

THE IRON AND STEEL, METAL AND ENGINEERING INDUSTRY

IN THE

PRETORIA - WITWATERSRAND - VEREENIGING REGION.

A dissertation submitted for the Degree of Master of Arts,

in the Department of Geography

in the University of the Witwatersrand.

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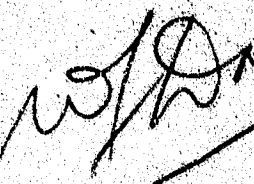
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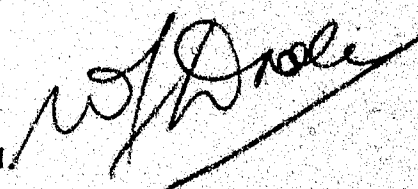
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INTRODUCTION

The present dissertation is concerned with the basic iron and steel industry, (which is the smelting of ores) and the engineering or manufacturing aspects of the metal industry in the Pretoria - Witwatersrand - Vereeniging Region.

The data available on this topic is limited. Prior to 1915, no Government Industrial Census existed and reliable figures are unobtainable.

Another difficulty presents itself in the methods of classification. Different methods have been used from time to time by various agencies. For example, the Population Census of 1960 records 13,314 persons of all races engaged in the manufacture of metal products in Johannesburg, while the 1959/60 Industrial Census quotes 15,901.

Where possible, the Industrial Census has been used, although this data has not been published since 1962. Subsequent research has employed a variety of sources which include the Department of Planning, Industrial concerns, data from commercial conferences, the Board of Trade and Industry and a Sample Survey. In conducting the latter, certain problems became manifest. In the first instance, support for such work did in no way compare with that afforded similar official surveys, and in the second, great difficulty was encountered in compiling a complete list of the street location of all metal and engineering establishments in the Pretoria - Witwatersrand - Vereeniging Area. A final population of 1762 firms was compiled of which 32% responded. For analytical purposes 25% of the total were usable.

With such problems in mind, the dissertation is presented in two parts, of which the first is a temporal consideration and the second a contemporary spatial analysis. Some forecasts are attempted. A significant feature of the industry and its temporal and spatial character is the manner in which it may be viewed in three major phases of growth, to each of which a chapter is devoted.

The first phase, termed the Initial Phase, covers the century, 1836 to 1936. This was a period distinguished by a lack of major development, except towards the end when large scale smelting began. The second Phase which may be described in Rostowian terms as the "Take Off" period examines the significant forces and processes brought to bear by the Second World War. The stimuli here can be summarised as the war effort coupled with the continuation of the take off period, which resulted in increased demands and an expanding market. The current Phase is seen as the "Drive to Maturity" in which expansion and diversification of the

industry were the most significant changes. This is exemplified by the spatial growth of the industry. There has been a great increase in the range and varieties of goods produced. Some regional specialization has also manifest itself within the Pretoria - Witwatersrand - Vereeniging complex and decentralization is occurring within the area. The full impact of the Physical Planning and Utilisation of Resources Act (88/1967) has not yet influenced the geographic distribution of industry within the region (with the exception of Rosslyn). However future growth will be slowed especially on vacated mining land.

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CHAPTER I

THE INITIAL PHASE OF THE BASE METAL INDUSTRY IN THE PRETORIA - WITWATERSRAND - VEREENIGING AREA, 1836 - 1936

1.1 Early Attempts to Establish an Iron and Steel Industry (1836 - 1900)

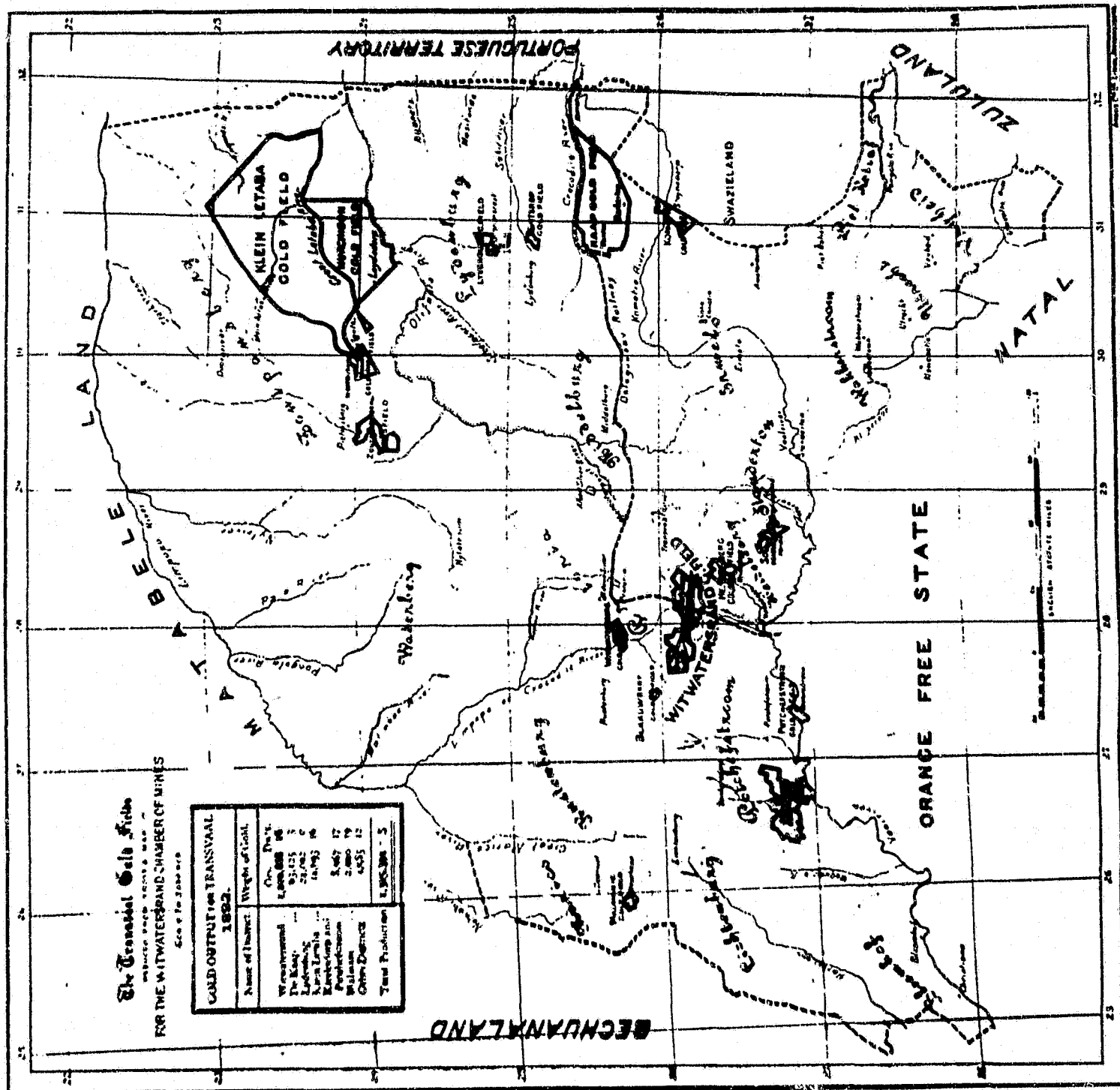
The ancients were known to have worked the ore of Thabazimbi and may have traded Pig Iron with the Arabs (Davidson, 1959), but it was not until the advent of the Europeans that large scale exploitation occurred.

The Transvaal was settled by Voortrekkers who migrated northwards from 1836 onwards, established isolated communities, and lived a life of nomadic pastoralism, so nothing was done in the field of mineral exploration because these people had neither the tradition nor the incentive to do so. After the discovery of diamonds in the Northern Cape in 1867 and gold in the Northern and Eastern Transvaal between 1871 and 1873 the European population increased significantly. By 1876 the Transvaal was bankrupt, following both the Bapedi War and President Burger's borrowing to finance a railway from Lourenco Marques to Pretoria. In 1877, Shepstone annexed the Transvaal and the First War of Independence in 1880/81 resulted in President Kruger securing a measure of independence. The war had severely strained the Republic's resources and economic recession followed.

On 7th July, 1881 a Hollander, Nellmapius, of the farm Hatherley in the Pretoria District, contracted with the Transvaal Government to erect ore smelters in the Republic. Kruger was attempting to improve the economy by encouraging development and improving trade and had made several unsuccessful attempts to join the Cape Customs Union. In 1884 an agreement was reached with the Nederland Zuid Afrika Spoorweg Maatschappij to build all railways in the Transvaal. It was hoped that some of the iron and steel requirements would be manufactured locally and so save foreign exchange and encourage industrial development.

At this stage George Harrison * discovered gold on the Witwatersrand (1886) which initiated a large influx of 'Uitlanders' and fortune seekers. It was thought that the goldrush would be shortlived and consequently the region was not considered a potential market.

* Reputed to be the first man to discover the Main Reef, at Langlaagte.
(A.P. Cartwright, 1965)



Lacking capital, Nellmapius had done little to exploit his concession and sold it for R9 000 to John Crosbei Aitken Henderson, who, in the speculative fever which followed the discovery of gold, sold it to the Transvaal Government Iron Concession Limited for R32 800 and 18½% of the shares of another company which was to be established in England. Due to the turbulent political situation no real exploitation of the concession was undertaken and when the railway to Lourenco Marques was completed in 1895, the Transvaal Government Iron Concession Limited went into liquidation and the concession was transferred to the Exploring Land and Minerals Company Limited (Richards, 1940). On 30th September, of the same year, it was again transferred to the British Transvaal Financial Company Limited, who held it in trust for Henderson. He still owned or controlled the concession, but lacked capital to exploit it. The buying and selling of the concession was due to speculation and to an attempt to raise capital.

Nellmapius' concession was limited to a period of 20 years and the government of the Transvaal supported this new industry with a levy of 2d sterling per pound weight of iron and steel of all kinds (Richards 1940). A further amount of 1½d per pound weight was levied on all persons producing iron and steel after Nellmapius. The potential market of the Transvaal was significant. Apart from the railways there were numerous goldmines in the seven major goldfields (Figure 1.1) and by 1892 the primary field was the Witwatersrand which produced 1,210,868 fine ozs. of gold, or 91.36% of the total production. The railway between Lourenco Marques and Pretoria, the Witwatersrand and the Orange Free State had been built and was the means of importing iron and steel goods. The Witwatersrand had established its position as the main consumer. The potential market within the area excited speculators to develop an iron and steel industry. However, a shortage of capital and the scale of production priced the local article out of the market. Political problems also existed. The question of tariffs threatened to restrict the market to the Transvaal. Some speculators feared that the South African gold fields would, like those in California and Australia, be quickly exhausted and with them the market for iron and steel.

Despite this, another group of investors, apart from Henderson, were interested in developing the industry in the Transvaal. They were Messrs. Lewis and Marks. In December 1892 estimates were obtained by their manager, T. Guttman, for a plant with a weekly output of 500 tons of merchant bar iron.* It included two blast furnaces, 40 puddling furnaces, several rolling mills and its delivered cost was ½ million rands. The proposer was Thomas Wilkinson of Tinsley Steel, Iron and Wire Works, in Sheffield. Nothing came of those proposals although the agreement was kept alive until

* High carbon iron bars used in all types of iron and steel manufacturing,

July, 1898 by the annual payments of an undisclosed rent. Henderson stated in evidence before the Transvaal Concessions Commission in 1901 that he had

"Sent men from England and Scotland out to examine the Transvaal from end to end as to the best place and best manner of dealing with iron - where you can get coal of sufficient quality to work that iron and also a place sufficiently central and suitable for people". (Richards, 1940)

Henderson claimed to have spent between R50 000 and R80 000 in trying to implement the contract (Richards, 1940). He estimated that R1 million would be necessary to make production possible and to fulfill the concession. He was unable to raise this amount and began negotiations with the government in 1898, in an attempt to gain a new contract for 30 years. This was drafted under the "model" scheme of 1896 by which Henderson agreed to build a factory possibly at Middelburg, as this town was favoured by Kruger, or alternatively at any suitable place where he could produce at least 100 tons of pig iron and 100 tons of other types of iron annually. A government director was appointed and a 25% protective duty imposed, which could be raised from time to time. The government would receive 5% of the net profits. In 1899 the Anglo Boer War broke out before the contract was ratified and in 1902 Henderson's request to the Concessions Commission, that the British Government ratify the agreement, was turned down and the Nelmapius concession lapsed.

The cause for the failure of Henderson and Marks can be ascribed to the political situation at the time. The cost of importing goods was high due to the existence of a customs union and protective tariff. Capital was expensive to offset the risks involved and the political scene was unstable, coupled with the idea that gold would be shortlived as in California and Australia. These factors combined to inhibit large scale, long term capital investment in solid slow growing industries such as iron and steel.

Between 1892 and the turn of the century, the gold mines and railways consumed the greatest proportion of imported iron and steel. Considerably smaller amounts were used in agriculture and construction. Figures are not available, but the mines and railways contributed to the growing piles of scrap. Workshop facilities were scarce or non-existent and it was often expedient to replace rather than repair equipment, which both increased consumption and favoured scrap accumulation. This was later an important source of material for the iron and steel industry.

1.2 Attempts Prior to Union (1900 - 1909)

The Transvaal's growing demand after 1900 for iron and steel stimulated further efforts to work local ores and in the following year Green smelted ores at Sweetwaters, near Pietermaritzburg and the Alverstone Iron Ore Syndicate Limited, and the Vryheid (Natal) Railway Coal and Iron Company Limited, were formed to exploit ores in Natal. These efforts came to nothing because of the high cost of capital equipment relative to returns.

In 1909 H.H. Wright found deposits at Magnet Heights in the Lydenburg district and spent R18 000 prospecting. The Government refused his discovery rights until he could initiate the formation of an iron and steel industry. Eventually he gained a lease to exploit the fields, but was unable to raise the necessary capital. As a result of the high costs of the war and the failure of agriculture, depression ensued. However, Wright persisted in his attempts. He took samples which contained titanium and were capable of being smelted, to England, but was still unable to export the raw ore as the railways refused to grant low rates from Belfast, the nearest station. Wright claimed 'without fear of contradiction that he was the sole promoter of the iron and steel industry in this country'. (Evidence to select Committee, Report No. 9, 1912.)

This statement was untrue in view of the efforts of Messrs. Nellmapius, Henderson, et al.

Sir Thomas Rees Price, General Manager of the Cape South African Railway, (1902 - 1910) recommended the use of scrap iron and the smelting of the country's natural ores to the Government. (Report No. 9, 1912). This scheme was postponed, but private enterprise (Marks, Lewis, Henderson, et al) continued in its attempts to establish an industry in response to the demand from the mines and railways in the Transvaal.

About the same time J.G. Anderson formed the Transvaal Iron and Steel Company Limited which imported a rolling mill from New Zealand. This was partly erected at Kempton Park with a capital of R100 000 which proved insufficient without Government aid. The company was forced into liquidation and the plant was sold for scrap in 1913.

Another attempt by Ballentine was made in 1905 to raise capital for steel works. This failed because he wanted financial assistance or a government guarantee, neither of which was forthcoming.

1906 saw the erection of a mobile open hearth furnace at Denver, Johannesburg. This scheme failed on technical grounds and insufficient financial support.

The accumulations of scrap iron from the mines and the railways initiated experimental smelting and conversion at the railway workshops in Pretoria. The chief instigators were Mr. Connolly, the foundry foreman and Professor Stanly, the incumbent of the Chair of Mechanical Engineering in the University of the Witwatersrand. He also smelted the titaniferous ores of the Pretoria series. Of particular significance with regard to the problem of scrap accumulation was the Transvaal Customs and Industries Commission (1907 - 1908), which investigated the extension of existing industries and said of the Iron and Steel Industry:-

" once fairly established, (it) could be worked successfully without protection of any sort; but it was improbable that without some inducement, the very large capital required would be forthcoming". (Report No. 6. 1908)

However, without the establishment of a large foundry or steelworks, scrap iron continued to accumulate and:-

" attained such dimensions as to constitute a serious nuisance to the managements, and that notwithstanding a very low railway rate for scrap export, scrap was being sold at 19/- a ton in Pretoria and 15/- in Bloemfontein and at times large quantities were sold at 10/- a ton or even less. In the year 1910 the exports of scrap from the Union amounted to 15,267 tons as against 18,885 tons in the preceding year and the value was £17 772 and £16 457 respectively, so that the value per ton was in one year well under £1, and in the other not much over £1". (Lewis and Marks 1926).

