invisible trade is negative or when factoral terms of trade** or income terms of trade are deteriorating. Commodity terms of trade also neglect the contribution of invisible trade which could be negative. Second, the selection of the base year as a yardstick against which gains or losses are measured is by necessity an arbitrary one and has an unavoidable bearing on results. Third, Beshai has only considered overall cotton-piece prices as the import price index in order to arrive at the terms of trade. The assumption that textile prices move in sympathy with other imports is rather unrealistic. The bulk of the cotton-piece imports was supplied by Egypt, India and Japan with a completely different price structure as opposed to comparable imports from Britain and West Europe. Furthermore, as textiles were generally cheap grey sheetings their prices would only move gently. Any deviation from this gentle movement would

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* The commodity terms of trade measures the export and import price indices.

** The factoral terms of trade relates price of exports and imports to domestic cost of exports.

lead to a drastic deterioration of the terms of trade as shown by Beshai's calculations for the years 1919-1921.(40) In one instance Beshai has undermined all his argument by maintaining that the Sudan terms of trade were almost static.(41)

Before attempting to develop the argument of trade gains consider, first, the conditions with no trade. It was reported early this century that Sudan could fully provide her immediate consumer necessities to the limits of satisfaction: 'I do not suppose', claimed the Governor-General, 'that there is any part in the world in which the mass of the population have fewer unsatisfied wants'.(42) That being so was only because of the limited needs of the population, and the self-sufficiency of a closed economy that had not yet felt the effects of international trade, and being until then divorced from the influences of the Empire's self-sufficiency. The productive factors were mainly engaged in subsistence with little to spare for external transactions. In fact, consumer goods such as textiles, leather wear, honey, 'beer' etc., were all produced within the village. Relapsing into that old system of production was observed at a later stage of the country's development during the Second World War when it was noticed that the producer:

> met the situation by becoming largely self-supporting, <u>once again</u>, growing his own cotton and weaving his own clothes, searching for honey to replace sugar, and reserving more grain for brewing instead of turning it into cash which he could not spend. (43)

However, a statement of this nature could not possibly reveal whether the community was becoming any better off without the advantages of trade. Such an economy, one would assume, could only attain a slow rate of economic growth because of the lack of regional specialisation, division of labour, the inability to save,

invest or raise productivity. In short, this means sacrificing the advantages of trade.

More serious perhaps was the immediate action taken at the turn of the century to incorporate the existing traditional system into international trade. Firstly, economic regeneration of Sudan during the colonial period (1898-1955) heavily relied on the export sector: almost all of her foreign earnings and national income emanated there. Secondly, Sudan's supply factor was determined by a low investment ratio, and also shackled with the chronic problem of Nile water limitations. It should be remembered that the proposals for the Gezira scheme were briskly opposed in Egypt because of the fears that this might impair Egypt's present and future right on the Nile.(44) Only a fraction of Sudanese irrigable land was utilised. Besides honouring the clauses of the Nile Waters Agreement of 1929, the British were probably not so keen to step up cotton production beyond their immediate requirements and market capacity. In one instance when Sudan's production was in excess of that limit, the British had to pass the extra cotton to India at prices well above what they paid for it, and a difference of £E1.7 million was later rebated to Sudan.(45) Further, more production would inevitably heighten competition in the labour market and increase labour costs, the very production factor that made the cotton enterprise a profitable British venture.

In the traditional sector it was quite natural that the supply of agricultural products could not respond to elasticities of demand as expansion was determined by seasonal distribution and annual rainfall totals, as well as income elasticities for importables, price elasticities of demand, and in the longer term population growth rate. In addition a substantial proportion of production

was normally consumed locally.

Given the conditions of a fairly low elasticity of supply in the modern and traditional sectors, it follows that the economy would be indifferent to the growth rate of world demand except within the limits set by the actual two extremes of low and high production and productivity.

Another ingredient with some bearing on the terms of trade was the labour factor. Since entering international trade, the Sudan administration was faced with the labour factor of production. But the labour force was apparently growing fast. This has often been noted and was specifically reported in 1921 with a shocking apathy:

> ... the villages are full of children: the result of quiet government and peace. This should in time lead to more cultivation and tax revenue I suppose. (46)

Infant mortality was progressively being curtailed and the trend was one of higher population growth rates. In the absence of a diversified economy, labour cost was kept low and overhead costs in both the traditional and modern sectors largely remained marginal to production costs. An adequate supply of cheaper labour was also guaranteed through planned schemes to encourage West African nationals to stay as long as possible in the production centres while pilgrims were traversing Sudan to and from Mecca.(47)

As long as marginal productivity remained stagnant and land under cultivation was sluggishly expanding, one would expect a higher man/land ratio due to natural population growth and immigration, on the assumption of a relatively low rate of out-migration from the rural areas because the economy was not creating alternative jobs in other economic activities. Excess supply of labour was thus a natural manifestation of the productive system, con-

tinually erasing any benefit from trade. This culminated in a further deterioration in the country's terms of trade especially when elasticity of demand for imports was increasing in the absence of local industries.

One more aspect of equal importance to population growth was the pattern evolved through the years for marketing Sudan's produce. The right of pre-emption over the country's produce was exemplified in the monopolistic manipulations in Britain and Egypt. Mention was made above of controlled purchase during the Second World War. However, that was in no way an isolated episode. In fact, the British Cotton Growing Association, the same establishment that promoted cotton production in Sudan and elsewhere in the British Empire, and the main shareholder in the Gezira Plantation Syndicate, was entrusted with cotton marketing since 1925 in what was known as the bulk sale system. The whole of the Gezira produce would normally be consigned to agents in Liverpool who bid within a monopsonist price range. Of course there were occasional factors which altered the price structure in favour of primary producers; the best example being the feverish stock-piling during the early days of the Korean War in 1950-51. With respect to the initial cotton expansion it must be added that production was horizontally extended regardless of international prices as evinced in the following statement in 1933:

> Sir John [Maffey] concentrated the extra money available on extending the Gezira Scheme as a measure of insurance against low cotton prices. (48)

Under such circumstances, the terms of trade would inevitably go against the producing community.

The bulk of the other primary products such as gum Arabic, groundnuts, cereals and livestock found their way, almost exclusively, to Britain, Egypt and India. This was achieved through an

elaborate auction system conducted and supervised by the colonial administration. Only a handful of powerful companies, specialising in one or two commodities were making economic transactions in complete isolation from world competition. To comply with the principles of the co-partner agreement for instance, Egypt was given the first call upon Sudan's food production and on many occasions export to countries other than Egypt was prohibited.(49) Moreover, Egypt, the sole importer of livestock was in a position to control her animal imports and intervene in the price structure by direct government purchases at fixed prices. This policy was immediately enforced when free competition between Egyptian traders started to yield higher returns to animal producers.(50) Essentially, the national income and terms of trade would be expected to suffer since the country could neither maximise proceeds from exports nor increase productivity to maintain a low price structure - such as happened in North America and Australia with regards to primary production at the beginning of this century.

One further point often neglected is the effect of the invisible trade account which caters for insurance, shipping, contributions towards pensions of retired personnel, tourism, and international transfer payments to expatriates, and company profits. The deficit on this account amounted to £E2 million in 1947.(51) Ignoring this and all other factors discussed above, Beshai's conclusion that the Sudan trade fared well is probably unjustifiable.*

It might well be argued that a secular deterioration of terms of trade was indivisible from the failure to strike a fair deal for

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*It must be stated however, that there are insuprable problems regarding the calculations of a realistic figure for the terms of trade. Basically, data is unavailable for variables such as free market prices, differential population and productivity growth, invisible trade, etc. Indeed, some of these variables are non-quantifiable.

Sudanese producers, and the inability to create self-generating expansion. Concurrent with population growth and stimulated demand for importables was a built-in process of impoverishment inherent in the charter government model, which was productive of social and economic imbalances that forcibly drove rural population to provincial towns and indeed to the Prime Base. In striking contrast, the trading community centred at the Prime Base, was well protected by authorised high profits of more than twenty per cent,(52) together with its ability to appropriate the surplus, and transfer it in differing proportions to the Prime Base and abroad.

3.6 Planned Non-industrialisation and its Impact

The economic model expounded hitherto, showed how the re-structuring of the productive system, its grafting to international trade and containment within various fiscal and monetary frames was only capable of restricted development. The mere absence of industry from the scene of development in Sudan during the first half of this century, would suggest that the efforts to effect economic development were somehow inimical to industrial growth and incompatible with its emergence as a productive sector.

Similar evidence of industrial undevelopment was repeated in many 'developing' countries with such regularity as to justify an assumption of a policy of non-industrialisation among colonial powers. It is worthy of note that while the empirical findings cover a host of countries no prognosis was ever made to link such non-industrialisation commitment with industrial location and industrial structures when industry was later promoted. A search of the literature on Sudan's development through half a century would only reveal an appalling lack of such empiricism and a

general unawareness of the significance of non-industrialisation. In retrospect, the impact of non-industrialisation seems to extend beyond the usual lament of missing a chance to the vital areas of National Income, income distribution, employment, and industrial location. Subsequent pages will be devoted towards rectifying these shortcomings.

Perhaps the most important asset of the colonial powers before their drive into Africa in the late nineteenth century was the invaluable experience acquired through earlier formal and informal colonisation especially in Asia and Latin America. Even if, 'the Imperialists were merely scraping the bottom of the barrel,'(53) in tropical Africa, they were doing so with unslackening interest and the utmost proficiency. There is available specific evidence of how industry was repudiated, but one could not find anything as outrageous as the action of the Queen of Portugal in 1786 when, by a sovereign decree, she ordered that industry, of all description, should be abolished and extinguished in her Brazilian Domain.(54) Though subsequent objections to industry took a more subtle mode, objectives changed little. Industrial development had to be suppressed in the colonial dependencies as the economies of these countries had to complement rather than compete with the industrial core.

British attempts to suffocate industry in India are a good example. British commercial policy there, as asserted by the Indian Industrial Commission in 1916-1918, was to confine business to trade and commerce to the exclusion of manufacturing industry. Instead of making India strong and self-supporting the British in their own interest as a manufacturing nation 'retarded her industrial progress'.(55) In the opinion of Lord Lugard the whole exercise was gravely mistaken:

> The attempt to suppress local industries by excise duties or otherwise is, on the other hand, a short sighted policy, unjust to the people for whose development we have assumed responsibility, and one, moreover, which fails to achieve its selfish object. (56)

To all intents and purposes the economic policies carried out in dependent Africa were derived from the Indian experience. In the North, Egypt's textile industry with substantial possibilities, was suppressed for no reason other than competition with Lancashire. In the final analysis, E.R.J. Owen was convinced of the enormous pressures on the British consul in Egypt, '... Cromer was anxious, at all costs to avoid protests from Lancashire millowners ...'(57) As with India in the 1890's, pernicious excise duties were imposed on local mills.

The Nigerian hand looms were considered by the British administrators as inefficient parasites consuming valuable cotton that should be supplied to Lancashire. The 'sensible' action was thus to channel the produce away from local manufacturers, as was suggested by the administration in the 1920's:

> Part of the problem was then to direct the supply of cotton from Nigerian hand-looms to the power-looms of Lancashire. (58)

In French West Africa any attempt to open a factory was met with severe restrictions wherever there was a threat to similar French industry as was the case in Senegal in the 1930's.(59)

The picture in East Africa was hardly different. Here too, the complementarity concept of development was well established in the 1920's. Even a small matches factory or a twine rope factory would cause alarm concerning public revenue losses through failing custom duties and in the case of the latter, losses of jobs and business in Aberdeen.(60) Excise duties were promptly imposed causing subsequent closure. However, the white settler's economy in Kenya was slightly different as pressure on the British

Colonial Office yielded some concessions to establish processing plants.

It seems evident that the charter government model and structural change in Sudan already discussed could not accommodate an industrial sector in Sudan. The concept of self-sufficiency held by the administration was an inception of complementarity between three economies at differing stages of development: Britain, the home of the Industrial Revolution, now in full swing; Egypt, an agricultural country, striving to establish her own industry; and Sudan, a wholly agrarian economy with a specific rôle as a primary producer. These varying levels of development and specialisation ensured different economic spheres of interest for the co-partners.

Engagement in Sudan's market and her trade could conveniently be shared by the co-partners if some understanding prevailed. The very fact that Egypt and Britain were at two extreme ends of technological advancement and industrial development defined their direct economic interests which were harmonised by the very nature of their varying raw material requirements, and saleable production.

Of immediate interest to Egypt was the vital question of securing surplus food supplies from Sudan for her fastly growing population, and raw materials as well as markets for a nascent industry. The fact that Egypt wished to safeguard her stake in Sudan is depicted in trade figures (see Table 3.1). In the Adly-Curson negotiations in 1921 it was clearly stated that besides the Nile waters the Egyptians had many other interests including the supplies of Sudan to Egypt.(61) By 1918 Egypt was importing about 79 per cent of Sudan's produce.(62) Equally important to Egypt were the soft markets of Sudan. On occasions when a favourable climate had prevailed for the promotion of industry as

Table 3.1 Sudan's foreign trade with Britain and Egypt as Percentages (1920-1956)

	Britain		Egypt	
	Imports	Exports	Imports	Exports
1920	21.5	42.3	55.2	45.8
1921	27.3	34.8	39.8	40.3
1922	24.3	34.9	39.0	33.7
1923	32.8	35.6	32.9	23.4
1924	30.1	57.3	33.3	16.9
1925	32.9	52.7	29.7	23.7
1926	30.9	66.7	24.8	13.8
1927	36.7	72.8	28.2	10.3
1928	34.8	71.0	25.6	9.9
1929	31.8	77.1	23.2	9.6
1930	34.3	63.6	21.6	11.4
1931	31.0	40.8	20.2	21.4
1932	22.7	65.9	21.8	9.4
1933	25.3	56.0	24.3	14.3
1934	24.7	51.7	22.1	21.4
1935	31.4	44.1	19.4	13.1
1936	26.5	53.4	20.5	11.3
1937	23.4	40.9	22.6	9.5
1938	26.2	45.1	23.0	14.5
1939	27.7	45.5	28.3	11.2
1940	19.3	36.8	35.5	19.1
1941	15.1	44.4	33.3	14.0
1942	8.0	58.4	37.1	24.7
1943	6.7	40.1	34.6	23.1
1944	7.3	40.2	22.5	27.6
1945	12.7	40.8	16.9	24.1
1946	23.9	34.4	18.8	19.2
1947	24.0	38.8	21.6	18.3
1948	30.0	61.4	21.2	13.9
1949	32.5	61.0	16.4	10.5
1950	39.7	54.8	9.4	8.1
1951	34.8	66.5	9.1	6.3
1952	33.6	55.3	7.1	7.0
1953	41.5	41.0	8.3	5.5
1954	32.4	42.3	10.4	8.8
1955	30.2	28.1	11.3	9.9
1956	27.6	33.0	13.9	11.1

Source: Compiled from (1) Sudan Government, Foreign Trade Report, 1947, Department of Economics and Trade, Khartoum, 1948. (2) Republic of the Sudan, Annual Foreign Trade Report, 1956, Ministry of Social Affairs, Department of Statistics, Khartoum, 1957.

in war time, or during a world economic recession, Sudan would paradoxically be faced with an increased volume of Egyptian exports. Thus in 1917 Egypt was increasing her export of industrial goods to Sudan, e.g., cement, textiles, glass, soap, (vegetable) oil, and leather.(63) These were precisely the sort of articles a country like Sudan would hope to manufacture locally. But the physical proximity of Egyptian suppliers, a common currency and customs union, all contrived to nulify such opportunities. Indeed, any initiation of such industries in Sudan would not only compete with Egyptian industry, but would deprive Egypt of a considerable volume of raw material for which she was paying low prices.

The second central economic stake in Sudan was that of the British. However, the stage was not set for an immediate British involvement. Achieving this goal hinged on a massive build-up through two decades of infrastructural development culminating in the launching of the Gezira scheme in 1925, and the informal schema that geared the economy of Sudan to the Empire's free trade and marketing systems. Because of savings on transport cost made possible by the new Red Sea line and Port Sudan and acquaintance with the European markets, and the establishment of British firms and agents in Sudan, the supremacy over Sudan's industrial crops and trade was gradually gathering momentum and redressing in favour of the British towards the mid-1920's.

On the import side it is necessary to distinguish between various types of goods. First, capital goods: primarily associated with the agricultural and transport sectors, such as locomotives, rolling stocks and rails, motor vehicles and tyres, pumps, agricultural machinery, power generators, ginneries, flour mills etc. These were invariably supplied by Britain. In the second

group were consumer goods which could be divided into durables such as electrical appliances, mainly supplied by Britain, and non-durables, including cotton and wool-piece goods, food stuffs, beverages, chemical products, pharmaceuticals, leather articles etc. Because of production and cost structures or natural endowment, Egypt and India specialised in providing items such as cement, sugar, tea and also successfully competed at the cheaper end of textiles and food industries. On the other hand, Britain had passed the stage of profitably producing at this end of the market because of the rising cost of the factors of production.

While trade with Britain, Egypt and India was conducted on the premise of free trade, these countries supplied, at times, more than 80 per cent of Sudan's imports.(64) Of course, the maxim of free trade was observed whenever grey areas were in question and some concessions were made at times of political tensions. The clauses concerning trade and commerce in the 1936 Friendship Treaty between Britain and Egypt is a good example.(65) It is important however, to note that in the rare cases when Britain went out of her way to promote a specific industry, meat canning for instance, the retaliation of Egypt was a deterrent.

There were strong factors in favour of a meat processing industry in Sudan. Prices of Sudanese animals were low and remained stable for a long period as a result of circumstances already disclosed. Secondly, official estimates of the animal wealth had always maintained that the off-take potential was high. In fact, as far back as 1904 an expert of the Indian Colonial Service, invited by the Sudan Government, ascertained this and recommended a tanning industry.(66) However, the animal wealth was unutilised because of limited demand in the traditional market. Other production factors such as labour and transport were favour-

able and would enhance the possibilities of profitable operation for new markets.

To the dismay of the Egyptian Government in 1950 a British firm, Messrs. Sudan Meat Products Ltd., a subsidiary of Liebigs, was handed the concession for a meat factory at Kosti (375 Km south Khartoum). One year later construction started and in 1953 production commenced after a delay of one season. It will be recalled that Egypt was the sole importer of livestock with a share of up to one hundred per cent, and that f.o.b. prices were persistently kept at about £E14 per head for the four years that preceded the sanctioning of the factory. It should also be remembered that the Egyptian Government was the direct importer and organiser of the trade through selected Sudanese cattle merchants and Egyptian dealers. This 'monopsony' was now seriously challenged. The newly created demand of a meat processing factory would either be met from existing supplies or an increased animal off-take. In either case, prices would inevitably go up in the absence of a duopoly agreement. The response of the Egyptian authorities was prompt, ferocious and intriguing. They took the initiative of starting a price war. As will be noticed from Table 3.2, per head wholesale price at El Obeid increased in 1951 to 38.6 per cent over prices of previous years, i.e. nearly £E2.0 per head. Taking 1950 as a base year, the increase amounted to 87.4 per cent in 1952, the year when production was due. These prices were evidently beyond any profitable operation for the company and probably £E4.0 per head above initial estimates of material costs. The factory's structure was consequently shattered, and the firm was in perpetual financial difficulty till it petered out in 1957.

Table 3.2

Egypt's relative share of Sudanese live animal trade (cattle) and price per head (1944-1956).

	Egypt's share of Sudanese live cattle trade (per cent)	Price Per Head (£E)
1944	99.96	8.85
1945	100.00	9.76
1946	97.68	11.49
1947	100.00	14 61
1948	100.00	14.74
1949	99.90	14.13
1950	96.40	14.67
1951	100.00	17.56
1952	100.00	20.00
1953	98.90	19.87
1954	100.00	18.28
1955	100.00	16.86
1956	98.20	17.26

Source: Compiled from data in Table 3.3

Nevertheless, the short-lived experience of meat processing in Sudan could neither prove the unfeasibility of meat canning nor demonstrate a positive attitude towards industry when the factory was approved. It was reckoned by the Sudan administration that the Sudanese animal resource was a time-honoured monopoly to Egypt, and the only feasible way to re-direct a sizeable portion of this resource to Britain could only be effected by making the product saleable in that market through canning. In 1954 alone Britain was for the first time air-lifting 1.35 million Kg of canned meat from Kosti factory, roughly equivalent to 14,000 head.

An especially relevant proposition was suggested by G. Karrar in 1966[67] to the effect that meat processing in Sudan represented resource utility minimisation. He claimed that, 'On per head basis export on-the-hoof brings greater returns of foreign currency.'[68] From a simple display of figures the disparity was projected by Karrar to disfavour meat processing with a total loss of foreign earnings in the region of more than a quarter of a million pounds in 1956.[69] It should however, be added that the quoted number of animals slaughtered in the factory was a mere approximation based on factory production in Kg. Furthermore, possible gains from ancillary and allied industries and employment were completely ignored.

Quite apart from these shortcomings, there is a critical assumption intrinsic in the comparison between live animal export and meat processing that supply and demand would remain constant. Once we assume an excess of supply over the limited demand of the traditional market because of differential rates of growth or elasticities, then the attainment of new markets in whatever form should simply multiply foreign earnings, as resources previously untouched would now enter international trade. In fact,

potential supply in Sudan was buoyant as confirmed by the off-take increase stimulated by the factory demand. As in Table 3.3 supply showed an increase of 174.8 per cent in 1954 over the average of the previous six years, 146.0 per cent in 1955, and 164.2 per cent in 1956. Significantly, this enormous expansion of off-take occurred at a time of a sharp price rise, reflecting the price elasticity of supply which was due to an escalated price war rather than price elasticity as such. Whatever the case may be, Sudan's gains from animal trade fared well because an unprecedented off-take growth coincided with a rising trend of prices, and this would not have occurred had it not been for the Kosti meat factory.

Considering the three years immediately before the factory was established and the same period afterwards, we notice that sales revenue for the first period was £E1,265,993, whereas the corresponding figure for the second period was £E3,351,209 with a net margin of more than £E2 million pounds.

The recurrent failure to achieve economic growth, and the anxiety that surrounded the government circles especially during economic depressions, increasingly emphasised the vulnerability of mono-culture and underlined the need to diversify the economy. Despite frequent concern however, industry was never considered as an obvious alternative. The principle against this line of development was presented by R. Davies, on behalf of the Sudan Political Service in 1934, possibly in response to applications put forward for flour milling and the manufacture of cigarettes, textiles and soap.(70) Basically, it was argued, the government would risk losing a substantial proportion of its revenue from import duties and railway freightage if such undertakings were granted. To provide an insight into the government's concept of

Table 3.3

Sudan's export of cattle, 1944-1956

	Export to Egypt	Total export	Value of export to Egypt (£E)	Total value of export (£E)
1944	34598	34611	306157	306270
1945	36281	36281	354059	354095
1946	29579	30281	339741	352217
1947	19001	19001	277538	277538
1948	21583	21583	318158	318158
1949	33300	33331	470580	471039
1950	31300	32467	459301	476796
1951	27980	27980	491331	491331
1952	25223	25223	504460	504460
1953	21520	21759	427538	431297
1954	45334	45356	828808	829204
1955	43460	43460	732658	732658
1956	58415	59480	1008429	1026267

Source: The Republic of the Sudan, Annual Foreign Trade Reports, 1950-59, Statistics Department, Khartoum, 1960.

proposed industrial projects it is essential to quote R. Davies at some length:

> It is clear, however, that, if the four industries mentioned were all established and were successful to the point of excluding the whole of the present import of the commodities concerned, then in the absence of any excise or other new tax, the government would lose a very serious portion of its revenue, even making generous allowance for the extent to which indirect return from money kept in the country would offset the lost import duty and railway freight. And it is very doubtful whether, if additional taxation were imposed on a scale to compensate for this loss, the local products could compete with those at present imported. It therefore seems unlikely that the Sudan will change to any considerable extent its present economic rôle of exporter of raw produce and importer of manufactured articles. (71)

This is an excellent illustration of the revenue argument in its very rigid form. Its proponents see income from taxes as outweighing all other benefits, both material and social. Thus any proposals to promote local industry would be scrutinised with the only objective of ascertaining that the industries in question would yield an income proportionate to the government's revenue from transfer charges and taxes on commodities normally imported in the absence of local industry.

Understandably, such nascent industries would not hope to score instant success. This was argued in what is now known as the infant industry argument first expounded by F. List in the 1840's.(72) In essence, List maintained that the infant industry within a free market situation would operate below the margins of internal economies of scale and would subsequently be undercut if unprotected. Industrial investment in Sudan was ultimately rejected as the government was strongly committed to its anti-protectionist policies and not prepared to forfeit the slice of

income from import dues and surcharges. This action was indeed short-sighted as it sacrificed long term benefits for immediate remuneration, and in the process, impeded the creation of new jobs and new production capacity in agriculture and industry, and thus petrified investment, re-investment and training. With regard to such tendencies, what has to be underlined is not so much the undermining of the infant industry argument, unjust as it may be, as the fact that the government would nevertheless repress any industry by imposing excise duties even if these industries were successful to the point of entirely supplanting imports, unaided by government intervention or protection. It is worth noting that the taxes in question, when calculated for the industries specified above as a percentage of all tax revenue would not exceed 2.0 and 2.5 per cent in 1928 and 1929 respectively.(73)

Once more, there were numerous examples from Africa of the line of argument that advocates non-industrialisation and the need to safeguard revenue. The causal relationship was posed by the Governor of Uganda in 1935:

> ... if industrial undertakings were started in East Africa a certain loss of revenue through the falling off of custom duties might accrue to Uganda. (74)

However, it is impossible to convey the deterrent effect of government policies which consistently reminded the entrepreneurs of the failures they would encounter should they indulge in industry.

New concepts and development ideals seized many colonial dependencies and inspired a deep sense of resentment to the practices of importing everything from the mother countries after the Second World War. This triggered an immense need for colonial

economic planning. In this spirit, industrial development in the French African territories for instance, became a hot issue for debate. Policies were presented, for the first time, with a full recognition of the contribution that industrialisation could make towards the progress of the community. The new policy of the French in 1944 was that 'the industrialisation of colonial territories is to be encouraged'.(75) Drastic measures were accordingly sought to provide protection for local industry whenever needed, also to conduct research and freely disseminate information to the private sector, and more generously, to assume the cost of pilot industrial schemes.(76)

Probably the most immediate result of international hostilities was the sudden collapse of the colonial economic mechanism, and the disruption of the centuries old momentum that adversely acted against local industry, and created a vacuum of compelling persuasion to new attitudes. After all, the war was fought in the name of liberty and in that context the colonies were aspiring for independence as a reward for their war effort. In the second place, it would appear that the paralysis that struck occupied France, and the distress that choked the West might have been eased had the economies of the colonies been strong and sound. The economic state of French Equatorial Africa, and for that matter of India in the First World War was deplorable. The most effective course of action to rectify these economic weaknesses was believed, at least in theory, to be the fostering of economic planning and in many cases the giving of high priority to industry. Finally, and of direct bearing, the desperate shortage of consumer goods, increased propensities to spend, inflationary prices and availability of capital, both foreign and local which was freed after a long break of investment, had all prompted the need for, and

enhanced the possibilities of industrialisation.

It was not surprising that the Sudan government emerged in 1946 as a contender in the field of economic planning through the restructuring of public expenditure to finance two Five Year Development Programmes (1946/1951, 1951/1956). Much of the capital investment in the first programme was devoted to the long overdue renewals of the deteriorating public service. Allocations in the second programme were mainly confined to education and health services, public utilities, agriculture and irrigation. Barbour, in reviewing these programmes commented:

> ... the absence of provisions for manufacturing industries is the most serious omission from the list of development projects. (77)

Before mourning this serious omission, we should analyse the principles that guided such a development programme. Since priorities must be established in any plan or programme, no absolute rules could be laid for or against one line of capital investment rather than another. Perhaps the very laws of change that brought about economic planning had persuaded the government to seek the participation of private capital in industry, as was the common practice in the capitalist economies. Attention should thus be focussed on the government's policy towards industry and private capital.

First let us examine the government's reaction to import substitution industries that sprang up during the Second World War which were fostered by the protection of a natural tariff barrier due to import shortages. Following in the line of tradition set by the anti-protectionists, the government opted to refrain from interfering with the market mechanism when things were normalised after the war. The government had an obligation towards the trading community and the suppliers alike, and would jeopardise

its stand if restrictions were imposed on imports. War time factories were dying out for lack of protection and their inability to compete with imports. To the administration that was a good omen, and a cause of jubilation. Thus it was a great relief to the Governor-General to report in 1945 that:

> There was welcome evidence of a slackening in the spate of ill-conceived projects hitherto fostered by the availability of disused and often derelict machinery in some of the neighbouring territories. While considering its duty to be the discouragement of such ill-fated ventures, the Department of Economics and Trade has done its utmost to support and encourage projects that were likely to succeed and to bring benefit to the country as a whole and not merely to their sponsors. (78)

To put the record straight at the risk of repetition, the 'ill-fated' projects were fostered, in the first place, by internal factors and directly promoted by the restrictions on imports and the complete rejection of laissez-faire during the war. It is misleading to attribute their promotion to any external impetus such as the availability of the described machinery. Having said that, it now becomes obvious that the government was under no circumstances ready to digress from its anti-protectionist path and would logically eschew all industries that would not survive the flood of imports. Of special interest, and possibly a direct reflection of the government's policy towards industry was the distinction made between undertakings that benefit the country as a whole, and those that merely profit their owners. This distinction, superficial as it may be, denies the importance of private entrepreneurs and their aggregate contribution to the economy. In modern capitalist thought, especially that of J. Schumpeter, it is this talented group, capable of innovation, investment and re-investment, that engenders economic

change and development through no special effort other than seeking opportunity and concerning itself with immediate interests.(79)

There was of course, the possibility of direct government participation in industry, or indeed a public/private partnership similar in outlines to the syndication system of the charter government model. Industrial development along any such course was openly rejected in front of the Advisory Council in 1948:

> ... it is not right for Government to use the taxpayers money for speculative undertakings and risky experiments. (80)

In passing it was asserted however, that industry was to be left to private initiative. But it is illusory to think that such a casual comment was meant to be taken seriously. For one thing, the government seemed resolved to pursue past policies and was resigned in its effort to continue the production of primary products as was stated in 1948:

> ... the economy of the Sudan of the future must be based, as it has been in the past, on increased exports of improved qualities of the primary products of land and animal husbandry which are the natural endowment of the country. (81)

It should be emphasised that this policy statement was maintained despite the clamant demand for industry reiterated in the local press. Even if we accept this view as an implication of the base sector argument, the same premise would not altogether exclude other activities such as industry.

The consolidation and extension of non-industrialisation policies was chiefly coined and presented by R.J. Hillard, director of the Department of Economics and Trade, within the body of a policy paper delivered to the Sudan Chamber of Commerce in 1948:

> This absence of consumer goods in sufficient variety and supply has led to ill-conceived expressions of opinion about the opportunities we have missed of industrialising the Sudan and altogether obviating the need for some of our present imports. There is a tendency to dismiss with an airy sweep of the hand the dangers and difficulties which industrialisation may bring in its train in a country such as this. There are useful lessons to be learned from India's experience. (82)

In this vein, the trading community and would-be industrialists, at their annual gathering, were not only discouraged by means of exaggerating the dangers of industry, but they were disuaded in the most fervent tone by condemnation of their critical resentment of non-industrialisation. In addition we are deliberately led to believe that agriculture in Sudan would be abandoned once industry started. Accordingly, the implications for Sudan development were thus:

> ... to take men away from food production and to have to import to feed them when they are only producing industrial products for home consumption may be a most unprofitable business.(83)

Although this conclusion seems, in an abstract sense, coherent and indeed plausible, it would certainly disintegrate if we retracted the hypothetical premise - that all active population would be completely drawn into a new industrial sector whose ultimate target is confined to the provision of import substitutes. In fact, it was none other than Hillard who observed the drift of underemployed labour to the towns in the recent post-war period;(84) and it was he who accounted for the tendencies of disguised unemployment in the countryside. Talking on a similar occasion one year late, he revealed the findings of research conducted by his own department in the following manner:

> ... the figures I have given you suggest that in this predominantly agricultural and pastural country there are too many people doing too little work, even that little being of unproductive nature. (85)

If it were only for these reasons, there should have been a sound argument for industrial promotion rather than the opposite. In fact, it is now widely accepted, especially after the inspired studies of W.A. Lewis, that this was the time to invite labour-intensive industries to absorb previously unemployed manpower.(86) Nevertheless, Hillard marshalled arguments to assert that industry under these assumed conditions would only dissipate the wealth of the country. Thus by induction, Sudan would find itself in that same wasteful position as if his assumptions had commanded the status of facts:

> If there is one thing the Sudan cannot afford to do at this stage of its development it is to dissipate its wealth. (87)

In a nutshell, Sudan should avoid industrialisation.

With these considerations in mind, and prior to the Second World War, it can be appreciated that local mechanical preparation of Sudanese produce was in a few cases unavoidable in the export sector, if world markets were ever to be profitably reached. Cotton, for instance, had to be ginned and baled because considerable economies, amounting to three-quarters of transfer charges, were possible on delivery to Liverpool.(88) Likewise, cleaning plants for dura(sorgham vulgare), gum Arabic and sesame were erected in the Gezira, Gedarif and Omdurman to meet the minimum impurities requirements of overseas. It was reckoned by the Economic Board of Trade in 1914 that:

> It would have been extremely difficult, if not impossible to have hand-cleaned these large quantities of grain. (89)

For the same reason of freight economies a small factory was built in Atbara in 1913 to produce button blanks which were sliced from dom nuts (hyphaene thebaica). On the same scale, though as an import substitution, a cheap quality soap factory was established

at Khartoum in 1914, and a dyeing factory was also santioned at Port Sudan, 1929, to supply 50 per cent of the goods dyed in piece for local consumption. This operation reduced retail prices by some 25 per cent.(90)

A cement factory was also installed at Sennar for the construction of the Sennar dam. A meeting held at the Foreign Office at London disclosed the aims of this action:

> It was originally intended before the outbreak of war (W.W.1), to obtain from England the cement necessary for the construction of the works [Sennar dam] but in view of the loss of tonnage caused by the war and the increased freights it has now been decided to make cement in the Sudan. (91)

While the production complied with British standards quality specifications, the cost was even lower. However, production was stopped after the completion of the dam by the mid-1920's. Two other undertakings significantly different in orientation were the date packing at Abu Hamad, and making tins and cases at Port Sudan. They both developed a considerable export trade.

A handful of import substitute industries were also initiated, during the Second World War and they included vegetable oil mills, soap manufacturing, perfumes mixing, packing paper, domestic glassware, a pilot sugar mill and a match splints factory. A brief addition to the list of import-savings industries that survived the flood of imports after the war to 1952/53 (self rule) were a cement factory, a mechanical tannery, two canned tomato puree factories, a number of soap and oil expression factories, in addition to printing, oxygen manufacturing and the spinning and weaving mill of Nzara. Noticeably, while the pre-war industries were resource-orientated, the war industries and the ones that followed were predominantly localised in the Prime Base, thus marking the new trend in location preference (see Fig.3.1). It

Fig 3.1 INDUSTRY IN SUDAN 1914-1955

PERIODS

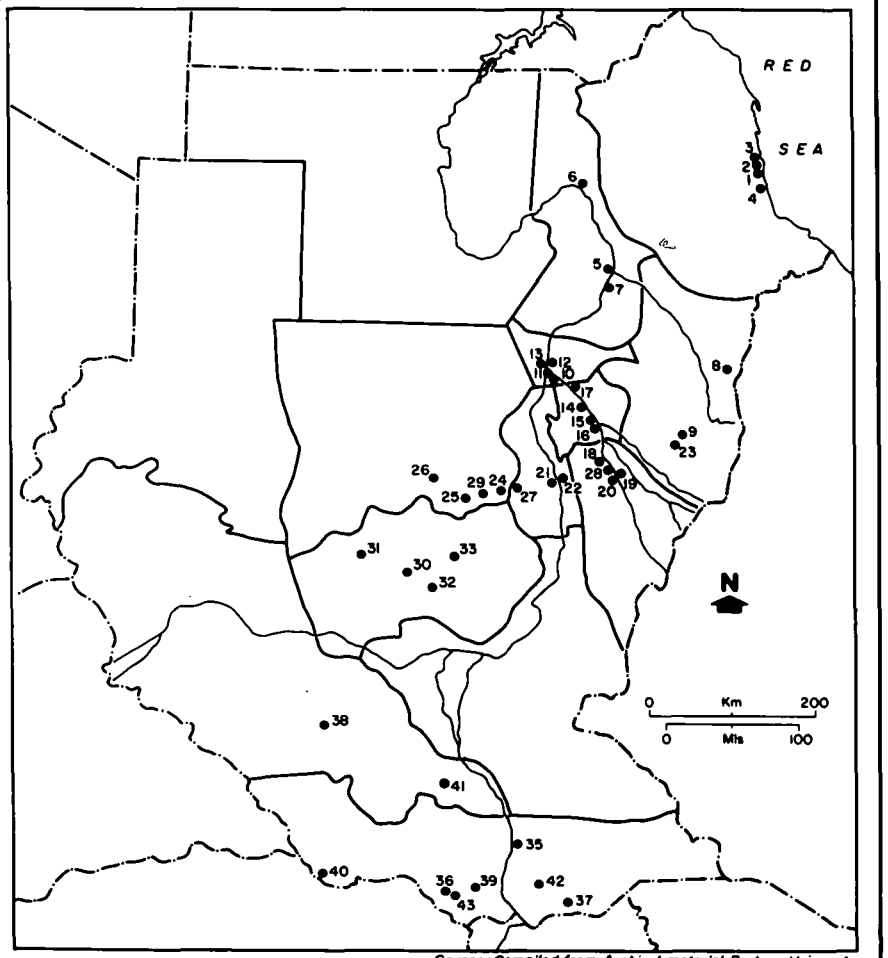
▲ 1914 - 1939

● 1940 - 1949

■ 1950 - 1955

		Glass	Perfumes	Tomato Canning	Oxygen Manufacturing	Cement	Spinning & Weaving	Brewing	Soft Drinks	Soap	Dyeing	Saltern	Date Packing	Domnuts Buttons	Ice Manufacturing	Vegetable Oil	Meat Canning	Printing	Metal Work, Joinery	Tannery	Matches	Tin Cases	Ginning Factories	Saw Milling	Groundnuts Decortication	Dura & Sesame Cln. Mach.	Brickworks	Confectionary	Freezing Plant	Briquette Fuel	Sugar Refining	Cigarette Manufacturing
1	PORT SUDAN										▲										▲●	▲						▲			
2	ROWAYA										▲																				
3	DARRA										▲																				
4	SUAKIN																					▲									
5	ATBARA					●							▲▲									▲				●					
6	ABUHAMAD											▲																	▲		
7	ZEIDAB																					▲									
8	KASSALA																					▲									
9	GEDARIF																								▲						
10	SOBA																								▲						
11	KHARTOUM	●			●			■■	▲▲				▲	●		▲■	■■					▲			▲	▲	●				
12	BAHRI	●	●	●●			■	●	■■					●●														■				
13	OMDURMAN		●						▲	●				●					●									●			
14	HASSAHEISA																					▲			▲						
15	MEDANI							■						■								▲▲			▲						
16	MARINGAN																					▲									
17	KAMLIN							■																							
18	SENNAR					▲								●								▲									
19	Es SUKI																						▲		▲				▲		
20	SINGA																					▲									
21	KOSTI							■	■						■																
22	RABAK																					■									
23	WAD AL-HURI																					■									
24	GHABSHA																														
25	SIMAIH																					■	▲								
26	ELOBEID																														
27	TENDALTI													■																	
28	HAMADNALLA													●●								■									
29	UMMRUWABA.													●																	
30	KADUGLI													▲								▲									
31	LAGAWA																					■									
32	TALODI																					▲									
33	ABUGIBEIHA																					■									
34	OENLANG *																					▲									
35	MONGALLA																												●		
36	IWATOKA																														●
37	KATARI																			●			▲								
38	WAU																						▲								
39	LUKA																						▲								
40	NZARA						■		■					■																		
41	YIROL													●																	
42	TORIT																					▲									
43	YET																					▲									
44	KALAFONI *																					■									

* Location not known



Source: Compiled from Archival material, Durham University.

should be stressed however, that the contribution of these industries to G.D.P. was insignificant and probably under one per cent.

It only remains now to relate the disproportionate growth of the economic sectors to localization of industry and its structure. Despite expansion of agriculture, services and importables, the economy remained stationary and typified by a shortage of productive investment as would happen in a mercantile economy and predicted by the charter government model. However, the exclusion of industry had freed the export-import sector to develop at its own pace a special system of commodity flows, specific channels leading to concentration of wealth and new 'wants' diffused through the various agencies of the export-import trade. The general pattern was one of centralised control over capital and the means of distribution and diffusion. Associated with this pattern too, were the bureaucratic machinery and commercial banks which were managed to gauge the allocation of essential services, money supply, and internal consumption. The effect was to a great extent concentration of public spending and more wealth with those already in command of internal supply and clearing houses. To this interest group centrality was both a cause and effect in that profit margins were larger at the Prime Base and thus inequity had a spatial connotation of considerable significance to industrial location. At the same time the same group acted as a vehicle to more horizontal production, more consumption of importables and indeed more concentration of capital as an integral part of the process.

The revitalised desire to industrialise after self-rule was a threat to certain established import businesses as the new industry would produce items previously imported. In many cases

this meant either surrendering import licences or positively participating in industry. In fact many sought the latter course. The shortest road to achieving this was superimposing industry on the well-defined centralised system to economise on transport, extension services, distribution channels and existing markets. Similarly, local industry, which was conducted by businessmen and traders was superimposed on a well developed export-import system, profit margins, and credit worthiness. In all, it inherited localization that characterised the unindustrialised economy.

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CHAPTER FOUR

THE PRIME BASE THEORY

4.1 Introduction

The purpose of this chapter is to seek an explanation of the high degree of industrial localization in the leading urban agglomerations of African and 'developing' countries, especially Sudan. An analysis of the irrelevance of classical, neo-classical and much of contemporary location theory is probably an appropriate starting point as these treatises reflect on experiences confined to the western model of development. Significantly, the close of the dependency state in Sudan and many other ex-colonies precipitated profound and rapid economic changes, especially with respect to industrial pursuits. Such countries developed a high degree of industrial localization in their Prime Base, that is, their centre of gravity of industrial and commercial life as expressed in the diversity and disproportionately large number of factories, workers, capital outlay, and value added; Khartoum, Lusaka, Tunis, Lagos, Nairobi, and Rio de Janeiro, are well known examples. If mining and allied activities and first stage processing are excluded, Prime Base industry may well exceed two-thirds of all industry.(1)

Although the rising tide of spurning Eurocentric models has reached many fields of development, this form of critical awareness has been rather slow in the field of industrial location. Probably the main reason is the acceptance of prescribed locational factors as fixed determinants of location. The proposed theory attempts to fuse factor location with the historic realities of economic development, structural transformation, economic growth and the underlying systems and institutions at both the macro and micro levels of inquiry.

4.2 Industrial Location Theory: A Critique

The essence of industrial location theory is the approximation, in abstraction, to the complex reality of socio-economic activities in the capitalists' market exchange system to resolve the question of optimum plant location. It seems essential for location theory, whether normative or positive deductionism, to assume undifferentiated functions and even distributions such as population, behaviour, demand and constant transfer cost over distance. Some further specific postulates about production, consumption, cost and objectives of decision-makers are also made or indeed assumed away. Thus, if we consider location theory as an image of reality or how reality should be, and the constructs of theory as adjusting devices, it will become clear that the more close these assumptions are to what is depicted or aspired for, at a given time, in a given economic system, the more sharp the image will become. Of course, the more withdrawn these assumptions are from reality, the more futile the theory will be.

Once we accept the concept of dynamism in industrial location, we are invited to reassess longstanding dogmas of location theory, and well-established location factors that were probably more relevant at a specific time and place. One such comprehensive approach that sought to resolve the question of optimal location was expounded in 1909 by Alfred Weber as the least-cost location theory.(2) Weber depicted simplified economic relations by eliminating the spatial variations of demand and competitive pricing - in other words, demand was assumed to be unlimited, and prices could not be influenced by individual action. Location of the market and materials were given and all purchasers had equal opportunity to buy from punctiform consumption centres. Thus what matters is the variation in trans-

port cost of raw material and transformed products, labour costs, and the economies or diseconomies of agglomeration.(3) Though Weber's neglect of the demand side may be considered the most serious oversight by contemporary western scholars in the light of the sheer growth and variety of demand, and consequent organisational set-up, this omission is in fact less drastic if seen from the developing nation's point of view where growth and variety of demand is limited, and more or less satisfied from one or two locations.

Another Eurocentric view-point relates to the distorting impact of technological progress on location factors such as raw materials and transportation. The basic argument is that technical advancement has positively affected scale of production and productivity, consumption patterns, mode of energy transmission, etc. For example, raw material is evidently exerting a decreasing pull on the location of modern western industry because refining of raw material is more likely to take place on the location of material source.(4) Viewed differently, this should imply material orientation at the material producing countries, much in line with Weber's least-cost treatise. For such countries the technological change that reduced raw material input per unit of output, and consequently diminished the need to locate near sources of raw material, is not as strongly felt as in industrialised nations. In the latter countries, more industries are increasingly becoming reliant on sub-contractors and components provided by other manufacturers - a situation promoting new locational forces.

From the West European and American experience too, it seems that transportation cost is showing relative decline because of advancement in transport technology and the radical change of the structure of industry where light industries with high value added

are growing fast. In passing, D.M. Smith excluded the 'emerging nations' from the effect of these changes and thus attached undue significance to classical location factors. He pointed out that

> the need to utilise basic raw materials, unskilled labour and cheap sources of power makes these factors still very important. (5)

Supported by Alonso, Smith went on to magnify the rôle of transportation as a detrimental factor of industrial location in 'developing' countries in sympathy with classical location theory.(6) It was argued that transport surface would generally have a very distinct low point, i.e., the cost gradient would rise sharply because of limited markets and location of material, and low value added. The optimal location is accordingly more definite.(7) Unfortunately, such generalised statements often neglect simple facts. Firstly the 'emerging nations' are not completely isolated from the influences and technology of the west. Many industries readily depict broad characteristics of the western style of production and were guided in outline by the changing technology. As H. Brookfield noted in 1974,

> many industrial undertakings in developing countries could not be isolated from the dominating power of transcontinental corporations and technostructures. (8)

Secondly, industry in developing countries is more likely to be inclined to locate away from basic raw materials, cheap sources of power or pools of unskilled labour. This is substantiated by the high degree of industrial localization in the Prime Bases of developing countries. Thirdly, transportation surfaces are not as they would theoretically appear to be since pricing systems, profit margins and discriminatory freight charges largely modify the transfer surface. This point will be expanded in subsequent sections. However, the validity of location factors as enunciated within the least-cost theory, could only be of some bearing on the location of

first stage industries which use bulky and/or perishable inputs such as ores and agricultural raw materials with high material index. Even in this narrow area empiricism has not decisively revealed compliance with the theoretical optimal location. In a fairly recent study of large-scale, government-sponsored industry of Sri Lanka, Y. Rasanayagam has shown the vast deviation of actual location from theoretical least-cost locations.(9) Rasanayagam is aware of external economies which draw first stage processing industries toward urban centres. By contrast, Kennelly's study of Mexican steel industry proved that there was consistency of actual locations with the theoretical optimum.(10)

The most obvious shortcoming of the Weberian model is the preoccupation with the individual firm, thus failing to explain aggregative patterns which are of prime consideration to 'developing' nations. Furthermore, material substitution and efficiency of material use brought about by advances in technology has created new locational forces. The emerging industries of 'developing' nations are a manifestation of this trend since they are overwhelmingly import-substitutes, consuming a wide variety and volume of semi-processed or raw materials from abroad.

Upon a different abstract platform August Lösch tackled the same problem of the best location with a profound awareness of the need to improve on reality and not merely explain it.(11) He rejected Weber in much the same way as Palander, Fetter and Hotelling did before him.(12) The common ground between these theorists is their acknowledgement of the locational interdependence of firms and the spatial variation of demand. However, Lösch's market area was the first general theory of location with demand as the major spatial variable.(13) Of prime concern in this theory is the identification of the location of profit maximisation which does not

necessarily coincide with the least-cost location.(14) The profundity and ingenuity of the Market Area Theory is undoubted. Nonetheless, it is attacked on two main fronts: logical inconsistency, and omission of cost, time, and human behaviour. Firstly, the predicted distribution centres will eventually grow to transform the uniform demand surface into an uneven one because of concentration of population, services, wealth and investment; thus contradicting the very assumption of an homogeneous plane.(15) Secondly, failing to incorporate the spatial variations of cost, the market area would only be a function of distance and demand which is often unrealistic. Furthermore, the assumptions of even distribution and identical tastes, technical knowledge, and economic opportunities grossly discard human behaviour as a factor of location.

Turning our attention to Lösch's landscape, it is possible to envisage some specific similarities readily depicted in many developing countries. For instance, the Löschian space economy of dispersed agriculture and markets resembles in more than one way the export-import model already outlined. Similarly, a large proportion of consumer-goods are produced and distributed from one location - the Prime Base - in much the same fashion as the postulated prerequisite of the Löschian landscape. Moreover, final demand is concentrated, as is the case with the assumed Löschian demand, although the larger proportion of the physical consumption does not necessarily take place in one location. This is particularly so where main importers, wholesale distributors, and at a later stage of development, industrial entrepreneurs, are all in physical proximity.

When considering irregularities such as pricing policies, Lösch maintained that such policies reinforce the maximisation of the number of separate entrepreneurs and would further reduce the size

of the market.(16) Pricing policies, as will be seen later, could also be an effective determinant of localization of market and entrepreneurs.

The limitation of Lösch, with specific reference to 'developing' countries is his neglect of situations where competitors locate at the same point. Oligopolistic co-existence is a normal practice in many such areas. Like scale economies of advanced countries, oligopoly functions in such a way that two or three undertakings satisfy a wide market, and indeed in some cases the whole national market, thus undermining the very idea of regional establishments and markets in the Löschian landscape. According to Lösch, firms of similar products should repel each other and hence he fails to explain the situation of co-existence where the same market area accommodates similar operations.(17)

On the basis of the analysis presided on so far, industrial location emerged at the two extremes; least-cost theory and profit maximisation. There were many gaps to be filled and intermediate ground to be occupied. Much of the theoretical development was either cosmetic in the sense of reinforcing existing treatises, or integrative, with the objective of marrying the two approaches. One of the principle developments in location theory associated with Weber, was the partial equilibrium approach expounded by Hoover.(18) His departure from the simplified assumptions of Weber was a concern with realistic details. Thus the question of best location, he maintained, must be extended and modified to include the influence of diminishing returns and consequently economies of scale and market area.

W. Isard attempted a general location theory, basing a good deal of effort on integrative analysis, by bringing together Von

Thunen, Lösch and Weber.[19] He rejected the idea of even distribution of resources and instead introduced irregular concentric zones to the Löschian landscape. Further, he fused location theory with the substitution principle of economic theory as applied to transportation, labour and market.[20] Furthermore, he was concerned with refining available techniques, a matter that culminated in the introduction of transformation lines and equal outlay lines.[21] Scale economies too, were of great relevance to Isard and are reckoned to have more weight on location than catered for by either Weber or Lösch. Summarising the effort of Isard, D.M. Smith acknowledged the following:

> The combination of all this in Isard's final diagrams probably represents the nearest thing to the spatial arrangement of economic phenomena in the real world that deductive theory has yet produced. (22)

Nevertheless, Isard's attempt is remote from the realities of developing nations. His conception of price policies for example, is a mere treatment of an exception, whereas the same conception has a paramount effect on location of 'developing' countries. As will be disclosed later, Sudan's experience of price policies has profound consequences on location, and indeed no realistic approach to the problem of industrial location could isolate price policies from the underlying location factors. Of course, at a later date, in 1959, Isard reconciled with regional growth, especially 'growth poles' when examining with Schooler the type of industry and location of major investment through linkages between sectors in Puerto Rico.[23] Economies of scale and agglomeration were critical in this latter analysis.

Melvin Greenhunt[24] differs in that he attempted to integrate the least-cost and locational interdependence theories by bringing together cost and demand. His introduction of 'psychic income' was

pioneering though much of this concept remained to be developed by Allen Pred.(25)

What distinguishes D.M. Smith is his ability to synthesize and provide a guide to empirical enquiry within the least-cost frame; an approach that admittedly suits advanced industrial economies.(26)

Industrial location in developing countries displays an essentially different picture. This is because dynamic change takes place in a different milieu, devoid of any industrial base while the process of change (what some scholars call modernisation) has for sometime penetrated many economic fields, such as the evolutions of cash economy, transportation systems, and consumption of imported goods. If only for this reason it is superficial to isolate a few factors and deem them responsible for industrial location in one place or another.

The general awareness of the need to identify special factors of location for developing countries springs from the regional planning studies especially W. Alonso in the mid-1960's.(27) Alonso points out the need to distinguish relative development as a factor of location(28) and couched Friedmann's centre-periphery in what he termed the "big city or the hinterland location."(29) If polarity is a fact of life in 'developing' countries, the historic evolution of spatial structure is crucial to the understanding of location in these countries. However, Alonso's observations were not so sharp when he considered the rôle of transportation, a factor to which he attributed undue significance in the specific case of 'developing' countries. In his bid to explain industrial localization, especially at the ports of developing countries, he postulated the existence of transport surfaces with a very distinct low point, i.e., transport

cost rises sharply away from the central point, thus producing a definite optimal location. Other factors magnifying this tendency are the low value added, imperfect articulation of the pricing system, and the socialised pattern of production. Obviously, these conditions only hold true in the very special case of government-sponsored industries. In fact there is a substantial number of industries where location is guided by a well organised pricing system and these contribute relatively high value added. As we shall see in subsequent sections, transportation is less significant in both cases than Alonso would assume.

One of the most longstanding oversights of industrial location theory is its detachment from the prolific theories of regional economic growth and regional economic planning. Yet the specific relevance to industrial location of concepts such as growth centres, the dual economy, export base and centre-periphery is only too obvious. In general theoretical terms these various branches recognise spatial differential growth, and the dynamism of spatial change. In each, the socio-economic processes culminate in the evolution of agglomerations and industrial localization. Nonetheless, the regional differences should be made clear. The export-base theory as applicable to North America is a case in point. Here the commercial relations with the metropole determines, among other things, the spatial arrangement of industry. On the other hand, while industrial location in Europe has no place for stage theories, the export-base theory has much relevance in explaining certain concentrations of investment and industry. Similarly, the theory of economic dualism has much relevance to the development of inequality as a result of the co-existence of two sectors, one traditional and the other modern. The latter is equipped with all the ingredients

of growth such as the promotional institutions, manning and financing. For that matter, growth is geographically concentrated and by necessity unbalanced, especially so at the early stages of development. Industrial localization is an effect within the spatial context of this development.

Equally significant is probably the centre-periphery concept developed by R. Prebisch within the context of international trade.(30) This was later formalised by J. Friedmann in the core-periphery thesis where the marginal returns to the factors of production differ greatly between regions, and the centre which "act as suction pumps, pulling in more dynamic elements from the more static regions."(31) Regional growth according to this thesis is a problem in industrial location, and the core is seen as the centre of diffusion, accessibility to funds, information exchange as well as the place of high growth rate, structural change and modernisation. However, this is indivisible from the weakening of the peripheral economy in the form of net transfer of natural, human and capital resources to the core through market and supply systems, and administrative control.(32) In a similar sense, growth centres recast the abstract concept of growth pole*, delving into spatial polarisation through propulsive industries and economic linkages.

On the same pretext too, is the singular spatial connotation of regional economic planning. Although regional planning in advanced countries after the mid-1940's was concerned with depressed areas, in many 'developing' countries it came about to relieve a nationwide depressed condition. The difference however, is that

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* According to Darwent "the growth pole concept a priori does not offer any explanation of the location of the propulsive industry in geographic space, nor of the consequence of a pole having a particular location in geographic space." (33)

while in the industrial nations regional planning could explain industrial location in isolated spots, in 'developing' countries it could account for the pre-eminence of specific locations. Beneath this lies the actual promotion of industry and progression of pre-industrial systems involving the special attention to specific economic sectors which resulted in skewed economic growth. This has invariably produced and is still promoting spatial polarisation far more significant than yet accounted for in industrial location studies. Thus if growth is geographically unbalanced, it is especially so in the early stages of industrial development since planning for industry ought to favour the most adequately served and developed location. In the formative years too, as noticed by Alonso, the need for entrepreneurship, coupled with meagre knowledge, sparse transport facilities and the necessity of face to face communication reduced choice of location and indeed enhanced localization. By probing all these forces, whether in the field of regional economic planning or economic growth, it is possible to provide a partial explanation for the spatial polarisation of industry in 'developing' countries. It follows that the problem of industrial location could not be solved in terms of conventional location factors such as transport, market, labour etc. Probably the most striking illustration of the incapacity of the latter approach as applied to industrial location of African countries is provided by Ogendo in his study of Kenyan industries(34) and El-Mehdawi in his industrial location analysis of Libya.(35) While the former is a mere cataloging of industrial factors that affect the location of industries (especially in Nairobi and Mombasa), the latter deployed the questionnaire method, and rated each firm according to its score on selected factors and hence produced a ranked factor location. If we ignore the shortcomings of post-facto rationalisation, biased sampling

and the general unawareness of the real factors by the firm, the net result is a false explanation of the compound mix of socio-economic processes that underly the mechanism of industrial localization. The rest of this chapter is addressed to the task of unravelling these forces as interpreted in the Prime Base theory.

4.3 Location of the Import Firm

The ground is now prepared for considering the location of one important economic activity in developing countries, and that is the import firm prior to industrial development. To begin with, the phenomenon of concentration of trade, population and at a later stage, industry in coastal cities was remarkable enough to warrant a special consideration, especially by Mabogunje,(36) Alonso(37) and Breese.(38) However, in most cases this observation is often too casual and abstracted from its spatial and locational context. Probably Alonso's treatment is an exception. He stated in 1968 the following:

> A glance at world maps of population concentration shows a striking pattern of coastal cities ringing the developing continents, while the hearts of the continents remain virtually empty. (39)

In attempting to explain this pattern, Alonso pays special attention to accessability and inaccessability. If distance is considered in terms of specific routes, as is the case of developing countries, it follows that the average distance between points in a country is longer than distance from the coastal location to these points. Thus the coastal city is the most central location for national distribution of commodities.(40) By induction, a coastal city will also become central for industries that depend on one material assembled from dispersed sources, or combining diverse materials from diverse sources. From the demand point of view Alonso's explanation is even

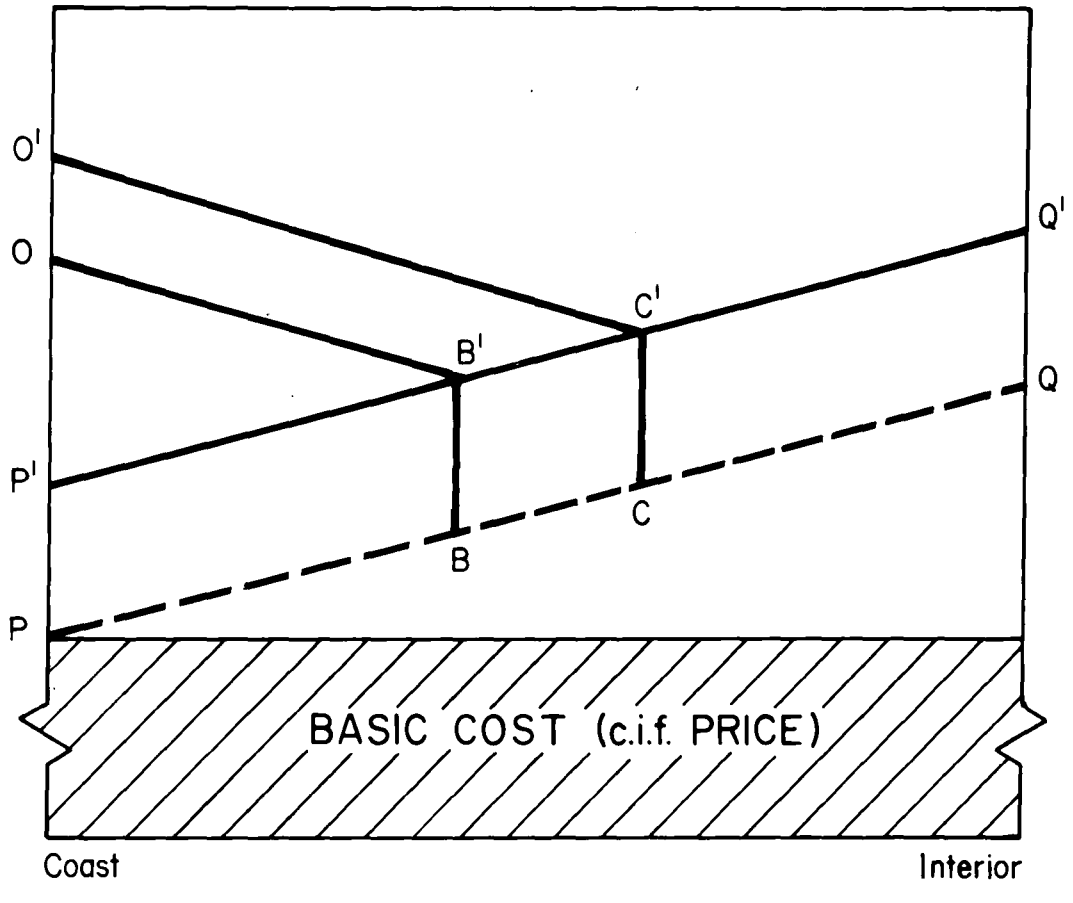
more abstract, as he maintained that:

> ... the concentration of demand is often preponderant both because income is always more concentrated geographically than population and because manufactured products are typically income-elastic, so that demand is more concentrated than income. Similarly, industrial demand for producer goods will typically be concentrated at these points [port cities]. (41)

It is implicit therefore, that the development of a market area and externalities are the explanation for the concentration of industry in the coastal nodes. However, there is little direct evidence to support this conclusion, and the very incidence of industrial concentration at inland locations undermine the whole argument.

