

commonplace amongst management in these firms. The presence of overseas migrants has led to the attraction of more immigrants from these areas, as word has returned to Europe of favourable economic conditions. A common occurrence in the region has been the breaking away of migrants from firms joined on arrival, and setting up of their own businesses, or partnerships, on similar lines and utilising already established contacts.

A change in the sex composition of the industrial labour force has similarly resulted from the transition in the economic base. The increase in light industrial firms has capitalised upon female labour available in the area. Of white employees in industry in 1963/64, 21% (1667), were female, one firm in Springs, manufacturing telephones, employing 550 white and 410 coloured females.

A great change has therefore occurred in the composition of the labour force and population of the area in the last twenty years, many of whom have been brought up in areas far removed from the influence of gold mining.

Other Indicators of Local Economic Health

Economic base analysis, as used in the previous section of this chapter, can only, due to the inadequacies of published statistics, show the effects on the local economy up until 1963/64. Since this date, as anyone passing through the area would observe, the transition has been consolidated, although no statistics on a comparable basis can show this. Other indicators will be used in this section to show the economic health of the region post 1963/64 and to relate developments to national economic fluctuations.

Since 1963/64 there has been many developments in the non-basic commercial sector in the locality, especially significant being the establishment of large department stores, four of which were opened in Nigel alone since 1960.

/ Development

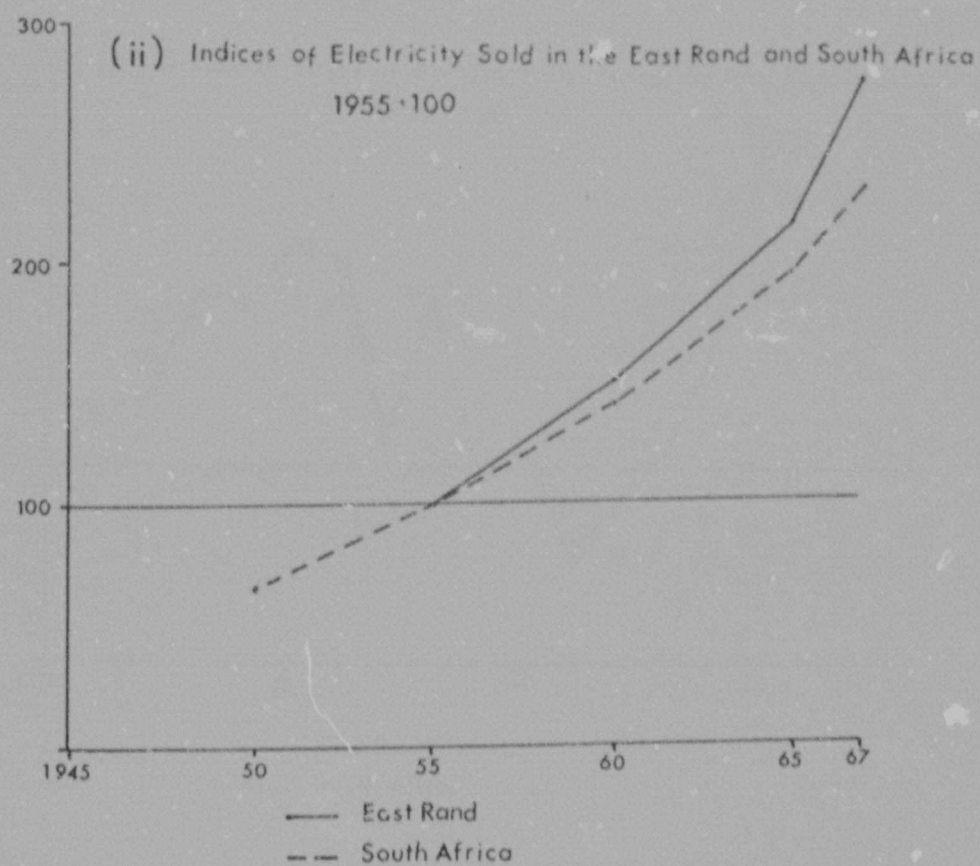
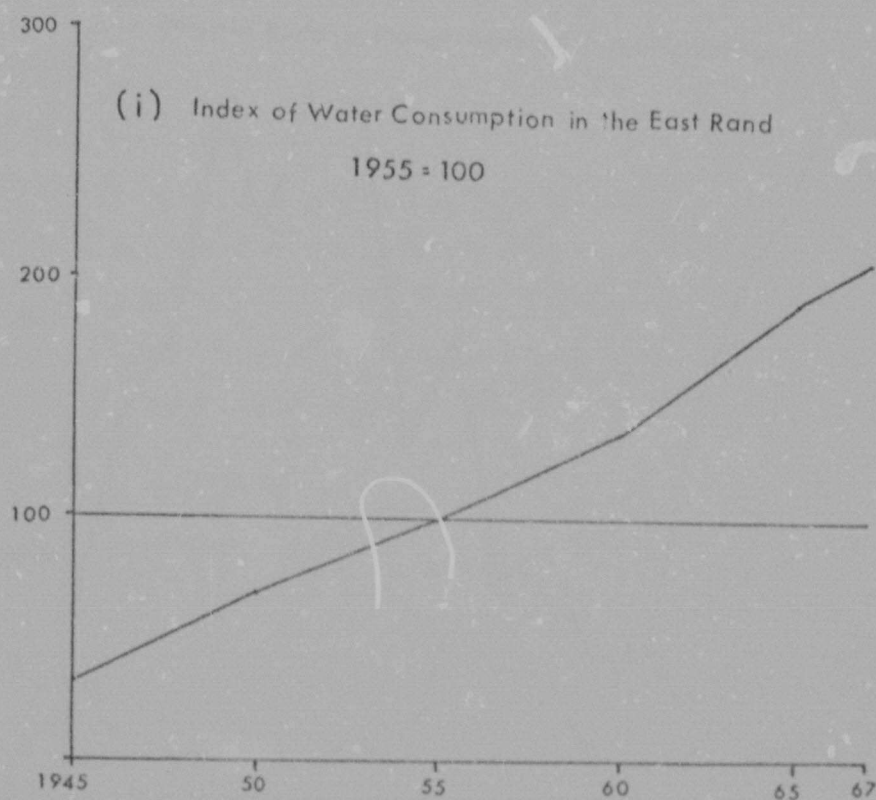
Development in the commercial sector has especially been stimulated by the industrial concerns now established in the region having much greater contact with local commerce than their base predecessors, the gold mines.

