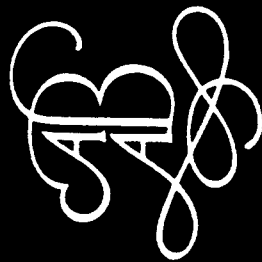


LEO KATZEN

—
GOLD

AND THE
SOUTH AFRICAN
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GOLD & SOUTH AFRICAN ECONOMY



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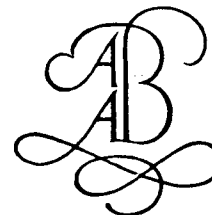
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GOLD & THE SOUTH AFRICAN ECONOMY

THE INFLUENCE OF THE GOLDMINING INDUSTRY
ON BUSINESS CYCLES AND ECONOMIC GROWTH
IN SOUTH AFRICA 1886-1961

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A. A. BALKEMA / CAPE TOWN / AMSTERDAM

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PREFACE

This book is based on a thesis presented for the degree of M.Sc. (Econ.) at the London School of Economics in 1954. It has since been revised and brought up to date. As a student of business cycles I was then particularly interested in the problem of anti-cyclical stabilisers. South Africa with its large gold mining industry offered an unusual opportunity of studying a country with a significant potential "built-in" stabiliser. That it plays this role in the South African economy has been suggested by several writers but no one has ever examined this hypothesis in detail. In actual fact my investigation reveals that although the gold mining industry has exercised a powerful anti-cyclical influence on the South African economy in certain periods, for various reasons, it has not always been the stabiliser that theory leads one to expect.

In dealing with a subject of this kind, it is necessary to examine certain theoretical aspects of the problem which can only be dealt with in technical terms, which the general reader may find a little difficult. Thus Chapters I and II deal respectively with the theory of gold mining as a stabilising force in an economy, and the factors causing a change in the supply of gold, with special reference to South African conditions. In Chapter III, however, the actual behaviour of gold production, investment in gold mining and the gold share market is described and related to the course of South African trade cycles. Chapter IV deals with how the structural importance of gold mining in the South African economy has changed over time as a necessary background to the detailed historical study in Chapter V of the effect of the industry on South African cycles.

I would like to take this opportunity of expressing my sincere thanks to Lord Robbins, Professor Basil Yamey and Mr. A. D. Knox of the London School of Economics for their painstaking guidance; to Mr. S. W. Johnson of the Geography Department, University of Cape Town, who did the graphs; to Mrs. A. Thom who did the typing; and a special debt of gratitude to my wife for her continuous help and encouragement throughout the writing of this book.

University of Cape Town
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Chapter I

INTRODUCTION

Business or Trade Cycles are commonly defined as "fluctuations in aggregate economic activity".¹ In recent years more attention has been paid by students of the Business Cycle to the behaviour of particular sectors of the economy through prosperity and depression.² There is a growing dissatisfaction with analyses of a purely aggregative type based on models which depend largely on the stability of certain relations such as the multiplier and accelerator. There is a movement among the econometricians themselves to "disaggregate" because of the failure of their models as predictive instruments. While their models are enormously complex from the layman's and non-mathematical economist's point of view, they are still highly simplified when seen in relation to the complexities of the real world. It is felt that a more detailed analysis of the parts should be made in the hope that a better picture of the whole can be built up.³

Detailed studies of particular sectors of the economy have yielded important information normally concealed in investigations of a purely aggregative type. The studies of consumer behaviour over a number of cycles by Duesenberry⁴ and Modigliani⁵ have cast doubt on the stability of the consumption function. Studies of individual industries have led to a questioning of the validity of the acceleration principle as a tool of cyclical analysis. Hultgren,⁶ for example, in his detailed investigation of the American transportation industry, has found that the acceleration principle does not seem to operate in that industry in the short run. That is to say he finds little correlation between the rate of growth of traffic and orders for new equipment, whereas there is a much better correlation between new orders and the volume of traffic (level of output). The acceleration principle is, however, a guide to changes in investment in that industry in the long run. Studies of other industries done by the National Bureau for Economic Research have led to similar conclusions.⁷

Industrial studies have also yielded information that is important in explaining the varying duration and intensity of depressions in different countries at different times. There seem to have always been certain industries in the major industrial countries that have continued to expand in spite of depression in other sectors of the economy. This phenomenon is usually found in industries producing a new product with a rapid rate of growth of demand and a high trend rate of growth of output. Continuous demand industries of this kind have an anti-cyclical effect on the economy during a depression and by raising the "floor" beyond which output will not decline, they accelerate recovery. Whether or not they exert much anti-cyclical influence depends on the importance of these industries in the economy. The rayon industry is an example of a new industry that continued to expand during the depression of the 1930's.⁸ But as rayon and other relatively small industries that were expanding during that period were not of

much importance in the economies of countries like the U.S.A. and Great Britain, their "cushioning" effect on the depression was negligible. Between 1897 and 1914 in the U.S.A., however, a number of major industries were expanding at a very rapid rate through boom and slump,⁹ with the result that depressions in this period were of short duration.

A similar development took place in Sweden in more recent years.¹⁰ Virtually a new industrial revolution had begun in Sweden in the 1920's. Such was the rate of growth of demand and the opportunities for pioneering new products that large numbers of new industries were even established in the depression of the 1930's and others established in the previous boom were expanded. While certain old export industries, like the pulp industry, were severely hit by the depression, these new industries took their place. The structural changes and high trend rate of growth of output and demand in this period, were the chief causes of the relative mildness of the depression in Sweden in the 1930's (See Tables 28 for figures of Swedish National Income in this period).

What we have been illustrating here is in effect the relationship between the trend and the cycle. In the upswing phase of the long waves in economic activity (or Kondratieff's as they are often called), the steep upward trend of output in the economy has the effect of shortening the length of the downswing and mitigating its severity. In the downswing phase when the trend of growth is not so steep, depressions are more intense and of longer duration.¹¹

In this study we are going to examine the relation of the gold mining industry to the trade cycle in South Africa and its effect on fluctuations in the South African level of activity.

Theory suggests that gold output should move anti-cyclically.¹² The price of gold under gold standard or semi-gold standard conditions is normally constant over long periods of time. Between 1717 and 1914 the price of gold in terms of sterling was £4.24773 per fine ounce, or what is the same thing, one gold sovereign contained 113 1/623 grains of fine gold. Dr. Busschau maintains that before 1914 gold did not have a price in the strict economic sense of that word. He prefers to call £4.24773 per fine ounce the "measure" of gold rather in the same way as pints are a measure of water.¹³ While the nominal value of gold is constant its 'real' value changes with movements in the price level. When the price level falls the 'real' value of gold increases and vice versa. Fluctuations in the level of activity are normally accompanied by movements in commodity prices, wages and interest rates. In a depression, therefore, with falling prices, wages and interest rates, the production of gold should become more profitable and so gold output should expand. In a boom the opposite should be the case.¹⁴

If gold output moves in this anti-cyclical manner, the gold mining industry should have a stabilising effect on fluctuations in a gold mining country. Gold mining is in a special position as a trade cycle stabiliser. Unlike the continuous demand industries mentioned before it should act as a stabiliser in both directions. That is to say it should not only curb the depression but restrain an inflationary boom as well. It also differs from these industries that have played a stabilising role in cycles, in that anti-cyclical fluctuations in gold output would be integrally related to fluctuations in the general economy via movements in costs and the price level, and not only due to trend factors and structural changes that persist in spite of, rather than because of the cycle. The gold mining industry would act as a kind of "built in" stabiliser. Other things being equal cycles in a

country with a large gold mining industry should be of smaller amplitude than in a country without a gold mining industry.

A gold mining industry can act as a stabilising force on the economy of a gold producing country in two ways. The first is via its effect on income and employment. The second is via its effect on the monetary system. We will first consider the direct income or 'real' effect of the gold mining industry on a country's cycles. To illustrate this process we will make the following assumptions:-

(1) All prices are flexible in both directions. Only the price of gold is fixed.

(2) Gold output is flexible with respect to changes in costs.

(3) Factors of production are mobile.

To begin with we will consider what happens in the upswing phase of the cycle. In the early stages of the upswing, while there are still unemployed resources in the economy and prices remain constant, gold production may continue to expand. As the economy approaches the full-employment "ceiling", however, commodity prices and wages begin to rise. Gold mining costs also rise. But in the case of the gold mining industry a rise in costs can not be compensated by a rise in the price of gold. As costs rise, therefore, gold output is curtailed. Marginal mines are forced to stop production. Workers are dismissed, less stores are bought by the industry and profits fall. In addition the decline in the profitability of the industry leads to a falling off of gold mining investment. A rise in interest rates will further accentuate this fall in mining investment. This decline in gold mining income, employment and investment, through the operation of the familiar multiplier-accelerator mechanism, will tend to slow down the rate of growth of income in other sectors of the economy and accelerate the coming of the downturn. What actually causes the downturn in the economy need not concern us here. In the case of a largely dependent economy like South Africa has been, the downturn will be primarily determined by a decline in the level of activity in the major industrial countries via a fall in the demand for her exports and supply of foreign capital. Whether or not declining gold output is the initiating cause of the downturn, it will increase the sensitivity of the economy in a downward direction.

In the downswing the process is reversed. As output and prices decline, gold production is stimulated. Gold-bearing ore rendered unpayable in the previous rise in costs can now be profitably mined. The fall in costs and interest rates and rise in profits will also lead to increased investment in gold mining. The greater the fall in the price level, the more will gold production and investment be stimulated. The industry will absorb some of the unemployed workers from other sectors of the economy and increase its outlay on stores. This increase in employment and income in gold mining will have a multiplier effect on employment and income in other sectors, and so tend to offset the deflationary forces at work in the economy. In certain industries very closely linked with the gold mining industry, the increased gold output will not only offset a fall in demand from other sectors but lead to an increase in demand. In this way some investment will be induced in industries other than the gold mining industry. The net effect of the expanding gold mining industry will be to limit the extent of the decline in income and employment and accelerate recovery.

The monetary effects of a gold mining industry will tend to work in the

same direction as its 'real' effects. If our economy is on a full gold standard, anti-cyclical fluctuations in gold output will have an added stabilising influence. As gold output declines in the upswing the supply of new 'real' money will contract. This will tend to cause interest rates to rise and credit to be curtailed. This would add to the 'real' deflationary effect of the gold mining industry in the upswing. The reverse process would take place in the downswing.

Even under full gold standard conditions, however, the monetary effect of fluctuating gold output on the economy of a gold producing country is not likely to be so direct. For most gold producing countries, gold is primarily an export commodity no different in essence from any other export. Gold is exported in exchange for other commodities and only a fraction of the gold output is retained for monetary purposes. This is particularly true of the output of the South African gold mining industry. A comparison between gold output and gold export figures shows this very clearly (see Tables 1 and 17). Before 1914, however, some of the raw gold exported was reimported into the country in the form of specie. South Africa only acquired her own gold refinery in 1921. How much gold will be retained for swelling the supply of internal money and reserves for foreign payments depends not only on gold output but also on the balance of payments position. When gold is a major export item, as in the case of South Africa, fluctuations in its output can have an important indirect monetary effect via the balance of payments situation. A decline in gold output and exports in a boom, if it is not compensated by an increase in the export of other commodities, can lead to an adverse balance of payments situation. This deficit can only be met by increased foreign lending or an outflow of gold held in reserve for international payments. If the economy is on the gold standard and "abides by the rules of the gold standard game", a fall in gold reserves should lead to a deflationary monetary policy. In a depression with a fall in the demand for imports and an increase in gold output a favourable balance of payments position may develop, and result in an easing of credit conditions. When, however, the gold standard is not in operation and fluctuations in the balance of payments are dealt with by means of movements in the rate of exchange or direct import controls rather than by monetary measures, the indirect monetary effect of fluctuating gold output will be limited. The income effect, however, will still remain.

It may be inferred from our analysis so far that the gold mining industry tends to produce an under-full-employment equilibrium. But equilibrium at a full-employment level is perfectly consistent with the existence of a gold mining industry as long as prices remain stable.

In the theory outlined we have been tacitly assuming an inherent tendency in the economy to fluctuate cyclically with the gold mining industry only tending to narrow the extent of the fluctuations. The question arises why the industry permits any marked overshoot of equilibrium and the continuation of cycles? This raises the exceedingly difficult problem of maintaining stability of the economy at the full-employment level (and thereby eliminating or at least compensating for fluctuations). Here we can do no more than indicate some of the requirements and difficulties in achieving this goal.¹⁵ While we assumed that prices were flexible and that gold output was flexible with respect to costs and therefore moved anti-cyclically, we made no assumptions about the size of the industry. How large would the industry have to be in order to be an effective stabiliser? It is difficult to provide an answer to this question. The greater the

relative importance of the industry in the economy the more effective will it probably be. But the effectiveness of a stabilising force is not only a function of its size but also of the speed with which it reacts to a change in conditions. The quicker the reaction of the stabiliser, the smaller will be the stabilising impulse have to be in order to restore equilibrium. Its effectiveness will also depend on the strength of the destabilising forces in the economy. In an inflationary boom such as characterises a war and post-war period, for example, a much larger stabilising force will be required than in a normal period. But even where a stabilising force is large enough to check an upward or downward movement in income, there is no guarantee that income will simply return to the equilibrium level. Where there are lags in the responding multiplier-accelerator mechanism, the stabiliser may itself propagate a cyclical reaction around the equilibrium level.

While it may not eliminate cycles, an anti-cyclical gold mining industry should nevertheless narrow the extent of the fluctuations. How effective it will be will depend on its size, the length of the time lags and the strength of the destabilising forces in the economy. The smaller the industry, the longer the time lags and the stronger the destabilising forces, the less effective will the industry be in its stabilising role.

So far we have assumed that gold output itself moves anti-cyclically. When, however, we relax the assumptions on which the anti-cyclical behaviour of gold output is based and introduce the factors that in practice modify its inverse relationship with the trade cycle, its stabilising influence is still further reduced. These factors are more fully dealt with in Chapter III so we will only mention them here. In practice gold mining costs tend to be fairly rigid and the price of gold has not remained constant. While gold output may be sensitive to changes in costs, the relation between costs and output is not a simple one. It is complicated by the fact that gold output is not only a function of the tonnage milled but of the grade of ore mined as well. While a fall in costs may lead to an increase in the tons of ore milled, it also leads to a fall in the grade of ore mined. As a result gold output may not increase to the extent that tonnage milled increases. Similarly when costs increase, an increase in grade may offset the effect on gold output of a fall in tonnage milled. There are also lags in the response of gold output to a change in costs due to the imperfect mobility of factors and the long gestation period of gold mining investment. The availability of unexploited reserves of ore is another obvious limiting factor.

Thus far we have only been concerned with the stabilising effect of a gold mining industry on the economy of a gold producing country. Some economists, however, have made more ambitious claims for the stabilising function of gold mining. M. Rueff,¹⁶ for example, asserts that under gold standard conditions, the gold mining industry of the world will also have an international stabilising effect. He uses the fact that gold production will be stimulated in a depression as one of his main points of attack against Keynes' general theory of under-employment equilibrium. In Keynes' theory an under-employment equilibrium will come about when an increase in income leads to an increase in demand for cash rather than commodities. But, Rueff argues, in a regime of metallic money, an increase in demand for cash will lead to a fall in prices. As the price of gold remains constant, resources that become unemployed in the production of commodities will turn to the production of money (gold). This will satisfy

the increased demand for cash and full employment equilibrium will be restored. Non-gold producing countries will benefit by an increase in demand for their exports by the gold producing countries. This will create employment in the export industries in those countries and also lead to a favourable balance of payments and an import of gold, thereby satisfying the desire of individuals for increased cash. Although not dealing specifically with business cycles, Rueff's case for the international stabilising role of gold mining is similar to ours for a gold producing country except that he carries the argument much further. The same obstacles to achieving stability exist here as in the previous case. But in the international case, the role of gold mining is further weakened. Even in the case of a gold producing country where there is a direct income effect the response is likely to be lagged. Where international trade is involved the effect is likely to be much more lagged and diffused. Besides basing his argument on the assumption of flexible prices, Rueff is clearly assuming that gold production is flexible with respect to a change in costs and that a considerable proportion of the world's unemployed resources can be absorbed in it. This seems unrealistic. Keynes himself has put it as follows:

Money cannot be readily produced; — labour cannot be turned on at will by entrepreneurs to produce money in increasing quantities as its price rises in terms of the wage-unit. In the case of an inconvertible managed currency this condition is strictly satisfied. But in the case of a gold-standard currency it is also approximately so, in the sense that the maximum proportional addition to the quantity of labour which can be thus employed is very small, except indeed in a country of which gold-mining is the major industry.¹⁷

We are not arguing that induced changes in gold output have no stabilising effect on the world economy. To quote Keynes again:

... the tendency in slumps for the price of gold to rise in terms of labour and materials aids eventual recovery, because it increases the depth at which gold-digging pays and lowers the minimum grade of ore which is payable.¹⁸

We are only saying that its importance is not likely to be as great as that ascribed to it by Rueff, especially in the short-run period of the trade cycle.

In the Nineteenth Century fluctuations in gold output do not seem to have been primarily influenced by economic factors, still less by cyclical factors. The supply of gold came in a number of waves. But secular changes in the supply of gold probably did have some effect on the long wave movements in prices and economic activity. The most noted exponent of this theory is Cassel.¹⁹ Rostow,²⁰ on the other hand, emphasises the importance of 'real' factors in these long-wave movements. The factors causing these long-wave movements are still a subject of considerable controversy. What is even less certain is the influence of fluctuations in the supply of gold on the short-run cycles in this period. In an interesting footnote, Hicks suggests that in a period of rapid secular expansion in the gold supply it would be possible for the monetary boom in the upswing phase of the cycle to be of a more protracted nature because new supplies of gold would always be coming to the rescue of bankers and facilitate an expansion of credit. Bankers would be inclined to take more risks. As a result of the strength of these

monetary booms interest rates would have to rise fairly high in order to impose an effective check. In periods when the monetary boom is not so strong, due to the smaller supply of new gold, the rise in interest rates would not have to be so sharp. He offers this as a possible explanation of the 'Rostow paradox'²¹ that interest rates generally ruled higher in the 1850's and 1860's when the supply of gold was increasing rapidly than they did in the 1870's and 1880's when there was supposed to be a relative shortage of gold.²²

It is only in this Century that the world supply of gold shows any marked sensitivity to changing economic conditions. In the depression of the 1930's, for example, world gold production expanded rapidly. The fall in the price level and the availability of unemployed resources on a large scale gave a special impetus to gold production. Yet by 1933 (the low year of the depression in most countries) world gold production had only expanded by 29% over the 1929 level. Even in the U.S.A., with many millions unemployed, gold output by 1932 had only increased by 45% and even fell in 1933 (see Table 16). It was only when most countries had abandoned the gold standard and the price of gold had risen considerably that gold output began to rise rapidly. By 1939 world gold output was double the 1929 level in quantity and more than double in value. The cyclical history of the 1930's, however, suggests the limitations of Rueff's thesis. Even with the vast increase in world gold output the period remained one of chronic unemployment.

While the stabilising effect of the world gold mining industry on international trade cycles is probably limited and also very difficult to show, the effect of the industry on the economy of a gold producing country should be more marked. In a gold producing country the industry has a direct income and employment effect and not only a delayed monetary or a secondary income effect via the international trade multiplier.

The special interest of the gold mining industry in South Africa is that for the last 50 years at least it has been the world's chief gold producer and has long been one of the country's most important industries. Since 1910 South Africa has annually contributed between one-third and two-thirds of the world's gold supply. Between 1910 and 1940 the industry's share of the total net national income was never less than 11% rising to as much as 20% in 1939/40. During and since the war the industry has declined in relative importance although it still contributes 10% of the national income (see Table 9). In no other country does the gold mining industry have such an important place in the economy. We would expect, therefore, the stabilising influence of the industry to be more pronounced in South Africa than in any other gold-producing country.

That the industry has had this effect on South African cycles has been suggested in a few places in South African economic literature,²³ but no attempt has yet been made to examine this effect in detail.

Our investigation will largely centre around an examination of the hypothesis that gold output moves anti-cyclically and has a stabilising effect on the economy, in relation to the experience of South Africa from 1886 (when gold mining on the Witwatersrand began) to 1961-62. Less attention, however, will be given to the period before 1910 due to the lack of statistical material.

There are in effect two problems with which we shall deal:

1. Does gold output move anti-cyclically?
2. Does the industry have a stabilising effect on the economy?

While the second problem is derived from the first, a negative answer to the first problem, as we shall see, does not necessarily imply a negative answer to the second. In Chapters II and III we will deal with the first problem. In Chapter II we will examine the factors causing a change in gold supply in general. In Chapter III we investigate to what extent the factors affecting the supply of gold are cyclically determined and how the resultant gold output is related to the Trade Cycle in South Africa. Chapter IV is devoted to an analysis of the structural importance of the gold mining industry in the South African economy. In Chapter V we deal with the second main problem, viz. the effect of fluctuating gold output on South African cycles.

Chapter II

THE CAUSES OF CHANGES IN THE SUPPLY OF GOLD

The relationship of the various factors determining the supply of gold is an exceedingly complex one. Before attempting, therefore, to relate the factors that cause a change in the supply of gold to cyclical fluctuations in the South African economy, we will first deal with the theory of gold supply in general, with special reference to South African conditions. Our treatment of this subject is not meant to be exhaustive. It is primarily designed to provide some of the background to the inquiry in the next chapter.²⁴

In the Nineteenth Century, changes in the supply of gold were largely due to fortuitous discoveries of new ore resources and their exhaustion. Cost factors were relatively unimportant as the basic capital equipment was often little more than a shallow pan or machinery of the simplest kind. Men were impelled by the "Eldorado Spirit" to go and seek their fortune in the newly-discovered gold fields, but on the average they probably earned less than they would have, had they never left home. For the last fifty to sixty years, accident has ceased to play a very big part in changes in the supply of gold. Gold mining has come to be undertaken by large units, mining at deep levels with expensive capital equipment. Improved techniques have reduced the risk factor in gold mining and prospecting. In short it has become an industry which is just as sensitive to costs and price as any other industry. Nowhere is this more true than in the case of the gold mining industry of the Witwatersrand.

The first period of development on the Rand was similar to that which characterized all new mineral discoveries. Gold was worked by numbers of individuals, small companies and syndicates employing little capital. The "outcrops" of the gold reef gave opportunities for this. But "outcrop" gold was soon exhausted and within a few years of the first gold boom of 1889 it became clear that the Rand gold deposits were quite different from previous discoveries of gold deposits elsewhere. The ore deposits were very widespread in area and depth and of a relatively low average grade. The successful exploitation of these to be known as the "Group System" of administration.²⁵ This process of amalgamation and financial concentration had taken form by 1897 and the "Group System" can be regarded as having been firmly established by the time of Union.²⁶

Professor Henry Clay has summed up the process as follows:-

The gold Mining Industry may claim to provide a working model of a 'rationalized' industry. Through the group system of control of the separate mining companies, and the close co-operation of the whole industry through the Chamber of Mines and its subsidiary services, it has substituted for the blind selection by competition of the fittest to survive, a conscious and deliberate choice of methods, equipment, areas and personnel on the basis of an extremely detailed comparative study of results. The experience of the industry is continuously analysed; periodic returns, which serve to measure every factor in costs that can be distinguished are received from every unit and circulated to every unit; so that the individual mine-manager is able to check his results against those of colleagues in other mines, and the controlling authority has continuously before it the divergencies of experience that point to the technical and administrative needs of the industry. Each group maintains an extensive and highly-qualified service of experts, which works on the problems so revealed; and the financial resources of the groups make it possible to give effect to any improvements -- from minor process alterations to the sinking of a new shaft at the cost of half a million -- which this practical research can suggest.²⁷

Although in no other gold-producing country is gold mining conducted on the scale and with the degree of concentration of the Witwatersrand industry, the mining of gold on capitalistic lines in fairly large units has become typical of the industry throughout the world in this century.²⁸ Easily won "outcrop" and alluvial gold has long ceased to make an important contribution to the world supply.

Even new discoveries have tended to become induced by economic factors rather than by accident. Prospecting for gold has become a science dependent on expert geological knowledge. It is now normally undertaken by large companies at considerable expense and is subject to economic considerations similar to those that determine a firm's expenditure on research. The discovery of the new Orange Free State Gold Field in South Africa can be contrasted with the gold discoveries of the 1840's in California. The latter was largely a chance discovery; the former was the result of careful geological investigation and considerable outlay on prospecting on the part of the large mining houses over a period of at least 10 years prior to the discovery in 1946. The existence of natural resources and their extent are of course still important in determining the supply of gold. No amount of prospecting on a scientific basis will produce gold if it is not there. But economic factors can accelerate or delay the exhaustion of known deposits of ore and promote or discourage new discoveries. In the absence of new discoveries and any change in the economic date, the supply of gold will gradually decline as the known resources of ore become exhausted. Exhaustion also has the effect of raising costs as the scale of operations declines and so accelerates the decline in output. The experience of Australia can be quoted in this connection. From 1905 onwards Australian gold output began to decline due to exhaustion, but the rise in costs in Australia from 1910 and particularly during the First World war, accelerated the decline so that by the 1920's Australia's contribution to world gold output was comparatively small (see Table 6).

The relationship between a change in the cost of mining gold or its price and the supply of gold is not, however, a simple one. It is complicated by the fact that the supply of gold is not only a function of the tons of ore milled but of the grade of ore mined as well. Because the grade of ore in a mine is not constant, a change in the tonnage milled need not lead to an equivalent change in the output of gold. When looking at the effect of a change in costs (or price) on output, therefore, we must examine its influence both on the tonnage milled and the grade of ore mined.

Changes in costs can take two forms:-

- (1) It may take the form of a change in the amount or value of the yield of gold from each ton of ore of a given grade and at a constant cost per ton, due to a change in the rate of recovery or price of gold, or,
- (2) it may take the form of a change in the cost of mining and milling a ton of ore.

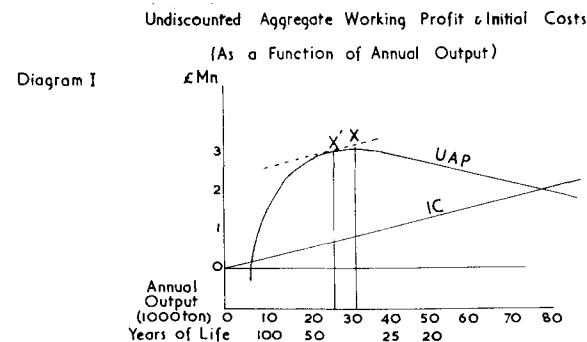
The first will lead to an automatic change in the quantity or value of the gold produced, in addition to any indirect effect it may have via an induced change in the quantity or grade of ore milled. The second will affect the output of gold only through its influence on the quantity or grade of ore milled.

We can best approach the problem of how changes in costs and price affect the supply of gold by first considering the optimum rate of mining under given conditions. Mining differs from other forms of production, in that the quantity of raw material is fixed. The rate of output and therefore the life of the mine is highly variable and depends on the quantities of the factors of production applied.

Let us make the following simplifying assumptions:-

- (1) The product is homogeneous and its price is fixed.
- (2) The deposits of ore are uniform (i.e. of constant grade) and the quantity of the deposit is exactly known.
- (3) Prices of factors are constant but not costs per unit of output. That is to say production is subject to increasing and diminishing returns.

If we further assume that the rate of interest is zero, then the optimum rate of mining will be at that point where undiscounted aggregate profits (UAP) are maximised. This is at the point X in diagram I.²⁹ But besides working costs there are also initial costs. If we assume that all initial costs are specific and have no value at the end of the life of the mine, then what is being maximised is undiscounted aggregate profits minus initial costs. This is also shown on the diagram. For simplicity sake we are assuming that initial costs (IC) bear a



constant ratio to the rate of output. The optimum point in this case is where the UAP curve is parallel to the line IC, i.e. at X^1 . This new optimum point (X^1) will lie to the left of the highest point of the UAP curve (X), and will move further to the left the steeper the slope of IC, up to the point where IC becomes tangential to the UAP curve and the development of the mine ceases to be profitable. Thus the greater the cost of initial equipment per unit of annual output, the smaller will be the most profitable rate of annual output and the longer the optimum life of the mine.

When the rate of interest is positive what is maximised is not aggregate net profit but the present discounted value of the profit earned over the life of the mine. With a positive rate of interest, the more time taken in exploiting a given asset, the lower will be the present discounted value of future profits. It pays, therefore, to mine as quickly as possible in order not to lose interest. The optimum rate with a positive rate of interest will be greater than when the rate of interest is zero. This may lead to an increase in the demand for capital equipment to speed up exploitation when the rate of interest rises. But this could only take place in very rich mines where the rise in interest rates would not greatly affect the profitability of the asset. It would, on the other hand, deter investment in marginal propositions. On balance the effect of a rise in interest rates would be to reduce mining investment. Only if all potential mines have ore so rich that the rise in interest rates has little effect on the world total of workable ore, is the rise likely to have the effect of increasing the total demand for gold mining capital.

The importance of the effects of changes in the market rate of interest are reduced when the assumption of perfect foresight concerning the contents of the mine, future costs of production and future selling prices is removed. The greater the degree of risk the smaller will be the effect of movements in the market rate of interest on investment decisions. In order to attract capital to a speculative venture potential profits must be high. The risks in gold mining are higher than those customarily associated with "representative", or "normal" industrial enterprises. This high degree of risk is due

(a) to the specificity of mining capital,

(b) the relatively long period of time that must normally elapse between the investment of capital, the first receipt of dividends and its eventual amortization. The longer the period of time for which the capital is "at risk" the greater is the degree of risk owing to a possible change in fundamental conditions. Because the bulk of the capital invested in a mine is specific to the mine in question, any over spending on development cannot be rectified. Thus if there is a considerable degree of uncertainty, mining will tend to start on as small a scale as possible. Larger outlays will be delayed until more certain knowledge of the extent of the deposits of ore and their profitability have been gained. Where it is technically necessary, as in the case of a deep-level mine, to begin developing by means of a large initial outlay, development is likely to be delayed until uncertainty is greatly reduced.