In our bid to understand the mechanism that favoured the growth of a Prime Base, we first verify the location of the import firm. If we assume the choice of a base-post at the time of political annexation, this could either be a fresh location, an indigenous nucleus or a charter government post at the coast or elsewhere. From that base, military, administrative and economic operations would be conducted. Now, if in a hypothetical example, three import firms opted to locate at either P, B or C, as depicted in a simplified diagram (Fig. 4.1), the margin of profit, i.e., revenue over cost, would be of considerable weight (assuming the import firms are not in business to make losses). If we further assume that importation is only through a sea port, and coast delivery cost of imports is the same for all three import firms, and that an authorised profit margin is granted over basic cost, say 100 per cent, and further an f.o.b. system is invoked where purchasers pay for the cost of transport, then the selling price will be the basic cost, plus profit, in addition to transportation cost to destinations of

Fig 4·1 Location of Import Firms



consumption. Evidently P could quote the same price as that of B, C, etc., at these places (line $P^1 Q^1$). Conversely, B, C, Q, etc., could not compete for the market to the left of their locations. Simply, prices $B^1 O$, $C^1 O^1$, etc., will be higher than those quoted by P. Furthermore, it is only P which could wage a price war, sell at basic cost at B, C, Q, and still squeeze some profit from the monopoly of area to the left of B. Neither B, C nor Q could afford to do so if they are to stay in business. In fact, B, C, Q, will incur extra cost in office expenses as they require clearing agents or offices at the port.

Since it is necessary in any trading system to have a hierarchy of distributors, i.e., wholesalers and retailers with varying margins of profit, their location reinforces the preference of one location to another. What determines the location of this group according to the assumptions of the previous case? There is an obvious inclination for wholesalers to reside at P, for they would be ousted at any other location if price competition arose. Besides, wholesalers intending maximum sales could command the whole market only from point P. Once importers are well entrenched at the coastal port, P, (a situation that often leads to widespread oligopolistic practices), regional wholesalers, with lesser capacities and ambitions could develop. This is only so because wholesalers have little flexibility to command or manipulate the prices of the import system. Moreover, P is a remarkable location in that it would still command the market even if we relax the assumptions of a constant transfer cost to distance, and even distribution of population. In the first instance, tapering off transfer charges will still leave B, C or Q at a disadvantage. Likewise, in a case of uneven distribution of population P could monopolise the market to the left of B however

meagre the population in this segment, and thus could afford to sell at basic cost, as in the previous example.

4.4 The Prime Base Near or at the Geographic Centre

That the Prime Base should develop at a coastal location is a logical conclusion of valid empirical standing, other things being equal. However, other things are often not equal. The occurrence of an inland Prime Base, at B in Fig. 4.1 for example, is a real possibility as manifested by the very existence of Khartoum, Nairobi, etc. This is a clear contradiction of the theoretical location of Prime Base developed in the preceding section.

We now address ourselves to resolving this disparity. For any one reason, or a number of reasons a colonial government may have opted to locate its seat inland. This could be because of the configuration of the territory whereby it was more strategic to stretch control from a central point, the prevalence of favourable climate, historical reconstruction of a previous pattern of location hierarchy, or the existence of a water-course, concentration of resources etc. Nevertheless, such a choice would by itself still fall short of creating a commercially viable location inland. To activate a favourable climate for trade would thus entail the enactment of discriminatory laws to negate the situation assumed in Fig. 4.1. Such laws may redress transfer charges and profit margins, and may extend to concessionary acts to tip the balance in favour of an interior location. The most striking illustration of this bias is probably the basing point system instanced in industrial location literature by the "Pittsburgh-Plus". The mechanism of this system was described by M. Chisholm as follows:

> ... the basing-point system regards all of the

> production of the commodity in question as originating from a single point, the basing point. Thus, a uniform ex-works price is set for all producers, irrespective of their actual cost of production, and the price that will be quoted to any consumer is calculated by adding to this 'base' price the cost of transport as if the consignment originated from the basing point. (42)

However, the optimum theoretical location as a result of such a pricing policy is rather controversial. Clearly, a non-basing point could sell at a higher margin of profit if it happened to have a lower cost of production. Nonetheless, such a location may not reap the benefit of scale economies in cases of price elasticity as pointed out by Chisholm.(43) On the other hand, backward linkage industries will tend to locate at the basing point as prices of inputs are at minimum here, and hence the development of agglomerations. The growth of steel industry and fabrications at Pittsburgh, to the detriment of Birmingham, Alabama, is a well known example.(44)

Remarkably, many industrial location theorists, including Isard,(45) Hoover,(46) Chisholm,(47) Smith(48) and Alonso(49) have referred to the basing point system as a marginal case of limited impact on industrial location where and when it prevailed. Yet they all failed to grasp the implication of such a system in 'developing' territories where a basing point could be a dispensing base of most commodities to the whole nation. The emphasis on commodities rather than industries is intentional, and an important one; because in many developing countries import trade long preceded industry. Whether and how the application of a basing point system had a varying result on location at a different stage of economic development will be verified with the Sudan example.

For generations it remained obscure how it could be plausible to trans-ship commodities direct from Port Sudan to Khartoum and re-

consign the port's quota from there. Anyone who encounters such an experience from within as J. MacManus of the Guardian did, can but wonder at the uncomprehendable nature of the practice. He observed on the eve of the Fifteenth African Summit Meeting at Khartoum in 1978:

> Strangely, the shortages are worse on the coast... the plight of Port Sudan stems from the practice of freighting all food imports direct from the port to the capital inland. (50)

And he further noticed:

> ... the seasonal food shortages in the city [Port Sudan] have become acute and much food is simply not finding its way back to the coast. (51)

It seems that the same practice was in operation in 1970 when the author was informed by the Ex-Governor of the then Red Sea Governorate that he had been pressing Khartoum authorities to dispatch back his governorate's consignment of wheat flour.

The immediate relevance of these observations becomes clear when we discover the existence of a basing point system presumably in force since the establishment of the Red Sea line in 1906. As Khartoum was reinstated as the capital of the country in 1898, it was decided by the British administration that it should also be the commercial centre (this in contrast to the case of Nairobi/Mombasa where the latter was the port-cum-capital until 1905 when a move was made to Nairobi as the new capital of Kenya).(52) If unchecked, the price mechanism would assert itself in favour of Port Sudan in a fashion similar to that depicted in Fig. 4.1. To answer the practical needs of a commercial centre at Khartoum the pricing policy was adjusted in such a way as to establish Khartoum as a depôt for all commodities and from there commodity prices rise proportionate to distance in all directions, i.e., f.o.b. prices (except when freight absorption is practised). Simultaneously, the authorised

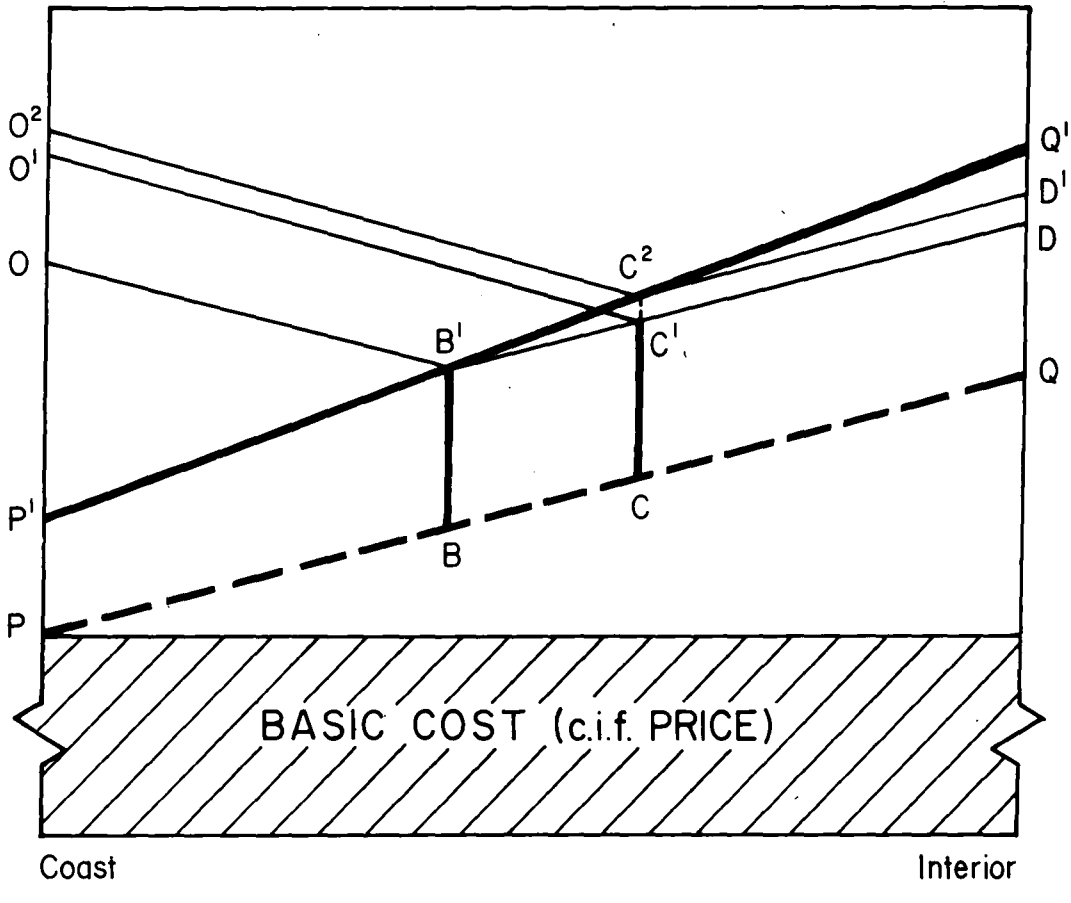
profit margin is calculated as a percentage on Khartoum procurement cost, including transfer cost, excise duties, insurance, etc., in what is known as 'profit on cost to store'. In other words, importers will collect profit on the total cost even though the purchaser pays in effect for transfer, duties and insurance. This practice was referred to in a speech by the Director of Trade and Economies in 1947.

> There is nothing my department can do to remedy matters for the consumer [in respect of high prices] beyond considering the suggestion that the present authorised rates of profit are too high and that, in any case, they should be based as they are in Egypt on c.i.f. values instead of on the cost to store. (53)

The trading community's margin of profit thus included an extra sum of profit, the maximum of which is only attainable at the Prime Base. Importers and wholesalers at the port would clearly sacrifice this concessionary margin, while counterparts located inland, beyond Khartoum, could not reap the benefit of further transfer since their prices are restrained by Khartoum-plus prices.

Now consider this simplified example: Suppose an importer's basic port delivery, c.i.f. cost is LS.1000; transfer cost and insurance to Khartoum is LS.100, and authorised profit is 20 per cent. While the importer's selling price of LS.1200 at the port gives a profit of LS.200, profits for an importer who transfers his commodity to Khartoum will be LS.220 because of the profit on transfer cost which is paid by the purchaser. To formalise this situation and attempt to explain the localization of import firms and wholesalers at an interior location, B in Fig. 4.1, a graphical representation will be developed as in Fig. 4.2. Let the left hand side be the coast, the right hand side the interior, and the shaded lower bottom area the basic port of delivery, c.i.f. price.

Fig 4·2 Location of Import Firms Under Prime Basing and Profit on Cost to Store.



Notation:

P	Port of importation.
B	Prime Base at an interior location.
C	An 'eccentric' interior location.
P Q	Transport gradient.
P^1 Q^1	Authorised profit on cost to store.
PP^1, BB^1, CC^1	Profit margin at P, B, C respectively.
OB^1 D	Prime Base price plus transfer charges.
O^1 C^1 D	f.o.b. prices from C.
O^2 C^2 D^1	Hypothetical f.o.b. prices from C.

The following assumptions will be made:- local industry has not yet started, i.e., all commodities were manufactured outside the country, imports through P only; a system of profit on cost to store, B is the store or depôt, and the point of origin of all f.o.b. prices to regional destinations.

Again, applying the simple hypothetical example of three importers P, B and C as in Fig. 4.2 it will be clear that P scores a net profit over costs of 50 per cent. B, C, Q will all be in the maximum profit zone of 75 per cent. This being so, because for each unit dispatched inland up to point B the trade profit will be calculated on total cost to B, although transfer cost is passed to purchasers as in f.o.b. systems. Now, if we introduce the demand factor, and scale economies (in this case larger unit distribution of a commodity), we enter a stage of monopolistic competition. Supplier B could quote the same price as any supplier to the right, C, Q, (line OB^1 D), while at the same time C (and with a similar procedure, Q), could not compete in areas left of C (line O^1 C^1) which is obviously too high a price. Consequently, wholesalers will be inclined to favour purchases from B where they command a larger segment of the market area. Thus, C, Q,

would not patronise main distributors and will be forced to locate at B. It will be noted that C, for example, could not sell at the higher profit margin $O^2 C^2 Q^1$ as selling prices are fixed by B's price plus transfer cost ($O B^1 D$). Otherwise, it would have been more profitable to locate at Q. However, if a firm at C were to sell at B at comparable prices, it should contend with the much lowered margin of profit of 25 per cent - i.e., the intersect $O B^1$ with $C C^1$, (not drawn in diagram).

Unlike classical basing-point system where it is possible as in the case of Birmingham, Alabama to sell local production at Pittsburgh-plus prices, P in Fig. 4.2 could not reap the price differential ($P^1 O$). As stated before, the selling price at any location is determined by basic cost plus authorised profits, and no more. In fact the policing of the price structure is an integral part of the discriminatory profit margins, basing system, and oligopolistic practices. Any attempt to undermine the delicate price structure would be met by sanctions and withdrawal of import licence by a vigilant government. More significant however, is that wholesale outlets will find it more remunerative to locate at B, since maximum net profit is only attainable here. At any profit sharing ratio, wholesalers are better off at B than anywhere else. (This ratio is generally 20, 10 and 5 per cent for importer, wholesaler and retailer respectively).(54) Trading operations from P are not only at a lower margin of profit, but suffer a distinct shortage of wholesale outlets. It should be clearly stated that the market forces were devised in such a manner as to favour one location, the Prime Base. Our concern here is the very existence of such a system which still prevails and in the process creates forces that sustain the grains of agglomerative growth.

4.5 Location of Export Firms

Export and import firms in developing countries are by necessity complementary. Their reciprocity is often attested by their spatial co-existence and functional unity. Thus, one firm could conduct both export and import business. The reason for combining these two functions is that both businesses are carried out within similar if not the same channels. A combination of the two is equally important because of the relatively higher risk element in export trade due to price fluctuation over the longer period of handling the produce. As profit margins vary from one mode of trade to another, an export firm would consolidate its transactions if it also engaged in import trade with a lesser risk element and secured commission. Also combing the two businesses would cut down on office expenses and promote economies of scale with regard to shipment space and cost. Furthermore, handling one or two products and commodities would enhance gains from specialisation as would indeed centralisation and pooling of resources in a business that must rely on well defined hierarchies extending from local agents to overseas corporations. Since the location of maximum profits for import firms is already defined, the location of the export firm is almost predetermined.

Nonetheless, the most important location factor for export firms is the low shape of the transport curve for the ongoing produce i.e., the gradient of the transport cost is rather gentle. As agricultural raw materials are generally of low value added, they could not sustain high transfer cost, a fact universally accepted and catered for in the form of low transfer charges. It follows that export firms are usually indifferent to transfer cost because such cost is marginal to the trade and often shared by the producers as

we have already seen in Chapter Three. Moreover, there is more than one source of material and more than one product which will significantly add to the denigration of transfer cost as a factor of location in the specific case of export firms. One may, of course, compare this to the benefits gained from locating in proximity to other businesses, commercial banks, information and telecommunication centres, which are localised at the Prime Base, point B in Fig. 4.2. Consequently any location other than node B would likely be a profit minimiser/risk multiplier as urgent commercial contacts and transactions would be slowed down thus eroding trading chances and increasing running cost in the absence of the right services. As with the import firm, oligopoly has the spatial function of centrally commanding the information flow and the reciprocity of collecting it.

Having established B as the Prime Base of import-export firms, other concomitant forces develop to consolidate the pre-eminence of this unique location. Firstly, land value will start to rise for real and speculative demand. Second, business profit tax will constitute an important proportion of the local government budget, and thus enable the extention of the service sector at the Prime Base. Third, high turn-over and profits will enrich the commercial banking system and enable larger short-term credit and further investment. Fourth, on-the-job training at most levels of management, and at maintenance workshops will continually be conducted. Fifth, contact with the outside world, and acquisition of new habits and consumption patterns will be conducted at B since the alien groups are engaged in the localised export-import trade. Sixth, and in connection with the export-import trade is the army of brokers, middlemen, peddlers, and the growth of petty trade. Seventh, job opportunity, real or

imaginary, will increase with the diversity of the economic activity at the Prime Base, thus rolling the ball of in-migration.

Away from the Prime Base the export-import firms also necessitate the development of regional centres or secondary bases as collection and distribution outlets. Of paramount significance, and detrimental to industrial location is the fact that all these processes interact in a time dimension completely isolated from the participation of industry. However, before introducing this sector there remains a further comment on the progressive spatial inequality and social set up.

4.6 The Contribution of 'New Wants' to Spatial Inequality

A crucial aspect of the process of development and polarisation often neglected in location theory is the flush of new wants a developing country would face from the early days of contact with European civilisation. The traditional and subsistence societies would be pervaded by commodities and articles which were either completely new or previously fabricated by the community. To mention only a few examples, think of a piece of soap or a box of matches. To the natives these were almost supernatural in utility and function, and to acquirethem has long become an obsession, and indeed, a necessity of life. On the other hand, articles subsvituting for products already in use such as clothes, shoes, china-ware, (the list is endless) were offered at better quality and durability. However, the principle leverage to the whole system of family division of labour was that the new commodities had to be paid for in cash. The societal fabric was attacked at its very roots. Agricultural products (including animal husbandry), the mainstay of the rural community, was drawn into a wider market and bartered for cash, thus paving the way for new production norms and maldeformity of the division of labour.

More exchange for cash meant also the ability to acquire more of the new goods.

Naturally, the first contact with the 'new wants' takes place not on a broad front, but on a localised main dépôt of importation, the Prime Base. The new items originated here. Their prices were cheapest here, and their interaction and usability was tested at this node, whence it diffused to the rest of the territory. The overriding concern for more cash to pay for the new wants was incompatible with the traditional production of the rural population where low returns from agriculture could not pay for the diversity of the new wants. At both ends, the drive was mutual and the Prime Base was the likely location to benefit. This was the case mainly because of the earning differential between core and periphery. In the former, earnings were more individual and regularly received whether weekly or monthly, as against the collective income at the end of a long growing season. Noticeably, the move to the Prime Base would, at least at the early stages, relieve pressures on land and increase per capita income. In turn this would enable the rest of the rural population to increase per capita intake of the new wants. Furthermore, the in-migration population would have a social obligation to remit a proportion of their income and indeed send back 'gifts' of the very items aspired for. The chain reaction of this process was self perpetuating as more consumption consolidated both importers in the Prime Base, and created a new drive to increase production in the rural areas. It should be emphasised however, that the marginal income in the periphery was kept at a relatively low level because of the low returns to agriculture through the procedures of international trade and unfavourable terms of trade. This feature was also an important one in projecting the gap between the rural areas

and the Prime Base and enhancing the move to the latter. Needless to say, economies of scale at the Prime Base were set up in response to increased demand both local and regional. More in-migration to the Base creating cheap labour, would also lower business cost, increase profits and dividends, and enable payment of high salaries to management, thus increasing inequality and preparing a new generation of 'shadow entrepreneurs'.

Whereas one finds that the creation of new wants promotes a sequence of incremental needs for new articles, it inevitably also produces scarcity. Once the family division of labour and subsistency has disintegrated, the equilibrium of reliance on commodities from other sectors is difficult to attain as the whole operation is at a level beyond the control of the local unit. Hard currency contingencies, protection of local industry and the shortcomings of this sector, culminate in creating instant scarcity. The spatial context of new wants is similarly reflected by scarcity, since the allocation of scarce commodities is centrally administered and often favours the interest groups and unionised masses of the Prime Base. The implication is also that supply and demand are not just the provision of wants, but the process of acquiring import licences, and ability to contact suppliers and creditors, etc. As these services are centralised at the Prime Base, proximity to this location enhances trade transaction.

Having concluded that the Prime Base would be the locale of import-export firms and the seat of central government, it is useful to probe the dynamism of interrelated services whose location is by necessity geared to those functions. These related services could be grouped into three categories. Firstly, services auxiliary to business and trade which include insurance companies, accounting,

auditing and book-keeping, storage facilities, banking and financial houses, consultancies and foreign trading missions, estate agents, development offices, hotel and catering facilities. These tertiary activities are much neglected in locational and regional theory because they are predominantly a product of industrialisation in the West. Such services in many 'developing' countries preceded industry and were probably the most important single sector in terms of urban employment on the eve of industrial promotion. Secondly, to sustain an efficient central administrative function, the government departments and offices are also centralised. These include the central bank, central treasury, ordinance departments and central depôt, public works, trade and commerce headquarters etc. Thirdly, services related to maintenance, training and social care, etc., reach their threshold at the Prime Base in relation to the scale of business conducted here, and availability of facilities such as extension services.

The particular significance of the spatial proximity of all these services is their enormous contribution to the local government budget, which finances essential developmental programmes such as roads, medical care and education. Hence the Prime Base in its entirety is a process, the effect of which is cumulative, and through time leads to more linkages, innovation and economies of agglomeration. The net result is the magnification of income differentials between the rural areas and the Prime and secondary bases. The process is still in progress, and the urban population of Sudan and many other 'developing' countries is increasing at a rate unprecedented in these countries, and possibly in the history of urbanisation.

Within the Prime Base complex, one would expect a well defined social set up congruous with the process of socio-economic change.

Of specific interest is the existence and influence of interest groups especially national politicians and religious leaders. Both groups were engaged, to varying degrees, in the government machinery and in foreign trade and agriculture. From Sudan's experience, it is noticeable that the two rival religious leaders, referred to in the previous chapter, developed their own economic hierarchies which were centralised on the Prime Base and encompass the whole country through extensive systems of surrogates and representatives. Because of their national stature, the two leaders acted, on the one hand, as guarantors to Barclays and Bank Misr and on the other, as partners in the agricultural schemes, market gardens and foreign trade. More than 50 per cent of the proceeds from these regional schemes was securely finding its way back to the Prime Base to further enrich its businesses and banks, and consolidate its grip on the whole economic system.

Sponsored by the two religious leaders and the intellegensia of the mid-1930's, the Sudanese national political parties emerged to assume the duty of enlightenment and political struggle. What concerns us from the location point of view is that all party headquarters were localised at the Prime Base where they could effectively woo the masses and earn their financial support from a spectrum of export-import firms. The centralised co-existence of the parties at the Prime Base is a striking manifestation of the growing politico-economic polarisation, and yet at the same time a powerful aid to polarity.

4.7 Promotion of Industry

Legislation providing for the promotion of industry in Sudan was introduced in 1956. Several factors help to explain the wish of

the national leadership to embark on 'crash industrialisation' on the eve of independence. For one thing industry glittered with promise of higher standards of living and was considered the vehicle to higher national income.(55) For another, nothing else than industry, as Robinson puts it, "Seems drastic enough to cast off the millstones of population increase and falling prices of primary producer's..."(56) To these may be added the disadvantages of an undiversified economy of monoculture. Industry was believed to be the panacea, the way to assimilate the advantages of technical progress and equitable distribution of income.(57) To encourage import-substitution, a number of concessions were granted to private industry; varying from tax-holidays, to reduction of import duties on raw material, machinery and spare parts, provision of land at nominal prices etc. The starting point in this sub section is thus the identification of would-be entrepreneurs, the type of industry likely to develop, and the concessions that relate to profit margins and price structure as a whole. It is only natural that local industry seeks protection from outside competition, and often secures it in the form of restrictions on imports of similar goods, the levy of high import duties, or through a complete ban on imports. Firms already engaged in import and distributive trade were the first to feel the real threat of losing their businesses. For this reason, and because many such businesses were in contact with international suppliers and were in a better position to raise capital, the response to the encouragement of local industry was likely to be evoked from 'shadow industrial entrepreneurs', i.e., business agents, merchants and/or family businesses which accounted for just under 90 per cent of all 'approved entrepreneurs' in operation in May 1966.(58)

Since it has already been established that the trading community

would normally locate at the Prime Base, the same locale would be the bed of new ideas, and diffusion of innovation. Imitation is also manifested through this clustering of shadow industrial entrepreneurs since the installation of one industry would mean - if protection is granted - the shut down of import business of the substituted commodity. Direct involvement in industry would seem the only open door for competing in the new market structure. This phenomenon was noticed by K.A.Hammeedin 1974,

> ... the imitated applications were mostly investments designed to produce goods the importation of which formed the basis of the trading businesses of some merchants. These latter, when they were not themselves the initiators of such projects, often reacted by submitting similar applications. (59)

Of practical bearing on industrial location were the concessions bestowed upon local industry by the Approved Enterprise (Concessions) Act, 1956, and its augmentation, the Organisation and Promotion of Industrial Investment Act, 1967. In effect this legislation enabled industry to operate within a sufficiently low basic cost and consequently an attractive margin of returns on investment. These include a reduction of custom duties on machinery, spare parts and raw material and components to not more than 10 per cent of the c.i.f. value at port of delivery. The concession regarding raw material is important since lowering the cost of imported raw material would guarantee a comparable transfer class with local raw material, i.e., the transfer cost slope would be a gentle gradient thus minimising the pull effect of local raw material, widening the disparity between this slope and the transfer gradient representing finished goods. Further reduction on transfer charge of raw material, both local and imported may also be possible through recommendations by the Ministry of Industry.(60) The differential transfer charge per unit between finished goods (or imported commodities) and raw

material is particularly high.

Another significant aspect of the two industrial acts is the compliance with a defined structure of profit margins and pricing mechanisms. Since local industry was still expected to operate at a higher average cost than similar overseas industries, government departments were directed to accept on local purchases the paying of up to 15 per cent extra on imported goods prices.(61) Within the free market however, the price of locally produced commodities is determined by the prevailing competing imports and the degree of protection enforced. Fully protected industries are pioneer firms that proved to be competitive to importables(price and quality-wise) and could sufficiently supply the local market. These were generally sub-groups of the food industry such as confectioneries, vegetable oil, biscuits, macaroni, vermicelli, soft drinks, etc. Prices were initially set by those of imports and subsequent increases determined by the Ministry of Commerce and Trade. When the quota system is implemented it means that the local industry in question is not producing sufficient quantities to meet local demand and has to be supplemented. The leading price would normally be the wholesale price at Khartoum, plus freightage, and may vary with percentage transit duties levied as a protection to local industry. The rôle of the Ministry of Industry in respect of setting prices is confined to industries that acquired the status of a fully protected industry shortly after operations started. Textiles, electrical appliances, and engineering industries are the outstanding examples. The pricing procedure was described by the I.L.O. in 1976:

> When production is initiated, each unit [factory] is obliged to obtain approval from the Ministry of Industry for its ex-factory prices. The Ministry approves prices on a cost-plus basis, using information supplied by the producer for its operations. (62)

Although this is a precise description of the procedure, it is only enforced on limited occasions. It is important to note that the import price and for that matter the substitute product is fixed according to the Khartoum-plus system, and the margins of profit on cost to store. In other words, the price and profit structure of local industry will depict the same principles as in Fig. 4.2.

Supply of consumer goods in sufficient quantities in recent years proved unattainable in the face of increased demand and restriction on hard currency. This has established the law of supply and demand, rendered difficult price control and prompted in many cases the growth of a black market. Such irregularities, together with scale and date of production, i.e. capital/turnover ratio were excluded from the preceding theoretical formulation of the Prime Base.

It is instructive to pursue the analysis of the location problem and price structure with broad identification of the sub-industries, as presented in Table 4.1. A quick survey of the (sic) sub-order industries, reveals the import-substitution of industries, which are predominantly geared to large input of imported raw material (including semi-fabricated/semi-processed material and components). On average, the proportion of imported material was estimated at 70 per cent by the I.L.O in 1976.(63) However, industries most likely to have a low imported material ratio are public enterprises (such as canning and preservation of fruits, sugar refining, tanning and cement), or non-basic industries producing for the immediate local market (such as bakeries, milk products, wood furniture, tiles), or non-final industries (as in the case of leather, textiles and vegetable oil). Also forward linkage industries such as soap and sweets naturally display a low imported material ratio. On the other hand,

Table 4.1

Imported raw material as a percentage of material input, and employment share of the Prime Base for industries using over 50 per cent imported material.

	Local raw material (LS '000)	Imported material (LS '000)	Importation ratio	Total employment	Prime Base share in numbers	Prime Base share (per cent)
Electric appliances	0.5	229.6	99.8	198	198	100.0
Printing, Publishing and Allied industries	1.8	434.8	99.6	1567	1567	100.0
Electric batteries	2.5	113.9	97.7	86	86	100.0
Oil Refining	3.7	107.0	96.7	163	-	0.0
Enamelware	31.2	915.2	96.7	1624	1624	100.0
Paper products	25.5	524.6	95.4	520	520	100.0
Footwear	117.9	1998.7	94.4	1622	1622	100.0
Plastic products	10.0	154.4	93.9	127	96	75.6
Tobacco	87.0	971.7	91.8	293	293	100.0
Paints	19.8	198.4	90.9	98	98	100.0
Ready-made clothes	2.8	27.5	87.9	79	79	100.0
Chemicals (miscellaneous)	70.8	255.4	78.3	451	451	100.0
Chemicals and Pharmaceuticals	21.8	59.2	73.1	149	149	100.0
Miscellaneous food preparations	145.7	285.5	66.2	738	738	100.0
Grain milling	1019.0	1738.0	63.0	238	238	100.0
Soft drinks	407.7	638.5	61.0	968	968	100.0
Steel furniture	222.1	325.1	59.4	1622	1622	100.0
Hosiery and knitting	164.1	200.1	54.9	414	414	100.0

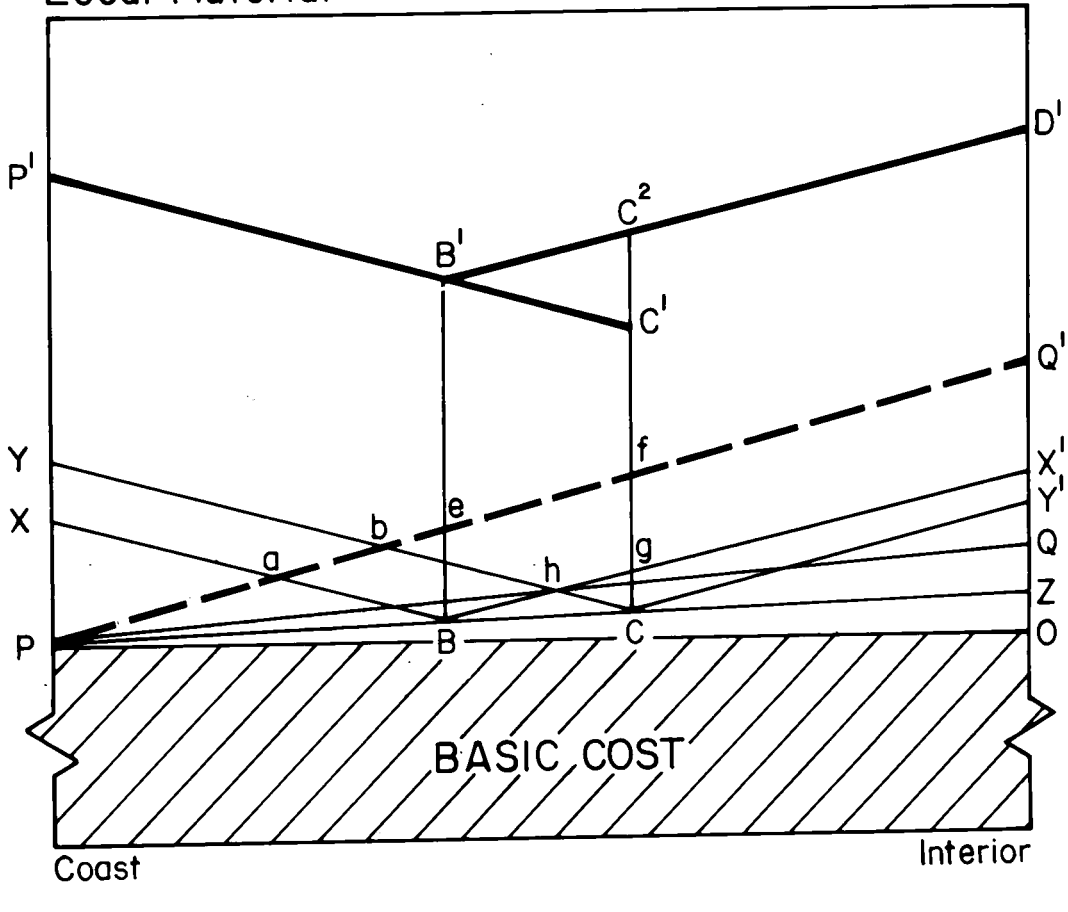
Source: Compiled from IDCAS, Industrial Survey, Sudan, 1969/70, Cairo, 1970, (in Arabic)

private industries producing for the national market, i.e. basic industries which are one stage industries producing final consumer goods such as Wood, Paper and Printing - Sic m Group IV, Chemical and Allied Industries - Sic m Group V, and Metal and Electrical industries - Sic m Group VI, all have a high ratio of imported raw material and evidently a material index round about one. Assuming that the imported material ratio is over 50 per cent, the price structure would not deviate much from that of imported goods, since the profit on cost to store and Khartoum-plus pricing apply equally to imported raw and semi-finished goods. Accordingly, one generalised prediction is that such import substitutes, high on imported raw material would tend to locate at the Prime Base to maximise profit margins in a similar fashion as depicted in Fig. 4.2 for pre-industry import firms.

To express the prediction about the inevitability of locating private industry at the Prime Base a few additions are superimposed on Fig. 4.2, together with the appropriate alterations to cater for the new conditions and assumptions in line with the prerequisites of an import-substitution industry (see Fig. 4.3).

Firstly, the transfer charge of raw materials whether local or imported is cheaper than for finished goods (imported as well as local) in the order of 1 : 5; this being the average differential as calculated from the freight rate book, 1959.(64) Lines PZ and PQ in Fig. 4.3 represent the transfer gradients of imported and local material respectively. Secondly, profit margins are determined by imported commodity prices at Khartoum, plus a margin of 20 per cent above that margin - line $P^1 B^1 D^1$. Thirdly, basic cost does not vary with location and should not alter proportional profits at different locations. Fourthly, other assumptions about even distri-

Fig 4·3 Spatial Profitability Margins with Imported Material through Port P and Ubiquitous Local Material



bution of demand, profit maximisation, supply of the national market and constant freightage cost to distance are all maintained as in Fig. 4.2.

The three locations of P, B, and C are set again in a series of diagrams, firstly with ubiquitous local raw material as in Fig. 4.3, then at C and B alternating in Fig. 4.4 and Fig. 4.5 with the following notation:

P	Port of importation.
B	Prime Base at an interior location.
C	An interior location relatively 'eccentric'.
$P\ Q^1$	Transport gradient of finished goods. (Also P's delivered price less profit).
$P^1\ B^1\ D^1$	Upper limit of profit margin (and in effect delivered price).
PZ, PQ	Transport gradients of local and imported material.
$X\ B\ X^1$	B's delivered price less profit.
$Y\ C\ Y^1$	C's delivered price less profit.

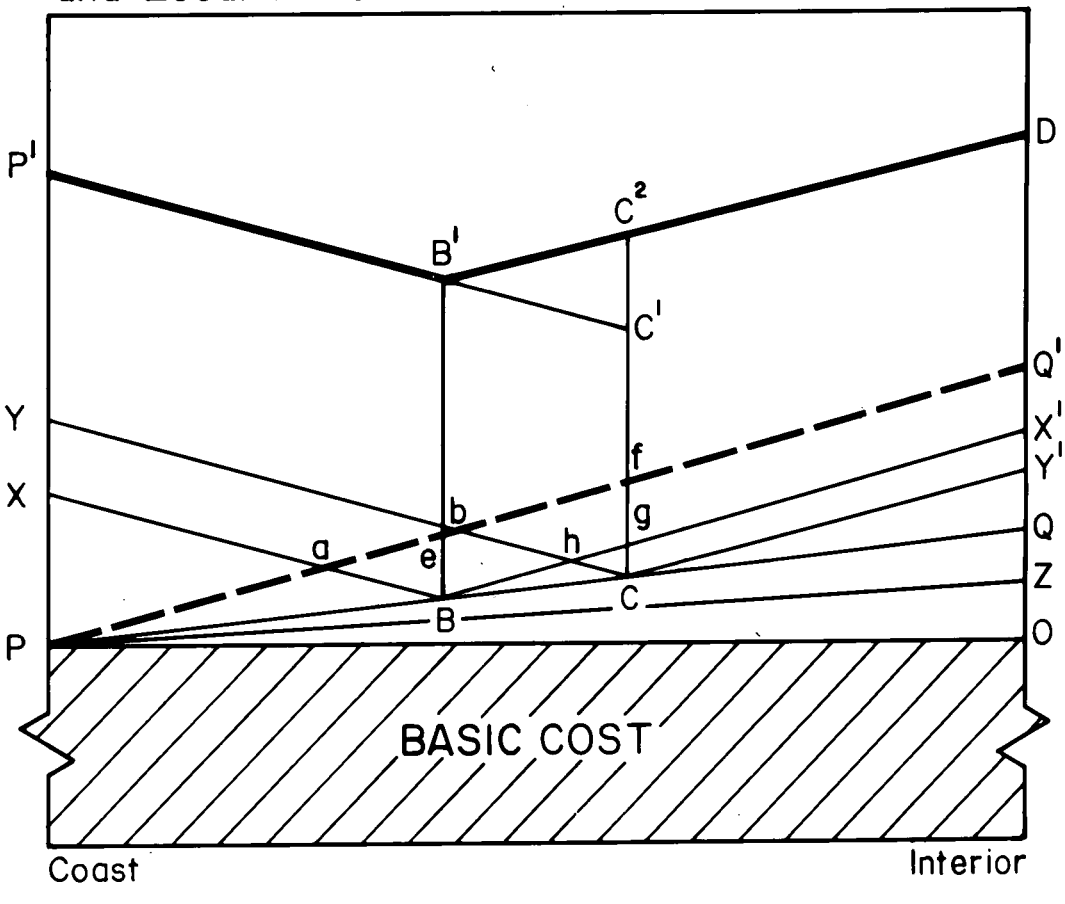
Now it is time to tackle the location problem of a single factory importing 50 per cent or more of its raw material input and procuring locally the rest of its material requirements. In other words, local material is assumed ubiquitous, and hence procurable at no extra transfer expense. Since the upper limit of profit is defined, and total profit assumed proportional to area in Fig. 4.3,* the profit attainable at any one location is defined by the lower part of the diagram - this represents basic cost and variable transfer cost of imported material as well as distribution of finished goods. Thus locating at B will yield a profit proportionate to area $P^1\ D^1\ X^1\ X$. On the other hand, locating at P will give a profit defined by $P^1\ D^1\ Q^1\ P$ which is evidently less than B's profit; in fact the

* Since even distribution of demand is assumed, sales quantity per sq.km. should also be even. Therefore, LS profit per unit sold can be made synonymous with area.

sacrificed amount is slightly less than e Q^1 X^1 B. Although an entrepreneur at P scoops a 'supernormal' profit (x a P) because of 'phantom' freight, i.e., delivered price up to point a which includes freight costs that are not actually incurred.(65) In effect he cuts back on profit in the area of freight disadvantage beyond point a. Now, considering location C, it becomes clear that profits to the right (C^2 D^1 Y^1 C) exceed those of location B (C^2 D^1 X^1 g) by the amount B has to cut back on profit beyond point h in the form of freight absorption. However, C has not only to absorb freight to the left of h, but to lower profit from C^2 to C^1 if to compete at all at B, P, etc., at a comparable profit limit. From the visual impression of the spatial profitability margin it is obvious that the loss of C to B left of h is larger than the gains over B to the right. Hence the clear conclusion under the stated assumption of local raw material ubiquity is that location B will provide the best location of maximum profit.

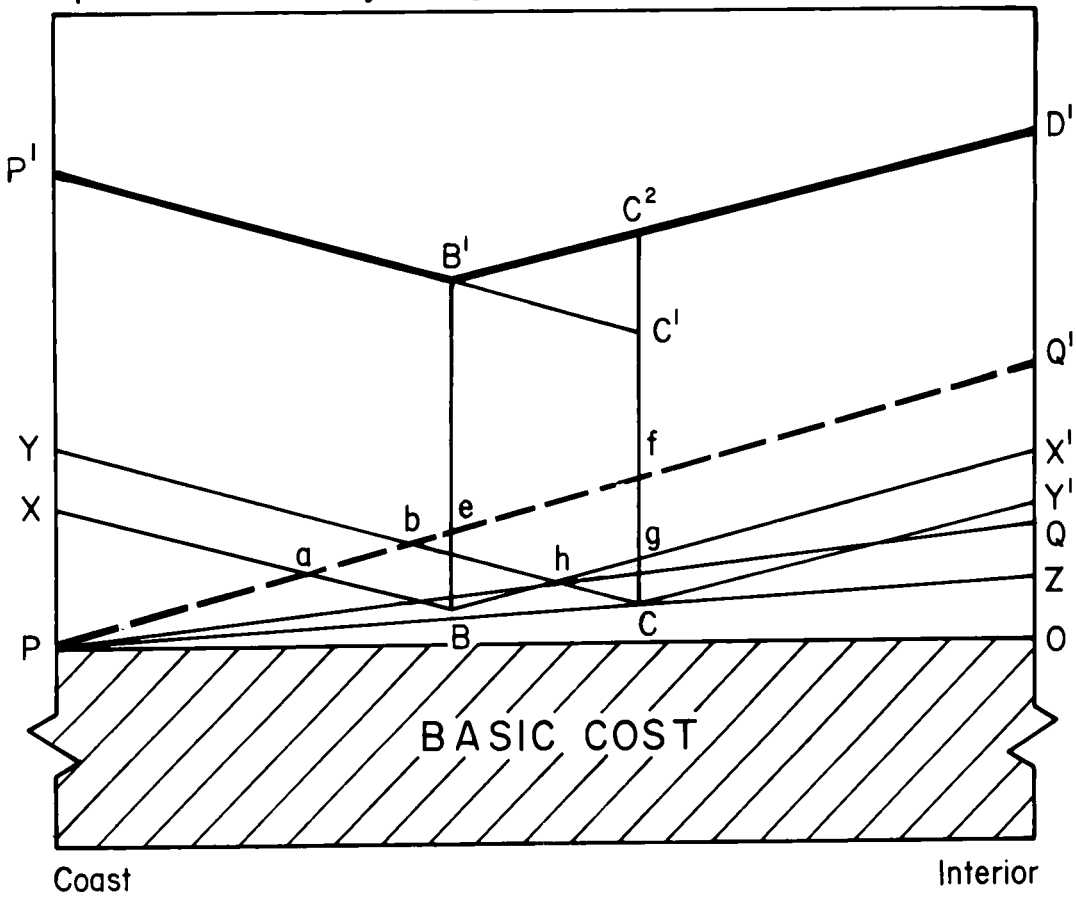
But the situation of ubiquitous local material is grossly simplified. Punctiform, supplementary raw material sources will now be considered alternatively at each location. By using a series of diagrams, we start with the assumption of local material at the port P (Fig. 4.4). Both B and C have to incur procurement cost of trans-shipping imported and local material at a freight cost for each that amounts to one-fifth of that for freightage cost of finished goods. Although P's profit has increased substantially, if compared to the case in Fig 4.3, it could still be seen that B furnishes a higher profit margin per one unit sold. The advantage of B is even more visually pronounced when compared with C (Fig. 4.4). The higher cost at C is not recompensed by a corresponding higher profit. Again, location B gives the right conditions for profit maximisation.

Fig 4·4 Spatial Profitability Margins with both Imported and Local Material from Port P



Alternatively we may think of C as the source of local material needed to supplement up to 50 per cent of imported raw material (Fig. 4.5). As expected, P will extend its variable cost and thus shift its delivery gradient over P Q^1 proportionate to the cost incurred in transferring material from C. The effect on P is a further cut on profit and consequently makes it the least favourable location in terms of profit maximisation and ability to compete. The contest between B and C is determined by the low procurement cost which evens out variable cost at both locations, while C's sales at the area to the left are only possible at a much lowered margin of profit (C C^1). B's gains over C are still detectable. Once more, a location at B secures the most profitable operation as far as profit maximisation is concerned. In the event of monopolistic competition and price cutting between B and any other location, say C or P, B will emerge with the highest profit possible under the above conditions and assumptions. Although C could monopolise the area to the right of h, it could only sell at a profit just under h X^1 Y^1 C. This limit is dictated by the possibility of B selling at net cost to the right of h (B X^1). With the same argument, B could monopolise the area to the left of h, albeit at a profit slightly lower than Y h B X. Nevertheless, the latter area is evidently larger than that of C, and the difference is the amount of profit by which B exceeds C's profits. Likewise, if P attempted to undersell B, it could do so only to point a where the two lines representing net factory prices intersect (B X and P Q^1). Actually, P could make a profit proportionate to the area just under X a P. However, it is clear that B will have a higher profit defined by area just under a Q^1 X^1 B. Thus in any duopolist competition between B and any other location, B gets a higher total profit. One important fact is that

Fig 4·5 Spatial Profitability Margins with Local Material from C.



competition will erode a large proportion of the authorised profit margins and confine profits to the lower portion of the diagram (Y h X^1). This may prove too low a profit to warrant conducting industry as the gestation period is longer than in trade, which means higher interest rates and higher risk.

For the first private basic industry which procures more than 50 per cent of its imports from abroad, B will produce the highest attainable profit margin as shown above. Subsequent basic industries with the intention of manufacturing a similar product to that of the pioneer firm will have to forsake a large proportion of profit (and so would the pioneer factory) unless the new firm locates at B (the Prime Base). It seems that the higher the profit margin in a developing economy, the lower the tendency to compete.

Another important aspect of the diagramatic representations of the Prime Base is that it combined demand and variable cost through the superimposition of profit maximum lines (the area so defined refers both to area of sale, i.e. market, and also the profit margin). Hence profitability is not only a function of sales area as Greenhut(66) and Smith(67) would have it, but a combination of sales area and price in proximity to variable cost at different competing locations. In that sense, the locational interdependence is fully integrated as an operational explanatory model.

Consequently, the proposition that emerges is that location B in the diagram (Prime Base) is the location of total profits maximisation. Monopolistic competition would tend to drastically lower profits for all parties. In any such competition however, B will be the location of maximum profit. For this reason, and since larger total profits are only possible in the absence of monopolistic competition, proximity of entrepreneurs to each other is the most likely

situation for securing the authorised profit margins. Since B is the location of maximum profit in monopolistic competition, it is only logical that B should be the location of total profit maximisation for aggregated industrial entrepreneurs. This conclusion echos the agglomeration tendencies explicit in Hottling.(68) However, the discrepancy with Hottling's case is that duopolists could share the market if they locate symmetrically along the linear market and thus they need not agglomerate.(69)

The high tendency for private basic industry to locate at the Prime Base (B in Fig. 4.3) is evident from Tables 4.1 and 4.2. A variety of industries encompassing virtually all Sic groups and subgroups are exclusively Prime Base industries. This tendency could be explained in the light of the theoretical formulation expounded above, and in fact would be predictable for the majority of the private industries which in any case import more than 50 per cent of their material inputs (as grouped, in percentage form, in Table 4.1). The case of industries under the 50 per cent limit is somewhat different. Many of these industries (Table 4.2) are forward linkage industries such as soap, bakeries, sweets, flour, and soft wood, whose major suppliers are Prime Base firms whether predominantly importers of raw material or users of local material. Noticeably, these industries are also expected to prevail at secondary bases since they are non-basics with a low threshold. This fact explains their omission from the Industrial Survey since they are too small to be included.

Other industries which are not represented in the Prime Base are source-base industries such as sugar refineries, canning and cement, with a high material index and/or a high degree of perishability. Conversely, they score a low import-ratio and they are mostly in the public sector. One exception is the cotton-seed

Table 4.2

Imported raw material as a percentage of raw material, and employment share of the Prime Base for industries using less than 50 per cent imported material

	Local raw material (LS '000)	Imported raw material (LS '000)	Importation ratio	Total employment	Prime Base share in numbers	Prime Base share (per cent)
Cotton-seed oil	5441.2	307.1	5.6	1864	1540	82.6
Milk products	65.7	4.8	6.8	127	127	100.0
Sugar refining	2169.3	479.8	18.1	5319	-	0.0
Manufacture of Leather	286.6	76.1	21.0	521	521	100.0
Distilling and Wine	159.7	45.3	22.1	179	179	100.0
Spinning and Weaving	2840.1	686.0	24.2	6052	6052	100.0
Cement	344.6	94.8	27.5	522	-	0.0
Sweets	1064.2	447.9	29.6	912	879	96.4
Soap, perfumes & cosmetics	1395.0	745.0	34.8	1392	1392	100.0
Canning and preservation or fruits and vegetables	119.1	48.6	40.3	448	-	0.0
Wood furniture	132.9	90.8	40.6	614	614	100.0
Tiles, cement blocks etc.	19.3	12.9	41.1	114	114	100.0
Bakery products	214.5	170.5	44.3	656	656	100.0

Source: Compiled from IDCAS, Industrial Survey, Sudan, 1969/70, Cairo, 1970 (in Arabic)

crushing industry. With a high material index and low import ratio one would expect a source-base location. Nevertheless, there is a remarkable localization of this industry at the Prime Base. Firstly, when this industry started in the 1940's there were strict laws prohibiting the storage of cotton-seed in the irrigated Gezira for fear of cotton disease. Secondly, the relatively recent development of cotton-seed as an export commodity was swiftly conducted by the already localised export firms of the Prime Base. For these firms transfer cost was immaterial, and only marginal if they were engaged in the seed crushing. Thirdly, cotton-seed oil was initially developed to satisfy a growing soap industry overwhelmingly centralised at the Prime Base. In many respects the complexity of these factors, and the rapid structural change of this industry, makes it an interesting target for a separate treatment of industrial location optimality as will be demonstrated in the case study - Chapter Seven. The cotton-seed industry is also of particular interest because it is unexpectedly concentrated at the Prime Base.

4.8 Conclusion

In the preceding discussion, an attempt was made to provide a framework for a new understanding of the considerable degree of industrial localization in the Prime Bases of 'developing' nations with special reference to Sudan. The task involved was by no means an alternative between explanations. Conceivably, the prolific literature and various treatises of industrial location are by necessity oriented towards the western model of development at progressive points on the time scale. But to accept such paradigms and pursue direct applicability to 'developing' countries is illusory, since the paths of economic development are fundamentally dissimilar.

The industrial location hypotheses are holisticly defined in terms of the socio-economic organisation, and translated into processes and systems. The charter import-export development was too inflexible to accommodate industrial development in dependent economies. At the time this was remedied, the export-import firms were well entrenched at the Prime Base, and adequately supported by the many attributes of the system especially distributive channels, pricing and transfer policies. Consequently, the development of new wants and the social set up were positively exploited as polarising elements of the system. Although the central tenets of the theoretical formulations were cast in a profit maximisation framework, the interplay of other polarising processes such as economic dualism and core-periphery are indivisible and equally valid. Given the prominence of shadow-entrepreneurs - (traders, businessmen) - already committed to export-import, and the very nature of an import-substitution industry, the new industrial firms would follow the pre-existing localization of this group, and the well-defined centralised service sector.

Another consideration of the proposed theory is the graphic representation of variable cost, demand and profit margins. It was shown that all basic private industry, in previously dependent economies, would locate at the Prime Base in order to maximise profit. Since we are dealing with processes, time is incorporated only within the involution of the process. The incapacity of the Prime Base theory to predict is augmented by the pragmatic nature of the process. Nevertheless, the theory can accommodate to change over a longer span of time. Finally, the bringing together of variable cost, demand and profit margins provides a much-needed operational explanatory model for 'developing' countries. The long-

standing failure to do this, and the want of holistic explanation, reduced many genuine attempts at regional industrial planning to trial and error.

CHAPTER FOUR

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CHAPTER FIVE

SPATIAL ORGANISATION OF INDUSTRIAL ACTIVITY IN THE PRIME BASE

5.1 Introduction

It will be clear by now from the findings of Chapter Four that Sudan's industrial activity is highly localized in the Prime Base. The sheer volume and variety of this concentration calls for separate consideration. The main objective has been to investigate the various aspects of this concentration with special emphasis on spatial variations, specialisation, and industrial structure at the Prime Base level. A combination of a localization coefficient and a location quotient(1) is introduced in the hope of revealing some of the spatial disparities and similarities within the Prime Base. The underlying structure and pattern of industry are closely examined and measured by ratios and coefficients such as 'the production-capital ratio', 'employment coefficient', 'capital density'(2) etc., and depicted and analysed by means of a correlation coefficient computed from figures compiled from the Industrial Survey of Sudan, 1969/70.(3) A sketch of industrial space will be made and appraised in its historic context and future trends examined with some reference to Man's decisions. Physiographic setting, centrality and population growth in the Prime Base are unavoidable realities that must also be surveyed. The criterion of '30 and above' workers adopted by the Industrial Survey, 1969/70, will be maintained here as an operational definition of firms under consideration. Factories so defined constitute about 67 per cent of the country's industry by number of firms. Availability of data made it possible to consider, besides employment, variables such as paid-

up capital and gross value added. The particular significance of the Prime Base lies in the high values of 59.3 per cent, 40 per cent and 56.6 per cent for these variables respectively.*

5.2 Geographic Setting

In any analysis of industrial activity so much localized as that of the Prime Base, it is necessary to consider basic geographical features such as nodality and climatic elements.

The Prime Base is a tri-partite urban cluster, filling all three angles where the White and Blue Niles merge to form the mainstream of the River Nile (Fig. 5.1). Apparently the defence qualities and excellent water-ways commended Khartoum as the military and administrative focus for the whole territory, and the fascination of the confluence of the Niles might also have enhanced the attraction of the spot.

Another aspect of this setting is the relative position of the Prime Base within Sudan's climatic zones and geographic boundaries. The Nile confluence occurs right at the southern fringes of the semi-desert, and well entrenched within the tropics giving the Prime Base a quasi-central location. This was enhanced by the White and Blue Niles, reaching to the south and south-east, and a railway system stretching north, east and westward.

5.2.1 Climatic Setting

Climatic elements of special interest to this study are temperature, rainfall, humidity and wind. Invariably these climatic elements affect directly or indirectly both Man and 'hard-ware' to the extent of essentially increasing structural and production costs. Production quality may suffer too. The precise effects of these climatic variations on factory machinery and equipment have

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* Regional comparison is provided in Chapter 6.

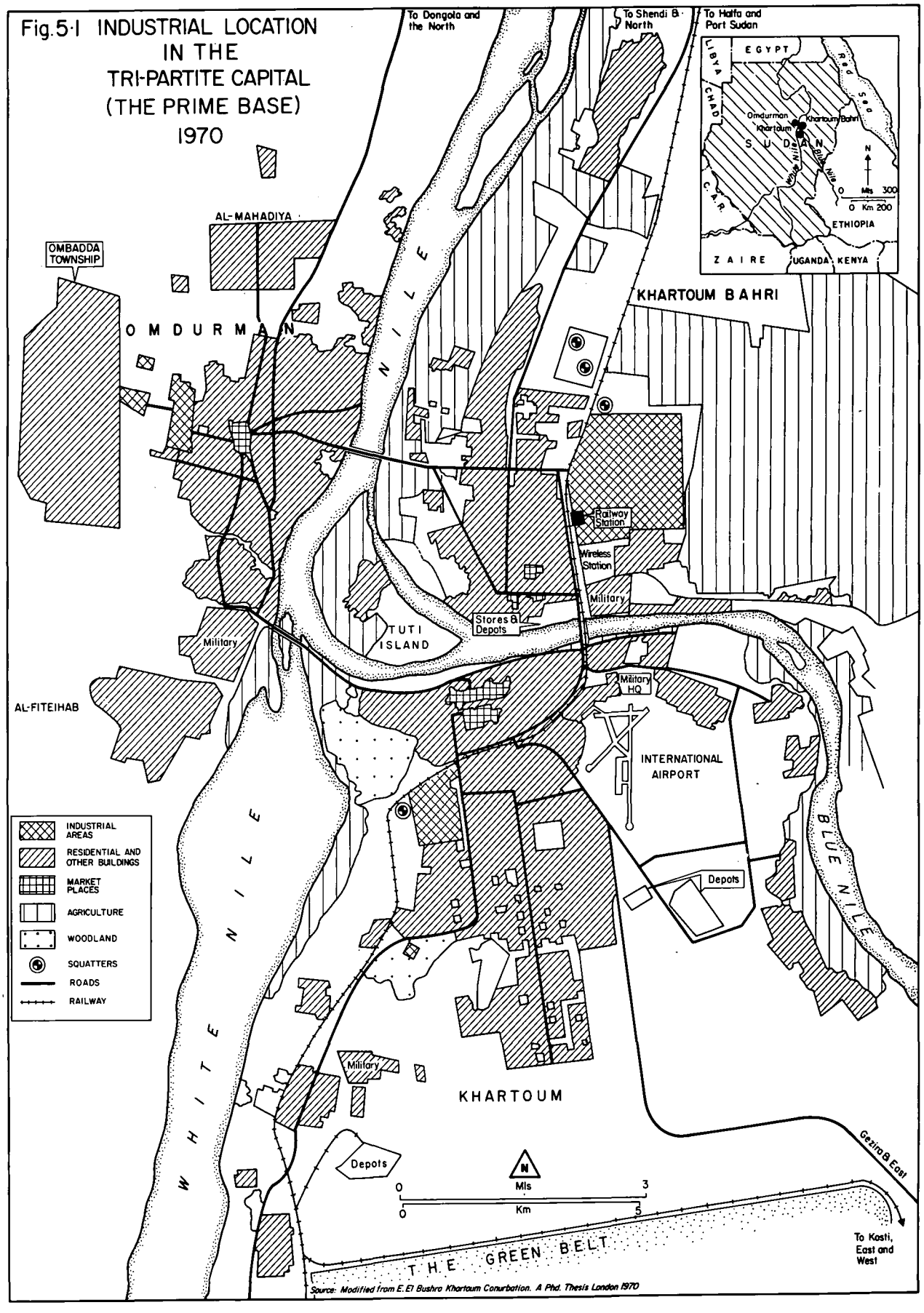


Fig.5·1 INDUSTRIAL LOCATION IN THE TRI-PARTITE CAPITAL (THE PRIME BASE) 1970
To Dongola and the North
To Shendi & North
To Halfa and Port Sudan
EGYPT
LIBYA
CHAD
SUDAN
ETHIOPIA
ZAIRE
UGANDA
KENYA
C.A.R
Red Sea
Omdurman
Khartoum
Khartoum Bahri
White Nile
Blue Nile
N
0 Mls 300
0 Km 200
AL-MAHADIYA
OMBADDA TOWNSHIP
OMDURMAN
KHARTOUM BAHRI
NILE
Railway Station
Wireless Station
Military
Stores & Depots
TUTI ISLAND
Military
Military HQ
AL-FITEIHAB
INTERNATIONAL AIRPORT
Depots
BLUE NILE
WHITE NILE
INDUSTRIAL AREAS
RESIDENTIAL AND OTHER BUILDINGS
MARKET PLACES
AGRICULTURE
WOODLAND
SQUATTERS
ROADS
RAILWAY
Military
KHARTOUM
Depots
N
0 Mls 3
0 Km 5
Gezira & East
THE GREEN BELT
To Kosti, East and West
Source: Modified from E. El Bushra Khartoum Conurbation. A Phd. Thesis London 1970

not yet been fully studied. One can imagine the extra costs incurred in standard tropicalised machinery, and the chain of problems involving additional costs and time delay. On the other hand, it is easy to appreciate the need for specially designed factory buildings to cope adequately with climatic factors such as contraction and expansion due to seasonal and daily temperature ranges. Indeed, reducing roof heating and providing proper ventilation with regard to machinery overheating and cooling systems, is often giving cause for concern. Furthermore, matters of concern to manufacturing are the excessive solar heat, the devastating dust-storms, the haboob, and the minimum wet-bulb temperature requirements, all of which are thorny problems that need rigorous interdisciplinary research.

Though regional climatic differences are not profound in Sudan, they will nonetheless interfere in the long run to some degree with locational decisions. Obviously the present day industrial bias to the Prime Base overrules many such aspects and neutralises their importance. Future industrial location choice will no doubt give more weight to environmental factors.

5.2.2 Population: change and growth

The first national population census was conducted in 1955/56; but for all practical purposes, government estimates published in Sudan Almanac and elsewhere do furnish an overall picture of the magnitude and population growth trends in the conurbation for the pre-census period. As expected, an upward trend of population growth is evident thought not uninterrupted. Considering natural increase and immigration together, the population growth was fairly rapid from 1905 to 1955 as can be seen in Table 5.1.

Table 5.1

Total Population Growth of the Prime Base, 1905-1955

Year	Khartoum	Bahri	Omdurman
1905	8,000	2,000	48,000
1910	20,000	7,000	43,000
1915	32,000	16,000	59,000
1920	23,000	16,000	50,000
1925	32,000	14,000	79,000
1930	50,000	22,000	104,000
1935	47,000	21,000	111,000
1940	45,000	19,000	116,000
1945	60,000	30,000	117,000
1950	80,000	34,000	125,000
1955	93,000	39,000	114,000

Source: Compiled by El-Bushra, E., The Khartoum Conurbation: An Economic and Social Analysis, Ph.D. Thesis, London University, 1970, p.92.

During these fifty years, the population of Khartoum multiplied nearly twelve times; Omdurman 2.45 times and Bahri 19.5 times. The varying population growth rates reflected here echo the basic figures. Nevertheless, one can pick some of the differences that might have in part contributed to these differential rates.