The two indicators of economic health shown in Figure I5, water and electricity consumption, show the sharp upward rise in demand continued after 1964. The best indicator available for the general economic health of the region is that of building plans, Figure I6 showing the fluctuations in development since 1950. Figure I6 (i) reflects the effects, in building plans, of the earlier industrialisation of Springs than the other municipalities of the region. In contrast Nigel in 1950 went through a period without development, with vacant shops and small industrial premises, before building developments in the late 1950's reflected the new industrial developments in the municipality.

With the exception of the period between 1950 and 1959, the index of East Rand building plans has followed very closely that of South Africa, reflecting the importance of national economic fluctuations upon local economic conditions. Indeed the transition of the economic base of the East Rand has been greatly facilitated by national economic conditions. The 1960-1962 Recession following the Sharpeville Riots, is clearly shown in Figure I6 (ii) for both South Africa and the East Rand. Since 1962 however the period has been dominated by a 'growth philosophy or mentality' (Sadie, 1966 ; Houghton, 1967), especially in the economic upsurge between 1962 and 1965 when, with the expanding national economy, many firms looking for sites in the Witwatersrand were attracted to the East Rand. To a large extent therefore the Boom of 1962-1965 softened the blow of the closure of the mines in the East Rand by creating the economic environment favourable for the