On the whole an increase in prospective profits, whether it comes from a fall in costs of production, higher price of gold, fall in the rate of interest or a cut in mining taxation will tend to increase initial outlay and the rate of production. Conversely a fall in prospective profits will tend to decrease initial outlay and the rate of production.

All this applies to new investment in mining where fixed costs have not yet been incurred. It applies equally to the case where fixed costs have already been incurred but profitability has increased. Changing prospects now make it profitable to increase the rate of output by further capital outlay - sinking another shaft for example. When, however, the investment has already been made and profitability declines, output will continue at a higher rate than if foresight had been better. Mines will even continue to operate for some time at a loss particularly if there is some chance of a change in economic conditions. Closing down a mine, even for a short time, may cause the investment to become a total loss. Mines fill up with water and may become unworkable.

So far we have dealt only with the effect of changes in costs where ore is of a homogeneous grade. Where the grade of ore varies but is accessible in blocks of a homogeneous grade, it pays to mine the richest ore first. In this way more interest is earned and profits are maximised. But if by mining the richest ore first the poorer ore is excluded, this policy will not be adopted. A progressive tax system will also deter this policy. The policy of selective mining is objected to for a number of reasons:-

(1) For technical reasons "picking the eyes" of the mine usually leads to the irretrievable loss of payable ore of a lower grade.

(2) It defrauds shareholders. High yields at first give way to declining yields in the future. Shareholders prefer a steady to a declining income.

(3) Those employed on the mines, as well as the State in South Africa, are more concerned with the longevity of the industry than short-run profit maximisation.

In view of these factors it has been the policy of the South African gold mining industry to mine ore of the average grade of payable ore in a mine. In most mines the grade of ore varies considerably. The composition of the ore of the Witwatersrand takes the form of a pyramid with a vast quantity of low-grade ore at the base and only a relatively small quantity of high-grade ore at the apex. The quantity of payable ore, or "pay-streak" as it is called, depends on the costs of mining (that is costs per ton milled) and the price of gold. If costs fall or the price of gold increases, the quantity of payable ore increases so that average grade falls. This will cause the quantity of gold per ton to fall but it will also induce an increase in the tonnage of ore milled. The grade of ore mined is not an independent variable in the determination of the supply of gold. It depends directly on changes in costs and price but it works in the opposite direction to a change in the tonnage milled induced by the cost and price changes. The net effect on the supply of gold of these opposing tendencies depends on the proportion of high to low grade ore in a mine, the elasticity of supply of labour and capital and the gestation period of mining investment. If the quantity of ore added to the "pay-streak" by a fall in costs or a rise in the price of gold is small, then the increase in tonnage milled will probably exceed the fall in grade and gold output will increase. Where the addition is large and the fall in grade sharp, tonnage milled will increase by less than the fall in grade so that gold output will decline. On the other hand, when costs increase, the increase in grade will tend to offset the fall in tonnage milled so that gold output will not fall to the same extent as tonnage milled. It is conceivable that a sharp increase in costs could lead to an increase and not a decrease in the supply of gold. This may be the case in individual mines but is unlikely to be true of

GOLD MINING AND THE TRADE CYCLE IN SOUTH AFRICA

the industry as a whole. It would depend on how much durable equipment is in use and the quantity of high grade ore that is left. The increase in output in rich mines is likely to be more than outweighed by a fall in output in low-grade mines.

Besides the change in grade, the effect of a change in costs or price on gold output depends also on the elasticity of supply of factors and the gestation period of mining investment. When the price of gold goes up in a period of full employment, and the supply of factors is inelastic, the increase in tonnage milled will be small. If the price of an important factor that is inelastic, such as African labour, is prevented from rising due to monopsony in the African labour market, tonnage milled may actually fall as the supply of African labour declines. The effect of an initial change in the price of gold on the quantity of payable ore may not last for very long in a period of full employment. If there is continued inflationary pressure in the economy, some of the new low-grade ore initially brought into the "pay-streak" by the higher gold price will no longer be payable. If the supply of factors is elastic, as is the case with labour in a depression, then output of ore will increase and offset the fall in grade of ore mined. But the rate at which tonnage milled increases also depends on the elasticity of supply of capital and the gestation period of investment. Between 1929 and 1932, for example, output of gold in South Africa increased due to a fall in costs, increase in the supply of labour and the existence of some surplus capacity. The increase in tonnage milled was sufficient to offset the fall in grade due to the fall in costs so that gold output expanded. But the capital flow into the industry was small in spite of a fall in interest rates and increased profits. As a result the rate at which output expanded was limited. It was only after 1932, with an increase in the price of gold, that the supply of capital into the industry increased markedly. This led to a more rapid increase in tonnage milled, although at first gold output fell due to the sharp fall in grade. But the rate at which tonnage milled increases also depends on the gestation period of mining investment. In South Africa it can take from 5 to 7 years to bring a large new mine to the producing stage. Although many new mines were begun in the first few years after devaluation in 1932, it was not before the late 1930s and early 1940s that these mines began to make their contribution to gold output.

The South African gold mining industry is sensitive to a fall in costs because of the large quantity of low grade ore available. A relatively small fall in costs can increase the quantity of payable ore tremendously. It was estimated in 1930 that a 2/- or 10% fall in costs would have lengthened the life of the industry by 50%. A 4/- or 20% fall would have increased it by over 100%. That is to say, if the rate of tonnage then being milled had remained constant, large quantities of additional ore could have been profitably mined over the life of the industry.³⁰ But due to the policy of mining ore of the average payable grade and the length of the gestation period of mining investment, it can take many years before the change in economic conditions, which induces a fall in grade and increased investment, leads to an increase in gold output.

With respect to grade policy and the length of the gestation period of mining investment, the South African industry differs from the gold mining industry in other countries. These differences will be illustrated in the next chapter when we relate fluctuations in gold output to the trade cycle.

In the previous chapter we dealt only with the causes of changes in the supply of gold in general with particular emphasis on some of the special factors that determine the supply of gold in South Africa. Reference to cyclical factors have only been made in passing. We will now consider specifically the relationship between gold output and the trade cycle and see to what extent the relationship suggested by theory is corroborated by the facts in South Africa.

Economic theory, as we pointed out in Chapter I, leads us in the first analysis to expect to find that gold output is inversely correlated with the trade cycle. Given that the price of gold remains constant, the costs of producing gold will vary with the cycle. Gold production will therefore become more profitable and expand in a depression when costs of production fall, and contract as costs rise in a period of prosperity.

This hypothesis, however, is based on a number of assumptions:-

(a) That gold mining costs vary with the level of activity. That is to say gold mining costs are flexible.

(b) That gold output is a function only of the price of gold, which is assumed constant, and the cost of producing gold which depends only on cyclical factors. This tacitly assumes that the other variables that determine the supply of gold, viz. grade of ore mined and discoveries of new ore resources, as well as taxation and technical improvements in the mining and refining of gold (which affect the cost and profitability of gold mining) are either constant or cyclically determined.

(c) Factors of production are mobile and there are no production lags.

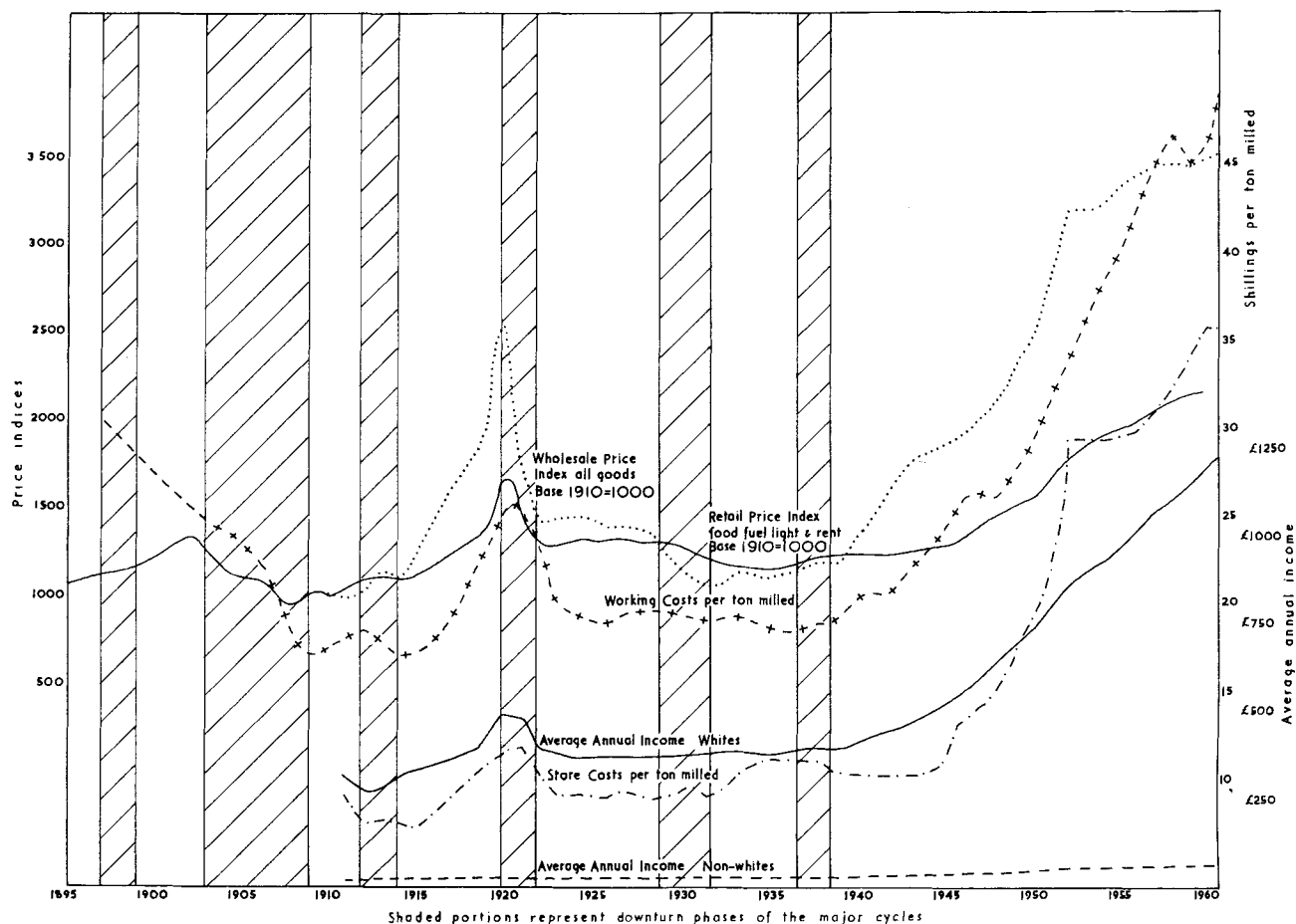
While we asserted in the previous chapter that gold output depends primarily on the cost of producing gold and the profitability of mining investment, actual gold output at any time is the result of a complex relationship between the variables cost, price and grade, and depends also on other factors such as the discovery of new ore resources, the elasticity of supply of factors etc. Gold mining costs in their turn depend not only on the price of labour, stores and capital but also on technical innovations and taxation.

We will now examine in some detail to what extent the factors governing the determinants of gold output are affected by cyclical fluctuations in the South African economy. Our discussion will mainly centre around the facts as presented in Graphs I and II and Table 1.

COSTS

In Chapter II we spoke in general about changes in costs without specifying the

GRAPH I SELECTED TIME SERIES OF SOUTH AFRICAN GOLD MINING AND PRICE INDICES 1895-1961



GRAPH II SELECTED TIME SERIES OF SOUTH AFRICAN GOLD MINING 1900-1961

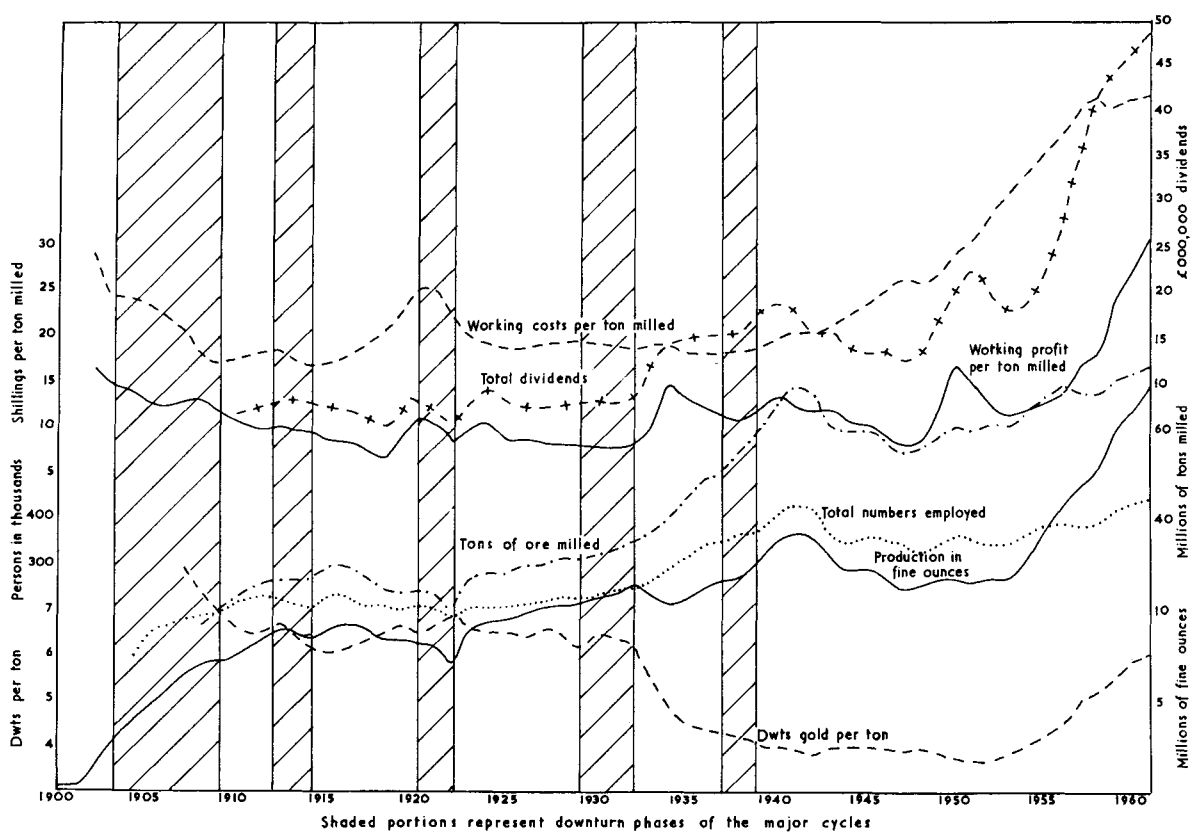


TABLE 1

SOUTH AFRICAN GOLD MINES - SELECTED OPERATIONAL STATISTICS 1888-1961

Year	Total (a) Union Output (ozs.)	At (a) Value Realised (£ 000)	Tonnage (b) Milled (000)	Per ton Milled			No. of Employees (b)			Salaries & Wages(b)		(a) Stores Consumed (£ 000)	Total (c) Divi- dends (£ 000)
				Average (c) grade of ore (dwts.)	Yield(c)	Working (c) costs profit	White (000)	Non-white (000)	Total (000)	White (£ 000)	Non-white (£ 000)		
1888	228	967	114			35/- 40/- (d)							
1898	3,823	16,240				25/- 30/- (d)							
1902	1,719	7,297			42/0	25/9	16/6						
1904	3,774	16,018			38/6	24/4	14/2	13	80	93(e)			
1909	7,295	30,988			28/11	17/1	11/6	20.6	169	189.6(e)			
1910	7,527	31,973		6.680	28/6	17/7	10/9	25.3	196.9	222.2			
1911	8,251	35,049	24,895	6.577	27/11	18/0	9/11	25.7	201.2	226.8	8,545	5,743	11,715
1912	9,109	38,092	26,607	6.793	29/0	18/8	10/2	24.7	204.1	229.4	8,196	5,966	10,311
1913	8,799	37,375	26,661	6.542	27/9	17/11	9/10	24.0	195.2	219.7	7,875	5,603	10,633
1914	8,396	35,664	26,701	6.233	26/6	17/1	9/5	21.9	178.8	201.2	7,172	5,361	10,277
1915	9,096	38,638	29,298	6.177	26/3	17/5	8/10	22.8	204.9	228.2	7,555	6,045	10,935
1916	9,297	39,491	29,451	6.275	26/8	18/1	8/7	22.9	213.0	236.4	8,034	6,268	12,321
1917	9,018	38,308	28,152	6.377	27/1	19/2	7/11	23.0	191.5	214.9	8,475	5,665	12,705
1918	8,418	35,750	25,468	6.566	27/11	21/7	6/4	23.2	186.4	210.0	8,881	5,572	12,984
1919	8,332	35,391	24,575	6.730	31/9	22/11	8/10	23.6	177.8	201.7	9,466	5,517	13,208
1920	8,158	45,606	24,662	6.578	36/9	25/8	11/1	22.7	183.4	206.3	11,356	6,014	14,364
1921	8,129	43,082	23,908	6.762	35/10	25/8	10/2	21.5	179.8	201.4	10,641	5,965	14,440
1922	7,010	32,343	20,083	6.935	32/0	23/6	8/6	14.4	169.4	184.1	5,797	5,582	11,126
1923	9,149	41,575	27,332	6.651	30/3	20/0	10/3	18.3	187.3	205.9	6,805	6,387	13,425
1924	9,575	44,739	29,135	6.526	30/6	19/7	10/11	19.1	190.0	208.4	7,323	6,386	13,779
1925	9,598	40,768	29,253	6.505	27/7	19/2	8/5	20.0	185.5	205.7	7,503	6,263	13,766
1926	9,955	42,285	30,383	6.487	27/7	19/0	8/7	20.4	192.7	213.2	7,654	6,461	14,037
1927	10,122	42,998	30,115	6.600	28/0	19/7	8/5	21.4	197.5	219.1	8,029	6,563	14,626
1928	10,354	43,982	30,992	6.545	27/10	19/9	8/1	22.2	206.4	228.9	8,360	6,879	14,952
1929	10,416	44,229	31,532	6.488	27/7	19/7	8/0	22.6	203.3	226.1	8,480	6,820	14,814
1930	10,716	45,520	32,141	6.530	27/9	19/5	8/4	22.6	211.6	234.4	8,527	7,073	15,046

1931	10,878	46,206	33,059	6.421	27/3	19/4	7/11	23.2	219.1	242.4	8,724	7,293	15,967	8,027
1932	11,559	49,098	35,623	6.331	27/3	19/0	8/3	23.9	226.5	250.6	9,066	7,553	16,142	8,379
1933	11,014	68,687	37,664	5.674	35/5	19/3	10/2	25.9	290.0	266.1	9,696	7,905	18,521	12,416
1934	10,480	72,311	40,619	4.986	34/5	19/3	15/2	29.3	261.9	291.4	11,224	8,593	22,120	14,567
1935	10,774	76,533	45,054	4.588	32/5	18/8	13/9	33.0	285.4	318.5	12,772	9,511	25,630	14,926
1936	11,336	79,495	49,107	4.402	30/10	18/6	12/4	36.4	310.0	346.5	14,330	10,587	27,097	15,514
1937	11,735	82,557	51,864	4.308	35/4	18/8	11/8	39.2	314.2	353.6	15,738	10,753	29,246	15,298
1938	12,161	86,670	55,208	4.194	29/11	18/11	11/-	41.7	329.0	370.8	17,207	11,409	31,159	15,553
1939	12,822	98,943	59,706	4.096	31/7	19/2	12/5	44.1	333.7	378.1	17,120	11,628	31,942	18,264
1940	14,047	117,991	66,203	4.055	34/11	20/4	13/9	46.5	366.9	413.5	19,399	12,834	33,296	19,474
1941	14,408	121,024	69,067	3.989	33/6	20/9	12/9	47.6	384.4	432.1	20,194	13,521	35,015	17,786
1942	14,127	118,666	68,839	3.896	32/9	20/8	12/1	47.5	373.6	421.2	21,040	13,196	31,635	15,547
1943	12,804	107,557	61,690	4.079	34/3	21/11	12/4	46.1	322.2	368.4	20,937	11,593	28,202	15,393
1944	12,280	103,149	59,933	4.034	33/11	22/10	11/1	44.2	311.8	356.2	20,916	12,922	29,263	13,729
1945	12,225	105,285	60,230	4.000	34/7	23/9	10/10	42.4	320.7	363.2	21,208	13,889	32,014	13,237
1946	11,927	102,872	58,255	4.02	34/11	25/7	9/4	41.6	318.3	360.0	22,996	13,896	37,596	13,411
1947	11,200	96,602	55,266	3.98	34/7	26/7	8/0	40.0	308.6	348.6	23,264	13,553	39,286	12,564
1948	11,585	99,919	56,800	4.006	34/9	26/2	8/7	40.1	291.0	331.2	24,867	13,264	42,290	13,546
1949	11,705	114,865	58,360	3.934	38/11	27/0	11/11	40.5	305.8	346.4	27,917	14,359	47,385	17,749
1950	11,664	144,776	61,202	3.759	46/11	29/7	17/4	44.4	318.6	363.1	33,215	16,580	58,803	24,699
1951	11,516	142,943	60,432	3.756	46/11	31/10	15/1	45.6	311.9	357.6	36,623	17,058	66,087	22,787
1952	11,819	150,829	62,746 (f)	3.767	47/1	34/2	12/11	45.9	308.8	354.8	39,818	17,389	90,415	19,805
1953	11,941	149,499	61,331	3.893	48/5	36/6	11/11	47.1	300.4	347.6	42,430	18,064	90,040	18,208
1954	13,237	164,688	65,350	4.068	50/11	38/8	12/3	48.8	324.1	373.0	45,109	20,378	95,660	19,127
1955	14,601	182,745	68,747	4.274	53/10	40/5	13/5	50.1	336.1	386.2	48,659	22,029	102,550	22,362
1956	15,897	198,500	70,250	4.553	57/3	42/11	14/4	50.2	343.7	394.0	51,359	22,707	106,670	23,177
1957	17,031	212,585	68,949	5.000	62/10	45/4	17/6	48.7	342.8	391.5	52,193	23,008	108,119	36,699
1958	17,656	220,025	68,688	5.228	65/9	46/11	18/10	48.0	347.1	395.2	53,020	23,714	111,863	42,571
1959	20,066	250,136	72,961	5.566	69/11	45/4	24/7	50.0	384.4	434.3	57,235	26,463	123,762	45,324
1960	21,383	268,009	73,841	5.865	74/2	46/6	27/8	50.9	391.4	441.5	60,857	27,963	132,919	46,974
1961	22,942	287,450	75,560	6.142	82/1	50/5	31/8	49.5	402.9	452.5	61,335	29,369	134,098	49,772

(a) Extracted from Annual Reports of the Government Mining Engineer. (b) Large mines only - Statistics from Annual Reports of the Government Mining Engineer. (c) Statistics from Annual Reports of the Transvaal and Orange Free State Chamber of Mines. (d) Source - C.W. Biccard Jeppe: Gold Mining in South Africa, Todd Publishing Group, London, 1948, p.35. (e) Witwatersrand only - Statistics from Annual Reports of the Transvaal Chamber of Mines. (f) All mines from 1952.

costs involved on the factors determining changes in costs. Here we will concentrate largely on the factors that determine changes in working costs. The factors that affect the supply price of capital, viz. interest rates and taxation of mining profits, will be discussed in a later section when we deal with the relation of gold mining investment to the trade cycle.

Table 2 shows in detail how the working costs of the large gold mine of the Witwatersrand (members of the Transvaal Chamber of Mines) were allocated in the years 1930 and 1945. This will enable us to see the relative importance of the different items entering into working costs.

The principal items in gold mining costs are wages and salaries, and stores. Together they have accounted for 85% to 90% of the total working costs over the period 1911 - 1961 for which figures are available. There has, however, been a secular trend for stores to increase and wages to decrease as a percentage of total costs. This has been largely due to a gradual increase in mechanization on the mines. The figures for the year 1945 in Table 2 do not reflect this trend, however, as many mining stores were unobtainable during the war. But since the war this relative increase in store costs has been particularly rapid due not only to continued mechanization but also to the fact that store prices have risen more than wage rates in the post-war inflation.

There has also been a trend for "social services" to increase as a percentage of working costs due to increased social legislation on the part of the State. All industries have been affected by this legislation. But due to the large number of accidents and the special incidence of miners' phthisis, in gold mining, the statutory contributions of the industry towards compensation and insurance funds are relatively higher than those of other industries.³¹ As annual not available, movements in these costs will not be discussed. But no single item in these two groups of costs is a large factor in total mining costs, so their omission will probably not materially affect our analysis.

In the following section we will consider the extent to which wage and store-costs are influenced by cyclical fluctuations in the economy and also the effect of changes in mining technique on costs.

(a) Wage Costs

Although white miners have only been employed in a ratio that has varied from one to seven to one to ten Africans, they have always earned on the average at least ten times the wages of African mine workers, and since the second World War this differential has risen to seventeen times. As a result the total wage bill for white miners has always been greater than that for African miners — more than twice as large from the beginning of the 1950s. The ratio in which white miners and African miners are employed is clearly a factor of considerable importance in determining total wage costs. Because of the wide differential in their earnings and the different factors affecting their movement, we will treat the wage-costs of the two groups separately.

(i) European wages and salaries

White wages are fairly flexible in an upward direction in boom periods.

TABLE 2

WORKING COSTS OF THE LARGE GOLD MINES OF THE WITWATERSRAND (MEMBERS OF THE TVL. CHAMBER OF MINES) - 1930 and 1945 (a)

Item	1930				1945			
	Amount (£000)	Costs per ton milled s.d.	s.d.	Percentage of Total	Amount (£000)	costs per ton milled s.d.	s.d.	Percentage of total
Wages and salaries (b)		14,313		46.2		31,900		46.4
European	7,866	5/0	9/1.2	25.4	19,500	6/7	10/10	28.4
Non-European	6,447	4/1.2		20.8	12,400	4/3		18.0
Stores (b)		13,312		43		28,400		41.4
Social Services (c)		800		3		3,400		4.9
Administration, etc.		2,510		7.8		5,000		7.3
Head Office costs etc. (d)	1,786	1/1.7		5.5				
Taxation (e)	724	5.4		2.3				
	30,935		19/7.9	100.0	68,700		23/4	100

(a) These are the only 2 years for which a detailed break-down of mining costs is available. The figures are derived from 2 sources viz., Report of the Low Grade ore Commission, 1930, U.G. 16. '32, p.26. and Report No. 11 of the Social and Economic Planning Council, "Economic Aspects of the Gold Mining Industry", 1947, U.G. 32-48, p.25. As mentioned above only the working costs of the large gold mines of the Witwatersrand that are members of the Transvaal Chamber of Mines are included in the table. These numbered 32 and 43 in 1930 and 1945 respectively. But as these mines in both years produced approximately 95% of the total gold output they are sufficiently representative of the whole industry in South Africa.

(b) The figures for wages and stores are not the same as those included in Table 1. The figures in the latter include all large mines.

(c) This item includes mainly statutory contributions in respect of miner's Phthisis, un-employment and workmen's compensation.

(d) This item includes head office costs, insurance, native recruiting expenses, fixed charges on Rand Water Board Stock and miscellaneous items. Figures only available for 1930.

(e) This item includes municipal rates, pass fees, claim licences and mynpacht dues. Figures only available for 1930.

In the two periods of war inflation, 1914-1930 and 1939-1951, the average annual income of all white employees on the mines³² rose by 53% and 93% respectively. (see Graph I). It went up a further 65% in the period 1951-61 although retail prices only rose by 35% in those years. Even in the upswing from 1933 to 1937 white incomes rose slightly although retail prices were falling. The exception was in the 1920's. Between 1923 and 1929 the average annual income of white employees remained almost constant.³³ But this was in keeping with the general constancy of the retail price level in this period.

White wages, however, are rigid in a downward direction. This is a feature common to most industries employing strongly unionised labour. But the problem of lowering the wages of white employees in the gold mining industry in a depression is aggravated by the fact that the industry has a much weaker case for lowering wages as the price of its product normally remains constant. (The exception to this rule was in the depression 1920-22, when the price of gold also fell.) Thus, while retail prices and wages in other sectors of the economy fell between 1929 and 1932, the income of white employees on the gold mines remained constant. Similarly in 1921 the incomes of white employees remained at their inflated 1920-level in spite of the rapid fall in prices and wages in other sectors. The attempt on the part of the Transvaal Chamber of Mines to lower costs in 1922 by reducing both the wages and numbers of white miners employed led to the famous General Strike of that year. But as the strike was won by the Chamber, wage costs were considerably reduced. The ratio of white to African miners was reduced from 1 to 8, to 1 to 10 and average white incomes were cut by 26%. This had the effect of reducing total wage-costs by 24%. As African wages remained constant, this factor was one of the chief causes of the 22% fall in costs between 1920 and 1923. (Other factors were a fall in the price of stores and technical innovations which will be dealt with in a later section.)

(ii) Non-European Wages

Practically from its inception the Rand gold mining industry has been organised on the basis of a large African labour force supervised by a relatively small number of high-paid white miners. In 1930, for example, the average rate of pay per shift was 2/3d for an African miner compared with 22/6 for a white miner,³⁴ i.e. exactly one-tenth of the wage of the white miner. To the cash wage of the African miner, however, must also be added remuneration in kind in the form of food and quarters costing 10½d. per shift in the same year.³⁵ It is clear that any substantial narrowing of the gap between white and African miners' wages would make an enormous difference to mining costs. If we take the year 1930, for example, and assume that African miners were suddenly to have received the same wages as white miners, working costs for that year instead of being £31 million would have risen to approximately £100 million, i.e. more than twice the value of the gold produced in that year.