Omdurman, the capital of the Mahdist State (1882-1898) still resembles African indigenous towns. However, the increase was not as dynamic or continuous as in the other two towns. Khartoum, the capital, was increasingly creating chances through its diversified economic functions, in government ministries and departments which were almost exclusively found there, and in foreign as well as local business and commercial undertakings. Being physically part of the conurbation, Bahri, with an estimated population of 2,000 in 1905, had seemingly more room for new-comers,

even though it was not creating as many chances as the other two centres in the pre-World War Two period.

It would be erroneous to think that industry itself attracted immigration in the conurbation much before 1956 simply because of the bare existence of industry at such a date. Nor would it be correct to assume a major industrial influence in that respect in subsequent years, as was suggested by El-Sayed El-Bushra.(4) He concluded:

> The flourishing of commerce and trade together with the introduction of light industries after the end of the Second World War have been responsible for the explosive expansion of the Conurbation during this period.

i.e. 1945 - 1970. In his argument El-Bushra adopted the 'push' from the countryside concept when saying:

> Nevertheless, more migrants continue to pour into the urban area simply because of unattractive conditions in the countryside. (5)

In effect, the erruptive nature of population in-flow by the 1960's cannot be explained by singling out one or two factors. There was only one basic force at work and that is the process of development, 'modernity' and change as seen in the previous chapter. It might suffice to show the trend and magnitude of the population growth rates in the Prime Base. The preliminary results of the 1973 population census have been compared with the 1955/56 figures as shown in Table 5.2.(6) Although the table is self-explanatory, the exceptionally high annual rate of population growth should be emphasised. The differential growth should, however, be read in the light of the above account.

Table 5.2

Prime Base: Population Growth Rates, 1955-1973

Urban Place	1955/1956 Total Population	Per cent	1973/1974 Total Population	Per cent	Annual rate of growth per cent
Khartoum	93,103	37.9	343,710	43.0	15.0
Omdurman	113,551	46.2	299,629	37.5	9.1
Bahri	39,082	15.9	155.254	19.5	16.5
Total	245,736	100.0	798,593	100.0	12.5

Source: Commission for the Reconsideration of the Provincial Boundaries, Final Report and Recommendations, No.1., Khartoum, April 1974, p.488.

5.3 Industrial Activity Zoning and Patterns

The structural zoning of industries within the Prime Base is interesting in many respects. For one thing, the industrial land allocation conforms to urban zoning regulated by the local government. Also it is of significance that a modified version of industrial estate has evolved in the late 1940's when the terms 'light' and 'heavy' industry were introduced with specific reference to the amount of land to be occupied. Accordingly Bahri's industrial area was labelled 'heavy' while the Khartoum and Omdurman industrial areas were 'light'. The industrial areas of Omdurman and Khartoum were situated on a site that has the combined advantage of being at minimum distance from the city commerical core and at the same time beyond the then immediate residential margins, in order to avoid the noxious character of the industrial area. The need to locate at a site near the market is lacking in the case

of Bahri. Bahri's 'heavy' industrial area was a superimposition and relates only to its own functional input and output needs within the context of the whole national market. The investment and production envisaged were extensive and Bahri's business circles and consumer market would have little impact on the choice of an industrial area.

The pre-World War Two linear nature of settlement in Omdurman and Khartoum, with a north-south axis on the Nile in the former, and an east-west axis lining the Blue Nile in the latter, would, according to the minimum distance to core hyopthesis formulated above, make us expect the industrial area to be located at a spot on the intersect of the town limit line with the perpendicular from the base line (see Fig. 5.1). In both cases, the immediate town limit was demarcated by conspicuous features such as the Omdurman khor on the western margins acting as a physical and psychological outer limit, and the railway loop that encircles Khartoum. Unexpectedly, Khartoum's industrial area shows a slight bias to the west of the point hypothesised. Two reasons can be given. Firstly, the optimum location described above had already been occupied by the 'Old Deims', the shanty residence of the town's labour force. Meanwhile, the expansion trend of the town southwards was clearly foreseen in the post-Second World War period.(7) Secondly, the inferior low land to the west of no value for residential purposes was incidently close enough to the central railway station to suggest itself as the 'new' industrial area. The railway line in Bahri offered some resemblance to that of Khartoum as a growth limiting factor on the eastern fringe. Yet the same railway line seems to have had a powerful pull force when the 'heavy'industrial area was chosen.

The opportunity for planning industrial areas was only made possible by the long period of delay before industrial growth began. In the process of modern economic evolution, other sectors such as commerce and trade had appropriated their physical places in the urban core. Any new sector - in this case industry - had to struggle for space elsewhere outside the zone. Such works as repair and maintainence workshops and hand-made articles, such as sweet, that co-existed with other activities in the C.B.D., were only part of other sectors such as transport in the first case and cottage industries in the second. The re-location of such works has tempted some scholars to think that there was a continuous process of industrial zoning:

> This type of decision-making (referring to the re-location of home-made sweet to market place) as well as zoning for new industry has been a continuing process. (8)

Clearly the misconception and illogical classifications of industry has led to this conclusion.

It might be of interest to note that this tendency to develop separate industrial zones is a common practice in many African cities, such as Lagos, Lusaka and Nairobi.(9) The non-industrialisation policies of the colonial era indiscriminately adopted in almost all African territories, funnelled the process to a point in time where there was no actual room in the central zone for industry, and compelled, within the context of modernisation, zoning regulations that yielded this locational pattern in Africa. In this respect, the African cities strike a remarkable contrast with Far Eastern and to a lesser degree, Middle Eastern countries, where machine-factory production was incorporated within the city.

In a span of between two and three decades, the industrial growth in the Prime Base demanded much more space than the planners

first anticipated. Estimates of the three industrial areas of the Prime Base were put in 1971 at about 1750 acres (7 Km^2).(10) The simultaneous growth of Omdurman's industrial area with that of Ombadda township to the west, has sandwiched the industrial area and rendered its expansion westward rather limited, though linear growth is possible. Khartoum industrial area had practically reached its limit in the late 1960's. Now it is endangered by the recurrent White Nile flood waters from the west, and encircled by residential and business buildings and the railway station. Reclamation of the low flood land has been contemplated but the overhead costs may well prove insuperable. As an alternative, the stretch of flat land at Al-Kalakla to the south has been sought. Bahri's industrial area is rapidly filling the allotted land and slowly encroaching upon the surrounding agricultural land on the north and east. Most likely the latter will be sacrificed for the dynamic expansion of the former.

Unless strict measures are enforced to curb the indiscriminate industrial expansion in the Prime Base, the problem of new industrial areas and re-location will continue to be a profound feature of the ever remoulding urban space.

5.4 Structural Analysis of the Industrial Activity

The focus of this section is on the array of production factors and their structural impact as perceived in the spatial context. In a sense this is analogous to processes in architecture and planning. Whatever the architect likes to express has to be in proportion with the available space. Most likely size-structure and display varies with standard usage and utility. Likewise, the analysis attempted here is the broad identification and appraisal of the different scale of industrial units that make different

demands for land, services and production factors. In fact, this may necessitate certain optimal site and market areas and hence confine the location choice to where those optima are satisfied. In that respect, industrial structure has a precise spatial meaning. Within the Prime Base an export-based industry will, theoretically, respond differently to locational forces from an import substitute industry. Accordingly, one would expect export-based industries to be specialised, large-scale, serving national as well as international markets. Because of their scale and functions, and possible affiliation to overseas corporations, they would normally seek location at the spacious and better served sites at Bahri.

The structure concept hitherto outlined has secured little attention in geographic industrial locational analysis, partly because of the apparent lack of spatial content and partly because structural analysis of the industrial activity has for long been the domain of economists. In subsequent sub-sections the structure and size-structure are identified and treated on the broad conurbation's industrial activity level and then on the individual industrial grouping level.

5.4.1 Structure of Input and Production

A correlation coefficient analysis was run to test the degree of association between some coefficients and ratios, computed to broadly identify structural inputs and production variations and measure labour and capital productivity in the Prime Base. These coefficients are themselves derivatives of standard variables and are used to detect industrial productivity as applied in our case to one hundred and three factories. The result is set out in a correlation matrix, together with a list of ten 'vari-

ables', in Table 5.3.

It is possible to single out five strong correlations, significant at the 0.001 level. These are positively between production-capital ratio and employment coefficient, A and E; capital coefficient and labour intensity, B and H; capital intensity and capital density, C and D; capital density and 'machinery' coefficient, D and I; and production-labour ratio and labour productivity F and G. Some other fairly strong correlations are also revealed and marked by dashed circles in the matrix.

When manipulating different inputs and production factors in industrial undertakings, one is looking for the optimum proportions of both, whether the objectives are absolute profit or profit at social price. Yet the right factory optimum is a highly theoretical conception. One should nevertheless be concerned with depicting the general trends and understanding their broad connotations. Any inference of cause and effect has to be disregarded when interpreting the above correlations. Such implied relationships may confirm what is previously suspected however.(11) A high 'machinery' coefficient, for example, does theoretically mean a high labour productivity and the connection might likely be inferred.

Some of the most obvious observations that can be made are presented right at the outset. They come into two distinct though associated packages:

(a) Labour Productivity:

Labour productivity as measured by the urits of value added per employee is indifferent to both capital density, i.e. capital units per employee, and employment coefficient which is the number

Table 5.3

Matrix of correlation coefficients (Pearson product-moment) for ten industry coefficients

Variables	A	B	C	D	E	F	G	H	I	J
A. Production-capital ratio: Value added per capital		-0.27	-0.36	-0.41	0.62	0.31	0.16	-0.15	-0.25	0.11
B. Capital coefficient: Capital per value added			0.45	0.36	-0.16	-0.26	-0.14	0.86	0.11	-0.04
C. Capital intensity: Capital per production value				0.70	-0.24	-0.24	-0.27	0.13	0.17	-0.05
D. Capital density: Capital per employment					-0.37	0.15	0.24	-0.05	0.57	-0.06
E. Employment coefficient: Employment per capital						-0.21	-0.12	0.08	-0.33	-0.02
F. Labour productivity: Value added per employment							0.68	-0.37	0.40	0.17
G. Production-labour ratio: Production value per employment								-0.22	0.49	0.01
H. Labour intensity: Employment per value added									-0.07	-0.03
I. Machinery coefficient: Machinery & equipment per employment										-0.13
J. Production-machinery ratio: Value added per machinery & equipment										

Note: (oval) Strong correlations at the 0.001 level of significance

(dashed oval) Fairly strong correlations at the 0.01 level of significance

Number of factories - 103

Source: Compiled from data in Appendix 5.1

of employees per unit of capital. Consequently, one may fairly state that neither labour-intensive methods nor capital-intensive techniques affect to any significant degree the performance of labour productivity as seen from the data in hand. Curiously, the implications of these insignificant correlations are even more serious than the significant ones.

The inaccordance of capital density with labour productivity is probably indicative of inactive capital participation in direct production and/or under-utilisation of installed capacities. While the latter is difficult to quantify because of data inadequacy, the former is suggested by the fairly high positive correlation coefficient of 0.40 between labour productivity and machinery coefficient (Fig. 5.2.i.). This means that although capital density is not associated with labour productivity, the proportion directly involved in production, i.e. machinery and equipment if high, is positively associated with higher labour productivity. An extreme example that vividly reflects this tendency is shown by a milk products factory. In that concern, fixed assets are loaded with extensive agricultural land values. Any ratio involving capital will produce astronomical figures. Such results have caused much concern in the Industrial Survey, Sudan, 1969-70.(12) Obviously, the inclusion of agricultural land values in paid-up capital has passed unnoticed in the survey. The existence of idle capacity in high capital density firms is now suspected; and might well account for a large proportion of the indifference of the correlation. The many problems of raw material, transportation, protection from foreign competition, etc., and the operational problems are all many reasons adversely affecting capacity. In anticipating these problems the entrepreneurs would minimise marginal uncertainty by locating at the Prime Base, since under-

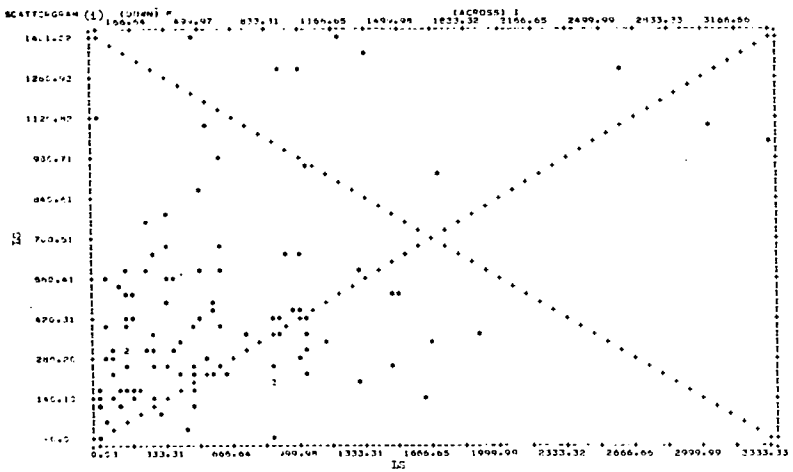
Fig. 5.2 Scattergrams for the Prime Base industries on the following coefficients:

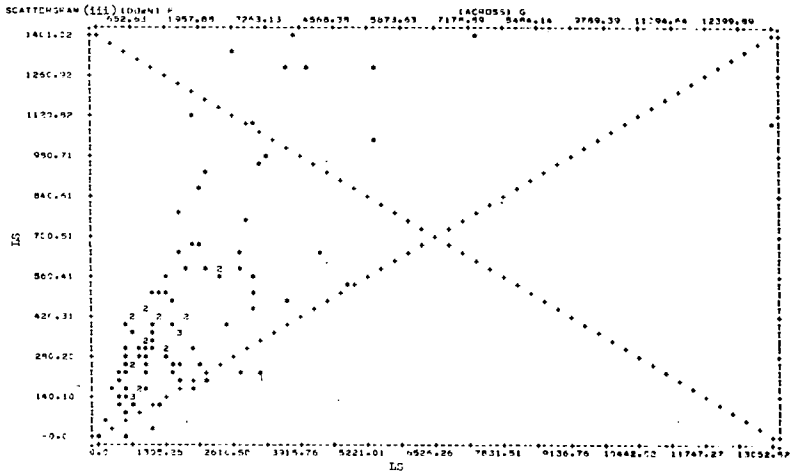
(i) Labour productivity and machinery coefficient (F and I), r = 0.40

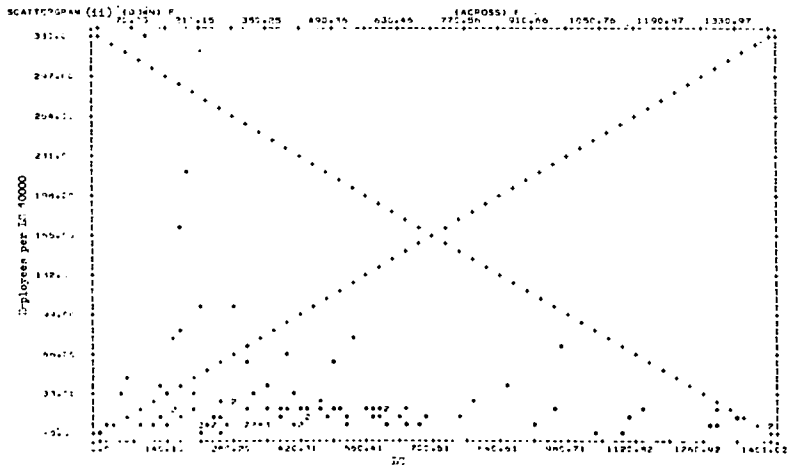
(ii) Employment coefficient and Labour productivity (E and F), r = -0.21

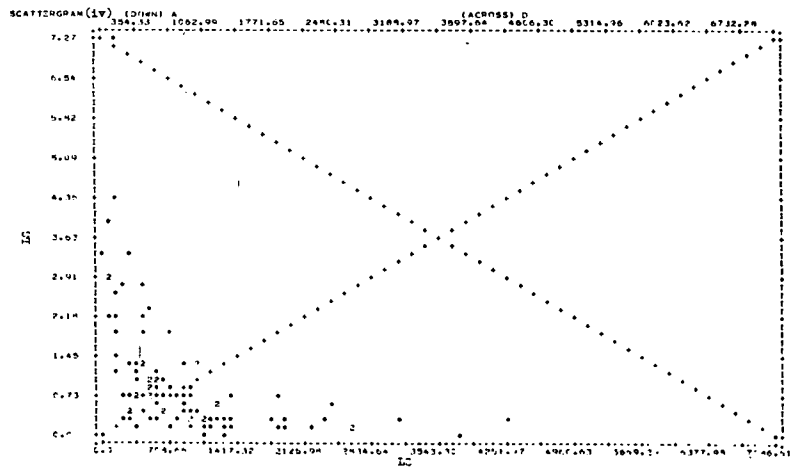
(iii) Labour productivity and Production-Labour ratio (F and G), r = 0.68

(iv) Production-capital ratio and Capital density (A and D), r = -0.44









capacity is assumed to be more serious in regional localities where services and distribution channels are less developed.

The dissociation of employment coefficient with labour productivity is also interesting. It clearly emphasises the generality of 'labour-intensive' attributes. Labour-intensive methods of production depend not only on the number of employees but on the division and organisation of labour, and labour price. This widens the range and creates enormous differences between industries under the same 'labour-intensive' title (Fig. 5.2.ii.). The likelihood of any sound co-ordinated relationship between labour productivity and employment coefficient is rather difficult to attain.

Turning now to the consideration of significant correlations with labour productivity, one can single out the production-labour ratio as the most conspicuous. This is shown by a positive correlation coefficient of 0.68. Perhaps the most fundamental thing about this relationship is that it actually quantifies the educated guess that whenever costly inputs are involved, management and labour are expected to be more skilled and generously paid. This means that a spinning and weaving mill will, other things being equal, have a higher production-labour ratio than say, a soap factory. While the former is specific in its locational needs, i.e. the extensive better served Bahri's industrial area, the other is indifferent (Fig. 5.2.iii.).

(b) Capital Productivity:

The line drawn to show the magnitude of capital productivity i.e. production capital ratio, is the intensity of value added produced per one unit of paid-up capital. Against this, one can roughly judge whether the capital invested is producing the desir-

able value added. Evidently, in all three coefficients introduced to gauge capital performance, the association with production-capital ratio is inverse. Any increase in capital per employee, for example, is associated with a lowering of value added per capital, the correlation coefficient being -0.41 (Fig. 5.2.iv.). Again these results confirm that capital has not been fully utilized for production purposes, and in part suggest the prevalence of idle capacities. As a matter of fact, under-capacity is underlined by the inverse though rather less significant relationship between production-capital ratio and machinery coefficient. A closer look, however, will reveal that all factories experiencing low capital coefficient are largely putting capital to uses other than direct production. A large proportion of capital is often locked in stocks, land or buildings. The bulk of such factories are incurring losses and incidentally all but a very few of them locate at Bahri.

The connections of capital and labour productivity can clearly be seen in three cases involving employment. Firstly, the strongest association in the matrix is between capital coefficient and labour intensity ($r = 0.86$). An increase of capital per one unit of value added is matched by a proportionate increase in the employment number needed to produce one unit of value added. Secondly, in cases where labour-intensive methods of production are adopted, there is a strong positive correlation coefficient with production capital ratio. Lastly, a fairly high positive correlation is also depicted for the association between labour productivity and production capital ratio. These generalisations will be further explored in the subsequent chapter as the same trend is more or less maintained.

5.4.2 Sectoral Structure

The investigation above into the structure of input and production deals with a wide spectrum of industrial activity. The extent to which the sectoral structure differs from the general industrial pattern is now examined according to the specific industrial orders of the Standard Industrial Classification, modified, (SIC m). An interesting facet of this exercise is to identify similarities or dissimilarities amongst the various industrial sectors in respect of their input and production factors and to assess, in general terms, whether any particular industry group or groups have influenced the overall pattern of industry.

By way of brief overview however, one should at this juncture, refer to the seven industrial sectors and their representation on five variables (see Table 5.4). A two-sector dominance favours Food, Drink and Tobacco, and Textiles and Ginning (SIC m Groups I and II). Indeed more than 50 per cent of the Prime Base's industrial activity measured on any one variable is contributed by these two industrial sectors. Sometimes this percentage reaches 70 as is the case with paid-up capital. If Leather and Footwear, and Wood, Paper and Printing (SIC m Groups III and IV), were included with SIC m Groups I and II by virtue of their initial agro-input, the picture will be one of overwhelming concentration in agricultural processing, well in the order of four-fifths. This bias clearly exemplifies the embryonic stage of industry in the Sudan, and more significantly perhaps, emphasises the contribution of factors other than cost minimisation which determines the location of material base industries at the Prime Base.

A correlation coefficient has been computed, wherever possible, for each individual SIC m group. Each such group it is evident,

Table 5.4

The industrial sectors by five variables as absolute numbers (LS.'000) and percentages

Industrial Sector (SIC m Group)	Number of employees & per cent	Paid-up capital per cent	Gross value added per cent	Production value per cent	Wages and salaries per cent
Food, Drink and Tobacco (SIC m I)	5415 (24.71)	5207.7 (22.60)	3110.2 (28.00)	15603.8 (41.30)	1930.9 (32.20)
Textiles and Ginning (SIC m II)	6502 (29.67)	10675.2 (46.40)	3124.1 (28.10)	7319.9 (19.4)	1471.1 (24.50)
Leather and Footwear (SIC m III)	2203 (10.05)	2175.4 (9.50)	1604.3 (14.50)	4560.1 (12.1)	704.4 (11.70)
Wood, Paper and Printing (SIC m IV)	2916 (13.31)	2525.9 (11.00)	1215.6 (11.00)	2629.6 (7.00)	777.1 (13.00)
Chemicals and Allied (SIC m V)	2187 (9.98)	1340.5 (5.80)	1053.3 (9.50)	4580.9 (12.10)	633.4 (10.60)
Metals and Electrical (SIC m VI)	2490 (11.36)	780.8 (3.40)	927.4 (8.40)	2960.3 (7.80)	420.7 (7.00)
Cement, Tiles, Glass etc. (SIC m VII)	201 (0.92)	290.0 (1.30)	63.5 (0.60)	169.8 (0.40)	62.9 (1.00)

Source: Compiled from IDCAS, Industrial Survey, Sudan, Cairo, 1969/70
See data in Appendix 5.1

has distinct labour and capital productivity, depending on the initial input factors, the complexity of manufacturing, and production outlet. 'Machinery' coefficient could for example be very essential in raising labour productivity in one group, though may have little significance to another. Pin-pointing these disparities will be the concern on this sectoral analysis.

The essential difference between groups which are controlled by their respective response to labour and capital productivity, are produced in a series of scattergrams (Fig.5.3, for matrixes see Appendix 5.5). The following features may be noted:

(i) The only group where higher labour productivity is associated with an increased capital density is Metals and Electrical Industry (SIC m Group VI) (Fig.5.3.i). The correlation coefficient is 0.60 at the 0.01 level. Two important sub-groups here, are the assembly of electric appliances and enamelware. The imported inputs for these assembly industries are either semi-finished or 'knocked down' parts to be fitted, thus simplifying operations, minimising risk, and consequently the chances of profit are better. A rather complicated situation develops where the machinery coefficient is unexpectedly indifferent to labour productivity. This should however, be read in the light of the fact that cost of machinery and equipment for some concerns exceeds the values of paid-up capital, indicating an error in the original figures of the Industrial Survey.

(ii) An increased 'machinery' coefficient, if not pushed too far, will most likely give higher labour productivity. This conception has not been verified by the data manipulated except in SIC m Group I, Food, Drink and Tobacco, ($r = 0.63$ at the 0.001 level, Fig.5.3.ii). An equilibrium has been struck between production input and application of

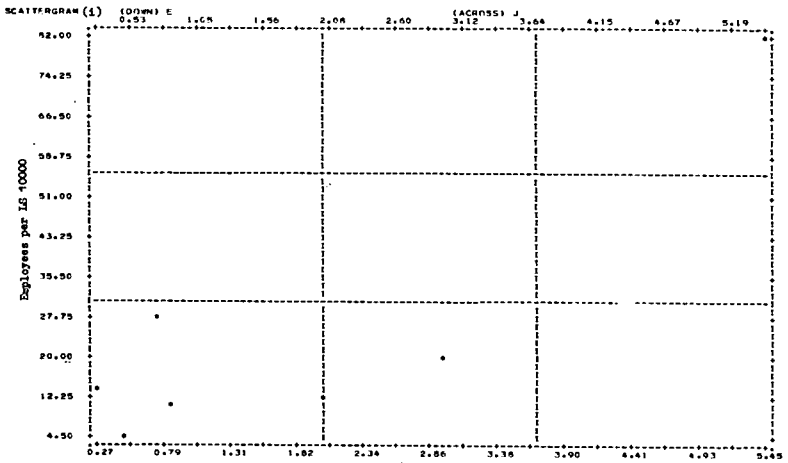
Fig. 5.3 Scattergrams for the Prime Base industries by industrial groups on the following coefficients:

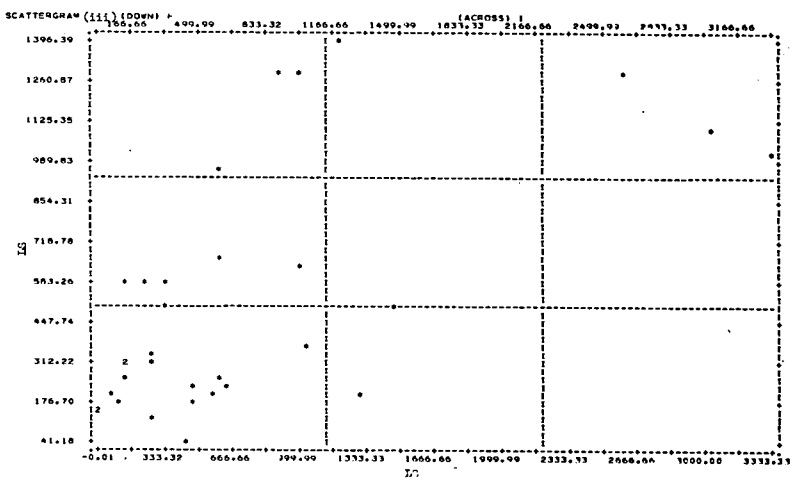
(i) SIC m Group III: Employment coefficient and Production-machinery ratio (E and J), r = 0.86

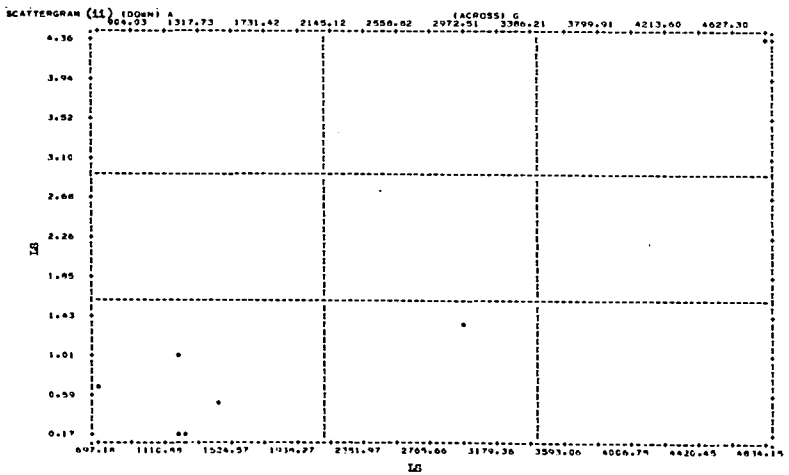
(ii) SIC m Group III: Production-capital ratio and Production-Labour ratio (A and G), r = 0.92

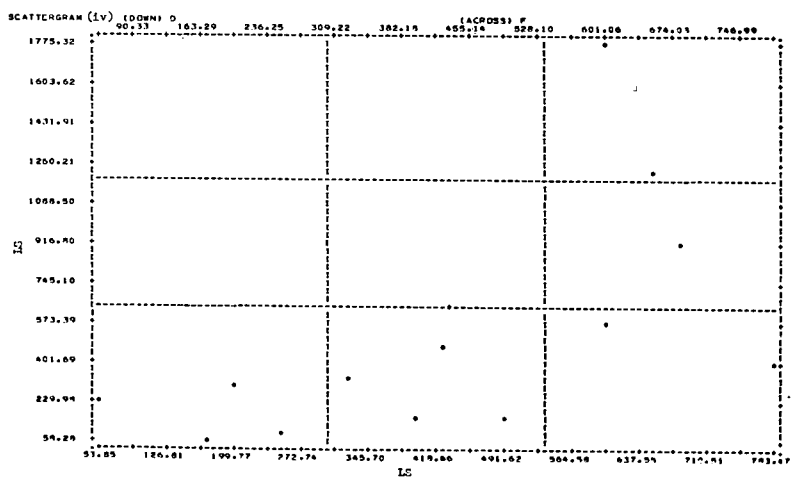
(iii) SIC m Group I: Labour productivity and machinery coefficient (F and I), r = 0.63

(iv) SIC m Group VI: Labour productivity and Capital density (D and F), r = 0.60









machinery, and probably evince that this industry is stable and mature enough to obviate many adverse conditions affecting other groups. Although the intensification of machinery coefficient has not been paired by a significant increase of labour productivity in SIC m Group II, there is a well defined inverse association between labour intensity and machinery coefficient, i.e. if the unit value of machinery and equipment per employee is increased, then one should expect a decrease in the number of employees needed to produce one unit of value added. However, this does not amount to a positive increase of productivity per employee. Another strong inverse correlation coefficient for SIC m Group II is between machinery coefficient and production-machinery ratio. Taken together, the two negative correlations consolidate the conclusion about under-capacity already referred to above.

(iii) An interesting association between employment coefficient and production-machinery ratio tells us, in the case of Leather and Footwear, and Wood, Paper and Printing, that an increase of employment per unit of paid-up capital is strongly correlated with increased value added per unit value of machinery and equipment. In both groups a decrease in machinery and equipment per employee is also associated with an increase of value added per machinery and equipment. These two correlations suggest an increase of productivity with labour-intensive tendencies in SIC m Groups III and IV.

(iv) The inference of high production value per employee has already been discussed. Special attention is given here to the sectoral differences. It is now possible to single out SIC m Group III as having high positive correlations between production-labour ratio and production-capital ratio, production-

machinery ratio and employment coefficient (Figs 5.3.iii and 5.3.iv). This emphasises the difference within the group between well organised concerns such as Bata, and other smaller plastic shoe factories. As a result, productivity does not increase simultaneously, nor does the machinery coefficient.

5.4.3 Size Structure

A structural analysis of industry by size is essential on the regional basis as well as the Prime Base level. Evidently, there is a high concentration in the Prime Base of large-scale industries as defined above. However, our terms of reference are the mere identification of the differentials in performance as it varies with size-class and size-structure preference within the limited choice between Khartoum, Bahri and Omdurman. Size classes are decided upon by the number of employees both in the production line and management. Equally important parameters are paid-up capital, gross value added, production value and wages and salaries. Four size-classes are identified and specified on an inevitably arbitrary basis, though the stratification accords to the conceptual range of small to large. Thus 30-99 compose the first class, and in the middle lies class two and three with employment figures of between 100-299 and 300-499 respectively. Employment beyond that range is included in class four.

Now, considering all SIC m groups by size-class as depicted in Appendix 5.4, one can immediately identify the higher concentration of employment, gross value added and particularly paid-up capital in size-class four. More than two-fifths of all labour force, more than half the paid-up capital and nearly 45 per cent of value added are contributed by this size class. In terms of absolute number of firms, this class represents only 5.8

per cent of total industrial establishments. Conversely, size-class one features a disparity, with a high number of factories and low percent share on all five variables.

In an attempt to measure some of the industrial structure and summarise industrial performance within the framework of the size-class, the same coefficients as those in the matrix (Table 5.3), are manipulated and presented in Table 5.5 as ratios and coefficients derived from the various variables already specified. A special note should be made of the generality inherent in any results attainable. Firstly, because a braod spectrum has been examined; seven major industrial sectors are grouped together. In any size-class, a diversity of sub-group industries exist. Secondly, there are no optimal productivity values for size-classes, i.e., no specified output for any particular industry. In the light of the information obtained from the matrix (Table 5.3), and size-class analysis hitherto attempted, one hopes to further the analysis of the industrial structure through a size-structure examination.

Outstanding among all classes, size-class three performs on the extremes. Henceforth, it attains the highest production - capital ratio, the highest employment coefficient and conversely the lowest capital density. In fact, all of these ratios are within the bounds of the correlations in Table 5.3. The only clear exception is the high labour intensity which, unlike the general trend, corresponds to a low capital coefficient. Probably this tendency, together with the low capital density and high employment coefficient, indicates the labour-intensive predominance in this class. Equally important is the relatively small figure for labour productivity and is associated with a low man/hour production and lower wages. When examining industries of

Table 5.5

Industrial structure by size-class, using ten coefficients and ratios*

Size-class	A	B	C	D	E**	F	G	H**	I	J
30-99	0.47	2.1	0.59	901.6	1.1	422.0	1530.4	2.4	537.1	0.78
100-299	0.56	1.8	0.43	1015.8	0.98	566.7	2372.5	1.8	793.2	0.72
300-499	0.64	1.6	0.35	674.4	1.48	434.1	1906.7	2.3	598.4	0.72
500 +	0.42	2.4	0.95	1294.3	0.77	539.3	1369.5	1.9	941.5	0.57

* Letters refer to variables in Table 5.3

** Employee per LS'000 of capital

Source: Compiled from data in IDCAS, Industrial Survey, Sudan, 1969/70, Cairo, 1970. see Appendix 5.4

this class, almost all concerns employ labour 'intensively', specially at the production line and packing end of the process. Examples of these industries are soft drinks and beer, enamelware and leather and footwear.

The relative labour concentration in industries of size-class three, is paralleled by capital concentration in size-class four. Judging from the trend in Table 5.5, class four diverges only slightly from the general pattern. However, when it does, it distinctly reflects the disparity between input and production. The high capital investment per employee is producing low value added per unit of capital and at the same time labour productivity is comparatively low. Both indicators suggest under-capacity possibly as a result of operational problems. This situation is made more clear when comparing the better labour productivity and labour-intensity scores of size-class two. As a matter of fact, class two looks more like securing the best running. Here, one sees the combination of a high capital density, labour productivity and production - capital ratio. The very high production value per employee is worth noting, especially in connection with the low capital intensity.

Some of the characteristics above described, of the size-class three and four, have been taken up by size-class one, where for instance, labour-intensity is slightly higher than in class three, and the corresponding figure for capital coefficient is just on line with that of class four. It will be recalled that this is the same trend expressed by the highest positive correlation between these two variables (B and H) in Table 5.3. Labour productivity is the least for all classes, and so is 'machinery' coefficient and capital density. These should be analysed in a manner similar to that of class three, though with a less distinct labour-intensive

operations. To a certain extent the capital and ratios connected with it are high, while at the same time, machinery constitutes only a little proportion. This is evident from the ratio of value added per machinery and equipment and the production - capital ratio. The former is the highest amongst all classes and the other is slightly above the lowest figure.

5.5 Industrial Localization and Distribution within the Prime Base.

So far, analysis has been confined to the broader aspects of industrial activity in the Prime Base. Spatial distribution, quantification of disparities and similarities in the three towns are the main theme of this section.

5.5.1 Industrial Localization

The overall pattern of manufacturing industry in the conurbation, and the general impression of industrial activity measured by numbers employed, paid-up capital, gross value-added, production value, and wages and salaries is one of mal-distribution favouring Bahri, as will be seen from Table 5.6. Bahri's share on any one variable is at least more than two-thirds of the total for the Prime Base. Because of this, Bahri earned the title of the workshop of the conurbation. The strong preference for Bahri is a direct manifestation of conscious urban planning and functional zoning. Industries of the type developed during and after the Second World War had created the need to apportion some of the urban land to accommodate industry and storing facilities. An extensive land was a pre-requisite because of the bulky nature of the products stored and processed. There was also urgent need for extensive open-ditch dumping grounds specifically necessary for the industries of this period, e.g., vegetable oil pressing, soap making and beer

Table 5.6

Prime Base modal industry structure by five variables

(As percentages)

Variables	Bahri	Khartoum	Omdurman
Employment	67.02	23.93	9.04
Capital	80.38	15.13	4.49
Gross value added	73.43	20.75	5.94
Production value	75.15	18.35	6.50
Wages & salaries	73.16	20.03	6.81

Source: Compiled from data in IDCAS, Industrial Survey, Sudan,1969/1970, Cairo, 1970.

manufacturing. The fact that the raw material input and produce were both bulky confined choice to areas within the Prime Base well served by railway. At the time of considering where to locate the heavy industry area neither Omdurman nor Khartoum were eligible for that description; Omdurman was never served by railways, and Khartoum could not offer space within the vicinity of the railway. In fact, in the latter, the Old Deims were lining the railway and plans for new expansion were underway. Conversely, Bahri had much land to spare in the neighbourhood of the railway station and still far enough by that time judgement from population concentration. Bahri was indeed a well considered choice and in some respects resembled industrial move to suburbs in industrialised countries. However, one further point merits note; as data understudy discards factories employing less than 30 workers, there must be an intrinsic bias to Bahri which by definition caters for larger industries. This is even more salient when considering other variables such as paid-up capital, wages and salaries, gross value added and production value (Table 5.6).

5.5.2 Coefficient of Geographical Association (Cg) and Location Quotient Analysis (L.Q.)

It is necessary to dwell, for a moment, on the formulation and validity of the two localization indices we are about to implement:

1. The coefficient of Geographical Association is a simple numerical device whereby one can examine the degree of concentration of any industry or industrial group and compare its percentage distribution by area with other similar industries or groupings. This is normally calculated on number of employment. Besides

employment, one attempts to use other variables such as capital, value added etc. The formal expression is a modified version of P. Sargant Florence's coefficient of localization as forwarded by D.M. Smith.(13)

$$Cg = \frac{1}{2} \sum_{i=1}^{n} \left| \frac{100Xi}{Xt} - \frac{100Yi}{Yt} \right|$$

where Xi = variable value for a given industry X in the ith area subdivision.

Xt = total regional 'variable value' of industry.

Yi = 'variable value' in all industry in area i.

Yt = total regional 'variable value' in all industry

"... the vertical brackets indicate the modulus or absolute value of the expression within, i.e. the differences irrespective of sign".(14) Another available measurement is the location quotient which describes the relative concentration of a particular industry in a region as compared with other industries. It is calculated by comparing a region's share of an industry percent, whether by employment, capital, value added, etc., with that region's total industry average percent. If, for example, the share of Omdurman is 30 per cent of the capital for food, drink and tobacco, and 60 per cent for the overall industrial activity, the location quotient for that group of industry would be the outcome of dividing the first percentage by the second, i.e. 0.5 L.Q. One may conclude accordingly that Omdurman's share in this group is less than proportionate, whereas a figure more than unity would mean a share more than the expected proportion.

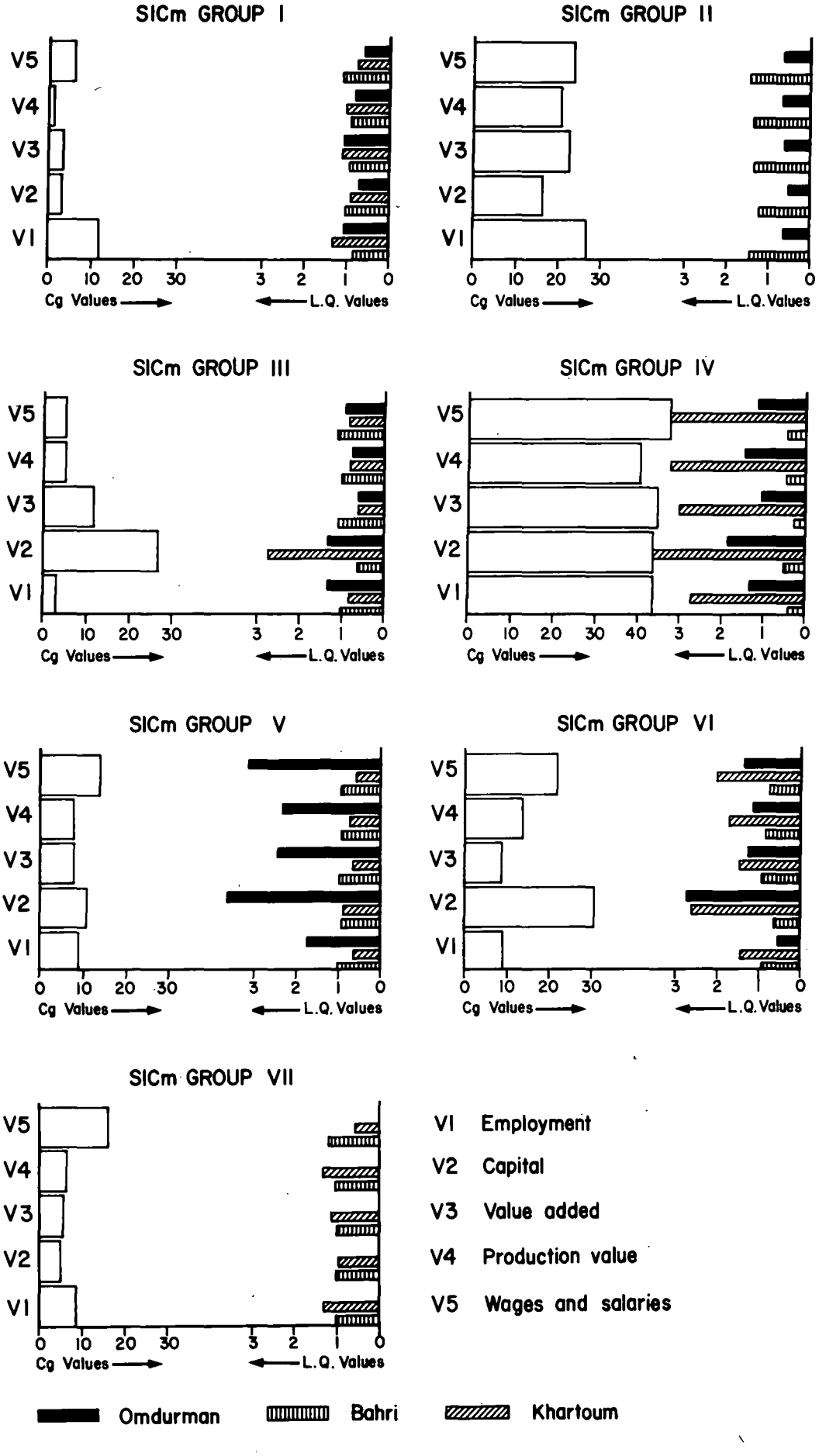
These two indices are applied concurrently, rather than separately, to enable portraying a more meaningful picture as in

Fig. 5.4 . One can easily spot which industrial group is more localized, and read corresponding L.Q. values that points to where that concentration occurs. The picture is perhaps even more interesting when considering five different variables and their variation within one group and all groups of industry. The starting point, when analysing these values should, however, be the full awareness of the underlying shape of 'platform' on which the index is moulded, i.e. keeping always in mind that the average percentage values for each region are being used as base-lines (Table 5.6). What we are in fact detecting by these indices is the degree of oscillation from an already existing line or 'platform'. So if that line is originally biased to one or a few urban places as might be the case with industries in developing countries, the figure for localization could sometimes be misleading if not used with caution. K.M. Barbour, for example, was surprised, using the coefficient of localization, to see that in Egypt, "...Group I [food, drink, tobacco] is least like the national pattern, although its products are consumed by all.."(15) and seemed puzzled by the figure for the coefficient of localization of that group, which expresses a concentration of a regionally dispersed industry. To resolve this seemingly paradoxical situation one should think of the overall pattern, which in the case of Egypt was one of a general industrial localization in few urban places. Any deviation from this line or 'platform' as happened with Barbour's Group I, would inflate the deviations from the base-line and consequently lead to a localization figure rather than an expected one of dispersion.

5.5.3 Industrial Distribution and Pattern

In the preceding two subsections, the lop-sidedness of the industrial distribution within the Prime Base has been attended to

Fig.5·4 COEFFICIENT OF GEOGRAPHICAL ASSOCIATION (Cg) AND LOCATION QUOTIENT ANALYSIS (L.Q.) FOR ALL SICm GROUPS: 1969-70, ON FIVE VARIABLES - FOR THE PRIME BASE.



in a more general way. Some measuring devices have also been verified against their theoretical validity. Under the present heading, the distribution of industry and the underlying reasons for difference is analysed. The distribution is graphed to offer a visual impression, a summary and contrast of the seven industrial SIC m groups and on five different variables, (Fig. 5.4):

1. Food, Drink and Tobacco (SIC m Group I):

The first thing one notices is the high degree of accordance of Food, Drink and Tobacco (SIC m Group I) with the general trend of industrial distribution, that lies roughly around a standard line represented by values of 67.02 per cent for Bahri, 23.93 per cent for Khartoum and 9.04 for Omdurman, (see Table 5.6). Any oscillation from that general trend as that of employment, may be picked up and analysed by values of the location quotient as in (Fig. 5.4.i). Thus employment in industry Group I is slightly more localized because Bahri's share of employment in this group is less than the overall optimum percentage. At the same time Khartoum is having more than its standard share. Khartoum industries in this group are dominated by mineral water sub-group (more than 50 per cent of labour of the group), and confectionaries, of the type established after World War Two, and before Independence (1956). These industries tend to be labour-intensive in the sense that it requires more hands on the 'assembly' line and packing stages. The machines are comparatively less sophisticated considering that they were installed before 1956.

Another disparity to be noticed is the slipping share of Khartoum's capital outlay as opposed to the employment and as indicated by location quotient of 0.88. Considering again, the time element, it is more likely that the value of paid-up capital

s actually far more than suggested by present-day valuation. In the absence of any proper price index valuation, the whole capital calculations are inclined to be less accurate; a discrepancy intrinsic in the basic industrial survey data. The production - capital ratio also tends to be proportionately high in this industry at Khartoum because of above, in addition to the stability of production acquired through time, e.g. managerial expertise, protection from foreign competition, financial backing of bankers, well-defined marketing channels etc. Within the narrow margins of variations in this SIC m group, the slight excess of wages and salaries at Bahri is indicative of the level of skills and management involved. This may not always hold true, as it has been reported that inflated salaries were paid for employees prior to confiscation and nationalisation in 1970:

> The committee has noticed the extravagant nature of wages, salaries and gratuities paid to the employees of these companies (referring to industrial firms), and believes that these companies resorted to such practices as over-payment to lower their taxable profits. (16)

2. Textiles and Ginning (SIC m Group II):

Khartoum industrial area is devoid of any textile mills within the size range under consideration. By the time non-industrialisation policies were revised and adverse sanctions were lifted, the Khartoum light industrial area was already crammed, and conversely, a spacious suitable urban industrial zone had opened at Bahri for such industrial undertakings as the two largest textile mills of the country, the Sudanese Textiles Industries Ltd., and the Khartoum Spinning and Weaving Company Ltd. Both factories were established in the 1960's and the obvious location within the tripartite capital was in the 'heavy industrial area' at Bahri. They tipped the balance on all variables in favour of that locale.

Although the figures for the coefficient of localization shows concentration on all five variables, still these coefficients seem far less than is suggested by the very high percentages. It must be remembered that our comparison is with the overall trend for all three urban places. Bahri's degree of participation is also reflected by the location quotient figure of more than unity attained on each variable. The same index gives a figure of around 0.6 for Omdurman textiles on all variables. This industry is just filling a tiny proportion of the town's industry, although Omdurman was, and still is, the country's leading wholesale market for grey sheeting and the traditional producer of native clothes. Omdurman's textile industry has not grown large enough to absorb the traditional skills already existing, particularly in the native production of toub, the national women's costume, and tailoring.

3. Leather and Footwear (SIC m Group III):

Distribution of leather and footwear would seem to oscillate sharply according to the variable dealt with. If capital and value-added were considered then the verdict is one of industrial concentration for this industry group. With the other three variables, a clear pattern may be observed. The identified localization of capital is primarily the result of a deviation from the expected trend in both Khartoum and Bahri. Although the overall average capital share of Khartoum runs at 15.13 per cent, her proportion for this industry is maintained at 41.4 per cent. Similarly, Bahri's capital share is far below her average of 80.38 per cent. Judging from adjacent values of location quotient (in Fig. 5.4), Khartoum's high location quotient of 2.74 clearly points to the general localization of leather and footwear. In fact, the Khartoum Government Tannery, with a paid-up capital of LS. 897.300,

has largely contributed to these imbalances. The localization of capital at Khartoum has not been paralleled by a correspondingly high value added, because the same establishment is producing little value added and reducing the Khartoum location quotient values to 0.56. This disparity suggests that the tannery is experiencing some difficulties. Raw material procurement and technical and managerial problems are believed to be the foremost reasons.(17) Comparing labour productivity of the tannery standing at LS.412 per employee, with LS.1100 per employee for the Sudan leading footwear producer, Bata at Bahri, one can only confirm what has already been figured out. At the same time, the very high labour productivity in Bata is solely responsible for the industry localization shown by the index for value added in (SIC m Group III). This last industrial concern is one of the largest modern factories in Sudan - nationalised 1970), well-organised on managerial level and has benefited from international experience which avails itself for regional branches all over the world. Probably such cooperation is still maintained. Other reasons that might have helped are the effective protection from foreign competition by limiting imports to an annual quota, the partial satisfaction of raw material from the local nearby Khartoum Tannery, and the ever expanding market; beside the special attention given to training both on-the-job and in Bata's specialised training centre at Bahri.

Omdurman has no doubt got many advantages for a leather and footwear industry. The most obvious are the traditional experience in both tanning and shoe-making, the traditional market for hides and skins and the major raw material catchment pool, especially after the installation of the largest modern abattoir. Omdurman, however, has failed to draw large concerns, partly because of the

intrinsic 'light industrial area' limitation and partly because of the lack of sewerage facilities. Availability of sewerage, an obvious necessity for such a noxious industry, existed only at Khartoum and that was reason enough to locate here, albeit some distance from the light industrial area. The advantages of Omdurman recorded earlier on, have had their imprints on this industrial group as reflected on our graph by significant location quotients for employment and capital (see Fig. 5.4 , graph iii).

4. Wood, Paper and Printing (SIC m Group IV):

Certainly, the most clearly identified localization of industry in the Prime Base is Wood, Paper and Printing (SIC m Group IV, see Fig. 5.4 , graph iv). As an immediate expression of this localization the values of Bahri swing drastically below its overall industry pattern and conversely, Khartoum's score shoots high beyond its normal industrial participation. To a lesser degree, Omdurman experiences a similar trend to that of Khartoum.

The whole difference in Wood, Paper and Printing (SIC m Group IV) is probably attributable to the concentration of printing and publishing houses at Khartoum. This sub-group is legitimately a 'big-city' activity. Throughout this century, Khartoum has always been the focus of commerce and business and residence of foreign trade agencies and the seat of all central government departments. In that respect alone, the capital had to cater for both public and private printing and publishing needs. For quite a time, Bahri and Omdurman were devoid of the need for such a specialised industry. When the two latter cities caught up with demands, printing and publishing was well entrenched in Khartoum and factors of geographical association were creating more and more concentration. Interestingly, these printing and publishing

houses were first located on the then outer rims of the city core (CBD), and still maintain that position, although the physical market area has expanded to engulf their old premises. Outstanding among the printing and publishing sub-group is the Government Printing Press, engaging nearly a thousand employees, i.e., two-thirds of all printing labour force in Khartoum, and more than one-third of the capital outlay. All five variables maintain a high and even line of localization extending beyond the 40 coefficient of localization limit. Wages and salaries are slightly more localized, and this is probably due to the concentration of relatively well paid skilled labour necessary to the printing trade.

Omdurman is well represented in this SIC m Group IV and is well known for its quality wooden furniture and traditions. Kabbashi and Issa furniture workshops, supply a large proportion of the tri-partite capital's ever increasing demand, and together they employ about 65 per cent of total capital outlay in this group. Incidentally, capital in this same group, as measured by the location quotient figure of 1.8 for Omdurman, is more localized than all other variables.

Of all industries, SIC m Group IV is the least represented in Bahri as shown by the small values of location quotient. On all five variables the location quotient score is less than 0.5. This under-representation is, in part, responsible for the high values of the coefficient of geographical association as was noticed above.

5. Chemicals and Allied Industries (SIC m Group V):

For convenience of classification, the greater portion of the chemical industry includes a diversity of concerns whose production

ranges from pharmaceutical goods and plastics to perfumes, soap, laundry blue, and paints. Omdurman seems to emerge as rather important in this SIC m order. The proportional share of this group as compared with other Omdurman industrial activity, reflect how important to Omdurman this group is. The result is a high location quotient of more than 3.5 on capital and more than 3 on wages and salaries. The latter quotient is probably more than one would expect. This is probably explained however, by the high number of expatriate workers in the perfumery industry. Employment figures are comparatively low and that is because the overall structure of industry in Omdurman is labour-intensive.

It must be noted that Omdurman's chemical and allied industry is mainly confined to common soap production, laundry blue, and perfumes. The acquaintance of Omdurman wholesalers and importers with the traditional market, its taste and volume, has tempted many such entrepreneurs to enter this field of very limited margins of risk. The capital city with very little share on this industry, had never been able to compete with Omdurman for common soap and perfumes since the early days of this industry. Khartoum merchants have not cared for a trade whose market was very well-defined and in effect monopolized. By the time large concerns interested themselves in the same or similar lines, Khartoum industrial area was clearly unsuitable and repulsive. The spacious and lucrative Bahri industrial area suits all purposes.

Meanwhile, the chemical and allied industry is slightly underrepresented in Bahri on all but the employment variable. Soap manufacturing, a labour-intensive industry, is probably mainly responsible for balancing employment location quotient values. Otherwise, the pharmaceutical branch is still nascent, and either deals with packing imported medicine or producing simple drugs,

the inputs of which are also imported. The same applies to paints.

Now it becomes clear that the high concentration depicted for Omdurman has ensured a detectable degree of localization, especially on wages and salaries (see Fig. 5.4, graph v).

6. Metals and Electrical Industries (SIC m Group VI):

It may be noted that a relationship does exist in this group between the pattern of distribution within the tri-partite capital and the functional sub-grouping. In respect, three categories may be taken into account:

a. Transport equipment, maintenance and repair works and irrigation constructional works. In both cases, engineering was directly geared to the export economy. Such activities were naturally some of the oldest industrial undertakings connected with Khartoum and Omdurman light industrial areas.

b. Electrical appliances such as refrigerators, air conditioning and air cooling units, and electric batteries: These industries may be referred to as import-substitute assemblies. The assemblage industries concept is new in the country and directly or indirectly involves foreign companies. The most likely location is Bahri.

c. Enamel and Hollow-ware and metal furniture. This is a well distributed sub-group and reflects in some ways the universal change of taste and an inclination to use even more of these items instead of wooden furniture for example. The factories of this sub-group are fairly well distributed within the three towns.

The general magnitude of industrial distribution in this group, as detected by the coefficient of localization, features a relatively heavy concentration of capital produced concurrently, this time in both Khartoum and Omdurman, (see Fig. 5.4, graph vi). On the other hand, paid-up capital for the electric appliances assembly at Bahri has proved to be below the general trend of capital outlay in the town. Marked localizations could also be seen for wages and salaries and production value. In each case a corresponding location quotient consolidates the pattern already noticed. The near normal employment distribution is indifferent to wages and salaries values; a disparity that reveals the character of a well developed employment structure, whereby, better pay is always expected.

7. Cement, Tiles, Glass, etc., (SIC m Group VII):

To complete this analysis by industry group, we now turn our attention to cement, tiles, glass, etc., a group well under-represented in the tri-partite capital for various reasons. Cement is conclusively a raw material-based industry and its absence in the Prime Base is understandable. Bricks, a very essential building material for the fast growing conurbation, are still produced by simple traditional techniques in the vicinity of Greater Khartoum. Thirdly, tiles are generally produced on a small scale, where a score of employees, below our chosen workers limit, could most likely more profitably cover the market. Omdurman is void of any such industry with over 30 workers. Whereas Khartoum is represented by Bittar's Cement and Mosaic Floor Tiles factory and Bahri with the Sudanese Glass Company. Incidentally, a disproportionate localization of wages and salaries is quite evident. Clearly, the latter factory is employing skilled labourers and

still paying more for workers who are subjected to the open furnace blaze.

5.6 Conclusion

The Prime Base is the nerve-centre of the country's industrial enterprise. The particular significance of the Prime Base is the well-developed sectoral structure. All industrial groups are represented within the full range of the demarcated size-class. This is a clear indication of the wide extent of the market served, which is by no means confined to non-basic industries. Of the major industrial sectors, agro-industries are dominant, with a share of more than four-fifths on variables such as paid-up capital and employment. Industrial concentration of this description must suggest a nascent stage of industrialisation and probably a belated start. More significantly, the localization of a diversified agro-industry suggests procurement of raw materials, often with a high material index, from regional material sources. The validity of the least-cost theory is accordingly challenged.

Although the wide data grouping of industrial orders is an obvious shortcoming, it has nonetheless been possible to identify the variations in performance and indicate where they actually occurred. An example is the high labour productivity in SIC m Group VI attributed to the assembly of semi-finished parts of the metal and electric industries. Similar trends in the food industry group is mainly a result of sound performance in the well-established vegetable-oil mills which compete for national and international markets. Likewise, the size-class structure shows some disparities between different scales of operation, and it is possible to single out the middle size-classes (100-299) and (300-499) as relatively

more efficient. This feature is not uncommon in some developing countries where low costs of production factors coincide with fairly developed internal markets and competitive prices at neighbouring territories.

The overall capital performance is weak, pointing, among other things, to redundant capacities. The locational implication of this tendency is important since entrepreneurs would normally tend to minimise risk by locating at the Prime Base which offers the best available services and well developed distribution channels. The chances of inadequate use of capacity are even higher in regional areas in the absence of specialised services. Equally important is the business/industry mentality which seeks to acquire extensive industrial land at basic prices. In the Prime Base, land is a valuable asset which could provide security in case of failure of industrial ventures. Moreover, industrial land functions as a security at the Prime Base's banks, and sometimes remunerative if partially rented.(18) The external characteristics of a new urban industrial area were largely determined by the specific requirements of the individual industries developed during the late 1940's. Thus matters such as provision for disposal of effluent, storage capacity and scope for future expansion were essential attributes. Bahri satisfied these requirements, and in the process particularly high concentration of industry developed attesting that Bahri is probably the real heart of Sudan's industry. Nevertheless, localization of some industries by virtue of narrow specialisation does occur elsewhere than Bahri. Printing and publishing is a case in point. On the other hand, Omdurman's industry is seen to be far less significant than it ought to be. The data bias inherent in considering factories of thirty-plus workers appears to deprive Omdurman of its importance as a centre for

small industrial units. The fact that relatively high industrial investment occurred in a short span of time must give the Prime Base a high industrial growth rate compared to general industrial investment in the country. This in many ways emphasises the growth potential of the Prime Base. Lastly, the quantitative measures adopted are not in any way ideal. Indeed, the limitations of localization coefficients and location quotient are cited in many texts, the major discrepancies being the variation of results with classification of industrial orders and in areal divisions.(19) Nonetheless, the harmful effects are reduced by creating base lines to gauge actual oscillations and by recognition of shortcomings.

CHAPTER FIVE REFERENCES

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CHAPTER SIX

INDUSTRIAL LOCATION PATTERN AND DISTRIBUTION

6.1 Introduction

The inquiry in this chapter focusses on industrial distribution and structure in the country as a whole. The evidence presented thus far suggests considerable localization of Sudan's industries in the Prime Base. But despite this, the fact still remains that where industry occurs outside the Prime Base it has local significance as well as strategic importance.

One is encouraged by availability of data to consider again multiple variables on value rather than volumetric basis. The same industrial code and threshold of 30 and above workers adopted in Chapter Five are maintained here (see Appendix 6.1).

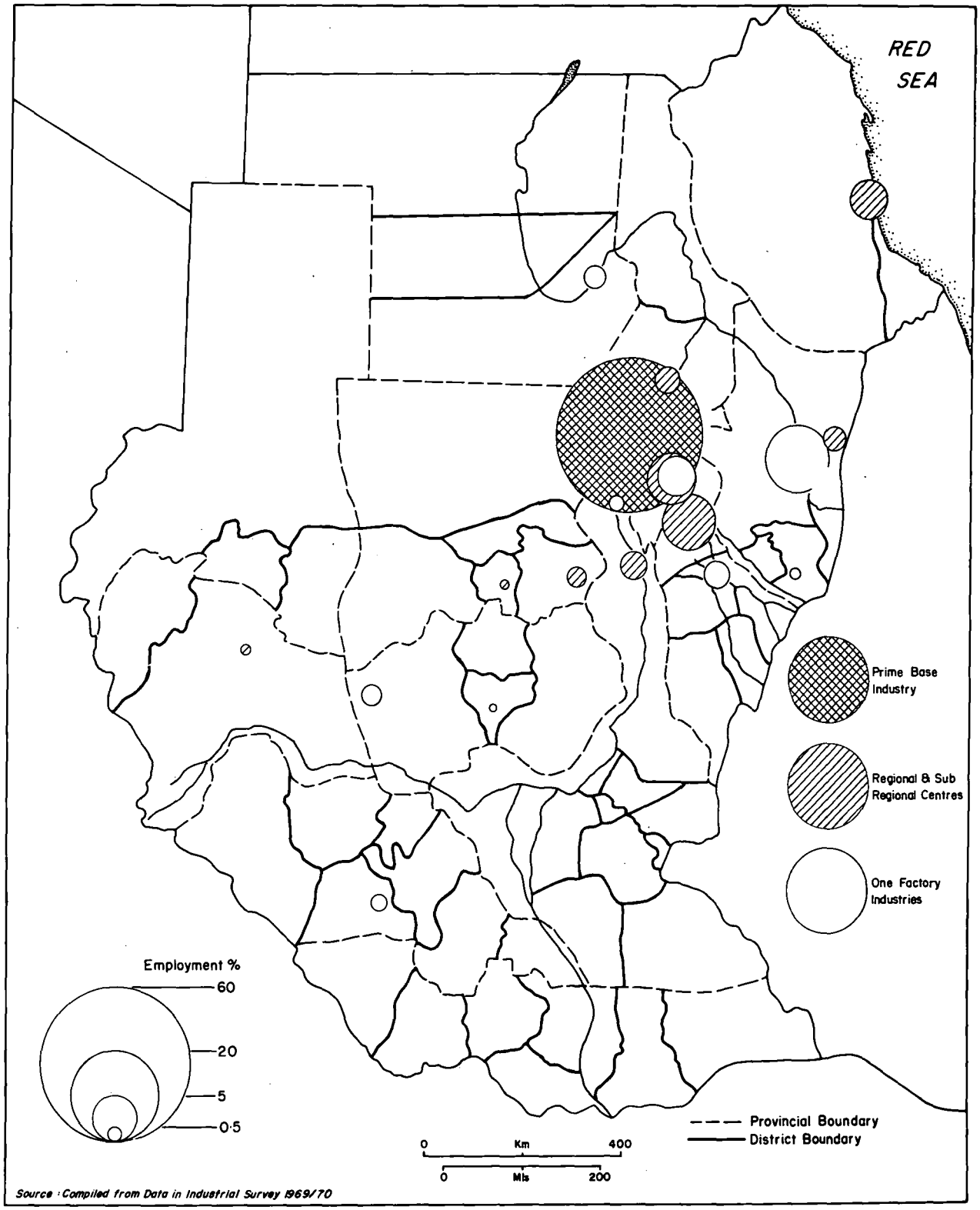
6.2 Industrial Location Pattern

The geographic pattern of industry is expressed by the differing degrees of dispersion or localization extending both spatially and through time. In the space dimension attention has already been given to industrial localization in the Prime Base. What remains to be seen is how such concentration affects the locational patterns of the vast surrounding territory. Two distinct patterns of industrial growth emerge away from the conurbation. Firstly, the industry in the regional centres, and secondly, the patchy one-factory industries associated with the agricultural base of the rural areas (see Fig. 6.1).