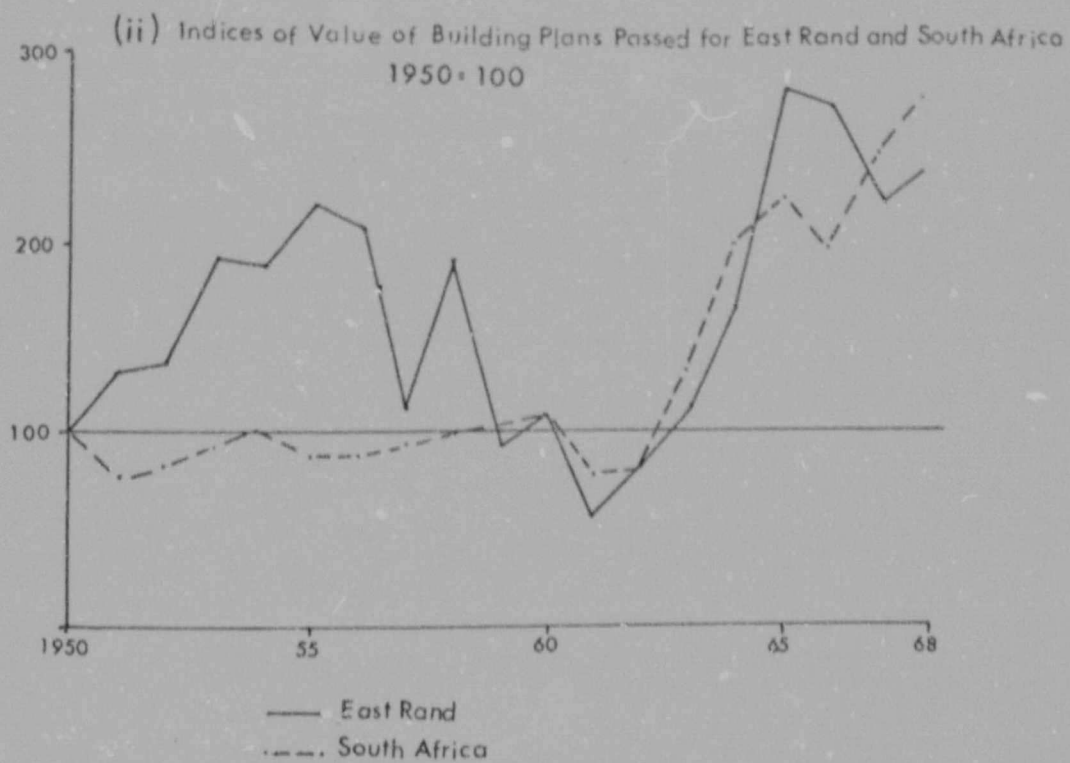
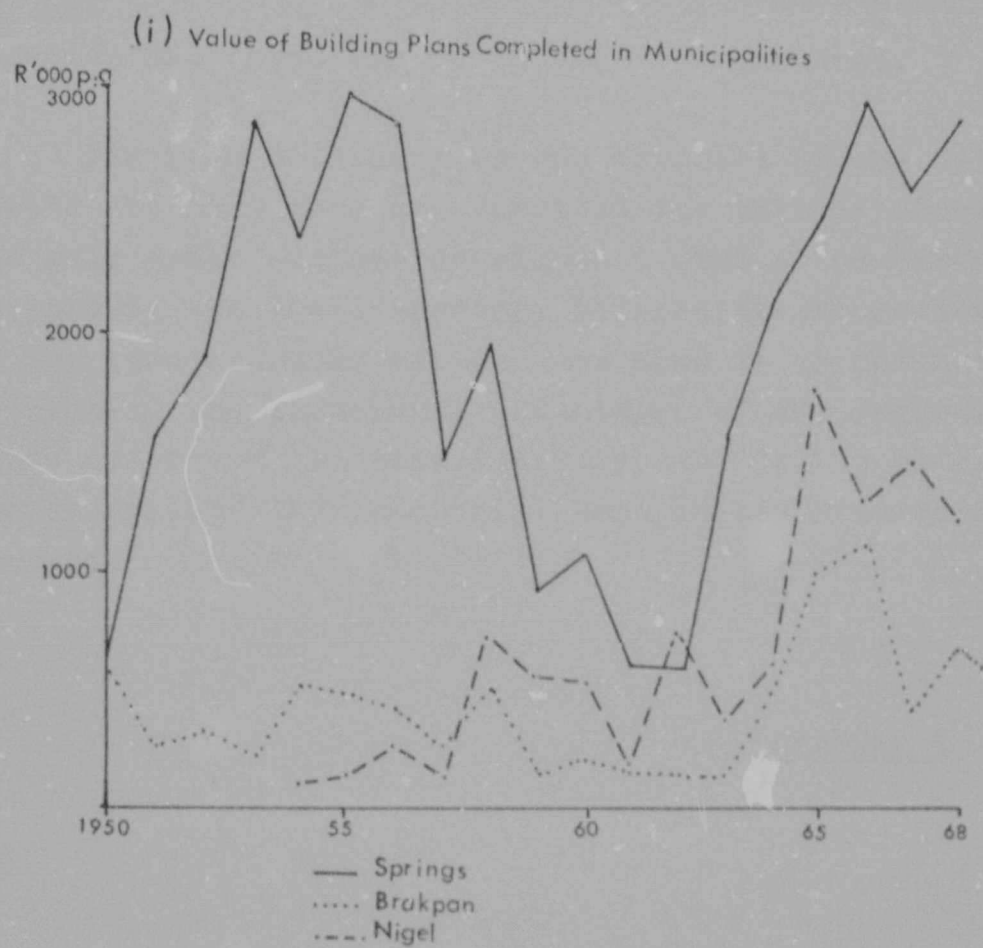
/ location