The Transvaal investigated the problem in 1908. Sir Robert Kotze, the Government Mining Engineer, produced a Memorandum on the Iron and Steel Industry in which he carefully examined the Transvaal deposits and concluded the blast furnaces, which when established, would draw the bulk of their ore from the Pretoria beds. This was a significant observation which had a bearing on the final site of the Iron and Steel Corporation of South Africa. Kotze felt that the needs of the mines could be met as also those of the railways and agriculture, by the production of bar and ingot steel. He favoured the Canadian System of Government Bounties with a guarantee of interest on a reducing scale. This, in his opinion would not impose a direct burden on consumers and would be particularly favourable to the mines. This opinion may be questioned on the ground that at this time organised agriculture was recovering from the vicissitudes of war and clearly had a greater claim to assistance than the mining industry. Kotze recommended that any company should start with considerable Government control and a monopoly to enable low price maintenance, at least until firmly established. He estimated a cost of R500 000 to R600 000. Unfortunately the Government could not introduce a bounty system to stimulate local exploitation without the consent of the Customs Union. J.A. Vaughan visited Europe to investigate the most suitable methods of smelting scrap and the Government invited F.W. Harbord (1909) to report on

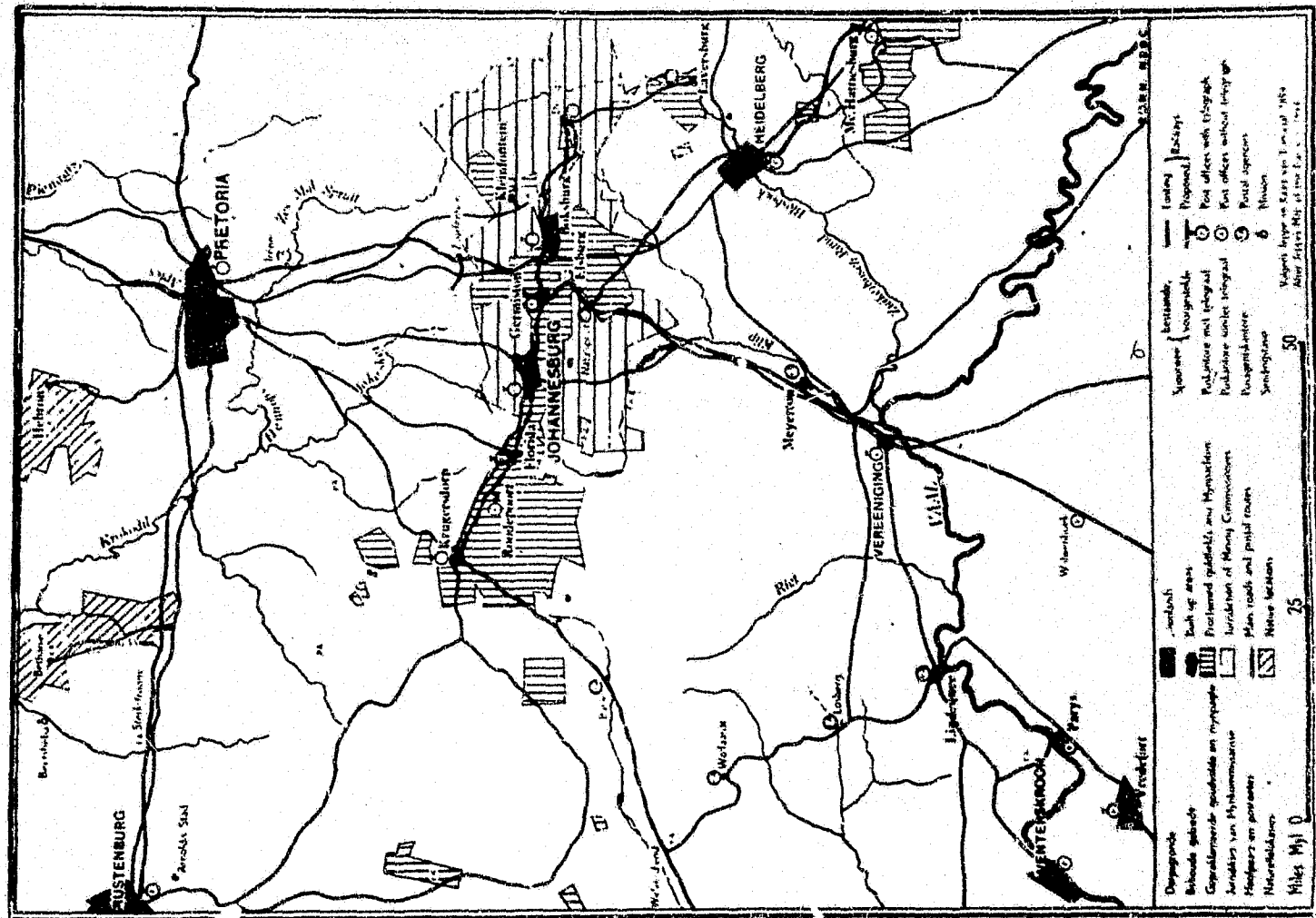
scrap smelting. He published his findings the following year and established that one blast furnace, producing 1 000 tons of pig iron a week, would supply the Transvaal market, but that greater economies of scale would be achieved with two furnaces. He was concerned at the limited knowledge of iron mines, but was favourably disposed towards the ore deposits. Relatively little was known of the available fuels and he recommended a more detailed investigation, particularly of coking coals. He analysed the domestic market for finished products and found it too small to compete satisfactorily against imported articles, particularly in coastal localities (Report No. 21, 1910).

Harbord maintained that any attempt, at that stage, to manufacture pig iron and steel from native ores would be premature, but saw the construction of an electric steel plant for the conversion of scrap as possible. He advised the Government to allow private enterprise free reign and to assist them in the purchase of scrap, both then and in the future.

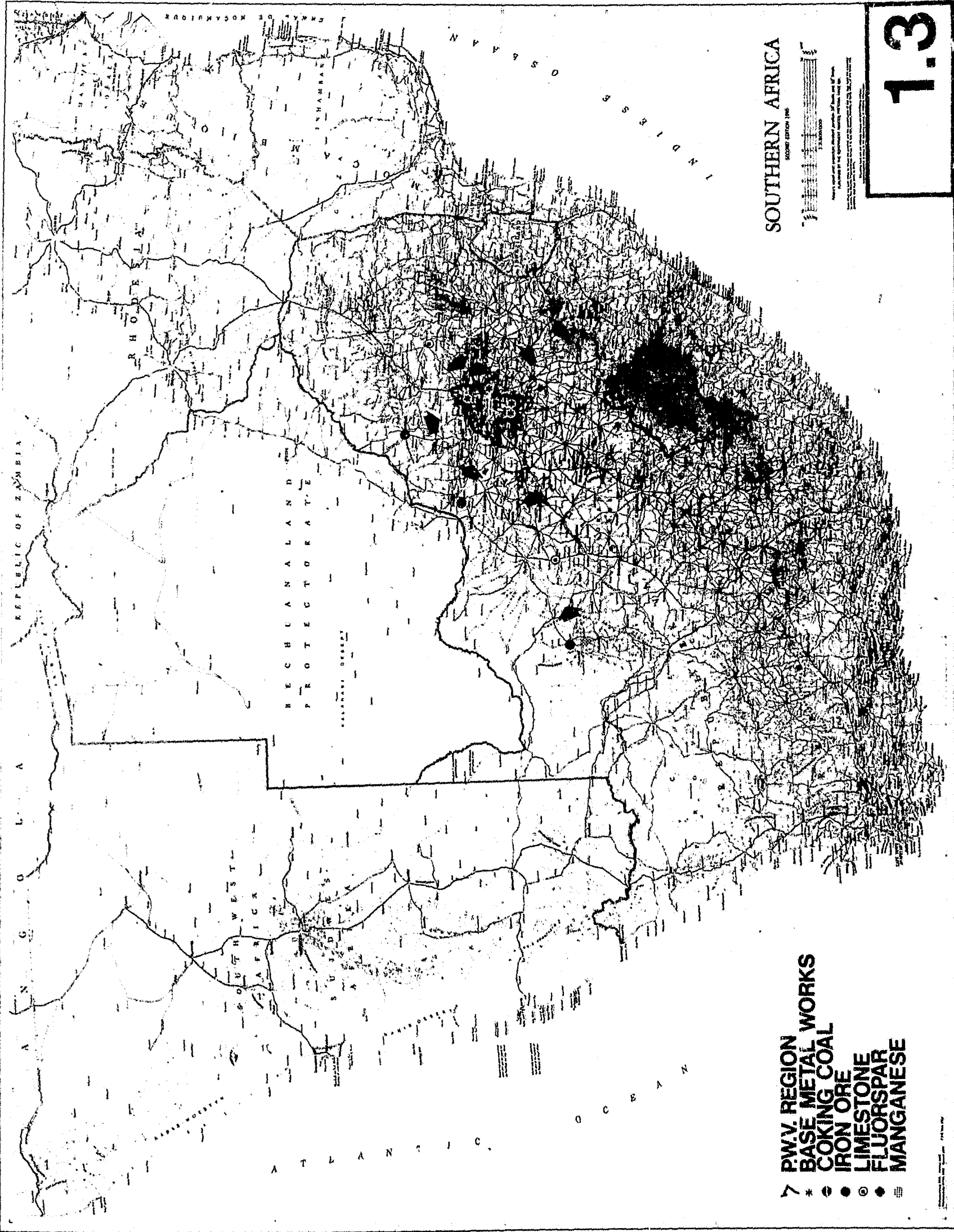
The Government reacted favourably to Harbord's proposals, called for applications for the purchase of 15 000 tons of railway scrap at R2.00 per ton and a further amount of not less than 500 tons a year for five years at the same price - the successful tenderers were to erect a local plant. Four applications were received from Mrs. Scott Anderson, British Colonial Metals Limited, (Sir J. Sivewright), the South African Iron and Steel Company Limited, H.H. Wright and Samuel Marks) and the South African Steel Corporation (Walker and Campbell). Mr. Kotze recommended that the South African Steel Corporation tender be accepted as they proposed to use the Heroult electrical furnaces which had proved most successful, and later to experiment on local ore. The Government accepted this proposal on 30th May, 1910, the day before Union, and in October the Union Government appointed the Commerce and Industries Commission to inquire into the conditions of trade and industry in the country. This Commission reported in November the following year and emphasised that a large scale effort should be made to establish the industry within the country. It also recommended sending an expert to Sweden to study recent developments, and that the Government should either erect blast furnaces and plant or offer a bonus to non-Governmental agencies who perform the same function. (Report No. 10, 1912).

1.3 The Formation of the Iron and Steel Producing Corporations after Union

In June 1911, Smuts instructed the termination of negotiations with the South African Steel Corporation as they had failed to guarantee R6 000 for the purchase of 15 000 tons of scrap. The Government had been negotiating with Messrs. Wright and Marks since March and agreement was reached on 16th June, 1911 by Smuts, the Minister of Mines and the Principals.



THE PRETORIA - WITWATERSRAND - VEREENIGING REGION IN 1899
 Source:- Jeppe's Map of the Transvaal 1899.



1.3

On November 15th, 1911, the Union Steel Corporation (USCOR) was formed with a capital of R500 000 and in January 1912 took over the agreement which had been ceded by Wright to the African Steel Syndicate in July 1911.

Much debate in Parliament followed the agreement and the terms of the contract and discussion revolved around the amount of capital required; whether the industry should be monopolistic; whether the industry would eventually have to export; the optimum location; the degree of Government support; the use of scrap and native ores; railway rates; labour and technical factors, customs and protection. Despite the apprehensions on the part of some Members of Parliament the steelworks was founded in the Transvaal on the Vaal River about a mile from the site of the signing of the Treaty of Vereeniging. After some delays the first steel ingot produced in South Africa was teemed on September 1st, 1913. The Government realised the importance of the industry, not only to offset foreign exchange, but also to encourage allied industries at the time. Only fourteen years previously Pretoria and Heidelberg had rivalled Johannesburg in size, and the townlands of Pretoria, Boksburg and Heidelberg were the only municipalities in the Pretoria - Witwatersrand - Vereeniging area (Fig. 1.2). No provision had been made for African housing in the area. The goldfields and Mynpachten* covered parts of the West Rand, Johannesburg and the Near East Rand, but those areas now called Benoni, Brakpan and Springs were controlled by the Mining Commissioners. At this stage there existed both rail and road networks which were to influence later development in the area. The east-west lines of communication followed the gold reefs to serve the mines and the proclaimed areas east of Johannesburg formed a north-south axis, which carried the major lines of communication. The iron and steel works at Vereeniging had a dual function. In the first instance they would serve the mines on the Witwatersrand and in the second the diamond fields, for which they produced similar equipment.

Water was available from the first weir on the Vaal, coal came from Coalbrook and the company had rights to ore from the northern Cape (Fig. 1.3). Table 1.4 compiled from Mark's observations (Marks 1926) shows that imports of iron and steel in 1910 were considerable. In many cases imports exceeded those of 1923, an indication of the expanding market in the country, especially for semi-processed goods such as bars, bolts and rods. Not much pig iron was imported due to the lack of processing facilities. Wire fencing and plain rod imports in 1910 amounted to 40,835 short tons, but since then imports in this field had decreased. Imports of heavier articles, especially rails and sleepers continued to rise, an indication of the expanding networks.

* Mynpachten: Mining Rights.

Figure 1.4

Title: Imports of Iron and Steel into the Union of South Africa

Source: The Iron and Steel Industry of South Africa,
The Union Steel Corporation (of S.A.) Ltd.,
Vereeniging 1926, (Messrs. Lewis and Marks).

Note: The Table does not include all iron and steel imports.

M. - Merchandise G. - Government
? - Quantities not given in official returns.
All in long tons.

	1925	1924	1923	1922	1910
Pig Iron	M. 7 405	2 915	2 440	953	1 360.8
	G. 3 222	5 335	1 847	1 537	840.8
	10 627	8 250	4 287	2 490	2 301.6
Angle, Channel and T Iron.	M. 7 525	6 425	4 993	1 907	11 784.64
	G. 723	472	341	36	807.52
	8 248	6 897	5 334	1 943	12 592.14
Bar, Bolt and Rod	M. 22 543	21 158	19 403	10 510	26 681.76
	G. 1 729	2 454	475	559	3 674.72
	24 272	23 612	19 878	11 069	30 356.48
Castings	M. 60	78	285	10	?
	G. 5	5	1	43	?
	65	83	286	53	?
Drill Steel	M. 2 867	4 104	With bar		
Hoop Iron	M. 1 966	1 668	1 415	1 635	1 526.56
	G. 3	0	3	7	?
	1 969	1 668	1 418	1 642	1 526.56 ?
Cast Iron Pipes	M. 10 830	7 858	6 922	5 663	
	G. 250	292	234	3	?
	11 080	8 150	7 156	5 666	
Wrought Iron and Steel Pipes	M. 23 475	21 777	16 977	15 779	
	585	571	807	85	?
	24 060	22 348	17 784	15 864	

Figure 1.4 (Continued)

	1925	1924	1923	1922	1910
Pipe Fittings:-					
A. Cast Iron	M. 830	820	1 335	975	
	G. 0	9	0	0	
B. Steel	M. 2 150	2 459	1 201	With Cast Iron	
All Pipes & Fittings					38 520.16
Plate	M. 13 231	17 037	9 896	4 732	14 860.16
	3 007	2 627	942	81	2 985.44
	16 238	19 664	10 832	4 813	16 945.6
Sheets:-					
A. Not galvanised	M. 1 962	2 682	1 637	900	
B. Galvanised-flat	M. 8 778	9 535	10 212	6 197	5 296.48
	G. 243	32	47	0	156.28
	9 021	9 567	10 259	6 197	5 457.76
C. Corrugated	M. 42 545	37 699	34 452	31 638	37 777.6
	G. with flat		101	61	1 384.32
Tinned iron	M. 9 049	5 266	6 549	3 431	215.66
	G. ?	?	?	?	16.8
Bolts, Nuts and Rivets	M. 1 076				
	G. 445	?	?	?	?
	1 521	?	?	?	?
Nails, Screws and Washers	M. 5 509				
	G. 1 816	?	?	?	?
	7 325	?	?	?	?
Fencing Standards & Droppers	M. 4 278	5 576	?	?	?
	G. 279	0	119	12	?
	4 557	5 576	119	12	?
Wire, Baling and Binding	M. 1 225	2 290	1 968	697	
	G. 115	4	0	0	With fencing
	1 340	2 294	1 968	697	
Wire, Fencing, Plain	M. 11 439	14 067	7 968	4 765	33 639.2
	G. 556	727	228	18	7 140.0
	11 995	14 794	8 196	4 783	40 835.2
Wire, Fencing Barbed	M. 22 851	28 719	18 316	18 490	Vide plain
	G. 200	48	vide plain (last item)		
	23 051	28 767	?	?	?

Figure 1.4 (Continued)

	1925	1924	1923	1922	1910
Wire, Netting	M. 16 349 G.	14 074	9 939	4 206	2 348.64
	Included in following item				
Wire, Other	7 365	2 781	2 242	1 672	with fencing
Structural Steel	M. 5 443 G. 512	3 797 2 220	2 738 6 077	2 628 4 917	? ?
	5 955	6 017	8 815	7 545	
Tram Rails	M. 1 548	875	1 075	552	?
Steel Windows	964	915	?	?	?
Railway Material:-					
A. Rails	M. 9 860 G. 61 003	15 870 50 210	7 154 25 099	? 5 440	? ?
	70 863	66 080	32 253		
B. Sleepers	M. 2 138 G. 17 497	1 432 6 816	872 649	? ?	? ?
	19 635	8 248	1 521		

The large market for iron and steel goods justified the development of a local industry, especially in the Transvaal where such would be able to compete more readily with overseas producers. This is supported by the fact that other iron and steel foundries came into operation in the southern Transvaal, before the outbreak of the first World War.

Increased mining and industrial activities after 1910 caused a growing demand for steel goods in the Pretoria - Witwatersrand - Vereeniging area and as a result small concerns and individuals began producing. Those who worked on scrap included George Stott who started as a blacksmith in Johannesburg in 1910, and subsequently expanded his business to produce 'Village Iron' from railway scrap, which he sold in rounds, squares and flats to engineering firms, the mines and merchants.

Cartwright and Eaton had been trading as machine merchants and converted their business into a private company in 1911.

"Named in honour of the formation of the Union of South Africa, Union Iron and Steel Works was launched in Johannesburg 6th May, 1911, with a works site at Dunswart junction near the small mining settlement of Benoni On 26th June, 1914 the name

of the company was changed to the Dunswart Iron and Steel Works Limited" (Dunswart, 1961).

Their capital was R6 739, later supplemented by R2 000 from J. Bromley-Kemp, and a further R5 800 in 1912 from the five shareholders.* In 1913, Eaton resigned as joint managing director, but retained shares and a seat on the Board. His interest in smelting native ores resulted in the floatation of the Newcastle Iron and Steel Works Limited in 1920. This company produced 170 666 tons of pig iron between 1926 and 1934 when the furnace was finally blown out.†

In 1914 the Union Iron and Steel Works became Dunswart Iron and Steel Works and the new company received capital of R50 000. The change in name was necessary because of confusion with the Union Steel Corporation (of South Africa) Limited which was expanding at Vereeniging. In 1911 an attempt was made by British Colonial Metals Limited (Sir James Sivewright) to obtain an agreement with the Pretoria Municipality to establish a blast furnace and steelworks on the Pretoria townlands. Nothing came of this. In 1909 the Witwatersrand Co-operative Smelting Works were established in a workshop of the Robinson Gold Mining Company. This was no more than a foundry, but pressure of war and the difficulties of importation resulted in a shoe and die works being founded at the Driehoek Foundry in 1919. The Union Steel Corporation at Vereeniging was already producing shoes and dies for stamp batteries, but the demand far exceeded the supply so the output of the foundry on the property of the Robinson Gold Mine found a ready market. The demands on the industry caused by World War I resulted in greater attempts to increase production, both in volume and variety of goods, to replace essential articles which were in short supply or unobtainable.