6.2.1 Regional-Centre Industry

Arriving now at a consideration of the industries that dot the

Fig.6·1 INDUSTRIAL EMPLOYMENT AND PATTERNS



Source : Compiled from Data in Industrial Survey 1969/70

regional towns and sub-towns, it is pertinent to recapitulate the mechanism operating on the Prime Base. The underlying colonial model of administrative nodes, trade and non-industrialization commitment has much influence on the creation of regional centres. Some of the apparent patterns are directly connected with the artificial smoothing of space friction, and the creation of efficient distribution and collection channels through the hierarchy of the regional centres. At the same time movement has been severely distorted by the ingenious device of 'profit on cost to store' and basing point whereby the Prime Base became a profit maximization location and the commodity prices increase according to distance from Khartoum depots. When industry was promoted later on, this proved to be a deterrent to industry outside the conurbation as much as an encouragement to industrial localization in the Prime Base (See chapter 4).

Previous analysis suggests that the two-way flow of trade had to create secondary bases with some services and functions necessary for any future industry in the regional centres. It could further be argued that processing as it stands in regional centres is predominantly basic-industry, serving the country-wide market. However, low-order industries such as bakeries, brick-making etc., are developing fast and non-basic market elements could be seen as in the case of Medani; though these elements are as yet a long way from being strongly felt. In this respect the diversion from the economic-base theory is notable since the structure or pattern of industry is not inferential from the population size of a town or sub-town. The non-industrialisation commitment applied equally to all places.

Evidently, the subsequent sparse disorderly growth of regional-centre industry rests on two basic criteria. First, the regional-

centre has to be a supplier of the main operational inputs if manufacturing industry is to locate there. The best example is Umm Ruwaba oil seed mills, which cluster around a production centre of ground nuts and sesame. Second, industrial budding away from the conurbation could only be feasible if the mechanism that favours the Prime Base is profitably neutralised. Ex-factory price at a lorry-assembly concern, for example, will be far less at Port Sudan than in any other location, other things being equal. The mechanism of profit on cost to store will be checked since a lorry could transport 'itself', and more than compensate the expense of movement to inland destinations by the shipment of a consignment from the ever congested port.

Another obvious choice of location is the petroleum refinery at Port Sudan as the obvious water front break-of-bulk site. The construction of extra depots for crude oil at an inland terminal and the transport of the bulky machinery are unnecessary costs than can simply be avoided by locating at the port. Diseconomies in the case of an inland refinery are also related to loading, unloading and re-loading of oil, since reverse-hauling of refined petroleum to the eastern region and re-exporting of products that either need further 'cracking' or manufacturing are unavoidable. But more important is the fact that the local products of the refinery were exceptionally treated as though they were imported goods to benefit from the 'profit on cost to store' concession. An important incentive to locate at the conurbation was simply nullified. It is amusing however, to notice how the 'profit on cost to store' applies to the petroleum products. Over and above all other processing costs, a ten per cent profit on transportation cost per metric ton is added to the total cost.(1) It is this sort of inexplicable decision in

'developing' countries that sometimes invalidates locational factors.

6.2.2 One-Factory Industries

Direct state control over the spatial decision is a principal factor in the creation of a distinct pattern of industries outside the Prime Base. The degree and nature of government involvement in public manufacturing enterprise changed with the attitude of alternating governments. There is ample evidence to suggest that the party government that succeeded the condominium rule had practically excluded the possibility of the participation of the public sector in industry. In the annual budget of 1957/58 only Ls. 37,000 were allocated to mining and industry.(2)

The views of the military government that took over in 1958 were quite different. An earnest quest was made for industrial financiers regardless of their political affiliation. Whatever was forthcoming was to form the first nucleus of the public manufacturing enterprise sector.

A new mode of industrial planning and development in the public industrial enterprise was prominent in the Ten Year Plan of Economic and Social Development, 1961/62 - 1970/71. The task was to strike a balance between many opposing aspects. In the forefront was the move to bring together the operations of both public and private sectors under the same system. Unlike the charter government, the new public sector broadened its field of activity to include industry, and took full responsibility of direct management. Long-term loans from the Soviet block were negotiated alongside bankers credit from West Germany.(3)

In essence however, this realm of development was particularly

a restoration of the short-lived liberal colonial thinking that coloured post Second World War. In addition, the military régime blended the laissez-faire doctrine with the essence of the central planning growth model. Yet the underlying colonial system of economic transactions and economic institutions was still in operation.

The central theme of the new departure was the urge to score instant identifiable progress within a short span of time. Admittedly there was a severe lack of information on the country's resources and potentialities. But this was not an insuperable task to a military government:

> This should not however, mean that we should wait until such data is available.... but should mean that economic planning should pay reasonable attention to research and exploration as well as the use of all known resources and potentialities and their full development. (4)

What was reckoned to be known resources and potentialities constituted an important factor in the choice of industries, and the location decisions, and indeed the pattern that eventually emerged.

Hence the numerous projects and proposals that were collecting in the Board of Economics and Trade, a colonial economic intelligence agency, were exhumed, dusted and used selectively. Considerable attention was given to industries whose raw materials were assumed to be bountiful in the natural environment. No further capital outlay for irrigation, land or research is needed, and no time should be wasted! Consequently the gestation period could thus be held to the bare minimum in localities that offer the lowest initial cost of operation. The rationale of optimum location was even less convincing to the private investor whose worries were attached to maximization of profit. As we will see in Chapter 7, the unit cost of production is not always paramount. The argument that the

social-cost-benefit in public industrial enterprise could be more significant than absolute monetary profits is rather controversial, and admittedly difficult to gauge. However, on the evidence from the new measures of the public sector participation, it is possible to see that the one-factory industries tend to locate according to the broad regions of south, west, centre, east and north. Nonetheless it is difficult to say that this 'regionalisation' of industry complies with a plan to create growth centres in secondary bases in the rural areas.

6.3 Industrial Distribution : Regional imbalance

The distribution of industries in Sudan illustrates the striking regional imbalance between core and periphery. Focussing initially on the Prime Base industries should not obscure the significance attached to regional industrial occurrence. The apparent lack of strong cohesion between the patchy regional industries makes it even more necessary to examine the diversity of locational factors as expressed by this dispersion. At a closer look there is even less concentration of industries in the Prime Base than is normally assumed. The often quoted concentration figure of more than 72 per cent for either employment or value added is evidently a product of gross imprecision.(5) How this miscalculation is manifested in the Industrial Survey is explained by the invalid comparison between regions and core industries. Where size-class 30-99 employees is incorporated in the percentages for the Prime Base, this size-class is admittedly excluded from the totals for the rest of the country. Adding to this inaccuracy is the exclusion of a significant regional industrial sub-sector, that is cotton ginning, even though many ginneries are employing above the 100 employees limit.

Needless to say, a perfect figure of the centre-periphery ratio is never attainable. A complete industrial survey is basic for this goal. However, within the bounds of available data, the use of a uniform set suggests a marked difference from the already established proportion of ratios of industry in the Prime Base. Correct figures are possible to arrive at by including the results of the survey convened by the Statistics Department in 1970 for regional areas.(6) Our manipulations cover 90 per cent of the country's manufacturing industry.

In contrast to the 72.6 per cent concentration figure for employment in the Prime Base, one gets a corresponding figure for employment concentration of 51.3 per cent. If four-fifths of the uncatered for ten per cent employment of under thirty factories is located in the Prime Base (this ratio is based on information on 'operating factories' prepared in 1970 by the Ministry of Industry & Mining), the total percentage for the conurbation will be 59.3.(7) Using the same procedure a figure of 56.6 is computed for value added instead of the 77.1 concentration given in the Industrial Survey.(8) Adding a third variable, paid-up capital, will progressively lower the impression of the Prime Base's industrial prominence. It is interesting to note that the Prime Base's share of paid-up capital for industries employing 30 and more is only 40 per cent. If one assumes that the factories with under 30 workers engage 20 per cent of the paid-up capital and again assume four-fifths of that to be in the Prime Base, the overall share of the Prime Base would still fall short of 50 per cent.

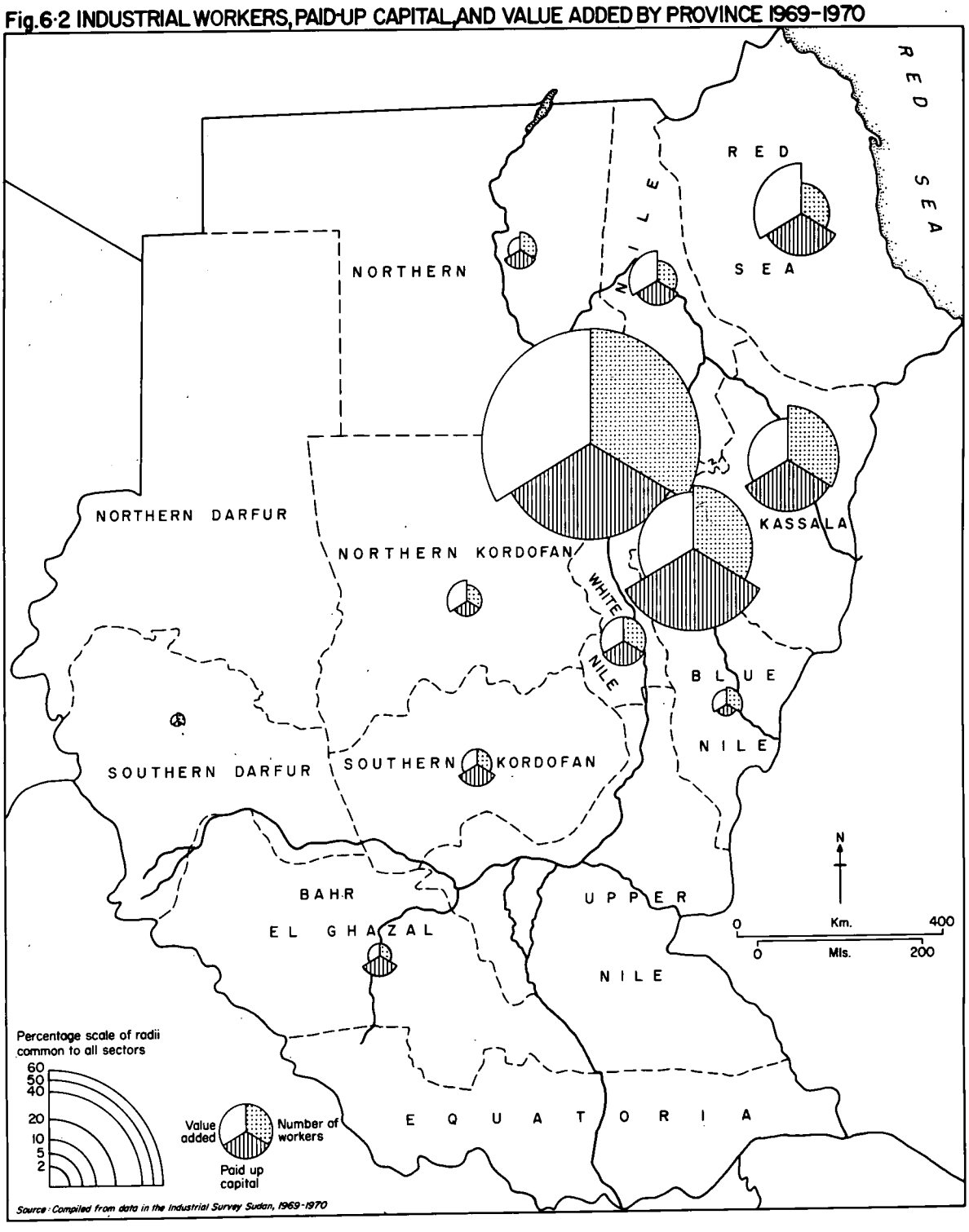
A useful and rarely-used method of portraying multi-variants in distributional studies is conveniently made possible by a Mercedes device developed by K.M. Barbour.(9) It is now easy to get

an immediate impression of the built-in regional differences on the compound mapping of employment values, paid-up capital and value-added. The picture which emerges in the distribution map (Fig. 6.2), asserts the presence of industry in one form or another in almost all Sudan's provinces.

However, the significance of industry to a region or a province varies with the underlying economic structure, the stage of the region's development and a myriad of other constraints. The prolonged isolation and political unrest in the southern region for instance, proved to be a deterrent to any sort of serious development. The saw-milling, a speciality in this forested region, had to be heavily guarded to operate at near prohibitive costs. Similarly, the Nzara Spinning and Weaving factory, established in 1951, encountered serious problems for the lack of security for cotton growers. For some time cotton was trans-shipped from the Nuba Mountains some 960 Km from Nzara.

Against many odds however, the military government of 1958-64 had chosen Wau, the provincial capital of Baher-el-Ghazal, for the location of one of the Russian supplied fruit canning factories. Raw material was thought to be plentiful though this proved an ill-conceived assumption. Consequently, the factory encounters grave problems. This factory largely resembles the one-factory industries category and is a good example of the high capital outlay per employee. Another feature associated with this form of investment is the low value-added per unit of paid-up capital. Both the relatively high capital density and low production-capital ratio are features repeated in almost all the one-factory industries throughout the country (see Fig. 6.2). The reasons are indiscriminately related to basic raw materials shortage, and managerial inefficiency. This applies to many of the public sector's industries. Within this

Fig.6·2 INDUSTRIAL WORKERS, PAID-UP CAPITAL, AND VALUE ADDED BY PROVINCE 1969-1970



sector, however, Khashm-al-Girba sugar factory stands as the exception. This factory sets the record of maximum-capacity production.(10) For this consideration the relative low production-capital ratio reflected in (Fig. 6.2) is particularly unexpected. The disparity is explained by the high production factors which minimise the margins of profit. Further, the factory is deprived of higher profits by the unrealistically low prices because of the government's monopoly practices over sugar trade. Another feature to be noticed is the high employment in this factory. Most likely the sugar plantation workers were erroneously included in the total industrial employment.

The only firm in the one-factory industries group with a value-added percentage in excess of that for capital is a ginnery in the Blue Nile Province. In fact this is a common feature of all but two of the ginneries. The labour-intensive nature of this well established primary processing industry plus a tendency to operate round about full capacity are all factors increasing the chances of higher value-added. By contrast, the two ginneries with low value-added are both 'capital intensive'. Moreover, the precarious nature of production factors in a flush irrigation area and a marginal rain-fed land are bound to render the availability of raw cotton a matter of chance for these two ginneries, and frequently gives rise to undercapacity running.

In the process of summing-up total scores of industries to form an overall distributional picture, the strong character of one-factory industries becomes apparent in some provinces. Indeed the main drawback of the Mercedes map is the averaging process (inherent in the totals) that gives a somewhat crude picture. A strong indication of this is shown in Fig. 6.2 by the total per-

centage of the Gezira Province and again reflected in the triple-variable ratios within the province. Immediately the inflated slice of paid-up capital is detected. The major contributor to this picture is the Guneid Sugar Factory. Operating along two extremes, the factory has the highest paid-up capital outlay in the country and indeed the lowest value-added on record. Both features are well exemplified in the Mercedes map for the Gezira Province. Among the many factors contributing to the problems of the Guneid factory is the tenancy system that commands a flat rate payment per feddan (1.04 acres).(11) It is interesting to note that the sugar plantation was super-imposed on the already existing cotton scheme and inherited many of the land tenure and production systems.(12) Mismanagement is also frequently cited as one of the adverse factors.(13)

Turning now to the regional-centre industry where one-factory industries do not exist, a conspicuous feature in contrast to the one-factory industries is that the aggregate production-capital ratio is always above the unity figure. Almost all factories in this category are privately owned and are chiefly dealing with simple processing where large profits are the main incentive for the private venture. This could be seen in Southern Darfur and Northern Kordofan Provinces. The Gezira and White Nile Provinces might have been included in this group as well, if not for the adverse effect of the one-factory industries. As a general rule, there is a tendency for the regional-centre industries to be 'labour-intensive', a matter closely related to the nature of the simple manufacturing processes and cheap labour. Low processing costs coupled with labour-intensive tendencies contribute to an increased value-added. This does not mean that 'capital-intensive' operations automatically produce low value-added. On the contrary,

where capital-intensive operations are run on an efficient basis high value-added could also be expected. As a matter of fact two capital-intensive undertakings in the Red Sea Province and the Nile Province produce a completely different Mercedes map. Besides the higher production-capital ratio, capital per employee is also high. This pattern too, could be taken as indicative of efficiency and higher utilisation of available capacities.

A magnified version of the regional-centre industry is quite clearly projected by comparing the relative significance of the three variables for the Prime Base. The underlying similarity of the combinations of variables broadly reflects the industrial characteristics and the driving forces behind private sector's industries both in the core and periphery. It bears repeating, however, that in a large population of diversified factories as in the case of the Prime Base, a situation appears to exist where low employment in some factories is compensated for by high employment in others and likewise high value-added in some factories is eroded by low value-added in others.

6.4 Industrial Localization

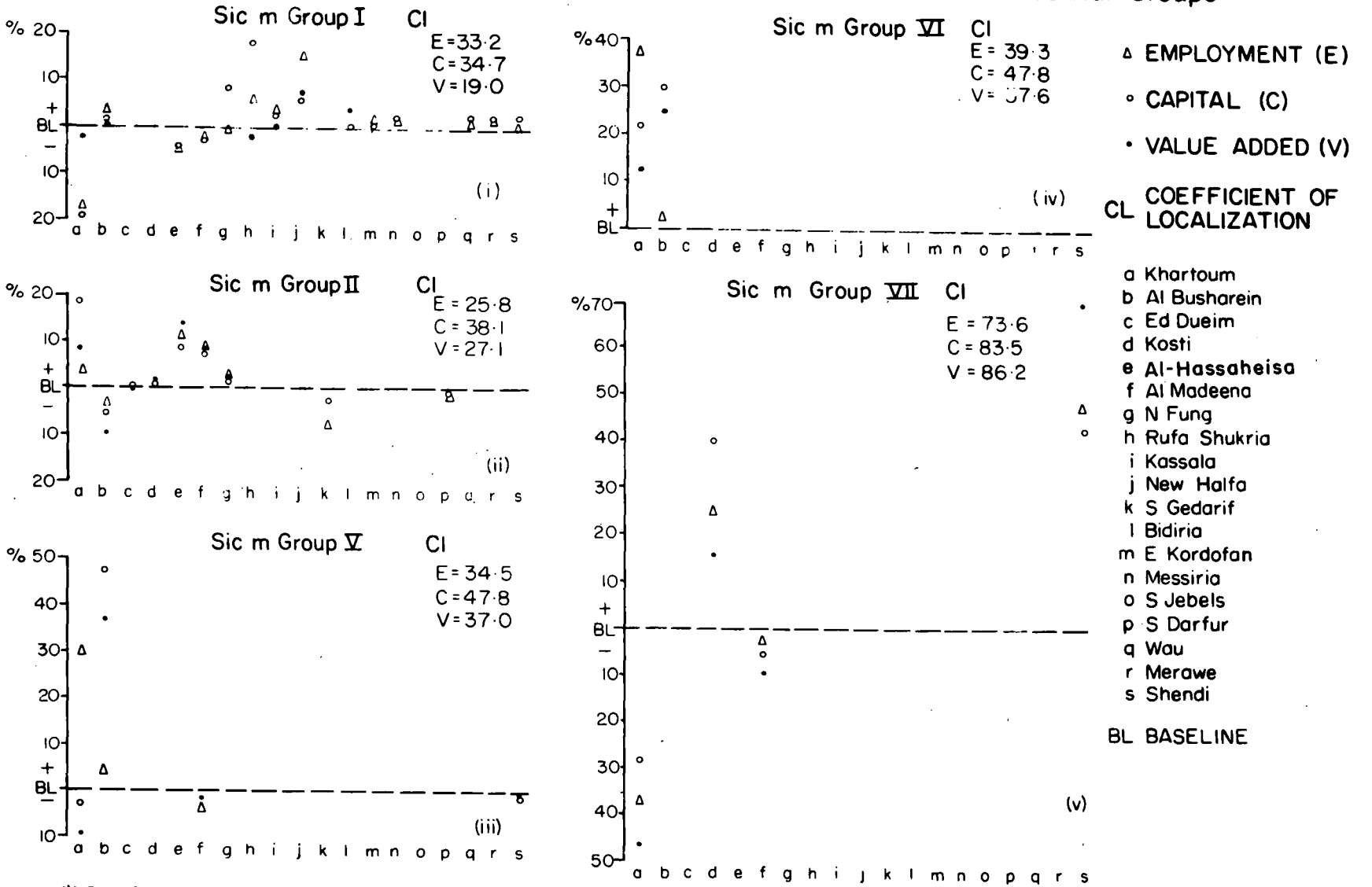
To develop the discussion on industrial location beyond the level of generalisation hitherto attempted a coefficient of geographical association has been used to show the localization or dispersion of each individual industrial sector. It should be remembered however, that the values obtained are based on a threshold of 30 and above workers referred to earlier. In addition it ought to be emphasised that the coefficient of industrial localization is apparently devoid of the spatial context as it just conveys comparison between different industrial groups. Sometimes this discrepancy is mitigated by the coefficient of specialisation.

As mentioned before, the latter coefficient loses much of its sharpness when applied to 'developing' countries. The reason is that a single remote factory with a few workers would produce a very high degree of specialisation, a situation which is obviously false. A deeper look into the coefficient of localization, on the other hand, might prove rewarding. In fact it is possible to answer why and where does the localization occur. As the coefficient of industrial localization is largely governed by the degree of deviation of each variable from the average of the sub-groups, it is possible to isolate each individual deviation and graphically portray them above and below a base-line that represents average values for each sub-region. A series of graphs has been constructed accordingly for five industrial groups for employment, capital and value-added (See Fig. 6.3). However, one problem emerges in the schematic representation, as some locations are devoid of particular industrial groups. Although their scores count in the formulation of the coefficient of localization, it is ignored in the graph, and broken lines through the base-line are drawn to indicate the non-existence of the industry in question in the localities. This would also mean that the adding-up of deviations regardless of the sign and dividing by two would not result in the exact coefficient of localization. Nonetheless we can depict the variations in the graph where they really matter.

Except in the case of two industrial groups - SICm Groups I and II - using ubiquitous or semi-ubiquitous inputs, all other industrial groups tend to localize, as measured by the number of employment, paid-up capital or gross value-added. In some cases the high localization is a result of a one hundred percent concentration in the Prime Base as in the case of Leather and Footwear (SICm Group III), and Wood, Paper and Printing (SICm Group IV).

Fig.6·3

Graphic Representation of the Coefficient of Localization for five Industrial Groups*



* See Appendix 6·2

Noticeably this form of localization does not produce the highest coefficient simply because the average, or platform, of the Prime Base is so high that a one hundred per cent figure will deviate only slightly from an already profound share.

Within the same range of high localization, Cement, Tiles, Glass etc. (SICm Group VII), records the highest localization as will be seen in Fig 6.3.v). As was noticed earlier on in Chapter 5, this industrial group is the least significant of all industries in the Prime Base. Understanding this, we expect to have two sharp divergencies from the average; one at the Prime Base and the other in the remote areas where a resource-base industry is so significant that the deviation value far exceeds the nodal share in such a locality.

A third pattern of high localization develops where a secondary base shares importance with the Prime Base. For locational factors already discussed in this chapter, Port Sudan emerges as a competitor to the core in Chemical and Allied Industries and Metal and Electrical Industries (SICm Groups V and VI), (See Figs. 6.3.iii and iv).

At the other extreme, Textiles and Ginning and Food, Drink and Tobacco, register low coefficients of localization. It is only expected that primary industry is the simplest form of manufacturing and is geared to the production areas. With a long history of cotton production, the country is dotted with ginneries. The commitment to process local raw material after 1959 plus the emergence of some regions as food processing centres have widened the processing base to cover several districts.

For the purposes of distribution and analysis, it suffices to mention the spatial variation of the coefficient as calculated on each individual variable. For example, a slight localization is detected for SICm Group I on capital and employment (Fig. 6.3.i).

The reason is clearly the low figure of 20 per cent below the overall average of the Prime Base on both variables, together with high values for provincial sugar refinery with large sums of capital investment and similarly high job enrolment. Conversely, the value-added runs closely along the base-line to give a low coefficient of localization. Besides, this feature is also indicative of some structural characteristics. For instance, the conurbation is doing better on value-added than capital and employment, a situation opposite to that of the provincial areas where value-added is far less than would normally be expected from the magnitude of capital or employment. This confirms what has already been said about the operational problems encountered by these rural food industries. By contrast, SICm Group II (Fig. 6.3.ii) shows a relative localization of capital. This time the share of the Prime Base is a high positive one, produced mainly by the high capital out-lay in the spinning and weaving sub-group.

A distinct tendency of the variable-to-variable comparison is offered by Chemicals and Allied Industry (SICm Group V Fig. 6.3.iii). On the one hand, the localization on the employment variable is mainly a product of 'labour-intensive' practices in the Prime Base. On the other hand the high capital localization is due to capital concentration in the Port Sudan Oil Refinery. Again value-added reflects the contrast between the efficient running of the refinery and the inefficiency of operations in the Prime Base shown by under-average values.

A noticeable feature in SICm Group VI (Fig. 6.3.iv), is the high employment percentage for the Prime Base which far exceeds the average. This is explained by the nature of the assembly industry of refrigerators and air coolers and air conditions and the 'labour-

intensive' enamelware industry and metallic furniture. On the other hand, lorry assembly at Port Sudan shows all signs of a newly established capital-intensive industry where capital percentage is rather high and exceeds that of value-added.

Another interesting feature is the disparity between the operations of the two cement factories (Fig. 6.3.v). The Nile Cement Factory at Rabak (Kosti), a recent establishment, reflects all the problems of a new mixed sector starting with organisational disorder, to the extreme of sub-optimal location. The Atbara Portland Cement Factory (Atbara), established in 1946, looks more mature and well established as is manifested by a high production-capital ratio, i.e. value-added per capital. From the foregoing analysis it might as well be concluded that it is possible to gain a wealth of information and more insight from the solid figures of the coefficient if we look beyond the numerical expression to the original elements that underlie the bare figures.

6.5 The Structural Configuration of Industry

In the analysis of industrial structure in the previous chapter, three structural sub-levels were scrutinised. The first relates to the aggregate input and production of the industrial activity in the Prime Base. Sectoral configuration and size structure were the other two levels. One of the advantages of that procedure was to bring together elements of production factors with those of locational factors. In the subsequent sub-sections all three levels will be examined separately.

6.5.1 Structure of Industry : Some Generalisations

For the present purposes much of this sub-section will be dealing with structural aspects of regional industries as they intertwine

with the activity of the Prime Base and in a manner similar to the treatment applied before.*

The incipient industry throughout the provinces is much tied to raw materials, and in that respect it is expected to show some different structural configuration. This conception is tested against empirical evidence later on, when some sub-industrial groups are examined more closely. But for the present, an immediate impression on the general disparities and similarities of the structural aspects of the regional industries and that of the Prime Base is offered. If the Prime Base's correlation matrix already discussed is compared with the one for all Sudan's industries, it will prompt the following observations:

(1) The coefficient of correlation between production-capital ratio and employment coefficient (A and E), r = 0.62, is identical to the figure for the Prime Base (See Tables 6.1 and 5.3). By going back to the scattergram (Fig. 6.4.i), it will be seen that the same extreme values of a tea packing factory and a wood workshop, both located in the Prime Base, still influence the correlation for the whole country. Another similar form of heterogeneity where two non-comparable dots are far apart in the chart, is again reflected in the scattergram for production-capital ratio and labour productivity (A and F, Fig. 6.4.ii).

(2) It is also possible to see a similar discrepancy when considering the differences. For example, capital intensity and capital density (C and D, Fig. 6.4.iii) have a low

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* The Guneid Sugar factory was excluded from computations of correlations and scattergrams because of its distorting effect on some coefficients due to disproportionate capital investment, and similarly extremely high negative value-added.

Fig. 6.4

Scattergrams for 153 factories on:

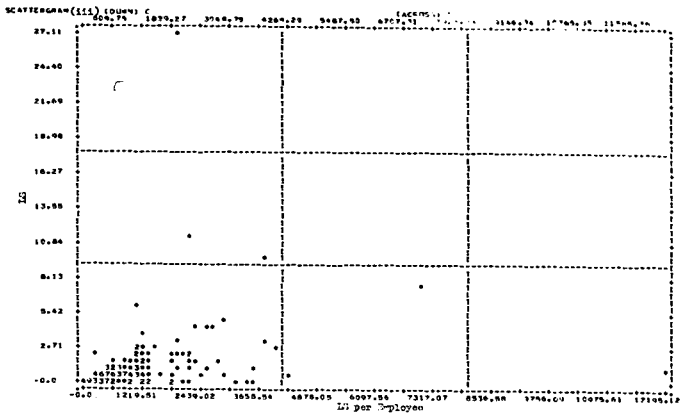
(i) Production-capital ratio and employment coefficient (A and E), r = 0.62.

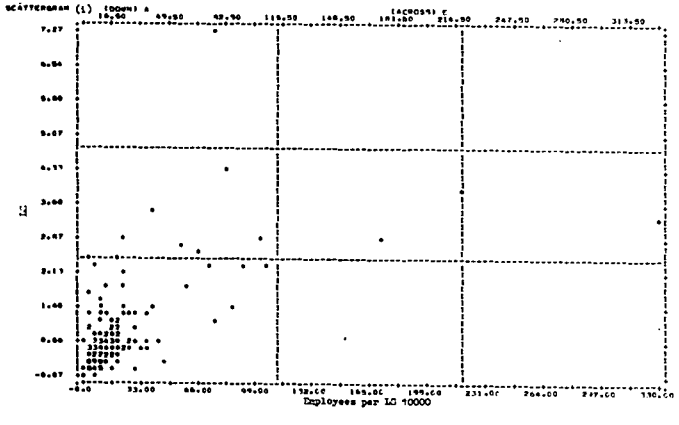
(ii) Production-capital ratio and labour productivity (A and F), r = 0.20.

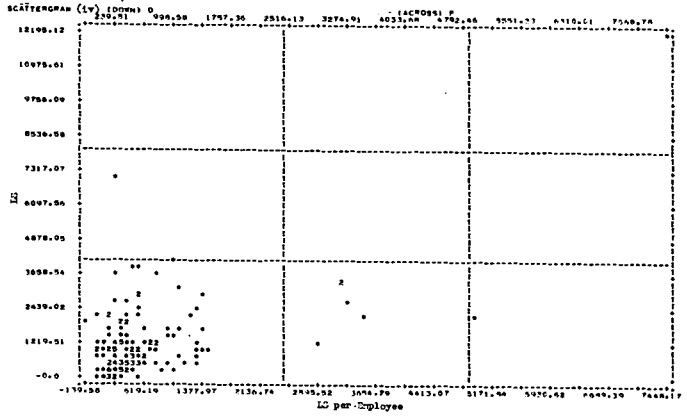
(iii) Capital intensity and capital density, (C and D), r = 0.28.

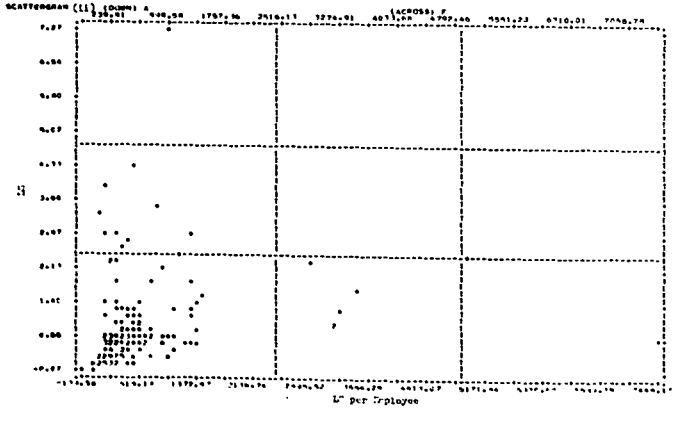
(iv) Capital density and labour productivity (D and F), r = 0.99.

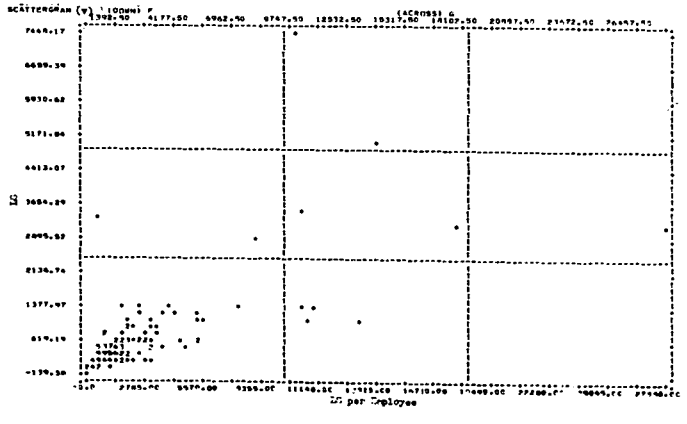
(v) Labour productivity and production-labour ratio (F and G), r = 0.69.











correlation for all Sudan whereas a high figure is recorded for the Prime Base. The inclusion of the oil refinery and the Port Sudan saltern, two factories at opposite poles in the Sudan chart, has greatly determined the Sudan overall coefficient. While production value in the former is extremely high, the saltern production-value is obviously on the other extreme. Thus any relationship involving these variables will directly reflect the disparity in the form of a low correlation.

(3) A clear example of heterogeneity is also provided by the fairly strong correlation of $r = 0.59$ between capital density and labour productivity (D and F) in the Sudan matrix (Table 6.1). The dot representing the oil refinery is evidently far removed from the others and thus responsible for a false correlation (Fig. 6.4.iv).

(4) Nonetheless, the inclusion of the provincial industries does consolidate some already existing trends in the conurbation. For instance an increase of value-added per employment (F and G) increases simultaneously with an increase of production-value per employee (Fig. 6.4.v). The inference is again confirmed for all Sudan and would have been even stronger but for the exceptionally high value-added per employee for the oil refinery which is not matched with a corresponding high production-labour ratio (See Table 6.1).

6.5.2 Internal Structural Configuration : Some Selected Industrial Groups

Textile and Ginning Industry, and Food, Drink and Tobacco (SICm Groups II and I) are selected to provide a close-up structural

Table 6.1 Matrix of correlation coefficients (Pearson Product-moment) for eight industrial coefficients (Sudan industries).

Variables:	A	B	C	D	E	F	G	H
A. Production capital ratio: Value added per capital		-0.26	-0.29	-0.31	(0.62)	0.20	0.16	-0.19
B. Capital coefficient: Capital per value added			0.30	0.17	-0.14	-0.17	-0.14	(0.86)
C. Capital intensity: Capital per production value				0.28	-0.17	-0.14	-0.20	0.14
D. Capital density: Capital per employment					(-0.34)	(0.59)	(0.35)	0.08
E. Employment coefficient: Employment per capital						-0.16	-0.13	0.05
F. Labour productivity: Value added per employment							(0.69)	-0.24
G. Production-labour ratio: Production value per employment								-0.21
H. Labour intensity: Employment per value added								

Number of factories - 153

Note: (○) Strong correlation significant at 0.001 level

(○ dashed) Fairly strong correlation significant at 0.01 level

explanation of the internal industrial configuration. The criteria for this selection were as follows. Firstly, the clear dominance of these two industrial groups on all five variables. Together they comprise 70.3 per cent of the country's industrial employment and 78.6 per cent of capital (see Table 6.2). Secondly, these two groups best resemble the resource base of the rural areas, thus creating a fresh opportunity to consider the operational and structural performance of the bulk of rural industry.

A first step towards introducing the structural differences in these two groups is to acknowledge the respective percentage share of each group. As our calculations include some factories, which were not accounted for by the Industrial Survey (1969/70) there is bound to be some difference in the total percentages, while the percentages for employment and value-added in the Survey stand at 40 per cent and 33 per cent for SIC m Group I and 26 per cent and 30 per cent for SIC m Group II, corresponding employment percentages that include ginneries and some public enterprise factories is nearly equal for both groups standing around 38 per cent.

Alternative value-added percentages for SIC m Groups I and II after the inclusion of those factories unconsidered by the Survey, are 45.4 per cent and 23.7 per cent respectively. To complete the picture, capital for which no percentage is given in the Survey stands at 47.4 for Food, Drink and Tobacco, and 35 per cent for Textiles and Ginning and Leather and Footwear.

6.5.2.1 Size-Class Structure for Food, Drink and Tobacco, and Textile and Ginning (SIC m Groups I and II)

Some insight into the industrial structure of the country may be gained by examining the size-class structures of the two dominant

Table 6.2 Sudan industrial sectors by five variables as absolute numbers and percentages

Industrial sector (SIC m Group)	Number of employees and per cent	Paid-up capital and per cent	Gross value-added and per cent	Production value and per cent	Wales and salaries and per cent
Food, Drink and Tobacco (SIC m I)	14715 (38.3)	27261.3 (47.4)	4678.4 (23.7)	29700.9 (46.2)	3504.6 (35.9)
Textiles and Ginning (SIC m II)	12304 (32.0)	17966.0 (31.2)	7369.7 (37.3)	12644.5 (19.7)	2721.4 (27.9)
Leather and Footwear (SIC m III)	2203 (5.7)	2175.4 (3.8)	1604.3 (8.1)	4560.1 (7.1)	704.4 (7.2)
Wood, Paper and Printing (SIC m IV)	2952 (7.7)	2577.1 (4.5)	1229.4 (6.2)	2649.4 (4.1)	782.0 (8.0)
Chemicals and Allied (SIC m V)	2505 (6.5)	3643.2 (6.3)	2555.6 (12.9)	7512.1 (11.7)	1096.8 (11.2)
Metals and Electrical (SIC m VI)	2648 (6.9)	1248.5 (2.2)	1450.5 (7.3)	5276.6 (8.2)	539.8 (5.5)
Cement, Tiles, Glass etc (SIC m VII)	1082 (2.8)	2620.8 (4.6)	881.5 (4.5)	1996.0 (3.1)	411.1 (4.2)

Sources: Compiled from (1) IDCAS, Industrial Survey, Sudan, 1969/70, Cairo, 1970
(2) Statistics Department, Sudan Regional Industries, 1970/71, compiled by the Ministry of Industry and Mining, Khartoum, 1971.

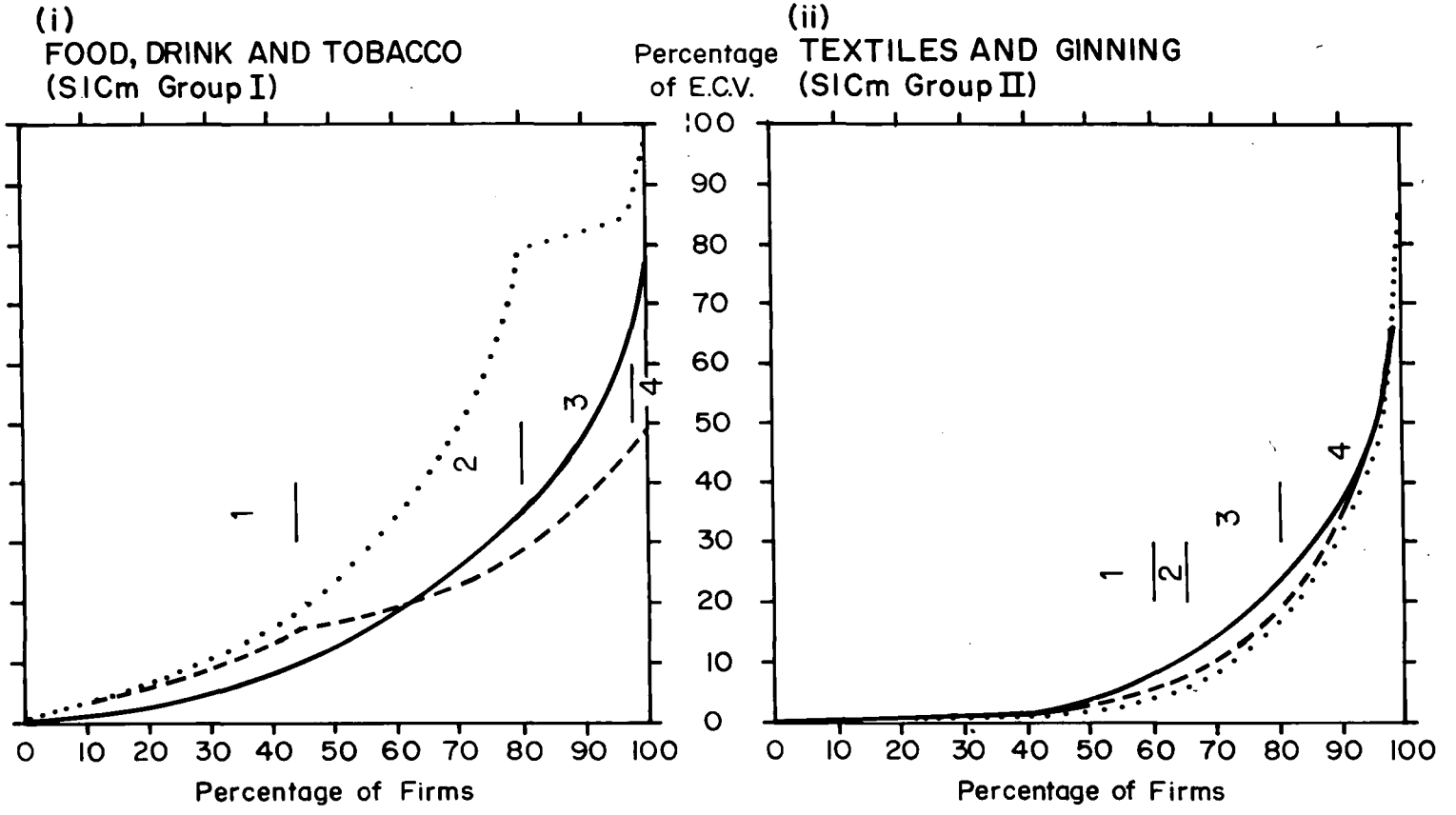
industrial sectors. The size-class structure as presented here will help to detect the degree of concentration of capital, value-added and employment. A high degree of concentration of the input and production factors in a few large-sized firms will mean that the industry in question is more orientated to the national markets than local demands.

If the inclination is for concentration in small and medium firms, we conclude that the industry is of the non-basic order. This will also furnish a clue to the stage of growth of the industrial sector, its imprint on the overall industrial structure, and will give a fair idea about the trend of growth. For a visual illustration of these concepts Lorenz curves were constructed to depict the proportional structural composition of size-class (Fig. 6.5).

It is clear from the out-set that the structure of the two industrial groups differ considerably in the degree of their departure from the line expressing optimality. The Textiles and Ginning curves of employment, capital and value-added are all related to one another and are sharply sagging (Fig. 6.5.ii). More than 80 per cent of any one of the three variables is confined to the four largest factories. Such a high concentration in many 'developing' countries is associated with primary and secondary processing for international markets and basic local demands for cheap goods. Both signs are indicative of a weak sectoral base. Industrial linkages are virtually lacking and skills only comply with preliminary stages of manufacturing. Cotton ginning is the most dominant and the best example.

With a wider range of sub-groups and products, food industries seem to show some of the basic features of a relatively integrated industrial sector. Alongside large firms that produce for the

Fig.6·5 LORENZ CURVES OF INDUSTRIAL LOCALIZATION: SIZE STRUCTURE ON THREE VARIABLES FOR TWO INDUSTRIAL GROUPS



Class Size 1 30-99 Class Size 2 100-299 Class Size 3 300-499
Class Size 4 500+

national market there co-exists a range of small and medium factories that are in many instances covering non-basic demands, i.e. local urban areas, such as bakeries, edible oil mills, and confectioneries etc. The impact of the small and medium-size factories of this group is very clear in the Lorenz curve. The sagging effect noticed for Group II is slightly eased for Group I and the curves are relaxed to positions nearer to the diagonal. This is markedly so for value-added (Fig. 6.5.i) where size-classes one and two represent 80 per cent of the number of factories and produce about the same percentage of value-added, 36 per cent of employment and 28 per cent of capital.

It is now clear that a relationship between the different production factors could roughly be approximated from respective percentages in the Lorenz curve. An obvious example is size-class two of the food industries where more than two-fifths of value-added in SIC m Group I is produced by this size-class. Yet the same size-class employs one-fifth of the capital which means a higher production-capital ratio. But the main discrepancy with the Lorenz curve is that one is dealing with totals and considerable generalisations are being made. One factory with a high value-added could result in a situation similar to that we have just seen. A more rigorous approach is attempted in the next sub-section however.

6.5.2.2 Input and Production in Food, Drink and Tobacco, and Textiles and Ginning (SIC m Groups I and II)

The internal structure of input and production of the two industrial groups now under consideration could be appropriately scrutinised by looking into the separate correlation matrices computed on eight variables (see Tables 6.3 and 6.4). By examining individual factories one notices that the picture is not at all as

Table 6.3 Matrix of correlation coefficients (Pearson Product-moment) for eight industrial coefficients (Food, Drink & Tobacco, SIC m Group I) (Sudan industries).

Variables:	A	B	C	D	E	F	G.	H
A. Production capital ratio: Value added per capital		-0.22	-0.24	-0.35	0.58	0.39	0.25	-0.20
B. Capital coefficient: Capital per value added			0.25	0.28	-0.18	-0.18	-0.19	0.86
C. Capital intensity: Capital per production value				0.32	-0.20	-0.23	-0.25	0.12
D. Capital density: Capital per employment					-0.53	0.13	0.18	-0.05
E. Employment coefficient: Employment per capital						-0.18	-0.23	-0.03
F. Labour productivity: Value added per employment							0.79	-0.30
G. Production-labour ratio: Production value per employment								-0.29
H. Labour intensity: Employment per value added								

Number of factories - 60

Note: ⬭ Strong correlation significant at 0.001 level

⬭ Fairly strong correlation significant at 0.01 level

Table 6.4 Matrix of correlation coefficients (Pearson Product-moment) for eight industrial coefficients (Textiles and Ginning, SIC m Group II) (Sudan industries).

Variables:	A	B	C	D	E	F	G	H
A. Producation capital ratio: Value added per capital		-0.70	-0.70	-0.54	0.48	0.40	0.15	-0.52
B. Capital coefficient: Capital per value added			0.93	0.18	-0.31	-0.50	-0.34	0.92
C. Capital intensity: Capital per production value				0.30	-0.45	-0.35	-0.39	0.79
D. Capital density: Capital per employment					-0.81	0.43	0.59	-0.13
E. Employment coefficient: Employment per capital						-0.39	-0.36	0.02
F. Labour productivity: Value added per employment							0.64	-0.57
G. Production-labour ratio: Production value per employment								-0.47
H. Labour intensity: Employment per value added								

Number of factories - 20

Note: ⬭ Strong correlation significant at 0.001 level

⬭ Fairly strong correlation significant at 0.01 level

might be suggested, for example, by the wide gap that exists between the total percentage share on capital and value-added of food industries (Table 6.2). In fact one factory in this sector produces the highest production-capital ratio which is in contrast with a score of very low added values resulting from poor performance of some public sector factories. The presence of such a disparity is bound to result in a low coefficient of $r = -0.24$ for production-capital ratio and capital density (A and C, Fig. 6.6.i).

A stronger negative correlation between production-capital ratio and capital density is featured in the Textiles and Ginning group ($r = -0.54$) (Fig. 6.6.ii). The situation that arises is far from the ideal one. Instead of a presumed increase of production-capital ratio with higher capital intensity, one is faced with the odd situation of a decreased productivity when capital intensity is increased. By going back to each individual factory one can single out the firms that show a tendency towards inefficient operations. As a general rule one would suspect redundant capacities. Among the many adverse factors, occasional unavailability of raw material is indeed the most profound. A case in point is the ginneries relying on rain-fed cotton. Severe fluctuation of production is directly related to the precarious rainfall. One has to remember that a ginnery's capacity would initially be decided upon by the average annual raw material production. Marketing problems could as well be cited as in the case of ready-made clothes. This industry could not secure protection because it was only producing a fraction of the local consumption and obviously could not compete with the cheap imports. The elasticity of price is a key factor to competition in this trade. However, such an inverse correlation should not mean in any way that higher employment per unit of capital would automatically produce the desirable production-

Fig. 6.6

Scattergrams for Food, Drink and Tobacco (SIC = Group I) and Textiles and Ginning (SIC = Group II).

On the following coefficients:

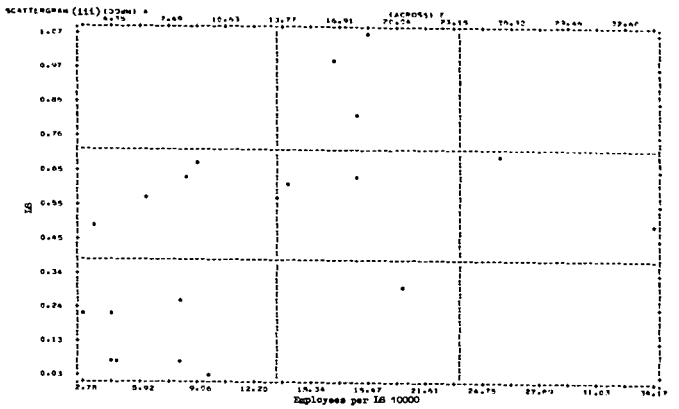
(i) Production-capital ratio and capital intensity (A and C, SIC = Group I), r = -0.34.

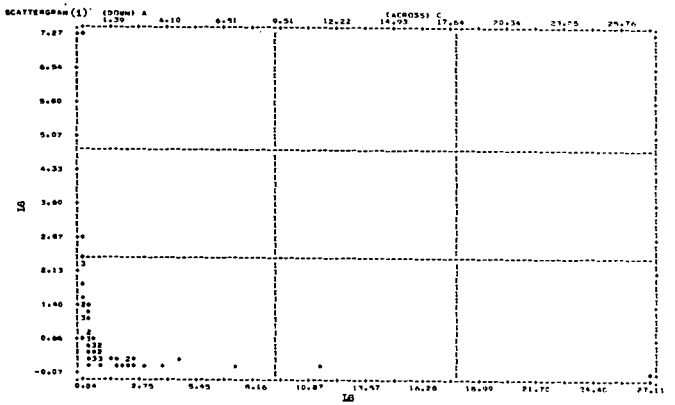
(ii) Production-capital ratio and capital density (A and D, SIC = Group II), r = -0.54.

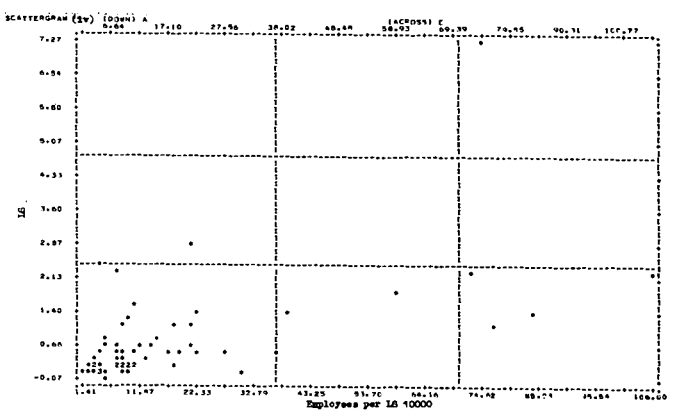
(iii) Production-capital ratio and employment coefficient (A and E, SIC = Group II), r = 0.48.

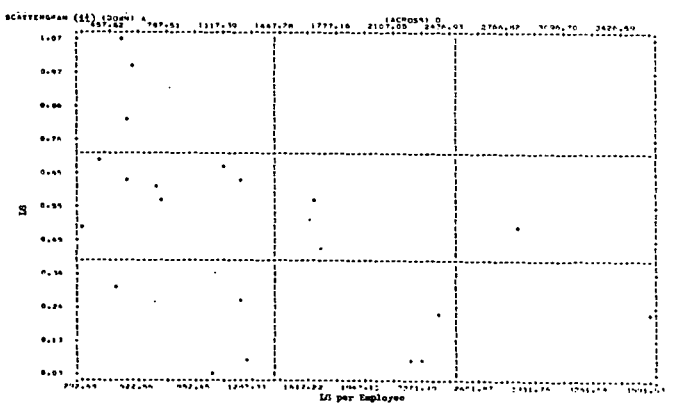
(iv) Production-capital ratio and employment coefficient (A and E, SIC = Group I), r = 0.58.

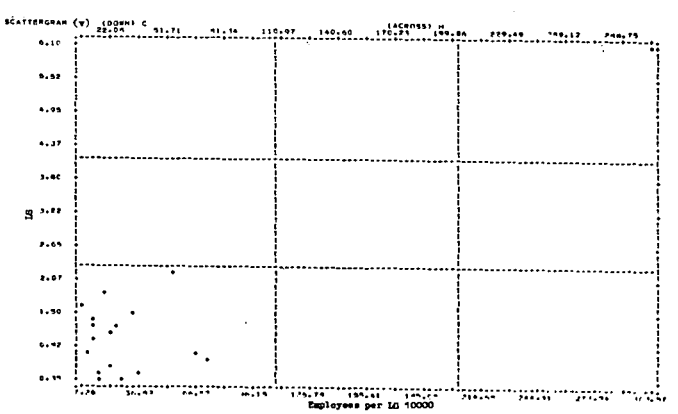
(v) Capital density and labour intensity (C and H, SIC = Group II), r = 0.79.











capital ratio. As a matter of fact the coefficient of correlation between employment coefficient and production-capital ratio is only r = 0.48 (Fig. 6.6.iii).

In contrast, the employment coefficient for food industries relates fairly well with production-capital ratio (r = 0.58). Labour-intensive practices are common in this sector, especially the packing sections and packing firms of food industries. Nevertheless the correlation of (E and A, r = 0.58) is higher than would be expected because a dot representing a soft drink factory is far apart in the chart from the rest with the inevitable distortion effect (See Fig. 6.6.iv).

A common feature of the two industrial groups studied in this sub-section is the high coefficient of correlation between capital coefficient and labour intensity (B and H). Thus high employment per unit value-added indicates the high capital investment per unit of value-added. The clear inference here is that value-added is far lower than it should be. The main factors that could bring about such a state of affairs are connected with operational problems, raw material shortage, poor management, and probably low performance and skill of labour. In a few cases market problems could be suspected. However, a positive correlation of r = 0.79 between capital intensity and labour intensity is only profound in the case of Textiles and Ginning, attesting to a complex situation where large sums of capital are necessary in weaving and spinning even though the product is cheap fabrics with comparatively low production value. Such an operation seeks cheap casual and semi-skilled labour, and in so doing it increases the number of workers per unit of value-added. The occasional under-capacity experienced in this sub-group and the disproportionate figures for one particular factory might have acted as a reinforcing factor to produce this

high significant correlation (Fig. 6.6.v).

6.6 Conclusion

Variations in space of industrial activity on a regional basis only recently began to show some character. The underlying pattern closely resembles the particular morphology of industry in the regional centres and rural areas in contrast to the agglomerative tendencies in the Prime Base. There is real evidence to suggest that the pattern of Prime Base, regional-centre and one-factory will persist for some time to come.

However, the industrial distribution is always subject to the dynamism of 'modernity' and geared to opportunities that come with the change of economic systems. The proportions of industrial concentration will probably be disrupted and soon curbed to a lower figure. However, this does not mean that rural areas will acquire the diversity and complexity of the Prime Base industrial activity. In that respect the gap may even widen. Thus the basic difference between rural and Prime Base industry lies in the structure and stage of development. Whereas a few large projects of the periphery type may strongly offset the dominance of the core percentage-wise, the Prime Base gains its strength from growing internal and external economies and linkages within the industrial and commercial sectors. This tendency was tested for Sudan industry by examining operational and structural configuration. It was established that the relative significance of countryside industry stems from the scale of operation of individual factories of the one-factory type. Large public industrial enterprise to process local material defines the basic nature of the structure of rural industry and the primary stage of operation. In that context, and possibly with regard to cost rather that profit maximization, raw material exerts a decisive pull.

At the same time the business/entrepreneur enterprise in the Prime Base demands a different set of financing, margins of profitability and cadre. However, operational problems are not necessarily different - they might only vary in magnitude and persistence.

CHAPTER SIX

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CHAPTER SEVEN

INDUSTRIAL LOCATION ANALYSIS: A CASE STUDY OF COTTON-SEED OIL

7.1 Introduction

Any high concentration of industry like that of the Prime Base is perhaps sufficient evidence of profit maximisation. The relative industrial diversity, and high degree of locational freedom that paradoxically gathered private industries together is clearly not typical of production-cost variability, and would hardly fit a least-cost model. For that matter, the optimum location of many material-oriented industries, whether local or imported (with Port Sudan assumed to be the material source), would have been at the material source away from the Prime Base.

In Chapter Four mention has already been made of the unexpected localization of cotton-seed industry in the Prime Base. It would be proved, according to measurable variables such as transfer cost and profitability margins, that a location away from the Prime Base, for instance at the material source, would give higher profits. In the specific case of a bulky raw material such as cotton-seed, one would expect the coincidence of the theoretical least-cost and profit maximisation (as specified above) within the vicinity of the material source.

However, to quantify the sub-optimality of the present localization of this industry as measured by material procurement cost and distribution cost, will only confirm the existence of other location factors that maximise profit at the Prime Base in spite of transfer cost considerations and authorised profit margins.

As yet these factors were only generally embodied in the Prime

Base Theory. The principle purpose of the present enquiry is thus to provide a deductive framework specific to the cotton-seed industry alongside an empirical testing appropriate to the production-cost variability. These objectives are not by necessity contradictory. In fact a deterministic model is complementary since there is ample evidence to suggest that planning for industrial development in both public and private sectors, as seen from Sudan's socio-economic development plans of the 1970's, will be conducted by the central government bodies, along lines of central planning systems. Already priority is clearly given to processing agricultural and mineral resources and expansion of production. Indeed, the concern to make fuller use of available resources may force cost considerations. However, this could not possibly be effected without a basic understanding of the current forces that undermine least-cost locations.

7.2 Selection of an Industry

In our attempt to check against optimal location, either a public or private industry would have served the purpose. But we already know from the distribution pattern of industry presented in Chapter Six that public enterprises, in the main, conform to the general principles of processing raw material at their base and are predominantly guided in such involvement by considerations of cost minimisation and social cost benefit. However the incompetence of many such enterprises is only partially connected with locational factors as such. The gross mistakes in this sector referred to in Chapter Six were mainly a matter of misjudgement of the quality of the raw material or miscalculation of the availability of the raw material in sufficient quantities throughout the season, or invariably through the life-span of the factory. In some cases the size

of the plants were basically disproportionate to the assumed exploitable raw material. Wau fruit canning and Babanousa milk processing factories are good examples.

More meaningful however, is to set the empirical problem against a selected private industry where considerations other than cost minimisation were paramount, and where the movement of the raw material to plant entails unnecessary costs because of the bulkiness of the material. An added advantage would be to further our understanding of the 'Prime Base Theory'. The Cotton-seed processing industry is therefore probably the best fit for these reasons and the set objectives.

The Cotton-seed oil industry is well-established in the private sector in the Prime Base some 200 Km away from the main material source. With a material index of 5.7 for the cotton-seed, the question posed now, is whether this industry would still locate at the Prime Base even though we relax the assumption that profit maximisation is the motive of entrepreneurs. A negative answer will form the prime hypothesis of this enquiry, i.e., the existing concentration is sub-optimal and consequently inefficient insofar as minimising production cost.

7.3 Raw Material Consideration and Local Crushing Possibilities

As a by-product of the ginning process, cotton-seed production is punctiform and geared to cotton acreage and yield. Thus the plantation system created to produce a fine grade for export had also produced top quality cotton-seed that involves little or no extra cost. While the price of cotton lint is seven or eight times that of the seed, it only constitutes one-third of the seed cotton by weight.(1) Clearly then we are dealing with a bulky and a compara-

tively low value commodity. However this fact conceals the real value of the product. Aided by international trade and marketing practices, the cotton-seed prices were determined on feed-stuff value and consciously ignored the more valuable oil content of the material. For this reason and for the generic quality of Sudan's fine grade produce i.e. higher oil content and baldness of the seed that requires no further cost on delinting, and for the initial low production cost and the subsidised rail freight rates; the British crushing industry practiced an exclusive monopsony over the Sudanese produce during the period from 1913 to 1940.(2) This monopsony was only to break when sea freight was curtailed during World War II and for even more pressing considerations, priority over the seed was granted to Egypt where the Middle East Force was centred.