Figure 15 INDICES OF ECONOMIC HEALTH IN THE EAST RAND
(i) Water and Electricity



Sources : Municipal Year Book 1967 66 & , South African Reserve Bank Quaterly Review

Figure 16 INDICES OF ECONOMIC HEALTH IN THE EAST RAND
(ii) Value of Building Plans



Sources : Building records of individual Municipalities,
and South African Reserve Bank Quarterly Review

location and expansion of industry in the area.

Far from declining as was forecast in the middle 1960's the East Rand has survived the bulk of closures of the gold mines and has developed a stable industrial base supporting the local economy. To predict future developments of the space economy of the East Rand it is now necessary to examine the locational advantages of the region, the exact nature of existing industry and its potentialities for growth, and the industrial base in its greater regional context.

/ CHAPTER 5

CHAPTER 5

ANALYSIS OF MANUFACTURING INDUSTRY IN THE EAST RAND

Having examined the reasons for the 'survival' of the economy of the East Rand in the transitionary period, the study now centres upon the industrial location-growth aspect of manufacturing in the region. This investigation takes two parts. Firstly, the attractions of the region for specific industry groups are examined in terms of the industrialists evaluations. Secondly, the intra and inter regional linkages of industry are analysed to reveal the patterns of industrial growth.

Data

To gain insight into the production/distribution patterns, locational forces, and other variables concerning industrial plants, a sample survey was taken of factories in the region.

To obtain an unbiased and yet areally and structurally realistic sample of the industries in the region, a stratified sample was taken, stratified areally by industrial townships, and structurally by the size of the factories, in terms of employment. Further, as the larger firms have a much greater significance to the regions industrial health, and being more varied in type, a differential sampling fraction was taken, being :-

<u>Size of Firm (Employ.)</u>	<u>Sampling Fraction</u>
I - 100	15 %
100 - 300	33 %
300 +	100 %

by which method most industry types present in the region were included in the survey. Hence, the sample was as shown