The year 1917 saw two important developments in the Iron and Steel Industry in the Southern Transvaal. The establishment of the works of Cartwright and Stott were based on scrap iron and had developed in the vicinity of both a good supply of scrap and a sound market. The Union Steel Corporation at Vereeniging, however, seemed less well situated, although at first Messrs. Marks and Lewis had little trouble in acquiring their raw material. The 15 000 tons of scrap was easily delivered at the site, water was in good supply, but the coal from Coalbrook proved unsatisfactory for coking, while Limestone came from Kromdraai, a distance of 140 miles and Vereeniging proved an indifferent market for the finished product. For as long as scrap was used, the railways could deliver conveniently, but the three ore deposits owned by the company were 27, 54 and 89 miles from the processing point (Figure 1.3) and in fact the Corporation's site:-

".... seems to have been chosen mainly because of the other interests of Lewis and Marks situated here and not from any conscious attempt to obtain the best location" (Report No. 58, 1920).

* Richards states that the company was called "Cartwright and Eaton Limited" and had a capital of R20 000, but the company itself has not printed anything to support this.

† Blown out i.e. the furnace was not recharged, but allowed to burn out.

✓ One of the companies which had failed to get the Government scrap contract earlier that year.

Due to the war effort and shortages of imported iron and steelware, the Union Steel Corporation expanded and increased its output from 272 tons in 1913 to 8 322 tons in 1919. (Figure 1.5)

Figure 1.5

Title: Annual Production and Sales of the Union Steel Corporation (S.A.) Ltd.

Source: Richards, C.S. 1940 "Iron and Steel Industry in South Africa", University of the Witwatersrand, Johannesburg p.50

<u>Year</u>	<u>Mines and Others</u>		<u>Railways</u>		<u>Total</u>	
	Tons	Value(£)	Tons	Value(£)	Tons	Value(£)
1913	253	3 200	19	234	272	3 434
1914	1 797	21 967	149	1 637	1 946	23 604
1915	2 747	38 110	997	11 976	3 744	50 086
1916	3 005	58 682	1 518	21 244	4 523	79 926
1917	6 124	140 067	1 413	22 762	7 537	162 829
1918	6 809	216 920	1 538	31 817	8 341	248 747
1919	6 499	180 236	1 823	39 998	8 322	220 234
1920*	4 354	115 143	605	14 683	4 959	129 826
6 years and 10 months	31 582	774 325	8 062	144 361	39 644	918 686
Average cost per ton		£24.5		£17.9		£23.4

* Only the first five months of the year

So it was partly due to the war and partly because of its obligation under the Government contract that the Union Steel Corporation floated the Transvaal Blast Furnace Company and an experimental furnace was built at Vereeniging near the Corporation's site. Participating in the project were the Industrial Development Company, and Mr. H.A. Neume, the Chairman of Dunsward Iron and Steel Works. The original equipment of the Corporation's furnace comprised a 10 to 12 ton Siemens gas fired open hearth melting furnace, a 600 ton press; two Siemens reheating furnaces and a 12 inch merchant bar rolling mill, but this proved inadequate in the face of the expanding demands being made upon the corporation at that time (Richards 1940). A shortage of skilled labour also existed despite the increases in staff during the initial phases of the war. (Figure 1.6)

Figure 1.6

Title: Labour Force of the Union Steel Corporation (S.A.) Limited.

Source: Richards C.S. 1940 "Iron and Steel Industry in South Africa", University of the Witwatersrand, Johannesburg. p. 51.

<u>Year</u>	<u>Europeans</u>	<u>Non-Europeans</u>
1916	113	252
1917	180	300
1918	117	253
1919	127	252
1920	190	340
1921	219	450

In consequence a blast furnace with a daily capacity of between 10 and 15 tons was designed by Professor G.H. Stanley of the University of the Witwatersrand and erected in 1917. The furnace started operations in October 1918, but the influenza epidemic and a power failure which caused a charge to set in the furnace, resulted in a loss of time.

In 1918 676 tons of pig iron, valued at R5 710 were produced, but the experiments were costly and over R120 000 was spent in three years. Operations were halted and the Transvaal Blast Furnace Company Limited, went into liquidation in September, 1919. The following October, Lewis proceeded with a bigger project, the establishment of a large co-ordinated iron and steel works. He decided to increase the capital of the firm by between R3 000 000 and R4 000 000 and in December 1919 Messrs. Butler and Reese began an investigation of the plant on behalf of their European principals and finally reported favourably to them. The post-war depression followed and had an almost crippling effect on the Corporation and by September 1921, the orders on hand could be met by rolling two days a week. Not only was there competition to be faced again from overseas imports, but the scrap market had been exhausted; dumping was rife, and there was growing restlessness on the labour front (Dunswart, 1961).

1.3 The Inter-War Period (1918 - 1939)

Another important development occurred at Pretoria, where Mr. Delfos engaged Dr. Wagner and Professor G.H. Stanley to report on the iron ore on the Pretoria townlands. The outcome of these deliberations was favourable and Delfos floated the Pretoria Iron Mines. On November 1st, 1917, construction was started on a small experimental

blast furnace designed by Professor Stanley and the first attempts to smelt took place in June the following year. From July to October the first run on production was made. Unfortunately the lining collapsed and the influenza epidemic stopped work. The furnace was raised and repaired and a second run lasted from March to September 1919. Finally a third run from January 1920 to April 1921 produced good pig iron and after some experiments with different ores and mixtures, the furnace collapsed once again and was finally stopped. The principal reason for the unsuccessful runs on this furnace can be ascribed to unsatisfactory refractory bricks in the lining, a fact of which the designers were aware. Little could be done to rectify this shortcoming as they had neither the equipment nor the technological experts to manufacture such commodities. Four thousand tons of pig iron was produced and sold throughout the country, and as far north as the Congo. The production cost of this pig iron had risen to R28.00 per ton, although Delfos (who was perhaps misinformed) stated that it was R19.00 at that time. (Report No. 14, 1925). In any event the smelting experiments were abandoned. Capital was difficult to obtain because of the recession due to labour unrest, the influenza epidemic and the aftermath of the war.

Despite these problems, the Pretoria Iron Mines Limited, was determined to study the erection of a co-ordinated iron and steel works. This evidence is of interest in the light of future developments and the eventual establishment of ISCOR.

A.C. Romijn, the Chairman of the Pretoria Iron Mines Limited, stated in evidence in 1920 that:-

"The local South African Market is limited. This might, at first glance, seem to suggest that one's work should be commenced on a small scale and be gradually built up with the increased demand. This is not so; it is a well established fact that the large output and properly arranged and co-ordinated works are absolutely essential to run steelworks on economical lines. Such a thing as building up a steelworks slowly and piece-meal is in these times of competition so uneconomical that it is utterly impossible. A plant of this nature has to be erected absolutely complete."
(Report 5B, 1920).

Therefore to study the problems of costs, labour, communications, markets, transport, raw materials, power and water, involved in the construction of large co-ordinated works, Dr. Wagner and Professor Stanley were commissioned to submit reports.* G.M. Clark and Delfos also contributed to these. The principal features of these follow:-

Wagner's report dealt with the ore deposits on the Pretoria townlands, those at Thabazimbi (Buffelshoek) those in the Eastern Transvaal, northern Natal, Griqualand West and Bechuanaland.

* Technical reports published separately and referred to in the prospectus of the S.A. Iron and Steel Corporation.

He estimated the ore reserves in the leased areas of the Pretoria townlands to be " 20 000 000 tons probably averaging in the neighbourhood of 48% of iron, a quantity sufficient, on the basis of 200 tons of pig iron per day, to keep the furnaces of the company supplied for 125 years". This ore could charge the furnace at 35c per ton - probably the cheapest rate in the world. He anticipated no difficulty in obtaining adequate supplies of coking coal from the Witbank area, at a pithead price of 60c per ton. The limestone deposits of Taungs (342 miles by rail from Pretoria) and Marble Hall (90 miles from Pretoria and 50 miles from a railway at that time), were too remote, but the Irene deposits could be delivered at 50c per ton, so he concluded that the Pretoria Iron Mines Limited would be assured of an abundant supply of all raw materials essential to the production of iron and steel. The cost of assembling these materials he estimated at between R3.77 and R4.26 per ton of pig iron produced, as "low as the pre-war U.S.A. costs and far below English costs". Professor Stanley considered that 10 000 tons of pig iron and 165 000 tons of iron and steel would be required annually, but could be increased by meeting other agricultural, mining and railway requirements. He suggested that the company should aim at supplying one third to a half of this, requiring a furnace capable of 200 tons a day, giving 10 000 tons of pig iron and 60 000 tons of steel a year. Pig iron was estimated to cost R5.50 a ton. Coke could be produced at Pretoria, where by-products would be used. The basic open hearth process was recommended. Stanley concluded that "Pretoria is a very suitable locality, for, although there may be a small advantage in locating it on a coalfield, this would be much more than nullified by the high cost of transport to the chief consuming centre".

Clark reported favourably on the water resources and after examining the claims of Vereeniging, Witbank, Germiston and Pretoria he concluded that the last would be the most economical location.

Delfos stated that their main object was to produce pig iron, rails, sleepers, fish plates, steel plates, steel bars, angles, tees and beams: it was not their present intention to produce articles of a more finished nature. He made the incorrect assumption that the South African Government had done nothing for the industry. However, the railways subsequently agreed to buy half their requirements from the company and offered them advantageous rates which would enable the company to dispose of its over-production.

The Pretoria Iron Mines Limited concluded a provisional contract with the Government, but this was later changed by a subsidiary agreement. Finally, the Railway's administration undertook to buy 50% of its annual requirements of iron and steel from a proposed new company for 15 years, i.e. from 1923 to 1937. A preferential railway tariff of 0.265 pence per ton mile for machined products for export was offered to all ports including Lourenco Marques. The Administration was to receive one third of all profits from the company after it had paid off 10% on capital. The company had to deposit R10 000, as surety, with the Administration and deliver 5 miles of rail for testing before 1923. Failure to comply with these conditions permitted the Administration to cancel the contract and recover any additional cost it may have incurred. The company was to manufacture pig iron and iron and steel, including rails, steel plates and sizes and sections of rolled or wrought iron and mild steel from South African raw materials. The new company named, The South African Iron and Steel Corporation Limited, was formed on 1st February, 1920 with a nominal capital of R3 000 000 of which R700 000 was issued. The 100 000 shares of the Pretoria Iron Mines Limited passed to the new company for 200 000 shares and the balance of 150 000 shares was publicly subscribed. The National Industrial Corporation Limited, guaranteed the issue of R2 000 000. The Union Steel Corporation felt, however, that the agreement of the Government to purchase half its annual requirements from the new company, if not actually infringing their own contract, was definitely hampering their ability to expand and acquire capital. The Union Steel Corporation was concerned about competition in the open market as the Administration would "in no case be bound to purchase any goods from the company if precluded by commitments under any now existing Contracts or Agreement". (Report 5B, 1920) The agreement was reported to Parliament and referred to the Railways and Harbours Select Committee on 25th May, 1920. There was much debate and the Committee was deeply divided. The Labour Party's proposals of establishing a state controlled industry were rejected, and the Select Committee's report advising the Administration to refrain from entering into a contract "by intimating publicly that (they) will be prepared to purchase (their) requirements in South Africa" was also rejected. An agreement with the company was confirmed by both Houses of Parliament on 11th August, 1920. The Minister approved the cession of shares on 5th September, 1921, by the Pretoria Iron Mines Limited, to the South African Iron and Steel Corporation Limited.

The Government had committed to writing their policy of fostering the development of the Iron and Steel Industry in South Africa and Lewis considered that they would become a partner. Believing that he held the optimum location at Vereeniging, Lewis did not ask for Government protection, but Romijn, Chairman of the Pretoria Iron Mines did ask the Administration to subscribe some of the capital. They declined as in their opinion "the prospects confronting

the company were not favourable. This, at the time, was interesting as the Pretoria site was subsequently chosen by ISCOR (Report 5B, 1920).

The Union Steel Corporation did not favour the Government becoming involved in another firm, (ISCOR) particularly as their agreement with the Government lapsed in 1928. The Government also felt that they would not be able to run their own furnaces economically at that time and in any event it became apparent that the new company's future lay not so much with sales to the Administration as with the local and export market. It would be in direct competition with the aims of the Union Steel Corporation and Sir William Hoy (business man and engineer) felt that there was no room in South Africa for two blast furnaces nor even as yet room for one. In advocating assistance for developing the industry he stated to the Select Committee that:-

"If South Africa is to wait until private enterprise finds from £1½ million to £2 million sterling - the minimum required to start a blast furnace works on a large and convenient basis, it will wait for many years and possibly never have a blast furnace industry at all" but
"there is no room in the country for more than one company for some considerable time"
(Report 5B, 1920).

The position in the early twenties was also aggravated by the post war depression and the 1922 strike. During this time a number of amalgamations were attempted and the search for capital was carried to Europe. Eaton, at Newcastle was slowly building his furnace, but needed at least R50 000. The Union Steel Corporation was looking for a R3 million to R4 million to erect a modern co-ordinated works at Vereeniging and the South African Iron and Steel Corporation entered the market for R3 million. In 1920 Delfos went to England in an attempt to raise capital. Professor Henry L of the University of Durham produced a favourable, but cautious report for Delfos on the prospects of establishing an iron and steel industry in South Africa. After consulting with Mr. Ernest Bury (General Manager, Skinningrove Iron and Steel Works, England), Delfos decided that a plant of 150 000 tons annual capacity would be profitable, provided it could market its produce in the sub-continent. He did feel, however, that it was more prudent to start with a smaller works of 50 000 to 70 000 tons, because of the difficulties experienced in raising capital. (Evidence, 1928). Mr. F. Bainbridge also prepared a report for Delfos in England and Mr. F.W. Harbord gave another favourable report despite the changes in the industry since 1910. Finally Ernest Bury, who left the Skinningrove Iron and Steel Works and joined the S.A. Iron and Steel Corporation as a consulting engineer, was consulted with Sir William Peat, an eminent accountant, and Dr. Stead, President of the Iron and Steel Institute, London, and this resulted in a favourable report. Bury visited the Transvaal with J.H. Brown, the Director of

Simon Carves and Company Limited, ar.J reported in August 1921. He recommended Pretoria as the site, the basic open hearth process as the method, estimated that a 75 000 ton plant would cost R5 000 000 and produce pig iron at R3.52 per ton, ingots at R8.99 and rolled steel for R15.20. He concluded that for his part he felt that there should be no delay in founding an iron and steel industry in South Africa (Bury, 1921). Dr. Stead concurred with Bury. Sir William Peat estimated the annual consumption of iron and steel at 143 000 tons and consequently declared that a 75 000 ton plant "might reasonably expect to be fully employed". A profit of about R10.00 per ton would have to be earned for the scheme to be viable and although cautious, Peat was favourably inclined. The only unfavourable report came from Mr. W. Thornycroft, President of the Federation of British Iron and Steel Manufacturers and a Governor of the Mineral Resources Bureau of the Empire, who visited South Africa in 1921. He thought that a plant producing 65 000 to 75 000 tons of pig iron and 110 000 tons of ingot steel per annum was feasible. It would cost R4 million and produce pig iron at R6.87 per ton. He favoured Witbank as a site and stated firmly that he "would not recommend the erection of such works at Pretoria". He felt that it was obvious that the Profit and Loss Account of an iron and Steel Works would be governed by the action of the S.A. Railways and ultimately by politicians (Report, 1921). By locating on a coalfield at Witbank, he was following the pattern set in Britain and the U.S.A. and felt that this would prove to be most economical.

In answer to these criticisms Delfos stated that "the Government is bound to assist us with the railway rates if it should be proved that competition from the outside would be harmful to the industry. I have the promise of the Minister of Mines and Industries, that if we can prove that protecting tariffs are necessary, we shall get them" (Delfos 1921). Delfos also stated that "apart from the economic position of Pretoria it is the intention of the Government that the industry should be established there and naturally under those conditions it will be easier to get concessions from the Government than if the industry were placed in another spot" (Delfos 1921). Wagner states in answer to Thornycroft that "he ignores the two greatest factors in favour of Pretoria, i.e. the goodwill of the Government and a huge tonnage of cheap ore so situated that operations could be started immediately" (Delfos 1921).