After the war the British feed-stuff industry could not adjust to the new material and transport price structure and was very much affected by the temporarily declining internal and West European demand, as the livestock population was greatly reduced during the war. By then Egypt was ready to take over from Britain and in fact became in 1943 the leading importer of Sudanese cotton-seed. Ironically enough, Sudan became the world leading exporter of cotton-seed from 1943 to 1963 at a time when she was only producing one per cent of the world cotton. In 1944 the Sudan was supplying about 84 per cent of world demand.(3) This position was made possible only in the absence of local crushing facilities while other traditional competitors such as Egypt, Brazil, India and China were developing their own local cotton-seed oil industry. This option was almost impossible in Sudan in the shadow of the non-industrialisation commitment, and for some other uncommon factors rather unique to

this industry in Sudan:

1. The local market for edible cotton-seed oil was rather marginal if not at all existent before 1955. The output of the traditional crushing industries of sesame and groundnut not only covered the market but were preferred to other edible oils. As we will see later this situation was to change as a result of a changing taste and price differentials.
2. Given the prevailing market conditions stated in No. 1 above, an unagreeable situation arose whereby contenders to produce locally faced fluctuating uncertain external outlets, and saturated internal markets. Thus the comparatively stable cotton-seed prices of the traditional markets paid off more to the exporter of the produce. This state of affairs has drastically changed since 1956 as will be discussed later. Meanwhile, the inability to process locally guaranteed a further push-down of the buyers' monopsony price of cotton-seed. Furthermore, the seed was not only considered a low value product but a disease carrier infectious to the cotton plant. Hence the seed was deemed an 'evil' that had to be destroyed before the following season, or used for suction gas fuel for which there was limited use, or otherwise exported.

Details of cotton-seed export figures are shown in Table 7.1 and provide a chronological dating of the development of the local industry. Although the industry started just in the late 1940's, the year 1964 witnessed the breakaway from the excessive exportation pattern, and earmarked the new trend towards establishing the local cotton-seed oil industry (see Table 7.1). The balance between annual

Table 7.1

Sudan export of cotton-seed, oil and oil cake, 1943-1975 ('000 tons)

Year	Cotton-seed	Cotton-seed oil	Cotton-seed oil cake	Year	Cotton-seed	Cotton-seed oil	Cotton-seed oil cake
1943	113.70	-	-	1960	93.00	3.16	48.35
1944	136.10	-	-	1961	117.30	6.30	52.31
1945	125.90	-	-	1962	203.70	6.32	82.37
1946	74.20	-	-	1963	152.10	n.a	95.90
1947	89.50	-	-	1964	47.30	10.10	109.40
1948	90.40	-	-	1965	65.30	9.80	123.4
1949	102.90	0.23	-	1966	47.30	9.65	133.6
1950	97.40	3.15	6.27	1967	32.20	7.59	115.93
1951	112.10	4.81	15.49	1968	36.00	12.43	167.79
1952	92.30	4.98	11.45	1969	112.00	13.32	129.81
1953	118.50	5.05	8.80	1970	84.50	18.40	179.10
1954	106.00	4.25	21.94	1971	99.80	34.33	153.71
1955	100.00	4.33	13.13	1972	21.80	30.98	149.85
1956	151.90	4.03	28.80	1973	15.10	19.80	115.96
1957	186.80	5.75	36.58	1974	4.60	-	42.47
1958	53.40	1.46	24.38	1975	-	10.70	92.80
1959	159.80	4.93	45.49				

Sources: Compiled from (1) Department of Statistics, Foreign Trade Statistics, Khartoum, (Various Issues).

(2) Bank of Sudan, Annual Reports, Khartoum, (Various Issues).

cotton-seed production and export is taken to mean local utilisation of the seed for oil production, plus the small amount retained for sowing. Only ten years later in 1974 export of the seed was altogether banned and still the average annual produce of black cotton-seed falls short of satisfying local demand. For details of recent production and analysis of seed cotton see Tables 7.2 and 7.3.

An explanation is now needed to verify the seemingly contradictory suggestion already made that it pays better for exporters to export than to process locally. The rapid switch from one form of economic practice to another as exhibited by this industry is a testimony to the sensitive balance of internal and overseas changes of demand patterns, price structure and climate of investment, and how industry reacts to them.

A close reconstruction of the then prevailing circumstances that culminated in establishing the local industry is necessary; of utmost importance, before going into further details is the fact that cotton-seed oil in Sudan was exclusively developed for industrial usage in soap manufacturing.(4) Severe limitations were imposed by war conditions in the 1940's on suppliers and importers of soap as a result of scarcity of tallow and the exceptionally high prices that follow the mechanism of supply and demand. A petty sort of soap manufacturing thus started in Sudan, utilising the available but relatively expensive and valuable supplies of edible oil. Atroon, a local substitute for caustic soda was widely used. Eventually cotton-seed oil was sought as a cheaper substitute and a new avenue for local industry was opened by the expanding local demand and the naturally protected markets. By the early 1960's cotton-seed oil for industrial use and food and margarine was gaining ground in Sudan and the nearby Middle East as prices were relatively stable

Table 7.2

Sudan cotton production by variety, area and source

Source	Variety	1973/74 Area (Feddans)	1973/74 Production (Metric tons)	1974/75 Area (Feddans)	1974/75 Production (Metric tons)
Gezira and Managil	Egyptian	589,573	417,418	588,441	383,075
Agrarian Reforms	Egyptian	234,710	131,469	234,524	132,420
Upper Nile	Egyptian	21,000	5,052	24,570	6,450
Total		824,283	553,939	847,535	521,945
Khashm el-Ghirba	Acala	109,535	59,992	108,895	61,645
Toker	Acala	33,250	7,623	54,000	11,450
esSuki	Acala	33,875	12,991	34,165	19,340
Guneid	Acala	14,903	12,760	14,923	8,312
Zeidab	Acala	4,750	914	6,642	3,102
Gash	Acala	-	-	945	401
Total		196,313	101,280	219,570	104,250
Nuba Mountains	American	124,423	9,510	108,528	10,310
Abu Habil	American	478	40	3,183	414
Gedarif	American	20,550	3,606	27,000	3,564
Habila	American	21,930	1,600	7,810	1,757
Equatoria	American	6,000	540	14,000	1,568
Total		173,381	15,296	160,521	17,613
Grand Total		1,193,977	670,515	1,227,626	643,808

Source: Ministry of Agriculture, Food and National Resources, Current Agricultural Statistics (CAS), Vol.1, No.1, Khartoum, July, 1975, p.5.

Table 7.3

Analysis of seed cotton to its constituents, 1963/64-1972/73
(Metric tons)

Years	Lint	Scarto and linters	Seed	Waste or loss	Total seed cotton
1963/64	106,045	1519	199,563	2946	310,073
1964/65	151,297	2168	284,722	4203	442,390
1965/66	153,501	2199	288,870	4264	448,834
1966/67	183,495	2629	345,315	5097	536,536
1967/68	180,188	2582	339,090	5005	526,865
1968/69	224,101	3211	421,730	6225	655,267
1969/70	230,845	3307	434,420	6412	674,984
1970/71	249,963	3581	470,399	6943	730,886
1971/72	234,271	3357	440,868	6508	685,003
1972/73	190,018	2722	357,589	5278	555,608
Ten Years Average	190,373	2728	358,256	5288	556,645
Per cent	34.20	0.49	64.36	0.95	100

Source: Ministry of Agriculture, Food and National Resources, Year Book of Agricultural Statistics, Khartoum, 1974, p.24.

as a result of the monopsony referred to above. In contrast, sesame and groundnut production fluctuated sharply and demand was expanding in pace with population growth, a gradual change of taste, and an expanding soap industry.

Export-import companies and traders were naturally closely watching the changing trends and were first to appreciate the new possibilities opened by government legislation in 1956 in a bid to encourage the private enterprise to invest in industry. The host of concessions granted by the Approved Enterprises Act, were just right to create the assurances needed. These concessions raised profit margins to new heights. For exporters and traders thus it was not only a matter of survival but of creating an opportunity to cherish and expand profit. As one is able to calculate the profit differential between exporter's returns and manufacturers, the profit margin difference as will be seen in Table 7.4 is well above 3:1, in favour of local cotton-seed crushing. (Table 7.4 is based on 1967/68 prices of cotton-seed ex-ginneries, export price f.o.b. Port Sudan and ex-factory prices of semi-refined oil and oilcake). Equally significant evidence is the 'rush' created by local entrepreneurs to establish oil mills in Sudan. By 1975 about 285 factories were approved by the Ministry of Industry for oil-bearing seed crushing.(5)

It is evident now internationally that the location of maximisation of profit has for the first time coincided with that of the least cost i.e., being the obvious least cost location, Sudan was becoming the region of profit maximisation rather than the United Kingdom, West Germany or Egypt. On the regional level, the concentration of the cotton-seed industry in the Prime Base is only a reflection of the forces that made it feasible to trans-ship cotton-

Table 7.4

Profit margins on cotton-seed export and local processing of one ton, 1967/68 (LS)

Cotton-seed	(1)	(2)	(3)	(4)	(5)	(6)
Export	18.45	4.15	22.60	24.73	2.13	9.42
Local processing	18.45	6.41	24.86	*31.50	7.26	29.20

* Includes oil and oil cake

(1) Ex-ginnery price of black cotton-seed

(2) Transport and other expenses or production cost

(3) Total cost (1) plus (2)

(4) Price per ton f.o.b. Port Sudan or ex-ginnery, oil plus oil cake

(5) Profit

(6) Profit per cent [(5)/(3)] x 100

Source: Compiled from IDCAS, Report on Productivity, Technical and Managerial Development of Vegetable Oil Industry and Allied Products in the Democratic Republic of the Sudan, Cairo, 1970, Vol.1, pp.120-140.

seed thousands of kilometres away from the least-cost production area.

The evolution of the cotton-seed industry, as may be gathered from the above discussion, was directly connected with margins of profit and market forces. It was then the export-import companies and traders, well established in Khartoum and well acquainted with the practices and 'tricks' of export trade who would be flexible enough to re-orient to the new profitable opportunity. At the same time it was these agencies and agents who were in touch with commercial banks, and later in 1962 with the Industrial Bank. For this credit-worthy group, short term loans were relatively easy because of the quick turnover of the cotton-seed industry and the little risk involved in a simple one operation industry that demands little skill.

On the other hand, the very fact that the cotton-seed was established in the first place to satisfy soap manufacturing, one might expect that the 'new' industry would inherit all the symptoms of an import-substitute industry. The forces of the Prime Base and the efficient distributive system renders any other location than the conurbation a place of profit restrictions.

Lastly, the transport cost of cotton-seed, like many other export products was heavily subsidised to promote a profitable and competitive industry overseas. For an exporter, much aware of the internal and external price structure and differential, and much involved in handling the produce to Port Sudan, the freight cost would relatively mean little and practically have no significance. Khartoum was only a lay-by or a depôt on a long transit line. At the initial period of cotton-seed industry development, the market forces were still uncertain; thus some time precedes a decision

on whether to export, process locally, or partially sell locally. The local market demand was determined by international prices and the commanding local prices. The latter was in turn closely associated with availability of other oils (sesame and groundnuts) and the capacity of the soap manufacturing industry. Considering the growing competition, and the advantage of prompt delivery of the raw material, the transfer charge to Khartoum was practically a profit bearing factor rather than a cost penalty. For the same reason it was and still is possible to trans-ship cotton-seed almost a thousand kilometres to Port Sudan for processing there. A reinforcing factor in the latter case is the fact that Port Sudan is mainly engaged in processing for the international market where manoeuvreability and profitability are synonymous. Thus the government regulation that seeds should be removed from the Gezira before mid-June gives priority to seed transfer and this coincides with the interests of Port Sudan's entrepreneurs. Otherwise if such an industrialist decided to crush at the material source, he would be faced with the uncertainty of transporting his oil due to the rainy season and frequent flooding of the railway line and could thus be unable to reap the benefits of prompt delivery and the usual higher prices at the opening of the season (this is generally so because the early amounts that enter the market are limited).

It is interesting to note that the provision of cheap and extensive pieces of industrial land in the Prime Base would mean more to the trader or exporter (who now becomes an entrepreneur) than is normally assumed. Such a concession would result in a reduction of storage costs for cotton-seed for local crushing, and moreover provide a handsome return on cotton-seed for export and other exportable primary products. Although the Ministry of Industry is aware

of this practice, and considers it an offence[6] it could hardly do anything about it as the Investment Act was primarily a concessionary one and the general sentiment was to encourage, not to deter!

Although the storing function of Khartoum and the market mechanism (as distinct from market area) are inseparable from the Prime Base Theory advanced above, two more locative factors, one repulsive and the other compulsive, may be distinguished.

Firstly, for a long time cotton-seed storage in the irrigated Gezira was prohibited throughout the growing season (mid-June to mid-December) as a precautionary measure against cotton disease. Apparently the pink bollworms stay dormant inside the seed and failure to cure or otherwise remove the seed altogether from irrigated land would increase the risk of plant infection in the following season. This does not mean however that it is not possible to process at such areas. As a matter of fact one mill produces at Medani but apparently some extra cost is incurred to provide for the fumigation at a cost of P.T.35 (LS 1/100) per ton paid to the pest control section, which carries out the methyl bromide treatment on behalf of the mill owners.[7]

Although the cotton-seed industry was only developed in the late 19th century in America the modernisation that followed in production techniques and diversity of products and use is startling. Thus a whole spectrum of technological development was waiting transplant to places where the industry had only recently started. Modern machines could increase the percentage extraction of oil and delinting and probably decortication machines put all the white cotton-seed to proper use. The problem of undercapacity could also be tackled by introducing a multiple process where oil bearing seeds

other than cotton-seed could profitably be produced by the same machine.

Secondly, the oligopoly status acquired by the pioneer processers has been challenged in the mid-1960's as a result of the general awareness of the opportunities opened in this field. New dimensions were added as competition began to intensify and new frontiers were reached for to cope with demand. Inevitably the limited annual cotton-seed production had to be rationed and under-capacity was becoming common practice in the 1970's. This further reduced the profitability margins.

Another point worthy of note is that the soaring competition necessitated up-grading the quality of oil to competitive international standards. Deodorisation and bleaching are now essential as the local and foreign markets are expanding, and as the supervision of the Ministry of Industry and protection of consumer are becoming tighter. A new system was introduced in1973 whereby the amount of seed allotted to a mill was directly connected with the level of mechanisation, and also a new department was created to check quality specifications.

All this dynamic change concerns us in our locational analysis is two ways:

1. Higher labour and management skills and standards are in demand in pace with the new developments and the Prime Base more than anywhere else is by sheer inertia well equipped to cope.
2. The new magnitude of investment preferred well established distributive channels, and the Prime Base and to a lesser extent, Port Sudan provide these requirements.

7.4 The Cost of Production

Before proceeding to a proper transfer analysis it is pertinent to consider operational and production costs of the cotton-seed industry. Fortunately it is possible to give actual figures as produced in the IDCAS report on the vegetable oil industry (1970) for a standard processing of one ton of cotton-seed.(8) Ten mills were closely observed in 1969 and production cost is summarised in Table 7.5., together with the average production cost. The first thing to notice is that eight out of the ten factories are located in the Prime Base. The other two (Nos. 9 and 10) are export-oriented mills located at Port Sudan. The significance of this observation is to establish the fact that there is a sharp variance of production cost of each individual item within the same location, and under almost identical production environments. The best example is the cost of raw material which varies considerably for mills at one industrial area although prices are fixed. Similarly one can pick up high values for wages and salaries in Factory No. 8 and interests at LS. 4.68 per ton in the same concern, or the exceptionally high figure of LS. 6.815 per ton for sub-contractors in Factory No. 1. Besides the natural variance of cost due to differing dates of starting the operation, there may be one of three other explanations; either there are miscalculations or deliberate inflating of production costs, or alternatively, gross inefficiency. The one fact that remains is the incomparability of production cost even at one point in space. Conversely, the similar raw material cost of two locations about 800 Km apart supplied from the same area must be a strong indication of misleading calculations. One could hardly expect that transportation is free of charges. An average has been calculated in the last column

Table 7.5

Production cost per one ton in ten cotton-seed oil mills (Nos.1-10) (LS)

Item	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	Average Production cost
Raw material	22.677	20.000	29.415	22.240	27.750	21.322	18.960	24.790	21.453	22.064	23.041
Packing	1.419	1.440	1.465	1.690	1.262	1.398	-	2.384	0.097	0.312	1.147
Maintenance and spare parts	0.360	0.150	0.530	0.358	0.805	0.143	-	0.873	0.091	0.615	0.393
Other material	0.726	1.085	1.028	0.884	1.502	0.821	1.825	1.639	0.996	0.447	1.095
Power electricity and fuel	0.018	0.005	0.031	0.029	0.359	0.018	-	0.064	0.026	0.008	0.053
Contractors and sub-contractors	6.815	0.600	-	0.362	-	0.804	1.263	-	-	-	0.985
Other expenditure	-	1.235	1.855	4.452	0.696	0.446	1.375	2.299	4.627	0.438	1.742
Wages and salaries	3.122	1.005	2.494	2.776	3.210	2.053	2.600	6.557	0.835	0.775	2.543
Depreciation	0.441	0.550	0.842	0.943	0.511	1.429	1.913	0.958	1.922	0.624	1.013
Interests	1.647	1.500	1.153	0.832	0.914	3.214	0.400	4.684	1.229	0.985	1.656
Taxes and duties	0.169	1.200	-	0.102	-	-	-	0.021	-	-	0.149
Inventories etc	0.152	0.270	-	0.088	-	0.072	-	0.511	0.226	0.010	0.133
Total Production cost per ton	37.547	29.040	37.319	34.775	37.009	32.571	28.275	44.581	31.504	26.280	33.890

Source: IDCAS, Ibid., pp.74-89

Table 7.6

Average annual operating costs for processing one ton of cotton-seed (^{m}/m)*

Item	Actual average for three leading oil mills (^{m}/m ton)	Adjusted average (^{m}/m ton)
Management	119	72
Wages and salaries	2270	1842
Contractors	667	452
Power & electricity	79	504
Fuel	247	210
Chemicals	265	202
Maintenance and spare parts	435	387
Internal communication	220	95
Rent and taxes	96	78
Insurance	132	132
Interest	1563	1490
Depreciation	980	870
Other fixed expenses	110	80
Annual processing cost per one ton	7683	6414

* ^{m}/m - LS ^{1}/1000

Source: IDCAS, Ibid., p.136

togive a rough idea of the overall production cost which stands at nearly LS. 4.34 per ton of black cotton-seed. It is interesting to note that the cost of the main raw material input plus infreight cost of the material is almost 68 per cent of the total cost.

At this point we now turn our attention to the annual operating cost for the processing of one ton of cotton-seed, (Table 7.6). As with production cost there is the inevitable display of disparity for different mills. To arrive at a reasonable average the IDCAS report selected the leading three mills, and discarded the odd value from each item to produce an adjusted average. Thus the annual operating cost according to this procedure is LS. 6.414 per one ton of cotton-seed. If we add the average transport cost to operation cost we clearly see that transfer cost accounts for nearly one-fifth of the total operation cost.

7.5 Selection of Alternative Locations

The mere fact that a source-base industry like that of cotton-seed is primarily conducted at the Prime Base is an open invitation for testing theoretical alternative locations on the basis of the spread of the raw material. Six possible locations, including existing ones are chosen, Hassaheisa, Maringan, and Rabak are major ginning centres; Sennar and Port Sudan are small seed producing areas and finally the Prime Base by virtue of the existing concentr-tion (see Fig. 7.1). The choice of Port Sudan is mainly because of the growing specialisation in export cotton-seed oil, while it is the destination of all exportable oil (See Fig. 7.2).

7.6 Comparative Transfer Cost Analysis

The second part of this analysis is directly connected with

Fig. 7·1 TOTAL GINNING CAPACITIES AND PRODUCTION OF BLACK COTTON-SEED 1973

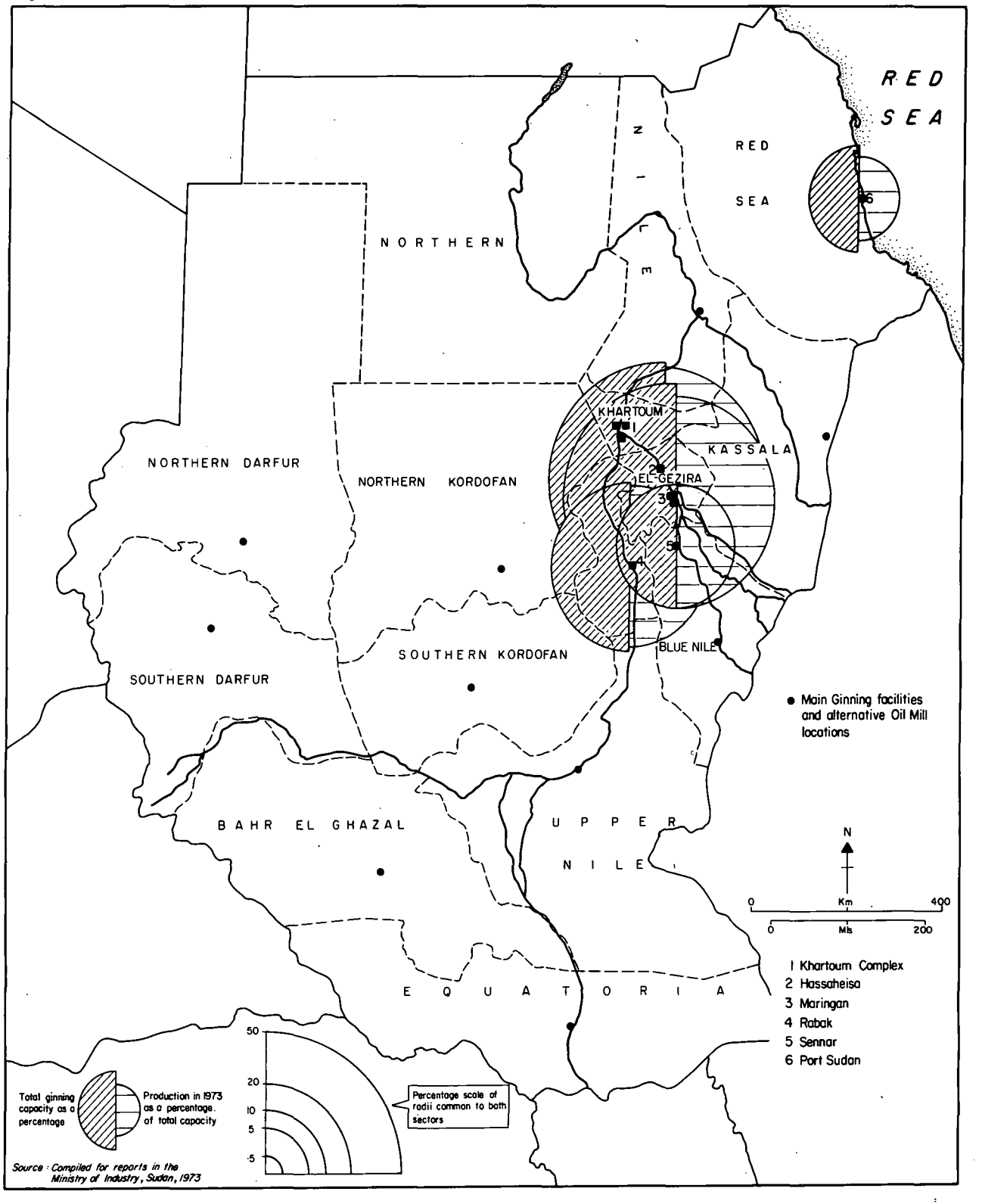
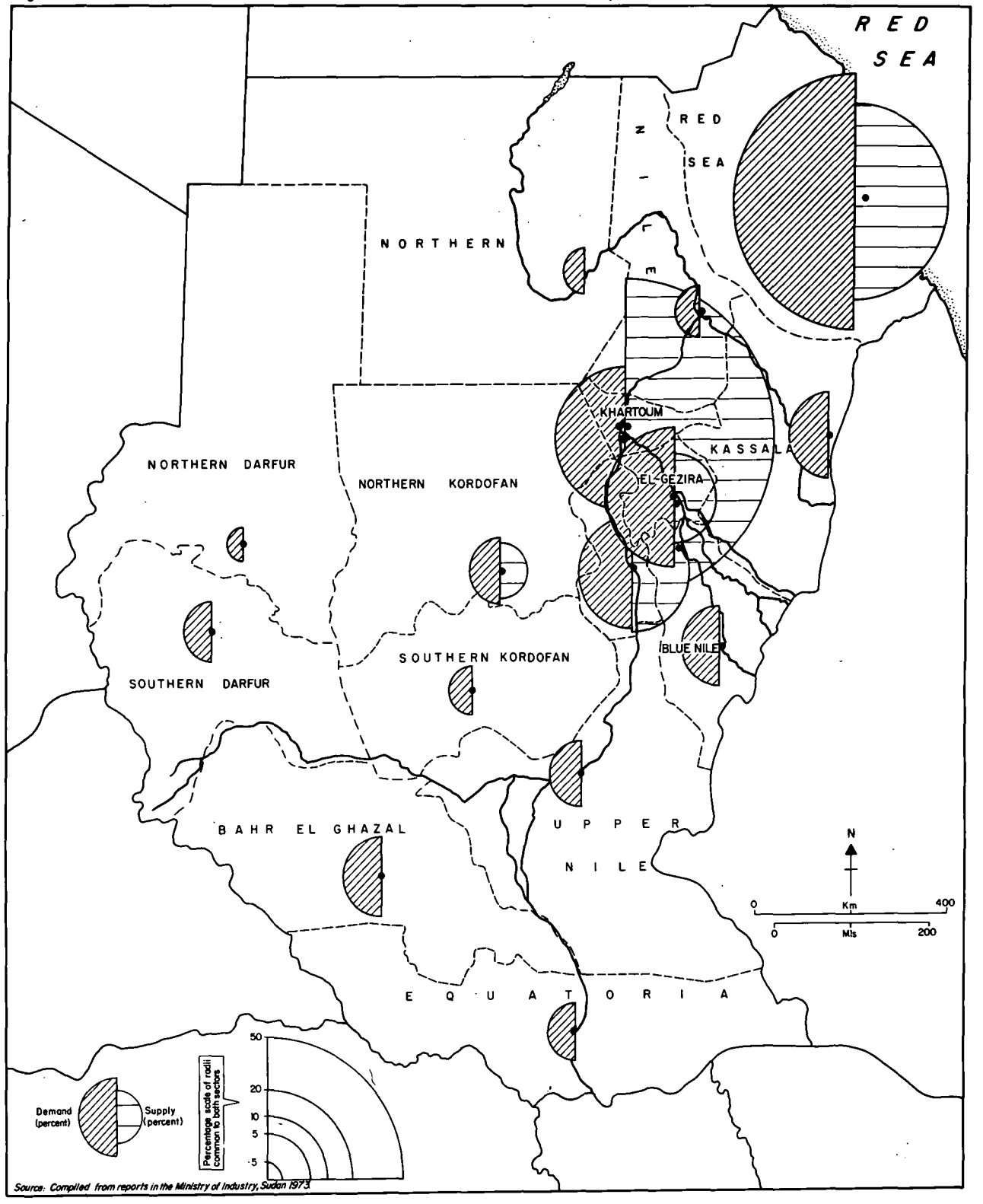


Fig.7·2 SUPPLY AND DEMAND OF COTTON-SEED OIL BY PROVINCE, 1973



Source: Compiled from reports in the Ministry of Industry, Sudan 1973

empirical research on the variability of transfer cost of raw material and distribution of output from the alternative locations chosen. Some comment is however needed, on how the figures of the tables below were arrived at. By necessity, too, some assumptions, and indeed some omissions were made:

7.6.1 Raw Material and Production

Although the country produces both black and white cotton-seed (the black cotton-seed produces more oil and needs no delinting) the industry depends mainly on the black variety. The small amount of white cotton-seed that enters the industry is ignored.

7.6.2 Freight rates and Mode of Transport

The main assumption made here is that it is cheaper and more convenient to trans-ship by rail rather than road. In fact all six localities under examination, and all but two of the secondary bases are well served by rail. The new Rail Freight Rates Book of 1974 is used for the calculations of transport cost of black cotton-seed, cotton-seed oil, caustic-soda and tin sheets.(9) A special cheaper rate for export-oil is possible to attain because tank wagons are used. For the transfer of oil cake calculation is based on the Freight Rate Book of 1959 in the absence of any specific rate in the new book.

7.6.3 Oil Production Coefficient

i. For convenience, the oil content of the black cotton-seed is calculated on the basis of the standard 17.5 per cent for oil and 80 per cent oil cake and 2.5 per cent wastage.(10) Obviously these percentages vary from one mill to the other according to the efficiency of the operation.

ii. It is also assumed that all mills will produce and trade in semi-refined oil.

iii. Accordingly the caustic soda requirements are calculated on the basis of one Kg per ton of cotton-seed. This figure is a rough estimate based on the needs of one factory.

iv. The most common form of packing is tin cans (capacity of 83 Kg). Evidently, it is cheaper to transport tin sheets than empty tins to inland destinations from the port (because of the redundant weight of the wagon load in the case of empty tins). Thus it is assumed that the manufacturing of tins takes place at or in the vicinity of the production location. Again a figure of 10 Kg per ton of cotton-seed is needed). (This estimate is based on one factory's requirement). No margin is made for the amount that would be exported in tanks.

7.6.4 The Demand Factor

i. Only one estimate for 1973 and 1974 nationwide consumption pattern is available.(11) However, the validity of these figures is doubtful as they are based on the gross average rural and urban consumption produced by the Household Sample Survey 1967-68. Each province's population as in 1973 is multiplied by the same two averages. The alternative adopted here is probably more reliable. The same 1967/68 Household Sample Survey is used as the base.(12) Thus actual expenditure by each household in 1968/68 is multiplied by the natural increase as attained by the 1973 census. Then the consumption values were converted into amounts by

using 1967/68 cotton-seed prices in each province (Khartoum ex-factory plus transport cost to the provincial centre).

ii. One item of consumption is missing in the calculations of the Ministry of Economics and Trade and that is the amount consumed by soap manufacturing. To arrive at this figure the actual soap production in 1973 is converted into its original oil content. A figure of 37 per cent is produced by laboratory analysis.(13) However, the cotton-seed oil requirement of soap is held constant by assuming that the main producing area will be the location of the soap industry. In only one case the Prime Base was assumed, as is probably true, to be the main market for oil needed for the manufacture of soap.

7.7 Hypothetical Development

In the rest of this chapter the locational analysis will seek a solution within the framework of four different postulates beside the actual locations of the cotton-seed industry. The first two are hypothetical situations where a threshold factory of an annual processing capacity of 7,500 tons of cotton-seed is examined. Another factory of an annual capacity of 250,000 tons is alternatively examined. The first figure is based on the capacity of the smallest operating factory, while the other accords with existing Prime Base's capacities. In the latter case only the two main raw material sources are examined. For both cases, out-bound freight corresponds to per cent provincial consumption.

In the third case one location to process and supply the whole country is to be decided according to the least-cost model. The

actual transport-cost for the existing production and distribution system is projected in case four. Case five seeks the optimum transfer of raw material and output within a theoretical framework.

In all cases the oil cake consumption is based on the actual export figure as it stood in 1973, plus the previously assumed pattern of local consumption.

7.7.1 Least-cost Location: Case One

Taking into account the six alternative locations previously selected, we now consider the first hypothetical situation of processing 7,500 tons of cotton-seed.

7.7.1.1 In-freight Bills

With the exception of the Prime Base, all other five locations could provide locally the cotton-seed needed for the capacity specified above. Total in-freight bills are summarised in Table 7.7.1. As the Prime Base is the only location which incurs raw material transfer costs and assuming that it will be provided from the nearest raw material source, we notice that the transfer expenses raises the in-freight cost to more than double that of Maringan, Hassaheisa or Sennar. More interesting however, is that Port Sudan will incur no in-freight cost on packing material and caustic soda as they are both imported through the port.

When considering the out-freight cost for both oil and oil cake, it is evident that Port Sudan incurs high inland distribution costs. On the other hand high consumption of oil cake at the Prime Base pushes down the outward transfer costs, and consequently the overall out-freight cost to become the lowest distributing location (see Table 7.7.2).

Table 7.7.1

In-freight bills per 7500 tons of cotton-seed (LS)

Locations	Cotton-seed	Tin sheets	Caustic soda	Total
Khartoum	12000.00	427.50	87.25	12514.75
Maringan	-	495.00	104.25	599.25
Hassaheisa	-	472.50	99.0	571.50
Rabak	-	592.50	123.75	716.25
Sennar	-	525.00	114.00	639.00
Port Sudan	-	0.00	0.00	0.00

Rail Transfer Cost 1 ton/100 Km LS 0.8

Table 7.7.2

Out-freight bills per 1312.5 tons of cotton-seed oil and 60000 tons of oil cake (LS)

Locations	Cotton-seed oil	Oil cake	Total
Khartoum	5470.89	7994.85	13465.74
Maringan	5497.57	11638.00	17135.57
Hassaheisa	5608.99	11322.00	16930.99
Rabak	5917.34	13456.30	19373.64
Sennar	5617.40	11020.50	16657.90
Port Sudan	5830.23	13330.60	19160.83

Transport cost per ton/100 Km

Cotton-seed oil - LS 0.8

Oil cake - LS 0.5

Table 7.7.3

Total freight cost (LS)

Locations	In-freight	Out-freight	Total
Khartoum	12514.75	13465.74	25980.49
Hassaheisa	599.25	17135.57	17734.82
Maringan	571.50	16930.99	17502.49
Rabak	716.25	19373.64	20089.89
Sennar	639.00	16657.9	17296.90
Port Sudan	00.00	19160.83	19160.83

The aggregate transfer costs are given in Table 7.7.3. Sennar records the lowest total transfer and Hassaheisa the second, only a few hundred pounds costlier than Sennar. The cost incurred at Khartoum is nearly LS 9000 more than the least cost location.

However, we know that the annual production of cotton-seed and cotton-seed oil is far beyond that threshold capacity and involves in practice a lot more movement of raw material if it is to be processed in one or more places.

7.7.2 Case Two: Khartoum versus Hassaheisa and Maringan

A more realistic approach is to show an approximation of the saving on transport cost when processing at the raw material source. The transfer cost likely to be incurred at Khartoum when processing 250,000 tons is now compared with a hypothetical situation where it is assumed that processing of the same amount is carried out at the two main material centres alternatively. This is achieved in Tables 7.8.1, 2 and 3, for in-freight, out-freight and the assembly cost respectively.

Although Khartoum's location is slightly less costly on out-freight, great economies are attained in Hassaheisa and Maringan on in-freight bills. The total difference between Khartoum and Hassaheisa reaches about LS 111,115 annually (fumigation cost at LS. 87,500). It might be mentioned that there could have still been further saving if the unnecessary two traffic transfers of raw material is avoided by locating at both Hassaheisa and Maringan.

7.7.3 Case Three: The Actual Assembly and Distribution costs

If one considers the 'actual' processing locations and cotton-seed production areas one can easily calculate the transfer cost of

Table 7.8.1

In-freight bills per 250000 tons of cotton-seed (LS)

Locations	Cotton-seed	Tin sheets (packing)	Caustic soda	Total
Khartoum	448000.00	14250.00	2925.00	465175.00
Hassaheisa	132000.00	15750.00	3300.00	151050.00
Maringan	143000.00	16500.00	3475.00	162975.00

Transport cost per ton/100 Km as in Table 7.7.1

Table 7.8.2

Out-freight bills per 43750 tons of cotton-seed oil (LS)

Locations	Cotton-seed oil	Oil cake	Total
Khartoum	182362.80	166495.00	448857.80
Hassaheisa	186967.30	377400.00	564367.30
Maringan	183252.66	387933.32	571186.00

Transport cost per ton/100 Km as in Table 7.7.1

Table 7.8.3

Total freight bills (LS)

Locations	In-freight	Out-freight	Fumigation cost	Total
Khartoum	465175.00	448857.80	-	914032.80
Hassaheisa	151050.00	564367.30	87500	802917.30
Maringan	162975.00	571186.00	87500	821661.00

the main inputs as in Table 7.9.1. Considering the transfer cost likely to be incurred by the industry according to the available material and capacities in 1973,(14) it will be found that the in-freight cost for the three main inputs is LS. 927,268.2, (details in Table 7.9.1).

As there is a high concentration of cotton-seed oil in the Prime Base (about 61 per cent), almost all out-freight will be heading to the various provinces plus the export consignment. Oil cake will be distributed according to the assumption already made, that is in line with existing regional capacities. (For edible oil distribution consult Table 7.10 and Fig. 7.3). The annual total transfer cost (including packing caustic soda and fumigation), as shown in Table 7.9.3 is about LS. 1,328,034.8 This figure will later be compared with the optimum solution figure.

7.7.4 Case Four: A Single Location

In a manner similar to the previous procedure and with the same data we now assume that the whole industry would be carried out at one locality; the six alternative locations were in turn considered to determine the least-cost location. The assembly cost of the main inputs is shown in Table 7.11.1. As before, the transferable cotton-seed is the actual production for 1973 of 380,000 tons. Maringan (Medani) records the lowest in-freight cost and in fact only slightly less than that of Hassaheisa. The striking feature of the in-freight bill is the exceedingly high transfer cost incurred at Port Sudan; reaching more than LS. 2,000,000. Although Khartoum is in a far better position it is still LS. 373,150 costlier than the least in-freight cost location.

Table 7.9.1

In-freight bills (actual capacities in tons) (LS)

Locations	Cotton-seed	Tin sheets (packing)	Caustic soda	Total
Khartoum	407444.00	13363.10	2727.30	423534.40
Medani	-	1228.70	3258.70	4487.40
Rabak	-	2582.50	3868.30	6450.80
Port Sudan	479083.00	-	-	479083.00
El-Obeid	13259.00	401.3	83.80	13712.60
		Total in-freight cost		927268.2

Transport cost per ton/100 Km as in Table 7.7.1

Table 7.9.2

Out-freight bills per ton (LS)

Location	Cotton-seed oil	Oil cake	Total
Khartoum	104238.40	285882.70	390121.10
Medani	-	-	-
Rabak	6508.00	-	6508.00
Port Sudan	-	-	-
El-Obeid	-	-	-

Transport cost per ton/100 Km as in Table 7.7.1

Table 7.9.3

Total freight bills (LS)

Locations	In-freight	Out-freight	Fumigation cost	Total
Khartoum	423534.40	390121.10	-	813655.50
Medani	4487.40	-	4137.50	8624.90
Rabak	6450.80	6508.00	-	12958.80
Port Sudan	479083.00	-	-	479083.00
El-Obeid	13712.60	-	-	13712.60
		Total Flow system		1328034.80

Table 7.10

Cotton-seed oil supply and demand* (Tons per Annum)

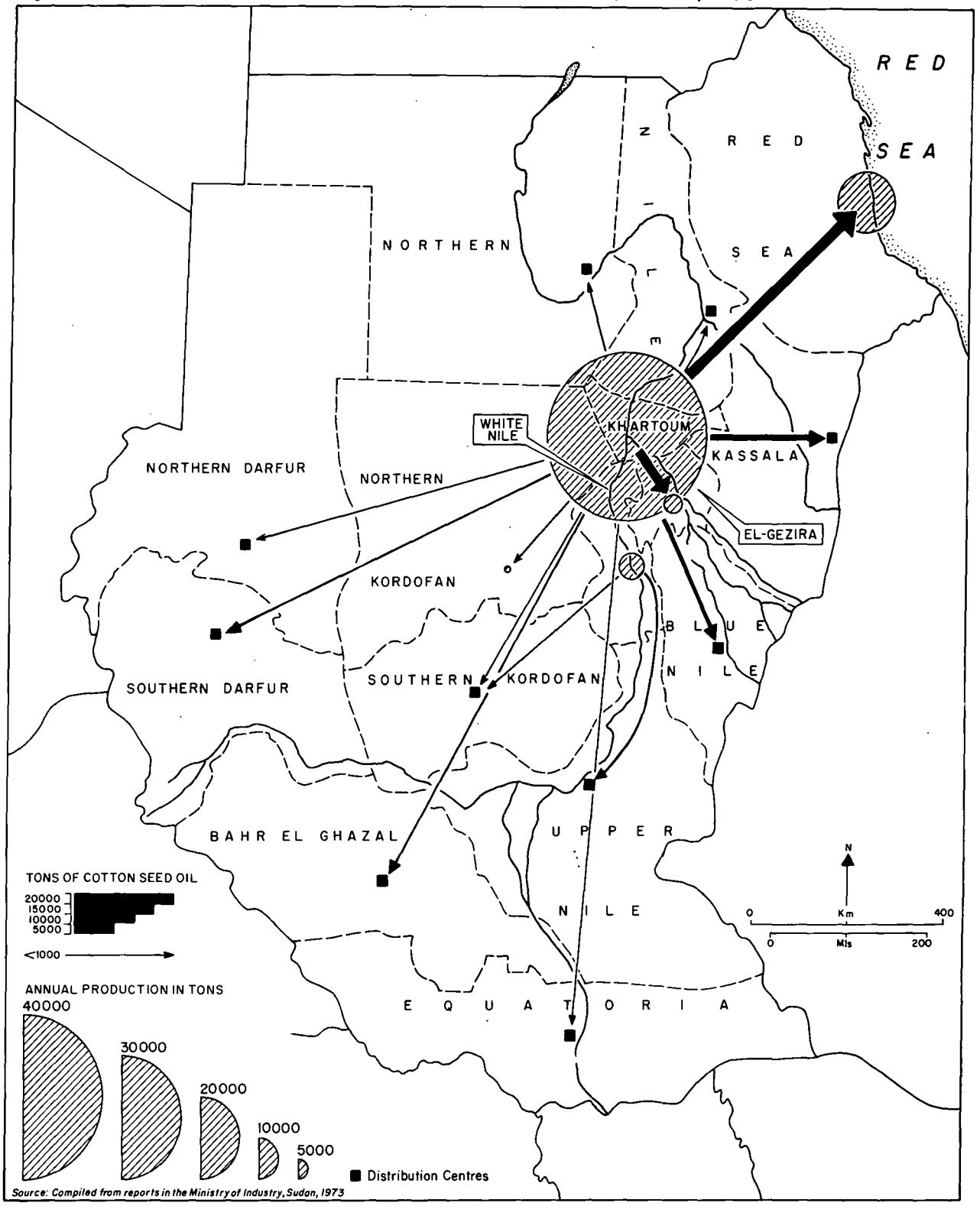
Provinces	Demand**	Supply	Surplus or deficit
Kassala	2314	-	-2314
Red Sea	20652	15550	-5102
Nile	846	-	-846
Northern	608	-	-608
Gezira	6340	3310	-3030
Blue Nile	1819	-	-1819
White Nile	3810	5720	+1910
Khartoum	6276	41026	+34750
Southern Darfur	1128	-	-1128
Northern Darfur	319	-	-319
Northern Kordofan	1279	889	-390
Southern Kordofan	702	-	-702
Baher El Ghazal	1778	-	-1778
Equatoria	950	-	-950
Upper Nile	1306	-	-1306
Total	48821 ~~30325~~	66495	

* Cotton-seed oil for soap manufacturing is not accounted for (see text).

** Demand figures are estimates based on the 1967/68 Household Sample Survey, and population in 1973.

Source: Supply figures obtained from Ministry of Industry and Mining, A memorandum on the basis of cotton-seed allocation to oil mills, Khartoum, 1973.

Fig.7-3 ACTUAL DISTRIBUTION FLOWS OF COTTON-SEED OIL (IN TONS) 1973



However, the out-freight bills as read off Table 7.11.2 reflect a different picture where distribution cost is lowest at the Prime Base. The total transfer cost is clearly in favour of Hassaheisa, though Maringan is still very competitive (see Table 7.11.3). It should however, be mentioned that extra expenses on methyl bromide fumigation of the cotton-seed in localities within the irrigated Gezira, were added at the rate of P.T.35 per ton, (this figure is multiplied by 62.5 per cent of the amount of cotton-seed processed as it is pertinent to assume that the other portion would normally be processed before the deadline of mid-June referred to above).

Now comparing the least-cost location in this one location analysis with the figures for the actual situation as computed above (Case 3), it could clearly be seen that the latter is even slightly more favourable than the theoretical least-cost location (a difference of about LS 40,000).

7.7.5 Case Five: Optimum Location

The result arrived at above leads us to an alternative theoretical consideration where production of the cotton-seed is assumed to be carried out at the various material sources and distributed thence to demand areas. Output distribution would have been more precise, had it been possible to use a computerised linear programming solution. However, manual processing was preferred for the simple nature of the calculations and the direct single mode of transport assumed. Knowing the production and consumption patterns from the preceding analysis, it is now easy to chart the optimum regional flow-system, see Fig.7.4. It should be restated that exportable cotton-seed oil and oil cake are taken to be consumed at

Table 7.11.1

Annual In-freight bills per 380000 tons of cotton-seed (LS)

Locations	Cotton-seed	Caustic soda	Packing	Total
Khartoum	831000.00	4446.00	21660.00	857106.00
Hassaheisa	455000.00	5016.00	23940.00	483956.00
Maringan	452000.00	5282.00	25080.00	482362.00
Rabak	707000.00	6270.00	30020.00	743290.00
Sennar	588000.00	5776.00	26600.00	620376.00
Port Sudan	2273000.00	-	-	2273000.00

Transport cost per ton/100 Km as in Table 7.7.1

Table 7.11.2

Out-freight bills for annum per 66495 tons of cotton-seed oil (LS)

Locations	Cotton-seed oil	Soap oil	Export oil	Oil cake	Total
Khartoum	110628.80	-	98238.00	405047.20	613914.00
Hassaheisa	105159.30	26188.80	111129.00	558338.60	800815.70
Maringan	97283.50	32736.00	112614.00	589623.20	832256.70
Rabak	99439.10	45830.40	126990.00	681740.90	954000.40
Sennar	98661.80	37646.40	118159.00	675373.80	929841.00
Port Sudan	200421.70	86750.40	-	573612.00	860784.10

Transport cost per ton/100 Km as in Table 7.7.1

Table 7.11.3

Total freight bills and seed fumigation cost (LS)

Locations	In-freight	Out-freight	Seed fumigation cost	Total
Khartoum	857106.00	613914.00	-	1471020.00
Hassaheisa	483956.00	800815.70	83.125	1367896.7
Maringan	482362.00	832256.70	83.125	1397743.7
Rabak	743290.00	954000.40	-	1697290.40
Sennar	620376.00	929841.00	-	1550217.00
Port Sudan	2273000.00	860784.10	-	3133784.10

Port Sudan. It is further assumed that Medani would be the locale of soap manufacturing.

For in-freight bills, the cost of tin sheets and caustic soda was calculated for four of the five major black cotton-seed producers (see Table 7.12). It is noticeable from Table 7.12 that Port Sudan is likely to incur no expenses neither on these two items, nor on out-freight, and was mainly included to reflect the contrast to earlier tabulations.

An attempt is made to chart the flows of the cotton-seed oil from surplus areas to 'deficit' areas through the least transport-cost surface (see Fig.7.4). It might be expected that Rabak with a total annual production of 12,250 tons of oil would likely supply the White Nile, the western and southern regions, at a cost of around LS.40,200. Likewise, Hassaheisa, the largest producer, would supply Port Sudan, the bulk of Khartoum needs and the northern provinces more economically. This amounts to LS.109,472.6. Although Maringan is the second producer, the whole production of 21,000 tons of oil would be consumed locally with still a deficit to be satisfied from the nearby mills of Sennar. Kassala Province and indeed the Blue Nile province, would be supplied by Sennar, and the small surplus would be passed to Khartoum. The whole oil flow system cost would likely be in the region of LS.163,000.

Based on the assumptions already made about the consumption pattern of oil cake, the flow cost of this product from the various locations of production is even higher than when production is carried out at the Prime Base (see Tables 7.11.2 and 7.12). Nonetheless, the economies made by the optimum flow system is best appreciated when the overall freight cost is considered. A saving of about

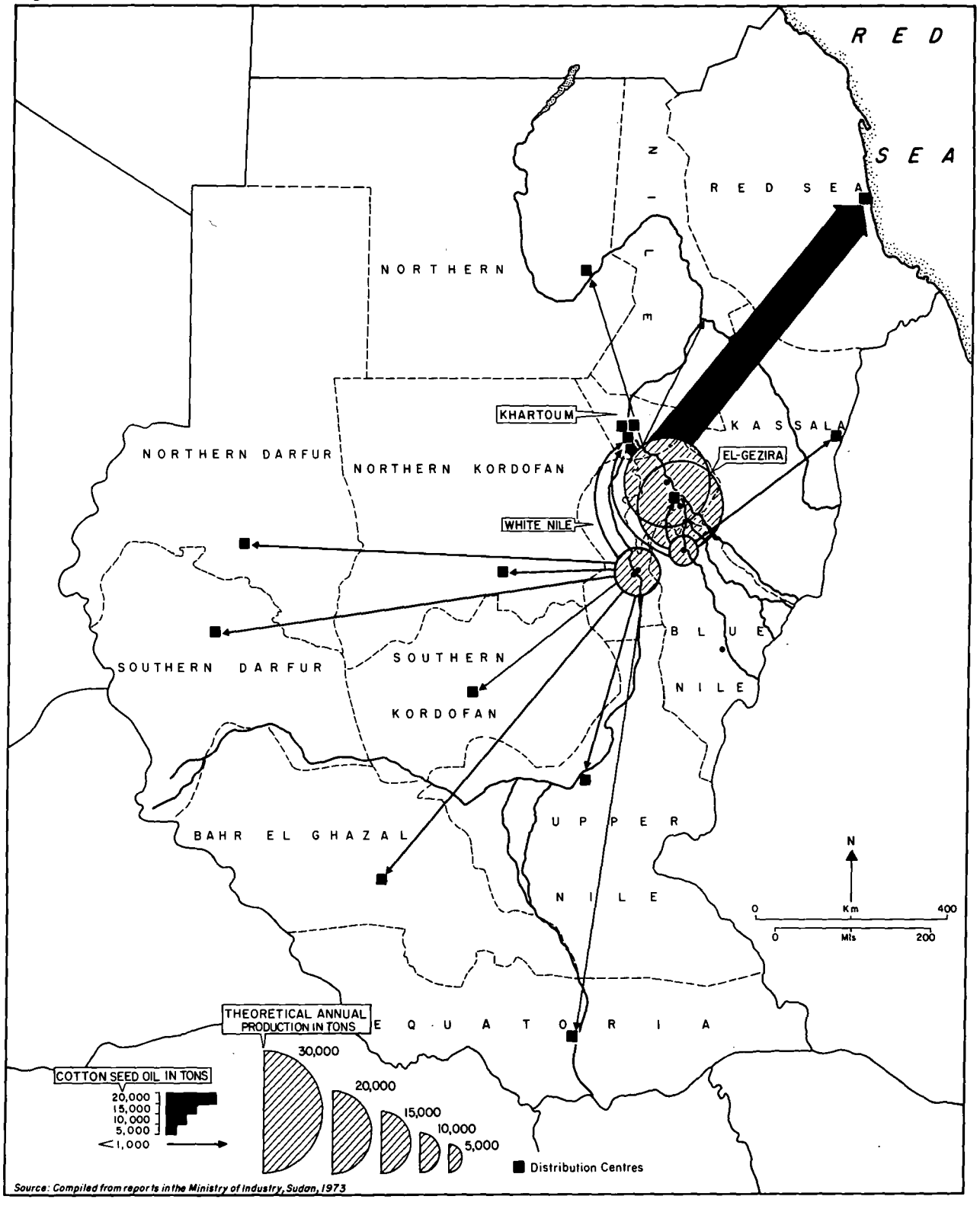
Table 7.12

In-freight, out-freight and total freight bills per annum for material-oriented production (LS)

Locations	In-freight		Out-freight		Fumigation cost	Total freight
	Tin sheets	Caustic soda	Oil	Oil cake		
Hassaheisa	8190.00	1716.00	109472.60	333420.78	4921.87	457721.25
Maringan	7920.00	1668.00	-	88953.70	4593.75	103135.45
Rabak	5530.00	1155.00	40278.40	51194.22	-	98157.62
Sennar	2800.00	608.00	12983.70	42240.00	-	58631.70
Port Sudan	-	-	-	-	-	-
Grand Total	2444.00	5147.00	162734.70	515808.70	-	717646.02

Transport cost per ton/100 Km as in Table 7.7.1

Fig.7·4 OPTIMUM DISTRIBUTION FLOWS OF COTTON-SEED OIL(IN TONS) 1973



LS. 610,388.8 could annually be made - after deducting the fumigation expenses at an average annual cost of LS. 9,515.6 - compared to the actual location system.

7.8 Conclusion

From the preceding discussion one should accept the hypothesis made about the sub-optimality of present concentration of the cotton-seed industry on the premise of least-transport-cost consideration. The unnecessary expenditure of more than LS. 600,000 likely to be incurred annually by this industry is particularly significant in a developing economy. The susceptibility of the cotton crop to diseases has for long precluded any attempts at cotton-seed processing in the Gezira. As already shown, the advances in the chemical industry and the low cost of fumigating the seed would clearly allow processing of the seed in the Gezira. Hassaheisa, the main centre of the Gezira ginning mills, emerges as the least-cost location when compared with the Prime Base, a difference of more than LS. 111,000. The question that immediately springs to mind, and one cannot attempt to fully answer here, is whether it is feasible to relocate the whole industry in compliance with these results? For one thing the figures attained here are only tentative; some omissions were necessary. Also, the non-availability of data on relocation costs is a difficulty. The results obtained here are only a hint that opens up the question of re-evaluation and relocation for serious debate and appraisal. Indeed, the promise of a least-cost solution is persuasive, especially for a centrally oriented government.

The exclusion of labour cost could prove to be a serious omission, especially skilled labour and management costs in the

light of recent trends towards modernisation. On the other hand, the availability of cheap labour supply at the growing areas and ginning mills is a great incentive to relocate at the material sources. By the extensive nature and periodicity of these practices (cotton growing and ginning), labour is redundant for a good part of the year. If the under-utilisation of the oil mills is a fact to be lived with (the country needs to produce an extra 275,000 tons of cotton-seed on top of the present annual production of 400,000 tons merely to utilise fully the existing milling capacities),[15] then it is prudent to inquire into the possibility of avoiding underemployment at least partially, on the two levels. Yet more, a move towards the provincial and rural centres would only be in the direction of regionalisation strongly encouraged by the 1974 Industrial Act.[16]

Another matter worthy of contemplation is for the Gezira tenants' co-operative societies to embark on a scheme to process their own cotton-seed. The recent success that met their efforts on flour milling is unprecedented. The tenants, by the 'ownership' right of the cotton-seed should have first priority, thus widening their margins of profit. This action would also meet the aspiration of introducing mixed farming in two ways; by creating extra jobs and surplus money, and by utilising locally the vast amounts of oil cake.

However, this should not distract us from the basic argument of profit maximisation. With locational interdependence, where demand vary in space, it is easy to appreciate that the least-cost location does not necessarily maximise profit. The interpretation of factors concomitant with the Prime Base (even to the exclusion of externalities and inter-linkages) as analysed above, would

evidently yield more profit, away from the least-cost location. The incompatibility between the location of maximum profit and least-cost is duly shown by the vast cost gap of processing available local material at Port Sudan and importing raw material from inland sources. Nevertheless, Port Sudan maintains a successful and possibly the most profitable operation of cotton-seed processing. Accordingly, any enactments to encourage the dispersion of industry might not bring about immediate results, and might well fail to halt the powerful momentum of the present system and the inertia of the present agglomeration.

The deductive explanatory approach adopted earlier on in Chapter Four and consolidated in the first half of this discussion is complemented by the deterministic testing of the least-cost to provide a secular framework for decision-making. In the process, the Prime Base Theory emerges as a powerful explanatory paradigm that aids understanding of industrial localisation even though classic location theories would suggest otherwise.

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CHAPTER EIGHT

RESOURCES AND PROSPECTS OF INDUSTRIAL LOCATION DYNAMICS

8.1 Introduction

The foregoing historical, theoretical and empirical account of industry and industrial location affords most essentials for the perception of future patterns and trends in industrial location. It is anticipated however, that the impact of the effective mobilisation of agricultural resources on industrial location will be to reshape industrial location patterns, distribution and structure to comply with priorities, capacities and the resultant regional growth and regional disparities. The course of action already adopted in the previous and current development plans (1970/1 - 1974/5 and 1977/8 - 1982/3) to promote agro-based industry is probably the most appropriate of all options to regional industrial growth. Yet, emphasis on natural resource utilisation may further advance the pre-eminance of the Prime Base industry as long as the economic system is subjective in nature and trapped in existing price policies, marketing, and even, income distribution.

A schematized analysis of natural resources on a regional basis follows to verify the relationship between natural endowment, equity, industrial activity and location. It is hoped that this analysis will prove to be of some predictive value, and is therefore deferred to the closing stage.

8.2 Industrial Location Dynamics and Resource Distribution

The regional imbalance clearly exemplified in the pattern and distribution of industry, and the varying levels of income and services between Prime Base and periphery has not yet been fully

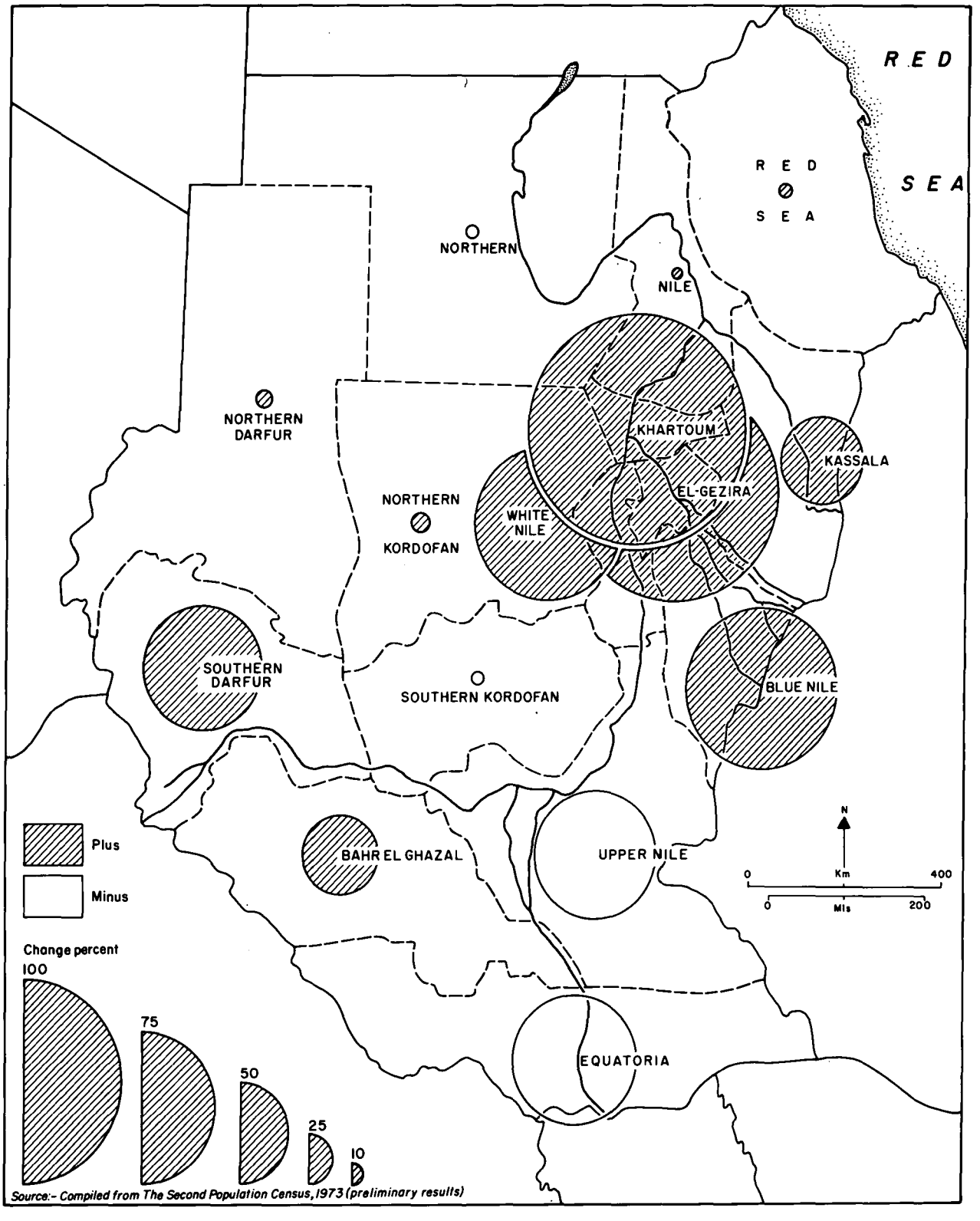
examined with specific reference to the country's natural resources. Up to now natural resources seem to bear no direct influence on entrepreneurs' location decisions. It is influences such as those mentioned earlier (Chapters Two, Three and Four) that stress the failure of the economic system to mobilise available resources and positively attract the traditional sector into the economic system. This realisation may well be a starting point for future strategies of economic development and in the process may affect industrial location dynamics and regionalism.

8.2.1.1. Population Change

The preliminary results of the second population census, 1973, provide for the first time an inter-censal comparison. However, one should always keep in mind the basic procedural differences between the two censuses: while the 1955/56 census used the dejure approach where each individual is recorded according to the usual place of residence, the second was a defacto enumeration, i.e. each individual is recorded wherever he happens to be at the time of the census. Nonetheless, this inconsistency alone does not explain the wide gap between the actual figures of 1973 and estimates for the same year which were based on the 1955/56 census. In fact, the wildness of this disparity was, on occasion, a great embarrassment to the central government. National planning and claims on international grants, aid and borrowings were apparently initially based on higher estimates of rates of population growth.