/ in

Table 13
STRATIFIED SAMPLE OF FACTORIES IN THE EAST RAND

Sampling Fractions Size	15%		33%		100%		Total
	No.	Sample	No.	Sample	No.	Sample	
Strata							
Pretoriusstad	4	1	1	(1)	2	2	7
Vorsterskroon	9	2	3	1	1	1	13
Town & Other	4	1	3	1	-	-	7
<u>Nigel</u>	17	4	7	2	3	3	27
Enstra							
New Era	24	3	1	(1)	1	1	2
Nuffield	17	2	12	4	4	4	40
Selection Park	6	1	11	4	4	4	32
<u>Springs</u>	47	6	2	1	-	-	8
			26	9	9	9	82
Vulcania							
Town	40	5	2	1	1	1	43
	24	3	2	1	-	-	26
<u>Brakpan</u>	64	8	4	2	1	1	69
<u>Total</u>	128	18	37	13	13	13	178

⊕ Firms at which interviews refused.

in Table I3.

The questionnaire devised (as reprinted in Appendix 2), was largely based upon Britton's industrial questionnaire of firms in the Bristol Region of England (Britton, 1967), with modifications to the South African context, and the inclusion of a question to find the market relationship with the gold mines. Unlike Britton's survey, it was found, in a preliminary survey, that firms were more able to give information on a value than on a volumetric base, as this was the unit in which management generally considered inputs and outputs of the manufacturing process.

As previous studies in South Africa had had a very low response rate when the survey was conducted by post, it was decided to do the survey in person, which in virtually all cases led to an interview being granted immediately. The survey was conducted in the month of August 1969. Although actual records were consulted in only a few cases, the breakdown of inputs and outputs by value, and origin and destination, was of common knowledge to those consulted (usually firm's accountants), and the results can be considered accurate. Only in two instances was an interview refused at 'sample factories', and even after follow-up letters and telephone calls, no information was forthcoming, so the firms had to be omitted from the survey.

Location Factors

The investigation of location factors is aimed at the appreciation of the advantages of a particular geographical and industrial environment that have permitted industrial location and growth. Developing from an examination of general location factors, the study ranks these factors and analyses their importance to different industry groups and according to size of firms.

/ Data

Data. On interview, management personnel in the factories were handed a list of possible location factors in main and sub-groups (see Questionnaire in Appendix 2), and asked to evaluate the importance of these factors in the setting up of their firm, or, if established for many years, in the possible expansion of the firm. They were asked to evaluate the factors basic to the economies of their particular firm which vary between alternative locations. Those factors which they considered important they were asked to rank (I - 4) in order of importance. In some cases only two or three factors could be thought of, and hence in Tables I3, I4 and I5, the factors do not add up to the sum of the rankings I - 4, that is, ten.

Apart from the typical location factors of labour, market, site and materials, two other major types were included in the light of circumstances in the region. These were, municipal incentive to develop in the region, and the residence of the founder of the firm.

The location factors, ranked and unranked, of all the firms sampled in the area are shown in Table I4. The first numerical column of this Table shows the frequency of general location factors cited. Column two has these factors weighted according to the rank given in replies, and in column three these rankings are reduced to a percentage of ten, the sum of the rankings I - 4. The Table shows clearly the two main location factors in the region, the access to markets, and the site factor of the low price of land or buildings. Other important locational factors which come out in this initial analysis are, the availability of raw materials and components, and the residence of the owner of the firm, both these factors assuming more importance in columns two and three, incorporating the ranking of factors. When the factors are combined into main group factors, as in column three, the predominance of market and site locational

/ factors

Table 14 LOCATION FACTORS OF FACTORIES IN THE EAST RAND
: INDUSTRIAL SURVEY

Factors	General Frequency	Ranked Frequency	Ranked Frequency No. of Firms
<u>Labour</u>			
Availability of labour.	3	4	0.09
Availability of skilled labour.	2	4	0.09
Availability of unskilled labour.	8	15	0.34
			0.52
<u>Market</u>			
Access to markets.	40	103	2.39
Anticipation of market growth	8	17	0.39
Low freight costs to market.	-	-	-
			2.78
<u>Site</u>			
Low price of land or building.	41	117	2.72
Scope for expansion.	5	12	0.27
Presence of suitable building.	6	13	0.30
Transport facilities available.	5	11	-
			3.54
<u>Materials</u>			
Availability of raw materials and components.	18	37	0.86
Availability of water	2	2	0.04
Availability of electricity	3	4	0.09
Low cost of water and/or electricity.	-	-	-
			0.99
<u>Municipal Incentive</u>	6	15	0.34
<u>Residence of Owner</u>	13	37	0.86
<u>Others</u>	10	15	0.34
			9.37

factors is seen, followed by materials, residence, labour and municipal incentive, in that order.