1.3.1 The Failure of the Private Sector to Expand the Industry

By 1921 the financial resources of the South African Iron and Steel Corporation were exhausted, despite the fact that the company had acquired the coal deposits of Steenkoolspruit and ore deposits of Buffelshoek (Thabazimbi). However, they lacked capital for further development. The National Industrial Corporation refused to underwrite the companies contract, but did advance an overdraft of R100 000. The country was suffering from the post-war depression

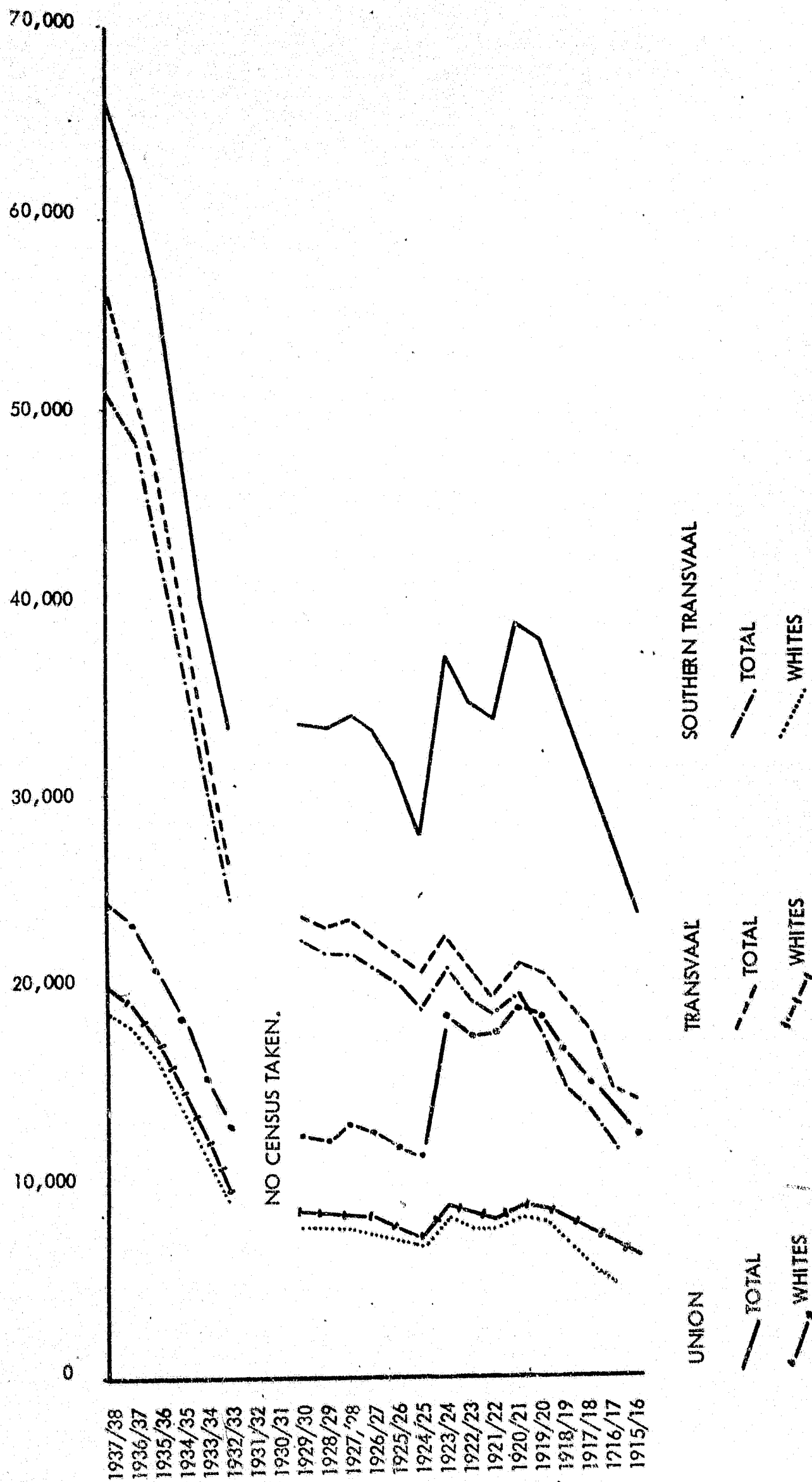
and was further troubled by the strike of 1922 on the West Rand. Capital could not be raised in South Africa and in Great Britain the price of No. 3 Cleveland pig iron fell from R22.45 per long ton in 1920 to R8.56 in 1922 and bar iron from R67.00 in 1920 and R27.00 in 1922. The recession in both England and America made it difficult to raise capital for foreign investments. Italy offered a steel plant for sale in Genoa and later one in Bagnone, but negotiations fell through. Delfos returned to England in 1922 in another fruitless attempt to raise R2 000 000 from the Trade Facilities Board, but since the South African Government would not advance a similar amount the negotiations terminated. Dr. H.J. van der Bijl, the Technical Advisor to the Government on Industries initiated a report which was submitted to the Government in 1922 by the Board of Trade and Industries, as a result of which the Iron and Steel Industries Encouragement Act of 1922 was passed. This Act made possible the payment, on a decreasing scale, of a R1.50 bounty per ton of pig iron and steel produced from South African ores for a period of eight years. Bounties were to be paid only if the plant had shown, to the satisfaction of the Minister, that it was capable of producing at least 50 000 tons of pig iron or steel per annum. Because of this the Union Steel Corporation approached Messrs. Armstrong, Whitworth and Company Limited, in August 1922, for designs and estimates for a comprehensive iron and steel plant. Delfos coincidentally made an almost identical request to the same company shortly afterwards. He realised that there could be only one large plant in South Africa and persuaded the Union Steel Corporation to come to an agreement with the South African Iron and Steel Corporation, whereby the major development was to take place in Pretoria. The Newcastle Iron and Steel Company was also admitted to this agreement.

Figure 1.7

Title: Number of Employees in the Metal and Engineering Industry.

Source: Government Industrial Census. U.G. Nos. 14/1918, 51/1918, 51/1920, 28/1920, 48/1921, 40/1922, 14/1924, 41/1924, 35/1926, 41/1927, 32/1928, 51/1928, 18/1930, 44/1930, 33/1931, 31/1935, 34/1936, 30/1937, 24/1938, 59/1939, 21/1941.

<u>Dates</u>	<u>UNION</u>		<u>TRANSVAAL</u>		<u>WITWATERSRAND</u>	
	<u>Whites</u>	<u>Total</u>	<u>Whites</u>	<u>Total</u>	<u>Whites</u>	<u>Total</u>
1915-16	12 138	23 617	5 856	14 028		n.a.
1916-17			6 256	14 787	4 737	11 813
1917-18	14 996	31 379	7 255	17 699	5 193	13 471
1918-19	16 583	34 736	7 988	19 281	6 795	14 990
1919-20	18 561	37 942	8 539	20 682	7 742	18 494



NUMBER OF EMPLOYEES IN THE METAL AND ENGINEERING INDUSTRY.

Source:- Government Industrial Census. Nos. 14/51/1918, 17/28/1920, 48/1921, 40/1922, 14/41/1924, 35/1926, 41/1927, 32/51/1928, 18/44/1930, 33/1931, 31/1935, 34/1936, 30/1937, 24/1938, 39/1939, 21/1941.

Figure 1.7 (Continued)

<u>Dates</u>	<u>UNION</u>		<u>TRANSVAAL</u>		<u>WITWATERSRAND</u>	
	<u>Whites</u>	<u>Total</u>	<u>Whites</u>	<u>Total</u>	<u>Whites</u>	<u>Total</u>
1920-21	18 931	38 997	8 676	21 169	7 975	19 395
1921-22	17 681	36 284	7 991	19 666	7 420	18 284
1922-23	17 410	37 188	8 137	20 794	7 555	19 252
1923-24	18 459	39 898	8 760	22 601	8 142	20 882
1924-25	11 246	27 935	7 191	20 419	6 676	18 860
1925-26	11 821	31 586	7 578	21 529	7 060	20 108
1926-27	12 495	33 265	8 000	22 358	7 414	20 832
1927-28	12 844	34 187	8 344	23 244	7 690	21 570
1928-29	12 336	33 338	8 198	23 186	7 723	21 872
1929-30	12 464	33 864	8 298	23 882	7 803	22 479
1930-31	NO CENSUS TAKEN					
1931-32						
1932-33	12 779	33 600	9 747	26 727	9 162	24 812
1933-34	15 469	40 731	12 177	33 113	11 514	31 045
1934-35	18 583	48 187	14 956	39 736	14 102	37 147
1935-36	21 502	57 145	17 468	47 432	16 566	44 533
1936-37	23 553	62 226	19 155	51 958	18 086	48 546
1937-38	24 652	66 036	19 872	55 982	18 724	50 982

Armstrong, Wiltworth and Company Limited, found two banking houses willing, conditionally, to provide capital of R4 000 000:-

1. that R1 400 000 to R1 600 000 should be guaranteed by South Africa and,
2. that the Union Government should undertake to pay the sum of R250 000 annually as bounties for a period of eight years.

Neither of these conditions could be fulfilled and negotiations broke down. A less ambitious scheme proposed that the S.A. Iron and Steel Corporation Limited raise R1 000 000 to complete the Newcastle Works and extend the Vereeniging works, but this also came to nothing. Eaton tried to raise R50 000 from the Government, but was twice refused, once in 1923 and again in 1924. In August 1924 negotiations were resumed between the management at Newcastle and Vereeniging. In October, after raising its issue of paid up capital from R268 214 to R1 179 374 (over R12 000 000 being tendered by the public) the Union Steel Corporation took over the Newcastle Iron and Steel Works Limited, and the ore deposits at

Kromdraai and Prestwick. The Newcastle works were completed by June 1925, and the works at Vereeniging were enlarged and extended.

Since the S.A. Iron and Steel Corporation Limited had failed to deliver the first five miles of experimental rails to the Administration for testing in 1923, a new agreement had to be drawn up. This was brought to the notice of the Minister by the General Manager of the Railways on 6th July, 1923. The result of the debates of this and other reports eventually culminated in the Iron and Steel Industry Act of 1928.

The importance of producing rails can be seen from Table 1.4. South Africa's imports of rails rose from 32 253 short tons in 1923 to 70 863 tons in 1925. Sleepers similarly showed a marked increase rising from 1 521 tons in 1923 to 19 635 tons in 1925. Both the mines and the S.A.R. & H. used rails and the country was developing steadily. The gold mines supplied a stable market for various iron and steel products, including machinery, as well as supplying the Government with the capital necessary to undertake larger development schemes. The expansion of rail communications was only one of these. The general increase in the importation of wrought iron and steel pipes from 15 864 tons in 1922 to 24 060 tons in 1925 is indicative of the building which was in progress. The importation of plate reached 19 664 tons in 1924, the highest figure since the country had begun producing its own plate at Vereeniging and this may be taken as an index of development. The significant expansion which did occur was not as great as that to follow, (Figure 1.7 and 1). Secondary industry was developing and broadening the basis of the country's economy.

"During the period from 1900 to 1932 various other preconditions for a successful takeoff were being fulfilled. Of major importance was the Act of Union in 1910, for it brought into being a common market of nearly six million people in a country of 472 000 square miles. In the 1920's the real foundations of future industrial expansion were being laid, particularly in the formation of the Iron and Steel Corporation (ISCOR) to work South African ores. Agriculture too had almost succeeded in making the adjustment to production for the growing urban centres" (Houghton 1964).

The general political unrest and labour problems of the twenties resulted in a shortage of capital for expansion and unemployment followed. This was reflected in the metal and engineering industry, especially after 1924 (Figure 1.7). Coupled with this was re-adjustment which European agriculture had had to make, from a subsistence-type to a more commercial type of farming. The net effect of these factors was the accumulation of 200 000 to 300 000 poor whites in

in the urban areas. These people had to be absorbed by expanding the industries within the urban centres. It was therefore essential that the country develop an industrial economy and so all forms of industry were encouraged and the development of an iron and steel industry became increasingly important, especially since it was felt that the country's expanding economy would support such a venture.

1.3.2 State Intervention - the Gutehoffnungshutte Commission

After the failure of the amalgamation negotiations of March 1923, the Prime Minister, General Smuts, instructed Karl Spilhaus, the Union Trade Commissioner on the Continent, to try and interest continental industrialists in the establishment of an Iron and Steel Industry in South Africa. The result was the Gutehoffnungshutte Commission, which visited South Africa in February 1924, for a period of four months. They worked with the S.A. Iron and Steel Corporation Limited. The position of the iron and steel industry of the whole country was studied and a final report was issued in German, at Oberhausen, Germany on 4th February, 1925. It was received by the S.A. Iron and Steel Corporation Limited in March of the same year.

The report consisted of eight sections, seven dealing with various aspect of the problem and an eighth, a summary together with three dossiers of diagrams and schedules. The eight sections were translated into English by Delfos. A summary of this was made by the Ministry of Mines and Industries, but no official translation into English or Afrikaans was made, although this document played an important part in the Iron and Steel Industry Act of 1928. The Gutehoffnungshutte report consisted of a general description of the Union's economy with the emphasis on iron and steel production, the assets of the S.A. Iron and Steel Corporation, raw materials, results of coking tests, estimates of costs and an analysis of technical and economic factors. Because of the importance which this report had upon later developments and the eventual establishment of ISCOR some of the more important points are summarised:-

The first item which the report considered was the location of the plant. Pretoria was considered the most favourable site because it was centrally situated and close to flux, coal and ore. It was also on the proposed through line to Rhodesia and well connected by road and rail with the Witwatersrand which would form its main market. This gave the site annual freight advantages of R166 000 and R522 400 over Witbank and Waschbank respectively. The topography of the proposed site at Pretoria with its north facing slope was considered ideal (para. 168).

The second item which the report considered was the availability of raw material. Total coal reserves were estimated at 50 000 million tons of which 42 000 million tons were at Witbank and 8 000 million at Dundee and

Vryheid. The best coking coal was in Natal at distances of 353 and 289 miles while Witbank was only 86 miles from the site. The report then emphasised the need for a preferential tariff on Natal coal so that it would not be more expensive than that from Witbank. (Page 52 of original report) ISCOR had rights to over 100 million tons of silicious haematite ore which was 47% iron and had about 50 million tons available, 9 million tons of clay and ore which was 54% iron and had 2.75 million tons available. Both these deposits were near Pretoria, but at Thabazimbi 46 million tons of very pure haematite was available. On completion of the railway line these deposits would be between 129 and 116 miles distant from the site. Manganese ores were not obtainable in sufficient quantities and would have to be imported, but chrome could be obtained from Rustenburg. There was over 7 million tons of limestone at Taungs 323 miles from Pretoria; Marble Hall also had deposits and was only 130 miles away, but suffered from a lack of rail facilities. Dolomite was also obtainable from Olifantsfontein, 16 miles from Pretoria, and Irene 9 miles away. The report also emphasised the importance of securing the minerals to two farms 8 and 10 miles from the site which also had dolomite deposits (Richards, 1940).

The third item of the report covered the South African Iron and Steel market in some detail, showing that the average annual imports of iron and steel from 1909 to 1923 (excluding the war period) were:-

Heavy rails	about	66 000 tons
Light rails	"	9 000 tons
Sections	"	6 000 tons
Rod iron and fencing posts	"	36 000 tons
Barbed wire and galvanised wire	"	26 000 tons
Sheet iron	"	38 000 tons

Their total value had varied from R5 million to R7.6 million being R15 million in the boom year of 1920. The Government had consumed 19% according to value and 25% according to quantity. The mines at their best had taken 40% of the total consumption of which 4/5ths was used on the Witwatersrand. The demand for rails had shown great fluctuations. The report concluded that "the Witwatersrand must therefore not be looked upon as the principle consumer of the iron and steel, but rather the principle consumer is the rest of the land" (Page 174).

The report proceeds with details of costs and optimum size of plant, types of ironware and steelware to be produced and the quantities. Estimates are made for all costs, including labour and finally concludes that the answer to "The question as to whether the undertaking will be a commercial success must be answered in the affirmative. The economic bases are thoroughly sound and with the increase of production an increase in the profits of the undertaking can be counted on (Richards 1940).

The report emphasised the need to establish a coking plant in Pretoria so that the by-products would find a good market. It also emphasised that a reduction in the freight rates of some R12.00 per ton for iron parts required in the building of the projected iron and steelworks was needed by ISCOR. The plant was to be kept as simple as possible in order to reduce the cost of erection to a minimum and to avoid an expensive working process which would result from an elaborate plant and the relatively simple and low requirements of South Africa. As far as the marketing and competition was concerned the report stated that "railway materials and sections (girders) manufactured at Pretoria could compete at the coast". However, other commodities such as wire, the imported article could still compete at the coast and even further inland. This would be rectified by a higher protective tariff if necessary, but the commission felt that the inland market, which would be dominated by Pretoria, would be large enough to yield a good profit. It was also felt that with the establishment of an iron and steel works in the country a greater demand for metal products would result, especially if the goods could be had quickly and cheaply. (Gutehoffnungshutte 1924).

The new industry would require some form of protection, especially during the initial phases, in fact the Commission foresaw that the Government would not only have to maintain the freight rates, but would have to make them more favourable in the course of time. In addition they would have to purchase not only the promised 60% of their requirements from the Pretoria works, but possibly even more (Gutehoffnungshutte 1928).

The Gutehoffnungshutte Commission was the work of Smuts' Government and the policy of encouragement was carried on by the Coalition Government. The Iron and Steel Encouragement Act of 1922 was amended in 1926. This pushed forward the dates during which bounties could be qualified for, to 1926/7 until 1933/4, that is, two years, so that possible bounty for the years 1924/5 and 1925/6 would not be lost to the iron and steel producers. At this stage the Government was already thinking in terms of acquiring the Pretoria company which Delfos was still struggling to establish. The Minister of Mines stated that:-

"The Pretoria undertaking has of course no means of its own to continue its business and it may be that an eventual solution will be found by the forming of a company which will take over the Pretoria undertaking, of course, at a valuation. The Government, in that case, will have to take care if it takes part in the floating of such a company that the Pretoria undertaking is paid nothing more than it is really worth, for that purpose" (Hansard, 1926).

1.3.3 The Iron and Steel Industry Bill - Establishment of ISCOR

By the following year the Government had decided to take steps to establish the industry. The Iron and Steel Industry Bill was introduced by the Minister of Defence on 10th February, 1927. The conclusions were based on the German report and although the Government did not follow it slavishly the Report formed the basis of the discussion and was used as the groundwork for all calculations and alterations. The Bill's aim was to promote the development of the iron and steel and allied industries, within the country and to constitute the S.A. Iron and Steel Industrial Corporation Limited for that purpose (White Paper, Preamble of Bill, 1927). The Bill provided for the incorporation of the new firm which was to have its head office in Pretoria. This Corporation was to carry on the trade or business of iron and steel makers and was allowed wide rights to "do all such things as are incidental or conducive to the attainment of any object". Clause 3 stated that the control and management was to be vested in a Board of Directors, five appointed by the Government (one to be chairman and he or another, Managing Director) and four to be appointed by the private shareholders. The Bill stated how the R7 000 000 authorised capital was to be divided amongst private investors and the Government. The dividends payable were limited initially to 6% and were later not to exceed 12½%. The original agreement between Delfos' ISCOR and the S.A.R. & H. was annulled and replaced by a similar 15 year agreement between the new S.A. Iron and Steel Industrial Corporation Limited and the Railways. The Corporation was excluded from the Companies Act and could be excluded from the benefit of the Iron and Steel Encouragement Act. However, no mention was made of where the actual site of the works should be.