Besides being low, the wages of African miners are extremely stable. "Nothing has changed so little in South Africa," an eminent South African authoress has written, "as the black man's rate of pay."³⁶ Nowhere is this more true than in the gold mining industry. African miners' wages display almost no cyclical sensitivity at all. Between 1920 and 1943 annual earnings per miner averaged

£34 with no more than a few shillings variation either way in any of those years (see Graph I). Between 1914 and 1920 they rose by only 10% compared with a rise in retail prices of 55% over the same period. Since 1943 they have shown a bigger increase than in the previous war period. But by 1950 they had only increased by 48.7% compared with a rise in retail prices of 65% over the period 1940-50. They rose a further 36% between 1950 and 1961, but even then they barely kept pace with the rise in retail prices over the same period.

The stability of African wages is the most important single factor causing the rigidity of mining costs with respect to changes in the level of activity and the general price level in South Africa. This stability and the lowness of African miners' wages are due to the numerous legal and other restrictions which govern the employment of Africans, the operation of the migratory labour system and the monopsonistic position of the Transvaal Chamber of Mines with regard to the recruitment of African labour. The mines do not compete with one another for the available labour. The Chamber operates two labour recruiting organisations; one for recruiting in South Africa and the other for recruitment beyond the borders of the Union. The available labour is distributed on a proportional basis to the individual mines. The Africans on their side are not organised into trade unions that can bargain for higher wages. The migratory labour system is also effective in keeping African wages low and stable. Workers are not paid a "family wage" as their families remain in the rural areas. The wages they earn merely supplement their income from agriculture. They are normally recruited for a period of about one year, after which time they return to their homes. While they are on the mines they live collectively and are provided with their food and shelter by the mining companies. Although cash wages are very stable there is probably some concealed fluctuation in wage costs in so far as the costs of maintenance vary with fluctuations in the level of activity. As this item is included in the cost of stores and is probably influenced by the same factors as determine movements in these costs, no particular purpose will be served by treating it separately. We will consider the factors affecting the supply of African labour in a later section.

(b) Store Costs

Costs of stores per ton milled, as can be seen from graph I, do not show a very high correlation with the South African trade cycle. This is chiefly due to two factors:-

- (i) the rigidity of store prices in both directions and
- (ii) anomalies in the movements of South African wholesale prices.

(i) The rigidity of store prices

Most of the principal mining stores (e.g. electricity and compressed air, explosives, coal, etc.) are bought on long contract and therefore move only slowly in price. This explains why store costs rose by only 53% between 1914 and 1920, compared with a rise in wholesale prices of 130%, and again why between 1939 and 1945 store costs per ton remained constant although wholesale prices rose by 56%. This does not signify, however, that prices of stores remained absolutely constant. Store costs per ton are only an index of the prices of stores

as long as the composition of the store items remains constant. In fact store prices did increase slightly during the war but this was offset by a fall in expenditure on unobtainable imported machinery, etc.³⁷ Store costs are also rigid in a downward direction as can be seen by the fact that store costs actually increased slightly in 1921 over their inflated 1920 level in spite of a sharp fall in wholesale prices. They also rose slightly in the depression from 1929 to 1932. Here again this does not signify that store prices actually rose in the depression. This increase is largely explained by the fact that more workers were put on to development work in the depression. This had the effect of raising costs without increasing the output of tons of ore to the same extent. Development work is normally accelerated when the supply of labour is plentiful and curtailed when labour is scarce. Footage developed per annum (for all mines excluding shaft-sinking) increased from 1.290.000 in 1930 to 1.506.000 in 1932.³⁸ But protective tariffs that had begun to be imposed after 1925 were an additional factor preventing store costs from falling in this period.

(ii) Anomalies in the movements of South African wholesale prices

On the whole South African wholesale prices have moved with the level of activity (see Graph 1). The notable exception was in the 1920s when wholesale prices steadily declined from 1925. This was the chief cause of the decline in store costs in the upswing phase of this cycle (see Graph 1).

South African price movements conformed with price movements in the rest of the world in this period although there were important differences in the degree of movement. As we can see from the following table the level of prices had risen less in South Africa in the 1920s than it had in other countries when compared with prices prevailing before the war. This difference in movement is important in explaining why store costs and gold mining costs as a whole had risen less in South Africa compared with costs in other gold-producing countries.

TABLE 3
Wholesale Price Indices 1913-1929
(1913 = 100)

	South Africa (All goods)	U.K. (Board of Trade)	U.S.A. (Bureau of Labour)
1913	100	100	100
1920	223	301	221
1922	128	159	138
1926	123	148	143
1929	116	136	138
Average 1922-29	124	151	140

Source of table, C.G.W. Schumann: The World Depression, South Africa and the Gold Standard, Maskew Miller, Cape Town, 1932, p. 27.

Before concluding this section on store-costs mention must be made of the factors determining these costs in the early days of mining on the Rand. Due to

lack of transport facilities, the scarcity of fuel and water and the granting of monopolies, the cost of mining stores was extremely high in the first few years of mining. The only form of transport at first was the ox-wagon. According to C.W. Biccard Jeppe "transport at £30 per ton represented fully one-third of the costs of mining."³⁹ Coal, which had to be brought from Middelburg by ox-wagon, cost £3 per ton in 1887.⁴⁰ The Government of the Transvaal Republic granted monopolies over certain important mining stores. The dynamite monopoly, for example, raised the price of explosives to £6 per case of 50 lbs.⁴¹ With the opening up of the railway connection with the Cape in 1892 and the discovery of ample supplies of cheap coal and water near the goldfields, store costs were rapidly reduced. Annual figures for store costs are not available for this early period, so no accurate picture can be gained of the movement in these costs in relation to cyclical fluctuations. The evidence, however, suggests that movements in these costs depended more on external economies than cyclical fluctuations in the economy.

(c) Technique

In addition to changes in the price of labour and stores, working costs also depend on changes in the technique of mining. Under changes in technique we include not only mechanical innovations but also changes in scale, organisation and skill. Besides the external economies already referred to in connection with the cost of stores, the reduction in working costs before 1910 was largely due to this factor. The most important cost-reducing innovation in the early days of the Rand was the introduction of the Macarthur-Forrest cyanide process for the treatment of ore in the sulphide zone in the 1890s. This process raised the recovery rate from below 60% to over 95%, thus greatly increasing gold output and lowering costs. The costs involved, however, were working costs per fine ounce of gold and not working costs per ton milled. Working costs per ton milled were also rapidly reduced by economies of scale, the development of the group system of administration, innovations in the methods of recruiting and organising African labour and a general increase in technical knowledge and skill. Mention has already been made of the development of large-scale production and the group system in the previous chapter. The group system enabled the administration of several mines to be economically concentrated in one office. It also enabled the mines to draw on expert technical services which were beyond their reach individually.

The second major phase of technical innovation on the Rand was the general introduction of the jack-hammer drill in place of the old hand-drill in the 1920s. This was a major cost reducing factor in this period. The Gold Producers Committee in their evidence submitted to the Low Grade Ore Commission of 1930 estimated that if in 1914 they had been working with the techniques in use in 1929, working costs per ton would have been reduced by 3/2, i.e. from 17/1 to 13/11. During the period, however, this saving in costs had been more than counterbalanced by the increased wages of white miners, increased miners' phthisis contributions, higher store prices and the increased costs of deep level mining entailing extra expenditure on support of workings, on pumping and on hoisting of men, rock and material.⁴²

One measure of the increase in mechanization is the tonnage handled

per man or, inversely, the number of employees at work per 1,000 tons of ore hoisted per day. Statistics for the latter are shown in the following table although it must be borne in mind that this is not a direct measure of mechanization but rather of the efficiency of labour. But increased efficiency has very largely been due to increased mechanization.⁴³

TABLE 4

Employees at work per 1,000 tons hoisted per day, Large Producing Mines 1910 — 1960

Year	Total number of persons at work per 1,000 tons hoisted per day	
	White	Non-white.
1910	250	1,858
1920	228	1,905
1930	158	1,559
1940	145	1,344
1950	157	1,273
1960 Witwatersrand and extensions	139	1,220
O. F. S.	124	1,125

Source: Annual reports of the Government Mining Engineer.

As can be seen from the table above the period of most rapid mechanization was in the 1920s. Although the large reduction in the number of white employees per 1,000 tons hoisted in this period was also due to the reorganization following the 1922 strike. But mechanization continued to increase in the 1930s and since the war although at a steadily diminishing rate. No figures are available, however, as to the effect of this factor in reducing (or offsetting) costs in the period since 1930. Although increased mechanization lowers wage-costs per ton it is partly offset by an increase in the stores consumed per ton as many capital items are included in the working costs of producing mines.

(d) Working Costs per Ton Milled and The Cycle

The net effect of these factors on working costs per ton milled can be seen in graph I. The correlation of working costs with the trade cycle is not very marked due primarily to the rigidities of wage- and store-costs, anomalies in the movements of prices and technical innovations.

Although annual figures for working costs per ton milled are not available before 1902, the evidence suggests they showed little cyclical sensitivity in the early period.⁴⁴ The trend in working costs was steeply downward in contrast to the general rise in prices from 1892-3. As we have shown, this fall in costs was due to technical innovations and internal and external economies in this period. This factor was still the prime cause of the sharp fall in costs per ton milled from 25/9 to 17/1 between 1902 and 1909, although the fall was accelerated by the general decline in prices in the depression.

Anomalies in the movements of prices partly explain the poor correlation of working costs with the trade cycle in the inter-war period. In addition the rigidity of wage- and store-costs in both directions reduced the sensitivity of working costs to fluctuations in the level of activity and prices. Between 1914 and 1920 working costs rose by only 50% compared with an increase of 130% in wholesale prices and 55% in retail prices. Similarly, between 1939 and 1950 working costs rose by 55% while wholesale prices rose by 100% and retail prices by 65%. On the other hand in the depression from 1929 to 1932 wholesale and retail prices fell by 20% and 11% respectively, while working costs fell by only 3%. The exception to this tendency was in the 1920s. After the post-war inflation working costs were reduced by 1926 to only 9% above their prewar average while prices in general remained 20 to 25 per cent above their pre-war level. But they were slow in falling. In 1921, in spite of the deflation that had set in from mid-1920, working costs were still at their 1920 peak level. It was only after the reorganisation that followed the 1922 strike and the mass introduction of the jack-hammer drill that costs fell.

(e) The Supply of African Labour

Although the supply of African labour is related to its price, already dealt with in section (b), we have preferred to consider the supply side separately in order not to overcomplicate the influences at work determining working costs.

The rigidity of the price of African labour tends to reduce cyclical fluctuations in gold mining costs and output. But output is also indirectly affected by fluctuations in the level of activity on the supply of African labour. The rigidity of wages leads to a shortage of labour in a period of price increases. Labour is attracted to other fields where price competition for its services is stronger. In spite of the increase in the costs of other factors the mines would be prepared to employ more African labour than is forthcoming at the prevailing price and so expand output. It is only when other costs have risen so sharply that the quantity of payable ore is considerably reduced that the demand for African labour also diminishes. This seems seldom to have been the case. The marginal product of an additional African labourer is normally in excess of his marginal cost. The fact that mines are not working at full capacity in a period of labour shortage may add somewhat to their costs but their costs would be still higher if they offered a competitive wage to attract more labour. At the higher cost per ton, output could only be maintained at the full capacity level if sufficient ore of a high grade were available. Low grade mines would have to close down and even if some of the richer mines benefited from the increased supply of labour, on balance the effect would probably be to lower output still further than under conditions of rigid wages and labour shortage.

Similarly in a depression, the increase in gold output is due more to an increase in the supply of African labour than to a fall in mining costs. A considerable amount of surplus capacity will have developed in the previous period of prosperity. But rural depression and the fall in the demand for labour in other industries such as the diamond mining industry will lead to a large increase in the supply of labour and the mines will be able to work to full capacity.

The supply of African labour is strongly influenced by cyclical factors particularly as they affect agricultural prosperity and the demand for labour on

the diamond mines. The sharp increase in the supply of labour in the 1930s and the decreases from 1916 to 1922 and after 1941 are evidence of the fact.

But lags in the mobility of labour may reduce the speed with which African labour reacts to changing cyclical conditions. Because of the time taken in recruiting and transporting migratory African labour to the mines, a considerable amount of time may elapse before a fall in demand for African labour in one sector leads to an increase in the numbers employed on the gold mines. Unemployment this year may only lead to an increase in the numbers working on the gold mines next year. When a depression is of short duration, as for example between 1937 and 1939, we find that the increase in the supply of labour is more rapid in the recovery phase of the cycle, 1940-41, than in the depression itself.

Other factors have also obtruded to offset the cyclical movement of the supply of labour. In the depression of 1913-14 the supply of labour fell off due to severe strikes on the part of white miners. As these strikes were partly directed against the employment of Africans and led to much racial bitterness, they were deterred from coming to the gold mines. There were approximately 45,000 fewer Africans on the mines in December, 1913, as compared with the same month in 1912.⁴⁵ An additional factor was the law passed in May, 1913, forbidding the recruitment of Africans from North of Latitude 22 South. This meant a loss of 15,000 workers per annum to the mines.

Another factor of a non-cyclical kind that affects the supply of African labour is a change in harvest conditions. After a bad harvest there is usually a marked increase of labour to the mines. This does not necessarily lead to an increase in gold output in the short run because the gold mines often use this temporarily increased labour force for development work neglected in a time of labour shortage. While this leads to an increase in output in the long run it may raise costs per ton milled in the short run. Similarly costs per ton milled may fall when fewer workers are put on to development work.

Changes in population growth, industrialisation and urbanisation are also factors that influence the supply of labour to the gold mines. The influence of these factors can of course only be seen over relatively long periods of time. But they are significant in explaining changes in the supply of labour in certain periods. The steady increase in the supply of labour in the prosperous Twenties is associated with a relatively high rate of growth of the African population in this period (an annual average rate of increase of 2.29% from 1921 to 1936, compared with only 1.57% between 1911 and 1921). On the other hand the sharp fall in the labour supply in the Forties and early Fifties is not unconnected with a slowing down in the population growth (only 1.73% per annum between 1936 and 1946) combined with the rapid industrialisation and urbanisation of the war and post-war period. The mines had to rely increasingly on labour from beyond the borders of South Africa. But so acute was the labour shortage after the war that at least one of the major mining houses was seriously considering departing from the traditional pattern of migratory labour on their new Orange Free State gold mines. In order to ensure a continuous supply of labour they were prepared to incur the higher cost of establishing a permanently settled African labour force. The scheme was dropped, however, because of opposition from both Government and other mining houses. The increase in the supply of labour that rescued the industry in the late Fifties and early Sixties was once again influenced by an increase in African population growth (2.48% per annum between

1951 and 1960) and a slowing down in the tempo of industrialisation.

THE PRICE OF GOLD

Since the First World War the price of gold has not remained constant for any appreciable length of time so that an important constant in the theory of gold supply and the trade cycle must now be treated as a variable. The price of gold could hardly be said to be cyclically determined in the case of South Africa although it is true that the depreciation of the currency (increase in the price of gold) between 1919 and 1925, 1932 and 1939 and again in 1949 was indirectly determined by the general economic situation. But there is no necessary causal relationship between any phase of the trade cycle and the depreciation of the currency. The depreciation of the currency at the end of 1932 took place at the bottom of a depression while that of 1919 and 1949 came in a period of inflation and full employment, although there had been a slight recession in South Africa from late 1948 to mid-1949. The policy of adherence to sterling and political considerations have been the dominant factors. In both 1919 and 1949 South Africa shared with the United Kingdom deficits in her balance of payments but the timing of the devaluations and their extent were primarily determined by the balance of payments situation in the United Kingdom and the Sterling Area *vis-à-vis* the dollar area. South Africa was not "forced off" the Gold Standard at the end of 1932. She actually had a considerable active balance in her international payments in that year. The policy of the South African Government had been to remain on gold and not follow sterling in devaluing after September, 1931. But considerable internal political pressure and a speculative flight of capital from South Africa caused the Government to change its policy and link the South African pound with sterling at the end of 1932. Thereafter the price of gold reflected the change in the rate of exchange between sterling and the U.S. dollar, fixed from 1933 at the new price of \$35 per fine ounce.

Changes in the price of gold have tended to offset the effect of cyclical factors on gold output.

Gold output declined in the inflationary period during and after the First World War. By July, 1919, 3 mines had closed down and 21 mines were working either at a loss or at a profit of less than 2/- per ton.⁴⁶ The increase in costs particularly affected the low-grade ore mines which were not in the position to compensate the increase in costs by raising the grade of ore mined. But from July 24th, 1919 the position altered when a premium began to be paid on the fixed price of gold. By February, 1920 the price of gold reached its maximum of 127/4 per fine ounce or an increase of approximately 50% above the standard price of gold. Gold mining profits and dividends were actually higher in 1920 (the peak year of the inflation) than they had been before the war and the grade of ore was even slightly reduced. While the higher price of gold did not actually check the decline in gold output that had begun in 1917, it slowed it down considerably. Costs per ton had increased by 19% between 1918 and 1920 whereas gold output fell by only 3%.

Devaluation in 1949 had a similar effect on gold output. It raised the price of gold from £8.12.6 to £12.8.3 per fine ounce — an increase of approx. 44%. Output had declined steadily from 1941 to 1948 (in 1947 output fell abnormally

due to a prolonged strike in that year). The higher price of gold checked the fall in output, albeit only temporarily, in spite of a continued increase in costs. It greatly increased profits as can be seen from the dividend figures after devaluation (see Table I). Tonnage milled increased by 4,000,000 tons between 1948 and 1950 but gold output responded only slightly due to a lowering of grade.

The offsetting effect of the higher gold price on the declining gold output of the old Rand mines proved to be only temporary. After devaluation mining costs rose steeply from 27/- in 1949 to 35/11 by the end of 1952, due to the inflation brought about by the devaluation itself and the post-Korean War rise in prices. This rise in costs soon swallowed up most of the benefit to the industry of the higher gold price so that output and profits were lower in 1951 than in 1950. This decline in total output would have continued into 1952 were it not for the fact that two large new Far West Rand mines — West Driefontein and Stilfontein — came into production in 1952, and the first two new Orange Free State mines, St. Helena and Welkom, completed their first full year of production. These 4 mines added 421,000 ounces to the total gold output of South Africa, offsetting a decline of 111,000 ounces in the output of the old Rand mines in that year.

Several new mines have since come into production in the Orange Free State, Klerksdorp, Far West Rand and Evander areas. As a result from 1952 total South African gold output has been increasing rapidly in spite of a continued increase in working costs and the steady decline in output of the old Rand mines. But were it not for devaluation there can be little doubt that the old mines would have declined far more quickly in the face of rising costs and the opening up of new mines might very well have been delayed.

Devaluation at the end of 1932 had the opposite effect on gold output to that of the two previous devaluations dealt with. Because it induced a much larger fall in the grade of ore mined there was a sharp fall in output in 1933 and 1934. At the same time it also stimulated an increase in tonnage milled, but it was not before 1937 that the increase in tonnage milled had compensated for the fall in grade to bring gold output to the 1932 level again.

GRADE OF ORE

Grade of ore mined, as we have already shown, is not an independent variable. It depends on the costs of mining, the price of gold and mining taxation. As grade is inversely related to the profitability of mining it will tend to offset a change in output due to a change in costs or price. It is only cyclically determined in so far as mining costs move cyclically. But its effect is opposite to that of changes in costs so that changes in grade tend to reduce the anti-cyclical behaviour of gold output.

Between 1915 and 1919 costs rose by 31.5%, tonnage milled fell by 16% — but due to the increase in grade, gold output fell by only 8%. Similarly the decline in grade from 1930 to 1932 caused gold output to increase by less than the tonnage. The rise in the price of gold at the end of 1932 led to a sharp fall in grade with the result that gold output actually fell in 1933 and 1934. This fall in grade was partly the result of the normal policy of the mining industry of mining the average grade of payable ore but it was also accentuated by the Government's imposition

of an Excess Profits Tax in 1933. In its later version the tax took the form of 50% of profits minus 5% of costs with a minimum of 15% of profits — the normal level of income tax. It therefore paid the mines to incur as big a cost as possible in earning a given amount of profit by mining low-grade ore.

NEW DISCOVERIES OF ORE

In the previous chapter we asserted that new discoveries of gold ore in South Africa tend, to-day, to be the result of painstaking research and prospecting strongly influenced by cost factors and the general profitability of gold mining rather than the result of pure accident. The timing of these discoveries, however, contains an element of chance and is certainly not related to any particular phase of the business cycle.

The increased profitability of gold-mining in the 1930s led to the discovery and opening up of the Far West Rand, known as the "West Wits Line". The discovery of the Orange Free State goldfield in 1946, however, came at a time of rising costs and decreasing profitability of gold mining on the Witwatersrand. But prospecting in the Orange Free State had begun in the mid-1930s and it was largely through these early pioneering efforts that this new field was discovered. While the actual timing of a new discovery may be accidental, whether or not a new ore discovery is exploited depends on the payability of the field which in turn depends on the extent of the ore deposits, the average grade, costs of mining and the price of gold in relation to the supply price of capital. Had the Orange Free State discoveries revealed an average grade of ore similar to that of the old Rand, it is certain that it would not have paid to exploit it in the post-war period.

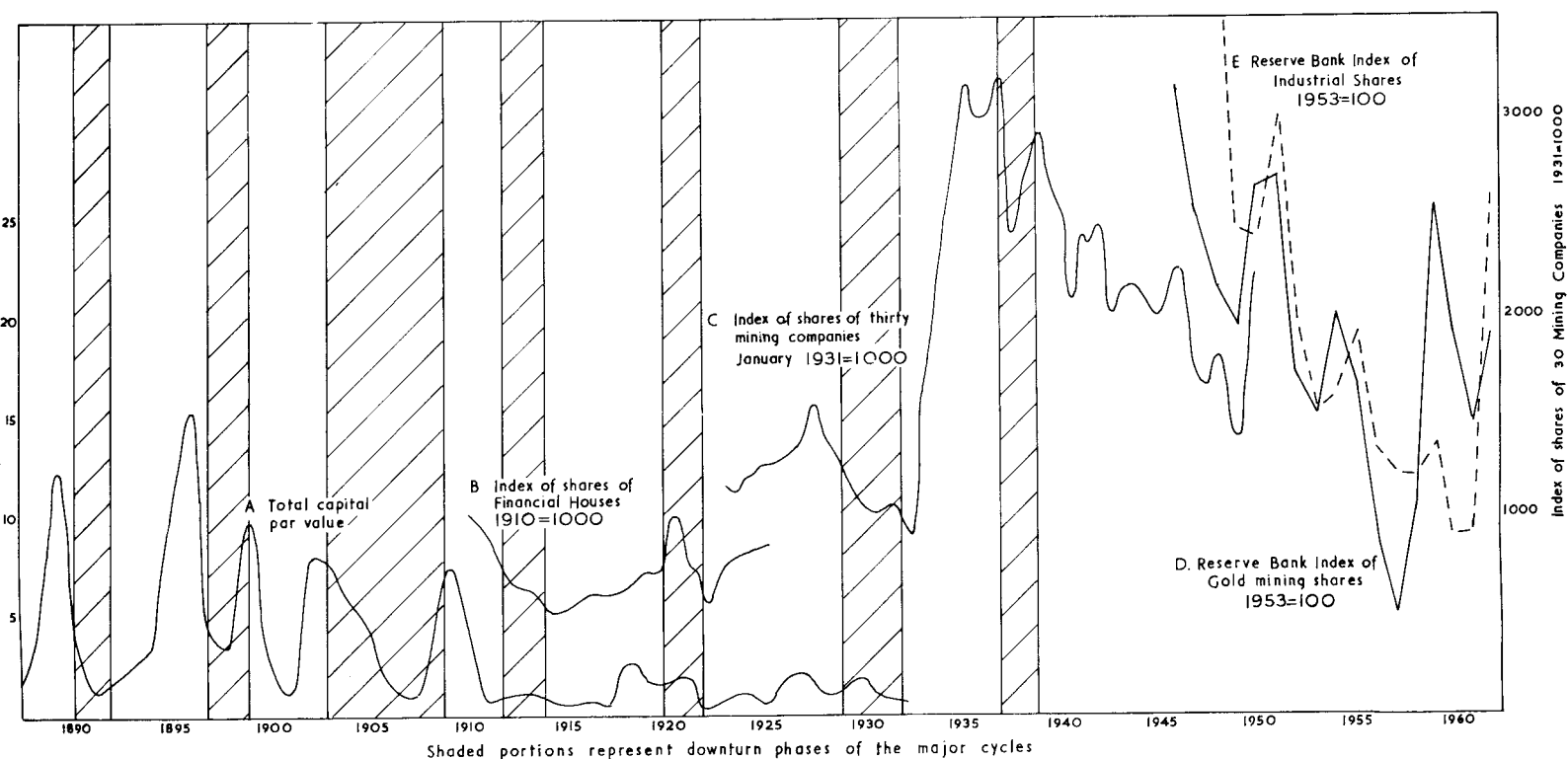
GOLD MINING INVESTMENT AND THE TRADE CYCLE

We have as yet said nothing about the relation of gold mining investment to the trade cycle and its effect on gold output. In order for gold mining investment to follow an anti-cyclical pattern a number of assumptions similar to those for gold output must be made:-

- (1) Costs must move cyclically. This includes the cyclical movement of the interest rate.
- (2) The price of gold must be constant.
- (3) Gold mining taxation must be constant.
- (4) The unexploited reserves of ore must be of the same average grade as that prevailing in the producing mines.
- (5) Expectations as to future costs must be elastic.
- (6) The risk factor must be constant.

Assumptions (1), (2) and (3) need no further elaboration as it is clear that unless they hold good, the profitability of gold mining will not move anti-cyclically. Assumption (4) is important because if a new body of ore is discovered with a grade much higher than that prevailing in existing mines, then, other things being equal, investment will take place even in the upswing of the cycle

GRAPH III GOLD MINING INVESTMENT AND SHARE PRICE INDICES 1887-1962



- A. Figures taken from S. Frankel "Capital Investment in Africa" page 95
 B. Figures taken from C. G. W. Shumann Chapter 9
 C. Figures taken from Official Year Books of Union of South Africa
 D. Figures taken from Quarterly Bulletin of Statistics of the South African Reserve Bank
 E. Figures taken from Quarterly Bulletin of Statistics of the South African Reserve Bank

when costs are rising and the profitability of mining is declining.

Elastic expectations as to future costs (5) means that a change in costs must be considered to be permanent. If a change in costs is soon expected to be reversed then expectations as to the future profitability of an investment in gold mining will not be affected by the current change in costs. Investment, therefore, could take place in a boom when costs have risen and be discouraged in a depression when costs have fallen.

Assuming the constancy of the risk factor (6) is a far-reaching assumption to make in an activity as risky and speculative as gold mining investment, where, as we shall see, the psychological attitude to risk is subject to such wide variations. Nevertheless, this assumption must be made in order for gold mining investment to depend largely on changes in objective conditions.

How far actual conditions in South Africa diverge from the rigorous conditions set out here will be seen in the following pages.

From graph III we can see that although gold mining investment has been subject to wide fluctuations, these fluctuations display little inverse correlation with the South African cycle. In fact the first four investment booms of 1889, 1895/96, 1899 and 1902 are closely related to years of high cyclical activity in the rest of the economy. As we will suggest in Chapter V, changes in the level of gold mining investment were a determinant of cycles in the pre-1910 period rather than determined by them. Investment in gold mining seems to have been largely autonomous in this period as far as the South African cycle is concerned. There does, however, seem to be some inverse correlation between booms in South African gold mining investment and English cycles as the following table suggests:-

TABLE 5
Cycles in gold mining investment, (a) British Cycles (b)

Trough	Peak	Trough	Peak
1891	1899	1886	1890
1898	1896	1894	1900
1900	1899	1904	1907
1907	1902	1908	1913
	1909		

- (a) Source:- S.H. Frankel, *op.cit.*, table 14, p. 95.
 (b) Source:- W.W. Rostow, *op.cit.*, table 11, p. 33.

The peaks in gold mining investment seem to be related to the early recovery phases of British cycles and in no case do the peaks in gold mining investment coincide with the peak years in British cycles. This is perhaps of some significance because foreign capital, and particularly British capital, largely pioneered the Witwatersrand. It suggests that gold mining investment was more attractive in periods of low cyclical activity.

In the protracted depression of 1903-09, gold mining investment remained at a relatively low level in spite of continuously falling costs and the rapid growth of output and profits. The mining boom of 1909/10 came in the early years of recovery. But between 1909/10 and 1933 mining investment remained at a low level showing almost no response to major cyclical fluctuations in the economy. The gold mining investment boomlets of 1918 and 1927, do coincide, however, with

minor recessions in the economy in those years.