The information was then analysed according to other factors to see whether the variables of, size of firm, or industry group, had a significant bearing upon the locational factors cited by the component firms.

The data was first analysed according to the size of the firm, in terms of employees, having three sub-divisions; I - 100 employees, 100 - 300 employees, and over 300 employees. The results shown in Table I5 show the more significant pull of labour and materials as location factors to large firms, whereas the market and residential factors are more significant to small firms. Above these differences however site factors are the most important to all three sizes of firms, reflecting the locational advantages of the East Rand already cited several times in this study, of the flat land, low price of land, availability of transportation facilities, and in some cases factory buildings provided by the municipality, (there is obviously an overlap here between site factors and municipal incentive).

TABLE I5
LOCATION FACTORS BY SIZE OF FIRM
: INDUSTRIAL SURVEY

	<u>Size of Firms</u>		
	<u>I - 100</u>	<u>100 - 300</u>	<u>300 +</u>
Labour	0.27	0.28	1.04
Market	3.05	2.99	1.84
Site	3.66	3.12	3.72
Materials	0.27	1.68	1.73
Incentive	0.27	0.38	-
Residential	1.05	0.92	0.21
Other	-	-	0.28
Total	<u>8.57</u>	<u>9.37</u>	<u>8.82</u>

/ When

When viewed according to industry groups (Table 16), however site factors assume a more differential importance according to the industry type. Of the thirteen industrial groups (Industrial Census classification), site factors are the most important in five, with market and materials each being predominant in three groups (with two groups shared).

Because of the small number of industries of certain types in the area, and the sampling of them, the results for some categories in Table 16 should not be taken as an example of the industry group. Such unrepresentative samples of the industry groups are seen in textiles, non-metallic minerals, and chemicals, the types of firms within these groups not being representative of the whole. Some groups are however representative and these are considered below.

The paper products group shows the almost equal importance of site, materials and market, an important factor in the material factors being the availability of water. The metal products group, the most important group by number of firms in the area, reflects its two component parts, the small engineering firms dependant upon the local market, and the large firms attracted by the locational advantages of site in the region. As an exception, one firm in this group, producing tungsten carbide and other hard metals, gave as its main location factor in the region the clean air in the East Rand, an important factor in powder metallurgy, causing its location in this area rather than the apparently more suitable locations of Vanderbijl Park and Vereeniging. The food and beverages industries are closely tied to the local market, especially the beverages (mineral waters) which are tied by the franchise areas for the product.

Only in two industry groups, metal products and

/ machinery

Table 16 LOCATION FACTORS BY INDUSTRY GROUPS : INDUSTRIAL SURVEY

	No. of Firms in sample												
	Food	Beverages	Textiles	Wood	Paper	Chemicals	Non-Met. Min.	Base Metals	Metal Prod's.	Machinery	Elect. Mach.	Transp. Equip.	Misc. Manufac
	2	2	1	1	2	2	1	1	21	3	1	3	4
Labour	-	0.50	1.00	2.00	0.50	0.50	-	-	0.20	-	-	1.66	2.10
Market	3.00	5.50	-	4.00	3.00	2.50	3.00	4.00	2.58	2.00	3.00	1.00	4.25
Site	1.00	3.50	6.00	4.00	3.00	4.50	2.00	2.00	3.59	3.00	2.00	5.33	3.25
Materials	4.00	1.00	-	-	3.50	2.00	4.00	4.00	0.80	1.00	1.00	1.33	0.25
Incentive	-	-	3.00	-	-	-	-	-	0.05	-	-	0.66	1.00
Residence	1.00	-	-	-	-	-	-	-	2.69	2.33	-	-	-
Other	-	-	-	-	-	-	-	-	0.20	-	-	-	-

machinery, is the residence of the owner an important factor, demonstrating the number of local people and immigrants who have started their own firms in the area, capitalising upon the industrial environment which has been established in the last fifteen years.