The Bill resulted in much debate and discussion in Parliament. The question of state participation was objected to, but the Minister justified the Government's position on the grounds that it was a key industry. The debates extended over a stormy two year period. Smuts was basically in favour of establishing an iron and steel industry in South Africa, but objected to state ownership and control of such a technical, complicated and competitive industry. He felt that this was done as a political move to appease the Labour Section of the 'Pact' Government. He wanted to see the industry established, but would have preferred it to be a private concern. The Opposition also criticised the inadequacy of information available, the non-publication of relevant reports and the precipitancy displayed.

The first attempts to pass the Bill failed. In the Assembly the criticisms were basically:-

1. The lack of any inducement to private enterprise to subscribe.
2. The possibilities of inefficient bureaucratic and political corruption.

3. The furtherance, through the enterprise, of the Government's "civilised" labour policy.
4. The subordination of economic and technical efficiency to uneconomical ends.
5. The sacrifice of vested interests.
6. The pressure to manipulate railway rates and customs tariffs to make the industry profitable at any cost to the detriment of other sections of the national life.

The loss in railage on imports and the need for further investigation were also stressed.

"A successful iron industry would be of the greatest benefit to the mining industry, but on the other hand an unsuccessful industry will be a very great handicap, particularly so if the iron industry is state owned" (Sir Ernest Oppenheimer, 1927).

Further objections were made by Butler on behalf of the Union Steel Corporation who stressed the fact that development was taking place at Vereeniging and Newcastle in the Iron and Steel Industry which would be adversely affected by the establishment of a plant at Pretoria. Stewarts and Lloyds had already agreed to erect a tube works at Vereeniging. The Union Steel Corporation could finance its own normal expansion programmes, but that for an additional outlay of only R3 million, Newcastle and Vereeniging could satisfy all the demands for iron and steel in the country. Butler further stressed that it would be sounder for the industry to progress in stages, financed by private enterprise; that the German Report was not impartial, but favoured Pretoria as a site; that the steel industry could be made a success without protection and that the question of the best location should be investigated.

Two other directors of the Union Steel Corporation, Reese and Armstrong, acknowledged Pretoria as a favourable site, provided water could be obtained, but they both objected to the establishment of a Government controlled Iron and Steel Works there. Armstrong felt that the Union Steel Corporation was being attacked under cover of privileged statement which otherwise would be libellous and was in any case damaging. He also said that without any serious enquiry into its ore deposits, the Corporation's future was being "publicly painted in terms of imaginary blackness" (Hansard, 1927).

These objections were, however, ignored by the Government majority in the Select Committee, and the Bill was re-introduced. Further objections were made and particularly the fact that protective duties would "put an incubus on every industry in the country which required iron and steel, particularly mining and agriculture". Stuttaford and Chaplin emphasised the sacrifice of the Railways to the Corporation in order to make the latter pay at any cost. Also it was generally felt by the Opposition that the policy which might be best for the industry was going to be deflected for political considerations (Hansard, 1927).

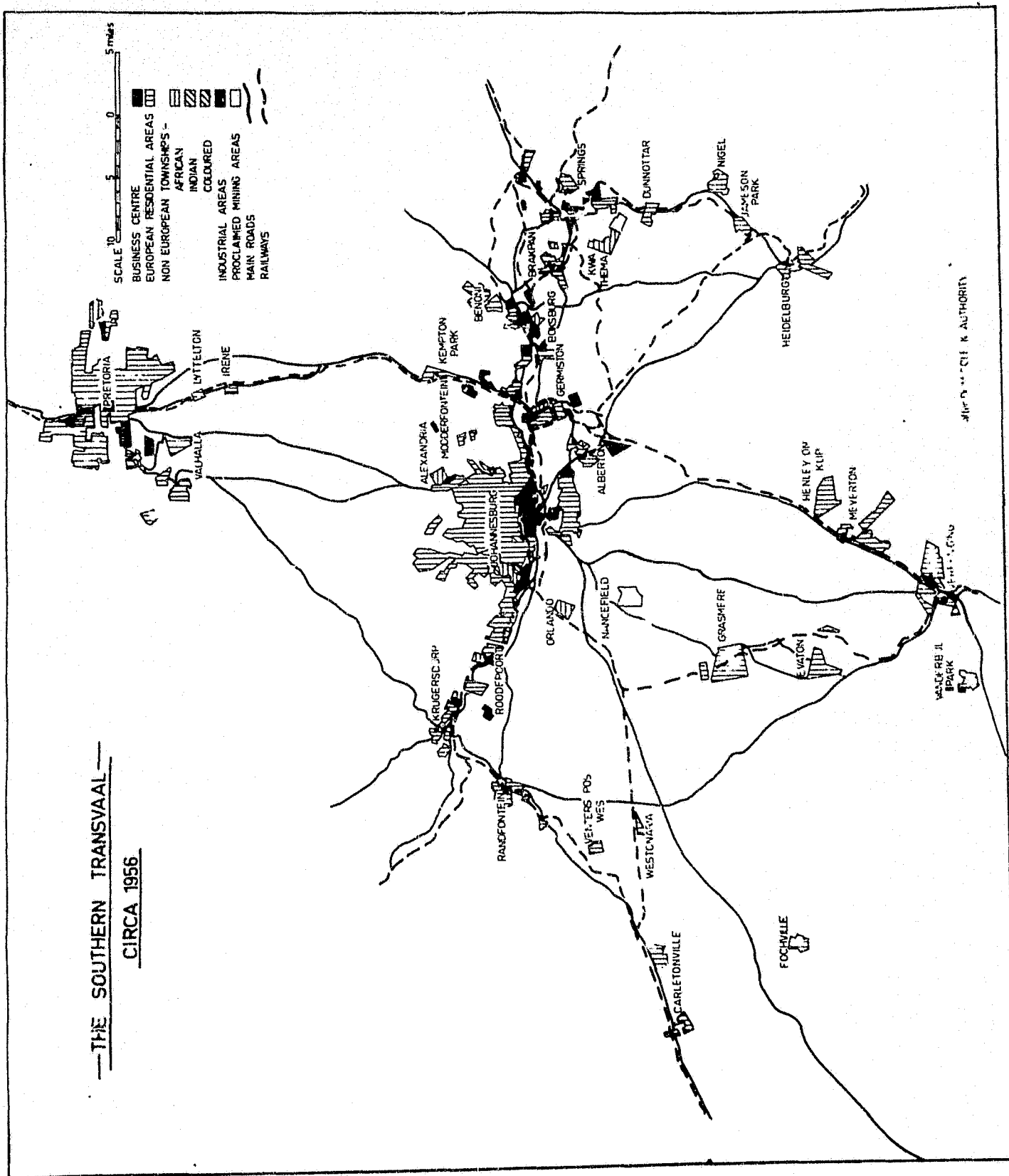
Despite these objections the Bill was passed by the Lower House, but the Senate refused to read it a second time. The Government was determined to have the Bill passed and so Parliament was recalled into Session in October of the same year (1927). The Bill was re-introduced and similar objections made to it. Smuts re-iterated that:-

"the Government of this country will be obliged, year after year, to come to us to vote further money or we shall have to use the tariff of this country in order to support this state institution" (Joint Sitting, 1928).

The Government failed to produce an official translation of the, then already dated Gutehoffnungshutte Report, in either English or Afrikaans, but it did give the Senate a "facsimile of the English copy, which it had lately acquired, laid on the Table of the House, which though an unofficial translation it regarded as satisfactory" (Hansard 1927). In any event, despite the fact that the figures and calculations were already two years old, the Bill based upon it was passed at a Joint Sitting of the Senate and Assembly on 14th April, 1928.

By August, 1928, the Government had nominated their directors who were, H.J. van der Bijl (Chairman) (Chairman of the Electricity Supply Commission), A.J. Bruwer (Chairman of the Board of Trade and Industries), J.H. Dobson and C.F. Delfos. The assets of the S.A. Iron and Steel Corporation Limited were taken over and three directors appointed by the private shareholders. The public subscribed a negligible proportion of the capital so that the three directors represented a very small shareholding. At the beginning of 1929, an international committee of consulting engineers was appointed in London to advise the Corporation and to carry out the engineering work in connection with the establishment of the Works at Pretoria. ISCOR also obtained a considerable number of coal, iron ore and other properties as well as leases and base metal claims. It also concluded an agreement with the Municipality of Pretoria for the lease of about 1 000 acres of land at Pretoria West and the right to mine iron ore on the Pretoria Townlands for a royalty of 2d per ton. In 1930 a controlling interest was acquired in the Union Steel Corporation Limited, at a cost of R400 000 and J.H. Dobson was appointed Chairman. This solved the problem of competition.

The estimated cost of erecting the works as well as the starting expenses, Administration, Agency Fees, Working Capital, and Contingencies amounted to a total of over R10 000 000. To cover this some contracts were obtained, but business was very depressed and the indications were that the public would not contribute. It was therefore necessary to amend the Iron and Steel Industries Act in 1931, which allowed the Government to take up any of the R6 000 000 worth of 'B' shares which had not been sold. In May of that year the Railways agreed to construct



THE PRETORIA - WITWATERSRAND - VEREENIGING REGION IN 1956

Source:- M. Cole and Department of Planning, Pretoria.

the 28 mile branch line to Thabazimbi and ISCOR guaranteed any loss involved in the running of the line for 15 years, and also guaranteed for a further 15 years an annual tonnage of ore of 150 000 tons.

During 1931 and 1932 steady progress was made and the Union Construction Company was established at Germiston to make the steel frames for the ISCOR works. The sale of ISCOR shares was slow and the vast majority were taken up by the Government, and a shortage of capital was averted by Government aid. In 1933 ISCOR contracted with Dorman Long and Company Limited for the equipment and erection of a plant for the processing and production of galvanised iron sheeting. A further amendment to the Iron and Steel Industries Act had to be passed in 1934 to obtain the necessary R1 000 000. Parliament had also to sanction the building of 37.5 miles of railway line from Tuinplaats and Marble Hall at an estimated total cost of R480 592. It was thought that the line would save ISCOR R20 000 per annum when compared to the limestone from Taungs. Both these amendments were severely criticised in the House. In June 1933, Dobson, who had been Chairman of the Union Steel Corporation took up his duties as General Works Manager of ISCOR to co-ordinate the construction work as it neared completion. It was in January of the next year that production actually started. An official opening of the works took place on 11th August, 1934.

There were, however, some important factors affecting production. Costs were initially high, but with experience the unit cost had been falling. The unexpected changes in the Railway Tariffs in July 1934 favoured the use of imported steel for structural purposes in the inland market. Also large scale dumping of iron and steel mainly from Europe had resulted in considerable losses to the Corporation. Despite these factors, some expansion was undertaken both at Pretoria and Vereeniging. The Steel Sales Company of Africa (Pty.) Limited was formed to handle the sales of both ISCOR and the Union Steel Corporation. To provide the capital to cover both the losses on structural steel production and the expansion, a further R3 000 000 was requested from Parliament in 1935. This time the Government held all the 'A' and 'B' shares except for R204 290 (number of shares unknown) and so appointed all the directors. Dumping duties were imposed upon foreign imported iron and steel goods, but an agreement was reached with the Continental Cartel whereby the South African iron and steel producers had first call on the country's annual market of approximately 350 000 tons. In 1936 a second blast furnace was blown in and production increased so, that by 1938 profits had doubled and a 6% dividend was paid.

The closing of the inter-war period saw the growth of the South African iron and steel industry primarily in the Southern Transvaal. (Figures 1.2 and 1.8). This was because, not only were the major resources and markets

available in this region, but because the industry was encouraged here by Government policy. The location of the Union Iron and Steel (USCOR) Works at Vereeniging was not carefully calculated, but it survived, partly because of the nurturing it received from the Government. Not only was it given contracts, but protective tariffs were introduced and freight rates were lenient enough to allow it to compete favourably with imported goods over most of the hinterland. Competition was not a serious threat until the establishment of ISCOR, but this problem was eliminated by the amalgamation. The USCOR works have remained secondary to the younger and larger ISCOR (Figure 1.9).

Figure 1.9

Title: Labour employed by Major Iron and Steel Producers in the Pretoria - Witwatersrand - Vereeniging Area

Source: "Iron and Steel Industry in South Africa", University of the Witwatersrand, Johannesburg. Richards C.S. 1940 p. 270

	European	<u>1934</u> Non-European	Total	European	<u>1937</u> Non-European	Total
1. ISCOR (Pretoria)	1 673	1 197	2 870	2 511	2 876	5 387
2. USCOR (Vereeniging)	n/a	n/a	1 463	n/a	n/a	1 942
3. Dunswart	125	356	481	188	467	655
4. Geo. Stott	42	226	268	46	233	279
Total			<u>5 082</u>			<u>8 263</u>

In the case of ISCOR, the dominant factor in respect of its location again appears to have been Government policy. Delfos was incapable of establishing the works without Government assistance. It is true that it would have been economically almost impossible to develop the industry by gradual stages. It is obvious that Government assistance would be necessary in establishing a viable industry. However, it remains questionable as to what degree of assistance was best and whether Pretoria was the optimum location. At the time of its establishment there was little secondary or allied industry in the Pretoria area and the major market was the mines and industries of the Witwatersrand (Figure 1.5).

Unfortunately the country suffered during the inter-war period from two depressions and a serious rebellion, all of which hampered the growth of industry and especially the struggling iron and steel industry. Despite these problems the country had made significant gains by the outbreak of the Second World War and the iron and steel industry was infinitely better equipped to meet the demands made upon it than was the case in the First World War. (Figures 1.9 and 1.7). This is perhaps best shown in the growth of the Union Steel Corporation which produced iron and steel goods valued at R1 837 372 during the six years preceeding 1920 (Figure 1.5). A figure exceeded by the 1935 production alone, which was worth R1 845 774 (Richards 1940).

The South African Steel producers at the close of the inter-war period included ISCOR, the Union Steel Corporation (of S.A.) Limited, Dunswart Iron and Steel Works Limited, and Geo Stott & Company Limited. All established within the Southern Transvaal with only those relying most upon their own capital being nearest the market. The larger Government sponsored corporation was, either by chance or foresight, placed at a less advantageous position with regard to its fixed major market on the Witwatersrand. However, they were all established and running at a profit. They were to prove the basis from which a large part of the War effort would evolve. In fact the stage was set for a period of growth and development which would not previously have been possible.

CHAPTER II

THE METAL PRODUCTS AND MACHINE INDUSTRY IN THE PRETORIA - WITWATERSRAND - VEREENIGING AREA 1936 - 1939

1.1 The Early Establishment of the Engineering Industry (1836 - 1900)

The industries allied to the iron and steel industry are numerous and cover a vast range of manufacturing. The high forward and backward linkage which the iron and steel industry has, makes it one of the most important industries of any country. The present chapter therefore limits the industries studied to those having a direct link with the iron and steel industry. These are defined in the Government Industrial Census and include the manufacture of:-

"Metal pipes and pipe fittings;
Heated and threaded articles;
Sheet metal products;
Tinware;
Cables, fencing wire and wire products;
All other metal products;
Agricultural machinery;
Industrial, mining and construction machinery;
All other machinery."

This division, however, is modern so that any history of the metal industry is somewhat shrouded. Figures which exist are often contradictory, referring as they do to the Transvaal or South Africa as a whole and make a study of the Pretoria - Witwatersrand - Vereeniging area more complex. Specific industries are not mentioned nor are locations accurately identified.

Engineering firms developed initially at the coast and advanced sufficiently to allow the launching at Durban (1894) of the first powered steel ship built in this country. The impetus to this engineering was due to the exploration of the ports, hinterland and particularly the discovery of diamonds and gold.

Structural engineering started in the Transvaal at the turn of the century. By 1903 these workshops were still confined to using imported structural steelwork and doing only those jobs which were regarded as essential to the maintenance of production.

Among the earliest firms established on the Reef were Messrs. F. Bell and J.A. Durie and they were followed by Wright, Boad and Company, the Britannia Engineering Works, Thos. Begbie and Company, the Old Rand Foundry and the Austral Iron Works. These were in existence during the first ten years of mining and were pioneers of the industry which grew with the gold mining industry.

1.2 Post Union Developments:

The number of heavy industrial establishments in the country increased from 1890 to 1914. (Figure 2.1). The Anglo Boer War did little to hamper this overall growth rate, except in the case of the establishment of engineering foundries and blacksmiths works which suffered a decline from 84 new works being established between 1895 and 1899 to only 65 during the 1900 - 1904 period. Despite this, the overall growth rate for the country is remarkable, an average of 118.2 new firms being established every five years or 23.64 per year. This rapid growth rate was attributed to the development of the gold mines who formed the major market for the industry.

Figure: 2.1

Title: The Number of new Establishments in the Union Prior to 1914.

Source: Government Industrial Census Nos. U.G. 17/1920 7285- 10/10/19 - 1250

	<u>Before 1890</u>	<u>1890 to 1899</u>	<u>1900 to 1904</u>	<u>1905 to 1909</u>	<u>1910 to 1914</u>
A. Brass and Copper Cutlery Works:	1	3	1	2	2
B. Engineering, Foundries and Blacksmiths: *	67	84	65	81	108
C. Galvanized iron and Plumbing works:	14	15	34	35	38
D. Wire Works:	1	-	2	5	4
E. Other Works:	1	3	5	11	9
<u>TOTAL:</u>	84	105	107	134	161

Average per five year period - 118.2

Average per year - 23.64

* Includes Government repair shops.