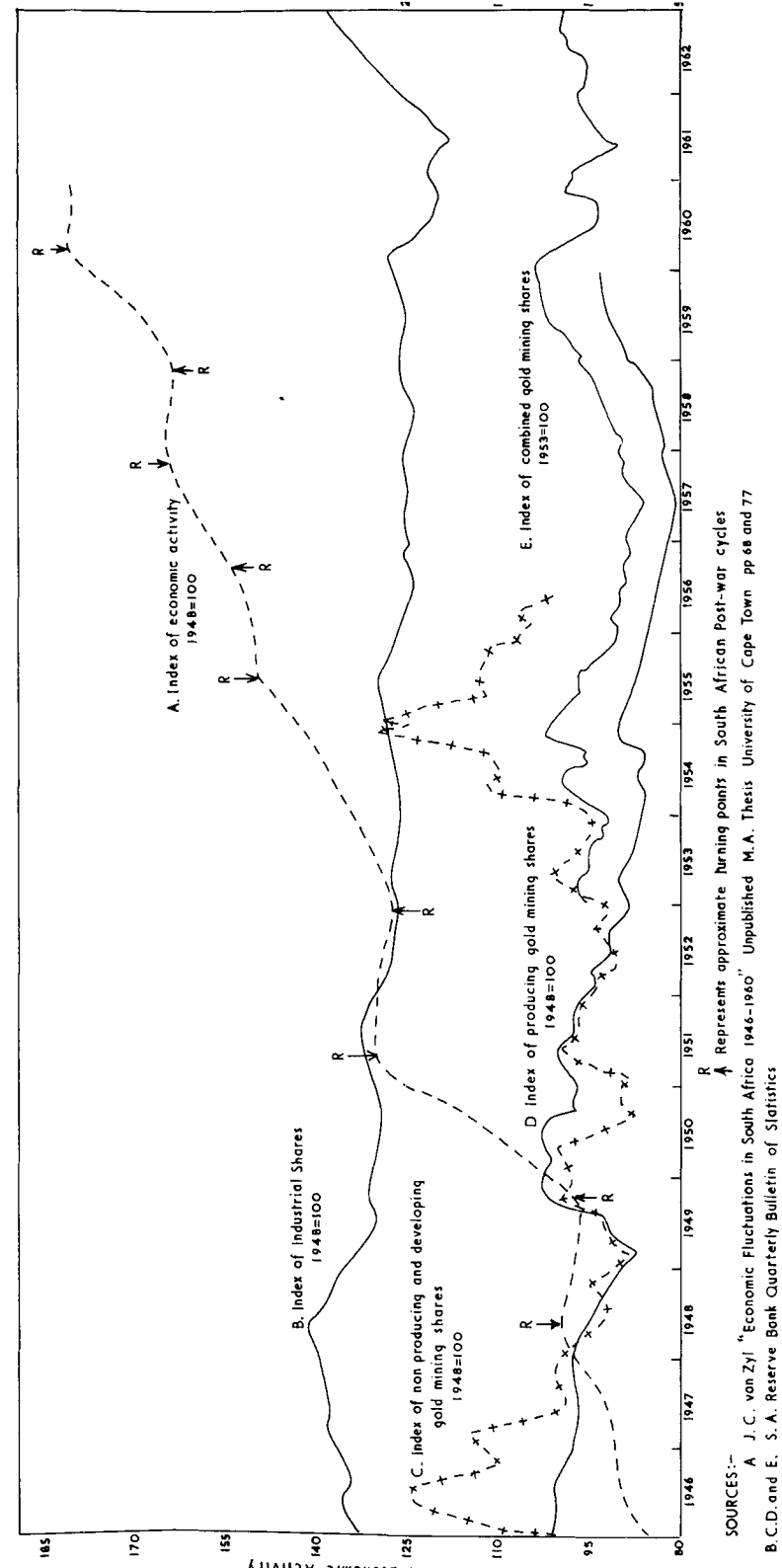
The great boom in mining investment after 1933 and the somewhat smaller boom since the Second World War, has been due, primarily, to a change in the constants, price of gold and grade of ore of unexploited resources, rather than cyclical factors.

That mining investment did not increase in the depressions of 1913-14 and 1920-22 can be attributed to the special disturbing factors at work during those years which affected the confidence of investors in the industry. The failure of mining investment to respond in the depression from 1929 to 1932, however, is perhaps more surprising in view of the availability of unemployed resources and increased profitability of the industry. But as we have already shown, costs fell only slightly and the increase in profits was not spectacular. It was also not before mid-1932 that there was a substantial fall in interest rates. But looking at the index of gold mining share prices (see graph III) it would seem that gold mining assets tend to be capitalised at a higher rate of interest in a depression. The decline in the price of gold mining securities from 1929 to 1932 cannot be explained by a fall in profits. Investors in gold mining stock seem to be affected by the general mood of pessimism prevailing in the capital market in a depression. In a boom the reverse is often the case. In the boom and inflation years of 1915 to 1918, for example, the value of gold mining shares increased steadily although profits and gold output were on the decline. A similar development took place in the years of general expansion from 1925 to 1927 and again after the war in 1945 and 1946 in spite of the fact that gold mining profits were declining. Speculative shares like Kaffirs seem to become popular, at least for a time, in a general boom when investors are less cautious, liquidity preference is low and a mood of optimism is prevalent.

The behaviour of gold mining shares since the Second World War is, however, more complex than the annual index in graph III suggests. Although no exhaustive investigation will be attempted here a further analysis of price movements in this period is of some interest. The details are presented in graph IV. All indices are shown on a monthly rather than an annual basis as there are wide fluctuations in prices within calendar years. Separate indices for producing and non-producing mines are given until early 1956. Thereafter only a new combined gold mining index (back-dated to 1953) is available. For comparative purposes an index of South African industrial shares has been included and a general index of economic activity has also been added so that share movements can be related to the business cycle. But caution must be exercised in using this general index of economic activity particularly as regards the exact timing and amplitude of cycles. The index is based on limited and rather inadequate statistics but is nevertheless useful as a guide to the post-war cycle.

From this graph it can be seen that the boom in gold mining shares in 1945 and 1946 was dominated by the shares of non-producing mines — particularly the speculative new Orange Free State issues. But there was also a distinct, if gentle, upward movement in the shares of producing mines as well from 1943 until about the middle of 1946 in spite of a steady fall in output and profits. The upward movement is less pronounced if the shares of the rich Blyvooruitzicht mine are excluded from the index (this is not shown on the graph). Also the downturn in the share prices of the other producing mines comes sooner — towards the end of 1945. Nevertheless the thesis advanced earlier, that in some boom

GRAPH IV INDICES OF GOLD AND INDUSTRIAL SHARES AND ECONOMIC ACTIVITY 1946-1962



SOURCES:—
A. J. C. van Zyl "Economic Fluctuations in South Africa 1946-1960" Unpublished M.A. Thesis University of Cape Town pp 68 and 77
B. C. D. and E. S. A. Reserve Bank Quarterly Bulletin of Statistics

periods investors in gold mining take a more optimistic view of prospects in the industry than objective conditions dictate, still seems to be borne out. There is evidence of this happening again early in 1951 when a rise in gold mining shares coincides with the latter phase of the post-Korean War boom, in spite of a decline in gold output and profits. Similarly the rise in the price of the shares of the old Rand mines in the boom year of 1959 (continuing their recovery from the low-point in the middle of 1957), and again in the general recovery period from mid-1961 to mid-1962, cannot be explained in terms of any improvement in the objective conditions in these mines but rather in investors sharing the general confidence prevailing and therefore being willing to accept a lower rate of return on these assets.

On the other hand, the downward slide in gold share prices in the recession of 1955-56 and the more dramatic fall in the post-Sharpeville recession of 1960-61, in spite of a steady increase in output and profits in the industry in both these periods, is further evidence of the great sensitivity of the gold share market in a downward direction when there is a general lack of confidence in the economy.

The comparative lack of interest and slight downward drift in gold share prices since mid-1962 contrasting with the spectacular rise in the price of industrial shares in the present boom is more in keeping with one's theoretical expectations. But this seems to be the exception. On the whole gold share prices have tended to move with rather than against the post-war business cycle.

While real investment in gold mining is not subject to the same degree of fluctuation as the market for mining securities, it would seem that the primary risk-takers in gold mining investment are also more cautious in a depression than they are in a boom in spite of the objective conditions.

Although the indirect correlation between gold mining investment and the cycle is a poor one and the influence of non-cyclical factors is strong, cyclical factors have nevertheless had some effect.

In spite of the gradual increase in gold output and stability of costs in the boom of the 1920's, little new capital went into the industry. Net investment in gold mining was actually minus £4.5 million for the period 1922/23 to 1928/29 (see Table 10). The high interest rates that prevailed throughout the 1920s and the return of the price of gold to its pre-war parity price of 85/- per fine ounce in 1925 made gold mining less attractive than other forms of investment. This is reflected in the decline in the price of gold mining securities from 1927 to 1929 while other industrial shares continued to increase in price until 1929.

The main stimulus to the great increase in investment in gold mining in the 1930s was the increase in the price of gold after December 28th, 1932, which by 1934 averaged 137/8 per fine ounce (i.e. an increase of approx. 60% above the old gold parity price). It is also unlikely that in the absence of the price increase mining investment would have expanded very much — costs having fallen by only 1/1 per ton by 1936 below the 1929 level. But given the increase in the price of gold, cyclical factors helped considerably to maintain the high rate of investment until the outbreak of the war. Interest rates were low and the mines were able to obtain almost unlimited supplies of factors at constant prices.

After the Second World War mining investment was not in such a favoured position as in the 1930s. The same factors that caused a decline in gold output

on the old Rand also slowed down the development of the Orange Free State goldfields in spite of their favourable prospects.

Labour shortage was the most acute problem but there was also a shortage of complementary factors of production such as power and water supplies. The new mines were also unable to attract the large sums of capital needed sufficiently quickly to bring them speedily to the production stage. Since the war it has taken from £7 to £8 million to bring a large mine to the production stage.⁴⁷ Some estimates have been as high as £11 million⁴⁸ as compared with the £2 to £3 million required before the war. Besides the capital needed for the mines themselves, large sums have also been required for public utilities, housing facilities, etc., that are indispensable for the development of a new goldfield. Dr. W.P. de Kock estimated in 1950 that it would take at least £300 million to fully equip the Orange Free State Goldfield with the necessary social overhead capital as well as the capital directly needed by the mines themselves.⁴⁹ In view of the inflation that still occurred after this estimate was made this sum was probably on the conservative side. Capital shortage is a common feature of a strong boom, particularly one as prolonged and as intense as that which took place in South Africa after the war. Competition for the available capital resources was much greater, therefore, in the first few years after the war than it was in a period of less than full employment like the 1930s. Foreign private risk capital, in particular, was more difficult to raise in adequate quantities. As a result the mining companies had to resort to new techniques of acquiring capital — in particular loan capital had to be raised in addition to the traditional equity capital — in order to meet their commitments.

Net investment in gold mining between 1946 and 1951 was £114 million compared with £55 million between 1933/4 and 1938/9 (see table 10).⁵⁰ The latter sum, however, probably represented more real investment in view of the rise in the capital cost of gold mining by at least 300%. By 1960 a further sum of £316 million was invested in the gold mining industry. If we also include the money invested in uranium plant, the net investment in the industry between 1946 and 1960 was approximately £500 million.

THE EFFECT OF FLUCTUATIONS IN INVESTMENT ON GOLD OUTPUT

Because of the long gestation period of gold mining investment — a large mine can take from 5 to 7 years before it is brought to full production — investment that takes place in a depression or the early recovery phase of the cycle may only come to fruition in the late stages of the boom or even in the next cycle. This is one of the factors that accounts for a rise in gold output in the recovery phase of a cycle even when costs are rising. It was not until 1915/16 that the new mines begun in the investment boom of 1909/10 came to the producing stage. As a result mining output expanded continuously from 1915 until March, 1917 in spite of a rise in costs of 2/- per ton over the 1914 level. The new mines compensated for the decline in output of the older low-grade ore mines. In fact 1916 was a record year for gold output on the Rand, when in most other countries output had begun to decline after 1915.

Similarly, the investment begun in the early years after devaluation only

began to make its contribution to gold output in the late 1930s and early 1940s. The rich Blyvooruitzicht mine on the Far West Rand, for example, only came into full production in 1942. The years of most rapid increase in gold output after devaluation were in fact from 1938 to 1941 during which period gold output increased by 19% in spite of a rise in costs of 1/10 per ton.

CONCLUSIONS AND SUMMARY

Surveying the history of the gold mining industry with respect to cycles in the general economy for the period 1886-1961 as a whole, we can come to the following conclusions:-

In 5 out of the 7 major downswings in our period gold output expanded, viz. 1890-92; 1897-98; 1903-1909; 1929-1932 and 1937-1939 (see graph II). In only 2 out of the 8 major upswings, however, did gold output decline, viz. 1917-1920 and 1941-1951, and these were both in periods of extreme inflation in the economy. It would seem, therefore, that the industry is more sensitive to a decline in general activity than it is to prosperity in the economy as a whole. This discrepancy can be attributed largely to the anomalies in price movements, rigidity of costs, the grade policy of the industry, fortuitous increases in the price of gold and new discoveries of ore.

In the pre-1910 period, the young industry displayed little cyclical sensitivity at all. Except for the break occasioned by the Boer War, output expanded rapidly and continuously through boom and slump. Costs in the industry were determined largely by technical progress and other internal factors rather than by external price movements, although the depression in the economy and decline in the price level from 1903 to 1909 did make it easier for the industry to reduce costs. Gold mining investment on the other hand was subject to extreme fluctuations in this period and followed the cyclical pattern in the economy rather than moved against it.

By 1910 the industry had reached a fairly mature stage in its development and from then on displayed more cyclical sensitivity. In the upswing to 1912 mining costs increased but this was offset by a rise in grade. In the depression till 1914 costs fell, but so did output because of the strikes of 1913 and 1914. In the early recovery phase output increased (in spite of a slight rise in costs) due to the additional supply of labour caused by continued depression in the diamond mining industry and the opening up of new mines that had been started in the investment boom of 1909/10. Output declined in the war and post-war boom, but this decline was slowed down by the increased price of gold after July, 1919, the raising of grade and the rigidity of costs in an upward direction. The value of gold output and gold mining dividends actually increased in the latter part of the boom. Gold output continued to fall in the depression from 1920 because of the fall in the price of gold and the rigidity of costs in a downward direction. The decline was accentuated by the General Strike in 1922 which brought the industry to a standstill for a number of months.

In the upswing of 1929 output gradually increased but this does not give a true picture of the condition of the industry. While output increased, working profit per ton decreased and profits remained static. Net investment in the period was negative and by 1929 the position of the low-grade ore mines in the

industry had become serious. Three mines closed down in 1929 and of the 32 producing mines belonging to the Transvaal Chamber of Mines, 10 paid no dividends at all and 86% of the dividends declared in that year came from the relatively new mines of the Far East Rand where only 40% of the total tonnage was crushed.⁵¹ Gold output expanded more rapidly in the depression, however, with a large increase in the numbers employed and a slight fall in costs. Devaluation greatly accelerated this expansion and led to a rapid expansion of the industry and new investment on a large scale. The value of gold produced and tonnages milled is a better guide to the industry's development after 1932 because of the sharp fall in grade which led to an actual decline in ounces produced in 1933-34. In spite of the prosperity of this period costs continued to fall to 1936 and remained fairly stable until the outbreak of the Second World War. The rate of growth of output slowed down in 1936 and 1937 due to labour shortage, but in the depression of 1938 and 1939 it increased again. Output continued to increase until 1941 in spite of rising costs as many new mines begun in the early years after devaluation only came into production at the end of the 1930s and the early war years. Output fell steadily in the war and post-war upswing to 1948. But devaluation in 1949 and the opening up of new mines in the Orange Free State, Far West Rand, Klerksdorp and Evander areas not only checked the downward trend in output but led to a sharp increase in gold production from 1951 onwards in spite of a continued increase in costs. In 1962 gold production in South Africa exceeded 25,000,000 fine ounces for the first time. Three-quarters of this output came from the four new mining areas.

WORLD GOLD PRODUCTION AND THE TRADE CYCLE

From Table 6 we can see that South African gold output fluctuates less widely than gold output in other countries. As a result there is a fairly regular tendency for her share of world gold output to increase in a period of price increases and high cyclical activity and decrease when prices and general economic activity are at a low level. Between 1915 and 1920 gold output fell by only 11% in South Africa, whereas in Australia and the U.S.A. it fell by 50%. South Africa's share of world gold output increased by 10% in this period. A similar process took place in the late 1920's, during the Second World War and again in the 1950's. By 1962 South Africa was producing over two-thirds of the world's gold (excluding the U.S.S.R.). During the depression years 1929-1932, on the other hand, American and Canadian gold output increased by 50% and that of Australia by 70%, while South Africa's increased by only 11% so that her share of world gold output fell by 6%. By 1939 her share of world gold output had fallen by fully 20%. Because of the cost rigidities, grade policy, length of the gestation period of mining investment and State interference peculiar to the South African gold mining industry, gold output in South Africa is less cyclically sensitive than in other countries. The contrast between fluctuations in gold output in South Africa and the U.S.A. is particularly striking. Fluctuations in gold output in the U.S.A. show the closest indirect correlation with the business cycle of any gold producing country. The decline in American gold output in the periods 1911-1913, 1916-20, 1925-29, and during and since the Second World War, are closely related with the upswing

TABLE 6

WORLD PRODUCTION OF GOLD 1884-1962

Year	South Africa		United States	Canada	Australasia	S.Rhodesia	Total world Production
	Production	% of world total					
	Fine ozs. (000's)	%	Fine ozs. (000's)	Fine ozs. (000's)	Fine ozs. (000's)	Fine ozs. (000's)	Fine ozs. (000's)
1884-1902	22,503	13.6	-	-	-	-	166,101
1903-1909	38,350	28.6	30,054	4,331	27,347	3,248	133,889
1910	7,531	34.2	4,657	494	3,167	610	22,022
1911	8,251	36.8	4,687	472	2,911	629	22,397
1912	9,109	40.3	4,521	612	2,637	643	22,605
1913	8,799	39.5	4,230	803	2,569	690	22,929
1914	8,396	39.4	4,573	773	2,301	854	21,876
1915	9,096	40.0	4,888	918	2,370	915	23,010
1916	9,297	42.2	4,479	930	1,958	930	22,400
1917	9,018	44.3	4,051	739	1,664	834	20,457
1918	8,418	45.2	3,321	700	1,491	631	18,701
1919	8,332	47.1	2,919	767	1,302	593	17,376
1920	8,158	50.6	2,476	767	1,144	552	16,130
1921	8,129	50.9	2,422	926	903	586	16,007
1922	7,010	45.4	2,289	1,263	912	653	15,576
1923	9,149	51.4	2,426	1,224	877	647	17,978
1924	9,575	50.3	2,446	1,525	800	628	18,667
1925	9,598	50.4	2,320	1,736	673	582	18,734
1926	9,955	51.4	2,239	1,754	652	593	19,252
1927	10,122	52.1	2,117	1,853	689	581	19,180
1928	10,354	52.4	2,145	1,891	688	576	19,399

1929	10,412	53.4	2,057	1,928	585	561	19,612
1930	10,716	51.4	2,100	2,107	622	548	20,576
1931	10,878	48.7	2,214	2,695	784	532	21,862
1932	11,559	47.9	2,919	3,051	998	574	23,792
1933	11,014	43.4	2,277	2,949	1,158	642	25,238
1934	10,480	37.5	2,742	2,972	1,257	691	27,007
1935	10,774	35.8	3,237	3,285	1,354	726	29,900
1936	11,336	34.2	3,768	3,748	1,601	797	33,115
1937	11,735	33.8	4,123	4,096	1,381	804	34,723
1938	12,161	32.9	4,267	4,725	1,592	814	36,909
1939	12,822	33.2	4,673	5,094	1,646	873	38,810
1940	14,047	34.9	6,003	5,311	1,644	907	40,242
1941	14,408	36.5	5,976	5,345	1,497	867	39,436
1942	14,127	40.4	2,742	4,841	1,154	834	34,937
1943	12,804	48.0	1,395	3,651	751	721	26,694
1944	12,280	51.3	1,022	2,293	657	650	23,959
1945	12,225	53.1	915	2,697	657	658	23,043
1946	11,927	50.7	1,462	2,808	824	545	23,504
1947	11,200	46.9	2,165	3,069	929	523	23,866
1948	11,585	46.4	2,025	3,530	891	514	24,959
1949	11,705	45.2	1,996	4,124	893	528	24,884
1950	11,664	43.9	2,375	4,441	861	511	26,586
1951	11,516	44.5	1,996	4,393	896	487	25,866
1952	11,819	44.6	1,938	4,450	978	497	26,485
*1953	11,941	48.7	1,990	4,061	1,078	501	24,500
1954	13,237	51.1	1,867	4,310	1,110	536	25,900
1955	14,601	53.7	1,913	4,580	1,050	525	27,200
1956	15,897	56.2	1,860	4,396	1,031	536	28,300
1957	17,031	57.9	1,817	4,419	1,084	535	29,400
1958	17,656	58.3	1,780	4,530	1,093	550	30,300
1959	20,065	61.7	1,600	4,450	1,075	570	32,500
1960	21,383	63.1	1,500	4,602	1,100	560	33,900
1961	22,941	65.6	1,517	4,438	1,060	570	35,000
1962	25,492	68.6	1,530	4,200	1,075	550	37,200

Source: South African Year Book 1949, and Annual Reports of Transvaal and Orange Free State Chamber of Mines.

*As from 1953 figures exclude U.S.S.R.

phases of American cycles. Similarly the increases between 1913-15, 1923-24 and 1929-1940 are associated with periods of depression or early recovery in the American economy. The conditions for the anti-cyclical movement of gold output, set out at the beginning of this chapter, seem to have existed more in America than in any other gold producing country. The price of gold, for example, except for the once-and-for-all devaluation of 1933, has remained constant in the U.S.A. American gold producers, therefore, did not get the relief of a higher gold price in 1919-20 and 1949 that gold producers in South Africa and other non-dollar countries received. Nor has gold mining in the U.S.A. been subject to the special taxes and subsidies which have tended to offset the anti-cyclical movement of gold output in South Africa, Canada and Southern Rhodesia.

Chapter IV

THE IMPORTANCE OF GOLD MINING IN THE SOUTH AFRICAN ECONOMY

In order to understand the part played by gold mining in South African trade cycles we must first know how important the industry has been in the structure of the South African economy. As the structural importance of an industry or sector of an economy changes through time, so its effect in producing (or offsetting) cyclical fluctuations in an economy changes. We know, for example, that a short-run fall in demand for British textiles both at home and abroad had a much more disturbing effect on the British economy in the first half of the 19th century than it did in 1952, because of the changed structural importance of the textile industry in the British economy.⁵² When an innovating industry with a rapid rate of growth dominates the field of investment, then fluctuations in output and particularly investment in that industry will have a powerful causal effect on fluctuations in the economy at large. Later as the industry's rate of growth slows down and it declines in relative importance, so fluctuations in output and investment in that industry tend to become an effect rather than a cause of general fluctuations in the economy.

From the 1850's to the 1880's, when railroads were the dominant form of investment activity in the U.S.A., fluctuations in railroad construction and the fortunes of that industry had an important causal effect on American cycles in that period; whereas after 1900, with a decline in the relative importance of the industry and its rate of growth, fluctuations in the railroad industry did little more than reflect changing business conditions in the economy as a whole.⁵³

Similarly, in the case of the gold mining industry. In the early rapidly expanding phase of the industry, when gold mining was the main field of investment activity and stimulus to expansion in the economy, we would expect to find that it played an active determining rôle in cyclical fluctuations in the economy. Its effect on the economy should resemble that of similar innovating industries in other countries. Only when the industry matured and the rate of growth of output and investment in the industry slackened, could it play a more passive mitigating rôle as a stabiliser working in the opposite direction to fluctuations in other sectors of the economy. But with a decline in the relative importance of the industry this effect may be expected to diminish.

The direct structural importance of the gold mining industry can best be measured by the industry's net contribution to national income relative to other sectors of the economy and that proportion of the total working population employed by it. Besides its direct importance as a generator of income and employment its indirect importance as a source of government revenue, foreign exchange and support for sub-economic industries will also be considered.

This procedure involves a certain amount of double counting. For example, the industry's contribution to public revenue is already included in its net con-

tribution to national income. The justification for this separate treatment, however, is that the gold mining industry is of special significance in the sectors of the economy considered and therefore fluctuations in the industry would have a more than proportional effect on these sectors.

We will divide our treatment of this subject into two parts — the first dealing with the pre-Union and the second with the post-Union period. The available statistics and the special role of gold mining in the pre-Union period makes this division convenient. This will be a largely descriptive chapter which will provide some of the background for our analysis of the part played by gold mining in South African cycles in the following chapter.

PART I: 1886 - 1910

Before 1870, South Africa had been almost entirely an agricultural country. Farming, particularly in the interior, was largely of a subsistence character. The main exports were wine, maize, sugar, fruit, meat, wool and hides and skins, but these were not exported in very large quantities, except for wool which became an important export after 1850.⁵⁴ The discovery of diamonds at Kimberley in 1870 began the transformation of the economy from one that was predominantly based on subsistence agriculture to a capitalistic agriculture-mining economy. By the 1880's diamonds equalled agricultural products in the exports of the country. This process was greatly accelerated by the discovery of the vast Main Reef of gold on the Witwatersrand in 1886. By 1892, that is in six years, the output of gold had already exceeded the output of diamonds in value. It continued to expand at a rapid rate throughout the period except for the years covering the Boer War, when gold output was brought almost to a complete standstill. Average annual diamond output, on the other hand, remained almost static between 1886 and 1905 (see Table 8).⁵⁵ The average annual rate of growth of gold output and the gross income of the industry was 18.7% for the period 1886-1910.⁵⁶ Output grew most rapidly until the Boer War, averaging 36.3% per annum. From 1904 to 1910 the rate had fallen to 12.7%. By 1910 the industry had reached an advanced stage of development. Gold output stood at 7½ million fine ounces valued at £32 million, yielding dividends of over £7 million per annum. Over 200,000 men were directly employed by the industry earning wages and salaries of approximately £14 million per annum. In addition £10 million per annum was being spent on stores.

Statistics are incomplete for the early years of gold mining so that no precise figures for numbers employed and the distribution of mining revenue can be given. The absence of national income figures also makes it impossible to give any numerical estimate of the relative importance of the industry in the economy. But evidence of the growing importance of gold mining can be found in other directions.

This period has quite correctly come to be known as the "Gold Era" because of the profound dynamic effect the discovery of gold and the rapid development of the new industry had on the growth and the determination of the economic structure of the country.

It greatly accelerated the rate of immigration into the country which reached its peak just before and after the Boer War. As the following table shows, the

European population of South Africa increased by approximately 100% between 1890-91 and 1911 while that of the Transvaal grew by approximately 250%.

Gold mining determined the location of many new cities, chief of which is Johannesburg. It also determined the pattern of South African railway transport, which in its early stages of development was chiefly designed to link the Witwatersrand with the sea. Without the discovery of gold it is unlikely that the largest centre of industry and population would have been situated in the interior of South Africa.

TABLE 7

Growth of the European Population in South Africa,
1875 - 1911 (a)

Year	South Africa		Year	Transvaal	
	Population	Annual rate of increase %		Population	Annual rate of increase %
1875	328,000	-	1880	50,000	-
1891	634,000	4.2	1890	119,128	9.1
1904	1,116,806	4.4	1904	297,277	6.8
1911	1,276,242	2.0	1911	420,562	5.1

(a) Table taken from C.G.W. Schumann, *op.cit.*, p.38.

Gold soon became South Africa's most important export. It is interesting, though, to note that while the export of diamonds until the late 1880's and gold thereafter, expanded very rapidly, the export of raw materials (mostly the products of agriculture) remained almost static between 1870 and 1900. That of food and drink actually declined. This can be clearly seen in Table 8 below.

It suggests that to some extent diamond mining, and particularly gold mining, grew at the expense of agriculture and that the latter sector declined in relative importance in the economy. Unfortunately there are no national income figures for the pre-1910 period to reinforce this assertion. It is what economic theory would lead us to expect, however, due to the comparative advantage in producing diamonds and gold which South Africa enjoyed.⁵⁷

At the same time, while the export figures in themselves are very suggestive, a certain amount of caution must be exercised in relating these figures to the output of the agricultural sector as a whole, as distinct from that section of the industry devoted to production for export. While the figures suggest that the wool, ostrich feather and hides and skins industry remained static, because the bulk of the output of these industries was exported, the same conclusion cannot be reached from the decline in food and drink exports. The large increase in population must have led to a considerable increase in internal demand. Nevertheless, the evidence still points strongly to a relative decline in the agricultural sector. Up to the outbreak of the First World War, South Africa remained on balance a food importing country.⁵⁸

Gold mining was also "The Financial Magnet" which attracted foreign capital to South Africa. Unlike diamond mining, which was largely financed

TABLE 8
FOREIGN TRADE OF SOUTH AFRICA - 1856-1910 (a)

Annual Average for period	Food and drink (c) (£000)	Exports of South African Produce (b)					Imports		
		Raw (d) Materials (£000)	Diamonds (£000)	Gold (£000)	Gold as % of Total	Total (£000)	Total average annual increase%	Total (£000)	Average Annual increase %
1856-60	191.2	1,406.9	-	-	-	1,741.8	-	2,541.1	-
1861-65	107.2	1,888.9	-	-	-	2,116.0	4.0	2,898.3	2.7
1865-70	112.7	2,251.8	35.7	-	-	2,520.6	3.5	2,334.8	4.4
1871-5	115.7	3,924.6	1,306.4	11.7	-	5,648.1	17.5	5,430.3	18.4
1876-80	92.0	3,740.9	2,268.7	30.4	-	6,613.9	3.2	7,808.2	7.5
1881-5	95.9	4,076.6	3,241.6	35.3	-	8,020.7	4.0	8,640.7	2.1
1886-90	87.6	3,924.9	4,091.3	890.1	9.2	9,855.6	4.2	9,215.9	1.3
1891-5	82.2	3,959.2	3,938.2	5,636.2	39.4	14,297.5	7.7	13,933.2	8.6
1896-1900	48.1	4,090.5	4,247.4	9,871.1	51.0	19,253.1	6.1	23,985.0	11.5
1901-5	56.2	4,338.4	5,802.3	12,226.1	50.6	24,149.8	4.7	39,113.5	10.3
1906-10	576.1	7,169.8	7,575.4	30,410.8	64.1	47,574.0	14.5	29,306.6	-5.9

- (a) Table taken from C.G.W. Schumann, *op. cit.*, p.44.
(b) Excludes reexports and specie.
(c) Mainly wine, fruit, maize, sugar and wheat.
(d) Mainly wool, hides and skins, ostrich feathers and mohair.

from within South Africa, gold mining, which required far larger outlays on fixed equipment, was for the most part financed from abroad. Professor Frankel has estimated⁵⁸ that between 1887 and 1910, £121,487,818 of new capital was invested directly in the gold mining industry — an average of just over £5 million per annum. A very large part of this sum came from abroad. Even in 1917, according to Professor Leideit's calculations,⁶⁰ only 14½% of the shares of gold mining companies were locally owned.