Labour as a location factor is most significant in miscellaneous manufacturing, transport equipment, wood and textile industries. Some industries are skilled labour-intensive, whilst others depend upon unskilled labour. The manufacturers of textiles and wooden articles depend upon high ratios of unskilled Bantu labour, in the region of 1 : 10. Of the transport equipment manufacturers interviewed, one was sensitive to skilled labour, the other unskilled. Similarly in the metal products group, skilled labour was more important to some types of manufacturers than others, who could rely on unskilled labour. For many firms in the metal products group however, a shortage of skilled labour is now becoming apparent especially for skilled welders.

Many of the larger firms entering the region in the last fifteen years have been subsidiaries of overseas companies trying to establish themselves in the expanding market of the P-W-V. Of the 44 firms interviewed, nine had parent companies overseas, in England, Italy, Belgium, Germany, Holland, Scotland and Japan.

In conclusion to this section on location factors, it would appear that site factors are by far the most important in the East Rand, especially for the larger firms, given the proximity to the market and the availability of raw materials. For the smaller firms, especially the metal products and machinery firms, which dominate by numbers industry in the East Rand, the market provided by the P-W-V and the larger firms coming into the area has been the main locational factor in their expansion.

/ Input-Output

Input-Output Patterns of Manufacture

The analysis of input-output patterns aims at establishing the flow pattern of various types of goods to and from manufacturers in the region, from the system of regions in South Africa, and hence examining the role of the new manufacturing based East Rand economy in the South African space economy.

Data. The input-output tables as presented in this section will unfortunately be very different from the strict input-output tables as used for projection by many regional analysts in the U.S.A. and U.K. (Barna, 1953 ; Isard and Kuenne, 1953 ; Isard, 1960). In South Africa industrial statistics are of the most meagre kind and any form of construction of input-output tables necessitates an industry-by-industry survey which involves the limitations associated with this type of survey.

The survey undertaken in the East Rand obtained a breakdown of inputs and outputs by origin and destination, between the East Rand, the P-W-V (excluding the East Rand), the Orange Free State, Cape Province, Natal, and the world outside South Africa. It was felt that any breakdown into smaller groups would lead to even greater inaccuracies in the statistics than were already present due to the method of collection.

Inputs. Table I7, showing the percentage breakdown of inputs by origin of the industrial groups in the East Rand, shows, as would be expected, the great variation between the industry groups. With the exception of the importation from overseas of various products for the chemicals, electrical machinery and transport equipment industries, inputs for all industry groups are almost totally derived from the Transvaal, especially the P-W-V. The metal products group, which made up almost one-half of the sample,

/ obtained

Table 17
INPUTS BY ORIGIN : INDUSTRIAL SURVEY
% DISTRIBUTION BY VALUE

Industry Groups	E. Rand	P-W-V	Tvl.	OFS	Cape	Natel	Imports
Food	50.0	-	50.0	-	-	-	-
Beverages	5.0	5.0	45.0	-	-	45.0	-
Textiles	-	-	80.0	-	-	-	20.0
Wood	-	-	100.0	-	-	-	-
Paper	2.5	5.0	91.5	-	-	-	1.0
Chemicals	2.5	45.0	-	-	-	-	52.5
Non-Metallic Min.	58.0	-	23.0	-	-	-	19.0
Base Metals	-	100.0	-	-	-	-	-
Metal Products	20.2	76.1	-	-	-	-	3.7
Machinery	1.6	93.4	-	-	-	-	5.0
Elect. Mach.	1.0	29.0	-	-	-	-	70.0
Transp. Equip.	14.6	49.3	-	-	1.8	-	34.3
Misc. Manufac.	8.7	65.1	2.5	-	-	2.5	21.2