By 1910 190 278.52 tons of iron and steel goods had been imported into the country (Figure 1.4). These figures are incomplete, but they do give some indication of the home market. At the time of the first Industrial Census in 1915 there were 679 metal, engineering, machinery and cutlery works in the country; of these 233 or 34% were in the Transvaal and only 124 were registered as companies. The remainder were either "one-man" businesses, or unregistered firms working on a contractual basis for the mines. Many of these tended to be "fly-by-night" operations, although they included Municipal and Governmental institutions representing capital investment of R4 409 618 or 49.2% of the country's total of R8 957 080 which was invested in this industry. The Transvaal metal, engineering, machinery and cutlery industries employed 14 028 or 59.3% of the country's 23 617 workers in this field.

Figure : 2.2

Title: Number of New Establishments per year during the 1914 - 1918 War

Source: Government Industrial Census No. U.G 17/1920 7285 - 10/10/19 - 1250

	<u>1915</u>	<u>1916</u>	<u>1917</u>	<u>1918</u>
A. Brass and Copper and Cutlery Works:	1	1	-	1
B. Engineering, Foundry and Blacksmith Works: *	35	25	26	36
C. Galvanized iron and Plumbing Works:	9	13	6	3
D. Wire Works:	-	1	-	1
E. Other Works:	2	1	2	5
<u>TOTAL:</u>	<u>47</u>	<u>41</u>	<u>34</u>	<u>46</u>

Average per year - 42.

* Includes Government repair shops

2.0

The First World War:

From the time of the establishment of the gold mining industry, the metal, engineering and allied industries in the Transvaal played an important part, soon outstripping the coastal ship repairing and maintenance firms in capital investment and size. Their importance was underlined by conditions during the First World War

when the engineering industry was forced to set about the manufacture of parts on behalf of the mining industry, whereas previously engineers had been concerned with maintenance only (S.E.I.F.S.A. 1957). By 1917 the Engineers and Foundrymen Association began to consider producing pig iron from native ores in South Africa. Delfos' work was watched with great interest and individual founders subscribed "a good deal of the capital necessary to the undertaking". (S.E.I.F.S.A. 1957). This interest was promoted by a shortage of scrap iron, worth at the time R4.00 per ton and a large quantity could no longer be supplied by foreign imports. The Foundrymen and Engineers were therefore keen to expand their supply of raw materials to meet the demands of industry. The results of this were both good and bad. Wages were increasing in response to a rise in the cost of living and the Foundrymen and Engineers Association was forced to approach the Government with a view to the control of prices of all necessary commodities. During the First World War the demands on the engineering industry resulted in rapid growth throughout the country (Figures 1.7, 2.3 and 2.4). An average of 42 new firms were established in one year, as compared with 24 per annum during the pre-war period. (Figures 2.1 and 2.2). By 1919 there were 753 metal, engineering machinery and cutlery works in the country: of these 350 or 46% were in the Transvaal and 251 or 33% on the Witwatersrand. (Industrial Census 1920 U.G. 48/1921). This meant that the Southern Transvaal had become an important centre of industry. With a third of South Africa's total heavy industrial establishments, the Witwatersrand had taken the lead as an industrial region. (Figure 2.3)

Figure 2.3

Title: The Number of Metal and Engineering Establishments in the Union of South Africa

Source: Government Industrial Census U.G. Nos. 14/1918, 17/1920, 28/1920, 48/1921, 40/1922, 14/1924, 41/1924, 35/1926, 41/1927, 32/1928, 51/1928, 18/1930, 44/1930, 33/1931, 31/1935, 34/1936, 30/1937, 24/1938, 39/1939, 21/1941.

<u>DATES</u>	<u>UNION</u>	<u>TRANSVAAL</u>	<u>WITWATERSRAND</u>
1915-16		233	n.a.
1916-17	651	288	206
1917-18	719	339	238
1918-19	753	350	251
1919-20	918	416	315
1920-21	897	394	303
1921-22	868	380	296
1922-23	856	371	294
1923-24	877	385	301
1924-25	897	392	312
1925-26	901	389	317

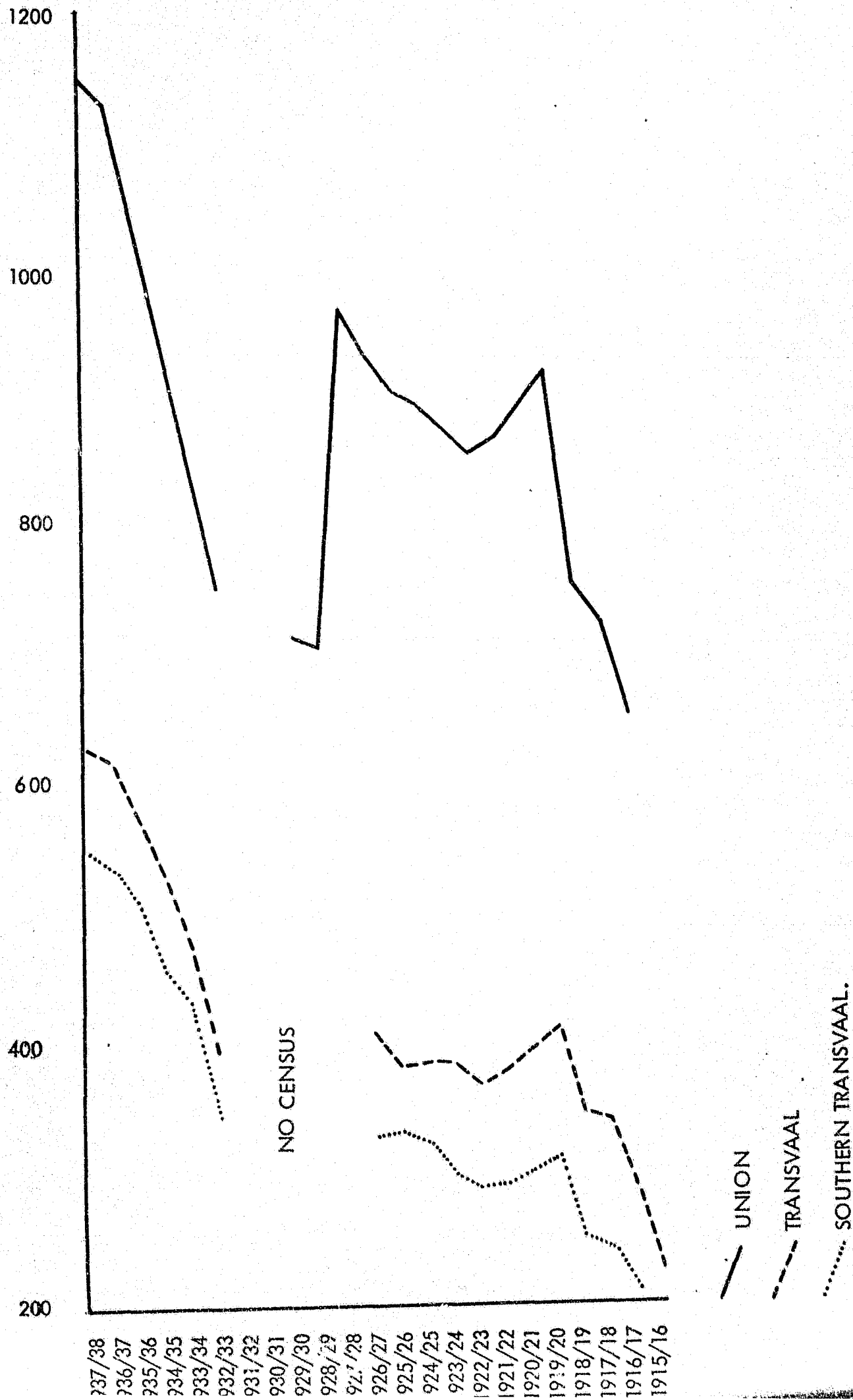
when the engineering industry was forced to set about the manufacture of parts on behalf of the mining industry, whereas previously engineers had been concerned with maintenance only (S.E.I.F.S.A. 1957). By 1917 the Engineers and Founders Association began to consider producing pig iron from native ores in South Africa. Delfos' work was watched with great interest by the Association and individual founders subscribed "a good deal of the capital necessary to the undertaking". (S.E.I.F.S.A. 1957). This interest was promoted by a shortage of scrap iron, worth at the time R4.00 per ton and a larger market which could no longer be supplied by foreign imports. The Foundrymen and Engineers were therefore keen to expand their supply of raw materials to meet the demands of industry. The results of this were both good and bad. Wages were increasing in response to a rise in the cost of living and the Founders and Engineers Association was forced to approach the Government with a view to the control of prices of all necessary commodities. During the First World War the demands on the engineering industry resulted in rapid growth throughout the country (Figures 1.7, 2.3 and 2.4). An average of 42 new firms were established in one year, as compared with 24 per annum during the pre-war period. (Figures 2.1 and 2.2). By 1919 there were 753 metal, engineering machinery and cutlery works in the country: of these 350 or 46% were in the Transvaal and 251 or 33% on the Witwatersrand. (Industrial Census 1920 U.G. 48/1921). This meant that the Southern Transvaal had become an important centre of industry. With a third of South Africa's total heavy industrial establishments, the Witwatersrand had taken the lead as an industrial region. (Figure 2.3)

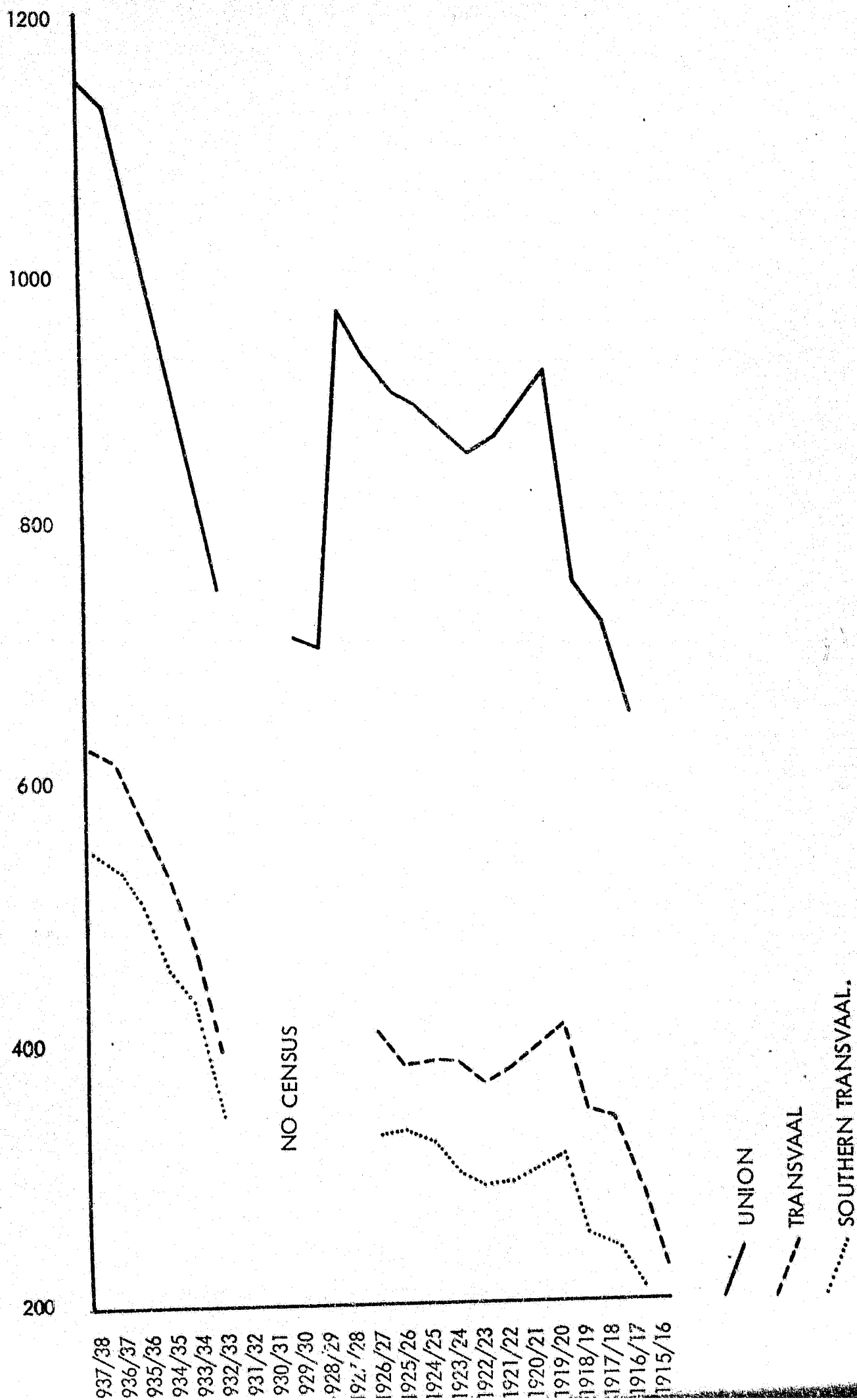
Figure 2.3

Title: The Number of Metal and Engineering Establishments in the Union of South Africa

Source: Government Industrial Census U.G. Nos. 14/1918, 17/1920, 28/1920, 48/1921, 40/1922, 14/1924, 41/1924, 35/1926, 41/1927, 32/1928, 51/1928, 18/1930, 44/1930, 33/1931, 31/1935, 34/1936, 30/1937, 24/1938, 39/1939, 21/1941.

<u>DATES</u>	<u>UNION</u>	<u>TRANSVAAL</u>	<u>WITWATERSRAND</u>
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1919-20	918	416	315
1920-21	897	394	303
1921-22	868	380	296
1922-23	856	371	294
1923-24	877	385	301
1924-25	897	392	312
1925-26	901	389	317





NUMBER OF METAL AND ENGINEERING ESTABLISHMENTS.
 Source: - Government Industrial Census, U.G. Nos. 14/1918, 17/1920, 28/1920, 48/1921, 40/1922, 14/1924, 41/1924, 35/1926, 21/1941, 41/1927, 32/1928, 51/1928, 18/1930, 44/1930, 33/1931, 31/1935, 34/1936, 30/1937, 24/1938, 39/1939

Figure 2.3 (Cont.)

<u>DATES</u>	<u>UNION</u>	<u>TRANSVAAL</u>	<u>WITWATERSRAND</u>
1926-27	935	405	326
1927-28	975	n.a.	n.a.
1928-29	706	354	315
1929-30	714	n.a.	n.a.
1930-31		NO. CENSUS	
1931-32			
1932-33	753	396	350
1933-34	857	475	426
1934-35	938	516	459
1935-36	1 041	575	506
1936-37	1 116	618	539
1937-38	1 152	633	548

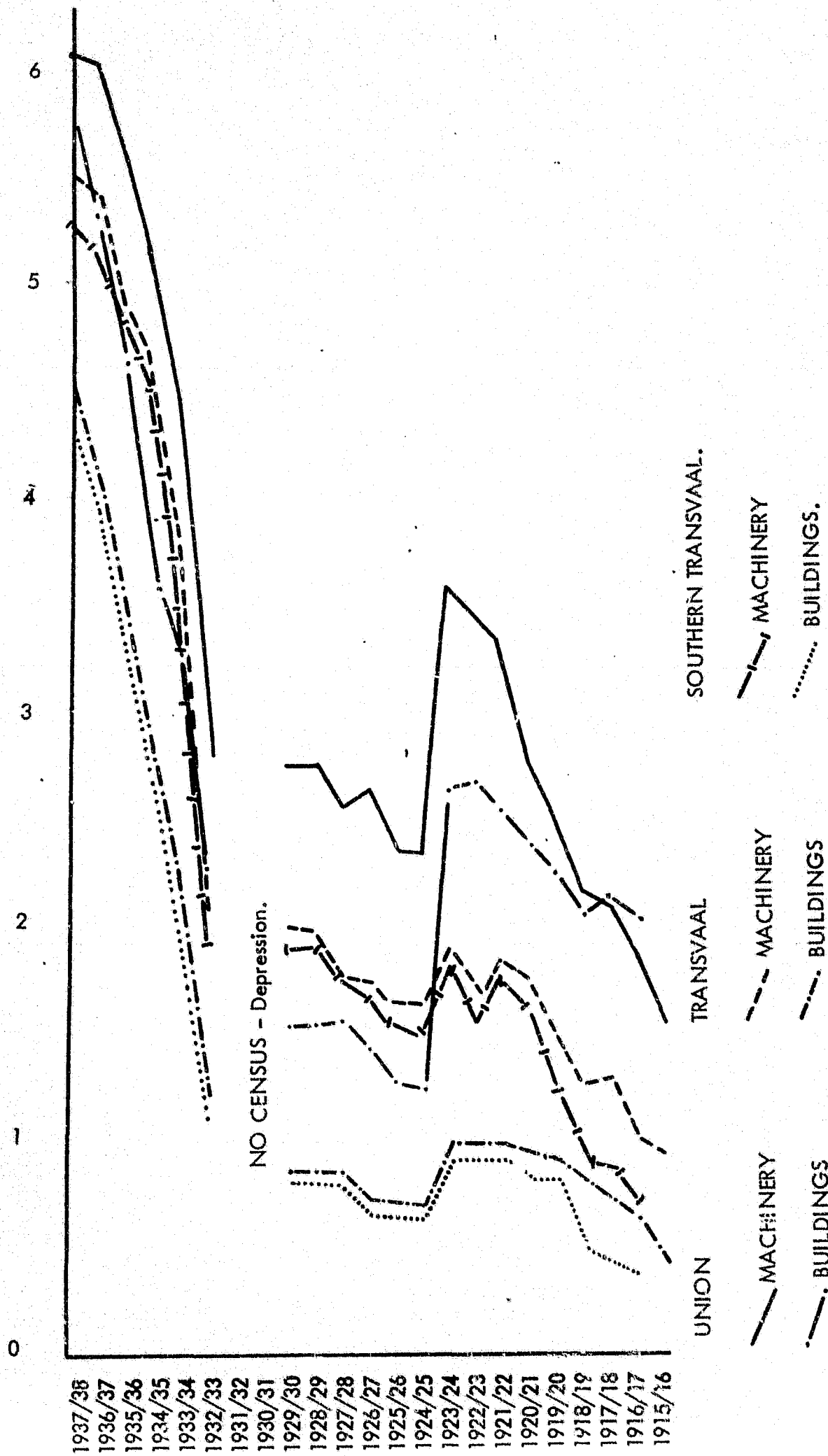
Figure 2.4

Title: Capital Investment in Machinery (M) and Land and Building (B) in £.s.d.