Besides directly attracting foreign capital, gold mining also induced foreign investment in other fields. Although there are no figures for total foreign investment in South Africa before Union, we do have the estimates of Sir George Paish for British investment in South Africa until 1910.⁶¹ As British investment represented the major share of foreign investment, this would not be far from the total. It must be remembered, however, that he also includes the Rhodesias in his calculations for South Africa. Of the £351 million invested, £125 million found its way into mining.⁶² Other principal items were:— Government — £97.4 million; railways — £9 million; financial, land and investment — £73 million; municipalities — £17.7 million. Most of the first item and a considerable proportion of the other items were probably associated with the gold mining industry.

It would be extremely interesting to know just how much investment in other fields was induced by autonomous investment in gold mining and what the timing of this induced investment was. Gold mining investment, as we saw in the previous chapter, did not proceed smoothly but came in a number of spurts between 1886 and 1910. A knowledge of how other forms of investment were related to fluctuating gold mining investment would be very useful in explaining cyclical fluctuations in this period. Unfortunately this information is not available.

PART II : 1910 - 1962

THE SHARE OF GOLD MINING IN THE NATIONAL INCOME

From 1911/12 we are fortunate in having national income figures which enable us to get a more precise picture of the relative importance of the gold mining industry in the South African economy and how this has changed through time.⁶³

Table 9 includes only the four main productive sectors of the economy viz., gold mining, farming and fishing, manufacturing and other mining. Apart from changes in the relative importance of these four sectors, the relative contribution of the other sectors of the economy to the net national income (viz. distribution, finance, transport, rent, government and other services) has remained fairly constant throughout the post-Union period.

Taking the period as a whole, the figures show that in terms of net contribution to national income alone gold mining has been one of the country's most important industries and in certain periods the largest single industry. Its average annual percentage contribution to national income over the period 1917/18 — 1941/42, for which we have continuous figures, has been 15%. In spite of fluctuations, its contribution has never been less than 7.6% of total national income (1953/54) and in certain years it has risen to over 20%. A brief glance at Table 9 shows that fluctuations in the relative contribution of gold mining to the national income are

TABLE 9

NET CONTRIBUTION OF VARIOUS INDUSTRIES TO THE NATIONAL INCOME OF SOUTH AFRICA 1911/12 - 1961/62^(a)
(£,000,000)

	1911/12	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Farming & Fishing	21.1	36.9	39.3	55.8	36.5	32.2	39.7	39.3	46	39.8	44	49.2	46.6	38.8	32
Total Mining	36	34.7	42.4	51.9	36.9	22.7	38.9	43.7	39.8	43.2	45.3	50.3	45	43.8	39.4
Gold Mining	25.6	24.7	28.5	34	30.8	23.1	29.8	32.1	28.2	29.4	29.7	30.4	31.1	32.4	32.4
Other mining	10.4	10	13.9	17.9	6.1	4.6	9.1	11.6	11.6	13.8	15.6	19.9	13.9	11.4	7
Manufacturing	8.9	16.4	19.2	26	26.6	21.7	23.8	26.1	28	30.7	32.8	35.8	38.2	39.1	37.2
Total Geographical Income (b)	130.9	170.9	193.4	248.3	206.7	176.6	208.3	222.4	230.4	237.1	249.6	270.3	270.7	256.8	235.6
31/32	32/33	33/34	34/35	35/36	36/37	37/38	38/39	39/40	40/41	41/42	42/43	43/44	44/45	45/46	
29	28.4	41.9	38.2	41.5	48.9	45.1	50	52.9	52.1	58	73.7	78.3	76.9	83.8	
39.2	56.4	58.4	63.2	67.3	72.5	73.2	81.5	98.3	99.7	101.1	94.2	93.2	95	90.8	
34.8	51.7	53.6	57.2	60	62.9	63.4	72.3	89	89.9	-	-	-	(b)	-	
4.4	4.7	4.8	6	7.3	9.6	9.8	9.2	9.3	9.8	-	-	-	-	-	
33.5	32	38.2	45.7	52.8	60.8	65.8	68.7	75.6	86.6	98.2	107.1	120	137.6	145	
217.2	234.7	278.1	298.7	328.9	368.9	374.8	394.8	432.6	472.8	531.1	570.3	618.5	661.8	700.3	
46/47	47/48	48/49	49/50	50/51	51/52	52/53	53/54	54/55	55/56	56/57	57/58	58/59	59/60	60/61	61/62
99.9	122.5	126.6	145.8	212	174.4	232	257.9	242.4	253.7	273.1	239.7	236.4	245.8	265.7	268.6
86.4	87.5	93	141.1	159.8	174.6	173	177.4	201	237.2	247.3	253.9	270.2	310.8	328.8	336.8
-	68.5	69.4	108.2	117.7	114.5	112.3	117.9	135.8	159.8	177.5	192.1	208	235.4	248.2	257.2
-	19	23.6	33.3	42.1	60.1	60.7	59.5	65.2	77.4	69.8	61.8	62.2	75.4	80.6	79.6
155.6	181	195.4	225.3	277.9	317.7	346.9	375.6	405.9	428.5	458.9	501.9	498.9	529.1	568.5	603.1
734.4	821.5	878.3	1026.1	1226.5	1272.8	1426.7	1545.7	1672.5	1796.6	1930.9	1986.1	2027	2245.6	2395.4	2501.9

PERCENTAGE CONTRIBUTION OF VARIOUS INDUSTRIES TO NATIONAL INCOME

	1911/12	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Farming & Fishing	16.1	21.6	20.3	22.5	17.7	18.2	19.1	17.7	20	16.8	17.6	18.2	17.2	15.1	13.6
Total mining	27.5	20.3	21.9	20.9	17.8	15.7	18.7	19.7	17.3	18.2	18.1	18.6	16.6	17.1	16.7
Gold mining	19.6	14.5	14.7	13.7	14.9	13.1	14.3	14.5	12.2	12.4	11.9	11.2	11.5	12.6	13.8
Other mining	7.9	8.8	7.2	7.2	2.9	2.6	4.4	5.2	5	5.8	6.3	7.4	5.1	4.4	3
Manufacturing	6.8	9.6	9.9	10.5	12.9	12.3	11.4	11.7	12.2	12.9	13.1	13.2	14.1	15.2	15.8

31/32	32/33	33/34	34/35	35/36	36/37	37/38	38/39	39/40	40/41	41/42	42/43	43/44	44/45	45/46
13.4	12.1	15.1	12.8	12.6	13.3	12	12.7	12.2	11	11.1	12.9	12.6	11.6	12
18	24	21	21.2	20.5	19.7	19.5	20.6	22.7	21.1	19.5	16.5	15.1	14.4	13
16	22	19.3	19.1	18.2	17.1	16.9	18.3	20.6	19	17.5	-	-	-	-
2	2	1.7	2	2.2	2.6	2.6	2.3	2.1	2.1	2	-	-	-	-
15.4	13.6	13.7	15.3	16.1	16.5	17.6	17.7	17.5	18.3	19	18.8	19.4	20.8	20.7

46/47	47/48	48/49	49/50	50/51	51/52	52/53	53/54	54/55	55/56	56/57	57/58	58/59	59/60	60/61	61/62
13.6	14.9	14.4	14.2	17.4	14.8	16.3	16.7	14.5	14.1	14.2	12.1	11.7	10.9	11.1	10.7
12.8	10.6	10.6	13.7	13.0	13.2	12.1	11.5	12	13.2	12.8	12.8	13.3	13.8	13.7	13.5
-	8.3	7.9	10.5	9.6	9.2	7.9	7.6	8.1	8.9	9.2	9.7	10.3	10.5	10.4	10.3
-	2.3	2.7	3.2	3.4	4	4.2	3.9	3.9	4.3	3.6	3.1	3	3.3	3.3	3.2
21.2	22	22.2	22.1	22.7	23.6	24.3	24.3	24.3	24.4	23.8	25.3	24.6	23.6	23.7	24.1

(a) Sources: S.H. Frankel and H. Herzfeld, "An analysis of the Growth of the National Income in the Union in the Period of Prosperity before the War", South African Journal of Economics, June 1944, and Quarterly Bulletin of Statistics of the South African Reserve Bank.

(b) Includes net income accruing to Non-Union factors of production.

TABLE 10
NET INVESTMENT IN SOUTH AFRICA 1922/23-1940/41^(a)
(£000,000)

	1922/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Total Public Investment	7.9	11.3	11.2	11.3	12.8	11.4	12.1	12.5	11.2
Gold Mining	-2.6	.6	-4.2	2.2	1.9	.2	1.2	-.3	-.2
Manufacturing	.8	-.1	.4	.3	1.9	1.6	1.8	.4	.3
Private Building	4.9	4.7	5.2	5.5	6.3	7.0	8.6	8.4	4.1
Other private investment ^(b)	2.1	2.2	2.6	2.4	3.7	4.2	4.8	4.5	2.7
Total Private Investment	5.2	7.4	4.0	10.4	10.0	13.0	16.4	13.0	6.9
Total Net Investment	13.1	18.7	15.2	21.7	22.8	24.4	28.5	25.5	18.1
Net Investment as a percentage of Total National Income	6.3	8.4	6.6	9.2	9.1	9.0	10.5	9.9	7.7

	31/32	32/33	33/34	34/35	35/36	36/37	37/38	38/39	39/40	40/41
Total Public Investment	8.9	6.3	7.2	10.4	13.3	18.9	22.7	28.7	25.3	19.4
Gold Mining	1.5	.5	3.4	6.5	10.2	11.0	12.2	11.7	8.1	6.5
Manufacturing	-.3	-.3	2.9	2.8	5.4	2.5	2.5	1.9	3.1	2.3
Private Building	1.6	-1.2	4.6	7.1	9.8	12.0	8.8	7.8	-.9	-1.2
Other Private Investment ^(b)	1.1	.1	2.1	5.4	5.0	6.6	6.4	6.7	5.1	4.5
Total Private Investment	3.9	-.9	13.0	21.8	30.4	32.1	29.9	28.1	15.4	12.1
Total Net Investment	12.8	5.4	20.2	32.2	43.7	51.0	52.6	56.8	40.7	31.5
Net Investment as a percentage of Total National Income	5.0	2.3	7.3	10.8	13.3	13.8	14.0	14.4	9.4	6.7

- (a) Source: S.H. Frankel and H. Herzfeld, "An analysis of the Growth of the National Income in the Union in the Period of Prosperity before the War", *South African Journal of Economics*, June 1944.
This table has not been extended beyond 1940/41 because no separate calculation of net investment in gold mining is made after that date.
- (b) Includes investment in "other mining", farming and commerce.

generally inversely correlated with the business cycle. It is therefore difficult to distinguish changes in the structural importance of the industry from changes of a more temporary kind. Nevertheless, certain phases can be distinguished.

By 1910 it can be said that the gold mining industry had reached a relatively mature stage of development. Most of what is called the "Old Rand" had been opened and the comparatively younger Far East Rand had become well established. Between 1910 and 1929 gold output only grew at the rate of 1.7% per annum, compared with the rate of 12.7% in the six years preceding Union. After the investment boom of 1909/10 little new investment flowed into the industry until 1933 so that in the 22 years 1910-1932 only £26 million of new capital or an annual average of £1,200,000 came into the industry. Also by 1910 most of the more important cost-reducing innovations had been introduced and the rapid downward trend in working costs was halted.⁶⁴

In 1911/12, as can be seen in Table 9, gold mining was the largest single industry in the economy, contributing 19.6% of total net national income. Between 1911/12 and 1928/29 the industry gradually lost its position of pre-eminence in the South African economy, yielding first place to agriculture. By 1928/29 the percentage contribution of gold mining to the national income had fallen to 11.5% — averaging 12.6% for the period 1922/23 — 1928/29. In the 1930's, first with the depression and then with devaluation, gold mining made a spectacular recovery. The industry resumed the dynamic role it had played in the economy before Union. Net investment in gold mining totalled £55.5 million for the period 1932/33 — 1938/39 — averaging 21.2% of total net investment in the period (see Table 10). In terms of its net contribution to the national income it again became the leading single industry in the country — averaging 18.1% of total national income in the period. During and after the Second World War, the industry once more declined in relative importance, yielding first place to manufacturing industry (which now accounts for about a quarter of national income) and second place to agriculture. The low-point in gold mining's relative contribution to national income since the war was in 1953/54 (having briefly increased its share after devaluation in 1949). But with the opening up of the new goldfields, the industry's share in the national income has risen again to over 10% in the early 1960's and is now closely rivaling agriculture, which has been on a relative decline since the early 1950s.

EMPLOYMENT IN GOLD MINING

The proportional contribution of gold mining to employment in South Africa can be seen in Table 11. Figures for the industrial distribution of the whole working population are only available for the 1936 and later censuses. In previous censuses estimates were not made for the economically active African population. The 1936 census, however, is also not comparable with the later censuses because it includes all Africans over 10 years of age who are economically active whereas in the later censuses only those 15 and over are included. This greatly exaggerates the numbers in 1936, particularly in the agricultural sector. (See Table 11.)

The percentage ascribed to gold mining gives an imperfect indication of the industry's true importance as an employment factor because of the considerable number of under-employed Africans in the agricultural sector. The significant

TABLE II

INDUSTRIAL DISTRIBUTION OF ECONOMICALLY ACTIVE POPULATION, 1936-1960 (a)

Industry Division	1936		1946		1960	
	Total (All Races) (000)	per cent	Total (All Races) (000)	per cent	Total (All Races) (000)	per cent
Agriculture, forestry & fishing	3,392	64.1	1,547	37	1,701	30
Gold mining (b)	362	6.9	360	9	442	8
Other mining & quarrying	81	1.5	138	3	164	3
Manufacturing	405 (c)	7.7	360	9	679	12
Construction	-	-	153	4	278	5
Electricity, gas, water & sanitary services	-	-	13	-	39	1
Commerce & finance	157	3.0	249	6	458	8
Transport, storage & communication	181	3.4	207	5	214	4
Services	467	8.8	962	23	1,228	21
Unspecified & unemployed	246	4.6	232	5	493	9
Total economically active (d)	5,294	100.0	4,221	100.0	5,696	100.0

(a) Sources: 1936 figures taken from Report No. 11, Social & Economic Planning Council, op. cit., p. 7. Figures for 1946 and 1960 from Monthly Bulletin of Statistics, May, 1946, p. 16.

(b) From Annual Reports of the Government Mining Engineer.

(c) Includes construction.

(d) The 1936 census includes Africans from 10 to 14 years of age whereas in 1946 and 1960 only those 15 years of age and over are classed as economically active. The 1936 census cannot therefore be compared with the later census.

comparison is between the gold mining and manufacturing sectors (including construction). In 1936 manufacturing employed only 11% more people than did gold mining. Since the war employment in manufacturing and construction has grown much more rapidly than in gold mining, and is indicative of the relative decline of the industry. Looking at earlier years, however, the importance of gold mining as an employment factor in comparison with other industries is apparent as the following table shows:-

TABLE 12

Employment in Gold Mining, Diamond Mining and Manufacturing Industry 1916 - 1926.

	Gold Mining (a)	Diamond Mining (b)	Manufacturing Industry (c)
1916	238,000	26,000	101,000
1926	215,000	72,000	193,000

(a) All mines — Source: Annual Reports of Government Mining Engineer.

(b) Includes alluvial diggings — Source: Annual Reports of Government Mining Engineer.

(c) 1916 = 1915/16 — Source: Official Year Books of the Union of South Africa.

THE INDIRECT IMPORTANCE OF GOLD MINING

From the point of view of the industry's contribution to national income and employment, gold mining has long been one of South Africa's most important industries, in spite of the changing structure of the economy.

But what we have said would not in itself justify the Industrial and Agricultural Requirements Commission's appraisal of gold mining as "the mainspring of the Union's economic system".⁶³ The special importance of gold mining must be sought in other directions.

Before dealing with these special factors it is necessary to deal with the vague assertions sometimes encountered that the key position of gold mining is due to the fact that it "puts money into circulation" or that it "provides a market for South African industries". The mines, however, are not in a special position as an income generator. Most South African industries use the products of other local industries to a greater or lesser extent. "Everyone is everyone else's customer, but that is no more true of mining than of any other occupation — for instance, a farmer spends his income and so gives employment to manufacturers of implements, of clothes, to the railway; there is nothing peculiar to mining in the matter."⁶⁶ As gold is primarily an export commodity, other industries and individuals are customers of the mines in the sense that gold provides the foreign exchange which enables them to purchase raw materials, capital goods and consumer goods from abroad.

TABLE 13

PROPORTION OF THE TOTAL OUTPUT OF CERTAIN SOUTH AFRICAN INDUSTRIES CONSUMED BY GOLD MINES 1912-1960
DIFFERENT YEARS (a)

Year	Coal Mining			Electric Light & Power		
	Value of total output £000	Output consumed by gold mining		Value of total output £000	Output consumed by gold mining	
		Value £000	Per cent		Value £000	Per cent
1912	1,999	1248	62.4	-	-	-
1920	4,519	1043	23.1	5,504	1,357	24.7
1930	3,494	1014	29	7,489	2,006	26.8
1940	5,326	1324	24.9	10,032	3,935	24.0
1950	14,796	1422	9.6	23,303	3,570	15.3
1960	27,551	2179	7.9	60,382	15,963	26.4

(a) Sources: Annual Reports of the Government Mining Engineer.
Censuses of Industrial Establishments.

This view, that the gold mines "support" South African industries, is based on the idea that there are basic or primary industries which, so to speak, produce wealth from nothing but the free gifts of nature and labour. Then there are secondary industries which are "supported" and only exist because of the primary industries. There is a sense in which this is true historically. As we have shown, gold mining was the dynamic force in the economy in its earlier stages and again in the 1930s and has been a powerful influence in determining the structure of the South African economy. The industrial superstructure of the economy would probably have been much slower in developing were it not for gold mining. But at any given point of time all activities are interdependent and therefore all incomes. The gold mines could not function without the support of the electric power generating industry or the railways, for example. Nor could the workers it employs exist without the host of industries that supply them with their needs. Many of these needs could not be satisfied by imports.

It nevertheless remains true that if the gold mines were to close down suddenly the resultant contraction of internal purchasing power would be an economic disaster to the Union. The contraction of purchasing power would be much greater than the sum which the industry distributes directly as wages, salaries, profits etc. But the cessation of any large industry or group of industries would have a similar effect in kind if not in degree.

When we assert that all industries are interdependent to a greater or lesser extent, this does not mean that it is impossible to make numerical estimates of the nature of this interdependence. A pioneering effort has already been made by Professor Krogh to analyse the structure of the South African economy on an input-output basis for the year 1956/57.⁶⁷ His tables follow work of this kind on the structures of the American, British and Japanese economies.⁶⁸ While Krogh's tables give us a clearer picture of the interdependence of the various

sectors of the economy, his work is based, on his own admission, on very inadequate statistics and then only for one year. A great deal more work will still have to be done before we will be in a position to predict, with any degree of accuracy, the probable effects of a major structural change in the South African economy such as would result from a significant alteration in the scale of the gold mining industry.

INDUSTRIES DEPENDENT ON GOLD MINING

Even without recourse to input-output tables we know that there are certain South African industries whose interests are very closely bound up with those of the gold mining industry, because of the very large proportion of their output which is bought by the industry. Table 13 illustrates the degree of dependence of two large industries on gold mining.

In view of the fact that the gold mining industry buys in bulk at prices lower than those paid by other consumers, the proportions of output by volume consumed by the industry are even higher. Moreover, the figures of total output in the table refer to the country as a whole. A much larger percentage of the total output of the branches of these industries situated in the Transvaal are consumed. There are no doubt many other industries and firms in the Union, smaller perhaps than the examples cited, which are even more dependent on the sales of their products to the gold mines. But these details are not available.

Because of this dependence, fluctuations in gold output have a considerable effect on the demand for the products of these industries. Interesting evidence of the effect of fluctuations in gold output on coal sales is provided in 1915 and 1922. The high degree of dependence of coal mining on the gold mining industry before the First World War can be clearly seen in Table 13. This explains why coal sales were lower than their seasonal norm in February, 1915, which was also a month of exceptionally low gold output on the Rand. Again in 1922, the sudden drop in coal sales from 720,000 tons in January to 550,000 tons in February is associated with the strike on the gold mines.

GOLD MINING AS A SOURCE OF GOVERNMENT REVENUE

For many years the gold mining industry has been subject to discriminating taxation and has therefore contributed a larger share of the State's income than it would have if it had only to pay the normal taxes imposed on other industries. The Excess Profits Tax on the gold mines from 1933 enormously increased State revenue from gold mining and during the Second World War discriminatory taxation reached extreme heights.

Table 14 includes only Government receipts from the direct taxation of the income of gold mining companies and the State revenue from lease mines. Even before 1938 most of the State's share in the profits of lease mines was credited to loan and not revenue account. Since 1938 all lease revenues have been credited to loan account. While this item does not appear in total ordinary government revenue, it is an important source of funds for State capital expenditure and assistance to farmers. It might be added that while the State receives

TABLE 14

GOVERNMENT REVENUE AND EXPENDITURE AND RECEIPTS FROM GOLD MINING 1911-1960. (a)

Year (b)	Ordinary Revenue £(000)	Ordinary Expenditure £(000)	Receipts from Gold Mining			Revenue from gold mining as percentage of total revenue (Column (3) as a per- centage of column (1)) (6)
			Credited to Revenue £(000)	Credited to Loan Account £(000)	Total Receipts £(000)	
	(1)	(2)	(3)	(4)	(5)	
1911	14,209	13,528	1,004	74	1,078	7.0
1912	14,176	13,947	1,001	80	1,091	7.1
1913	12,606	13,294	1,049	97	1,146	8.3
1914	10,967	12,955	975	106	1,081	8.9
1915	13,168	12,769	1,253	104	1,357	9.5
1916	14,941	14,377	1,433	116	1,549	11.2
1917	16,011	15,313	1,347	268	1,615	8.4
1918	18,312	17,723	866	410	1,276	5.0
1919	23,179	20,719	1,071	631	1,702	4.6
1920	25,748	26,048	1,359	851	2,210	5.2
1921	24,551	25,757	2,002	96	2,098	8.0
1922	22,675	23,673	1,579	120	1,699	7.0
1923	24,253	24,027	2,046	472	2,518	8.4
1924	25,336	24,528	1,827	1,375	3,202	7.2
1925	26,987	26,315	1,454	1,457	2,911	5.4
1926	28,577	27,362	1,611	1,758	3,369	5.6
1927	30,094	28,304	1,593	1,608	3,201	5.3
1928	30,502	28,669	1,602	1,589	3,191	5.5
1929	30,486	29,998	1,623	1,574	3,197	5.2
1930	28,563	29,949	1,648	1,670	3,318	5.8
1931	27,741	28,742	1,696	1,770	3,466	6.1

1932	28,442	28,452	2,338	1,927	4,265	8.2
1933	37,625	33,091	12,548	1,997	14,545	33.0
1934	38,730	35,456	9,206	3,999	13,205	23.8
1935	39,675	36,520	10,594	3,706	14,300	33.6
1936	43,087	37,247	10,178	3,470	13,647	23.6
1937	40,446	41,187	9,456	4,135	13,591	20.4
1938	47,233	44,082	9,204	3,387	12,591	19.5
1939	48,620	46,746	13,119	3,517	16,636	27.0
1940	66,604	65,444	22,378	3,979	26,347	33.6
1941	84,736	75,935	23,481	3,438	26,919	27.7
1942	99,448	94,699	24,392	2,886	27,288	24.5
1943	112,785	110,745	19,102	2,205	21,307	17.0
1944	121,599	116,092	18,726	1,414	20,140	15.0
1945	136,120	131,240	16,637	1,341	17,978	11.5
1946	139,971	130,355	10,357	983	11,340	7.4
1947	132,822	120,493	5,554	751	6,305	4.2
1948	146,760	136,846	6,537	867	7,394	4.4
1949	152,142	144,474	10,702	1,182	11,884	7.0
1950	169,180	155,418	20,305	2,391	22,696	12.0
1951	207,124	195,963	20,599	2,331	22,930	10.0
1952	234,270	210,061	14,393	1,810	16,203	6.1
1953	261,781	220,324	11,030	1,378	12,408	4.2
1954	271,077	248,945	13,180	1,531	14,711	4.9
1955	284,544	242,531	15,109	1,863	16,972	5.3
1956	305,227	264,590	14,522	2,017	16,539	4.8
1957	318,422	270,924	15,319	2,259	17,578	4.8
1958	332,881	283,258	16,162	2,421	18,583	4.8
1959	351,356	299,488	23,606	3,313	26,919	6.7
1960	365,435	325,959	28,917	6,758	35,675	7.4

(a) Source: Official Year Books of the Union of South Africa and Reports of the Auditor General.

(b) To 31st March of the year following that stated.

a share of the profits of lease mines on the basis of a formula that varies from mine to mine, it makes no contribution to the capital invested in gold mines nor does it share in any of the risks of gold mining.

This table excludes public revenue from the gold mines in the form of native pass fees, licences and mynpacht dues, municipal rates, non-resident shareholders' tax, indirect and concealed taxation etc. as the amounts attributable to gold mining cannot be accurately ascertained.

The importance of this factor from the point of view of our analysis is that the South African Government is in the fortunate position of having a large source of income that tends not to decline in a depression. This helps the State to balance its budget without the drastic cuts in expenditure that tends to add to the deflationary forces in the economy. A distinct tendency for receipts from gold mining to increase as a percentage of total receipts in a depression can be seen in Table 14. We will deal with this factor in more detail in the appropriate places in the next chapter.

GOLD AS A SOURCE OF FOREIGN EXCHANGE

No special importance need be attached to gold as an export commodity over and above its ordinary value expressed in monetary terms. It may be argued that £1 worth of gold exported in exchange for foreign goods is exactly equivalent to £1 worth of any other commodity produced in South Africa. But such is South Africa's dependence on imports, due perhaps very largely to the existence of the gold mining industry itself, that a change in gold output and its price has a profound effect on South Africa's foreign trade position.

As table 15 shows, South Africa is highly dependent on international trade - more so than most other countries.

TABLE 15

MERCHANDISE IMPORTS, MERCHANDISE EXPORTS AND NATIONAL INCOME OF VARIOUS COUNTRIES 1938 (a)

Country	Merchandise Exports	Merchandise Imports	National Income	Imports as a % of National Income
	£S.A.000,000	£S.A.000,000	£S.A.000,000	
Australia	111.6	111.0	654.8	17.0
Canada	175.8	139.3	879.6	15.8
New Zealand	46.9	44.4	174.0	25.5
Sweden	95.8	108.2	556.2	19.5
United Kingdom	474.8	865.3	4,643.1	18.6
U.S.A.	639.0	402.7	13,259.2	3.0
South Africa	29.5	100.2	374.8	26.7

(a) Source: Report No.11 of Social and Economic Planning Council, *op.cit.*, p.12.

Note - National Income figures for South Africa, New Zealand and Australia are for 1937/38.

Imports in the 1930's were a lower proportion of national income than in the 1920s or before the First World War. Since the Second World War, however, the dependence on imports increased again especially in the immediate post-war years (see Table 16).

TABLE 16

Imports as a percentage of South African National Income for different periods. 1912 to 1962 (a)

	Imports as % of National Income
1912	29.6%
1913 - 1929	30%
1932 - 1939	24%
1946 - 1952	38.9%
1953 - 1962	25.6%

(a) Derived from Table 17.

The dependence of South Africa on imports (and hence on exports to pay for the imports) is particularly striking in the case of manufacturing industry. Up to 1938 the value of imported materials used in manufacturing industry fluctuated around a level slightly below 50% of all materials used. Yet manufacturing products comprised only about 2½% of all exports by value. In 1937/38, for example, while manufacturing industry used £45 million worth of imported materials, it exported only £2½ million worth of products.⁶⁹ Since the war the ratio of manufacturing exports to imported materials used has been somewhat higher. But it is still neither self-sufficient nor able to pay by exports for the imports it requires and therefore depends on the existence of other industries whose products can be exported to pay for essential requirements from overseas.

Gold has long been South Africa's chief export as can be seen in Table 17. In the 1930s, gold comprised more than 70% of all exports in value. In the 1920s the percentage was over 50%. Since the Second World War it has been a smaller percentage of total exports (averaging 40% between 1946 and 1961), but still remains the largest single export item. Because of its high percentage contribution to total exports and South Africa's high marginal propensity to import, changes (or failures to change) in gold output have had an important effect on South Africa's balance of payments position. In so far as these changes have been anti-cyclical, the industry has had an important stabilising effect on cycles in the economy. The mechanism by which this works has been outlined in Chapter I. Historical illustration will be provided in the next chapter.