obtained all but 3.7 % of its inputs from the P-W-V, whilst machinery, all but 5 %. The industries using large proportions of raw materials, food, textiles, wood, and paper, obtain the vast majority from the Transvaal, the only exception here being the beverage industries importing sugar from Natal. The orientation in respect of inputs is therefore very much towards the P-W-V for industries using semi-processed goods, and towards the Transvaal for industries using unprocessed materials.

Outputs.

Market Orientation. To obtain full understanding from the areal destination of outputs in Table I9, it is necessary to know the market destination of outputs by industry groups. The majority of products of manufacturing industries in the region, as shown in Table I8, are destined for other industry, or household consumption. Only a small proportion of the manufactured goods are exported, the highest proportion being for the food industries, resulting from the exporting activities of a food cannery firm to other countries in Africa.

Areal Orientation. In almost every industry group in Table I9 the P-W-V and the East Rand together receive over 50 % of output by value, from East Rand industries. When Tables I8 and I9 are viewed in relation to each other the integration of the East Rand into the P-W-V industrial economy, in terms of output orientation, becomes obvious. Of the 73 % of the output of metal product industries going to the P-W-V and the East Rand, 92 % is sold as intermediate goods to other industries. The paper industry is similarly orientated to other industries in the P-W-V, of the 78 % sold in the P-W-V and East Rand, 95 % being consumed by other industry. Of the more household market orientated firms, all beverages are sold in the Transvaal, 65 % of transport equipment in the P-W-V, and 75 % of

/ electrical

Table 18 MARKET ORIENTATION OF OUTPUTS : INDUSTRIAL SURVEY
% DISTRIBUTION BY VALUE

Industry Groups	Gold Mining	Other Industry	Govt. Sector	Household	Export
Food	2.5	42.5	-	42.5	12.5
Beverages	-	-	-	100.0	-
Textiles	20.0	79.5	-	-	0.5
Wood	-	100.0	-	-	-
Paper	-	95.0	4.0	-	1.0
Chemicals	-	-	-	97.0	3.0
Non-Metallic Min.	-	98.0	-	-	2.0
Base Metals	-	80.0	10.0	-	10.0
Metal Products	15.0	77.4	4.2	-	3.4
Machinery	25.0	30.0	8.4	33.3	3.3
Elect. Mach.	-	-	20.0	80.0	-
Transp. Equip.	2.4	30.0	-	65.3	2.3
Misc. Manufac.	0.5	34.1	27.5	31.2	6.7

Table 19 OUTPUTS BY DESTINATION : INDUSTRIAL SURVEY

% DISTRIBUTION BY VALUE

Industry Groups	E. Rand	P-W-V	Tvl.	OFS	Cape	Natal	Exports
Food	10.0	25.0	20.0	2.5	25.0	5.0	12.5
Beverages	33.5	35.0	31.5	-	-	-	-
Textiles	2.0	77.0	-	-	10.0	10.0	1.0
Wood	20.0	80.0	-	-	-	-	-
Paper	5.0	73.5	5.0	-	15.5	-	1.0
Chemicals	7.5	37.5	2.5	2.5	29.0	18.0	3.0
Non-Metallic Min.	10.0	50.0	8.0	10.0	10.0	10.0	2.0
Base Metals	15.0	35.0	-	-	30.0	10.0	10.0
Metal Products	37.1	36.7	6.6	8.1	5.1	3.0	3.4
Machinery	8.7	15.0	29.0	22.3	11.0	10.4	3.3
Elect. Mach.	-	75.0	15.0	-	10.0	5.0	-
Transp. Equip.	2.2	63.3	9.0	7.1	9.0	7.1	2.3
Misc. Manufac.	8.2	58.0	6.2	6.4	5.5	9.3	6.7

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