Source: Government Industrial Census U.G. Nos. 14/1918, 17/1920, 28/1920, 48/1921, 40/1922, 14/1924, 41/1924, 35/1926, 41/1927, 32/1928, 51/1928, 18/1930, 44/1930, 33/1931, 31/1935, 34/1936, 30/1937, 24/1938, 39/1939, 21/1941.

<u>DATES</u>	<u>UNION</u>	<u>TRANSVAAL</u>	<u>WITWATERSRAND</u>
1915-16 M.	1,505,401	926,015	N.a.
B.	-	447,749	
		1,373,764	
1916-17 M.	1,831,419	986,504	672,992
B.	1,948,836	569,378	299,342
	3,780,255	1,555,882	972,334
1917-18 M.	2,141,796	1,259,155	885,502
B.	2,192,995	708,208	402,890
	4,334,791	1,967,363	1,288,392

£'s millions.



CAPITAL INVESTED IN MACHINERY AND LAND AND BUILDINGS.

Source:- Government Industrial Census. Nos. 14/1918, 17/28/1920, 48/1921, 40/1922, 14/41/1924, 35/1926, 41/1927, 21/1941.
32/51/1928, 18/44/1930, 33/1931, 31/1935, 34/1936, 30/1937, 24/1938, 39/1939

Figure 2.4 (Cont.)

<u>DATES</u>	<u>UNION</u>		<u>TRANSVAAL</u>		<u>WITWATERSRAND</u>
1918-19 M.	2,107,723		1,237,398		843,286
B.	<u>2,030,146</u>		<u>772,051</u>		<u>488,904</u>
		4,137,899		2,009,449	1,332,190
1919-20 M.	2,497,095		1,404,567		1,222,308
B.	<u>2,278,345</u>		<u>856,969</u>		<u>785,284</u>
		4,775,440		2,261,536	2,007,592
1920-21 M.	2,701,915		1,480,108		1,386,266
B.	<u>2,341,349</u>		<u>861,018</u>		<u>815,667</u>
		5,043,264		2,341,126	2,201,933
1921-22 M.	3,273,780		1,819,287		1,710,256
B.	<u>2,513,785</u>		<u>934,251</u>		<u>891,144</u>
		5,787,565		2,753,538	2,601,400
1922-23 M.	3,439,501		1,670,739		1,546,637
B.	<u>2,668,830</u>		<u>952,018</u>		<u>902,483</u>
		6,108,331		2,622,757	2,449,120
1923-24 M.	3,563,434		1,856,298		1,732,878
B.	<u>2,645,707</u>		<u>967,904</u>		<u>917,140</u>
		6,209,141		2,824,202	2,650,018
1924-25 M.	2,299,369		1,597,628		1,469,625
B.	<u>1,218,880</u>		<u>662,126</u>		<u>611,329</u>
		3,518,249		2,259,754	2,080,954
1925-26 M.	2,289,489		1,619,985		1,522,347
B.	<u>1,246,116</u>		<u>691,201</u>		<u>647,470</u>
		3,535,605		2,311,186	2,169,817
1926-27 M.	2,618,223		1,714,748		1,616,911
B.	<u>1,410,688</u>		<u>739,296</u>		<u>693,717</u>
		4,028,911		2,454,044	2,210,628
1927-28 M.	2,539,446		1,806,259		1,700,115
B.	<u>1,513,917</u>		<u>831,734</u>		<u>785,434</u>
		4,053,363		2,637,993	2,485,549
1928-29 M.	2,727,721		1,955,750		1,360,026
B.	<u>1,507,968</u>		<u>878,090</u>		<u>840,983</u>
		4,235,689		2,833,840	2,701,009
1929-30 M.	2,726,015		1,960,716		1,865,867
B.	<u>1,516,142</u>		<u>842,638</u>		<u>801,650</u>
		4,242,157		2,803,354	2,667,517

NO CENSUS

Figure 2.4 (Cont.)

<u>DATES</u>	<u>UNION</u>		<u>TRANSVAAL</u>		<u>WITWATERSRAND</u>	
1932-33 M.	2,747,554		2,086,143		1,983,047	
B.	<u>2,233,935</u>		<u>1,213,698</u>		<u>1,161,681</u>	
		4,981,489		3,299,841		3,144,728
1933-34 M.	4,403,565		3,898,980		3,787,476	
B.	<u>3,245,912</u>		<u>2,230,618</u>		<u>2,178,618</u>	
		7,649,477		6,129,598		5,966,096
1934-35 M.	5,173,762		4,644,065		4,520,535	
B.	<u>3,851,465</u>		<u>2,758,535</u>		<u>2,696,047</u>	
		9,025,227		7,402,600		7,216,582
1935-36 M.	5,521,763		4,969,533		4,824,931	
B.	<u>4,675,925</u>		<u>3,453,037</u>		<u>3,367,146</u>	
		10,197,688		8,422,570		8,192,077
1936-37 M.	6,019,589		5,464,106		5,266,008	
B.	<u>5,328,680</u>		<u>4,042,559</u>		<u>3,941,571</u>	
		11,348,269		9,506,665		9,207,579
1937-38 M.	6,065,158		5,473,966		5,283,425	
B.	<u>5,852,388</u>		<u>4,500,597</u>		<u>4,381,957</u>	
		11,917,546		9,974,563		9,665,382

3.0 The Inter War Labour and Economic Problems (1919-1933)

The industry employed 34 736 people and paid R10 320 472 in salaries. (Figure 2.5). Of these 14 990 or 43% worked on the Witwatersrand and earned R4 625 104 or 44.8% of the total wages. (Industrial Census 1920 U.G. 48/1921). The war period was followed by a depression which disrupted the industrial growth and the development of the Witwatersrand. Labour problems grew and the demand for iron and steel goods dropped. Problems arose with the accommodation of soldiers recently returned from Europe as apprentices in view of the agreements which existed between employers and employees. These stipulated a ratio of apprentices to qualified artisans. The influx of demobilized soldiers seeking work upset this balance and wages declined as unemployment rose. By 1920 a slight improvement had occurred, but this was temporary.

Figure 2.5

Title: Metal Engineering, Machinery and Cutlery Establishments in South Africa in 1918-1919

Source: Government Industrial Census U.G. No. 281920

	<u>Union</u>	<u>Transvaal</u>	<u>Witwatersrand</u>
A. Brass, Copper and Cutlery Works	14	6	6
B. Engineering, Foundries and Blacksmiths	520	255	170
C. Galvanised Iron and Plumbing Works	175	65	54
D. Wire Works	10	7	6
E. Other Works	34	17	15
	<u>753</u>	<u>350</u>	<u>251</u>

Number of Employees in the Metal, Engineering, Machinery and Cutlery Industry in 1918 - 1919

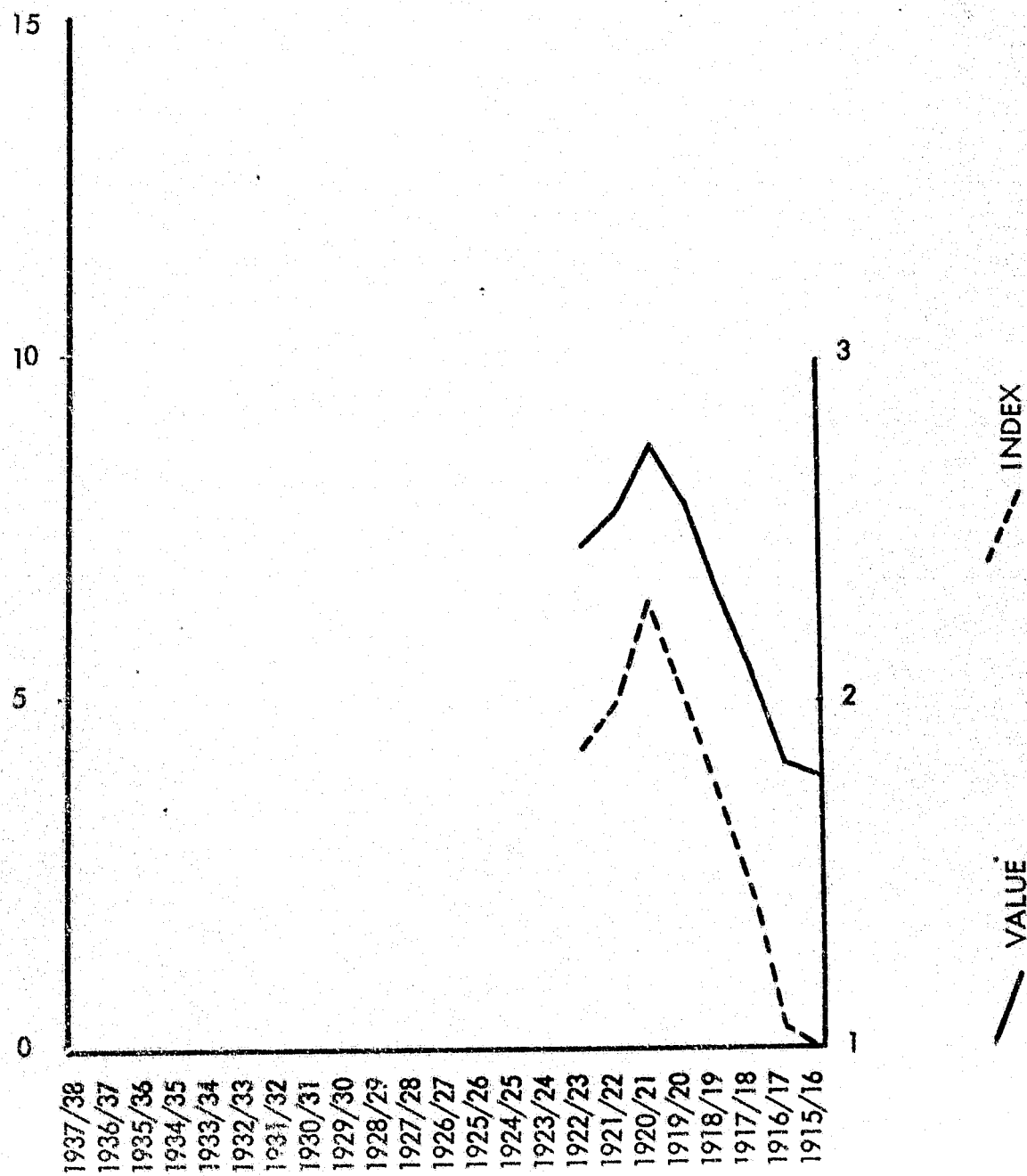
	<u>EUROPEANS</u>			<u>NON-EUROPEANS</u>		<u>TOTAL</u>
	<u>Male</u>	<u>Female</u>	<u>(%)</u>	<u>Male</u>	<u>Female</u>	
Witwatersrand	5 768	27	(38.7%)	9 195	-	14 990
Transvaal	7 951	37	(41.2%)	11 393	-	19 281
Union	16 474	109	(47.7%)	17 984	169	34 736

Amount of Salaries paid out to Employees in 1918 - 1919

	<u>EUROPEANS</u>	<u>NON-EUROPEANS</u>	<u>TOTAL</u>
Witwatersrand	R3 865 820	R759 284	R4 625 104
Transvaal	R5 136 516	R908 734	R6 045 250
Union	R8 777 078	R1 553 394	R10 320 472

By this time S.E.I.F.S.A. was in existence and members of the Association were purchasing pig iron from the Pretoria iron mines. The cessation of hostilities in Europe resulted in a fall in the scrap price, which now competed with production from Pretoria. Members of the Association agreed not to buy scrap for some months and to offer between R14.00 and R16.00 per ton for equal proportions of No. 1 and No. 3 grade Pretoria pig iron.

£'s millions



VALUE ADDED TO PRODUCTS OF THE METAL INDUSTRY.
Source: - Government Industrial Census. U.G. Nos. 35/1926, 2332/31/3/26/1350.

The recession was further aggravated by the prospect of Britain's return to the gold standard at the pre-war gold parity in terms of which the price of gold would fall from R15.00 an ounce to R8.50 and consequently a major crisis developed in the gold mining industry. Unless costs were reduced, twenty four out of thirty nine gold mines would close, so to avoid retrenching 10 000 white miners the Chamber of Mines lowered labour costs by employing Africans. The South African Industrial Federation, representing the white miners, rejected the proposals, demanding the ratio of one white to every 3.5 non-whites throughout every industry except agriculture. Led by the extreme Action Group, whose members were communists associated with the "Third International"*, the miners armed themselves and went on strike. They called for a general strike to protect white workers and were soon in possession of most of the Witwatersrand. The Government mobilised police and defence forces and used artillery and air power before the strikers were suppressed. The Rand Rebellion of 1922 is particularly significant because it was a turning point in the development of South African labour policy. Political developments which ensued effectually entrenched the now traditional policy of "civilised labour", a precursor of job reservation (Act 28, 1956).

The trouble lasted for the first three months of 1922, but it had a marked effect on the growth and industrial development of the Witwatersrand (Figures 2.6, 2.7 and 2.8). The graphic evidence reveals (1922/23) a drop in the value added per head to articles produced by the metal and engineering industries. Although by 1924/25 these European workers had managed to regain a favourable figure, the values added for all races never regained their original peak. The graph also shows that the metal industry in the Union suffered, but that the rest of the country and the Transvaal recovered more rapidly than the Witwatersrand which gained the lead again in 1926.

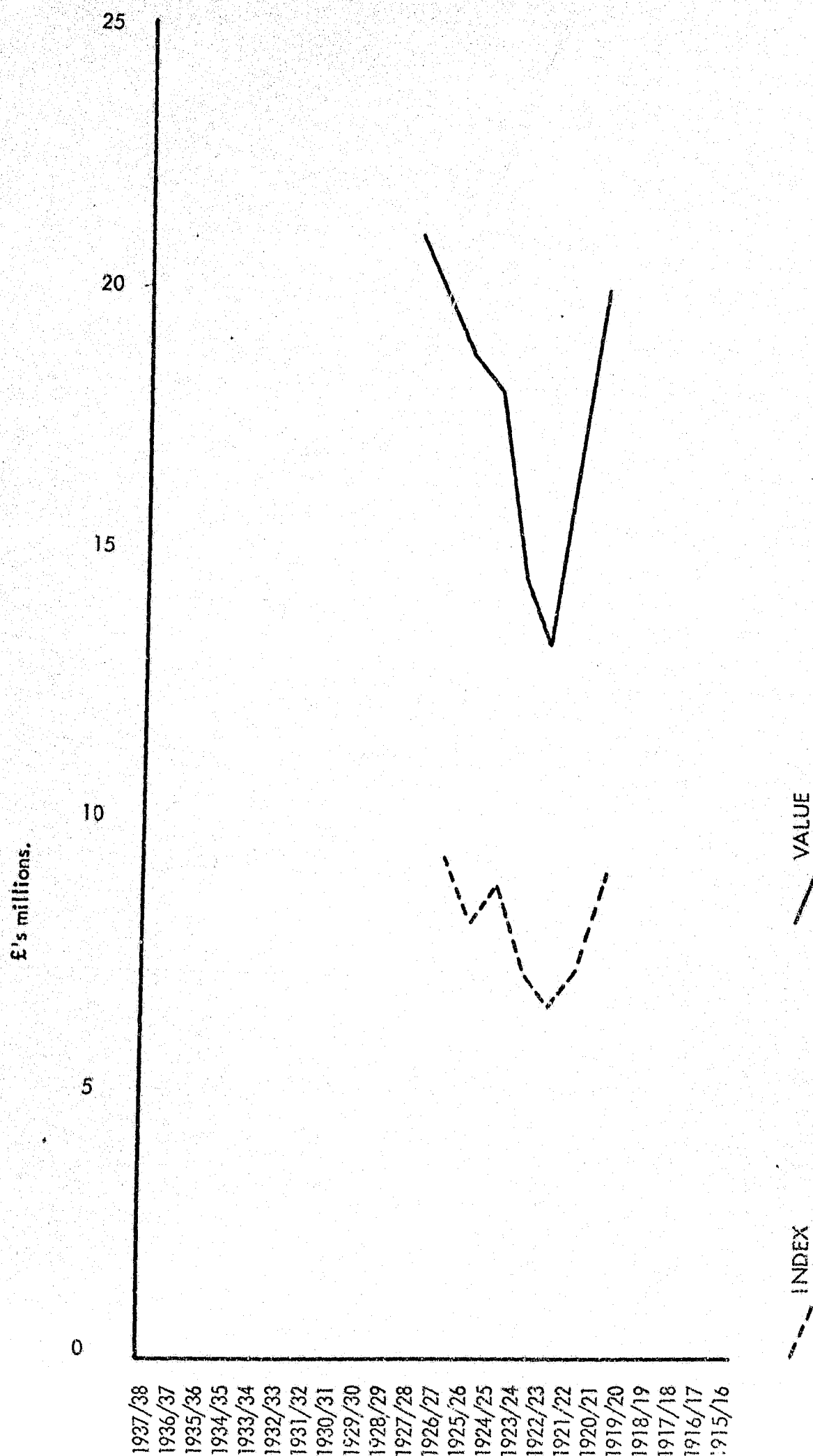
Figure 2.6

Title: The Value added to the Products of the Metal Industry.