TABLE 17

SOUTH AFRICAN FOREIGN TRADE STATISTICS ^(a) 1910-1962
(£000,000)

	Merchandise Imports	Domestic Produce Exported (including gold)	Gold Exports	Diamond Exports (Cut and Uncut)		All Mineral Exports		Agricultural Exports		Imports as % of National Income.
	£	£	£	£	%	£	%	£	%	
1910	36.7	51.8	31.8	61.4	8.5	16.4	42.0	81.1	9.5	
1911	36.9	54.9	35.1	63.9	8.3	15.1	45.3	82.5	9.2	
1912	38.8	61.0	38.3	62.9	9.2	15.0	49.4	81.0	11.2	29.6
1913	41.8	64.5	37.6	58.2	12.0	18.6	51.9	80.3	12.0	
1914	35.8	52.8	35.3	67.0	5.5	10.5	43.3	82.0	9.1	
1915	31.8	52.8	38.3	72.6	1.7	3.2	42.2	80.0	8.9	
1916	40.4	62.1	39.1	63.0	5.3	8.5	48.0	77.4	12.9	
1917	36.5	66.1	38.0	57.4	6.1	9.2	48.5	73.4	16.3	
1918	49.5	65.7	35.4	53.9	7.1	10.7	46.2	70.2	18.2	29.2
1919	50.8	88.8	39.0	43.9	11.5	13.0	54.3	61.1	33.1	26.4
1920	101.8	91.7	46.8	51.0	11.6	12.6	64.3	70.1	25.6	41.1
1921	57.8	68.8	43.0	62.5	1.4	2.0	49.8	72.4	17.9	28.0
1922	51.4	60.9	31.8	52.7	4.4	7.3	39.6	65.6	19.4	28.8
1923	57.8	76.8	41.7	54.3	7.2	9.4	53.1	69.2	22.6	27.8
1924	65.8	80.7	44.2	54.8	7.1	8.8	55.8	69.1	23.9	29.2
1925	67.9	85.6	41.4	48.3	8.6	10.1	54.5	63.7	29.8	29.5
1926	73.2	80.5	42.6	52.9	10.7	13.3	58.3	72.4	21.3	30.8
1927	74.1	89.4	43.6	48.8	12.3	13.7	60.5	67.7	27.8	29.6
1928	79.1	89.0	42.8	48.1	8.9	10.0	55.9	62.9	31.8	29.2
1929	83.4	89.0	45.0	50.6	12.1	13.6	61.5	69.1	26.3	30.6
1930	64.6	76.7	46.3	60.4	5.5	7.1	55.6	72.5	19.9	25.6
1931	52.9	65.1	45.1	69.4	3.6	5.5	51.6	79.3	12.8	22.3
1932	32.7	66.2	48.5	73.3	2.0	3.0	52.2	79.0	13.4	15.2
1933	49.1	92.0	69.9	76.0	2.1	2.3	74.3	80.7	16.9	20.8

1934	66.3	78.1	56.2	72.0	2.8	3.6	61.4	78.7	16.1	20.6	23.7
1935	75.3	97.9	71.4	72.9	3.0	3.0	77.5	79.0	20.0	20.4	25.0
1936	86.3	109.3	82.7	75.7	3.3	3.0	89.2	81.6	19.1	17.5	26.1
1937	103.4	119.6	82.9	69.3	3.3	2.8	90.1	75.3	28.1	23.5	27.8
1938	95.6	102.9	73.3	71.3	2.4	2.3	79.8	77.6	20.5	20.0	26.7
			(c)								
1946	212	190	102	53.6	12.1	6.4	125.7	66.1	49.2	25.9	30.3
1947	303	197	97	49.2	10.9	5.6	(b)		46.3	25.0	41.3
1948	354	231	99	42.8	11.4	4.8	(b)		70.1	30.3	43.1
1949	314	254	115	44.9	10.8	4.3	(b)		71.0	28.0	35.8
1950	305	352	143	41.7	20.1	5.7	(b)		105	29.8	29.7
1951	467	403	143	35.5	25	6.2	(b)		136	33.7	37.2
1952	417	393	151	38.4	17	4.3	(b)		115	29.2	32.0
1953	425	410	149	36.3	29	7.1	(b)		130	31.7	29.3
1954	439	459	165	35.9	27	5.9	(b)		139	30.3	27.9
1955	481	515	183	35.5	32	6.2	(b)		156	30.3	28.5
1956	495	569	199	35.0	32	5.6	(b)		169	29.7	27.3
1957	550	615	213	34.6	35	5.7	(b)		183	29.8	27.7
1958	556	578	220	38.0	36	6.2	(b)		161	27.9	27.5
1959	489	645	250	38.8	38	5.9	(b)		167	25.9	23.4
1960	556	668	268	40.1	34	5.1	(b)		162	24.3	24.6
1961	503	712	287	40.3	42	5.9	(b)		193	27.1	21.0
1962	514	750	319	42.5	37	4.9	(b)		215	28.7	20.5

(a) Figures for 1910 - 1937 taken from S.H. Frankel, *Capital Investment in Africa*, op. cit., Table 16, p.108.Figures for 1938 - 1962 taken from *Official Year Books, Annual Statements of Trade and Shipping and Foreign Trade Statistics*.

(b) Not classified.

(c) Gold exports are taken to be the equivalent of gold output from 1946.

THE EFFECT OF THE GOLD MINING INDUSTRY ON SOUTH AFRICAN TRADE CYCLES

In Chapter III we examined the effect of cyclical fluctuations in the economy on the gold mining industry. We took the fluctuations in the economy as given and treated the gold mining industry as if it merely reacted passively to changing economic conditions caused by other factors. We will now investigate to what extent the gold mining industry has played an active determining rôle in both the timing and amplitude of South African cycles. In particular we will attempt to test the hypothesis set out in the introductory chapter that the gold mining industry should have had a stabilising effect on the country's cycles.

Our method will be to discuss cycle by cycle the impact of gold mining on South African fluctuations throughout the period 1886-1962. Only by a detailed study of individual cycles can we provide the evidence to support, reject or modify our hypothesis. As far as possible we will first indicate the general features of each cycle and its causes and then consider the impact of the gold mining industry on the cycle. But a separation of this kind is not always possible, particularly in the early period, when fluctuations in the gold mining industry are very closely bound up with fluctuations in the economy as a whole.

The factors we put forward as being the causes of South African cycles are very much in the nature of suggestions. Much of the information necessary for a causal analysis of South African cycles is lacking. What information we have points to South African cycles being largely determined by fluctuations abroad via fluctuations in the demand for her exports and supply of foreign capital. This is supported by what we know of the structure of the economy. But a great deal of research has yet to be done before more certain knowledge of the causes of South African cycles can be given. Although statistics concerning exports are available over a long period, the information we have about capital imports - particularly imports of private capital - is very limited.

Our chief source of information on South African cyclical history before 1910 is the study by Professor Schumann.⁷⁰ For the cycles after Union we also have the work of Dr. J.C. du Plessis⁷¹ and a study by J.C. van Zyl of the period after the second World War.⁷² Although Professor Schumann's study of cycles continues up to 1936 we have preferred to use Du Plessis' dating of turning points after Union as the latter's calculations are based on a larger number of time series and more refined statistical techniques than those used by Schumann. Although for the most part their dating of turning points is similar, there is a major disagreement between them over the timing and severity of the first post-Union cycle. We will postpone our discussion of this disagreement until we come to the cycle in question.

The cyclical history of South Africa from the discovery of gold to Union has been briefly summarised by Schumann⁷³ as follows:

1882 - 6	Severe Depression
1886 - 7	Revival
1887 - 9	Prosperity and gold mining boom
1889 - 90	The Gold Crisis. Speculative collapse in 1889, banking and financial crisis in 1889-90 and economic recession from mid-1890
1890 - 92	Depression
1892 - 93	Revival
1893 - 95	Prosperity and speculative boom in 1895. Speculative collapse in September but continued economic prosperity
1896 - 97	Prosperity
1897	Economic Recession
1898 - 99	Depression
1899	Revival
1899 - 1902	War period - Prosperity in Cape and Natal
1902 - 03	Post-War boom
1903	Recession but no sudden crisis
1903 - 09	Severe Depression
1909 - 10	Revival.

The period contains three clearly identifiable cycles, viz. 1886 - 1893; 1893 - 1899 and 1899 - 1909.

1886 - 1892/93

The discovery of gold on the Witwatersrand in 1886 came at the bottom of a long and severe depression. This gave a tremendous impetus to recovery. Large numbers of people were attracted to the new goldfields and vast sums of capital poured into the industry. Exports of gold increased from £67,500 in 1885 to £1,496,700 in 1889. But more important and more characteristic of the period than this evidence of the actual productive activity of the gold mines was the degree of speculation and the extent of flotation of new mining companies. By the end of 1887 no less than 270 gold mining companies had been formed.⁷⁴ Early in 1889 the speculative boom collapsed. The market value of thirty "best-known shares" with a nominal value of £7,174,000 which had reached a peak of £24,813,200 on February 15th, 1889 had dropped to £9,421,000 on 4th March, 1890. Investors were uncertain about the future prospects of the goldfield. The easily mined "outcrop" gold had been exhausted. The mines were developing out of the oxidised free-milling zone into the sulphide zone and recovery by the old process of amalgamation had fallen to less than 60%.⁷⁵ As a result of this loss of confidence in the industry, new investment declined from a peak of £12 million in 1889 to £1 million in 1891.⁷⁶

The crisis in 1889 was purely a financial and speculative collapse. The economic recession came only towards the middle of 1890.⁷⁷ The speculative collapse had its most serious effect on the banks of the Cape Colony, which, by over-extending credit up to 1889, had been partly responsible for feeding the flames of speculation. They reacted by over-contracting credit in the years

1890-02. All but one of the eight of the remaining District Banks disappeared during this period either through liquidation or amalgamation with the Imperial Banks.⁷⁸

The depression, however, was moderate and short-lived, lasting only to 1892-93. Imports for the whole country showed a slight recession declining from £14,500,000 in 1890 to £12,200,000 in 1891, while exports continued to expand.⁷⁹ The four colonies and republics were not all affected in the same degree, however. The depression in the Transvaal and especially Natal was more severe than in the Cape Colony or the Orange Free State.⁸⁰

In spite of the decline in gold mining investment, gold output continued to expand. Gold had begun to be mined at deeper levels. The new Macarthur-Forrest cyanide process made extraction more profitable and better methods of recruiting labour were introduced. In 1892 the rail connection with Kimberley and the Cape was completed, thus greatly relieving transport problems. By 1892 confidence in the industry was revived and capital began to pour into the industry again.

While fluctuations in mining investment and the banking system seem to have been the main cause of this cycle, other factors also contributed to the prosperity before 1890 and the ensuing depression. The period 1886-90 was one of prosperity in Europe and America.⁸¹ There was an excellent market for diamonds, wool, etc. Money was plentiful in Europe and it flowed relatively easily into the new gold mining industry. The railway from Cape Town to Kimberley had been completed in 1886, and this helped to stimulate business, farming and the general spirit of optimism in the country. Harvests were also excellent in 1889-90.⁸² The crisis and depression again, was undoubtedly intensified by the well-known Baring crisis in England in 1890 and the long depression that followed it in Europe and the New World.

1892 - 1899

The revival in 1892-3 coincides with the renewed investment activity in the gold mining industry. There was another boom in "Kaffirs" mainly during 1895, which again culminated in a severe speculative crisis at the end of that year. By 14th September, 1895, the market valuation of 24 dividend-paying, 129 non-dividend-paying gold mining companies and 31 land companies, with a total nominal capital of £50,157,000, had risen to £215,373,000 on the bourses of the world.⁸³ The collapse came towards the end of the year and large capital losses were again sustained.

Here, again, just as in 1889 the collapse on the share market came some time before the general economic recession set in. This only began in 1897. In spite of the speculative collapse, capital continued to be invested in the gold mining industry. In fact 1896 was the record year of capital investment in the industry for the whole period 1886-1932 with over £15 million being invested.⁸⁴ Gold mining investment only declined in 1897 and 1898, reviving again in 1899. The depression once more followed the same course as mining investment. Although it was also short, it was, according to Schumann⁸⁵ more general and intense than the previous depression, in spite of the fact that the period 1896-9 was one of relative prosperity in England.

The chief causal factor in this cycle appears again to have been fluctuations in mining investment. Gold output and exports expanded continuously until 1899. Exports of other commodities did not decline from 1897 to 1899 and remained fairly constant throughout the cycle. The large scale of mining investment and capital imports caused imports to increase very sharply from £12,784,000 in 1892 to £24,439,000 in 1896, declining to £22,052,000 in 1898.⁸⁶

While the decline in mining investment appears to have been the chief determinant of the depression, other external factors also played a part. The well-known Jameson Raid at the end of 1895 had an unsettling effect on business conditions. Later on the heavy drought of 1896, the "rinderpest" (a disastrous cattle disease), the closing of the drifts over the Vaal river into the Transvaal, as well as the general climate of political uncertainty and tension that prevailed before the Boer War, helped to accentuate the depression.

1899 - 1909

Revival from the previous depression came just before the outbreak of the Anglo-Boer War in 1899. Gold mining investment rose to a peak of £9,900,000 in 1899 from the low level of £3,400,000 in 1898, but it fell back again in the war years. The gold mining industry came to almost a complete standstill during the war years. Gold output fell from £15,452,000 in 1899 to £1,481,000 in 1900 and £1,097,000 in 1901. While there was destruction in the two interior Republics, the Transvaal and the Orange Free State, there was considerable prosperity in the two coastal provinces, the Cape Colony and Natal, due to the large sums spent by Great Britain in the country to finance the war. After the end of the war in 1902 a typical post-war boom developed. There was a general feeling of optimism about future prospects in South Africa. This led to large imports of capital, an apparent over-import of goods, large expansion in bank credit and a stream of new immigrants. In 1903 no less than 71,089 people landed at Cape ports. This immigration led to extensive speculation in fixed property, especially in the coastal towns.⁸⁷

This boom was short-lived, however. The prosperity had been based on over-optimistic expectations. During the war production and trade had increased in the Cape and Natal due to the increase in demand occasioned by the war. After the war production and trade expanded still further in the expectation of prosperity and expansion in gold mining and other industries. Gold mining investment was heavy in 1902-3, totalling approximately £15,800,000 in the two years.⁸⁸ But gold production was seriously impeded in the first years after the Boer War by a shortage of African labour. The shortage was so acute that it was only in 1904, with the importation of unskilled Chinese indentured labourers, that the pre-war level of gold output was equalled. This discouraged investment in gold mining which fell sharply after 1903. Capital imports for other purposes also fell off from 1903.⁸⁹ The decline in military expenditure and the sale of large stocks of military material coming on top of an apparent over-import of goods were additional factors contributing to the recession. The recession, however, was not preceded by a sudden crisis as in the previous two cycles. There was no speculative boom or collapse in gold shares.

There followed between 1903 and 1909, in the words of Professor Schumann,

"one of the severest, and undoubtedly the most prolonged depression South Africa had experienced during the past hundred years."⁹⁰ This in spite of the rapid expansion of the gold mining industry between 1904-09. Gold output doubled in this period (see Table I) and the African labour position gradually improved. By 1907 no more Chinese labourers had to be imported and by 1910 the last Chinese, having fulfilled their contracts, were repatriated. Schumann attributes the length of the depression to the destruction in the interior caused by the war.⁹¹ It took many years to restore the productive capacity of the farms. With the decline in capital imports South Africa was in the position of a debtor nation in its later stage.⁹² In order to service her foreign debt, exports had to considerably exceed imports to balance her international payments without losing gold. In fact exports were 63% in excess of imports on the average between 1906-10 (see Table 8). The banks had to exercise a fairly stringent control over credit in this period to keep the country internationally solvent.

Another reason for the length of the depression was that in its early stages it coincided with a general world expansion until 1907. There was also a slight tendency to revival in South Africa in 1906-7. The diamond mining industry, for example, was very prosperous with exports reaching the record level of £9,666,000 in 1906.⁹³ But with the world crisis in 1907, the depression in South Africa deepened in 1908 and recovery only came in 1909. In spite of the fact that gold output expanded so rapidly in this depression, gold mining investment remained at a low level, recovering only in 1909. In view of the importance of gold mining investment in determining the level of activity in this period, its low level was probably an important depressing factor.

This depression remains, however, somewhat of an enigma, particularly as to the severity ascribed to it by Schumann. The time series he uses as business cycle indices in the pre-Union period are very few in number. They are exports, imports, government revenue, bank deposits and railway revenue for the Cape Colony and Natal and train-miles travelled in the Cape Colony. Except for train-miles travelled, these series are all of a monetary kind. But prices had reached an extremely inflated level by the end of the Boer War (see Graph 1). Their inevitable reaction would exaggerate the decline in real activity. That prices continued to decline until 1908 can be partly explained by the fact that South African prices, even before the Boer War, had been well above prices in most other countries, due largely to the rapid increase in demand for goods and services brought about by the gold discoveries.⁹⁴ With the expansion of transport and housing facilities and a general increase in productive efficiency, the gap between South African prices and prices in other countries gradually narrowed. What real indices there are besides that of gold output, suggest that the level of real activity in this period was higher than the purely monetary indices lead one to believe. For example, railroad mileage opened each year averaged 370 miles per annum in the period 1903-9, compared with an annual average of 195 in the decade before the Boer War.⁹⁵

The close connection between fluctuations in gold mining investment and general business fluctuations in the period 1886-1910 is not accidental. As we tried to show in Chapter IV, gold mining was the dynamic force in the economy at this time. It is understandable, therefore, that it not only determined the structure of the economy and its secular rate of growth but also played an important part in causing cyclical fluctuations. We also noted in Chapter III

that gold output was relatively insensitive to changing economic conditions in the general economy in this period. Similarly gold mining investment fluctuated largely independently of the South African economic milieu although, as we have shown, these fluctuations were probably related to changing economic conditions abroad from whence most of the pioneering capital of the industry came. Gold mining investment appears to have been the main destabilising force in the economy in this period. Its effect on the economy can be compared with that of the main innovating industries in other countries. But the continued expansion of gold output between 1890-93 and 1897-99 and the speedy recovery of gold mining investment, contributed to the relative mildness and brevity of these depressions. The same, however, cannot be said of the long depression from 1903 to 1909.

It is also interesting to note the distorting effect the gold mining industry had on the timing of South African cycles in this period. While the turning point in 1890 is in accord with cyclical movements in the main industrial countries,⁹⁶ the timing of the second cycle in the "Gold Era" is quite out of alignment. Recovery from the recession of 1890 came only after a long and severe depression in 1895-96 in most of the important industrial countries. Recovery in South Africa, on the other hand, came in 1892/93 after a short and moderate depression, reaching a peak in 1896 (the early recovery year in Europe), declining again in 1897 and 1898 (years of prosperity in most other countries). The distortions after 1900, however, were due more to the Boer War and its aftermath than to fluctuations in gold mining investment.

Mitchell has pointed out that South African cycles, together with those of Russia, Brazil and China, show the greatest divergence from the international pattern since 1890 - "all countries rather backward in economic organisation and predominantly agricultural."⁹⁷ The analysis of the facts, however, shows that the divergence after 1890, especially from English cycles, was mainly due to the gold discoveries and the Anglo-Boer War. It was, therefore, not so much a backwardness in economic organisation, for the country may be said to have reached a distinctly capitalistic phase by then, as the timing of important "external" factors that caused this divergence. In fact, before 1890 the correspondence between South African and English business cycles was much closer, as the following table shows:

TABLE 18

Comparison between S.African and British Cycles. 1806-1909 (a)

Period	Length of Period	Years of Agreement	Years of Partial Agreement	Years of Disagreement
1806-25	20	8	7	5
1826-45	20	9	9	2
1846-56	20	13	6	1
1865-85	20	7	9	4
1886-1909	24	6	9	9
1806-1909	104	43	40	21

(a) Source: C.G.W. Schumann, *op.cit.*, p.123.

CYCLES IN THE SOUTH AFRICAN ECONOMY 1910 - 1962

This period contains $4\frac{1}{2}$ major cycles. For the purposes of this study we are ignoring the minor fluctuations except in the period after the Second World War. The following is a summary of the major phases and turning points in the period:⁹⁸

Jan. 1910 - May 1912: upswing
May 1912 - Oct. 1914: downswing
Oct. 1914 - June 1920: upswing
June 1920 - Mar. 1922: downswing
Mar. 1922 - Aug. 1929: upswing
Aug. 1929 - Jul. 1932: downswing
Jul. 1932 - Apr. 1937: upswing
Apr. 1937 - Oct. 1939: downswing
Oct. 1939 - 1962: upswing
(upward phase not ended)

1909 - 1914

In the prefatory remarks to this section, we pointed out that there is some disagreement concerning both the timing and severity of this first cycle in the Union period between the calculations of Professor Schumann on the one hand and Du Plessis on the other. As the timing of this cycle is of some significance to our analysis of the part played in it by the gold mining industry, it merits further consideration.

Du Plessis dates the cycle from January 1910⁹⁹ to October 1914 with the upper turning point in May 1912 and considers the depression to have been a fairly deep one.¹⁰⁰ Professor Schumann, however, considers the period 1910- in November 1913 and the lower turning point between February and May 1915. He also regards the depression as having been a moderate one.¹⁰¹ This difference of opinion seems to be largely due to the fact that Du Plessis has calculated his average cycle series in terms of standard deviation from trend while Schumann has only used the fluctuations in the absolute level of various time series. Whereas in subsequent cycles the elimination of trend has made very little difference to the timing of the cycles, in this cycle the difference is considerable - the turning point comes $1\frac{1}{2}$ years earlier according to Du Plessis' calculations. No definite conclusions can be drawn as to the precise timing and severity of this cycle because of the paucity of the time series used in deriving the average cycle series and the trend.¹⁰²

Unfortunately we only have national income figures for the year 1911/12. The lack of adequate information concerning investment, imports of capital, employment, level of real output etc. makes it difficult to get a clear idea of the course of this cycle. The statistics of new company registrations, however, probably give some idea of changes in the level of investment from year to year, although it must be remembered that they are a very imperfect substitute for investment figures. They show a fall in the value, if not the number, of

companies registered in 1913 as compared with 1912.

TABLE 19

Registration of new companies 1912-1915 (a)

	1912	1913	1914	1915
Union				
No. of companies				
Nominal Capital (£000,000) (b)	377	386	280	311
(a) Source: Official Year Book of the Union of South Africa, 1910-16, pp.652-3	18.0	12.0	4.5	6.3

Figures only available from 1912.
 (b) Nominal capital is the sum which a new company registers as its capital. It is allowed to raise money to the extent of its registered nominal capital but its paid-up capital is usually less than this sum. This figure also gives no indication of the time involved in making investment or the amount that is spent on fixed capital in the year of registration.

The figures for that the property market and building industry reached their peak in 1912, declining in 1913 and 1914. A decline, however, in the number of plans passed for building is likely to precede an actual decline in building activity by a number of months. This is borne out by the fact that imports of cement, electric cables and fittings only declined in 1913.¹⁰³

TABLE 20

Transfer Duty & Building Plans Passed, 1911-14

	1911	1912	1913	1914
	(£000)	(£000)	(£000)	(£000)
Transfer Duty (a)	486	501	440	247
Building Plans passed in Chief				
Centres (b)	2,668	3,265	2,576	1,811

(a) Source: J.C. du Plessis, *op.cit.*, Appendix 3, p.69. The figures are given monthly and show a turning point at the end of 1912. Transfer Duty is the duty paid to the State when transferring immoveable property. The duty is a proportion of the value of the property transacted and therefore is a guide to the value if not the number of property transactions.
 (b) Source: Official Year Book of the Union of South Africa 1910-16. p.355.

While there is some evidence of a recession in 1912, it seems to have been uneven in character. Imports and exports, for example, only reached a peak in 1913, turning down in November of that year (see Table 21). Diamond exports, which accounted for nearly half of the non-gold exports in 1913, remained high through most of the year, declining only in November. Similarly ostrich feathers - another key South African export - only declined towards the end of 1913. But both these industries slumped heavily in 1914, and 1915. Diamond exports alone fell from £12 million in 1913 to £5.5 million in 1914 and £1.7 million in 1915 (See Table 21).

TABLE 21

IMPORTS AND EXPORTS 1908-15 (a)

	Merchandise Imports (£000,000)	Total Exports (S. African produce) (£000,000)	Exports excluding gold (£000,000)
1908	24.5	42.9	12.9
1909	27.3	48.2	17.1
1910	36.7	51.8	20.0
1911	36.9	54.9	19.8
1912	38.8	61.0	22.7
1913	41.8	64.6	27.0
1914	35.3	52.8	17.4
1915	31.8	52.8	14.5

(a) Source: Official Year Book of the Union of South Africa, 1910-22, p.707.

The decline in South Africa's exports was closely connected with the world-wide recession in the last quarter of 1913 and the depression in 1914 and early 1915, aggravated by the dislocations to trade caused by the war. As we have already pointed out, South Africa had moved into an old debtor position after the Boer War and was highly dependent on exports to pay for essential imports. Exports in 1911/12 were approximately equal to 40% of the Net National Income and exceeded imports by more than 50%. A loss of export income, therefore, must have had a serious depressing effect on the economy. For this reason the recession appears to have only gained momentum when exports also began to fall off.

The importance of the timing of factors causing this cycle is obvious in view of that fact that gold output fell in 1913 and 1914. If we adopt Du Plessis' turning point, however, it would seem that the decline in gold output was not the immediate cause of the recession. The monthly figures in Table 22 below show that gold output expanded until May 1913. The Strike and riots of

TABLE 22

Monthly figures of tons milled and gold produced, 1913(a)

	Tons milled	Ounces of fine gold produced
Jan. 1913	2,347,929	789,390
May "	2,425,333	794,306
July "	1,931,527	655,389
Dec. "	2,014,358	672,815

(a) Source: Annual Report of the Tvl. Chamber of Mines - 1913.

TABLE 23

INCREASE IN OUTPUT OF CERTAIN AGRICULTURAL PRODUCTS IN SOUTH AFRICA, 1916-1920 (a)

	1916	1920
Head of cattle (000,000)	6.8 (1918)	7.9
Butter production (lbs.000,000)	12.9	18.9
Cheese (lbs.000)	1,975.	4,619.
Maize (lbs.000,000)	2,167.	2,669.
Bacon & Ham (lbs. 000,000)	2.	6.8

(a) Source: Official Yearbook of the Union of South Africa, 1910-1922, Chap.XV.

TABLE 24

MANUFACTURING INDUSTRY IN THE UNION 1915/16-1920/21^(a)

	1915/16	1920/21
No. of factories	4,000	7,000
Gross value of output (£000,000)	40.4	98.3
No. of employees	100,000	178,000

(a) Source: Official Yearbook of the Union of South Africa, 1910-1922, Chap.XIX.

June-July, followed by the sharp fall in the African labour supply, caused the fall in output for the rest of the year. At the end of December 1913 there were 45,000 fewer Africans on the mines than in the same month of the previous year. This also caused a fall in European employment of 1,665 by the end of the year. The General Strike on the Rand in January 1914, caused a further reduction in gold output. Output expanded again in August 1914, but declined again from September due to the falling off in the supply of labour following the Rebellion and the declaration of Martial Law.

Whether or not the decline in gold output and employment actually set off the downturn, there can be little doubt that it must have added considerably to the forces of depression in the economy. As we pointed out in Chapter IV, gold mining was very important in the economy at this time. It contributed nearly 20% of the net national income in 1911/12 and over 60% of the exports of the country. Nevertheless, it must be remembered that gold output only declined by 8% between 1912 and 1914 although in some months the decline was greater. In comparison with the fall of 37% in non-gold exports, the contraction in mining activity was relatively slight. Even in 1914 gold exports tended to offset the

decline in other exports. This can be clearly seen in Table 17. Gold increased as a percentage of total imports from 58.2 in 1913 to 67 in 1914.

1914 - 1922

The next major cycle in the Union period is from October 1914 to March 1922 with the upper-turning point in June 1920. Recovery from the previous depression was accelerated by war activity although the diamond mining industry remained extremely depressed in 1915 and agricultural exports only improved slowly. But from the end of 1915 to mid-1920 the South African economy was booming. The war gave a great impetus to South African agriculture and industry. No national income figures exist for the early war years, but from 1917/18 to 1919/20 net agricultural output increased from £36.9 million to £55.8 million while that of manufacturing rose from £16.4 million to £26 million. Much of the increase in value was due to the price inflation in this period but as Tables 23 and 24 show there was also a considerable increase in the real output and size of these sectors.

The downturn in 1920 was closely connected with the downturn in most of the major industrial countries. Exports of diamonds fell from £11,597,000 in 1920 to £1,355,000 in 1921. Agricultural exports fell from £25,624,000 to £17,899,000 in the same period (See Table 17). New companies registered declined from a peak of 803 with a nominal capital of £42,763,385 in 1920 to 628 with a nominal capital of only £8,857,232 in 1922.¹⁰⁴ National income fell sharply from £248.3 million in 1919/20 to £176.3 million in 1921/22, but because of the rapid price deflation the fall in money income exaggerates the decline in real activity. Employment in the manufacturing sector actually increased in 1921/22.¹⁰⁵ The depression was relatively short-lived and by 1922 income and employment began to increase again.

Although the gold mining industry added to the forces of depression in the economy in 1913 and 1914, it played an important part in accelerating recovery in 1915. The stimulus to production given by the war only began to make its impact towards the end of 1915. The agricultural and particularly the diamond mining sectors remained depressed throughout 1915. There were only 9,325 men employed in the diamond industry in 1915, i.e. 55,000 fewer than the 1913 peak level.¹⁰⁶ Gold output, on the other hand, began to expand again rapidly from February-March 1915. A number of new mines begun in the investment boom of 1909/10 came into production. In spite of increased costs, mining profits actually increased. By 31st December 1915 there were 44,863 more Africans employed on the mines than at the same date in the previous year.

Besides the absolute increase in the numbers employed, there was an even greater increase in the number of Africans from the Union who obtained work on the mines.¹⁰⁷ In this way the gold mining industry largely compensated for the decline in employment opportunities in diamond mining and other industries.