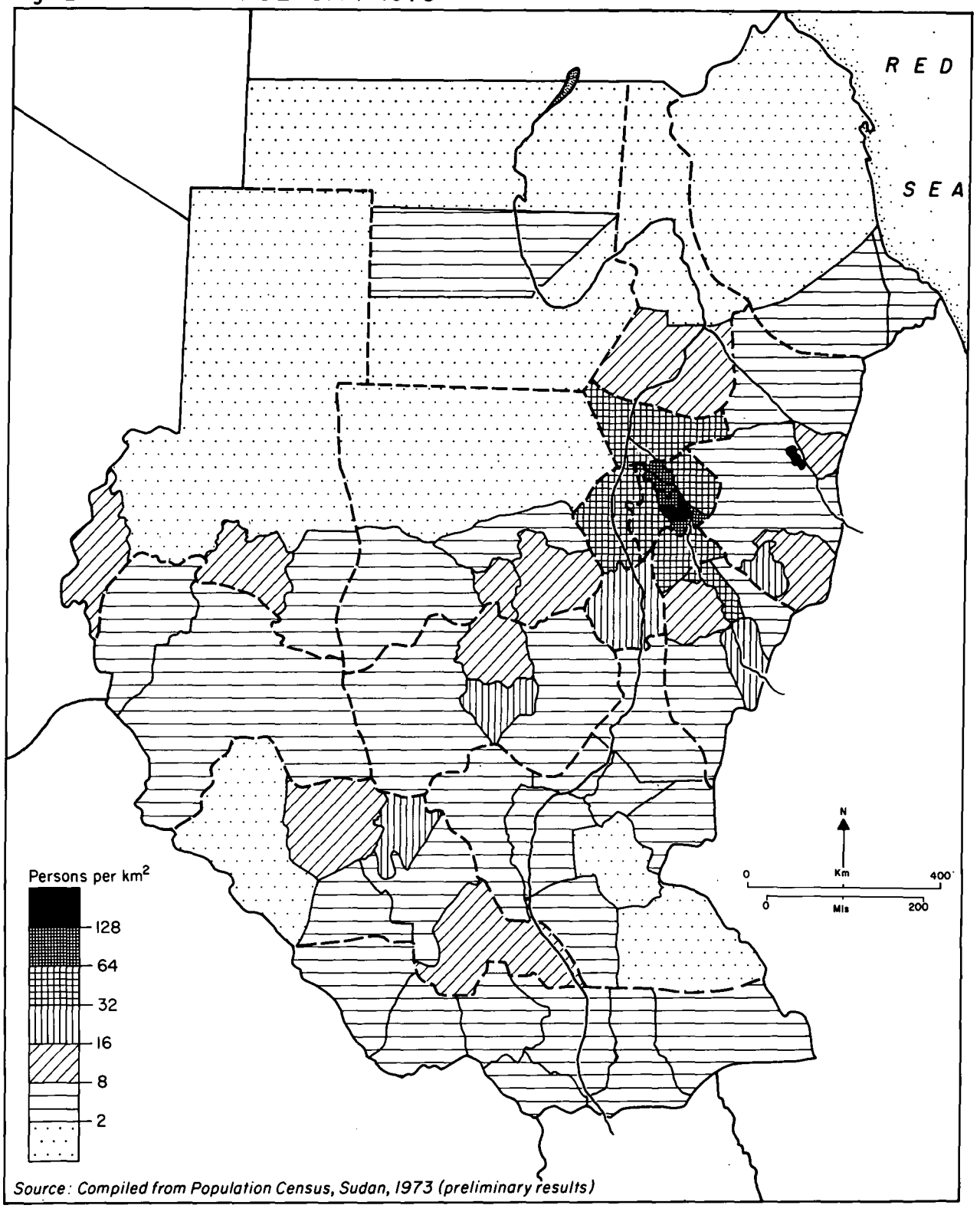
The difference between the population growth rates of provinces in the inter-censal period (1955/56-1973) is very great. Of special relevance to the industrial location analysis is the high annual population increase in the central provinces of Khartoum, Gezira, Blue and White Niles (see Fig. 8.1). The economic activity

Fig.8·1 POPULATION CHANGE BY PROVINCE PERCENT, 1955/56 – 1973



Source:- Compiled from The Second Population Census, 1973 (preliminary results)

Fig.82 POPULATION DENSITY 1973



Source: Compiled from Population Census, Sudan, 1973 (preliminary results)

of the Prime Base and the modern agricultural practices of the Gezira and adjacent riverain lands of the White Nile is quite distinct from the rest of the country and is characterised by lower infant and pre-natal mortality and higher population density (see Fig. 8.2).

Inter-regional migration is another guide to growth regions and future economic change. It is in Khartoum and the Gezira that the extent of immigration becomes of special value to industrial location. About two-thirds of the internal migration heads to this central region (30.1 per cent to Khartoum and 33.5 per cent to the Gezira, see Table 8.1).* However, one characteristic special to this latter province is that outward movements make up to 11.4 per cent of the total internal immigration, twice as much as the share of Khartoum. The economic structure of a 'pulling' province satisfies the expectations of a range of migrants. At the same time the economic health of a 'pushing' region largely determines destination of outward immigrants. Thus migrants from the modern agricultural sector of the Gezira seek jobs in the Khartoum conurbation. Conversely, Kordofan migrants who move to Khartoum from a predominantly traditional sector are probably accommodated within the lower grades of the secondary and tertiary sectors. This dynamic process of sorting and grading, rearranges skills and incomes in a spatial context, because of the varying economic opportunities and production systems, in a way detrimental to future development and locational change.

While national planning, regional policy and industrial location and relocation are permanently influenced by the unemployment problem in the 'developed' countries,(2) these aspects of development have no direct consideration to unemployment in Sudan. More often, unemployment statistics encompass a marginally low ratio of the real

*The figures given in the Six Year Plan, 1977/78-1982/83 are 30.6 and 29.6 per cent for Khartoum and the Blue Nile Provinces respectively.(1)

Table 8.1

Sudan: Per cent distribution of population by province*of birth, and province of enumeration, 1973

Province of Enumeration / Province of Birth	Red Sea	Baher el Ghazal	Blue Nile	Dar Fur	Equatoria	Kassala	Khartoum	Kordofan	Northern	Upper Nile	Total population per cent
Red Sea	80.99	0.15	0.13	0.07	0.13	1.12	0.43	0.07	0.39	0.05	2.38
Baher el Ghazal	0.17	97.54	0.14	0.36	0.61	0.12	0.73	0.49	0.07	0.57	10.47
Blue Nile	0.92	0.09	85.21	0.38	0.29	3.15	6.37	1.06	0.60	1.80	23.46
Dar Fur	0.48	0.45	4.18	94.45	0.43	3.60	4.25	1.82	0.25	0.60	14.83
Equatoria	0.13	0.28	0.09	0.05	87.78	0.13	0.67	0.24	0.07	0.47	5.20
Kassala	1.44	0.01	0.56	0.10	0.10	80.60	1.07	0.14	0.67	0.06	5.48
Khartoum	1.41	0.15	0.90	0.22	0.35	1.43	60.30	0.58	0.88	0.38	5.71
Kordofan	1.97	0.28	4.91	1.32	1.14	1.93	11.29	94.05	0.79	4.64	15.16
Northern	11.15	0.08	1.72	0.17	0.42	3.52	11.31	0.55	95.56	0.37	9.34
Upper Nile	0.10	0.11	0.25	0.02	1.13	0.12	0.82	0.15	0.12	90.81	5.91
Province not stated	0.23	0.80	0.22	0.26	0.61	0.13	0.18	0.24	0.03	0.10	0.27
Other continents	1.01	0.06	1.69	2.60	7.00	4.04	2.60	0.63	0.57	0.14	1.77
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Provincial divisions before 1974

Source: Statistics Department, The Second Population Census, Sudan, 1973, (Preliminary results), Khartoum, 1973.

unemployed because of imprecise information, disguised unemployment in the agricultural sector, low female activity rates especially in the urban areas, and over-employment or under capacity in the manufacturing and service sectors. Thus the unemployment figure of 6.3 per cent for Sudan in 1973 invites no serious consideration and probably the real extent of the problem is buried in the complex of social and economic structures.(3) The exceptionally high unemployment in the case of the three southern provinces is obviously boosted by thousands of returning refugees in 1972, the prolonged stand-still of the economic machinery, and the high rate of urbanisation, related to insecurity. For these reasons unemployment in the south is largely a measurable phenomenon.

8.2.1.2 Urban Population Growth

The national definition of what is urban is an arbitrary minimum of five thousand persons plus a discretionary margin to include administrative and market centres under this limit. According to this imprecise definition, the urban population of Sudan has shown a remarkable growth rate during the inter-censal period from 8.3 per cent in 1955/56 to 17.4 per cent in 1973.(4) The most conspicuous feature of urban growth in Sudan is the integration of provincial areal units into the broader regions of the south, centre and north which closely relate to the pace of economic development, political stability, or the lack of it, and potential for economic exploitation.

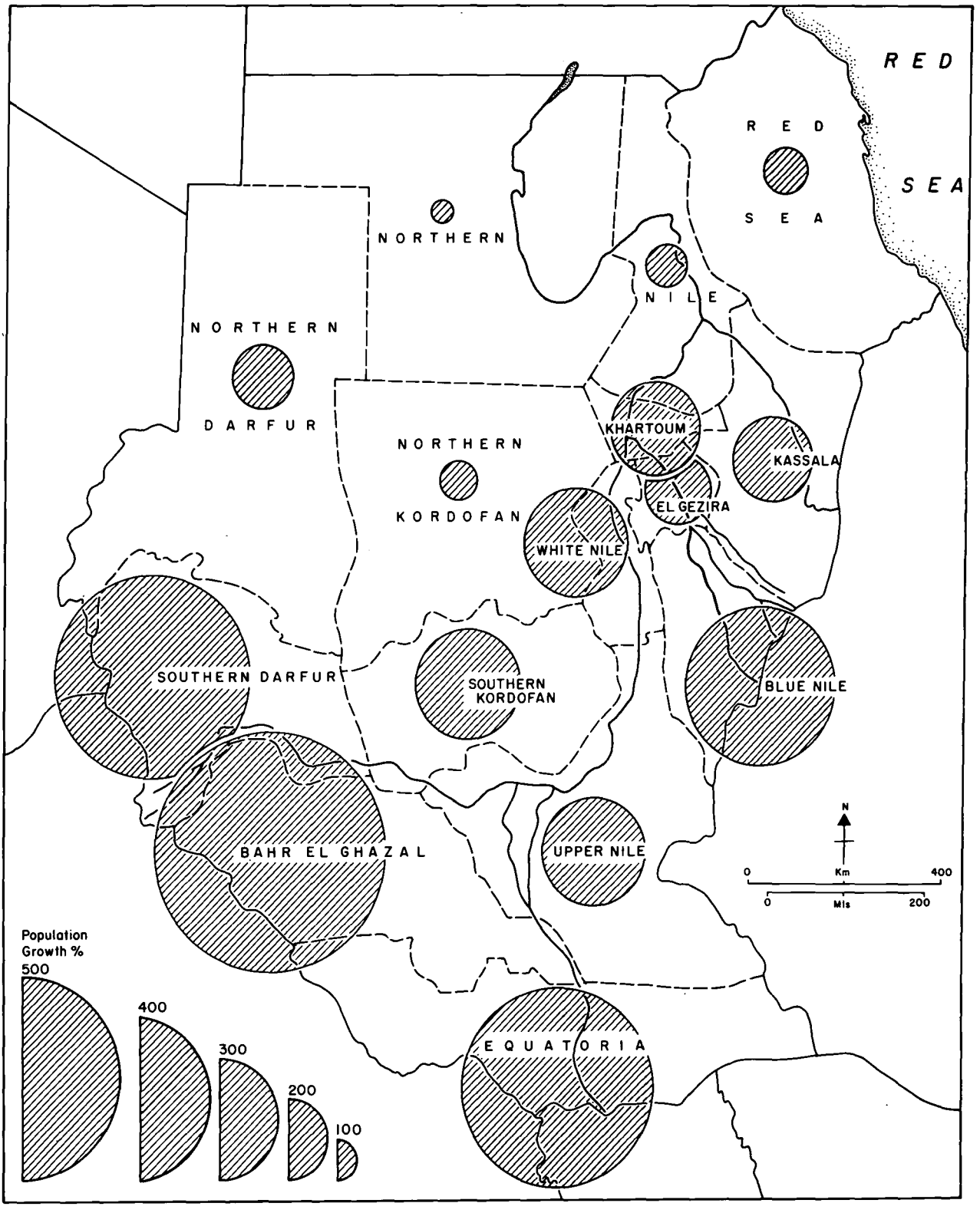
The southern part of Sudan (including Southern Dar Fur, Southern Kordofan and the Blue Nile, as well as the three southern provinces), has certainly witnessed the most significant urban population growth relative to the country as a whole, at an average rate of 9.4 per cent in the inter-censal period (1955/56 - 1973), and hence appears to have a higher proportion of the country's urban population in the order of 24 per cent in 1973 as against 14 per

cent in 1955/56 (see Fig. 8.3). Two factors were probably responsible for this urban population upsurge.

Firstly, the prolonged political unrest in the three southern provinces has created a deep sense of insecurity that has driven many of the rural population to the more secure district and provincial headquarters. From the history of African urbanisation, tribal warfare was one of the strong factors that grouped people together in indigenous agglomorations such as those of the Yoruba in Western Nigeria. A lively example from South East Asia is the exodus of rural population to Saigon during the recent Vietnamese War. Moreover, it should be emphasised that the enumeration of 1973 had just coincided with the rush of refugees back to the country after the 1972 Peace Agreement. The destination of the returning refugees was mainly to the towns. Another minor factor, special to Equatoria, and again associated with political unrest, was the influx of refugees from neighbouring Zaire in the 1960's. About seven per cent of the population of this province were aliens in 1973.(5)

Secondly, the extention of railways in the later 1950's and early 1960's to the west (Nyala) and south (Wau) and construction works such as the Roseires Dam, played a major rôle in the transformation of many small towns into larger urban centres such as Nyala, Babanousa, Abuzabad and Wau, and even the creation of altogether new urban centres such as Damazin in the Blue Nile Province. In Damazin jobs of various descriptions were created during the construction work and manpower was drawn from all corners of the country. El Roseires, the old district centre was loosing heavily at the beginning though later was able to adjust and even benefit from its reciprocity with the new town.

Fig.8·3 URBAN POPULATION GROWTH BY PROVINCE PERCENT, 1955/56 – 1973



In contrast, the northern part of the country which includes Northern Dar Fur, Northern Kordofan, and the Red Sea provinces as well as the two northern provinces, records a much lower average rate of urban population growth, of four per cent for the period 1955/56 - 1973. In fact, the region's share in the country's urban population dropped to 22.8 per cent in 1973 from just over 33 per cent in 1955/56. It is to be expected that a region of poor economic base, meagre exploitable resources (much of it lies in the desert and semi-desert areas), and low export earnings would be lacking in the driving force for urbanisation. Even the present rate of growth in this region is largely associated with nodes of national significance and related to the economy and infrastructure of pre-independence days: Port Sudan, Atbara, and El Obeid are the best examples. Moreover, the real constraint on urbanisation in many such regions is the direct migration from the rural sector to destinations beyond the boundaries of the province.

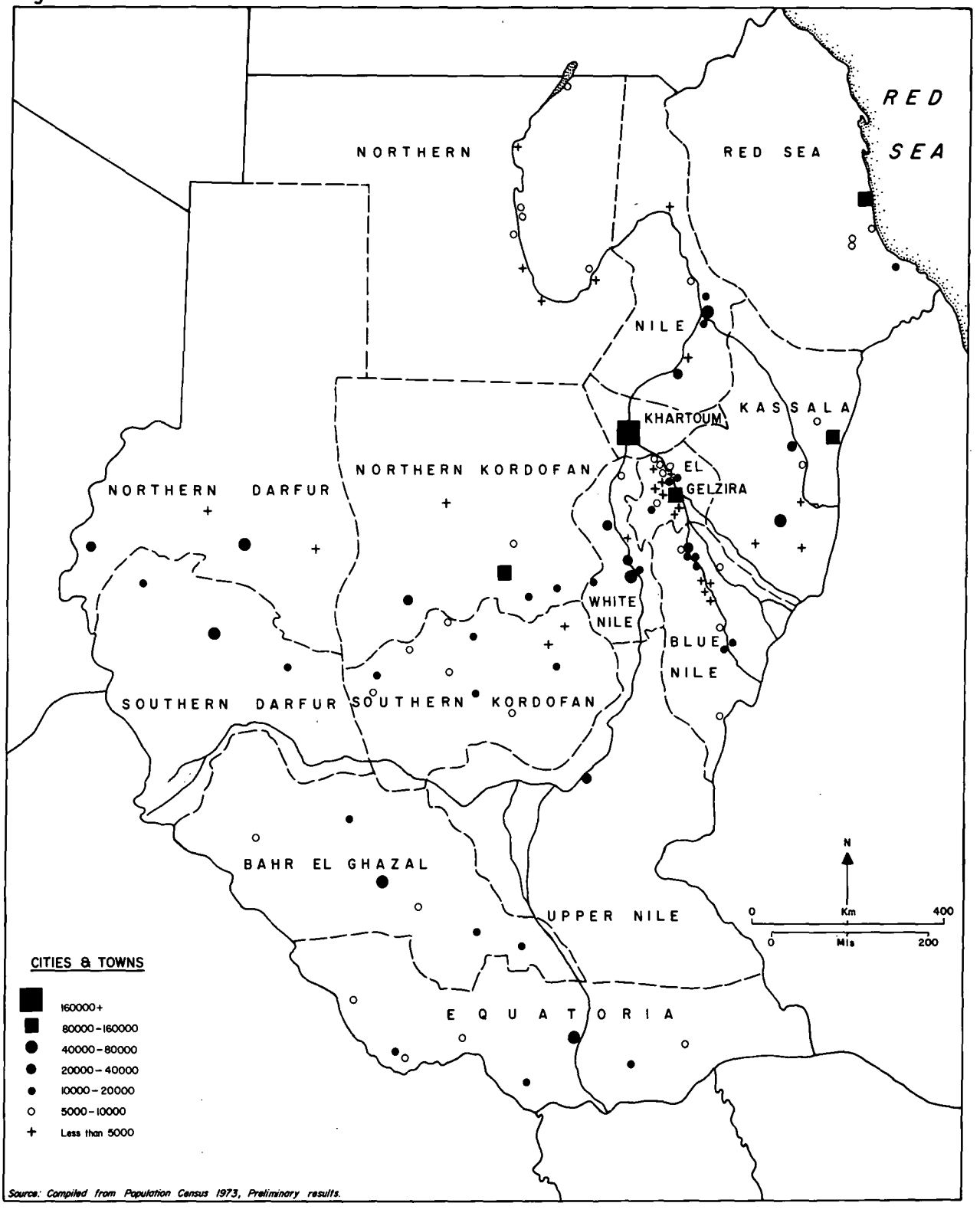
The conjunction of urban population growth with development, and the economic potential would, theoretically, permit a rapid growth of urban population in the central part of the country (Khartoum, Gezira, White Nile and Kassala) where inward migration, incomes and number of services are highest. Nonetheless, urban growth was less spectacular and the share of these provinces only increased from 52.2 per cent in 1955/56 to 53.2 per cent in 1973, at an annual average growth rate of 6.6 per cent. One characteristic that held back the expansion of urban population growth in this region relative to the southern part is that the increase occurs only in a handful of towns already of profound prominence whereas growth in other regions is characterised by the metamorphism of many villages into 'overgrown villages' because of new

stimuli such as the western railway to Nyala. Moreover, it is quite possible that the filling-up of rural areas occurs in cycles and a large number were just passing the numerical limit in 1955/56 whereas a second generation were as yet some distance from qualifying in 1973 (see Fig. 8.4). The urban-rural hierarchy is well placed to permit the creation of new urban centres, and any rural 'spillover' is directed towards already existing urban centres. In this respect urban population growth is hardly a true index of the dynamism of an economic region. The relative economic maturity of this section of the country is reflected in the modern agricultural sector and the Prime Base with higher average incomes and services. As will be seen later, the prospects of redressing this disequilibrium is anticipated in the light of the existing infrastructure and scope for development as perceived by planners and investors. Although there exists no evidence to suggest a direct relation between industry and urbanisation, it is predictable that the large investment in industry in this core area will positively affect the reciprocity of industrialisation and urbanisation.

8.2.2 Mineral Resources

The extractive industry of Sudan has a daunting history of failure and a low growth profile at present. Not surprisingly minerals have played a very insignificant rôle in the economy of modern Sudan. On the face of it, this would imply a scarcity of mineral deposits in the rock formations of Sudan, but this is increasingly becoming invalid in the light of recent discoveries: the earlier search for minerals at the beginning of this century must have been superficial and inconclusive. The lack of interest and poor follow-up which continued through a good part of half a century certainly demands some attempt at explanation. Identifying

Fig.8·4 URBAN POPULATION 1973



the objectives of the British prospectors is probably the first step towards that goal. The target set by London Syndicates with the successes in Southern Africa and Congo in mind, was to strike highly mineralized rocks, noble or precious minerals or easily worked deposits. Anything less than that would have involved disproportionate capital investment to returns, higher production costs, uncompetitive produce, or lower margins of profit. Indeed the attempt was fruitless as far as achieving such targets was concerned. Soon afterwards, as was noted earlier in Chapter Two, the policy towards private foreign investment took a different course. The motto of economic development was one of slow progress, balanced budget and specialisation on agriculture. Further exploration and the possibility of initiating a mining sector would clearly have involved two basic inputs that could least be afforded; foreign capital and an intensive labour force. Capital investment was not forthcoming for reasons outlined above, and in a country sparcely populated, like Sudan, mining would compete in the labour market with the priority sector, agriculture. Any such action would jeopardise the British interest and should be averted.

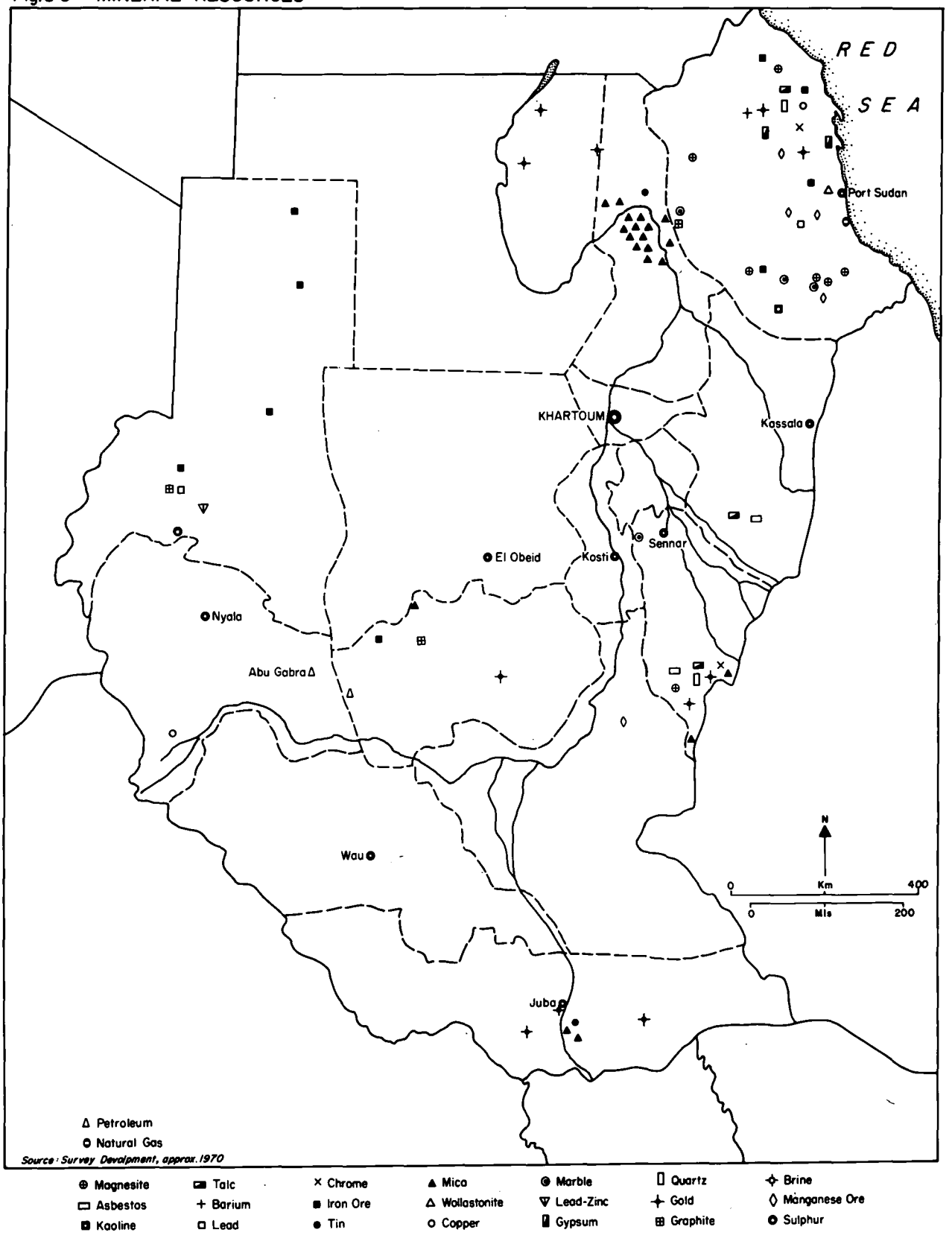
The national aspirations of a new nation were roused in the mid-nineteen fifties by erratic geophysical and geochemical data and tentative results on mineral finds. With rising hopes of mineral wealth and oil riches a fully-fledged ministry of mining was immediately created. Two acts were passed in 1958 and 1959 to encourage and promote oil exploration and mineral prospecting. However, it was soon realised that long-term investment, associated with extractive industry, would not be forthcoming given the description of the mineral deposits, facilities and utilities available and, more important perhaps, the nebulous political scene on the eve of self-rule.

It is a formidable task for any government to secure a favourable investment climate for long enough to interest large scale mining corporations whose interests are, by necessity, of a long-term nature. Competitive costs and better grades are of paramount significance in considering a territory as a feasible contender for mineral exploration and exploitation. The rating of Sudan in the books of mineral investors must have been very low.

However, marginal production costs and the critical mineral contents of the ore are dynamically changing because of change in world consumption patterns and prices, structural growth, depletion of new discoveries and improvement in processing methods and techniques. Two further aspects of this change which directly affect Sudan's mineral exploration are only indirectly affected by cost: the interest of centrally planned economies, especially East European countries, in their bid for markets and raw materials and in the context of barter or bilateral agreements. Secondly, the U.N. call for action in the 1960's to increase the effective use of resources and participate in financing development projects through specialised agencies such as the United Nations Special Fund - Development Programme.

With all such complex structures, mixed interests and varied concerns, the signs of serious participation in the mineral resource development of Sudan has only materialised in the last decade and reflects what could amount to a scramble by industrialised countries. The Red Sea littoral and, later, offshore areas were the first locations to be extensively leased for the obvious reasons of geology and accessability. Spearheaded by the Soviet Union, the Eastern Bloc is now undertaking prospecting for manganese and iron ore (see Fig. 8.5). Under a bilateral agreement Romania was already trans-shipping iron ore from this region. A fresh attempt to

Fig.8·5 MINERAL RESOURCES



exploit copper, zinc and silver, deposited in the Red Sea mud, is now underway. The French company, Bureau de Recherches Geologiques is executing the project on behalf of the Sudanese and Saudi Governments.(6) Other discoveries in the area include natural gas (Pacific International and Standard Oil of California).

Japanese companies showed much interest in the early 1970's in the rich chrome deposits of the Ingessana hills (Blue Nile Province). The ore is now shipped to Japan and a new agreement to expand production (300 - 400 thousand tons annually) was concluded in January 1977.(7)

The move made by the American Oil companies after the 1973 Oil War was unprecedented. The soaring oil prices after that war and the ever expanding demand, especially by industrialised countries, were the prime force behind this fresh attempt. Western and central Sudan were this time included in the frantic and unfettered search for oil. In 1975 the Minister of Industry, it was announced in a local newspaper,(8) was having talks with the representatives of the American Chevron Overseas and Ball and Collins of the United Kingdom, on the prospects of the economic exploitation of oil and gas in the Red Sea and central Sudan. Later, in 1977, oil discovery was hinted at in the Middle East Economic Digest (M.E.E.D.):

> Despite the discovery of small and commercially viable quanities of oil deposits, production has not yet started. (9)

An official announcement of oil discovery was broadcast in July, 1979. The Abu Gabra oil strike may prove to be the first commercially viable oil well.(10)

A few hundred kilometres to the south west lies Hofrat en Nihas where the United Nations Special Fund (Development Programme) has

been financing copper exploration since the mid 1960's with, as yet, no conclusive results. However, oil discovery nearby must add a new dimension to the long search for copper (see Fig. 8.5).

The activities of the Geological Survey Department were hard hit by the political unrest in southern Sudan. The result was a total lack of up-to-date data on the region's mineral resources. As an interim arrangement, the United Kingdom is now conducting investigations aimed at the exploration of rare minerals and minerals of immediate industrial use such as limestone, asbestos, clay and talc, to help construction and building works urgently needed in the region.(11)

From the standpoint of the long-term extractive industry in Sudan, the contribution to the industrial location milieu will be direct, in the sense of promoting benefication processes at the source of ore. The structure of such undertakings will probably determine the quality and the quantity of other inputs such as energy, water, labour and also the extent of the market. Infrastructure and utilities associated with extractive industry, fabrication and allied industries will probably act as a catalyst to industrial growth in new locations and regions. Within the "thumb-forefinger" growth region (to be described below), Port Sudan and Kosti-Sennar stand the best chance for such integrated industries.

Meanwhile, the effects of the mining industry in Sudan will only be indirect in the form of large capital inflow managed from the Prime Base. Slowly, revenue build-up will contribute to the promotion of investment in both the public and private sectors.

8.2.3.1 Agricultural Resources: Crop Production

Agriculture still plays a central rôle in the Sudanese economy and is anticipated to do so for some time to come as the potential for extension is highly impressive. An estimated 120 - 200 million feddans (1 feddan - 1.038 acres) of cultivable land awaits exploitation,(12) yet the present acreage under cultivation of about 15 million feddans provide 98 per cent of export earnings(13) (including livestock). The share of the agricultural sector in the Gross Domestic Product (GDP) is also impressive, fluctuating from 31.9 per cent in 1970/71 to 41.4 per cent in 1973/74.(14) Probably these figures would have been even higher but for the disproportionate increase of prices in the service and the industrial sectors.

The complex structure and detailed organisation of agriculture in Sudan is beyond the scope of this study. However, the dual character of the economy fosters the co-existence of a dual system of agricultural production in which the modern sector or commercial sector is complemented by a traditional sector.

The modern sector specialises in cash crop production and is confined to the irrigated lands of the Gezira, Nile banks, and some annually flooded banks and deltas. Future expansion of this type of production is predictably tied-up with the Nile and gravitationally irrigable lands. By virtue of the production characteristics of such areas, agro-based industries would naturally ally with this sector, and even future industrial location is bound to be affected by development in this direction. In the sub-system of this sector, many tropical and sub-tropical products could be produced and processed. The diversity of the raw material base is a great asset to future expansion and proliferation of processing industries (Fig.8.6).

Fig 8·6 SUDAN AGRICULTURAL DEVELOPMENT

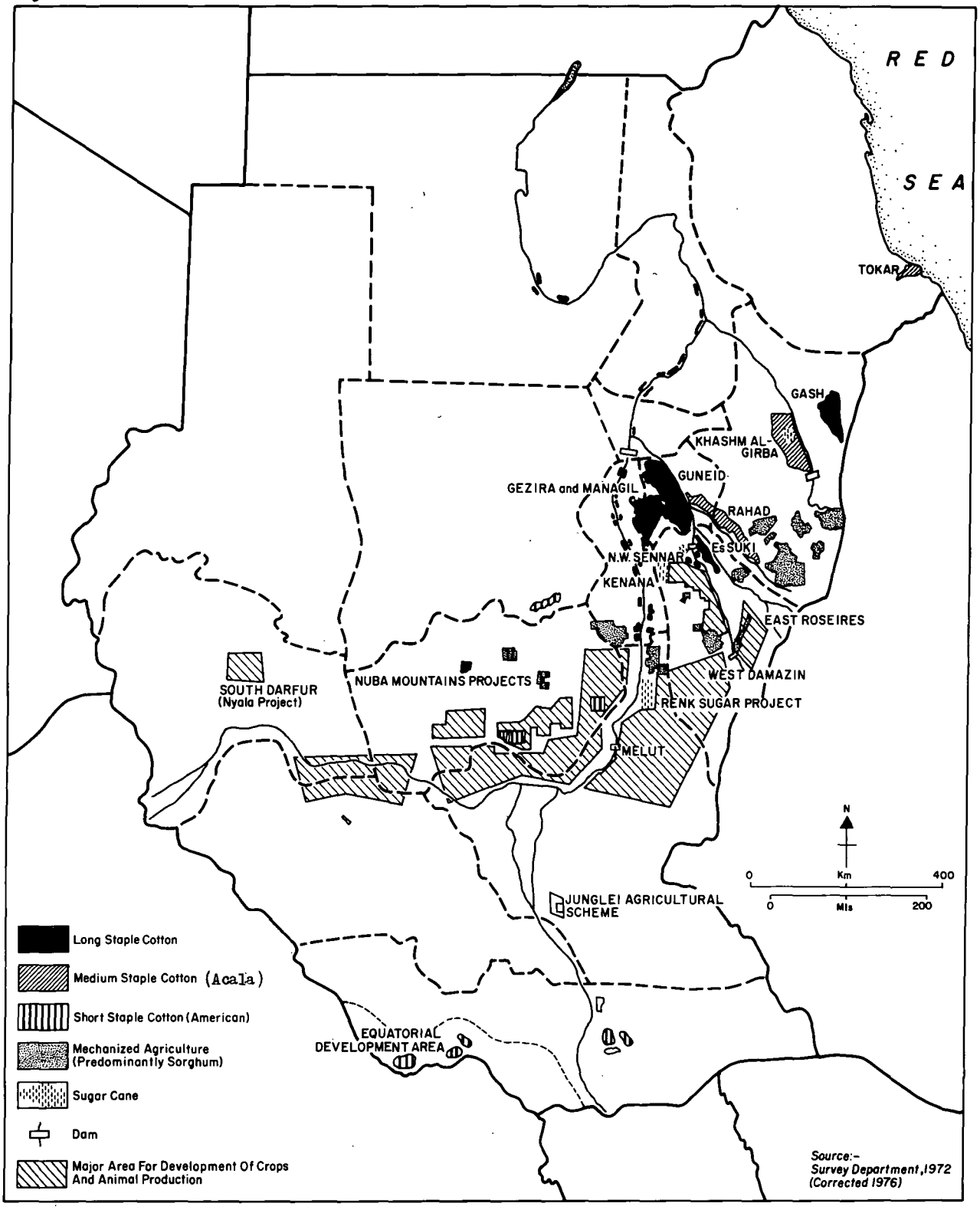


Table 8.2 shows the rate of increase in acreage of the main crops of Sudan for three periods between 1960/61 - 1975/76, and a fourth tentative period as projected by the current Six Year Plan, 1977/78 - 1982/83. The rate of growth for each individual crop is a parameter of entangled natural and human factors that determine the degree of growth or degeneration. In the traditional rain-fed areas, for example, initial crop acreage is largely determined by the timing and amount of rainfall, whereas mechanised rain-fed agriculture expands in response to direct government policy and demarcation of areas to be annually cultivated. Price trends, marketing policies and economic plans have an everlasting though varying effect on restructuring the acreage growth rate. These trends are closely examined in the following pages, with emphasis on selected industrial crops.

From Table 8.2 it appears that the importance of short staple cotton (Nuba variety) was progressively weakening during the earlier two periods. This is a classic example of government intervention to discourage growers by fixing low prices to ensure a balance between supply and demand. Prices, and consequently acreage, were slowly picking-up during the third part in response to a new consumption pattern of local industry. The Nuba variety, it was planned, would be used for the production of coarse counts for 50 per cent of the popular fabrics.(15) Export prospects were also becoming brighter as demand was increasing through trade and bilateral agreement.(16) The revitalisation of the Equatoria Project after 1973 has also contributed to the new trend which is manifested in an annual rate of growth of 12.3 per cent for the third period and 14.5 per cent for the projected period of the Six Year Plan (1977/78 - 1982/83).

Table 8.2 Acreage growth under selected crops (in '000 feddans), and rate of annual increase (per cent).

	Five to Six Year Average					Rate of Annual Increase per cent				
	A	B	C	C_1	D	A-B	B-C	C-D	A-C	C_1-D
Long staple cotton	726	782	788	760	790	1.5	0.1	0.0	0.7	0.6
Medium staple cotton	57	121	190	210	350	16.2	7.8	9.1	11.6	8.9
Short staple cotton	261	251	155	155	350	-0.8	-8.7	12.3	-4.6	14.5
Sorghum	3307	3650	5076	6000	9100	2.0	5.7	8.7	4.0	7.2
Millet	1118	1426	2356	2500	2800	5.0	8.7	2.5	7.0	1.9
Wheat	65	215	425	622	890	27.0	12.0	11.1	18.6	6.2
Groundnuts	652	902	1594	1840	2900	6.7	10.0	8.9	8.5	7.9
Sesame	950	1157	2173	2200	2700	4.0	11.0	3.2	7.8	3.5
Sugar cane	15	29	39	40	288	14.1	5.1	33.1	31.0	39.0
Tobacco	-	-	2	2	8	-	-	21.9	-	26.0
Coffee	-	-	2	3	15	-	-	33.4	-	30.8
Caster seed	13*	31	38**	50	70***	19.0	3.5	9.1	10.2	5.8

A. 1960/61 - 1964/65
B. 1965/66 - 1969/70
C. 1970/71 - 1975/76
C_1. Plan's base year, 1976/77
D. Six Year Plan's Projection to 1982/83

* Three years average
** Five years average
*** Estimates

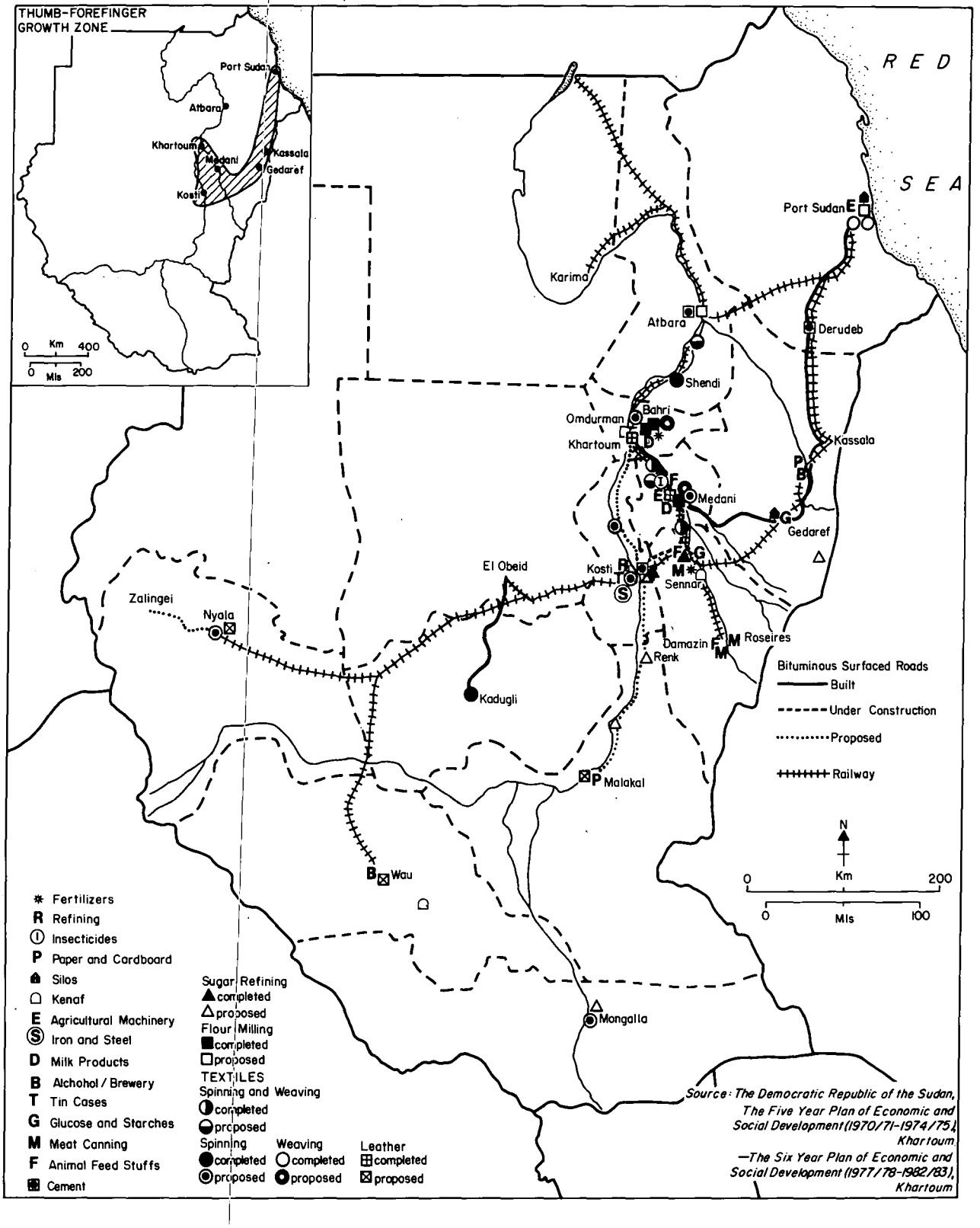
Source: Compiled from: (1) The Democratic Republic of the Sudan, The Six Year Plan of Economic and Social Development, 1977/78-1982/83, Vol.1, Ministry of National Planning, Khartoum, n.d., (in Arabic).
(2) Ministry of Finance, Planning and National Economy, Economic Survey, 1975/76, Economic Research Section, Khartoum, 1976.
(3) International Bank for Reconstruction and Development, The Economic Development and Prospects of Sudan - The Agricultural Sector, (Restricted), East Africa Department, Vol. 1, No. AE-27, 1972.

In contrast to the situation of the Nuba variety, the medium staple cotton (Acala Variety), was gaining much ground in the late 1960's. Much of this expansion resulting from the construction of Khashm al-Girba scheme, was in response to external factors of world demand by medium spinners. Further expansion was achieved, though at a slower growth rate, during the 'Amended Five Year Plan' 1970/71 - 1974/75, with the completion of Es-Suki Scheme in 1971. Perhaps the most significant expression of the general sentiment towards the cotton industry was shown in the introduction of a phased programme, outlined in 'A 15 Year Tentative Plan, for Sudanese Cotton Textile Industries' in 1972.(17) Much emphasis was given to the importance of medium variety Acala for the local textile industry. Beside supplying about 50 per cent of the coarse counts, this staple will provide the medium counts in the proposed spinning mills with the prospects of export to neighbouring countries, especially Egypt. Accordingly, medium variety Acala will progressively be expanded at an annual rate of about nine per cent during the Six Year Plan (1977/78 - 1982/83).

The aggrandisement of medium staple Acala cannot fail to exert some influence on the spatial distribution of the industrial activity in the country. The first thing to notice is that the locations of the proposed textile mills are broadly material-orientated in character and essentially concentrated in the central region with an inclination to stretch eastwards in an effort to secure the advantages of an outlet to the overseas markets through Port Sudan (see Fig. 8.7).

Complementary to cotton production and indeed to the importance of the central region was the idea of crop diversification which was becoming a major issue of agricultural policy in Sudan after the completion of the Roseires Dam in 1965. Apart from the concern

FIG 8·7 SUDAN INDUSTRIAL DEVELOPMENT 1970-1985



Source: The Democratic Republic of the Sudan, The Five Year Plan of Economic and Social Development (1970/71-1974/75), Khartoum
—The Six Year Plan of Economic and Social Development (1977/78-1982/83), Khartoum

over the instability and occasional failure of cotton production and the problem of marketing, demand for imported foods, especially wheat, was gradually becoming a prominent fixture on the country's list of imports. The unacceptability of this situation was expressed in an extensive programme, in the early 1970's, to increase wheat production on land formerly devoted to cotton. By inspecting the average annual rate of increase in wheat acreage for the three periods in Table 8.2 wheat scores a figure of 18.6 per cent, second only to sugar cane.

Ultimately, this consideration favoured the growth of modern flour mills as an industry distinct from the widespread, small, sorghum mills. For one thing, the effect of the new structure on location is tremendous: where the customers of the traditional small stone mills are individual households, the patrons of the new mills are localized bakeries closely associated with the urban population. It is due to such populations that consumption was so rapidly increasing. Probably the spread of the 'wheat-eating' habit in urban areas is due to the changing rhythm and style of life which do not fit in well with the preparation of the staple food, Kisra. This is a lengthy and complex procedure, exclusively a female speciality to satisfy the immediate needs of the household. A large and growing sector of town dwellers are male immigrants who are obviously incapable of producing Kisra and at the same time could not conveniently buy it. Bread, a commodity obtainable from the corner-shop, is the practical solution, practical even for many families whose 'woman/hour' input is limited while the number to be fed is increasing through reproduction, and immigrant relatives who visit for a period that may extend for years! The strain on the labour-input necessitates supplementing Kisra with bread.

Moreover, Kisra is unadaptable to go with new food dishes such as the popular Egyptian beans (vicia faba), thus it is practically excluded from all meals taken away from home during the working day. Furthermore, the food grain itself is unsuitable for making items such as biscuits, macaroni, vermicelli, cakes, pastries etc., consumption of which is rapidly expanding.

The most important direct impact of the expansion of durum wheat production on location of flour mills was the radical adjustment to new organisations and structures rather than the switch to local sources of wheat. It is true that the processing of imported wheat should take place in the location of maximum profitability, i.e. the conurbation, according to the Prime Base doctorine. Furthermore, from classical location theory, developing local sources of material should not alter the situation, since flour milling is a market-orientated industry, because the weight of the end-product increases in the milling process. This being so because of the low moisture content of 7.4 per cent of the durum wheat, as compared with 14.5 per cent moisture content of flour.(18) Unconventionally, all new flour mills were located in the Gezira and Khashmal-Girba in an apparent material source orientation (see Fig. 8.7).

There appear to be at least two dimensions of this situation indirectly connected with materials and market. Firstly, in the government-tenant agreement of the Gezira scheme, and the later Khashm al-Girba scheme, food and fodder crops grown in rotation with the cash crop, cotton, are exclusively for the benefit of the farmer. Unlike cotton, the marketing of such crops is left to the discretion of the tenants. To the farmer, the production cost is too high to warrant any profit if he has to sell at the ruling price of imported wheat. To maintain production, however, the

government pays a subsidy to growers. Revolving around a delicate price structure was the revitalisation of tenants' cooperatives to emancipate farmers from the exploitation of traders and grain dealers. Now farmers could at least sell at the fixed minimum price. The cooperatives could in no way miss the price differential between grain and flour. To process would not only mean achieving added value but selling at the wholesaler's margin of profit. Like many processed, imported commodities, Khartoum f.o.b. prices were laden with a high margin of profit, import duties, the additional 'profit on cost to store' and initial high processing cost. Grain milling in the Gezira by the cooperatives was further made possible by the facilities and concessions given by sympathetic governments. The example set by the Gezira tenants was soon followed by the farmers of Khashm al-Girba scheme. The effect of the Prime Base is no longer applicable since the new price structure and government concessions negate the 'profit on cost to store' and curb the influence of the basing system. Eventually, the private sector outside the Prime Base was freed to act within a new market structure where basic flour milling could flourish.

As was shown in Table 8.2, it was sugar cane that made the greatest rate of annual acreage growth for the period A-C. Confronted with an ever-increasing sugar consumption and reliance on overseas suppliers, successive government realised the need for import-substitution. Because of the multiplicity of conditions under which sugar cane can grow, large tracts of the heavy clayey soils (Grade 2 and 3 - with varying degrees of Sodium content) of central, eastern and southern regions, lie near the climatic margin of irrigated sugar cane production.(19) Within this broad area, sugar refining started and, in the same area, the sugar industry

will probably flourish as a classic material-orientated industry.

Nonetheless, quite a range of factors of significance from the point of view of location decision are involved when choosing a specific location. In an obvious material-orientated industry, the influence of the local market has no relevance to the location problem in the absence of competition. One should remember that the state monopoly of the sugar trade has been the practice for the last 60 years. During this period an efficient price-basing system was developed. With Khartoum as the base, uniform delivered prices are quoted in all directions, except where 'freight absorption' is practised for the sake of remote areas. Where production is meant for overseas markets, the price-basing system obviously ceases to operate as will be subsequently shown.

Because the location of a sugar refinery is deeply set in the agricultural framework, agronomists have much to say in identifying prospective cane fields according to experiments which consider soil quality, land configuration and irrigability, relative humidity, etc. It lies in the domain of hydrologists however, to determine which water source could possibly be tapped.

Availability of 'timely' Nile waters (February to May), poses a cumbersome and a somewhat intricate problem for agricultural development in Sudan. At the present pace of acreage expansion and crop intensification, the few coming years will almost certainly witness the complete utilisation of the 20.5 milliards (measured at Sennar) allotted to Sudan by the 1959 Nile Waters Agreement. It is reckoned that 23 milliards will eventually be needed by the year 1985[20] - a deficit of 2.5 milliards.

The implications of adjusting to such a situation have far reaching effects on industrial location. The symbiotic relation-

ship between river régime and agricultural development has for many years favoured the Blue Nile, whose widely inconsistent flow pattern throughout the year (about 65 per cent of its annual discharge occurs during the two months of September and October, whereas only seven per cent flows during December to May),[21] commanded priority of regulation and harnessing. By the early 1970's it was realised that the existing storage capacities on the Blue Nile of 3.11 milliards would only be sufficient in 1978, for 'timely' water needs for the early stages of the Rahad Project and crop intensification.[22]

Any major irrigation schemes to be watered with no further capital outlay on dam construction should obviously be within reach of the White Nile. Previously, water supply from this river was limited to lift irrigation to adjacent pump schemes, as the whole White Nile System was conventionally designated for the benefit of Egypt. Because of the gentle gradient, sluggishness, and uniformity of the White Nile's flow, it was alleged that maximum storage capacity had already been reached with the construction of Jabel Auliya dam in 1935 (total capacity of about three milliards).[23] After the completion of the over-year storage High Dam in 1959, the urgency to release Jabel Auliya's stored water was apparently alleviated. Hence it was becoming possible to maintain water to levels high enough to ensure late winter-early summer watering. White Nile water supply for irrigation will eventually rise from 1.91 milliards in 1975 to 3.55 milliards in 1985.[24] Along the upper reaches of this river too, the prospects of adding 2.35 milliards are well in sight as construction work on the long-awaited Jonglei canal is now underway. In conformity with a steadily increased use of the White Nile waters, the prime determinants of locating the ambitious sugar plantation projects are

clearly set. Hagar Asalaya, Melut, Mongalla and Kenana Sugar schemes will all be irrigated from this source (Fig. 8.7).

Within these confines, entrepreneurs or planners make the final location decision. Displaying a multitude of these factors was the grand Kenana Sugar scheme. Although there were initially three possible areas to choose from, the extensive stretch of Kenana plains between the White and Blue Niles probably had most advantages for the following reasons:

1. While Kenana could technically be watered by both White and Blue Niles, the limited available Blue Nile Waters should logically be spared for the irrigable eastern plains out of reach of the White Nile. For this reason, the Roseires-Singa stretch was discarded.

2. The other option, the Malakal-Kosti stretch requires additional transportation and energy facilities already available at Kenana. Since the project has an ultimate capacity of a million tons of refined sugar annually with export plans in mind, the southern stretch was comparatively at a clear disadvantage. Besides, the Kenana location will make use of ancillary works taking place in the central region and indeed benefit from existing facilities such as the cement factory at Rabak and roads already under construction.(25)

One more aspect of location involved in the development of the sugar industry is regionalism in a general sense: specifically, the aim is to create employment opportunities and to maintain a regional self-sufficiency for the southern region and to bridge the growing economic disparity between central and southern Sudan.

After the completion of this massive sugar production programme, it is hoped that Sudan will become a net exporter by the

1980's (see Table 8.3). Success in that direction too, will encourage future expansion of sugar cane production and present new possibilities of industrial location. The Malakal-Kosti stretch and Upper Atbara are already cited as the next likely locations.(26)

Though less dramatic in absolute terms, the phased expansion of other crops is still quite substantial. The projected promotion of tea and tobacco production as import-substitutes, for example, will have a special bearing on development in southern Sudan and will mean the establishment of new packing plants. Similarly, castor-seed production in the Gash delta has already drawn attention to the possibilities of castor-oil refining for export at either Port Sudan or Aroma.

All in all, a new dimension will be added to the picture of Sudan as merely a primary producer. If current programmes were to be put into action, many institutions influencing personnel, marketing and credit, should be revised or replaced because of the new orientation. The new strategy has its own rules and special requirements: a different banking system, marketing structure, patterns of consumption and saving, infrastructure and investment will be necessary.

8.2.3.2 Animal Resources

Sudan is renowned for her rich animal resources to the extent of occasionally being equated with Texas in terms of future potential.(27) The opportunity for development is commonly identified by interested parties. Range land is predominantly natural pasture closely lined with the wide Savanna belt. The 400 mm Isohyet broadly divides the country into wet and dry zones, though semi-desert and desert conditions to the upper fringe of this zone do

Table 8.3

Projection of Sugar Production in Sudan 1974-1985, ('000 tons)

Location of Mill	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85
Guneid	55	55	60	65	70	75	75	75	80	80	80
Khashm al-Girba	80	80	95	100	100	105	105	105	110	110	110
N.W. Sennar	-	40	80	110	115	120	125	130	135	135	135
Asalaya	-	-	40	80	110	115	120	125	130	130	135
Kenana	-	-	85	200	300	330	350	360	370	380	390
Malut	-	-	40	70	90	100	105	110	110	115	120
Mongalla	-	-	-	-	10	15	25	30	35	40	50
Renk	-	-	-	-	-	140	280	360	400	410	430
Sitait	-	-	-	-	-	-	-	70	140	220	240
Total Production	135	175	400	635	795	1000	1185	1365	1510	1620	1690
Local Consumption	300	320	340	360	380	400	430	460	490	520	550
Import (-) or Export (+)	-165	-145	+60	+275	+415	+600	755	+905	+1020	+1100	+1140

Source: Ministry of Agriculture, Food and Natural Resources, Current Agricultural Statistics, Statistics Section,(CAS - Vol.1, No.1,) Khartoum, 1975.

not impede nomadism, whereas livestock breeding is restricted by the tsetse endemic in the southern tip of the wet zone. Latest estimated totals of animal wealth are 15.8 million head of cattle, 27.3 million sheep and goats and 2.8 million camels.(28) However, annual animal offtake is disproportionately low, at an estimated figure of 2.5 - 5.0 per cent.(29)

Curiously enough, this sector was the first to be exposed to foreign trade and yet the least affected by the growing modern sector. The willingness to sell involves a complex of ecological, sociological and market factors: the natural range is of relatively low nutritive value and the animals are susceptible to a variety of diseases and parasites and occasional epidemics. The reliance on unselective animal breeding is tightly intertwined with the nomads' conception of wealth. Once the nomads came in touch with the cash economy, self-sufficiency, or subsistency, started to fade away against an overwhelming set of wants. Because real cost is no more than labour input and time, and both have no material value in the rhythmic way of nomadic life, nomads could sell cheaply. On the other hand, demand for livestock in both local and foreign markets always involved artifically low prices because of a pending concession to Egypt, a country whose supply interests in Sudan were closely safeguarded during the foreign rule and are still preserved in an air of sympathetic bilateral agreements. Thus whatever differential may exist between producers and consumers prices, is snatched by rapacious livestock traders and monopsonist importers.

Until recently, the government appears to have played little part in striking a fair deal for either the central treasury or the nomadic producer. Under these circumstances, animal owners

were tied to a virtually stagnating environment, as returns were too slight to justify elaborate infrastructural projects. The acute lack of infrastructure on the other hand, has further rebuffed private investors. The viciousness of these disparities are particularly self-perpetuating.

Perhaps the most prodigious sign of a break-through is the orchestrated attempt by the Arab countries at a conscious long-term, intra-regional policy of agricultural development.(30) The 1973 Oil War not only brought about massive riches in the Middle East, but also precipitated a frustrating feeling of insecurity, and emphasised the contradiction of reliance on provokable, retaliatory international trading partners, who among many other items, supply more than 50 per cent of the food needs of the region.(31) Directly connected with the volume of money inflow and world inflation is the escalation of demand for, and price of, goods, especially foodstuffs, imported into the region.

Understandably, some industrialised countries are also becoming interested in the possibilities of Sudan since they are enduring the depths of economic recession. In many such countries unemployment is notoriously high, and inflation lingers at an astronomical level. To revitalise these economies the options are broadly to boost exports, increase local investment in new machinery, restrain wages and curb spending, and, if need be, borrow. Obviously, foreign investment is unwelcome, though contractors, sub-contractors and engineering consultancies and agencies are encouraged. Thus the combination of Western technology and Arab finance is heralded as coming at the right time, and in the right style and proportions. Consequently, the pressing infrastructural needs which were the basic deterrent of private investors are for the first time being viewed within a long-term objective. Furthermore, the often dis-

suaded private foreign investors are now encouraged by the image of 'Arab money' in Sudan, and are seeing great opportunities for involvement in Sudanese developmental projects. Animal health, breeds, pasture, commercialisation and marketing would be improved by both the already committed investment, and the forthcoming inflow of capital envisaged by the Six Year Plar 1977/78 - 1982/83, and anticipated in a comprehensive 25 -year plan (1976 - 2000) engineered by the Arab Fund for Economic and Social Development (A.F.E.S.D.).(32)

At this point a distinction has to be made between the traditional pastoral nomadism and emerging commercial grazing and farming activities. In the first sector, immediate gains will be proportionate to the intensity of services rather than structural or institutional changes, and development will positively effect growth rates of animal offtake, net price to producers and continuity and rise of demand. Under this activity, one aspect of prime importance, from the location point of view, will be the creation of upkeep stock corridors. Through such routes animals move overland from the production centres in the west to a disease-free zone in central, northern and eastern Sudan. It is the urban nodes of the distributive system in this zone that would commercially be invigorated in response to increased income and demand in both catchment areas and catchment points. In the latter, the enlargement of the slaughter houses would eventually provide a new stimulus for a leather industry. Of course, this could not be visualised in isolation from the overall sectoral development.

Turning to livestock ranching and commercial farming, the position is still in the formative process. Large-scale ranching projects have already been mooted and pre-feasinility studies are now underway. Millions of feddans are being surveyed in the

savanna plains of southern Dar Fur and the southern reaches of the Blue Nile Province. Unlike pastoral nomadism, this sort of farming is capital intensive and highly specialised. The objective is to effect structural changes in response to market range and intensity, and consumer proximity and preference. Preparation and cold storage of meat would probably be the main livestock-based industries, at least for some time, as demand in the Arab market is characterised by fresh meat preference.

To institute a full range of meat canning and processing is an obvious future possibility intrinsic in the nature of such projects and associated with cost-price structures and demand characteristics. Probably a gradual change of consumption patterns and consumer preference in favour of canned and frozen meat at the traditional market would be encouraged by an increase of demand and by supply regularity, price abasement and stability. When competitive prices are maintained and demand characteristics are met, access to the preferentialist, protected markets such as those of the European Community, could be just conceivable on evidence of the growing gaps between supply and demand.(33)

Assuming rationality of planners and investors, the meat canning and processing industry should locate in the vicinity of the preparation and cold-storage projects. A resource-base orientation is emphasised by the freight cost differentials between trans-shipping packed meat to consumption destinations and whole meat transportation to Port Sudan for further processing. Damazin, Nyala and probably Sennar or Kosti are the most likely locations because of initial cost advantage, accessibility to raw materials, fresh water, energy, pools of semi-skilled labour, and transportation (see Fig. 8.6).

Now we turn to the other form of stock farming, that of intensive commercial feeding and breeding. The emergence of this activity is only recent and in effect a product of vigorous interplay of supply and demand. Both were erratic and eruptive since the beginning of this decade and especially so after the winter of 1973. Under the prevailing conditions of animal trade, three short-comings could be identified: firstly, the rate of growth of offtake is disproportionately low compared with that of demand, both domestic and foreign; secondly, a disparity between peak and off-peak supply is inherent in the pastoralism production system and is accentuated from time to time by vagaries of climate and marketing system; thirdly, the widening of the gap between previously stable or quasi-stable internal prices and Middle Eastern inflationary prices after 1973. Under the norms of an unrestricted trade with this region, internal prices were practically uncontrollable. As net returns to traders are higher when exporting, they can profitably manage to pay the extra prices demanded by animal owners who are themselves pressed for money because of the inflationary prices of consumer goods. In an attempt to stabilise prices the government was forced to ban export of animals and meat in 1975.(34) Although this action temporarily eased the acute problem, inflationary prices and supply fluctuations were still far from being curbed.

A radical solution, it was anticipated, would be the establishment within the public sector of intensive, urban-orientated commercial farming. A pilot fattening unit was established in 1974 in the neighbourhood of Khartoum.(35) Far from being competitive, meat costs proved to be rather exorbitant. The cost of feed produced under irrigation was prohibitive and the size of farms and stock numbers were all too small to realise economies of scale.

Moreover, overhead costs and labour and management costs were other problems that contributed to the unsuccessful running of this new sector. Probably the most promising line to follow is the development of animal feedstuffs from crops within the existing rotations or from by-products such as oil-cake.

In contrast, dairy farming and dairy products are gaining popularity in urban areas, particularly the conurbation, because the main traditional suppliers are cut off by distance and the perishability of the product. Nearby animal keepers, though they are still the main suppliers, could not cope with the increased demand nor the diversity of milk products and specifications now required.