Source: Government Industrial Census U.G. Nos. 35/1926 2332 - 31/3/26 - 1 350

<u>Dates</u>	<u>Value (in £'s)</u>	<u>Index</u>
1915-16	3,905,000	1000
1916-17	4,157,000	1065
1917-18	5,523,000	1414
1918-19	6,660,000	1706
1919-20	7,915,000	2027
1920-21	8,879,000	2274
1921-22	7,796,000	1996
1922-23	7,308,000	1871
1923-24		

* The third International Communist Congress in Moscow 1921



VALUE OF ARTICLES PRODUCED AND LABOUR DONE IN THE METAL INDUSTRY.

Source: - Government Industrial Census, U.G. Nos. 40/1922, 14841/1924, 35/1926, 41/1927, 32/1928, 51/1928.

2.6

Figure 2.7

Title: The Value of Articles Produced and Labour Performed (in £.s.d.)

Source: Government Industrial Census. U.G. Nos. 40/1922, 14/1924, 41/1924, 35/1926, 41/1927, 32/1928, 51/1928.

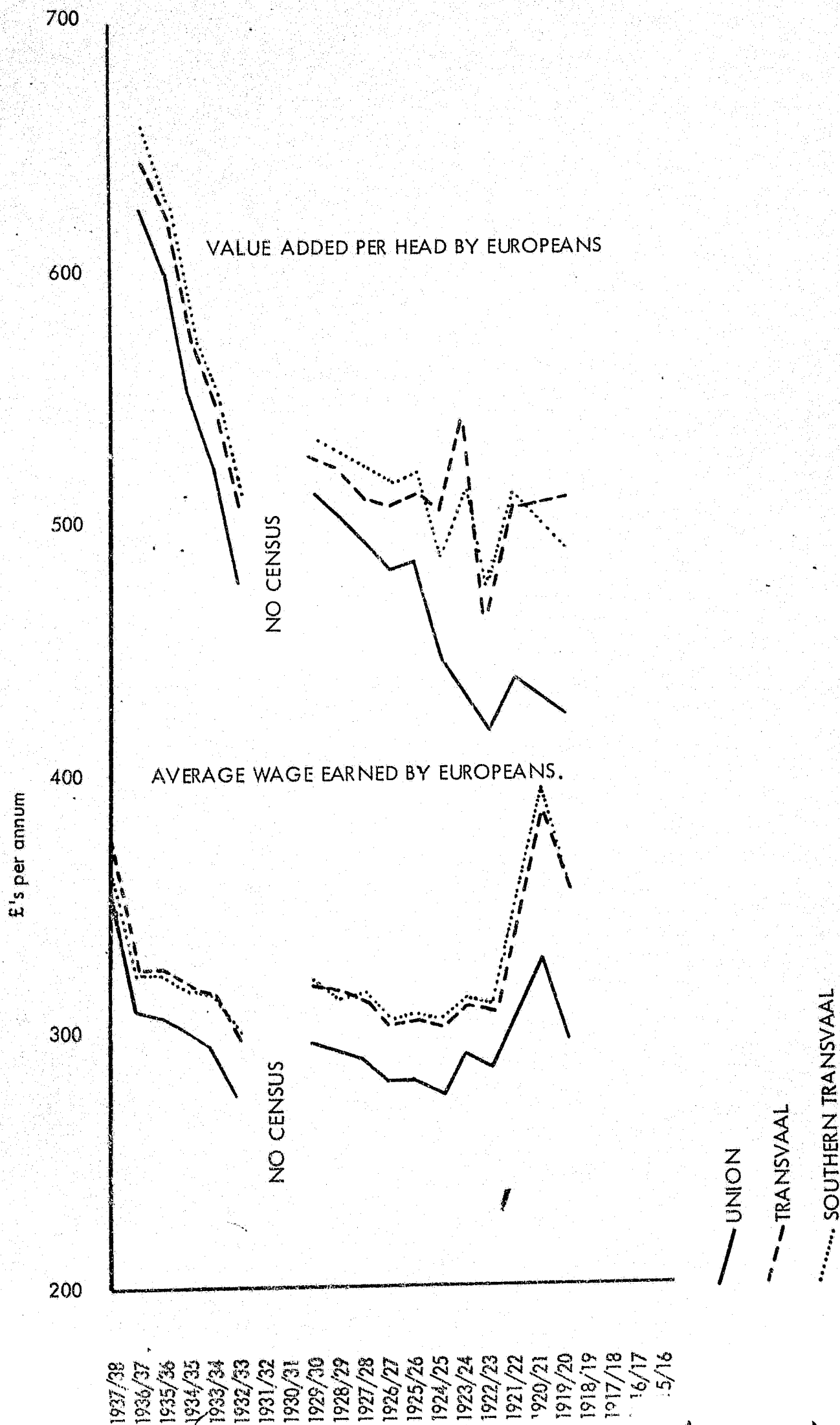
<u>Dates</u>	<u>Witwatersrand</u>	<u>Union</u>
1920-21	8,937,535	20,010,688
1921-22	7,187,596	16,657,712
1922-23	6,533,065	13,238,061
1923-24	7,138,757	14,449,211
1924-25	8,803,779	18,274,324
1925-26	8,086,864	18,749,614
1926-27	9,389,996	21,074,176

Figure 2.8

Title: Wages Earned and Value Added per Head in the Metal Industry (in £'s per annum)

Source: Government Industrial Census U.G. Nos. 48/1921, 40/1922, 14 & 41/1924, 35/1926, 41/1927, 32/51/1928, 18/1930, 44/1930, 33/1931, 31/1935, 34/1936, 30/1937, 24/1938, 39/1939, 21/1941.

<u>DATES</u>	<u>EUROPEANS</u>						<u>NON-EUROPEANS</u>					
	<u>Wits.</u>		<u>Transvaal</u>		<u>Union</u>		<u>Wits</u>		<u>Transvaal</u>		<u>Union</u>	
	<u>Value</u>	<u>Wage</u>	<u>Value</u>	<u>Wage</u>	<u>Value</u>	<u>Wage</u>	<u>Value</u>	<u>Wage</u>	<u>Value</u>	<u>Wage</u>	<u>Value</u>	<u>Wage</u>
1937/38		372		378		358		87		86		72
1936/37	661	322	648	323	628	309	246	76	239	58	238	68
1935/36	634	321	624	322	604	306	236	60	230	60	227	64
1934/35	585	317	576	318	555	301	184	60	184	59	165	65
1933/34	562	317	554	317	525	296	208	73	204	73	199	63
1932/33	518	300	509	299	480	277	191	72	186	72	183	57
1931/32												
1930/31												
1929/30	539	322	530	320	515	298	187		184		190	71
1928/29	532	312	524	318	506	294	188		185		187	69
1927/28	526	318	513	315	496	290	187		184		186	69
1926/27	523	307	511	305	485	282	186	80	183		182	67
1925/26	526	308	515	306	488	282	185	82	181		182	65
1924/25	493	304	508	302	449	278	192		197		208	61
1923/24	519	314	549	311	512	292	182		192		190	
1922/23	472	313	468	310	420	287	185		183		197	
1921/22	516	353	507	350	441	308	209		206		215	
1920/21		395		391		330						
1919/20	486	357	513	357	426	297	202		212		209	
1918/19				322		265						



PRODUCTION AND WAGES IN THE METAL AND ENGINEERING INDUSTRY. 1919 TO 1938.
 Source: - Government Industrial Census. U.G. Nos. 48/1921, 40/1922, 14/1924, 35/1926, 41/1927, 32/1928, 51/1928, 18/1930, 44/1930, 33/1931, 31/1935, 34/1936, 30/1937, 24/1938, 39/1939, 21/1941.

The demands made upon the engineering industry as a result of the decrease in imports during the First World War allowed much expansion to occur, but the post war period was not as favourable to the industry. The demobilisation resulted in unemployment and industry was not able to adjust rapidly to a peace-time economy. The recession which followed was further aggravated by the renewal of cheap imports and the 1922 strike. From a maximum in 1919 the number of establishments decreased both in the Witwatersrand and in the country as a whole. By 1922 the figures had dropped to 294 establishments on the Witwatersrand, although the industries classified under Group IV had greatly diversified. *

Following this there was a gradual increase in both the number of establishments and capital investment until 1924, when as a result of discontent a change of Government occurred. The new coalition of the Nationalist and Labour Parties adopted a more positive attitude towards industrial development. Despite this, however, there was once again a drop in capital investment and the number of unemployed rose (Figures 1.7 and 2.4).

The years 1924 and 1925 showed marked cutbacks in the industry. The number of Europeans employed on the Witwatersrand fell by 1 466 while in the country as a whole 11 963 employees were laid off (Industrial Census 1925/26. U.G. 32/1928). This decline was the result of increased competition from Europe and America, as well as poor management within the industry resulting in a decline of productivity of all races (Figures 2.3 and 2.8). This was well illustrated by a statement of the Director of the 1924/25 Census, that: "The general state of the engineering trade is still very unsatisfactory. Ship repair work has fallen off considerably owing to overseas competition. The repair work done is barely sufficient to keep local firms busy." This unfavourable state was not confined to the coast for: "During the year under review the engineering trade in the Transvaal has suffered heavily from overseas competition

* Agricultural implements
Brass and Copper Works
Cutlery
Knife grinding
Enamelling
Blacksmithing
Engineering and Steel Works
Tramway workshops
Railway workshops
Mine workshops
Engraving (Metal)

Galvanised iron
Plumbing
Gunsmith
Lead works
Machinery erection
Stoves and ovens
Wire works
Gate and fences
Smelting tin
Smelting copper
Smelting iron

Smelting other metals
Locksmiths
Typewriter repairs
Scale repairs
Steel ceilings
Sewing machines

and few of the leading firms have been fully employed. Three well known engineering companies have been compelled to cease operations. Generally the supply exceeds the demand for work, with the result prices are keen and the margin of profit very small, at times just sufficient to keep the regular staff in employment."

He pointed out that the advent of the Newcastle Iron Works would assist the founders and the country as a whole and allow further expansion. The engineering industry's recession may also be in part attributed to its dependency, at that time, upon the gold mines for its main market. The return to the gold standard and consequent fall of the gold price and loss of profit had resulted in many of the mining groups adopting an "all-slimming process", in an effort to maintain production in the face of rising costs and falling profits. This, with the exception of a few mine extensions, had reduced the engineer's market. The Government had reduced its orders to private firms, while foreign competition further reduced the industry's small market in the manufacturing sphere.

Through the years 1922 to 1925 a general increase in the imports of iron and steel occurred (Figure 1.4). After 1923 some articles showed a decline such as castings, drill steel, galvanised flat iron and most of the wire products. This was due both to the Government's protective tariffs and poor economic conditions. In any event the imports had an adverse effect on the domestic metal industry. Notwithstanding the fact that the figures refer to the country as a whole, they do support the Witwatersrand's claims against dumping (Figure 1.4).

Another feature is the imports of Angle, Channel and T. iron, as well as Bar Bolt and Rod Iron which all decreased between 1910 and 1925. With the exception of Pig Iron, Hoop Iron and Galvanised Iron, all imports were lower in 1922 than 1910. This was partly due to the development of the industries during the war and partly due to the depression and economic upheaval which did not allow sufficient liquidity or stability for the purchase of any goods imported or otherwise. The situation was further aggravated by smaller orders from the mines and the Government, who were also placing orders with overseas firms.

The situation was not helped by the influx of poor whites from the Platteland who had failed to make the adjustment from subsistence to commercial farming. These came to the cities to seek employment, but had to compete with Africans in markets of unskilled labour and were a continuous problem to the Government. It was estimated that there were between 200 000 and 300 000 (Houghton 1960). The major problems of the metal industry on the Witwatersrand can therefore be summarised as:-

- A. The belief that the gold mines were almost past their peak of production.
- B. The need to develop industry for South Africa.
- C. The unemployment and "poor white" problem.

It was these three factors that resulted in the Government accepting the opinion of the Director of Census ... "that the only hope of advancement of industries in this country is that a discriminating tariff should be put on those articles which could be manufactured in this country equal to the imported articles."

This increased the cost of articles produced, but it was hoped that as the internal market developed and the industry flourished, it would eventually reach a stage where the tariff was no longer necessary. The Director warned that, unless some efficient form of protection was given to the engineering industry, it would not improve. Quotations from local firms were being turned down in the face of cheaper imported articles. It was cheaper to import new machinery, in many cases, than to repair the old. Consequently employers had to retrench labour, particularly where there was insistence for wages on the maximum scale.

Since the new Coalition Government was committed to solving white labour problems of the country, it soon enforced a protective tariff system with the Customs Tariff and Excise Duties Amendment Act, No. 36 of 1925. This Act extended protection considerably and included in its scope a number of industries which had previously enjoyed no protection. The policy was continued and during the following twenty years, protection, to a greater or lesser degree was extended over the vast majority of industries in the Union.

With the introduction of protective tariffs, South African industry grew significantly during the next five years. (Figures 2.3 and 2.7). In 1926 the Director of the Industrial Census was able to report that the Engineering Industry had shown a steady increase and local manufacturers were able to hold their own against very severe overseas competition.

The gold mines remained the major source of work for the industry. The price of gold averaged R8.50 during the 1925 - 1932 period and this together with the belief that 7 000 feet was the limit to which any mine could operate economically, retarded rapid expansion and limited the demand for engineering goods.

One factor which distinguished the metal and engineering industries from all others at this stage was the development of local materials.

"The production of pig iron at Newcastle had already assisted us enormously and we are pleased to report that the product of Newcastle is excellent, enabling us to turn out a much higher grade article than previously, at practically the same cost. With this advantage we ought to and in fact are able to tender with confidence for much more of the Government work than hitherto". (Industrial Census 1925/26. U.G. 32/1920)

The development of South Africa's natural resources in this field eventually had a beneficial effect upon the industry and was one of the major factors in decreasing the engineering works dependency upon the mines. The difficulties faced by this primary industry in establishing itself have been studied earlier and it should suffice to say that its development was now considered of great importance by the Government, so that state capital and aid were made available for its establishment.

The engineering firms were also asking for more Government jobs and notwithstanding the protective tariffs already enjoyed by it, preferential railage rates. Wire producers were especially keen on having railage rates reduced, because they had been raised from R4.06 per 2 000 lbs bale to R15.90 on the grounds that it was manufactured in South Africa. (Industrial Census 1925/26. U.G. 32/1928). The political stability and protective tariffs already enjoyed by the industry allowed significant development. Wages were high on the Witwatersrand. Europeans earned an average of R616 per annum as compared with R564 per annum for the Union as a whole. Production per head was increasing in value (Figures 2.7 and 2.8) and the industry was beginning to feel the benefits of the Government's interest. Despite this, Engineers still felt they needed more protection. It was agreed that the mines did not support local industry sufficiently. The Director of the 1926/27 Industrial Census concluded that there was still a marked tendency, especially in connection with general engineering, for orders to be placed overseas without considering the abilities of local firms to carry out such work. This situation would continue, he felt, unless more adequate protection was afforded the industry. Further demands were made for the reduction of railage rates on both raw materials and finished goods. With the advent of ISCOR in 1928 the industry looked forward to a brighter future. It was hoped that with locally produced iron and steel, foreign competition would be faced more easily. Quality was the key to the position, in that local products would have to be of improved quality to compete with imports. (Industrial Census 1927/28 U.G. 18/1930).

The total number of establishments engaged in metal and engineering work on the Witwatersrand had varied only slightly in comparison with the country as a whole. The stable era in labour relations had not resulted in any marked growth. By the beginning of 1930 the Witwatersrand Engineering Industry had a capital investment of R4 533 034. Of this R3 731 734 or nearly two thirds was in machinery. It employed 22 479 or two thirds of the people engaged in engineering throughout the country. Its European workers added R1 078 per head every year to the articles they produced - nearly R50 more than the rest of the country. Pipes and mining equipment were being sold to the newly developed copper mines of Northern Rhodesia. So it was on the eve of the great depression that the Witwatersrand

had come to dominate the country's industry. Having developed the infra-structure of industry, although depending upon the mines, it was beginning to develop on its own.

The great depression adversely affected the entire economy of the country. From 1930 to 1933 no Industrial Census was taken and both production and employment greatly declined. The opening of ISCOR was delayed. Capital investment declined as profits fell off and many firms closed down. By 1933, however, the Witwatersrand was showing signs of recovery. The total number of establishments on the Reef had risen from 714 in 1930 to 753 in 1933. Also the total numbers employed in the industry had risen from 22 479 in 1930 to 24 812 in 1933. The overall number for the total employment in this industry in the Union fell from 33 864 to 33 600 over the same period. This would indicate that without the gold mines to fall back upon, the Witwatersrand engineers would not have made so rapid a recovery. Another indication was that non-European labour increased on the Witwatersrand from 14 676 in 1930 to 15 650 in 1933, while the Union's overall total in this industry decreased from 21 400 in 1930 to 20 921 in 1933. So despite the "civilised labour policy" of the Government which substituted white workers for non-white, the industry was still strong enough to increase its non-white labour. In 1933 wages paid to European workers on the Witwatersrand were about R44 or 7% lower per annum than in 1930, while those of non-Europeans had fallen by R6 per annum or 2.3% (Figure 2.8).

4.0 The Introduction of a period of Sustained Economic Growth (1933 - 1939)

From 1933 to 1937 wages in the industry remained more or less constant while the value added to the product increased rapidly (Figure 2.8). The growth rate was a result of South Africa's recovery from the depression of the previous decade. The six years following devaluation of the South African pound and the abandonment of the gold standard showed phenomenal growth. The number of engineering establishments on the Witwatersrand increased from 350 in 1933, to 539 in 1937 - an increase of 54% or growth rate of 13.5% per annum. This is significant when seen against a population increase of 2% per annum. In all spheres of the industry growth was rapid (Figure 1.7, 2.3 and 2.4). The numbers employed on the Witwatersrand also rose from 24 812 in 1933 to 50 982 in 1937, an increase of 26 170 or 26.3% per annum. The fact that the industry was able to absorb this number without any significant rises in wages is indicative of the unemployment which existed. After 1937 the position stabilised sufficiently to allow a pay increase, proportional to the productivity increase (Figure 2.8).

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