From the beginning of 1917, gold output declined under the impact of rising costs and a falling labour supply. The question arises whether this decline in the gold mining industry had any restraining effect on the inflationary boom. As the following Table shows, wholesale prices of South African goods rose less

than those of other countries. This does seem to point to relatively less internal inflation in South Africa than in other countries. But to what extent this

TABLE 25

Wholesale Price Indices, S. Africa, U.K., U.S.A. 1913-1920(a)
(1913=100)

	South Africa (S. African Goods)	U.K. (Board of Trade)	U.S.A. (Bureau of Labour)
1913	100	100	100
1920	192.4	301	221

(a) Source: Official Yearbooks of the Union of South Africa.

can be attributed to the restraining influence of the gold mining industry is difficult to determine. It is partly explained by the fact that prices of South African goods were generally higher than those prevailing in other countries before the war. The stimulus to production given by the war tended to narrow the gap between South African and overseas prices. Although gold output fell by 12% between 1916 and 1920, the value of the gold produced increased after July 1919 when a premium began to be paid on the fixed price of gold. In 1920 the value of the gold output was £10,000,000 or 30% more than in 1918. As a result dividends increased and white employees were able to win a substantial increase in wages at the beginning of 1920. This tended to increase the inflationary pressure in the economy towards the end of the boom. On the other hand, the continued decline of gold output and employment in 1921 due to the rigidity of costs and a fall in the price of gold, contributed to, rather than offset the depression. But as in the depression of 1913-14, the decline in gold output was small compared with that in other sectors. The value of gold production fell by only £2.5 million or 5½% in 1921, whereas diamond production fell from £14.8 million in 1920 to £3.1 million in 1921. The net contribution of agriculture to national income fell by 35% in value over the same period. The relatively smaller decline in gold production can also be seen from the fact that gold mining's percentage contribution to total national income increased in 1920/21. In 1922, however, the complete stoppage of the industry for a number of months as a result of the prolonged General Strike, had the effect of intensifying the depression at its deepest point.

In neither of the two post-Union cycles so far considered can the gold mining industry be said to have played a clear anti-cyclical role in the South African economy. Both these cycles provide interesting evidence of how in practice cost rigidities and "exogenous shocks" like strikes and devaluations can offset the potential stabilising effect of the industry.

TABLE 26

UNION OF SOUTH AFRICA. BALANCE OF PAYMENTS 1927-32(a)
(£000,000)

	1927	1928	1929	1930	1931	1932
Merchandise:						
Imports	-79.5	-84.3	-89.1	-69	-56.4	-36.4
Exports	+51.6	+52.5	+51.5	+35.9	+25.7	+20.5
Balance	-27.9	-31.8	-37.7	-33.1	-30.7	-15.9
Interest & Dividends	-16.5	-15.8	-15.7	-15.1	-13.9	-12.6
Other services	- 4.4	- 4.7	- 4.9	- 4.6	- 4.4	- 4.3
Gold	+43.6	+42.8	+45	+46.3	+45.1	+48.3
Total balance on Current Account	- 5.3	- 9.5	-13.4	- 6.5	- 3.9	+15.5
Long term capital items only	+ 6.2	+ 2.8	- 1.8	+ 9.9	+ .4	+ 4.6
Final balance	+ 1.0	- 6.7	-15.1	+ 3.4	- 3.5	+20.1

(a) Source: Balance of Payments 1938, League of Nations.

TABLE 27

NATIONAL INCOME: SOUTH AFRICA 1927/28 - 1932/33(a)
£(000,000)

	27/28	28/29	29/30	30/31	31/32	32/33	Percentage decline
Farming & fishing	49.2	46.6	38.8	32	29.0	28.4	42.2
Gold mining	30.4	31.1	32.4	33.4	34.8	51.7	-
Other mining	19.9	13.9	11.4	7.0	4.4	4.7	77.8
Manufacturing	35.8	38.2	39.1	37.2	33.5	32.0	18.0
Total net National Income	270.3	270.7	256.8	235.6	217.2	234.7	19.0

(a) Derived from Table 9.

Recovery from the previous depression coincided with the end of the General Strike in March 1922 and the return of the gold mining industry to economic health. Both diamond and agricultural exports increased in 1922 and by 1923 business conditions had improved considerably. There followed one of the longest periods of almost unbroken prosperity in the history of South Africa until the downturn in 1929. National Income grew at an average annual rate of 4.6% at current prices in the period 1922/23 - 1928/29. Per head of the gainfully occupied population the increase in national income averaged 2.5% per annum.¹⁰⁸

Manufacturing industry enjoyed the largest expansion in this period, especially after 1925, when a policy of protection was adopted by the Government. The net contribution of manufacturing to the national income rose from £23.8 million in 1922/23 to £39.1 million in 1929/30 - an average annual increase of 7.4%. It also increased in relative importance in the economy - its percentage contribution to the national income rising from 11.4 to 15.2 per cent over the same period. Agriculture and diamond mining also expanded considerably in this period due to the growing demand for the products of these industries abroad. In the case of wool, for example, one of South Africa's chief farming products and second only to gold in her export trade, production rose from an average of 142.5 million lbs. in 1922-24 to 223.5 million lbs. in 1927-29 - an increase of 56.8%.

With the reorganisation of the gold mining industry following the 1922 strike and the introduction of the jack-hammer drill, gold output rapidly recovered. By the end of 1923 output had exceeded the 1916 peak level. For the reasons outlined in Chapter III, gold output continued to expand in the boom, but at a much slower rate than output in other sectors. Between 1923 and 1929 gold output increased by only 13%. The value of the gold produced increased by even less because of the disappearance of the premium on the price of gold when South Africa returned to the gold standard in 1925 at the pre-war parity price.

The slow rate of growth of the income of the gold mining industry probably had some restraining effect on the rate of growth of incomes in the rest of the economy. It also contributed to the adverse balance of payments situation that developed in 1928 and 1929.

Because of South Africa's high marginal propensity to import, imports increase rapidly in a period of prosperity. Other things being equal the failure of the country's major export to expand at the same rate as imports and other exports tends to produce an unfavourable balance of payments position. In actual fact the situation between 1927 and 1929 was not as simple as this as Table 26 shows.

While gold exports increased only slightly between 1927 and 1929 and therefore widened the gap between exports and sharply increasing imports, the deficit was aggravated by the fact that merchandise exports remained constant. What happened was that increased agricultural exports in 1928 were offset by failing diamond exports. In 1929 the opposite took place. Diamond exports increased but were offset by declining agricultural exports. The combination of these factors produced a large deficit in 1929, with the result that

interest rates rose and credit was restricted.

Given the particular conditions of the period, however, it is doubtful whether the restraining influence of the gold mining industry on the economy in this period can be suitably described as having been a stabilising one. As we know, the period was one of full or nearly full employment with prices remaining stable in spite of the relatively high rate of growth of income. In many ways this period was the closest approximation we have had to a regularly progressive equilibrium at full employment with constant prices (falling in the case of wholesale prices). A decline or relative decline in the gold mining industry under these circumstances, would be tending to produce an under-full employment equilibrium and act as a drag on the economy. But as we pointed out in our introduction, there is no a priori reason why the existence of a gold mining industry should not be compatible with a growing equilibrium at full employment given constant prices. Gold output could expand at the same rate of growth as output in other sectors. While prices must remain constant, the level at which they remain constant is also important given the price of gold. In the Twenties, although retail prices were constant and wholesale prices fell after 1925, their level was higher than that prevailing before the war. On the other hand the price of gold after 1925 returned to its pre-war parity level. Had it risen commensurately with the higher price level the situation in the gold mining industry would have been radically different. In addition, certain factors of a non-cyclical kind such as the increased costs of deep-level mining, higher phthisis fund contributions and protective tariffs obtruded to raise mining costs between 1926 and 1928.

THE GREAT DEPRESSION 1929 - 1932

South Africa, as we have already shown, is highly dependent on international trade for her well-being. (In the 1920s her exports were equal to 30% of national income on the average.) As a result of this dependence, her economy is highly sensitive to fluctuations in the demand for her exports in the major industrial countries. The Great Depression after 1929 was almost entirely imported from abroad. The prices of some of South Africa's major agricultural exports like wool, maize, hides, tobacco, sugar, cotton and wattle-bark had already begun to decline between February and June 1928.¹⁰⁹ As a consequence, income from agricultural and pastoral exports was £5 million less in 1929 than in 1928. This was largely compensated by high diamond prices in 1929 so that total exports in that year were still slightly above the 1928 level. But with the collapse of the diamond market towards the end of 1929 following on the Stock Exchange crisis in the U.S.A. and the accelerated decline in agricultural prices on the world markets, income and employment fell considerably in South Africa.

How severely hit was South Africa by the depression? From the South African point of view this was certainly one of the severest, if not the most severe depression in her history. Total net national income declined from £270.7 million in 1928/29 to £217.2 million in 1931-32 - a decline of 19%. The General Index of Employment declined from an average of 1,142 in 1929 to 1,013 in 1932 - a fall of 12.75%. On the monthly figures, however, the decline from the peak month April in 1929 to the lowest month October in 1932 was 15%.¹¹⁰ But a simple recourse to global figures while useful, particularly when we

TABLE 28

COMPARITIVE NATIONAL INCOME OF VARIOUS COUNTRIES,
1929 - 33 (a)
(000,000 of national currencies)

Country	Currency	Peak Year	Low Year		% decline in Nat. Income
		1929	1932	1933	
South Africa	£SA	270.7	217.7		19
United States	\$	87,355		39,584	54.8
United Kingdom	£	4,178	3,568		15
Australia	£A	768	528		31
New Zealand	£N.Z	176	130		26
Sweden	Kr.	8,220		6,840	16.8
Canada	\$ Can.	4,689		2,387	49.8
Germany	R.M.	75,900	45,200		46.4
Hungary	Pengo	5,039	3,374		33.1
Rumania	Lei	200,900	103,500		47
Japan	Yen	11,918	(1931) 10,043		15.7
Greece	Dr.	41,000	28,000		30
Belgium	B.Fr	(1930) 68,490	50,000		26
Netherlands	Fl.	6,108		(1935) 4251	30.3
Austria	Sch.	7,249		(1935) 5141	29
Poland	Zloty	28.3		15.5	56.8
Yugoslavia	Dinar	69	32		54
Switzerland	S.Fr.	9,469		(1935) 7,429	27.1
Czechoslovakia	Korvanas	66.1		(1935) 51.5	22
France	fr.	245,000		180,000	26
U.S.S.R.	R	28,900	45,500		-

(a) Source: All statistics taken from the United Nations Statistical Yearbook 1949/50.

come to compare South Africa with other countries, does not give the whole picture. As Table 27 (on page 75) shows, the burden of the depression was unevenly distributed throughout the economy. The agricultural and diamond mining industries were very severely depressed, while manufacturing was relatively slightly affected. Gold mining, on the other hand, expanded.

To the extent that South Africa was still largely an agricultural country, the depression brought wide-spread economic distress.¹¹¹ The net income of the farming and fishing sector fell by 42% between 1927/28 (the high year for farming in South Africa) and 1932/33. By 1932 the export value of wool had fallen by 65%.

The sharp fall in the income of the sector "other mining" was due primarily to the depressed state of the diamond mining industry. Diamond exports fell from £12,074,000 in 1929 to £1,955,000 in 1932 (see Table 17). Employment in the industry fell from 63,391 to 24,078 over the same period.¹¹² By the end of 1931 most of the important diamond mines in South Africa had closed down.

Manufacturing industry was relatively less severely affected than the two sectors previously mentioned. It still expanded in 1929/30. By 1932/33 the net income of this sector had fallen by only 18% and the numbers employed in it by only 26,000 or 11.9%.

The gold mining industry, on the other hand, expanded throughout the depression. But before we analyse in greater detail the stabilising effect of the industry on the economy in this period, it will be useful to make some international comparisons.

In spite of the absolute severity of the depression in certain sectors of the economy, there can be little doubt that South Africa was less severely affected than most other countries. This can be seen in Table 28.

A comparison of South Africa with Australia and Canada, also gold producing countries, is instructive. Even though Australia devalued her currency early in the depression and Canada followed the United Kingdom in her devaluation in September 1931, the boost this gave their gold mining industries had little stabilising effect on the income of these countries. This was because of the relative smallness of their gold mining industries, and their dependence - especially Australia's - on the export of primary products whose prices had slumped heavily.

Although both South Africa and Australia are highly dependent on exports, the export of primary farming products represented only 35.8% of South African exports in 1928, whereas in Australia they represented 87.5%. On the other hand gold was 48.1% of South Africa's exports in that year compared with only 1.7% in Australia. By 1932 gold was 73.3% of South Africa's exports but only 5.8% of Australia's.¹¹³

The only other country comparable with South Africa in the depression was Sweden. We're excluding a comparison with Japan - whose economy was geared to military preparations early in the depression - and the U.S.S.R. which was virtually insulated from the depression. The relatively small decline in the United Kingdom's national income is misleading because of the low level of activity in the country throughout the 1920s.

As we pointed out in Chapter I, the relatively favourable position of Sweden was due to the fact that the rapid structural change that had begun to

take place in her economy in the 1920s persisted in the depression years. While certain primary industries, like the pulp industry, were declining, there was a rapid growth of secondary industry during the depression and many new products were pioneered.

The relative mildness of the depression in South Africa must be largely attributed to the stabilising effect of the gold mining industry. No other stabilising force appears to have been at work in the economy at this time. The agricultural and "other mining" sectors, as we have already shown, were in a depressed condition. Manufacturing was less severely affected, but largely because of the growing market provided by the gold mining industry in the urban areas of the South Transvaal. Although the rate of growth of manufacturing had been high in the preceeding boom, no such industrial revolution as took place in Sweden during the depression years occurred in South Africa. This can be seen from the fact that net investment in manufacturing was approximately zero in the years 1929/30 to 1932/33. Nor did the state engage in an active anti-cyclical policy in this period. The Government of the day pursued an orthodox policy of balancing its budget. It did increase its assistance to farmers from loans, but as half the state's receipts from gold mining were credited to loan account, a good measure of this assistance was being paid for by the gold mining industry itself.

In the previous two depressions all we could say was that gold mining declined relatively less than other activities. In this depression, however, gold mining expanded continuously. The numbers employed by the industry increased by 24,500. There was only a relatively small increase in the numbers of Europeans employed (approximately 1,300) but as the mines had been chronically short of African labour up to 1929 they were able to absorb many thousands of Africans rendered unemployed in other industries. The increase in the number of Union Africans employed was greater than the total increase. The percentage of Union to non-Union Africans rose from 43.8% in 1929 to 55.7% in 1932, and the numbers employed by 36,000. Their earnings rose from £2.8 million to £4 million over the same period.¹¹⁴

Gold output increased by 1,143,000 fine ounces representing an increase in value of £4,869,000. Table 29 shows how the gross revenue of the mining industry was distributed in the years 1929 and 1932. Only the principle outlays are included as figures are not available for a complete breakdown of mining expenditure in these years.

In analysing the effect of the increasing output of the gold mining industry on income and employment in different sectors of the economy, account must be taken of the leakages abroad in the distribution of mining revenue. To the extent that part of the increased revenue of the industry leaks abroad, its effect on internal incomes is reduced. The three principal leakages in mining expenditure are (a) dividends paid to foreign shareholders, (b) wages paid to non-Union Africans, (c) the purchase of imported stores.

(a) It was estimated that approximately three-quarters of the dividends of the gold mines in 1930 went to overseas shareholders, that is to say some £6½ million.¹¹⁵ As dividends went up very slightly in the depression, only a small proportion of the increased revenue of the industry would have leaked abroad via this channel (approximately £225,000).

(b) As we mentioned before, the industry employed a larger propor-

TABLE 29

ISTRIBUTION OF MINING REVENUE (ALL GOLD MINES)
1929, 1932 (a)
(£000)

	1929	1932	Increase
European wages and salaries	8,593	9,159	606
Non-European wages	6,864	7,613	749
Stores	14,814	16,142	1,328
Taxation and lease payments	3,197	4,265	1,074
Dividends	8,087	8,379	292
Miscellaneous (b)	2,814	3,540	726
Value of gold output	44,229	49,098	4,869

(a) All mines - Statistics from Annual Reports of the Government Mining Engineer.

(b) Includes miners phthisis compensation, native recruiting expenses, head office costs, pass fees, claim licenses and mynpacht dues, auditors fees, donations, interest and redemption of loans etc.

tion of Union Africans in 1932. The increase in wages distributed in the Union would therefore be approximately £450,000 more than the figure of £149,000 given as the absolute increase in Non-European wage outlay in the Table. Including the figure for whites, the industry distributed approximately £1,800,000 more in wages and salaries to Union citizens in 1932 than it did in 1929.

(c) Approximately £400,000 of the industry's increased outlay on stores went on purchasing imported stores. Not all of this sum, however, represented an increased leakage, as the cost on the mines of imported stores includes customs and railage paid in the Union. On the other hand there was an increase of over £900,000 spent by the gold mines on South African products over the same period.

As the increased wage outlay in the Union approximately balanced the dividend and imported stores leakages, the increase in the total sum distributed in the Union was approximately equal to the increase in gold revenue, viz. £4,869,000.

As we can see in Table 29 the state was a large recipient of the increased revenue of the gold mining industry. Government receipts from gold mining increased by over £1 million between 1929 and 1932. This includes only direct receipts from income tax and the revenue from lease mines. It does not include licences, mynpacht dues, native pass fees and the considerable indirect contribution of the industry to the revenues of the state via customs duties and differential railway rates.

Revenue from most other sources declined in the depression but, due to the compensating increase in direct and indirect revenue from gold mining, the Government of the day was probably exceptional in being able to balance its budget in 1932 without the drastic cuts in expenditure that added to the deflationary forces in the economies of other countries.

Finally, the industry had an important stabilising effect on the economy via the balance of payments position. Whereas the failure of gold exports to

expand more rapidly had contributed to the unfavourable balance in 1928 and 1929, the increase in gold exports in the depression coupled with a large fall in imports produced a large balance of payments surplus in 1932 (see Table 26). This had the effect of increasing the overseas balances of the South African Banks. As the South African Banks are sensitive to the state of their foreign balances, they began to lend more freely and lowered interest rates towards the middle of the year. This was an important factor in bringing about recovery in 1932.

In the latter half of the year, i.e. some months before devaluation, there was a distinct upturn in activity (Du Plessis dates the lower-turning point at July 1932). Imports began to increase after August and employment after October. Recovery at first was slow. But the slow recovery was suddenly converted into a rapid one after devaluation at the end of the year.

The question that occurs is why income declined as much as it did in South Africa in spite of the existence of a large gold mining industry. The explanation lies partly in factors internal to the gold mining industry and partly in the external environment.

Although the gold mining industry expanded more rapidly in this depression than in the previous boom period, the expansion was not in any way exceptional given the availability of unemployed resources on a large scale. The rigidity of mining costs was the most important factor limiting the growth of the industry. Working costs per ton milled fell by only 3% between 1929 and 1932. What reduction in costs there was came largely from a fall in the price of imported stores and the economies of scale due to an increase in the supply of African labour. While cost rigidity is a persistent feature of the industry, it was aggravated in this period by the state's policy of protection towards manufacturing industry and agriculture. Protective tariffs had the effect of keeping local prices high.

In spite of the relatively favourable position of gold mining in the depression, net investment in the industry increased by only £1 million. This set a limit to the growth of output. At first the industry was able to absorb many thousands of workers by taking up the slack of excess capacity, but after a while further expansion depended on increased investment. While, as was suggested in Chapter III, it is probable that investors were over-cautious at this time, the objective conditions were not such as to make mining investment very attractive. Interest rates remained high, falling only substantially after 1933. Although there were reserves of unexploited ore available, they were for the most part not of a sufficiently high grade in terms of prevailing costs, and rather pessimistic expectations, to make investment seem profitable. In addition, because of the long gestation period of mining investment, what little investment there was only came to fruition at a later stage.

The industry's decline in relative importance in the economy in the 1920s also limited its effectiveness as a stabiliser. Although gold mining was still one of the major industries in the country, it did not command the position it had held before the First World War.

Besides its size and degree of response to changing conditions, the effectiveness of a stabilising industry depends also on the strength of the de-stabilising forces at work in the economy. As we have shown, the external forces depressing activity in agriculture and diamond mining were extremely

powerful at this time. Also the fact that South Africa did not follow Great Britain in devaluing in 1931 intensified and prolonged the depression. South Africa's exports were put at a disadvantage on the English market. There was a flight of capital from South Africa between September 1931 and December 1932, speculating on South Africa's abandonment of the gold standard. The fact that she did not have to devalue before December 1932 was a reflection on the strength of her external trade position due to increased gold exports. But this is not to say that the depression would not have been mitigated considerably had she followed sterling in September 1931.

1932 - 1939

Recovery from the Great Depression began, as we indicated in the previous section, from the middle of 1932. But this gradual recovery soon developed into a period of unprecedented prosperity after South Africa left the Gold Standard on the 28th December 1932.

Before devaluation actually took place, there had been considerable controversy over the wisdom of taking such a step. The country was divided on this issue. Those that stood to benefit by devaluation were the gold producers, farmers, exporters in general and debtors. Those that stood to lose, if a rise in prices were to follow devaluation, were importers, wage-earners, fixed income receivers in general, and creditors.

In the evidence before the select Committee set up by the Union Government to investigate the question of the Gold Standard in 1932, the main arguments put forward against the abandonment of the gold standard were:

(a) The balance of payments position of the country was essentially sound.

(b) Devaluation would result in a rise in prices. This would mean a rise in costs which would soon nullify the benefit to the gold mining industry of the rise in the price of gold. Dr. J.E. Holloway, the Director of Census and Statistics, produced evidence to the effect that prices in gold standard countries had continued to decline during the depression, whereas prices had risen in non-gold standard countries. Wholesale prices in Great Britain, for example, had risen by 12½% between September 1931 and February 1932, whereas in the United States of America, which had not devalued, they continued to decline over the same period.¹¹⁷

(c) It was also felt that as South Africa was the premier gold-producing country, her abandonment of the gold standard would have a bad psychological effect on the future willingness of the world to continue to use gold as an instrument of international trade, and would also impair South Africa's credit-worthiness in the international capital markets.

These arguments prevailed against those who advised the immediate abandonment of the gold standard, and the Government determined to remain on gold as long as possible. But towards the end of 1932 there was renewed political agitation for leaving the gold standard culminating in Roos' speech of December 17th 1932. This was followed by rumours that the Government would abandon gold which led to a renewed flight of capital, estimated at between £2,000,000 and £3,000,000, in the last few days prior to devaluation and helped

TABLE 30

SOUTH AFRICAN PRICE INDICES 1929 - 1939 (a)
(1910 = 1000)

	Wholesale prices			Retail Prices Food, fuel, light, rent & sundries	Wages	
	All groups	S. African goods	Imported goods		Nominal	Real
1929	-	-	-	1431	n.a.	n.a.
1930	1155	1027	1428	1397	n.a.	n.a.
1931	1196	1033	1304	1345	n.a.	n.a.
1932	1032	952	1197	1285	1306	1092
1933	1047	972	1201	1251	1320	1130
1934	1143	1115	1196	1268	1319	1112
1935	1066	1004	1180	1261	1372	1169
1936	1109	1085	1154	1266	1395	1183
1937	1136	1081	1235	1295	1400	1164
1938	1174	1131	1252	1342	1410	1133
1939	1146	1088	1252	1341	1414	1135

(a) Source: Official Year Books of the Union of South Africa.

to precipitate devaluation itself on the 28th December 1932.

The immediate effect of devaluation was a sharp rise in the internal price of gold from 85/- to 120/- per fine ounce. Working profit per ton jumped from 8/- to 18/-. This inaugurated a stock exchange boom in gold mining shares on an unprecedented scale. Between December 17th (the date of Roos' speech) and May 27th 1933 gold mining shares had doubled in price.¹¹⁸ The large increase in the price of gold gave rise to expectations of high profits in the future.

Devaluation had little effect on the National Income at first. There was no immediate rise in the sterling price of gold so that the value of South African gold exports in terms of sterling remained unchanged. What took place at first was largely a transfer of income from importers and the purchasers of imported goods to exporters of primary products - the farmers and gold miners. This redistribution, however, had important effects on business incentive and created a strong stimulus to invest and produce. It was only later with the devaluation of the dollar and further increases in the sterling price of gold, without any appreciable rise in the general price level, that the real value of gold in terms of the exports of other countries increased.

Another immediate effect of devaluation was the return of the capital that had left South Africa after Great Britain abandoned the gold standard.

But with the rapid increase in gold mining production and investment following on devaluation and the inducement this gave to investment and increase in activity in other sectors of the economy, national income and employment rose very quickly. National Income in 1933/34 was already slightly higher than

that for 1928/29, the high year before the depression (see Table 9) and exceeded it by approximately 15% in real terms because of the fall in the price level. National Income continued to grow at a rapid rate throughout the 1930s with an average annual percentage rate of growth at constant prices of 7.5% over the period 1932/33 to 1938/39 as compared with 5% in the period 1922/23 to 1928/29 and 3% between 1911/12 to 1919/20.

By June 1934 employment had recovered to the level it had reached in the peak month before the depression and continued to expand throughout this cycle.¹¹⁹ Employment in 1939 averaged 60% above the pre-devaluation level.

The fears of those who opposed the abandonment of the gold standard proved to be unjustified. Wholesale prices increased very slightly in 1933 over 1932 and then rather more in the case of South African goods than imported goods. Retail prices actually fell in 1933. Nor did prices increase much with each increase in the price of gold. The price level remained remarkably constant throughout most of the period rising slightly in the latter half of the 1930s. Nominal wages, too, rose only very slowly. These price movements can be seen in Table 30.

This prediction that prices would soon rise to the same extent than incomes increased as a result of the higher price of gold, thereby neutralising the advantages of devaluation, had ignored the following factors:-

- (a) the existence of unemployed resources,
- (b) the incentive effect of a higher gold price,
- (c) the lag in wage increases which is lengthened in a period of unemployment.

In using the quantity theory of money, it was argued that an increase in M in the identity $MV \equiv PT$, where V is assumed constant, involves an increase in P.¹²⁰ This would only be true in a period of full employment where T (the quantity of real output) is inflexible. In the sphere of foreign trade, the belief that devaluation would raise the price of imports to the extent of the devaluation ignored the possibility of further devaluations (particularly that of the U.S.A. dollar), and the effects these would have on the price of the exports of those countries, (Great Britain in particular), which had devalued earlier in the depression. As Great Britain soon lost the initial advantage she had gained by her early devaluation, she was forced to lower the sterling price of her exports in 1933 because of the continued depressed state of international trade.

The incentive effect of the higher gold price can be seen from the enormous increase in the investment in this period (see Table 10). By 1934/35 total net investment had already exceeded the 1928/29 peak level and continued to expand throughout the whole period. Net investment as a percentage of National Income increased continuously from 2.3% in 1932/33 to 14.4% in 1938/39. It averaged 11.5% for the period as a whole compared with 8.6% in the period 1922/23 - 1928/29.

Particularly spectacular, was the extent of net investment in gold mining which totalled £55.5 millions, averaging 21.2% of total net investment in this period. This compares with the negative net investment in gold mining of £4.5 million in the 7 years 1922/23 - 1928/29 of the previous upswing and

the positive net investment of only £1 million in the depression before devaluation.

This high rate of investment in gold mining combined with the sharp increase in real income from gold mining, were the main factors determining the high rate of growth of income and investment during this period.

Investment in private building also expanded rapidly until 1936/37. But next to gold mining, public investment (which includes investment in railways and harbours as well as investment by the Central, Provincial and Local Governments) increased most rapidly. It increased continuously from £6.3 million in 1932/33 to £28.7 million in 1938/39 averaging £15.4 million for the period. Public investment had been remarkably constant in the previous upswing, averaging £11 million for the period and showing no tendency to increase or decrease during the boom. But it fell off in the depression years and therefore exercised no anti-cyclical effect. In this cycle, however, public investment expanded by £10 million between 1936/37 and 1938/39, compensating for the decline in private investment in the downswing after April 1937. It therefore shared with gold mining the rôle of depression stabiliser. Although anti-cyclical public spending was partly the result of conscious policy in the late Thirties, it was facilitated by the vastly increased revenue derived from the gold mining industry after 1932 which enabled the Government to carry on its programme without running into deficit (see Table 14).

It is interesting from a theoretical point of view to distinguish the way in which the gold mining industry acted as a stabiliser in the depression before and after devaluation. During the depression the gold mining industry "cushioned" the effects of the slump via the income multiplier only. There was hardly any investment multiplier effect at all. There might have been a slight accelerator effect due to the expanding gold output - but only where industries were largely dependent on the gold mines. This income multiplier effect did set a limit to the fall in income in the economy. But because there was no increase in investment, recovery was slow till the end of 1932. With devaluation, however, not only a much greater income multiplier, but also an investment multiplier, came into effect. The resultant rapid growth of income put into operation the accelerator mechanism of induced investment. But the accelerator mechanism alone (that is to say the technical relationship between the rate of growth of output and the investment that is required to sustain that rate of growth) could not explain the whole of the sudden burst in investment activity in spheres other than mining following devaluation. Much of this increase in investment, (in building in particular) was of the "autonomous" kind resulting from optimistic expectations concerning future demand, rather than a response to current changes in demand.¹²¹

Between 1933 and 1939 the gold mining industry not only jerked the South African economy out of depression, but inaugurated a period of expansion and prosperity perhaps only equalled in the period from the discovery of gold to the Boer War. Gold again assumed the autonomous rôle in the South African economy which it had played in the period before Union. It once more became an active determinant not only of the secular rate of growth of the economy, but also, as we will see later, of the cyclical process.

The industry's relative importance (in terms of net contribution to national income) exceeded that of all other sectors in this period (See Table

9). Agriculture and other branches of mining remained depressed throughout the period, together contributing less than gold mining to the national income. Manufacturing grew steadily in relative importance in the period but still contributed less on the average than gold mining to the national income (gold mining 18.7%, manufacturing 15.8%). Gold made a larger contribution to total exports in the 1930s than at any other period in the industry's history. (Gold average 71% of total exports in the 1930s, compared with 50% in the 1920s and 63% in 1906 to 1914.)