8.2.3.3 Forestry and Fisheries

Forestry and fisheries are two economic activities largely in abeyance at present in Sudan, and command low priority in the development strategy. While funds for the promotion of fisheries are minimal, investment in forestry has been confined to reservation, plantation and research, conducted in the public sector. For the pioneering private entrepreneur, primarily engaged in import-substitution industries, forestry and fisheries are not an attractive proposition, due to the low level of imports and thus the lack of opportunity for import-substitution. Moreover, the products of these two activities could be consumed in their raw state with little or no transformation needed. Charcoal, railway-sleepers, telephone poles, sun-dried fish, etc. are examples. Rigorous promotion plans are thus needed in the absence of ready markets and lack of established taste. Forested areas as well as marine and freshwater fisheries are remotely located from local markets. To

the private investor, the time element and costs are prohibitive.

However, the current Six Year Plan (1977/78 - 1982/83) has shown some interest in high-value and/or low-cost products such as plywood, paper, beeswax, garad (sant-pod) for tanning, smoked and dried fish, etc. Beside the obvious material orientation, location will be determined by the structure of the industry, i.e. whether it will be for export or local sale or whether it will be in the hands of the private or public sector. With a ready market for fish in central Africa, and the intention of the government to explore the economic possibilities of the south, priority will be given to the fishing industry in the vicinity of the swamps and numerous streams of the south. Similarly the extensive fresh-water fishing possibilities of Lake Nubia (about two to five million feddans) and marine fishing along the 480 Km of the Red Sea coast aroused interest in foreign private concerns, especially those of the Middle East where a large market awaits exploitation.(36)

8.3 Ancillary, Intermediate and Residual Industries

The structural features and magnitude of investment so far discussed could be a promising environment for a process of complementary development which is, in part, a prerequisite for the establishment of allied 'ancillary', 'intermediate' and 'residual' industries. It is possible, therefore, from a locational point of view, to identify a spatial development where distributional change is exemplified by the degree of linkages, structure, and the size and form of capital. Locational preferences of residual industries, for example, are geared to the food, textile and leather industries and they expand horizontally wherever such raw materials as molasses, bogasse, cotton-wool, tallow and animal feedstuff are available.

Intermediate industries such as sweets, biscuits, margarine, artificial silk, shoes, tyre inner-tubes, steel and engineering, furniture, hardboard, etc., show a great degree of locational inflexibility because their intermediate inputs are diversified and sensitive to distance friction. Easy access to suppliers and distributors is essentially, provided in the Prime Base where a wide spectrum of industries already exists, and where distance friction is minimised by the pricing system and mechanism.

In the light of the present annual acreage growth rate of 4.3 per cent, and projected annual production growth of 6.5 per cent for the coming six years, the scope for ancillary industries such as agro-chemicals, agricultural machinery and implements, and packing material is considerable. The importation of fertilizers, insecticides, tractors and sacks, absorbs about one third of the country's foreign earnings, and constantly strains the balance of payment. Thus, in view of the government's import-substitution policy and the horizontal and vertical expansion of agriculture, a series of projects to manufacture, assemble or process ancillary products were earnestly sought (see Fig. 8.7).

The most obvious and, indeed, the most controversial is the agro-chemical industry. While the Confederation of British Industry (C.B.I.) believe that local production is economically unviable,[37] the F.A.O. is advocating the establishment of this industry,[38] and the Japanese are very interested and deeply involved in promoting the agro-chemical industry.[39] Because the main input could either be a ubiquitous material such as nitrogen or a punctiform one such as naphtha, location would be in the first case near the markets, i.e. in the Gezira, whereas in the case of naphtha the industry would align with the oil refinery at Port Sudan. In an industry where economy of scale is a prime consideration for

successful operation, it is interesting to note the suggestions of the F.A.O. which recommends smaller fertilizer units to be dispersed in the main production areas of Gezira, Khashm al-Girba and Southern Kordofan.(40) Another ancillary industry of equal importance is the processing of jute substitute for packing. This could either be natural such as kenaf (Hibiscus Cannabinus), or synthetic. The Ministry of Agriculture has been experimenting with kenaf since the early 1940's in the rainy southern region (in the Tonj area), and later under irrigation in central and eastern Sudan. Being a material-orientated industry, the choice to be made was determined, in the first place, by cost differentials under the two water supply systems. Clearly, production under the rain-fed system is less costly. However, fluctuations of rain and of production have shifted the emphasis to irrigated production of kenaf in Abu Naama (Blue Nile Province) where production per feddan is higher and also it is nearer to existing markets.

It is interesting to note that in 1971 a private concern started production of plastic sacks in the Prime Base with an initial capacity of ten thousand tons per annum. One wonders what benefit the country gets from such an undertaking that imports all its raw material at a time when local fibres could be processed!

During the last few years there has been a strong tendency to favour local assembly of agricultural machinery and implements. In contrast to many ancillary industries in developing countries this activity has a distinctive locational attraction to ports since components are imported from overseas. Port Sudan is no exception.

8.4. Industrial Location and Regional Policy

It is quite clear that regional industrial policies had not been formulated within the body of legislations to promote indus-

trial investment in Sudan issued prior to 1972. Unlike industrialised countries where such policies are spontaneous measures to combat regional imbalances, Sudan's attempt was one of initiating industry to augment sectoral malformation. Any such attempt is indifferent to place and, in an imperfect market, one location, the Tripartite Capital, was already garnering the essentials for the incubation of industry, i.e. consumer import substitutes.

The rising number of rural population and exodus to the Prime Base, the economic growth rate differential between periphery and core, and the intensified political unrest in the south (1955 - 1972) projected the regional disparities and precipitated a growing anxiety amongst planners. A new regional approach was first promulgated in the attempt to decentralise through local and regional governments in the early 1970's. Encompassed in this realisation was a fresh approach to regional industrial location. Preferential treatment of 'Rural Areas' was for the first time explicit in the 1972 Investment Act which conferred upon the Minister of Industry powers to "issue specific directions to grant enterprises established in Rural Areas priorities in obtaining finance from the Industrial Bank and other Financial Banks ..."(41) This, it was discovered two years later, was insufficient to create the desired effects. More detailed provisions were further made in the 1974 Industrial Investment Act, including further preferential concessions to regional industry.(42) Subsidiary industries or branch factories were for the first time encouraged, and promised fiscal assistance.

Although it is early days to consider the impact of these policies, the limitations are many: firstly, there seems to be a universal lack of awareness about the range and complexity of the mechanism that disproportionately maximises profits and reduces

risk margins at the Prime Base. As long as the base pricing system is in operation, benefits in the Prime Base will always tend to outweigh those of any possible fiscal assistance to regional industry. Under the prevailing conditions even 'basic' branch factories would only duplicate overhead and management costs, since within the existing distributive system it is more profitable to expand at the Prime Base.

The second point relates to the ambiguity of the very concept of regional industry in the various enactments. There is no clue whatsoever to whether regional private industry is going to comply with growth points or expand within growth zones. All this demands organisation, definition and the provision of facilities currently unavailable. Hence the most crucial aspect of this shadowy promotion of regional industrial location is its detachment from current development programmes and growth strategies.

8.4.1 Thumb-forefinger Growth Zone

Underlying the concurrent development of agriculture and industry is a dynamic evolution of a 'thumb-forefinger' growth zone, defined by the two tips of Khartoum and Port Sudan, and the broad base of Kosti-Sennar. In between are a few 'joints' such as Medani, Hassaheisa and Gedarif and Kassala (see Fig. 8.7). Presently most new investment in both public and joint ventures is directed towards this region which is favourable to growth because of the existence of a multivarious export-orientated infrastructure. A.F.E.S.D's short-term programme allocates about 60 per cent of its capital investment for the coming ten years to this central region, as was reported by M.E.E.D. in 1977:

> The A.A.D.A.I. (Arab Authority for Development and Agricultural Investment - an A.F.E.S.D. agency) found it necessary to concentrate its projects up to 1985 in the northern and eastern regions where it can make immediate use of the existing facilities of water, irrigation, electricity, manpower and, most important, port facilities, which are available only at Port Sudan. (43)

It is most likely that a blend of agro-based industries, as well as non-basic industries, would prosper in proportion to the capital outlay and general rise in income. Yet, in the short-run, this industrial growth is only horizontal, void of any structural substance, i.e., a one-industry one-factory situation.

In contrast, the Prime Base, with its image of primacy, manages the inflowing capital with its financial and banking agencies, and this adds intensity to its economic transactions. A new environment for a more mature industrial structure would thus be created and the enrichment of the 'thumb-forefinger' zone would further consolidate the distributive mechanism already centred at the Prime Base. However, one would anticipate that in the long-run this situation would be interrupted by pressures extending from a new centre of gravity at the new base of Medani-Sennar-Kosti created by the projected development of agro-based export industry, in line with the intended full use of the economic resources of central, southern and south-western regions.

At this 'midland', a diversity of industrial linkages would probably develop to satisfy growing demand for consumer and capital goods as the remnant wealth generated in the agricultural and industrial sectors is reinvested. At the 'forefinger tip', Port Sudan, and probably Suakin, (if reinstated as an international sea port) would grow into despatching centres having a distinctive industrial structure based on assembly and petrochemicals with a wide range of industries ranging from edible oil mills to spare parts and pharmaceuticals.

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CHAPTER NINE

CONCLUSIONS

9.1 Prologue

The concern in this thesis is with industrial location in Sudan with special reference to two particular aspects. The first relates to the analysis of events and economic development processes that culminated in the present location pattern, while the other presents a theoretical framework to explain industrial localization through these events and processes. The complementarity of the empirical and theoretical approaches demonstrated in this study facilitates a better understanding of industrial location in Sudan, and could assist in the appraisal of future industrial location both in the private and public sectors.

9.2 The Economic Process

The nature of the economic process in Sudan is expressed in a charter government model which was endowed with the capacity to polarise the export-import trade, the service sector and skilled personnel, and empowered to create a modern sector, thus fostering a dual, primary producer economy. One obvious consequence is the fact that the gulf that separates the urban agglomeration, the Prime Base, and the periphery is widening thus promoting economic inequality and smoothing the road for in-migration, especially to the modern agricultural sector and ultimately to the Prime Base. Another important disparity is reflected by the disproportionate development of the economic sectors and their varying contribution to the national economy. Significantly, industry in Sudan was suppressed for half a century while export-import trade, agriculture

and services were developing. However, when industry was later promoted, it had to comply in areal terms with a well-established pattern of localization of wealth, commodity flows and 'shadow entrepreneurs', and was naturally drawn to where these factors localize. The effect of this time lag on industrial location must be the logical starting point of industrial location analysis. In Brookfield's words:

> Proper analysis of the economy of a spatial aggregate thus demands examination of its production system and the whole structure and organisation of its economy. It demands furthermore that this be done with historical perspective, and with attention to its spatial plan. (1)

The pattern discovered for Sudan, and indeed many similar economies, is one of centralised control over capital and control of the means of distribution and diffusion through bureaucratic machineries and commercial banks, thus leading to accumulation of wealth with those in command of foreign trade and clearing houses. Public spending, managerial skill and technical know-how are likewise concentrated. The shortest route to industrialisation then is to superimpose it on the well-established centralised system to economise on transportation, extension services (i.e. electricity, water, industrial land, sewers etc.) and the time involved in providing these facilities afresh. 'Shadow industrial entrepreneurs' in Sudan were quick to take advantage of the concessionary measures offered to promote industry in 1956. As industry is predominantly conducted by this group, it automatically inherited the entrenched systems of export-import, accessibility to credit funds, and the intrinsically higher profit margins at the Prime Base. The market area of this urban complex extends over the whole country where access to the market at the national scale is more profitably achieved since the Prime

Base is the central depôt where all commodity prices are fixed, increasing in all directions proportionate to distance. Accordingly, industrial localization is an integral part of the whole economic process as seen along the space-time scale. Obviously this explanation goes far beyond Hoover's general observation of the tendency for young industry to locate at specific favourable places:

> When an industry is young and its problems unfamiliar it prospers best in those few places which provide the combination of appropriate basic skills, together with experienced managers and some venturesome enterprisers and financial backers... (2)

Our departure from Hoover lies in the attempt in this study to resolve the question why certain locations, or indeed one location, should garner the prerequisites for the nascent industry, and how it all began.

It has already been indicated that the Prime Base is the heart land of Sudanese industry, and without doubt it comprises the most complex organisation of the incipient industry in the country. As such, it is imperative to stress that 'basic' industry is still dominated by agro-industries, engaging four-fifths of the country's industrial manpower and paid-up capital. However, the overall capital performance is weak and indicates among other things the presence of redundant capacities. Undercapacity is likely to be greater outside the Prime Base since the distributive channels are less developed there, and ill-equipped to cope with commodity discharge on the national level. It follows that the risk element is more pronounced in the regional areas in contrast to the Prime Base where assets such as industrial land and storage facilities adequately compensate for any losses that may be incurred. The results of this study also point to variations of

performance within the sectoral and size structures as revealed by the relative efficiency of the Electrical and Engineering Industry (SIC m Group VI), and middle size-classes (100 - 500 workers). Bahri has more industry, particularly in these categories, than any other location, and for that reason may justifiably be described as the nerve-centre of Sudan's industry.

9.3 Industrial Location Patterns and Trends

In many ways the distribution of industry in Sudan resembles that of a 'developing' country which often displays a three-tier pattern; at the heart is the conspicuous Prime Base industry surrounded by the emerging 'non-basic' industries of the secondary bases, and the patchy, one-factory industries of the public sector which sparsely dot the remote areas. Structural configuration of the industry varies from one industrial pattern to another thus underlining pattern differentiation. The one-factory, public sector industry, for instance is characterised by large capital investment to satisfy socio-political objectives, and at the same time to tap unexploited agricultural resources. The function and performance of this industry is often at odds with the Prime Base industry except that both industries serve the nationwide market. While the Prime Base industry has developed a complex structure, industrial inter-linkages and relatively higher value added, regional industry is isolated and registers low value added. The non-basic industry of the secondary bases on the other hand, identifies more with the Prime Base, albeit on a much smaller scale. Yet functionally it processes local material, again on a very limited scale. Secondary base industry is singular however, in that it only serves the immediate market.

In developing a prognosis for the direction and growth form of Sudanese industry, one must note the important changes taking place in terms of urban growth, and regional and agro-industrial development. About one-fifth of the country's population were urban dwellers in 1976. Of this proportion 30 per cent live in the Khartoum Province, and the population of the Prime Base is now nearing the million mark. A diversity of 'non-basic' industries can thus reach their threshold in the Prime Base, and the chances of higher industrial growth and productivity are increased because of the growing industrial inter-linkages and economies of scale. This fact stresses the growing disparity between the Prime Base and the rural areas, and is causing much concern among the administrative and planning authorities. Regional autonomy and regional planning are sought to bridge this gap. The viability of this approach will be considered in the subsequent section. However, what concerns us here is the impact of plans now under execution on industrial location trends. The strategy adopted in the mid-1970's to invite foreign investment, especially Middle Eastern capital, to promote agri-business and infrastructure will have a skewed impact on industrial location since the central region (Gezira - Prime Base) garners a multifarious export-oriented infrastructure, and registers a higher-than-average income, productivity and population per sq. Km. than the rest of the country. As production, both primary and secondary, is predominantly export-oriented, major road construction is now traversing the central region and reaching through the fertile east to the Red Sea. This development will lead to the evolution of a 'thumb-forefinger growth zone' defined by the two tips of Khartoum and Port Sudan and the broad base of Kosti-Sennar. Capital investment will be

attracted to this zone, and already 60 per cent of A.F.E.S.D's (Arab Fund for Economic and Social Development) short-term programme (up to 1985) is concentrated here. Agro-based industries, and eventually allied, ancillary and residual industries such as fertilizers, agricultural machinery and animal feed-stuffs will prosper in the 'thumb-forefinger growth zone'. The discovery of oil in Western Sudan in 1978 will add a new dimension to development in the central region if commercial viability of oil production is ascertained. The proclamation of 1980 as 'the year of oil' in a 'Presidential' broadcast is a strong hint of the positive results so far obtained.(3) There is already speculation about the extension of pipe lines to the oil fields of the west, and in fact, a pre-feasibility study for a new oil refinery was prepared in 1979. Either Sennar or Kosti were selected as the most suitable locations, again manifesting the strong pull of the central region. It may be anticipated however that the proportion of industrial concentration in the Prime Base itself will be somewhat curbed. Nevertheless the diversity and complexity of the Prime Base industry will continue. Already the Prime Base has embarked upon 'sustained growth', and will further intensify its capacity to manage foreign capital inflow and hopefully Sudanese oil dividends. All this, it is anticipated, will increase economic transactions and industrial localization at the Prime Base.

9.4 The Theoretical Framework

Although several location models and treatises have been cited (Chapter Four), two broad themes run through industrial location literature, relating to least-transfer-cost and locational interdependence. These theories are lamentably inadequate for explanation

of industrial localization in 'developing' countries. As G. Norcliffe noted, the reasons may be congenital in view of the limited knowledge of 'developing' countries, and more significantly because: "the rest of the world will probably not follow patterns of locational development exhibited in economically advanced countries."(4) Since the paths of economic development in industrial and 'developing' countries are fundamentally dissimilar, and since industrial location is inseparable from the totality of the economic process, a theory of industrial location must have as its roots an explanation of these processes of economic development. In contradistinction to many location models, the theoretical explanation proposed here through the formulation of the Prime Base Theory is thus an attempt to understand industrial location in terms of socio-economic organisation as translated into structural systems and economic process in Sudan. From this standpoint, the author takes account of the malformations of the charter export-import development and the contradictions of the economic system to form the basic hypotheses whose truth were asserted in Chapters Two and Three. Furthermore, in any theoretical abstraction one inevitably has to make some assumptions. Among the explicit assumptions of the theory one may list even distribution of demand (market), uniform transfer cost in all directions, and identical labour cost and skill. This is not to decry their importance. In fact, the assumptions made closely resemble the real conditions they operate in. For example, the practice of 'profit on cost to store' and price basing has more far-reaching effects on location than actual transportation cost. Similarly, the import-substitute 'basic' industry that developed, and the centralised distributive channels have reduced the impact of the market as a discrete area. The ineptitude with which location factors are

usually catalogued often ignores the basic fact that location factors operate within the mechanism of the whole economic process which conditions their effectiveness through the existing economic system and policy goals.

The central tenets of the Prime Base Theory are cast in a profit maximisation model, and accordingly industrial localization can be explained in terms of the spatial variability of profit margins, variable cost, and demand. All three factors are graphically represented to depict locations of maximum profitability. Three points, P (port), B (Prime Base), and C (countryside) are concurrently considered. Since 'basic' industry often imports more than 50 per cent of its input, the local material consumption is alternatively assumed to be procurable from P, B or C. Moreover, as transfer cost of finished goods is five times higher than that of raw materials, and profitability varies with profit on cost to store, the visual impression from Figs. 4.3, 4.4 and 4.5 (Chapter Four) indicates in each case that B is the location of maximum profitability. The main theoretical and methodological conclusion therefore, is that basic private industry which normally imports a high proportion of its inputs, will concentrate in a specific location, the Prime Base. Of course, considerations other than maximisation of profit are important in general terms. However, these considerations are far less significant in a 'developing' country because the lack of basic services and minimum prerequisites in many non-Prime Base areas rules out personal preference. By contrast, in industrial countries personal factors or 'psychic' income has often stimulated preference for certain locations.

9.5 Industrial Location and Regional Planning

The degree to which the existing economic system limits industrial dispersion was examined in the case study (Chapter Seven). The economic efficiency of alternative locations for the cotton-seed industry on the premise of the least-transfer-cost is tested. Although sub-optimality of the present concentration of the cotton-seed industry at the Prime Base is ascertained in monetary terms (a difference of more than LS. 600,000), the constructs of the Prime Base Theory point to the existence of complex factors that yield more profit at the Prime Base. Paradoxically then, a least-cost location does not necessarily maximise profit. The dilemma of this paradox must concern the planning authority in two ways. There is the depressed periphery with its incapacity to fulfil the private entrepreneur's objective of maximising profit, and apparently there is an enormous wastage in absolute monetary terms (as has been shown from the example of cotton-seed industry), and social cost both at the urban and regional levels. The question we must now pose relates to the feasibility, or even the desirability, of curbing industrial localization at the Prime Base of Sudan, and conversely the monetary cost and economic returns of industrial regionalisation. The rising tide against the dispersion of industry in regional planning circles in the 'West' is neatly summarised by Smith:

> Powerful economic forces are encouraging the increasing concentration of economic activity and population in major metropolitan regions, and it would be foolish and impracticable to attempt to reverse this to any great extent. Thus there will always be some places where industry declines and where subsidised economic revival will not be in the national interest on either economic or welfare grounds. (5)

What Smith had in mind was probably the coal mining and textile

industries of North-East and North-West of England. His attitude is possibly a direct response to the widespread negative results of regional planning to alleviate depressed conditions by fiscal assistance and creation of growth centres and zones. In the two instances mentioned, industrial decay was largely attributable to the dynamic restructuring of the industry in the face of new technology, and national and international market forces. However, there is another facet to this exposition convincingly argued by Alonso:

> ... legislation which encourages the investment of national resources in depressed areas would seem to sacrifice some national economic growth for greater internal equality. (6)

The implicit assumption here is that higher productivity is more likely to be attained in the urban agglomeration because of industrial inter-linkages, specialised services, massing of reserves, and externalities. These objectives could not be satisfied at the periphery and consequently in attempting to regionalise industry, the country will forfeit national economic growth. The counter argument that may be advanced is that externalities in the Prime Base are sustained largely because of indirect subsidies related to spatial profitability margins and price basing system. This distortion of the space economy has a marginal cost - distinct from external diseconomies - unaccounted for by Alonso, that would certainly result in a lower marginal product at the Prime Base than is generally assumed. According to the findings of this study if these economic factors are understood in their true perspective, higher productivity at the Prime Base can be achieved simply by scrapping certain regulatory practices such as the spatial variability of profit margins, and the price basing system. Withdrawing these indirect subsidies will largely reduce marginal cost,

and in effect, mean higher marginal product. One might also argue however, that a multiple price basing at different secondary bases, restructuring of transfer cost and profit margins, and striking a fair deal for primary producers could together create stimuli similar to those currently in operation at the Prime Base. Regional industries could accordingly be promoted without direct subsidies to minimise marginal cost in proportion to marginal product, thus achieving national economic growth at the regional as well as the urban levels. The corollary of this simple solution is that explanation of the economic system is crucial for controlling phenomena. Thus instead of pouring financial subsidies and concessions into rural industry, a thorough understanding of how the 'powerful economic forces' function is proposed here as the most appropriate basis for correcting and reshaping the spatial malfunctions of the system in conformity with our own objective pursuits.

As expected, the planning body of industrial development in Sudan adheres to the common practice of fiscal assistance to 'rural areas' as explicitly evinced from the 1972 Industrial Act and its more generous reinforcement two years later, the 1974 Industrial Act. But the many adversities that consistently bog down attempts at induced regional industrial growth must be viewed in the light of the measures adopted and the approach to industrial location as Smith rightly observed:

> ... it is not surprising that public industrial location policy is generally based on less sophisticated approaches, involving concepts that may have more intuitive appeal than theoretical or empirical support. (7)

One extraordinary demonstration of such an approach is provided by the selection of a location for textile mills in Sudan in 1972 by

a UNIDO expert and nearing completion towards the end of the 1970's.(8) The procedure adopted was merely an arbitrary score-rating for each intuitively selected location, using various location factors such as availability of raw materials, transportation, water, etc. Hazardous procedures of this kind will not do. Whatever industrial location strategies may be chosen, they should be integrated with national planning objectives, and related to theory and relevant methodological solutions. The lack of co-ordination is possibly best shown by the restructuring of the Transfer Rate Book, 1974. Although the main objective was more efficient running of Sudan Railways, the emphasis on capacities and monetary concessions to bulk transfer clearly serves the interests of the larger firms of the Prime Base. If the positive effect of transfer cost and price basing was understood at all, the freight regulations could have been more creatively deployed to serve the national interest in line with the desire to regionalise industry. This is one example to substantiate claims made in this study that a theoretical and empirically derived framework is long overdue for planning industrial location in Sudan.

CHAPTER NINE

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APPENDICES

Appendix 5.1

Basic data for industry in the Prime Base on 13 variables.

Key to variables:*

1. Employment
2. Paid up capital
3. Gross value added
4. Raw materials (local)
5. Raw materials (imported)
6. Fuel
7. Value of production
8. Wages and salaries
9. Buildings
10. Machinery and equipment
11. Total cost (local)
12. Total cost (imported)
13. Spare parts and maintenance

* Except (1) all variables in LS.

Source: Compiled from IDCAS, Industrial Survey, Sudan, 1969/70, Cairo, 1970.

'BAHRI'

1	2	3	4	5	6	7	8	9	10	11	12	13
'FOOD DRINK & TOBACCO'												
33	140000	34000	119400	0	4600	176500	11500	10000	110300	180400	0	800
49	56200	17400	0	40400	2700	79800	6200	11200	50000	33100	40000	600
77	199500	16200	189100	0	6600	236800	16000	22000	42800	249400	0	3400
83	150000	115900	400000	0	21700	606200	20100	12000	100000	577800	3000	3000
87	60000	49600	114500	10800	11600	206500	31100	15800	27700	175900	22400	9100
92	110000	61300	22900	9100	13300	167100	55600	44700	54700	146300	22900	3900
113	100000	57800	238200	0	6100	332500	37200	0	166500	331000	0	5000
153	50000	6300	113600	1900	7700	155900	30800	4100	68200	207500	3500	4100
154	160100	35400	151200	0	14600	222300	20800	29400	98600	226200	2400	0
127	900000	32900	64700	300	1900	121000	25700	61400	78000	110700	4800	1000
173	140000	100900	203500	51500	13800	398400	29500	66000	22800	288700	51500	7400
238	750000	261400	911900	1738000	56100	3106500	13900	645700	719600	1344200	1738000	7400
293	300000	378300	87000	951400	19100	1551600	133700	165100	292100	438300	971700	20300
302	734100	385500	153900	0	36100	1114600	135500	425200	782200	841600	185800	70300
352	60000	110900	157400	105800	9200	449300	80700	22600	42700	330600	115300	9200
426	200000	208600	915600	66100	39000	1533600	122500	31900	146800	1415900	124300	15800
441	250000	283300	1103000	49000	36900	1909700	158600	98100	447600	1827200	83300	18300
'TEXTILES & GINNING'												
80	100000	6700	1600	26400	900	41600	9300	39300	22700	26000	27500	1500
90	50000	32000	8600	82800	2600	135600	21300	28700	82300	58600	82800	2400
149	90000	88100	101800	53300	5100	258100	46100	38800	75900	173200	62900	8500
1983	1108500	903600	666000	12200	102500	1763100	436600	485600	1102900	1450100	65200	53000
3845	9103000	1981000	2000000	130000	300000	4821000	900000	2240000	5800300	4426000	330000	28000
'LEATHER & FOOTWEAR'												
116	110000	55400	4700	92000	4500	168200	30900	14300	65000	58500	93100	3000
354	178100	179600	0	175600	17400	426300	72900	8500	61000	171800	192800	17200
1023	858000	1125300	22000	1232100	33000	3040900	443900	371000	552000	1295000	1471300	107700
'WOOD PAPER & PRINTING'												
43	53800	13800	4600	0	600	19700	8900	33500	9800	17900	100	100
57	60000	6600	12600	0	900	21100	8300	38500	5900	24300	0	600
88	120000	12400	8800	1600	14600	49700	24700	57400	142500	76900	11100	9500
113	425100	23900	11900	3500	600	42900	24200	256400	115100	43500	3500	100
155	97900	39500	15200	13500	4400	88300	29800	25200	135000	93000	13500	6000
262	250000	67700	0	272100	5900	370200	71200	147500	381400	169500	274000	3100
'CHEMICALS & ALLIED'												
37	50000	33900	0	27000	1300	75800	9600	0	63000	39200	27000	4500
46	20000	25900	3200	48400	500	139400	11200	3100	1100	35100	97900	600
55	105800	23400	4800	28100	800	95400	15000	38400	47500	62400	33900	500
94	100000	1300	0	24100	1000	54100	39900	101600	82800	81900	25300	1200
98	100000	137300	13000	144600	1900	370900	46700	0	45900	143000	198400	1100
289	246000	184000	29400	173900	7500	437800	79400	103000	268000	232500	180000	9100
393	150000	107800	239600	128400	6000	526500	65700	188400	215800	389900	128400	6900
525	200000	241800	737800	230000	54300	1567800	162100	152200	502400	1378900	255600	30400
'METALS & ELECTRICAL'												
77	136700	46100	0	152000	2700	210500	23000	66500	100200	53000	152200	500
86	50000	51500	2700	109500	3900	179000	33100	56200	50700	71000	113900	4400
121	50000	94800	0	76400	6500	195800	51200	36000	38500	102900	77400	1000
429	25000	71800	0	142800	19000	348100	68300	53000	87300	207200	150900	4100
829	125000	328200	0	451400	23600	850800	32500	103000	101300	168400	468600	16700
'CEMENT TILES GLASS ETC'												
137	250000	47800	10400	34200	23800	128000	55500	89500	229000	140200	37000	5000
14767	18572800	8086900	8844600	5890250	946800	28784900	3750700	6440800	13636500	19014700	7943200	575300

3/2	2/3	2/7	2/1	1/6	3/1	7/1	1/3	10/1	3/10
0.24280	4.11760	0.79320	4242.42420	2.35714	1030.30300	5348.48480	9.70589	3333.33330	0.30910
0.30960	3.22980	0.75420	1145.93870	8.71886	355.10200	1628.57140	28.16091	1020.40810	0.34800
0.08130	12.31480	0.84240	2590.90900	3.85964	210.38960	3075.32460	47.53385	555.84410	0.37850
0.77260	1.29420	0.24740	1807.22890	5.53333	1396.38550	7303.61440	7.16134	1204.81920	1.15900
0.32660	1.20960	0.29050	689.65510	14.50000	570.11490	2373.56320	17.54032	318.39080	1.79060
0.55720	1.79440	0.65820	1195.65210	8.36363	666.30430	1816.30430	15.00815	594.56520	1.12060
0.57800	1.73010	0.30070	884.95570	11.30000	511.50440	2942.47780	19.55017	1473.45130	0.34710
0.12600	7.93650	0.32070	326.79730	30.60000	41.17640	1018.95420	242.85714	445.75160	0.09230
0.22110	4.52250	0.72010	1039.61030	9.61898	229.87010	1443.50640	43.50282	640.25970	0.35900
0.03650	27.35560	7.43800	7086.61410	1.41111	259.05510	952.75590	38.60189	614.17320	0.42170
0.72070	1.38750	0.35140	809.24850	12.35714	583.23690	2302.89010	17.14568	131.79190	4.42540
0.34850	2.86910	0.24140	3151.26050	3.17333	1098.31930	13052.52100	9.10482	3023.52940	0.36320
1.25100	0.79300	0.19330	1023.89070	9.76666	1291.12620	5295.56310	7.74517	996.92830	1.29510
0.52510	1.90420	0.65860	2430.79470	4.11388	1276.49000	3690.72840	7.83398	2590.06620	0.49280
1.84830	0.54100	0.13350	170.45450	58.66666	315.05680	1276.42040	31.74030	121.30680	2.59710
1.04300	0.95870	0.13040	469.48350	21.30000	489.67130	3600.00000	20.42186	344.60390	1.42090
1.13320	0.88240	0.13090	566.89340	17.64000	642.40360	4330.38540	15.56653	1014.96590	0.63290
0.96700	14.92530	2.40380	1250.00000	8.00000	83.75000	520.00000	119.40298	263.75000	0.29510
0.64000	1.56250	0.36870	555.55550	18.00000	355.55550	1506.66660	28.12500	914.44440	0.38880
0.97880	1.02150	0.34870	604.02680	16.55555	591.27510	1732.21470	16.91259	509.39590	1.16070
0.81510	1.22670	0.62870	559.00150	17.88903	455.67320	889.10740	21.94555	556.17750	0.81920
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1.00840	0.99160	0.41770	503.10730	19.87647	507.34460	1204.23720	19.71046	172.31630	2.94420
1.31150	0.76240	0.28210	838.70960	11.92307	1100.00000	2972.53170	9.09090	539.58940	2.03850
0.25650	3.89850	2.73090	1251.16270	7.99256	320.93020	458.13950	31.15942	227.90690	1.40810
0.11000	9.09090	2.84360	1052.63150	9.50000	115.78940	370.17540	86.36363	103.50870	1.11860
0.10330	9.67740	2.41440	1363.63630	7.33333	140.90900	564.77270	70.96774	1619.31810	0.08700
0.05620	17.78660	9.90900	3761.94690	2.65819	211.50440	379.64600	47.28033	1018.58400	0.20760
0.40340	2.47840	1.10870	631.61290	15.83248	254.83870	569.67740	39.24050	870.96770	0.29250
0.27080	3.69270	0.67530	954.19840	10.48000	258.39690	1412.97700	38.70014	1455.72510	0.17750
0.67800	1.47490	0.65960	1351.35130	7.40000	916.21620	2048.64860	10.91445	1702.70270	0.53800
1.29500	0.77220	0.14340	434.78260	23.00000	563.04340	3030.43470	17.76061	23.91300	23.54540
0.22110	4.52130	1.10900	1923.63630	5.19848	425.45450	1734.54540	23.50427	865.45450	0.49150
0.01300	76.92300	1.84840	1063.82970	9.40000	13.82970	575.53190	723.07692	880.85100	0.01570
1.37300	0.72830	0.26960	1020.40810	9.80000	1401.02040	3784.69380	7.13765	468.36730	2.99120
0.74790	1.33690	0.56190	851.21100	11.74796	636.67820	1514.87880	15.70652	927.33560	0.68650
0.71860	1.39140	0.28490	381.67930	26.20000	274.30020	1339.69460	36.45640	549.10940	0.49950
1.20900	0.82710	0.12750	380.95230	26.25000	460.57140	2986.28570	21.71215	956.95230	0.48120
0.33720	2.96520	0.64940	1775.32460	5.63277	598.70120	2733.76620	16.70281	1301.29870	0.46000
1.03000	0.97080	0.27930	581.39530	17.20000	598.83720	2081.39530	16.69902	589.53490	1.01570
1.89600	0.52740	0.26910	413.22310	24.20000	783.47100	1535.53710	12.76371	318.18180	2.46230
2.87200	0.34810	0.07180	58.27500	171.60000	167.36590	811.42190	59.74930	204.66200	0.81770
2.62560	0.38080	0.14690	150.78400	66.32000	395.89860	1026.29670	25.25498	121.83350	3.24950
0.19120	5.23010	1.95310	1824.81750	5.48000	348.90510	934.30650	28.66108	1671.53280	0.20870
0.43540	2.29660	0.64520	1257.72330	7.95087	547.63320	1949.27200	18.26039	923.38320	0.59300

'KHARTOUM'

1	2	3	4	5	6	7	8	9	10	11	12	13
'FOOD DRINK & TOBACCO'												
83	45000	12900	22600	16900	6500	66900	19100	18900	0	52700	22800	5900
84	79700	21100	105600	27500	4800	167000	8300	30000	12500	130400	27500	700
102	127900	20800	59800	75400	6300	166000	18700	64700	133200	116700	77000	2100
118	14000	19600	38400	36300	5200	108800	22300	10000	19000	70700	42100	5800
168	75000	100200	88100	144000	21200	403900	55500	49700	41000	216400	162900	13900
294	135000	379200	420300	222000	17200	1137700	58800	37100	263000	605100	297500	3300
105	10000	22300	36700	29100	2800	100200	18100	0	6300	7000	30400	1300
337	91600	44500	15400	62400	13300	202200	31500	13900	93100	105800	91800	2100

387	100000	138800	142900	254300	6100	625500	100300	84100	109600	337500	286000	49100
'TEXTILES & GINNING'												
'LEATHER & FOOTWEAR'												
41	5000	21800	0	161000	600	198200	7900	0	4000	29700	163900	1400
404	397300	166700	260900	24000	10400	499300	105600	252900	360000	467700	26100	5400
'WOOD PAPER & PRINTING'												
31	3000	8700	7300	0	300	16500	6700	0	1300	15200	0	100
34	15000	6900	4500	0	200	11700	5400	43000	30000	11200	0	0
34	30000	15000	100	14500	1000	32800	9500	0	34100	18100	14500	0
59	30000	24400	0	11400	0	38000	12900	0	30000	19100	11900	600
65	124300	23100	200	13300	900	40300	23700	90800	124100	48100	14000	700
69	79600	18600	0	35200	400	63600	13400	13800	68800	27400	36300	1500
77	200000	32400	0	11000	1100	48100	23800	40000	80000	35700	11000	0
134	34000	115400	0	106000	5600	260400	41900	21700	57900	105200	110600	4600
153	150000	56900	0	89900	2600	155100	42500	41500	113000	71300	91500	1500
228	161000	304600	2800	244200	10100	594100	124500	134400	302800	267100	244200	12900
976	488400	371600	0	140000	5000	530000	248400	167000	586000	349400	145000	5000
'CHEMICALS & ALLIED'												
38	18000	42900	200	7300	5500	69700	27400	12000	0	51900	11400	4100
60	26500	57500	0	119700	2900	187700	22100	0	61900	57400	119700	2900
89	4100	15900	3900	100200	1600	164500	10100	2700	16300	28700	134300	100
132	105100	31500	59900	68700	1700	212000	12300	21600	62300	129700	68700	2200
'METALS & ELECTRICAL'												
45	8000	22100	0	24600	200	47800	12400	0	6000	16600	24600	900
80	50000	34700	53000	0	300	92600	28900	10100	12600	90700	0	600
91	20000	4900	400	4000	700	10400	3900	5000	3000	6000	4000	0
78	22400	15600	142100	0	5400	167200	23500	18300	57300	197900	0	100
211	100000	90200	10000	241800	5500	348100	44800	35700	25800	93100	241800	0
306	100000	98900	0	189600	2900	308500	63400	0	125300	130200	199600	1600
'CEMENT TILES GLASS ETC'												
64	40000	15700	9500	9200	600	41800	7400	2200	16100	26600	9200	900
5178	3389900	2352400	1484600	2483500	148900	7166600	1255000	1221100	2867500	3999400	2710300	139400

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3	1/1	3/3
0.28660	3.48830	0.67260	542.16860	18.44444	155.42160	806.02400	64.34108	-0.01200	12900.00000
0.26470	3.77720	0.47720	948.80950	10.53952	251.19040	1988.09520	39.81042	148.80950	1.68800
0.15260	6.14990	0.77040	1253.92150	7.97498	203.92150	1627.45090	49.03846	1205.88220	0.15611
1.40000	0.71420	0.12860	118.64400	84.28571	166.10160	922.03380	60.20408	84.74570	1.96000
1.33600	0.74850	0.18560	446.42850	22.40000	596.42850	2404.16660	16.76646	244.04760	2.44390
2.80880	0.35600	0.11360	459.18360	21.77777	1289.79590	4039.79590	7.75316	994.55780	1.44180
2.23000	0.44840	0.09980	94.33960	106.00000	210.37730	945.28300	47.53363	59.43390	3.53960
0.48580	2.05840	0.45300	271.81000	36.79039	132.04740	600.00000	75.73033	276.26110	0.47790
1.35800	0.73630	0.15980	258.39790	38.70000	350.90430	1616.27900	28.49779	283.20410	1.23900
4.36000	0.22930	0.02520	121.95120	82.00000	531.70730	4834.14630	18.80733	97.56090	5.45000
0.18570	5.38270	1.79710	2221.03960	4.50239	412.62370	1235.89100	24.23515	891.08910	0.46300
2.90000	0.34480	0.18180	96.77410	103.33333	280.64510	582.25800	35.63218	41.93540	6.69230
0.46000	2.17390	1.28200	441.17640	22.66666	202.94110	344.11760	49.27535	882.35290	0.23000
0.50000	2.00000	0.91460	882.35290	11.33333	441.17640	964.70580	22.66666	1002.94110	0.43980
0.81330	1.22950	0.78940	508.47450	19.66666	413.55930	644.06770	24.18032	508.47450	0.81330
0.18580	5.38090	3.08430	1912.30760	5.22928	355.38460	620.00000	28.13852	1909.23070	0.18610
0.23360	4.27950	1.25150	1153.62310	8.66834	269.56520	921.73910	37.09677	997.10140	0.27030
0.16200	6.17280	4.15800	2597.40250	3.85000	420.77920	624.67530	23.76543	1039.96100	0.40500
3.39410	0.29460	0.13050	253.73130	39.41176	861.19400	1943.28350	11.61179	506.71640	1.69950
0.37930	2.63620	0.96710	980.39210	10.20000	371.89540	1013.72540	26.98927	738.56200	0.50350
1.89190	0.52850	0.27090	706.14030	14.16149	1335.96490	2605.70170	7.48522	1328.07010	1.90590
0.76080	1.31430	0.92150	500.40980	19.98361	380.73770	543.03270	26.26480	500.40980	0.63410
2.38330	0.41950	0.25820	473.68420	21.11111	1128.94730	1834.21050	8.85780	-0.02630	42900.00000
2.16980	0.46080	0.14110	441.66660	22.64150	958.33330	3128.33330	10.43478	1031.66660	0.92890
3.87800	0.25780	0.02490	45.06740	217.07317	178.65160	1848.31460	55.97484	183.14600	0.97540
0.29970	3.33650	0.49570	796.21210	12.55946	238.63630	1606.06060	41.90476	471.96960	0.50560
2.76250	0.36190	0.16730	177.77770	56.25000	491.11110	1062.22220	20.36199	133.33330	3.68330
0.69400	1.44090	0.53990	625.00000	16.00000	433.75000	1157.50000	23.05475	187.50000	2.75390
0.24500	4.08160	1.92300	219.78020	45.50000	53.84610	114.28570	185.71428	30.96700	1.63330
0.59640	1.43580	0.13390	287.17940	34.82142	200.00000	2143.58970	50.00000	859.97430	0.23280
0.90200	1.10860	0.25720	473.93360	21.10000	427.43810	1649.76300	23.39246	122.27490	3.49610
0.98900	1.01110	0.32410	326.79730	30.60000	323.20260	1008.16090	30.94934	409.47710	0.78930
0.39250	2.54770	0.95690	625.00000	16.00000	245.31250	653.12500	40.76433	251.56250	0.97510
0.69390	1.44100	0.47300	654.67360	15.27478	454.30660	1384.04780	22.01156	583.68960	0.82050

'OMOURMAN'

1	2	3	4	5	6	7	8	9	10	11	12	13
'FOOD DRINK & TOBACCO'												
32	37000	7600	27300	36500	2400	89200	4300	5500	15000	45400	42500	0
36	32600	6300	12000	0	300	19400	4300	2000	17000	17700	0	200
75	10000	72700	0	142700	400	247900	20400	32100	45200	65300	160700	500
77	10000	11600	2200	22600	100	47400	6800	0	900	19100	24200	0
106	50000	32900	54000	92000	3100	196300	22400	0	26700	96700	94300	2300
217	30000	67000	86900	1000	3100	191600	24600	21200	29100	159800	1700	10200
'TEXTILES & GINNING'												
41	12000	5700	0	8800	800	18100	4000	12000	3300	6600	10900	400
64	25000	17500	0	29200	300	48500	9000	7000	5000	13800	29200	400
75	36700	11200	500	23900	2500	47500	8700	16400	13400	22500	33900	600
82	100000	25000	7500	27400	1800	67900	11600	39900	85900	32900	27900	300
93	50000	53300	30700	26500	1400	118500	24500	19500	73600	84500	26500	2800
'LEATHER & FOOTWEAR'												
88	64000	10800	500	76200	1600	103800	11900	3700	40000	30400	77600	3300
177	63000	44700	17100	50000	1900	123400	31300	15000	63000	97900	50000	0
'WOOD PAPER & PRINTING'												
30	43000	10200	7800	6400	600	26900	8900	34200	34200	27300	6400	800
38	41900	12000	2900	22400	300	38700	6400	0	13700	12900	22400	0
66	2000	6600	38000	0	400	45100	6000	0	700	45000	0	0
77	90000	23700	5200	61200	1400	96900	31400	34000	5400	34700	61200	500

127	30000	21600	12600	2100	1000	39500	14900	0	15000	34600	3600	1500
'CHEMICALS & ALLIED'												
46	50000	10900	8700	300	4500	25600	5300	15000	18000	23000	300	400
74	56000	56200	82700	1900	1900	208300	9500	10300	17200	107900	54300	500
78	25000	31200	2800	400	400	111700	18500	17900	36400	43500	63700	2500
133	74000	51800	8200	2000	100	333700	98600	21000	5700	227500	5800	1600
'METALS & ELECTRICAL'												
39	47700	25400	0	74900	800	104900	21200	4000	10600	25300	76400	1500
43	40000	29300	4300	46700	1500	82500	5800	2000	15900	23600	46900	200
55	6000	13900	8400	0	1200	24100	8700	0	5300	20400	0	100
'CEMENT TILES GLASS ETC'												
1969	1032800	659100	420300	755100	33800	2457400	408700	316700	552400	1317500	910400	30600

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3	10/1	3/10
0.20540	4.86840	0.41470	1156.25000	8.64864	237.50000	2787.50000	42.10526	468.75000	0.50666
0.19320	5.17460	1.68040	905.55550	11.04294	175.00000	538.88880	57.14285	472.22220	0.37050
7.27000	0.13750	0.04030	133.33330	75.00000	969.33330	3305.33330	10.31636	602.66660	1.60840
1.16000	0.86200	0.21090	129.87010	77.00000	150.64930	615.58440	66.37931	11.68830	12.88880
0.65800	1.51970	0.25470	471.69810	21.20000	310.37730	1851.88670	32.21884	251.88670	1.23220
2.23330	0.44770	0.15650	138.24880	72.33333	308.75570	882.94930	32.39805	134.10130	2.30240
0.47500	2.10520	0.66290	292.68290	34.16666	139.02430	441.46340	71.92982	80.48780	1.72720
0.70000	1.42850	0.51540	390.62500	25.60000	273.43750	757.81250	36.57142	78.12500	3.50000
0.30510	3.27670	0.77260	489.33330	20.43596	149.33330	633.33330	66.96428	178.66660	0.83580
0.25000	4.00000	1.47270	1219.51210	8.20000	304.87800	828.04870	32.80000	1047.56090	0.29100
1.06600	0.93800	0.42190	537.63440	18.60000	573.11820	1274.19350	17.44840	361.29030	1.58630
0.16870	5.92590	0.61650	727.27270	13.75000	122.72720	1179.54540	81.48148	454.54540	0.27000
0.70950	1.40930	0.51050	355.93220	28.09523	252.54230	697.17510	39.59731	338.98300	0.74500
0.25500	3.92150	1.48690	1333.33330	7.50000	340.00000	896.66660	29.41176	1140.00000	0.29820
0.28700	3.48330	1.08010	1100.00000	9.09090	315.78940	1018.42100	31.66666	360.52630	0.87590
3.30000	0.30300	0.04430	30.30300	330.00000	100.00000	683.33330	100.00000	10.60600	9.42850
0.26330	3.79740	0.92870	1168.83110	8.55555	307.79220	1258.44150	32.48945	70.12980	4.38880
0.72000	1.38880	0.75940	236.22040	42.33333	170.07870	311.02360	58.79629	118.11020	1.44000
0.21800	4.58710	1.95310	1086.95650	9.20000	236.95650	556.52170	42.20183	391.30430	0.60550
0.85150	1.17430	0.31680	891.89180	11.21212	759.45940	2814.86480	13.16725	232.43240	3.26740
1.24800	0.80120	0.22380	320.51280	31.20000	400.00000	1432.05120	25.00000	466.66660	0.85710
0.70000	1.42850	0.22170	556.39090	17.97297	389.47360	2509.02250	25.67567	42.85710	9.08770
0.53240	1.87790	0.45470	1223.07690	8.17610	651.28200	2689.74350	15.35433	256.41020	2.54000
0.73250	1.36510	0.48480	930.23250	10.75000	681.39530	1918.60460	14.67575	348.83720	1.95330
2.31660	0.43160	0.24890	109.09090	91.66666	252.72720	438.18180	39.56834	109.09090	2.31660
0.63810	1.56690	0.42320	524.53020	19.06467	334.73840	1248.04460	29.87407	380.54850	1.19310

Appendix 5.2 Industrial Localization in the Prime Base by SIC Group on five variables, and the Coefficient of Geographical Association (Cg.)*

SIC m Group	Food, Drink and Tobacco (SIC m I)					Textiles and Ginning (SIC m II)					Leather and Footwear (SIC m III)				
Locality	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Bahri	58.9	83.7	69.3	75.5	78.4	94.5	97.9	96.4	95.9	96.1	67.8	52.6	84.8	79.7	77.8
Khartoum	31.0	13.0	24.3	19.4	17.2	0.0	0.0	0.0	0.0	0.0	20.2	41.4	11.7	15.3	16.1
Omdurman	10.0	3.3	6.3	5.1	4.3	5.4	2.1	3.6	4.1	3.9	12.0	5.8	3.4	4.9	6.1
Coefficient of Geographical Assoc.(Cg)	12.0	3.0	3.6	1.4	6.2	27.2	17.1	23.0	21.3	23.8	3.5	27.0	11.9	5.1	5.1

SIC m Group	Wood, Paper & Printing (SIC m IV)					Chemicals and Allied (SIC m V)					Metals and Electrical (SIC m VI)				
Locality	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Bahri	23.5	36.3	33.0	31.0	28.4	70.3	72.3	71.7	71.3	67.8	61.9	49.5	63.9	59.9	49.4
Khartoum	64.9	55.6	60.9	59.6	64.3	14.6	11.4	14.6	13.8	11.3	32.6	38.4	28.7	32.9	42.0
Omdurman	11.6	8.1	6.1	9.4	7.3	15.1	16.0	14.3	14.8	20.8	5.5	12.0	7.4	7.1	8.4
Coefficient of Geographical Assoc.(Cg)	43.6	43.8	44.8	41.0	47.7	9.1	11.5	8.3	8.3	14.0	8.8	31.2	9.0	14.6	22.8

SIC m Group	Cement, Tiles, Glass etc. (SIC m VII)				
Locality	1	2	3	4	5
Bahri	68.1	86.2	75.3	75.4	88.2
Khartoum	31.8	13.8	24.7	24.6	11.8
Omdurman	0.0	0.0	0.0	0.0	0.0
Coefficient of Geographical Assoc.(Cg)	9.0	8.2	5.0	6.5	16.0

Key to numbers	
1	Employment
2	Paid-up capital
3	Gross value added
4	Production value
5	Wages and salaries

Source: Compiled from data in Appendix 5.1

* For formula see text

Appendix 5.3 Location quotient on five variables for the Prime Base

SIC m Group	Food, Drink & Tobacco (SIC m I)					Textiles and Ginning (SIC m II)					Leather and Footwear (SIC m III)				
Locality	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Bahri	0.85	1.04	0.95	1.01	1.09	1.40	1.21	1.32	1.27	1.33	1.01	0.65	1.16	1.07	1.08
Khartoum	1.31	0.88	1.15	1.02	0.82	0.00	0.00	0.00	0.00	0.00	0.85	2.81	0.55	0.81	0.77
Omdurman	1.11	0.73	1.07	0.78	0.63	0.61	0.47	0.61	0.63	0.58	1.33	1.30	0.58	0.77	0.90

SIC m Group	Wood, Paper & Printing (SIC m IV)					Chemicals and Allied (SIC m V)					Metals and Electrical (SIC m VI)				
Locality	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Bahri	0.35	0.45	0.45	0.30	0.39	1.05	0.90	0.98	0.96	0.94	0.92	0.61	0.88	0.80	0.68
Khartoum	2.71	3.53	2.94	3.25	3.21	0.61	0.78	0.66	0.73	0.54	1.37	2.61	1.36	1.74	2.01
Omdurman	1.28	1.80	1.03	1.45	1.08	1.68	3.57	2.40	2.28	3.06	0.61	2.67	1.25	1.10	1.25

SIC m Group	Cement, Tiles & Glass (SIC m VII)				
Locality	(1)	(2)	(3)	(4)	(5)
Bahri	1.01	1.07	1.03	1.01	1.22
Khartoum	1.34	0.94	1.17	1.30	0.56
Omdurman	0.00	0.00	0.00	0.00	0.00

Key to variables

(1) Employment
(2) Paid-up capital
(3) Gross value added
(4) Production value
(5) Wages and salaries

Source: Compiled from data in Appendix 5.1

Appendix 5.4 Number of workers, paid-up capital and gross value added by size class and industrial group (LS.'000)

SIC m Group	Size Class 1 (30-99) Employment	Capital	Gross value added	Size Class 2 (100-299) Employment	Capital	Gross value added
Food Drink & Tobacco	808	930.0	426.6	2362	2842.0	1515.0
Textiles & Ginning	525	373.7	151.4	149	90.0	88.1
Leather & Footwear	129	69.0	32.6	293	173.0	100.1
Wood Paper & Printing	768	889.5	214.4	1172	1148.0	629.6
Chemical & Allied	715	565.4	436.4	554	425.1	267.3
Engineering & Electrical	594	380.8	243.5	332	150.0	185.0
Cement, Tiles & Glass etc	64	40.0	15.7	137	250.0	47.8
Total and Per cent	3603 (16.44)	3248.4 (14.13)	1520.6 (13.7)	4999 (22.81)	5078.1 (22.08)	2832.9 (25.53)

SIC m Group	Size Class 3 (300-499) Employment	Capital	Gross value added	Size Class 4 (500 -) Employment	Capital	Gross value added
Food Drink & Tobacco	2245	1435.7	1168.6	-	-	-
Textiles & Ginning	-	-	-	5828	10211.5	2884.6
Leather & Footwear	758	1075.4	346.3	1623	858.0	1125.3
Wood Paper & Printing	-	-	-	976	488.4	371.6
Chemicals & Allied	393	150.0	107.8	525	200.0	241.8
Engineering & Electrical	735	125.0	170.7	829	125.0	328.2
Cement Tiles Glass etc	-	-	-	-	-	-
Total and Per cent	4131 (18.85)	2786.1 (12.12)	1793.4 (16.16)	9181 (41.9)	11882.9 (51.67)	4951.5 (44.6)

Source: Compiled from data in Appendix 5.1

Appendix 5.5*

Matrixes of correlation coefficients for ten industry coefficients

5.5.(i) Engineering and Electrical (SIC m Group VI)

5.5.(ii) Leather and Footwear (SIC m Group III)

5.5.(iii) Food, Drink and Tobacco (SIC m Group I)

* Variables as in Table 5.3

Source: Compiled from IDCAS, Industrial Survey, Sudan, 1969/70, Cairo, 1970

5.5.(i)

PEARSON CORRELATION COEFFICIENTS

	A	B	C	D	E	F	G	H	I	J
A	1.0000 (32) S=0.001	-0.3611 (32) S=0.021	-0.2558 (32) S=0.079	-0.3549 (32) S=0.023	0.5999 (32) S=0.001	0.2840 (32) S=0.058	0.0050 (32) S=0.489	-0.2272 (32) S=0.106	-0.1726 (32) S=0.172	-0.0995 (32) S=0.294
B	-0.3611 (32) S=0.021	1.0000 (32) S=0.001	0.9115 (32) S=0.001	0.7913 (32) S=0.001	-0.3532 (32) S=0.024	-0.2785 (32) S=0.061	-0.1352 (32) S=0.230	0.2460 (32) S=0.087	0.0387 (32) S=0.417	0.0057 (32) S=0.488
C	-0.2558 (32) S=0.079	0.9115 (32) S=0.001	1.0000 (32) S=0.001	0.7954 (32) S=0.001	-0.2796 (32) S=0.061	-0.1669 (32) S=0.181	-0.1713 (32) S=0.174	0.0307 (32) S=0.434	0.0249 (32) S=0.446	0.0064 (32) S=0.486
D	-0.3549 (32) S=0.023	0.7913 (32) S=0.001	0.7954 (32) S=0.001	1.0000 (32) S=0.001	-0.5143 (32) S=0.001	0.2176 (32) S=0.116	0.3243 (32) S=0.035	-0.1763 (32) S=0.167	0.5438 (32) S=0.001	-0.0778 (32) S=0.336
E	0.5999 (32) S=0.001	-0.3532 (32) S=0.024	-0.2796 (32) S=0.061	-0.5143 (32) S=0.001	1.0000 (32) S=0.001	-0.2944 (32) S=0.051	-0.3713 (32) S=0.018	0.1848 (32) S=0.156	-0.4670 (32) S=0.004	-0.0494 (32) S=0.394
F	0.2840 (32) S=0.058	-0.2785 (32) S=0.061	-0.1669 (32) S=0.181	0.2176 (32) S=0.116	-0.2944 (32) S=0.051	1.0000 (32) S=0.001	0.7354 (32) S=0.001	-0.5718 (32) S=0.001	0.6292 (32) S=0.001	-0.1627 (32) S=0.187
G	0.0050 (32) S=0.489	-0.1352 (32) S=0.230	-0.1713 (32) S=0.174	0.3243 (32) S=0.035	-0.3713 (32) S=0.018	0.7354 (32) S=0.001	1.0000 (32) S=0.001	-0.3995 (32) S=0.012	0.7178 (32) S=0.001	-0.1395 (32) S=0.223
H	-0.2272 (32) S=0.106	0.2460 (32) S=0.087	0.0307 (32) S=0.434	-0.1763 (32) S=0.167	0.1848 (32) S=0.156	-0.5718 (32) S=0.001	-0.3995 (32) S=0.012	1.0000 (32) S=0.001	-0.2976 (32) S=0.049	0.1145 (32) S=0.266
I	-0.1726 (32) S=0.172	0.0387 (32) S=0.417	0.0249 (32) S=0.446	0.5438 (32) S=0.001	-0.4670 (32) S=0.004	0.6292 (32) S=0.001	0.7178 (32) S=0.001	-0.2976 (32) S=0.049	1.0000 (32) S=0.001	-0.1617 (32) S=0.188
J	-0.0995 (32) S=0.294	0.0057 (32) S=0.488	0.0064 (32) S=0.486	-0.0778 (32) S=0.336	-0.0494 (32) S=0.394	-0.1627 (32) S=0.187	-0.1395 (32) S=0.223	0.1145 (32) S=0.266	-0.1617 (32) S=0.188	1.0000 (32) S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE) (A VALUE OF 99.0000 IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED)

5.5.(ii)

PEARSON CORRELATION COEFFICIENTS

	A	B	C	D	E	F	G	H	I	J
A	1.0000 (14) S=0.001	-0.7777 (14) S=0.001	-0.5567 (14) S=0.019	-0.6193 (14) S=0.009	0.7457 (14) S=0.001	-0.1106 (14) S=0.353	-0.4614 (14) S=0.048	-0.1997 (14) S=0.247	-0.4154 (14) S=0.070	0.3518 (14) S=0.109
B	-0.7777 (14) S=0.001	1.0000 (14) S=0.001	0.8872 (14) S=0.001	0.4782 (14) S=0.042	-0.4018 (14) S=0.077	-0.1881 (14) S=0.260	0.1167 (14) S=0.346	0.6341 (14) S=0.007	0.2906 (14) S=0.157	-0.3272 (14) S=0.127
C	-0.5567 (14) S=0.019	0.8872 (14) S=0.001	1.0000 (14) S=0.001	0.1416 (14) S=0.315	-0.2291 (14) S=0.215	-0.2990 (14) S=0.150	-0.2857 (14) S=0.161	0.8160 (14) S=0.001	-0.1085 (14) S=0.356	-0.1005 (14) S=0.366
D	-0.6193 (14) S=0.009	0.4782 (14) S=0.042	0.1416 (14) S=0.315	1.0000 (14) S=0.001	-0.6212 (14) S=0.009	0.5976 (14) S=0.012	0.7954 (14) S=0.001	-0.3443 (14) S=0.114	0.6414 (14) S=0.007	-0.2108 (14) S=0.235
E	0.7457 (14) S=0.001	-0.4018 (14) S=0.077	-0.2291 (14) S=0.215	-0.6212 (14) S=0.009	1.0000 (14) S=0.001	-0.5873 (14) S=0.014	-0.5905 (14) S=0.013	0.2624 (14) S=0.182	-0.3544 (14) S=0.107	-0.0787 (14) S=0.395
F	-0.1106 (14) S=0.353	-0.1881 (14) S=0.260	-0.2990 (14) S=0.150	0.5976 (14) S=0.012	-0.5873 (14) S=0.014	1.0000 (14) S=0.001	0.6624 (14) S=0.005	-0.7272 (14) S=0.002	0.2434 (14) S=0.201	0.2581 (14) S=0.186
G	-0.4614 (14) S=0.048	0.1167 (14) S=0.346	-0.2857 (14) S=0.161	0.7954 (14) S=0.001	-0.5905 (14) S=0.013	0.6624 (14) S=0.005	1.0000 (14) S=0.001	-0.5854 (14) S=0.014	0.7002 (14) S=0.003	-0.2342 (14) S=0.210
H	-0.1997 (14) S=0.247	0.6341 (14) S=0.007	0.8160 (14) S=0.001	-0.3443 (14) S=0.114	0.2624 (14) S=0.182	-0.7272 (14) S=0.002	-0.5854 (14) S=0.014	1.0000 (14) S=0.001	-0.2654 (14) S=0.180	-0.2093 (14) S=0.236
I	-0.4154 (14) S=0.070	0.2906 (14) S=0.157	-0.1085 (14) S=0.356	0.6414 (14) S=0.007	-0.3544 (14) S=0.107	0.2434 (14) S=0.201	0.7002 (14) S=0.003	-0.2654 (14) S=0.180	1.0000 (14) S=0.001	-0.6962 (14) S=0.003
J	0.3518 (14) S=0.109	-0.3272 (14) S=0.127	-0.1005 (14) S=0.366	-0.2108 (14) S=0.235	-0.0787 (14) S=0.395	0.2581 (14) S=0.186	-0.2342 (14) S=0.210	-0.2093 (14) S=0.236	-0.6962 (14) S=0.003	1.0000 (14) S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE) (A VALUE OF 99.0000 IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED)

5.5.(iii) - - - - - PEARSON CORRELATION COEFFICIENTS - - - - - - - - - - - - -

	A	B	C	D	E	F	G	H	I	J
A	1.0000 (7) S=0.001	-0.6250 (7) S=0.067	-0.6106 (7) S=0.073	-0.5556 (7) S=0.098	0.9482 (7) S=0.001	0.2867 (7) S=0.267	0.9224 (7) S=0.002	-0.3817 (7) S=0.199	-0.6517 (7) S=0.056	0.9453 (7) S=0.001
B	-0.6250 (7) S=0.067	1.0000 (7) S=0.001	0.7349 (7) S=0.030	0.6557 (7) S=0.055	-0.5270 (7) S=0.112	-0.5630 (7) S=0.094	-0.5085 (7) S=0.122	0.6920 (7) S=0.042	0.6513 (7) S=0.057	-0.6943 (7) S=0.042
C	-0.6106 (7) S=0.073	0.7349 (7) S=0.030	1.0000 (7) S=0.001	0.9430 (7) S=0.001	-0.5929 (7) S=0.080	-0.2883 (7) S=0.265	-0.5292 (7) S=0.111	0.0934 (7) S=0.421	0.8512 (7) S=0.008	-0.6276 (7) S=0.066
D	-0.5555 (7) S=0.098	0.6557 (7) S=0.055	0.9430 (7) S=0.001	1.0000 (7) S=0.001	-0.6402 (7) S=0.061	0.0087 (7) S=0.493	-0.3624 (7) S=0.212	-0.0783 (7) S=0.434	0.9329 (7) S=0.001	-0.5607 (7) S=0.095
E	0.9482 (7) S=0.001	-0.5270 (7) S=0.112	-0.5929 (7) S=0.080	-0.6402 (7) S=0.061	1.0000 (7) S=0.001	-0.0111 (7) S=0.491	0.7804 (7) S=0.019	-0.1583 (7) S=0.367	-0.7295 (7) S=0.031	0.8592 (7) S=0.007
F	0.2867 (7) S=0.267	-0.5630 (7) S=0.094	-0.2883 (7) S=0.265	0.0087 (7) S=0.493	-0.0111 (7) S=0.491	1.0000 (7) S=0.001	0.5067 (7) S=0.123	-0.7580 (7) S=0.024	0.0485 (7) S=0.459	0.3612 (7) S=0.213
G	0.9224 (7) S=0.002	-0.5085 (7) S=0.122	-0.5292 (7) S=0.111	-0.3624 (7) S=0.212	0.7804 (7) S=0.019	0.5067 (7) S=0.123	1.0000 (7) S=0.001	-0.4183 (7) S=0.175	-0.4071 (7) S=0.182	0.8471 (7) S=0.008
H	-0.3817 (7) S=0.199	0.6920 (7) S=0.042	0.0934 (7) S=0.421	-0.0783 (7) S=0.434	-0.1583 (7) S=0.367	-0.7580 (7) S=0.024	-0.4183 (7) S=0.175	1.0000 (7) S=0.001	0.0157 (7) S=0.487	-0.4807 (7) S=0.137
I	-0.6517 (7) S=0.056	0.6513 (7) S=0.057	0.8512 (7) S=0.008	0.9329 (7) S=0.001	-0.7295 (7) S=0.031	0.0485 (7) S=0.459	-0.4071 (7) S=0.182	0.0157 (7) S=0.487	1.0000 (7) S=0.001	-0.7262 (7) S=0.032
J	0.9453 (7) S=0.001	-0.6943 (7) S=0.042	-0.6276 (7) S=0.066	-0.5607 (7) S=0.095	0.8592 (7) S=0.007	0.3612 (7) S=0.213	0.8471 (7) S=0.008	-0.4807 (7) S=0.137	-0.7262 (7) S=0.032	1.0000 (7) S=0.001

(COEFFICIENT / (CASES) / SIGNIFICANCE) (A VALUE OF 99.0000 IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED)

Appendix 6.1

Sudan industry by district on five variables

Key:

1. Employment
2. Paid-up capital (LS)
3. Gross value added (LS)
7. Value of production (LS)
8. Wages and salaries (LS)

(except 1. in LS)

Sources: (1) IDCAS, Industrial Survey, Sudan, 1969/70, Cairo, 1970

(2) Statistics Department, Regional Industry, 1970/71, Khartoum, 1971

'DAHRI'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
33	140000	34000	176500	11500
49	56200	17400	79800	6200
77	199500	16200	238800	16000
83	150000	115900	606200	20100
87	60000	49600	206500	31100
92	110000	61300	167100	55600
113	100000	57800	332500	37200
153	50000	6300	155900	30800
154	160100	35400	222300	20800
127	900000	32900	121000	25700
173	140000	100900	398400	29500
238	750000	261400	3106500	13900
293	300000	378300	1551600	133700
302	734100	385500	1114600	135500
352	60000	110900	449300	80700
426	200000	208600	1533600	122500
441	250000	283300	1909700	158600
'TEXTILES & GINNING'				
80	100000	6700	41600	9300
90	50000	32000	135600	21300
149	90000	88100	258100	46100
1983	1108500	903600	1763100	436600
3845	9103000	1981000	4821000	900000
'LEATHER & FOOTWEAR'				
116	110000	55400	168200	30900
354	178100	179600	426300	72900
1023	858000	1125300	3040900	443900
'WOOD PAPER & PRINTING'				
43	53800	13800	19700	8900
57	60000	6600	21100	8300
88	120000	12400	49700	24700
113	425100	23900	42900	24200
155	97900	39500	88300	29800
262	250000	67700	370200	71200
'CHEMICALS & ALLIED'				
37	50000	33900	75800	9600
46	20000	25900	139400	11200
55	105800	23400	95400	15000
94	100000	1300	54100	39900
98	100000	137300	370900	46700
289	246000	184000	437800	79400
393	150000	107800	526500	65700
525	200000	241800	1567800	162100
'METALS & ELECTRICAL'				
77	136700	46100	210500	23000
86	50000	51500	179000	33100
121	50000	94800	185800	51200
429	25000	71800	348100	68300
829	125000	328200	850900	32500
'CEMENT TILES GLASS ETC'				
137	250000	47500	128000	55500
14767	18572800	8086900	28734900	3750700

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.24280	4.11760	0.79320	4242.42420	2.35714	1030.30300	5348.48480	9.70588
0.30960	3.22980	0.70420	1146.93870	8.71886	355.10200	1628.57140	28.16091
0.08120	12.31480	0.84240	2590.90900	3.85964	210.38960	3075.32460	47.53086
0.77260	1.29420	0.24740	1807.22890	5.53333	1396.38550	7303.61440	7.16134
0.82660	1.20960	0.29050	689.65510	14.50000	570.11490	2373.56320	17.54032
0.55720	1.79440	0.65820	1195.65210	8.36363	666.30430	1816.30430	15.00815
0.57800	1.73010	0.30070	884.95570	11.30000	511.50440	2942.47780	19.55017
0.12600	7.93650	0.32070	326.79730	30.60000	41.17640	1018.95420	242.85714
0.22110	4.52250	0.72010	1039.61030	9.61898	229.87010	1443.50640	43.50282
0.03650	27.35560	7.43800	7086.61410	1.41111	259.05510	952.75590	38.60182
0.72070	1.38750	0.35140	809.24850	12.35714	583.23690	2302.89010	17.14568
0.34850	2.86910	0.24140	3151.26050	3.17333	1098.31930	13052.52100	9.10482
1.26100	0.79300	0.19330	1023.89070	9.76666	1291.12620	5295.56310	7.74517
0.52510	1.90420	0.65860	2430.79470	4.11388	1276.49000	3690.72840	7.83398
1.84830	0.54100	0.13350	170.45450	58.66666	315.05680	1276.42040	31.74030
1.04300	0.95870	0.13040	469.48350	21.30000	489.67130	3600.00000	20.42186
1.13320	0.88240	0.13090	566.89340	17.64000	642.40360	4330.38540	15.56653
0.06700	14.92530	2.40380	1250.00000	8.00000	83.75000	520.00000	119.40298
0.64000	1.56250	0.36870	555.55550	18.00000	355.55550	1506.66660	28.12500
0.97880	1.02150	0.34870	604.02680	16.55555	591.27510	1732.21470	16.91259
0.81510	1.22670	0.62870	559.00150	17.88903	455.67320	889.10740	21.94555
0.21760	4.59510	1.88810	2367.49020	4.22388	515.21450	1253.83610	19.40933
0.50360	1.98550	0.65390	948.27580	10.54545	477.58620	1450.00000	20.93862
1.00840	0.99160	0.41770	503.10730	19.87647	507.34460	1204.23720	19.71046
1.31150	0.76240	0.28210	838.70960	11.92307	1100.00000	2972.53170	9.09090
0.25650	3.89850	2.73090	1251.16270	7.99256	320.93020	458.13950	31.15942
0.11000	9.09090	2.84360	1052.63150	9.50000	115.78940	370.17540	86.36363
0.10330	9.67740	2.41440	1363.63630	7.33333	140.90900	564.77270	70.96774
0.05620	17.78660	9.90900	3761.94690	2.65819	211.50440	379.64600	47.28033
0.40340	2.47840	1.10870	631.61290	15.83248	254.83870	569.67740	39.24050
0.27080	3.69270	0.67530	954.19840	10.48000	258.39690	1412.97700	38.70014
0.67800	1.47490	0.65960	1351.35130	7.40000	916.21620	2048.64860	10.91445
1.29500	0.77220	0.14340	434.78260	23.00000	563.04340	3030.43470	17.76061
0.22110	4.52130	1.10900	1923.63630	5.19848	425.45450	1734.54540	23.50427
0.01300	76.92300	1.84840	1063.82970	9.40000	13.82970	575.53190	723.07692
1.37300	0.72830	0.26960	1020.40810	9.80000	1401.02040	3784.69380	7.13765
0.74790	1.33690	0.56190	851.21100	11.74796	636.67820	1514.87880	15.70652
0.71860	1.39140	0.28490	381.67930	26.20000	274.30020	1339.69460	36.45640
1.20900	0.82710	0.12750	380.95230	26.25000	460.57140	2986.28570	21.71215
0.33720	2.96520	0.64940	1775.32460	5.63277	598.70120	2733.76620	16.70281
1.03000	0.97080	0.27930	581.39530	17.20000	598.83720	2081.39530	16.69902
1.89600	0.52740	0.26910	413.22310	24.20000	783.47100	1535.53710	12.76371
2.87200	0.34810	0.07180	58.27500	171.60000	167.36590	811.42190	59.74930
2.62560	0.38080	0.14690	150.78400	66.32000	395.89860	1026.29670	25.25898
0.19120	5.23010	1.95310	1824.81750	5.48000	348.90510	934.30650	28.66108
0.43540	2.29660	0.64520	1257.72330	7.95087	547.63320	1949.27200	18.26039

'KHARTOUM'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
83	45000	12900	66900	19100
84	79700	21100	167000	8300
102	127900	20800	166000	18700
118	14000	19600	108800	22300
168	75000	100200	403900	55500
294	135000	379200	1187700	59800
106	10000	22300	100200	18100
337	91600	44500	202200	31500

387	100000	135800	625500	100300
'TEXTILES & GINNING'				
'LEATHER & FOOTWEAR'				
41	5000	21800	198200	7900
404	897300	166700	499300	105600
'WOOD PAPER & PRINTING'				
31	3000	8700	16500	6700
34	15000	6900	11700	5400
34	30000	15000	32800	9500
59	30000	24400	38000	12900
65	124300	23100	40300	23700
69	79600	18600	63600	13400
77	200000	32400	48100	23800
134	34000	115400	260400	41900
153	150000	56900	155100	42500
228	161000	304600	594100	124500
976	488400	371600	530000	248400
'CHEMICALS & ALLIED'				
38	18000	42900	69700	27400
60	26500	57500	187700	22100
89	4100	15900	164500	10100
132	105100	31500	212000	12300
'METALS & ELECTRICAL'				
45	8000	22100	47800	12400
80	50000	34700	92600	28900
91	20000	4900	10400	3900
78	22400	15600	167200	23500
211	100000	90200	348100	44800
306	100000	98900	308500	63400
'CEMENT TILES GLASS ETC'				
64	40000	15700	41800	7400
5178	3389900	2352400	7166600	1255000

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.28660	3.48830	0.67260	542.16860	18.44444	155.42160	806.02400	64.34108
0.26470	3.77720	0.47720	948.80950	10.53952	251.19040	1988.09520	39.81042
0.16260	6.14900	0.77040	1253.92150	7.97498	203.92150	1627.45090	49.13846
1.40000	0.71420	0.12860	118.54400	84.28571	166.10160	922.03380	60.20408
1.33600	0.74850	0.18560	446.42850	22.40000	596.42850	2404.16660	16.76649
2.80880	0.35600	0.11360	459.18360	21.77777	1289.79590	4039.79590	7.75316
2.23000	0.44840	0.09980	94.33960	106.00000	210.37730	945.28300	47.53363
0.48580	2.05840	0.45300	271.81000	36.79039	132.04740	600.00000	75.73033
1.35800	0.73630	0.15980	258.39790	38.70000	350.90430	1616.27900	28.49779
4.36000	0.22930	0.02520	121.95120	82.00000	531.70730	4834.14630	18.80733
0.18570	5.38270	1.79710	2221.03960	4.50239	412.62370	1235.89100	24.23515
2.90000	0.34480	0.18180	96.77410	103.33333	280.64510	532.25800	35.63219
0.46000	2.17390	1.28200	441.17640	22.66666	202.94110	344.11760	49.27535
0.50000	2.00000	0.91460	882.35290	11.33333	441.17640	964.70580	22.66666
0.81330	1.22950	0.78940	508.47450	19.66666	413.55930	644.06770	24.18032
0.18580	5.38090	3.08430	1912.30760	5.22928	355.38460	620.00000	28.13852
0.23360	4.27950	1.25150	1153.62310	8.66834	269.56520	921.73910	37.09677
0.16200	6.17280	4.15800	2597.40250	3.85000	420.77920	624.67530	23.76543
3.39410	0.29460	0.13050	253.73130	39.41176	861.19400	1943.28350	11.61178
0.37930	2.63520	0.96710	980.39210	10.20000	371.89540	1013.72540	26.38927
1.89100	0.52850	0.27090	706.14030	14.16149	1335.96490	2605.70170	7.43522
0.76080	1.31430	0.92150	500.40980	19.98361	380.73770	543.03270	26.26484
2.38330	0.41950	0.25820	473.68420	21.11111	1128.94730	1834.21050	8.85780
2.16980	0.46080	0.14110	441.66660	22.64150	958.33330	3128.33330	10.43478
3.87800	0.25780	0.02490	46.06740	217.07317	178.65160	1848.31460	55.97484
0.29970	3.33650	0.49570	796.21210	12.55946	238.63630	1606.06060	41.90476
2.76250	0.36190	0.16730	177.77770	56.25000	491.11110	1062.22220	20.35199
0.69400	1.44090	0.53990	625.00000	16.00000	433.75000	1157.50000	23.05475
0.24500	4.08160	1.92300	219.78020	45.50000	53.84610	114.28570	185.71428
0.69640	1.43580	0.13390	287.17940	34.82142	200.00000	2143.58970	50.00000
0.90200	1.10860	0.28720	473.93360	21.10000	427.48810	1649.76300	23.39246
0.98900	1.01110	0.32410	326.79730	30.60000	323.20250	1008.16990	30.94034
0.39250	2.54770	0.95690	625.00000	16.00000	245.31250	653.12500	40.76433
0.69390	1.44100	0.47300	654.67360	15.27478	454.30660	1384.04780	22.01156

'OMOURMAN'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
32	37000	7600	89200	4300
36	32600	6300	19400	4300
75	10000	72700	247900	20400
77	10000	11600	47400	6800
106	50000	32900	196300	22400
217	30000	67000	191600	24600
'TEXILLES & GINNING'				
41	12000	5700	19100	4000
54	25000	17500	48500	9000
75	36700	11200	47500	8700
82	100000	25000	67900	11600
93	50000	53300	118500	24500
'LEATHER & FOOTWEAR'				
88	64000	10800	103800	11900
177	63000	44700	123400	31300
'WOOD PAPER & PRINTING'				
30	40000	10200	26900	3800
33	41800	12000	38700	6600
66	2000	6600	45100	6000
77	90000	23700	96900	21000

127	30000	21600	39500	14900
'CHEMICALS & ALLIED'				
46	50000	10900	25600	5300
74	66000	56200	208300	9500
78	25000	31200	111700	18500
133	74000	51800	333700	98600
'METALS & ELECTRICAL'				
39	47700	25400	104900	21200
43	40000	29300	82500	5800
55	6000	13900	24100	8700
'CEMENT TILES GLASS ETC'				
1969	1032800	659100	2457400	408700

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.20540	4.86840	0.41470	1156.25000	8.64864	237.50000	2787.50000	42.10526
0.19320	5.17460	1.68040	905.55550	11.04294	175.00000	538.88880	57.14285
7.27000	0.13750	0.04030	133.33330	75.00000	969.33330	3305.33330	10.31636
1.16000	0.86200	0.21090	129.87010	77.00000	150.64930	515.58440	66.37931
0.65800	1.51970	0.25470	471.69810	21.20000	310.37730	1851.88670	32.21884
2.23330	0.44770	0.15650	138.24880	72.33333	308.75570	882.94930	32.33805
0.47500	2.10520	0.66290	292.68290	34.16666	139.02430	441.46340	71.92982
0.70000	1.42850	0.51540	390.62500	25.60000	273.43750	757.81250	36.57142
0.30510	3.27670	0.77260	489.33330	20.43596	149.33330	633.33330	66.96428
0.25000	4.00000	1.47270	1219.51210	8.20000	304.87800	828.04870	32.80000
1.06600	0.93800	0.42190	537.63440	18.60000	573.11820	1274.19350	17.44540
0.16870	5.92590	0.61650	727.27270	13.75000	122.72720	1179.54540	81.48148
0.70950	1.40930	0.51050	355.93220	28.09523	252.54230	697.17510	39.59731
0.25500	3.92150	1.48690	1333.33330	7.50000	340.00000	896.66660	29.41176
0.28700	3.48330	1.08010	1100.00000	9.09090	315.78940	1018.42100	31.66666
3.30000	0.30300	0.04430	30.30300	330.00000	100.00000	683.33330	100.00000
0.26330	3.79740	0.92870	1168.83110	8.55555	307.79220	1258.44150	32.48945
0.72000	1.38880	0.75940	236.22040	42.33333	170.07870	311.02360	58.79629
0.21800	4.58710	1.95310	1086.95650	9.20000	236.95650	556.52170	42.20183
0.85150	1.17430	0.31680	891.89180	11.21212	759.45940	2814.86480	13.16725
1.24800	0.80120	0.22380	320.51280	31.20000	400.00000	1432.05120	25.00000
0.70000	1.42850	0.22170	556.39090	17.97297	389.47360	2509.02250	25.67567
0.53240	1.87790	0.45470	1223.07690	8.17610	651.28200	2689.74350	15.35433
0.73250	1.36510	0.48480	930.23250	10.75000	681.39530	1918.60460	14.67576
2.31660	0.43160	0.24890	109.09090	91.66666	252.72720	438.18180	39.56834
0.63810	1.55690	0.42020	524.53020	19.06467	334.73840	1248.04460	29.87407

'AMA./BUSHARIN'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
41	50000	19700	63700	14400
170	505200	94000	910000	30000
278	250000	395500	2849700	86800
480	940600	-67000	34700	63000
'TEXTILES & GINNING'				
64	144800	11300	33700	34200
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
30	20000	800	10600	3800
164	2000000	1221500	1654300	374100
'METALS & ELECTRICAL'				
65	141100	228700	661700	73200
93	326600	294400	1654600	45900
'CEMENT TILES GLASS ETC'				
1385	4378300	2198900	7873000	725400

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.39400	2.53800	0.78490	1219.51210	8.20000	480.48780	1553.65850	20.81214
0.18600	5.37440	0.55510	2971.76470	3.36500	552.94110	5352.94110	18.03510
1.58200	0.63210	0.08770	899.28050	11.12000	1422.66180	10250.71940	7.02907
0.07120	14.03880	27.10660	1959.58330	5.10312	-139.58330	72.29160	-71.64179
0.07800	12.81410	4.29670	2262.50000	4.41988	176.56250	526.56250	56.63716
0.04000	25.00000	1.88670	666.66660	15.00000	26.66660	353.33330	375.00000
0.61070	1.63730	1.20890	12195.12190	0.82000	7448.17070	10087.19510	1.34261
1.62080	0.61690	0.21320	2170.76920	4.60666	3518.46150	10180.00000	2.84215
0.90140	1.10930	0.19730	3511.82790	2.84751	3165.59130	17791.39780	3.15896
0.50220	1.99110	0.55610	3161.22740	3.16332	1587.65340	5684.47650	6.29865

'EDDUEIM'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
97	50000	28100	52900	13600
'TEXTILES & GINNING'				
92	150000	86400	197400	38400
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
189	200000	114500	250300	52000

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.58200	1.77930	0.94510	515.46390	19.40000	289.69070	545.36080	34.51957
0.57600	1.73610	0.75980	1630.43470	6.13333	939.13040	2145.65210	10.64814
0.57250	1.74670	0.79900	1058.20100	9.45000	605.82010	1324.33860	16.50655

'KOSTI'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
34	20000	10300	47800	3900
'TEXTILES & GINNING'				
375	264800	164800	227000	71300
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
294	1118400	155800	356400	100400
703	1403200	330900	631200	175600

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.51500	1.94170	0.41840	588.23520	17.00000	302.94110	1405.88230	33.00970
0.62230	1.60670	1.16650	706.13330	14.16163	439.46660	605.33330	22.75485
0.13930	7.17840	3.13800	3804.08160	2.62875	529.93190	1212.24480	18.87034
0.23580	4.24050	2.22300	1995.01700	5.00997	470.69700	897.86620	21.24578

'ALHASAHISA'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
116	153100	78400	620300	34300
'TEXTILES & GINNING'				
2139	2368900	1602200	1834300	383400
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
2255	2522000	1680600	2454600	417700

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
1.12250	0.89080	0.10780	1182.85710	8.45410	1327.85710	10962.85710	7.53093
0.24800	4.03220	2.24790	2134.14630	4.68571	529.26820	949.39020	18.89410
0.60270	1.60570	0.16640	1782.85710	5.60897	1110.28570	10712.00000	9.00669
0.77050	1.35870	0.24280	1372.96770	7.29411	1081.61290	5645.16120	9.98388
0.63440	1.57610	1.36770	1200.94690	8.32676	751.93180	878.07760	13.12453
1.21900	0.82030	4.25530	2702.70270	3.70000	3294.59450	635.13510	3.03527
0.92370	1.08250	0.12320	3433.33330	2.91262	3171.42850	27850.00000	3.15315
1.20160	0.83220	0.27610	269.56520	37.09677	323.91300	976.08690	30.87248
0.85340	1.53030	0.50280	1335.49270	7.48787	872.67400	2655.99580	11.45903

'NORTHERN ZONE'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
'TEXTILES & GINNING'				
445	330800	188800	256200	83800
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
445	330800	188800	256200	83800

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
2.51200	1.95280	0.24680	1319.82750	7.57674	675.86200	5347.41370	14.79591
0.67630	1.47850	1.29140	1107.48010	9.02950	749.04160	857.55020	13.35039
0.66530	1.50060	1.02740	1113.40350	8.94131	745.27710	1088.51440	13.41782

'ALMEDINA'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
140	165600	185900	1534600	47800
164	350000	86800	155700	90600
175	312000	194300	1874600	57100
186	255000	186300	1050000	53200
'TEXTILES & GINNING'				
2112	2536400	1609200	1854500	400000
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
37	100000	121900	23500	29700
42	144200	133200	1169700	51200
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
46	12400	14900	44900	6500
2902	3875600	2532500	7707700	736100

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
-0.14760	-6.77150	2500.05000	6775.20320	1.47597	-1000.54200	2.71000	-9.99458
-0.14760	-6.77150	2500.05000	6775.20320	1.47597	-1000.54200	2.71000	-9.99458

'KASSALA'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
474	1060600	11200	94000	72400
'TEXTILE & GINNING'				
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
474	1060600	11200	94000	72400

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.57070	1.75210	1.29110	743.37070	13.45223	424.26960	575.73030	23.56991
0.57070	1.75210	1.29110	743.37070	13.45223	424.26960	575.73030	23.56991

'RUFAA SHUKRIA'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
	1476 10000200 -1476800		4000	281800
'TEXTILES & GINNING'				
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS'				
	1476 10000200 -1476800		4000	281800

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.01050	94.69640	11.28290	2237.55270	4.46916	23.62860	198.31220	423.21428
0.01050	94.69640	11.28290	2237.55270	4.46916	23.62860	198.31220	423.21428

'NEW HALFA'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
3843	4282000	1014600	1729700	330300
'TEXTILES & GINNING'				
382	1086000	526000	657100	181400
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
4225	5368000	1540600	2386800	511700

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.23690	4.22030	2.47550	1114.23360	8.97477	264.01240	450.09100	37.87699
0.48430	2.06460	1.65270	2842.93190	3.51749	1376.96330	1720.15700	7.26235
0.28690	3.48430	2.24900	1270.53250	7.87071	364.63900	564.92300	27.42433

'SOUTH GEDARIE'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
'TEXTILES & GINNING'				
85	88500	2800	14500	17000
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
85	88500	2800	14500	17000

3/2	3/3	2/7	2/1	1/2	3/1	7/1	1/3
0.03160	31.60710	6.10340	1041.17640	9.60451	32.94110	170.58820	303.57142

0.03160	31.60710	6.10340	1041.17640	9.60451	32.94110	170.58820	303.57142

'BIDEIRIA'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
30	37300	87400	244100	4100
33	69600	164400	463500	3600
'TEXTILES & GINNING'				
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
36	51200	13800	19800	4900
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
99	158100	265600	727400	12600

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
2.34310	0.42670	0.15280	1243.33330	8.04289	2913.33330	8136.66660	3.43249
2.36200	0.42330	0.15010	2109.09090	4.74137	4981.81810	14045.45450	2.00729
0.26950	3.71010	2.58580	1422.22220	7.03125	383.33330	550.00000	26.08695
1.67990	0.59520	0.21730	1595.96960	6.26185	2682.82820	7347.47470	3.72743

'EAST KORDOFAN'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
33	50000	6200	34300	4000
33	45000	10100	33800	4300
34	15000	8600	20600	3800
38	40000	7700	17300	7300
50	35000	23200	60800	2600
68	80000	1700	20800	5700
70	70000	9000	37000	9200
'TEXTILES & GINNING'				
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
326	345000	66500	224600	36900

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.10330	9.67740	1.74920	1818.18180	5.50000	187.87870	1039.39390	53.22580
0.22440	4.45540	1.33130	1363.63630	7.33333	306.06060	1024.24240	32.67326
0.57330	1.74410	0.72810	441.17640	22.66666	252.94110	605.88230	39.53488
0.19250	5.19480	2.31210	1052.63150	9.50000	202.63150	455.26310	49.35064
0.66280	1.50860	0.57560	700.00000	14.28571	464.00000	1216.00000	21.55172
0.02120	47.05880	3.84610	1176.47050	8.50000	25.00000	305.88230	400.00001
0.12850	7.77770	1.59180	1000.00000	10.00000	128.57140	528.57140	77.77777
0.19270	5.18790	1.53600	1058.28220	9.44927	203.98770	688.95700	49.02255

'MESSIRIYA'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
373	1074700	196400	231000	110000
'TEXTILES & GINNING'				
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
373	1074700	196400	231000	110000

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.18270	5.47190	4.65230	2881.23320	3.47073	526.54150	619.30290	18.99185
0.18270	5.47190	4.65230	2881.23320	3.47073	526.54150	619.30290	18.99185

'SOUTH JEBELS'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
'TEXTILES & GINNING'				
49	108700	9200	48900	17800
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
49	108700	9200	48900	17800

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.08460	11.81520	2.22290	2219.36730	4.50781	187.75510	997.95910	53.26086
0.08460	11.81520	2.22290	2219.36730	4.50781	187.75510	997.95910	53.26086

'SOUTH DABUR'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
51	40000	13300	48000	3900
55	20000	9600	55200	4000
'TEXTILES & GINNING'				
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
106	60000	22900	103200	7900

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.13910	7.18400	2.38190	1995.55550	5.01113	277.77770	837.77770	36.00000
0.13870	7.20820	2.27530	2069.55550	4.83195	287.11110	909.55550	34.82972
0.13870	7.20600	2.28430	2062.82820	4.84771	286.26260	903.03030	34.93295

'SHEND1'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
'TEXTILES & GINNING'				
59	211900	44900	201000	23000
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
45	38500	24900	73100	4600
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
541	1200000	647300	1424900	241300
645	1450400	717100	1699000	268900

372	273	277	271	172	371	771	173
0.33250	3.00750	0.83330	784.31370	12.75000	260.78430	941.17640	38.34586
0.48000	2.08330	0.36230	363.63630	27.50000	174.54540	1003.63630	57.29166
0.38160	2.62000	0.58130	566.03770	17.66666	215.03770	973.58490	46.28892

'WAU'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
263	1051600	127600	361800	121500
'TEXTILES & GINNING'				
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
263	1051600	127600	361800	121500

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.12130	8.24130	2.90650	3998.47900	2.50095	485.17110	1375.66530	20.61128
0.12130	8.24130	2.90650	3998.47900	2.50095	485.17110	1375.66530	20.61128

'MEROWE'

1	2	3	7	8
'FOOD DRINK & TOBACCO'				
45	89800	12500	37700	9400
450	931300	129200	409300	101100
'TEXTILES & GINNING'				
'LEATHER & FOOTWEAR'				
'WOOD PAPER & PRINTING'				
'CHEMICALS & ALLIED'				
'METALS & ELECTRICAL'				
'CEMENT TILES GLASS ETC'				
495	1021100	141700	447000	110500

3/2	2/3	2/7	2/1	1/2	3/1	7/1	1/3
0.21180	4.71930	1.05420	3591.52540	2.78433	761.01690	3406.77960	13.14031
0.64670	1.54610	0.52660	855.55550	11.68831	553.33330	1624.44440	18.07228
0.53940	1.85380	0.84210	2218.11460	4.50833	1196.48790	2633.82620	8.35779
0.49440	2.02250	0.85360	2243.68210	4.44704	1111.78290	2634.10850	8.99456

Appendix 6.2

Coefficient of Specialisation, Coefficient of Localization and Location Quotient for Five Variables

Source: As in Appendix 6.1

KEY:-
1 = 'FOOD DRINK & TOBACCO'
2 = 'TEXTILES & GINNING'
3 = 'LEATHER & FOOTWEAR'
4 = 'WOOD PAPER & PRINTING'
5 = 'CHEMICALS & ALLIED'
6 = 'METALS & ELECTRICAL'
7 = 'CEMENT TILES GLASS ETC'

COEFFICIENT OF SPECIALISATION FOR EMPLOYMENT CS.

	1	2	3	4	5	6	7	
'BAHRI'	16.5275	8.7756	4.2004	3.0578	3.8083	3.3422	0.5223	20.1175
'KHARTOUM'	5.7244	32.8500	2.6841	28.0012	0.4393	8.5624	0.2140	39.2377
'OMDURMAN'	10.5725	14.8205	7.5486	9.2451	10.2105	0.1422	1.4500	26.9952
'AMA./BUSHARIN'	31.8139	28.2291	5.9100	7.9200	7.4072	4.3079	1.4500	43.5191
'EDDUEIM'	13.1728	15.8272	5.9100	7.9200	6.6000	7.1000	1.4500	28.9900
'KOSTI'	33.3136	20.4928	5.9100	7.9200	6.6000	7.1000	40.3708	50.8536
'ALHASAHISA'	38.0059	62.0059	5.9100	7.9200	6.6000	7.1000	1.4500	61.9959
'ALMEDINA'	15.2348	39.9274	5.9100	7.9200	3.8777	7.1000	0.1351	40.0525
'NORTHERN FUNG'	38.1500	67.1500	5.9100	7.9200	6.6000	7.1000	1.4500	57.1400
'RUFAA SHUKRIA'	61.8500	32.8500	5.9100	7.9200	6.6000	7.1000	1.4500	61.8400
'KASSALA'	61.8500	32.8500	5.9100	7.9200	6.6000	7.1000	1.4500	61.8400
'NEW HALFA'	52.9086	23.8086	5.9100	7.9200	6.6000	7.1000	1.4500	52.7986
'SOUTH GEDARIF'	38.1500	67.1500	5.9100	7.9200	6.6000	7.1000	1.4500	67.1400
'BIDEIRIA'	25.4864	32.8500	5.9100	28.4436	6.6000	7.1000	1.4500	53.9200
'EAST KORDUFAN'	61.8500	32.8500	5.9100	7.9200	6.6000	7.1000	1.4500	61.8400
'MESSIRIYA'	61.8500	32.8500	5.9100	7.9200	6.6000	7.1000	1.4500	61.8400
'SOUTH JEBELS'	38.1500	67.1500	5.9100	7.9200	6.6000	7.1000	1.4500	67.1400
'SOUTH DARUR'	61.8500	32.8500	5.9100	7.9200	6.6000	7.1000	1.4500	61.8400
'WAU'	61.8500	32.8500	5.9100	7.9200	6.6000	7.1000	1.4500	61.8400

COEFFICIENT OF SPECIALISATION FOR CAPITAL CS.

	1	2	3	4	5	6	7	
'BAHRI'	24.2153	24.0132	2.2209	0.7408	1.3176	0.1779	1.2239	26.9598
'KHARTOUM'	27.6835	32.2600	22.6673	34.1206	2.0159	6.6016	1.4000	63.3745
'OMDURMAN'	31.2686	10.6004	8.3467	19.0528	14.2672	6.8124	2.5800	44.4641
'AMA./BUSHARIN'	7.5161	28.9528	3.9500	4.6800	39.5866	8.4222	2.5800	47.0939
'EDDUEIM'	22.6900	42.7400	3.9500	4.6800	6.5500	2.2600	2.5800	42.7250
'KOSTI'	46.2647	13.3885	3.9500	4.6800	6.5500	2.2600	77.1235	77.1085
'ALHASAHISA'	41.6194	61.6694	3.9500	4.6800	6.5500	2.2600	2.5800	61.6544
'ALMEDINA'	19.7563	33.1854	3.9500	4.6800	0.2490	2.2600	2.2600	33.1704
'NORTHERN FUNG'	47.6900	67.7400	3.9500	4.6800	6.5500	2.2600	2.5800	67.7250
'RUFAA SHUKRIA'	52.3100	32.2600	3.9500	4.6800	6.5500	2.2600	2.5800	52.2950
'KASSALA'	52.3100	32.2600	3.9500	4.6800	6.5500	2.2600	2.5800	52.2950
'NEW HALFA'	32.0790	12.0290	3.9500	4.6800	6.5500	2.2600	2.5800	32.0640
'SOUTH GEDARIF'	47.6900	67.7400	3.9500	4.6800	6.5500	2.2600	2.5800	67.7250
'BIDEIRIA'	19.9254	32.2600	3.9500	27.7046	6.5500	2.2600	2.5800	47.6150
'EAST KORDUFAN'	52.3100	32.2600	3.9500	4.6800	6.5500	2.2600	2.5800	52.2950
'MESSIRIYA'	52.3100	32.2600	3.9500	4.6800	6.5500	2.2600	2.5800	52.2950
'SOUTH JEBELS'	47.6900	67.7400	3.9500	4.6800	6.5500	2.2600	2.5800	67.7250
'SOUTH DARUR'	52.3100	32.2600	3.9500	4.6800	6.5500	2.2600	2.5800	52.2950
'WAU'	52.3100	32.2600	3.9500	4.6800	6.5500	2.2600	2.5800	52.2950

COEFFICIENT OF SPECIALISATION FOR VALUE ADDED CS.

	1	2	3	4	5	6	7	
'BAHRI'	3.7933	1.8080	9.0610	3.9133	2.8990	0.3154	0.5389	11.1645
'KHARTOUM'	1.7044	35.4300	0.2531	35.6176	5.9571	4.3146	0.4626	41.8697
'OMDURMAN'	0.3939	18.3309	0.6606	5.3026	10.5335	3.3981	1.1300	19.8748
'AMA/BUSHARIN'	5.7511	34.9456	7.7600	5.9400	40.1540	15.4127	1.1300	55.5468
'EDDUEIM'	5.9085	40.0285	7.7600	5.9400	12.2400	7.0100	1.1300	40.0085
'KOSTI'	27.3373	14.3736	7.7600	5.9400	12.2400	7.0100	45.9537	60.3073
'ALHASAHISA'	25.7850	59.9050	7.7600	5.9400	12.2400	7.0100	1.1300	59.8850
'ALMEDINA'	4.6534	28.1120	7.7600	5.9400	2.1669	7.0100	0.5416	28.0920
'NORTHERN FUNG'	30.4500	64.5700	7.7600	5.9400	12.2400	7.0100	1.1300	64.5500
'RUFAA SHUKRIA'	69.5500	35.4300	7.7600	5.9400	12.2400	7.0100	1.1300	69.5300
'KASSALA'	69.5500	35.4300	7.7600	5.9400	12.2400	7.0100	1.1300	69.5300
'NEW HALFA'	35.4075	1.2875	7.7600	5.9400	12.2400	7.0100	1.1300	35.3875
'SOUTH GEDARIF'	30.4500	64.5700	7.7600	5.9400	12.2400	7.0100	1.1300	64.5500
'BIDEIRIA'	64.3542	35.4300	7.7600	0.7442	12.2400	7.0100	1.1300	64.3342
'EAST KORDUFAN'	69.5500	35.4300	7.7600	5.9400	12.2400	7.0100	1.1300	69.5300
'MESSIRIYA'	69.5500	35.4300	7.7600	5.9400	12.2400	7.0100	1.1300	69.5300
'SOUTH JEBELS'	30.4500	64.5700	7.7600	5.9400	12.2400	7.0100	1.1300	64.5500
'SOUTH DARUR'	69.5500	35.4300	7.7600	5.9400	12.2400	7.0100	1.1300	69.5300
'WAU'	69.5500	35.4300	7.7600	5.9400	12.2400	7.0100	1.1300	69.5300

COEFFICIENT OF SPECIALISATION FOR PRODUCTION VALUE CS.

	1	2	3	4	5	6	7	
'BAHRI'	4.5520	4.5657	5.3695	2.1637	0.4879	2.2354	0.4563	9.9152
'KHARTOUM'	5.2657	19.8200	2.4726	20.7653	2.9948	5.1992	0.3147	28.4172
'OMDURMAN'	15.2990	7.5916	1.9855	5.8353	15.8030	0.2067	0.9000	23.8106
'AMA /BUSHARIN'	1.4842	19.3920	7.2600	4.2200	9.3070	21.0208	0.9000	31.7920
'EDDUEIM'	26.3854	59.0454	7.2600	4.2200	11.8400	8.4000	0.9000	59.0254
'KOSTI'	39.9471	16.1432	7.2600	4.2200	11.8400	8.4000	55.5639	71.6871
'ALHASAHISA'	22.2491	54.9091	7.2600	4.2200	11.8400	8.4000	0.9000	54.9891
'ALMEDINA'	12.3565	4.2404	7.2600	4.2200	3.6406	8.4000	0.2175	26.2175
'NORTHERN FUNG'	47.5200	80.1800	7.2600	4.2200	11.8400	8.4000	0.9000	80.1600
'RUFAA SHUKRIA'	52.4800	19.8200	7.2600	4.2200	11.8400	8.4000	0.9000	52.4600
'KASSALA'	52.4800	19.8200	7.2600	4.2200	11.8400	8.4000	0.9000	52.4600
'NEW HALFA'	24.9494	7.7106	7.2600	4.2200	11.8400	8.4000	0.9000	32.5406
'SOUTH GEDARIF'	47.5200	80.1800	7.2600	4.2200	11.8400	8.4000	0.9000	80.1600
'BIDEIRIA'	49.7580	19.8200	7.2600	1.4980	11.8400	8.4000	0.9000	49.7380
'EAST KORDUFAN'	52.4800	19.8200	7.2600	4.2200	11.8400	8.4000	0.9000	52.4600
'MESSIRIYA'	52.4800	19.8200	7.2600	4.2200	11.8400	8.4000	0.9000	52.4600
'SOUTH JEBELS'	47.5200	80.1800	7.2600	4.2200	11.8400	8.4000	0.9000	80.1600
'SOUTH DARUR'	52.4800	19.8200	7.2600	4.2200	11.8400	8.4000	0.9000	52.4600
'WAU'	52.4800	19.8200	7.2600	4.2200	11.8400	8.4000	0.9000	52.4600

COEFFICIENT OF SPECIALISATION FOR WAGES & SALARIES CS.

	1	2	3	4	5	6	7	
'BAHRI'	7.1456	7.0010	6.6026	4.4348	0.9561	0.5817	0.4533	13.5836
'KHARTOUM'	5.4180	30.6800	1.0438	35.1498	6.0809	7.9656	1.7434	44.1393
'OMDURMAN'	11.6006	16.5376	2.5701	5.1361	19.8631	2.6050	1.9300	30.1432
'AMA./BUSHARIN'	5.1486	25.9654	8.0000	8.8900	39.6954	10.2885	1.9300	49.9539
'EDDUEIM'	5.7662	43.1662	8.0000	8.8900	12.4100	6.1300	1.9300	43.1462
'KOSTI'	29.6990	9.9235	8.0000	8.8900	12.4100	6.1300	55.2454	65.1490
'ALHASAHISA'	23.7084	61.1984	8.0000	8.8900	12.4100	6.1300	1.9300	61.0884
'ALMEDINA'	1.8662	23.6604	8.0000	8.8900	1.4196	6.1300	1.6470	25.5066
'NORTHERN FUNG'	31.9200	69.3200	8.0000	8.8900	12.4100	6.1300	1.9300	69.3000
'RUFAA SHUKRIA'	68.0800	30.6800	8.0000	8.8900	12.4100	6.1300	1.9300	68.0600
'KASSALA'	68.0800	30.6800	8.0000	8.8900	12.4100	6.1300	1.9300	68.0600
'NEW HALFA'	32.6295	4.7705	8.0000	8.8900	12.4100	6.1300	1.9300	37.3800
'SOUTH GEDARIF'	31.9200	69.3200	8.0000	8.8900	12.4100	6.1300	1.9300	69.3000
'BIDEIRIA'	29.1911	30.6800	8.0000	29.9989	12.4100	6.1300	1.9300	69.1700
'EAST KORDUFAN'	68.0800	30.6800	8.0000	8.8900	12.4100	6.1300	1.9300	68.0600
'MESSIRIYA'	68.0800	30.6800	8.0000	8.8900	12.4100	6.1300	1.9300	68.0600
'SOUTH JEBELS'	31.9200	69.3200	8.0000	8.8900	12.4100	6.1300	1.9300	69.3000
'SOUTH DARUR'	68.0800	30.6800	8.0000	8.8900	12.4100	6.1300	1.9300	68.0600
'WAU'	68.0800	30.6800	8.0000	8.8900	12.4100	6.1300	1.9300	68.0610

COEFFICIENT OF Localization FOR EMPLOYMENT CL.

	1	2	3	4	5	6	7
'BAHRI'	17.1657	10.5801	28.1512	15.2975	22.8597	18.6126	14.2965
'KHARTOUM'	2.0827	13.8900	6.3097	49.1181	0.9225	16.7369	2.0601
'OMDURMAN'	1.4614	2.3809	6.7491	6.1699	8.1753	0.1063	5.2800
'AMA /BUSHARIN'	3.1043	3.1873	3.7100	3.7100	4.1762	2.2568	3.7100
'EDDUEIM'	0.1821	0.2513	0.5000	0.5000	0.5000	0.5000	0.5000
'KOSTI'	1.6409	1.1825	1.8800	1.8800	1.8800	1.8800	52.4638
'ALHASAHISA'	5.2342	11.4184	6.0500	6.0500	6.0500	6.0500	6.0500
'ALMEDINA'	3.1035	9.4679	7.7800	7.7800	4.5686	7.7800	0.7228
'NORTHERN FUNG'	1.1900	2.4441	1.1900	1.1900	1.1900	1.1900	1.1900
'RUFAA SHUKRIA'	6.4197	3.9600	3.9600	3.9600	3.9600	3.9600	3.9600
'KASSALA'	2.0633	1.2700	1.2700	1.2700	1.2700	1.2700	1.2700
'NEW HALFA'	15.6953	8.2104	11.3300	11.3300	11.3300	11.3300	11.3300
'SOUTH GEDARIF'	0.2200	0.4742	0.2200	0.2200	0.2200	0.2200	0.2200
'BIDEIRIA'	0.1830	0.2600	0.2600	0.9595	0.2600	0.2600	0.2600
'EAST KORDUFAN'	1.4225	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700
'MESSIRIYA'	1.6231	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
'SOUTH JEBELS'	0.1300	0.2702	0.1300	0.1300	0.1300	0.1300	0.1300
'SOUTH DARUR'	0.4654	0.2800	0.2800	0.2800	0.2800	0.2800	0.2800
'WAU'	1.1495	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
	32.2685	36.0486	41.1700	56.2075	35.1711	37.5663	53.1466

COEFFICIENT OF Localization FOR CAPITAL CL.

	1	2	3	4	5	6	7
'BAHRI'	17.1347	25.1191	18.9346	5.3172	6.7908	2.7768	18.1543
'KHARTOUM'	3.5754	6.1600	35.3174	44.8756	1.8961	17.9009	3.3447
'OMDURMAN'	1.2237	0.6100	3.9680	8.0381	4.0944	5.6350	1.5700
'AMA./BUSHARIN'	1.2968	7.1344	7.9500	7.9500	48.0880	29.5110	7.9500
'EDDUEIM'	0.1695	0.4849	0.3600	0.3600	0.3600	0.3600	0.7600
'KOSTI'	2.4738	1.0585	2.5500	2.5500	2.5500	2.5500	75.1662
'ALHASAHISA'	5.9965	8.7628	4.5800	4.5800	4.5800	4.5800	4.5800
'ALMEDINA'	2.9143	7.2463	7.0400	7.0400	0.2655	7.0400	6.1573
'NORTHERN FUNG'	0.6000	1.2532	0.6000	0.6000	0.6000	0.6000	0.6000
'RUFAA SHUKRIA'	19.9402	18.1700	18.1700	18.1700	18.1700	18.1700	18.1700
'KASSALA'	2.1219	1.9200	1.9200	1.9200	1.9200	1.9200	1.9200
'NEW HALFA'	6.5685	3.6331	9.7500	9.7500	9.7500	9.7500	9.7500
'SOUTH GEDARIF'	0.1600	0.3385	0.1600	0.1600	0.1600	0.1600	0.1600
'BIDEIRIA'	0.1274	0.2800	0.2800	1.7067	0.2800	0.2800	0.2800
'EAST KORDUFAN'	0.6948	0.6200	0.6200	0.6200	0.6200	0.6200	0.6200
'MESSIRIYA'	2.1456	1.9500	1.9500	1.9500	1.9500	1.9500	1.9500
'SOUTH JEBELS'	0.1900	0.4223	0.1900	0.1900	0.1900	0.1900	0.1900
'SOUTH DARUR'	0.1287	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
'WAU'	2.0976	1.9100	1.9100	1.9100	1.9100	1.9100	1.9100
	33.7796	43.5910	58.1750	57.8950	52.1374	53.0018	74.1212

COEFFICIENT OF Localization FOR VALUE ADDED CL.

	1	2	3	4	5	6	7
'BAHRI'	4.8759	1.9924	45.6709	25.7883	9.2706	1.7211	18.7101
'KHARTOUM'	0.6387	11.3800	0.3597	58.1385	5.5397	6.9861	4.6763
'OMDURMAN'	0.0331	1.6414	0.2795	2.8473	2.7512	1.5494	3.1600
'AMA/BUSHARIN'	2.1268	11.1257	11.2800	11.2800	37.0189	24.7534	11.2800
'EDDUEIM'	0.1036	0.6296	0.5500	0.5500	0.5500	0.5500	0.5500
'KOSTI'	1.4364	0.6499	1.6000	1.6000	1.6000	1.6000	64.9243
'ALHASAHISA'	6.8846	13.7436	8.1300	8.1300	8.1300	8.1300	8.1300
'ALMEDINA'	1.8721	9.7192	12.2500	12.2500	2.1698	12.2500	5.8879
'NORTHERN FUNG'	0.9100	1.6575	0.9100	0.9100	0.9100	0.9100	0.9100
'RUFAA SHUKRIA'	1.6347	0.7100	0.7100	0.7100	0.7100	0.7100	0.7100
'KASSALA'	0.1279	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500
'NEW HALFA'	8.6673	0.2689	7.4500	7.4500	7.4500	7.4500	7.4500
'SOUTH GEDARIF'	0.0100	0.0282	0.0100	0.0100	0.0100	0.0100	0.0100
'BIDEIRIA'	2.7199	1.2800	1.2800	0.1575	1.2800	1.2800	1.2800
'EAST KORDUFAN'	0.7364	0.3200	0.3200	0.3200	0.3200	0.3200	0.3200
'MESSIRIYA'	2.1699	0.9500	0.9500	0.9500	0.9500	0.9500	0.9500
'SOUTH JEBELS'	0.0400	0.0856	0.0400	0.0400	0.0400	0.0400	0.0400
'SOUTH DARUR'	0.2538	0.1100	0.1100	0.1100	0.1100	0.1100	0.1100
'WAU'	1.4170	0.6100	0.6100	0.6100	0.6100	0.6100	0.6100
	18.3275	28.4410	46.2850	70.9508	39.7351	35.0050	64.8843

COEFFICIENT OF Localization FOR PRODUCTION VALUE CL.

	1	2	3	4	5	6	7
'BAHRI'	4.3991	10.5602	33.8719	23.5021	1.9234	12.2261	23.4371
'KHARTOUM'	1.2613	11.4100	3.8857	56.1751	2.8887	7.0602	4.0908
'OMDURMAN'	1.2564	1.4951	1.0723	5.4166	5.2216	0.0983	3.9100
'AMA /BUSHARIN'	0.3900	12.2592	12.5400	12.5400	9.8407	31.3576	12.5400
'EDDUEIM'	0.2127	1.1964	0.3900	0.3900	0.3900	0.3900	0.3900
'KOSTI'	0.8398	0.8242	1.0000	1.0000	1.0000	1.0000	61.4059
'ALHASAHISA'	1.8211	10.8410	3.9000	3.9000	3.9000	3.9000	3.9000
'ALMEDINA'	3.1970	2.6334	12.2700	12.2700	3.7698	12.2700	4.4080
'NORTHERN FUNG'	0.4000	1.6589	0.4000	0.4000	0.4000	0.4000	0.4000
'RUFAA SHUKRIA'	1.7748	1.5900	1.5900	1.5900	1.5900	1.5900	1.5900
'KASSALA'	0.1750	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400
'NEW HALFA'	1.9969	1.4807	3.8000	3.8000	3.8000	3.8000	3.8000
'SOUTH GEDARIF'	0.0200	0.0965	0.0200	0.0200	0.0200	0.0200	0.0200
'BIDEIRIA'	1.2214	1.1500	1.1500	0.4027	1.1500	1.1500	1.1500
'EAST KORDUFAN'	0.4027	0.3500	0.3500	0.3500	0.3500	0.3500	0.3500
'MESSIRIYA'	0.4142	0.3600	0.3600	0.3600	0.3600	0.3600	0.3600
'SOUTH JEBELS'	0.0700	0.3230	0.0700	0.0700	0.0700	0.0700	0.0700
'SOUTH DARUR'	0.1859	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
'WAU'	0.6425	0.5700	0.5700	0.5700	0.5700	0.5700	0.5700
	10.3404	29.5543	38.7700	61.5318	18.7721	38.4561	61.3459

COEFFICIENT OF **Localization** FOR WAGES & SALARIES CL.

	1	2	3	4	5	6	7
'BAHRI'	9.5417	9.7353	35.1141	21.2717	3.3065	4.0887	9.9545
'KHARTOUM'	2.4253	14.2700	1.8430	56.4077	7.6870	18.5014	9.9119
'OMDURMAN'	1.6913	2.4980	1.4929	2.6574	7.4365	1.9735	4.6400
'AMARYBUSHARIN'	1.3240	6.9726	8.2400	8.2400	26.3599	13.8277	8.2400
'EDDUEIM'	0.1057	0.8331	0.5900	0.5900	0.5900	0.5900	0.5900
'KOSTI'	1.8511	0.6523	1.9900	1.9900	1.9900	1.9900	57.1384
'ALHASAHISA'	3.5185	9.4684	4.7400	4.7400	4.7400	4.7400	4.7400
'ALMEDINA'	0.4968	5.4636	6.3600	8.3600	0.9529	8.3600	4.5320
'NORTHERN FUNG'	0.9500	2.1555	0.9500	0.9500	0.9500	0.9500	0.9500
'RUFAA SHUKRIA'	5.8356	3.2000	3.2000	3.2000	3.2000	3.2000	3.2000
'KASSALA'	1.7583	0.8200	0.8200	0.8200	0.8200	0.8200	0.8200
'NEW HALFA'	5.9528	0.9125	5.8100	5.8100	5.8100	5.8100	5.8100
'SOUTH GEDARIF'	0.1900	0.4400	0.1900	0.1900	0.1900	0.1900	0.1900
'BIDEIRIA'	0.1342	0.1400	0.1400	0.4856	0.1400	0.1400	0.1400
'EAST KORDUFAN'	0.9041	0.4100	0.4100	0.4100	0.4100	0.4100	0.4100
'MESSIRIYA'	2.6674	1.2500	1.2500	1.2500	1.2500	1.2500	1.2500
'SOUTH JEBELS'	0.2000	0.4597	0.2000	0.2000	0.2000	0.2000	0.2000
'SOUTH DARUR'	0.2013	0.0800	0.0800	0.0800	0.0800	0.0800	0.0800
'WAU'	2.9469	1.3800	1.3800	1.3800	1.3800	1.3800	1.3800
	21.8476	31.0706	38.4000	59.5317	33.7464	34.2487	57.0884

Location Quotient FOR EMPLOYMENT LQ.

	1	2	3	4	5	6	7
'BAHRI'	0.5657	1.2670	1.7104	0.6139	1.5769	1.4607	0.6391
'KHARTOUM'	0.8498	0.0000	1.4539	4.5361	0.9333	2.2044	0.8515
'OMDURMAN'	0.7223	0.5487	2.2768	2.1672	2.5468	0.9793	0.0000
'AMA./BUSHARIN'	1.8837	0.1406	0.0000	0.0000	2.1221	1.6056	0.0000
'EDDUSIM'	1.3451	1.4315	0.0000	0.0000	0.0000	0.0000	0.0000
'KOSTI'	0.1268	1.6235	0.0000	0.0000	0.0000	0.0000	28.8099
'ALHASAHISA'	0.1348	2.8870	0.0000	0.0000	0.0000	0.0000	0.0000
'ALMEDINA'	0.6006	2.2151	0.0000	0.0000	0.4124	0.6000	1.0920
'NORTHERN FUNG'	0.0000	3.0436	0.0000	0.0000	0.0000	0.0000	0.0000
'RUFAA SHUKRIA'	2.6209	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'KASSALA'	2.6209	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'NEW HALFA'	2.3839	0.2752	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH GEDARIF'	0.0000	3.0436	0.0000	0.0000	0.0000	0.0000	0.0000
'BIDEIRIA'	1.6678	0.0000	0.0000	4.5909	0.0000	0.0000	0.0000
'EAST KORDUFAN'	2.6209	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'MESSIRIYA'	2.6209	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH JEBELS'	0.0000	3.0436	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH DARUR'	2.6209	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'WAU'	2.6209	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Location Quotient FOR CAPITAL LQ.

	1	2	3	4	5	6	7
'BAHRI'	0.4922	1.7439	1.5607	1.1573	0.7987	0.9175	0.5213
'KHARTOUM'	0.4195	0.0000	6.7321	8.2839	0.6921	3.9053	0.4569
'OMDURMAN'	0.3443	0.6712	3.1101	4.2129	3.1775	3.9982	0.0000
'AMA✓BUSHARIN'	0.8361	0.1025	0.0000	0.0000	7.0421	4.7076	0.0000
'EDDUEIM'	0.5242	2.3243	0.0000	0.0000	0.0000	0.0000	0.0000
'KOSTI'	0.0299	0.5848	0.0000	0.0000	0.0000	0.0000	30.8654
'ALHASAHISA'	0.1273	2.9109	0.0000	0.0000	0.0000	0.0000	0.0000
'ALMEDINA'	0.5857	2.0282	0.0000	0.0000	0.9618	0.0000	0.1239
'NORTHERN FUNG'	0.0000	3.0990	0.0000	0.0000	0.0000	0.0000	0.0000
'RUFAA SHUKRIA'	2.0968	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'KASSALA'	2.0968	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'NEW HALFA'	1.6726	0.6270	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH GEDARIF'	0.0000	3.0990	0.0000	0.0000	0.0000	0.0000	0.0000
'BIDEIRIA'	1.4178	0.0000	0.0000	6.9141	0.0000	0.0000	0.0000
'EAST KORDUFAN'	2.0968	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'MESSIRIYA'	2.0968	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH JEBELS'	0.0000	3.0990	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH DARUR'	2.0968	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'WAU'	2.0968	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Location Quotient FOR VALUE ADDED LQ.

	1	2	3	4	5	6	7
'BAHRI'	0.8752	1.0508	2.1671	0.3407	0.7629	1.0438	0.5216
'KHARTOUM'	1.0557	0.0000	1.0324	6.9868	0.5131	1.6137	0.5890
'OMDURMAN'	0.9868	0.4825	1.0849	1.8901	1.8600	1.4831	0.0000
'AMA./BUSHARIN'	0.8109	0.0137	0.0000	0.0000	4.2792	3.1951	0.0000
'EDDOEIM'	0.8058	2.1293	0.0000	0.0000	0.0000	0.0000	0.0000
'KOSTI'	0.1022	1.4053	0.0000	0.0000	0.0000	0.0000	41.5531
'ALHASAHISA'	0.1532	2.6901	0.0000	0.0000	0.0000	0.0000	0.0000
'ALMEDINA'	0.8470	1.7930	0.0000	0.0000	0.8227	0.0000	0.5192
'NORTHERN FUNG'	0.0000	2.8218	0.0000	0.0000	0.0000	0.0000	0.0000
'RUFAA SHUKRIA'	3.2833	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'KASSALA'	3.2833	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'NEW HALFA'	2.1623	0.9634	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH GEDARIF'	0.0000	2.8218	0.0000	0.0000	0.0000	0.0000	0.0000
'BIDEIRIA'	3.1128	0.0000	0.0000	0.8735	0.0000	0.0000	0.0000
'EAST KORDUFAN'	3.2833	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'MESSIRIYA'	3.2833	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH JEBELS'	0.0000	2.8218	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH DARUR'	3.2833	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'WAU'	3.2833	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Location Quotient FOR PRODUCTION VALUE LQ.

	1	2	3	4	5	6	7
'BAHRI'	0.9040	1.2303	1.7387	0.4872	0.9580	0.7333	0.4888
'KHARTOUM'	0.8890	0.0000	1.3399	5.9203	0.7465	1.6180	0.6411
'OMDURMAN'	0.6779	0.6169	1.2726	2.3826	2.3328	1.0240	0.0000
'AMARYBUSHARIN'	1.0310	0.0216	0.0000	0.0000	1.7846	3.5003	0.0000
'EDDUEIM'	0.4447	3.9788	0.0000	0.0000	0.0000	0.0000	0.0000
'KOSTI'	0.1593	1.8144	0.0000	0.0000	0.0000	0.0000	62.0679
'ALHASAHISA'	0.5317	3.7701	0.0000	0.0000	0.0000	0.0000	0.0000
'ALMEDINA'	1.2598	1.2139	0.0000	0.0000	1.3064	0.0000	0.6404
'NORTHERN FUNG'	0.0000	5.0451	0.0000	0.0000	0.0000	0.0000	0.0000
'RUFAA SHUKRIA'	2.1039	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'KASSALA'	2.1039	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'NEW HALFA'	1.5247	1.3889	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH GEDARIF'	0.0000	5.0451	0.0000	0.0000	0.0000	0.0000	0.0000
'BIDEIRIA'	2.0467	0.0000	0.0000	0.6450	0.0000	0.0000	0.0000
'EAST KORDUFAN'	2.1039	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'MESSIRIYA'	2.1039	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH JEBELS'	0.0000	5.0451	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH DARUR'	2.1039	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'WAU'	2.1039	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Location Quotient FOR WAGES & SALARIES LQ.

	1	2	3	4	5	6	7
'BAHRI'	0.7761	1.2281	1.8232	0.5010	0.9223	0.9039	0.7664
'KHARTOUM'	0.8300	0.0000	1.1291	4.9528	0.4613	2.2965	0.3054
'OMDURMAN'	0.6345	0.4609	1.3197	1.5767	2.5987	1.4231	0.0000
'AMA✓BUSHARIN'	0.8385	0.1537	0.0000	0.0000	4.1948	2.6750	0.0000
'EDDUEIM'	0.8191	2.4068	0.0000	0.0000	0.0000	0.0000	0.0000
'KOSTI'	0.0696	1.3234	0.0000	0.0000	0.0000	0.0000	29.6134
'ALHASAHISA'	0.2572	2.9916	0.0000	0.0000	0.0000	0.0000	0.0000
'ALMEDINA'	1.0582	1.7711	0.0000	0.0000	0.8850	0.0000	0.4574
'NORTHERN FUNG'	0.0000	3.2592	0.0000	0.0000	0.0000	0.0000	0.0000
'RUFAA SHUKRIA'	3.1320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'KASSALA'	3.1320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'NEW HALFA'	2.0217	1.1554	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH GEDARIF'	0.0000	3.2592	0.0000	0.0000	0.0000	0.0000	0.0000
'BIDEIRIA'	1.9140	0.0000	0.0000	4.3736	0.0000	0.0000	0.0000
'EAST KORDUFAN'	3.1320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'MESSIRIYA'	3.1320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH JEBELS'	0.0000	3.2592	0.0000	0.0000	0.0000	0.0000	0.0000
'SOUTH DARUR'	3.1320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
'WAU'	3.1320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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