As we pointed out in Chapter III, the best measure of the growth of the industry in this period is the increase in the tonnage milled and the numbers employed rather than the number of fine ounces produced. Tonnage milled increased by 65% in the 7 years 1932 - 39 compared with an increase of only 29.4% in the 9 years from 1923 to 1932. Fine ounces produced actually fell in 1933 and 1934 and rose slowly throughout the period. This was due, as we have shown, to the normal policy of the industry of mining the average grade of payable ore on the one hand, and the imposition of the Excess Profits Tax on the other. (We will consider the economic effects of the Excess Profits Tax in an Appendix to this chapter.)

THE DOWNTURN OF APRIL 1937

The downturn in this cycle was partly internally and partly externally caused. By 1937 the high rate of private investment began to slacken off. Net investment in building and manufacturing began to decline although manufacturing output continued to expand both in value and in volume in 1938 and 1939. This can be seen in Table 31.

TABLE 31:

Gross output of Manufacturing Industry in South Africa 1917/18 - 1939/40 ^(a)
(1937/38 = 100)

	Value	Volume		Value	Volume
1917/18	32.1	24.5	1935/36	80.2	82.4
1920/21	52.4	30.3	1936/37	93.4	94.8
1932/33	48.5	48.9	1937/38	100	100
1933/34	59.4	59.6	1938/39	106.5	106.8
1934/35	70.2	71.7	1939/40	115.6	111.3

a) Source: Board of Trade and Industries Report No. 282. Investigation into Manufacturing Industries in the Union of S. A. Annexure D. p. 150.

Although net investment in gold mining continued to increase, reaching its peak in 1937/38, there was a decline in expectations with respect to gold mining investment in April 1937, resulting in the well-known Black Friday speculative collapse in gold mining shares in that month.

There had been a slowing down in the rate of growth of gold mining output in 1936 and 1937 due to labour shortage. The increase in the African labour force in 1937 over 1936 was only 6,000 whereas the average annual increase in the previous four years had been 20,000. The shortage was a re-

TABLE 32

Monthly index of share prices of 30 gold mining Cos.

(1931=1000)^(a)

Jan. 1931 = 1000	April. 1937 = 2871 (Black Friday)
July. 1932 = 899	July. 1937 = 2395
Jan. 1933 = 1503	Dec. 1937 = 2673
April. 1933 = 2043	April. 1938 = 2555
Feb. 1935 = 3029	Nov. 1938 = 2900
Dec. 1936 = 3203	July. 1939 = 2539

(a) Source: Official Year Books of the Union of South Africa.

lative one in terms of the growing needs of an expanding industry. In 1936 there were no less than 14 large new mines in the development stage. Besides this factor there was uncertainty about the future price of gold in 1937. The price of gold had reached a peak of 147/7 per fine ounce in March 1937. It then declined reaching its lowest point for the year in August 1937 at 139/3 per fine ounce. Because of the key position of gold mining in the field of private investment in South Africa at this time, the decline in mining expectations and shares on the stock market had an adverse effect on investment in other fields.

The other cause of the downturn was a decline in exports in 1938. Exports of agricultural products fell by £9 million in 1938 from the 1937 peak of £29 million. The export of other mine products (excluding gold) also fell by £1 million.

Most of the monthly time series used by Du Plessis as Trade Cycle indicators, show only a small absolute decrease during 1937, 1938 and early 1939.¹²² Employment, for example, fell off slightly from April 1937, but the average for 1937 was still higher than 1936. The annual average level of employment continued to increase in both 1938 and 1939 although at a much slower rate than up to April 1937. Seasonal declines in employment in the summer months began to reappear from 1937 to 1939. From October 1932 to April 1937 the rapid cyclical recovery and expansion had caused the increase in employment to override normal seasonal fluctuations. Almost without exception, the monthly index of employment shows continuous increase throughout the period.

The downturn in 1937 has many features in common with the "ceiling" kind of downturn, as formulated in Hicks' theory,¹²³ where a relative shortage of real factors of production causes a slowing down in the rate of growth of output, leading via the accelerator mechanism, to a decline in investment. But because of the steep upward trend in the economy and the anticyclical influence of the rapidly expanding gold mining industry, there was little absolute decline in output. Net National Income continued to increase in 1938 and 1939 although real National Income in 1938 was slightly lower than in 1937 due to price rises in 1938. Seen as a deviation from the steep upward trend of the previous period, however, the downturn was more conspicuous. But it was still much milder than the previous downturns in the post-Union period.¹²⁴

Whereas the slowing down of the rate of growth of the gold mining industry and the speculative collapse in gold shares had some part in causing the

TABLE 33

NATIONAL INCOME AT CURRENT PRICES FOR CERTAIN COUNTRIES, 1929-39 (a)

(000,000)

	South Africa £	Great Britain £	Canada \$	(c) New Zealand £	(c) Australia £	U.S.A. \$	(b) Sweden Kr
1929	270.7	3925		176.7	768	93424	8220
1932	217.2	3325	2893	135.5	528	39628	6841
1933	234.7	3550	2795	130.0	550	39283	6840
1937	368.9	4350	4342	197.8	774	70000	10274
1938	374.8	4350	4246	215.0	814	62334	10704
1939	394.8		7862			68785	11510
Annual Av. Rate of growth 1929- 1937	3.9%	1.2%	-	1.4%	.9%	-	2.8%

(a) Source: Board of Trade and Industries Report No. 282, *op. cit.*, Annexure C, pp. 146-149.

(b) Source: *Statistik Arsbok för Sverige*, 1951.

(c) 1929 = 1928/29 for South Africa, New Zealand and Australia.

TABLE 34

Price Indices of Various Countries, 1938-1951 (a)

(Base 1938 = 100)

	Wholesale Prices		All goods	U.K. All goods	Canada All goods	U.S.A. All goods	Retail Prices South Africa All Items
	Union goods	Imported goods					
1938	100	100	100	100	100	100	100
1945	143.6	167.3	157.6	167	130	135	132
1946	150.7	165.4	156.2	173	136	154	134.1
1947	155.6	177.4	163.8	189	160	194	139.7
1948	160.2	199.1	174.9	216	190	210	147.8
1949	164.8	217.5	184.7	227	195	197	153.2
1950	171.6	240.3	197.6	259	207	205	159.3
1951	187.4	288.9	225.8	315	235	229	171

Source: Quarterly Bulletin of Statistics of the South African Reserve Bank, September 1951, Table XI, p.7.

downturn, the continued increase of gold mining output and investment had a powerful stabilising effect on the economy in the ensuing depression. In spite of the speculative collapse in gold shares, real investment in gold mining reached a peak of £12.2 million in 1937/38, declining only slightly to £11.7 million in 1938/39. This contrasted with net investment in other private sectors which declined from 1937 and in the case of manufacturing from 1936 (see Table 10). Gold output expanded by over 1 million ounces from 1937 and by £17,000,000 in value. The numbers employed increased by 23,000 and the outlay on stores and wages by £5,000,000.

With worsening economic conditions in 1938, the labour shortage of 1936 and 1937 was ended and the supply of labour to the mines increased considerably.

Although the mines were probably the largest single stabilising factor in this cycle, there were 3 other factors which played their part in causing this to be a relatively mild depression:-

(a) In spite of a decline in net investment in manufacturing, manufacturing output, as we have already mentioned, continued to expand in the depression although at a slower rate. Numbers employed in manufacturing increased by 6,000 between 1936/37 and 1938/39.

(b) The second factor already alluded to, was the continued increase in public investment. Public investment increased by £9.8 million between 1936/37 and 1938/39.

(c) It must also be noted that internationally, the downturn after 1937 was much less severe than after 1929, so that the external conditions for stabilisation were much better. Total South African exports declined by only 5% in 1938. Agricultural exports fell by 30%, but this was overshadowed in the total by increased gold output and the high share of gold in South Africa's exports in this period.

South Africa was not unique in the cyclical history of the late Thirties as Table 33 shows. Neither in New Zealand, Australia, the United Kingdom or Sweden, did National Income fall in 1938 or 1939. But in none of these countries, Sweden included, had recovery from the previous depression been so complete and expansion so rapid as in South Africa until 1937.

1939 - 1962

The last period in our survey covers only the upswing phase (not yet ended) of a major cycle which began towards the end of 1939 - just at the outbreak of the Second World War. National income at current prices has grown at a very rapid rate during this period - averaging 8.3% per annum between 1938/39 and 1961/62. But as this has also been a period of considerable inflation, the real rate of growth of income (at constant 1938 prices) averaged only 4.5% per annum. While comparatively high, this rate of growth was no higher than that which took place in South Africa in the 1930s (between 1928/29 and 1938/39 national income also grew at an average rate of 4.5% per annum at constant prices). It must be remembered, though, that this decade covered two major depressions. If we consider only the cycle following devaluation in 1932 (i.e. from 1932/33 to 1938/39) we find that real income grew at the exceptional rate of 7.5% per annum - a rate probably never equalled in South African economic history.

Several important structural changes, however, have taken place in the economy during and since the war (see Table 9). The most significant has been the relative growth of manufacturing industry which now accounts for approximately one-quarter of the national income. Agriculture, which had been very depressed in the 1930s, improved its position markedly in the first few years after the war, but has declined again in relative importance since 1953/54. Gold mining on the other hand, has moved in exactly the opposite direction to agriculture. From being the most important industry in the economy at the outbreak of the war it declined steadily in importance, yielding first and second place to manufacturing industry and agriculture respectively. By 1953/54 it contributed only 7.6% of the net national income (having briefly increased its share after devaluation in 1949). But with the opening up of the new gold fields, the industry's share in the national income has risen to over 10% in the 1960s and is now closely rivalling agriculture for second place.

Although money national income has risen in every year since 1939, the period has not been one of uninterrupted or steady expansion. There have in fact been several minor fluctuations around the upward trend. The recessions in these minor cycles have been relatively mild and of short duration. They have more in common, therefore, with the minor recessions of 1923/24 and 1926/27 in the major upswing of the 1920s than with major downturns like 1912-14 or 1929-32.

The following is a chronology of post-war turning points taken from Van Zyl's study.¹²⁵ These fluctuations are also visually represented in an index of economic activity in Graph IV (Chapter III).

Upper Turning Points

1. First half of 1948
2. First half of 1951

Lower Turning Points

- Second half of 1949
- Last quarter of 1952 and first quarter of 1953

3. Second and third quarters of 1955

Very ambiguous

4. Second half of 1957

Last quarter of 1958 and first quarter of 1959

5. First half of 1960

Last half of 1961.

Comparing South African cycles with those in the U.S.A. since the war we find a fairly close correspondence between the two except in the case of the downturns in 1951 and 1955.

Turning Points in American Cycles

Upper Turning Points

1. Second half of 1948
2. First half of 1953
3. Second half of 1957
4. First half of 1960

Lower Turning Points

- Second half of 1949
- First half of 1954
- First half of 1958
- First half of 1961

No attempt, however, will be made in this study to analyse post-war South African cycles in any detail except where interesting relationships can be detected between these fluctuations and the gold mining industry.

The last war began, as did the first world war, at a period of low cyclical activity. This stimulated gold mining at first but with the increase in war-time activity and rise in prices, gold mining gave way to other activities. The

TABLE 35

SOUTH AFRICAN BALANCE OF PAYMENTS, 1946-1962 (a)
(£,000,000)

Item	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
<u>Current Account</u>																	
Merchandise:																	
Imports f.o.b.	-217	-304	-357	-317	-306	-469	-420	-430	-445	-488	-500	-556	-565	-498	-564	-511	-522
Exports f.o.b.	78	108	145	147	218	290	291	300	334	371	415	452	387	439	440	464	472
Trade balance	-139	-196	-213	-170	-88	-179	-129	-136	-111	-117	-85	-105	-178	-56	-124	-47	-50
Gold output	102	98	100	114	147	150	152	153	165	183	198	215	220	252	265	238	316
Other current items (net) (b)	-53	-82	-58	-66	-81	-107	-108	-109	-112	-117	-113	-125	-107	-118	-137	-141	-119
Total current Account (net)	-90	-180	-171	-123	-22	-136	-85	-86	-59	-52	0	-6	-77	83	11	101	148
Omissions & Errors (net)	x	x	x	x	x	x	x	x	x	x	- $\frac{1}{2}$	5	12	-8	-7	-8	11
<u>Capital Account</u>																	
Private capital (net) (c)	41	179	87	58	76	88	70	60	89	14	12	-31	30	-20	-76	-33	-36
Official & Banking; Change in foreign liabilities & assets (net) (d)	2	-2	$\frac{1}{2}$	3	18	10	9	-4	14	13	-	11	40	-16	6	-6	-29
Change in reserves of gold & foreign exchange (e)	47	3	89	68	-71	38	7	30	-44	20	-12	31	-5	-40	66	-54	-94
Total Capital Account (net)	90	180	171	123	22	136	85	86	59	52	$\frac{1}{2}$	11	65	-76	-4	-93	-159

(a) Source: S.A. Reserve Bank Quarterly Bulletin of Statistics, March, 1963, p.39. Note that R000,000 have been converted back into £000,000.

(b) Including transfer payments and up to 1955, adjustments for omissions and errors.

(c) Capital inflow +, capital outflow -.

(d) Increase in liabilities or decrease in assets +, decrease in liabilities or increase in assets -.

(e) Increase -, decrease +.

rapid spurt in gold output from 1939 to 1941 was partly the fruit of large-scale investment in the pre-war period (a number of new mines including the very rich Blyvooruitzicht mine, came into production in these years) and partly due to the rapid increase in the native labour supply in 1940 and 1941 brought about by relatively depressed conditions in other industries. The value of gold output increased by £22 million between 1939 and 1941 and employment by 43,100 over the same period. This helped to stabilise income and employment at a high level in the early war years until the new opportunities for expansion provided by war-time conditions began to have their effect.

Between 1941 and 1948, as we have shown, gold output fell steadily both in volume and value with a somewhat larger drop in 1947 due to the strike in February of that year. Gold output fell by £21 million in value and employment in the industry by just over 100,000 in the same period.

It is not easy to show what restraining effect, if any, the declining gold mining industry had on the economy in this period because of the powerful expansionary and inflationary forces in the war and post-war boom. But Table 34 shows that there was less price inflation in South Africa than in some other countries before 1948. To what extent this was due to the declining gold output is difficult to determine. It would demand a detailed study of the factors effecting price movements in the different countries considered. But the gold mining industry probably had some effect.

The most important effect of the declining volume and real value of gold output is to be seen in South Africa's balance of payments position. There was a repetition of the deficit in the balance of payments in 1948 and again in 1951 which we are familiar with in previous boom periods. The large volume of imports that flowed into the country at inflated and continually rising prices was not compensated by a corresponding rise in the volume and value of gold. While gold no longer held the position it had had in the South African economy in the 1930s, it still accounted for 50% of South Africa's exports in 1947. Other exports did not expand sufficiently rapidly to compensate for the decline in the value of gold exports.

From Table 35 we can see that a large deficit on current account had already appeared in 1947 but this was more or less offset by the vast net movement of private capital into the Union in that year. In 1948, however, with a halving of capital imports and a further increase in merchandise imports, a large net deficit in the balance of payments appeared. The continued loss of gold reserves in 1948 led to the introduction of severe import restrictions towards the end of the year. This, together with the decline in foreign investment, were the main causes of the slight recession that began towards the end of 1948 and continued throughout most of 1949.

The exchange difficulties of South Africa were not of course peculiar to this country alone at the time. The tremendous increase in imports after the war was the result of war-time shortage. Disequilibrium in the balance of payments was a widespread feature of the post-war world. The problem was aggravated in 1949 by the recession in the U.S.A. which caused a decline in imports from the non-dollar world. The general belief that devaluation was imminent contributed to the drying up of the capital flow into South Africa and also led, as it did in 1931-32, to an outflow of "hot money" speculating on the

likelihood of devaluation.

While South Africa was not in as serious a predicament as the Western European countries, where the dislocations of the war had been more severe, she was in a more difficult position than other primary producing countries such as Australia because her main export had not increased in value.

Devaluation in September 1949 changed the position radically. The value of gold exports increased over 40%. As a result of this increase in the value of gold exports and a fall in imports following on import control, South Africa had a considerable active balance in her overseas payments in 1950. But in 1951, with the post-Korean war rise in the price of imports and the failure of gold exports to increase above their 1950 level, a deficit reappeared in the balance of payments.

Devaluation altered the rôle that the industry had been playing in the economy up to 1949. It added considerably to the inflationary forces at work and together with the world-wide increase in prices following the Korean war, accounted for the sharp increase in prices in South Africa between 1950 and 1952. But as the increase in the price of gold was a once-and-for-all increase, the industry was not a source of continuous inflation in the economy. The benefit to the mines of the higher gold price was soon swallowed up by rising costs and in 1951 gold output again declined.

From 1952, however, with the opening up of new mines, gold production steadily expanded again reaching the record output of 26.9 million fine ounces, valued at £339 million, in 1963 – more than double the 1952 level. Whereas in 1952 the Old Rand mines still accounted for 83.4% of total gold output, by 1963 they contributed only 23.6%. The new Orange Free State mines alone accounted for a third of total output in 1963.

In addition to gold, the industry has also been responsible for the production of considerable quantities of uranium since 1952. Uranium exports earned the record total of £54 million in 1960. Since then Uranium exports have declined but still earned £37 million in 1962.

The stabilising effect of the gold mining industry on the South African economy has again reasserted itself in the last decade. This is particularly apparent in the two most recent recessions of 1957/59 and 1960/61.

In the latter half of 1957 and 1958 there was a sharp fall in the value of merchandise exports due to the recession overseas. The agricultural sector was particularly hard hit by the fall in export prices. But manufacturing industry also suffered a setback in this recession. For the first time since the war manufacturing industry registered an absolute fall in its contribution to the national income in 1958/59 (See Table 9). Net private investment fell sharply in 1958 and 1959 and unemployment rose. Gold and uranium output, on the other hand, increased by £38 million and £6 million respectively, between 1957 and 1959; and employment in the industry rose by 43,000, thereby softening the effects of the recession. Also the balance of payments crisis of 1958 (caused essentially by monetary and import control mismanagement in the face of declining export earnings) would have been far worse had it not been for the expanding gold and uranium industry.

The stabilising effect of the gold mining industry was perhaps even more dramatic in the recession of 1960-61 and the subsequent recovery. This recession, which was also experienced overseas, was aggravated in South Africa

by the flight of foreign capital and decline in business confidence that followed the Sharpeville troubles. The balance of payments crisis of 1960 and the first half of 1961 was not caused by any difficulties on current account (which showed a surplus) but by the large-scale exodus of private capital (see Table 35). By mid-1961 South African reserves of gold and foreign exchange had fallen to less than £75 million. This led the authorities to introduce measures to control the repatriation of foreign assets for the first time in South Africa's history in the middle of that year. These measures, together with intensified import and exchange controls on local residents and a continued increase in gold output, soon led to a sharp rise in foreign exchange reserves. By September 1963 the reserves reached an all-time peak of £259.7 million. Because of the crucial rôle that the foreign exchange reserves play in the liquidity position of the banks, interest rates fell sharply in 1962 and 1963 and credit became plentiful. Easy money conditions together with a revival in confidence in the private sector and a continued increase in export earnings accounted for the spectacular recovery and boom conditions of recent years.

Besides its stabilising influence in the monetary sphere via the balance of payments, the gold mining industry also had a real anti-cyclical effect in the recent recession. The industry's consumption of stores (mostly locally produced) rose by £11 million in 1960 and 1961. Employment also increased by 18,500 in this period, thereby taking up some of the slack in other sectors. The employment effect was actually greater because the mines increased the proportion of local Africans contracted.

On the debit side, however, was the sharp fall in gold share prices after Sharpeville, already referred to in Chapter III. Admittedly this slump was inspired by political uncertainties, particularly on the part of foreign investors, and was not only confined to the gold share market. But such is the central rôle of gold shares in the South African stock market, and the importance of foreign investors in this industry, that a loss of confidence in the South African economy as reflected in the fall in share prices has a profound effect not only on other sections of the share market, but on the general state of confidence in the country. The depressed state of the share market undoubtedly increased liquidity preference and adversely affected real activity and investment in 1960 and 1961.

A NOTE ON THE EXCESS PROFITS TAX

Any indirect tax that raises the cost of producing gold in a depression and thus limits the expansion of the gold mining industry, would have a destabilising effect on the economy. An income tax does not have the same effect although by reducing the prospective returns from gold mining investment it may discourage investment.

The Excess Profits Tax was the subject of heated debate in the 1930s. It is of some interest in retrospect to try and assess some of the effects of this tax on the South African economy. The tax was designed (a) to promote the mining of low grade ore and so prolong the life of the industry, (b) redistribute some of the windfall profits that accrued to the industry after devaluation, to other sectors of the economy. Those that opposed the tax at the time advanced the following arguments:-

(a) The level of taxation was discriminately high against gold mining, averaging 42% of profits.

(b) Although the tax did stimulate the mining of low grade ore, the high price of gold did this anyway. It also encouraged wasteful practices because it now paid the gold mines not to sort out waste rock but to mill it alongside with gold-bearing rock.

(c) The use to which the Government put the revenue derived from gold mining was also objected to. In 1933/34 total Government revenue from gold mining was £14,545,000 — an increase of £10,000,000 over the preceding year. But in the same year the Government spent £8,646,000 on agriculture. It was felt by some economists that this was an excessive sum to spend on supporting an industry that in the face of changes in world trade had become uncompetitive.¹²⁶ It would be better, they argued, to allow the gold mines to expand by reducing taxes. Not only would this cause gold mining to expand and therefore increase Government revenue from the industry in the long run, but it would also provide the capital for expansion in other fields.

The policy of the gold mining industry of mining ore of the average payable grade in a mine has a destabilising effect on the economy from a cyclical point of view, in so far as it raises gold output in a boom and lowers it in a depression. But as it prolongs the life of the industry it may have a stabilising effect on the economy in the long run.

To the extent that the tax led to a lowering of gold output, encouraged wastefulness and deterred mining investment, it can be said to have had a destabilising effect on the economy in this period. But the latter in particular would be difficult to prove. The attractiveness of gold mining investment in the 1930s is apparent not only from the large number of new mines that were

developed but also from the statements of men engaged in the industry.

Nor can the support given to agriculture from the funds derived from gold mining be said to have been destabilising. In so far as it distributed income to a distressed section of the population with a high marginal propensity to consume it must have had a multiplier effect on other incomes. From the long term point of view this may also have been a wise policy, because neglect of the land in a country like South Africa usually leads to irreparable harm being done to fertile soil by rapid soil erosion. During and since the last war, many countries, including Great Britain, regretted the neglect of the soil that took place in the 1930s. If anything many economists after the war, because of the shortage of food and raw materials, began to speak of a permanent change in world trade in favour of primary producers. But to speak of permanent changes in world trade conditions is a highly speculative matter in the field of economic prediction. There is therefore some justification for caution in policies designed to influence the reallocation of resources, particularly as these affect the land, which, in contrast to the famous dictum of Ricardo, is certainly not an indestructible asset in a country like South Africa.

In addition, in the absence of the E.P.T., a much larger sum would have gone abroad in the form of dividends as between 60% and 70% of the dividends from gold mining found their way abroad in this period.¹²⁷ Although some of this increased sum would probably have been reinvested in South Africa, it is doubtful whether this would have compensated for the loss of income to the country.

CONCLUSION

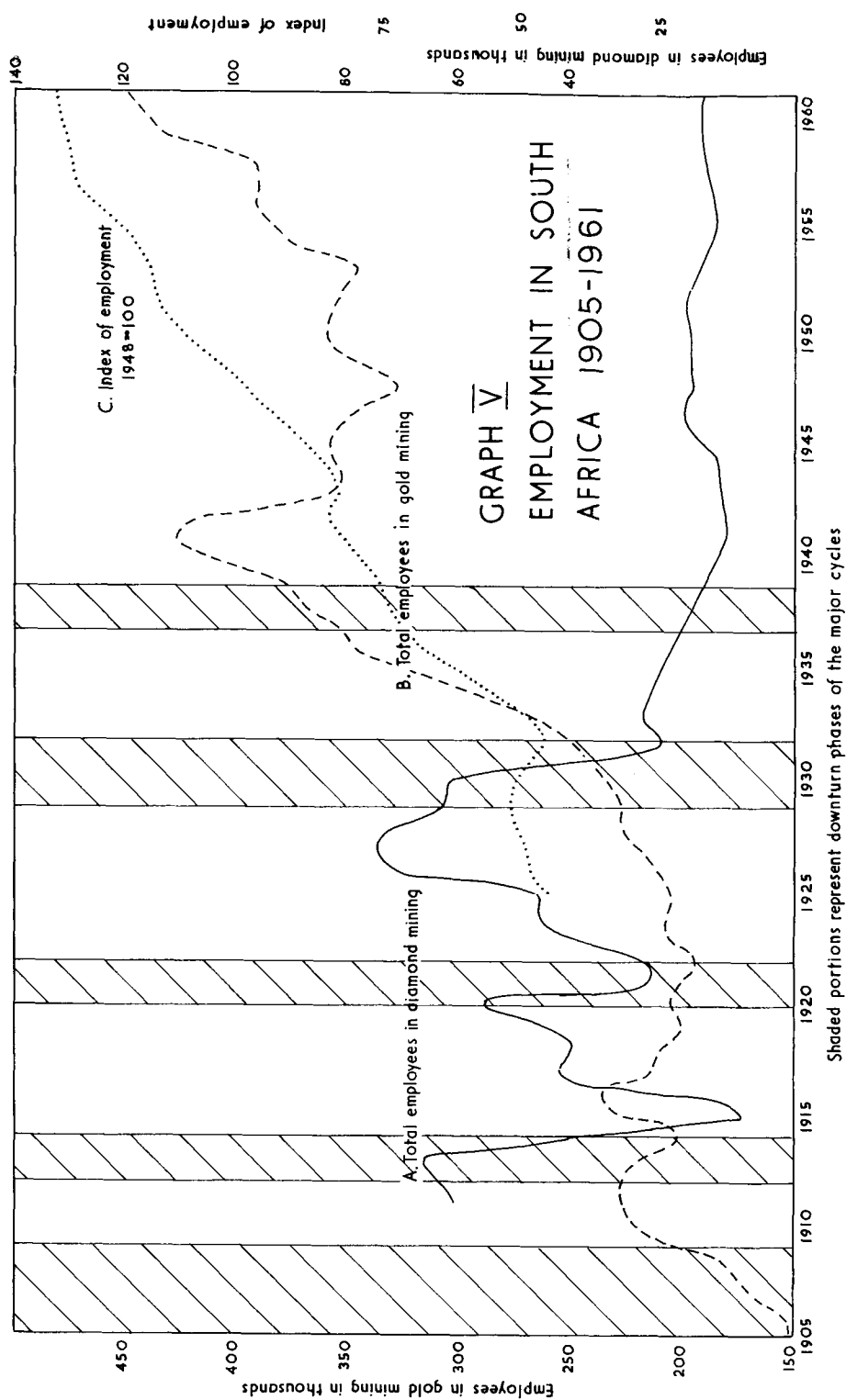
Our general conclusion is one that gives a qualified affirmative answer to our two original questions. That is to say the gold mining industry does display some anti-cyclical tendency in South Africa although not nearly as much as theory leads us to expect. Most of the conditions for the anti-cyclical behaviour of the industry have been absent at one time or another. Cost rigidities, exogenous disturbances such as changes in the price of gold, new discoveries and strikes etc., have militated against gold output changing anti-cyclically.

Nevertheless, the industry's predominant effect on South African cycles has been one of stabilisation, although not in the early years of gold mining. This effect has often been limited and offset by other factors but there is a good deal of positive evidence for the industry having lived up to theoretical expectations, at least between the wars and in the last decade.

An indication of the stabilising influence of the gold mining industry on the economy in the inter-war period can be seen from the behaviour of employment (see Graph V). The index of total employment shows remarkably little deviation from an extremely high trend. For the period as a whole, the stability of gold mining employment stands in sharp contrast to that of diamond mining. Even in the depressions 1912-14 and 1920-22 when gold mining employment also fell, the fall was markedly smaller than in diamond mining.

There is one respect, however, already referred to in previous chapters, in which gold mining has probably had a destabilising effect on the South African economy. This is in the sphere of speculation in gold mining shares. This element of speculation was particularly noticeable in the early years of gold mining and again in the 1930s. It has also not been absent in the post-war period.

We have already referred to the enormous boom in company promotion and speculative movement in gold mining shares following on devaluation in 1932. No less than 249 new companies with a registered capital of £27 million, were formed for purposes of gold mining, land speculation and prospecting connected with gold mining in the two years following devaluation. Although most of this capital was associated with a few large companies with excellent prospects of reaching the producing stage, most of the companies were of a highly speculative if not fraudulent nature, never reaching the producing stage and resulting in considerable wastage of resources. These companies attracted capital from small investors in particular because the terms offered were more attractive with respect to the price of each share and the lots in which shares could be bought, than the shares of large new companies or existing mines. The laxity of South African company law in this connection also facilitated this type of wasteful company promotion.



A. Figures taken from Annual Reports of the Government Mining Engineer
B. Figures taken from the Chamber of Mines Year Book and the Annual Reports of the Government Mining Engineer
C. Year Books of Union of South Africa and Monthly Bulletin of Statistics

It is not easy to judge whether the meteoric rise in the price of the shares of existing mines was justified by subsequent returns because not only the course of dividend payments but the life of the asset have to be taken into account. But the violence of share price fluctuations (see Graph III) suggest that many people were speculating only on capital gains and not on a sound estimate of future returns. Share speculation has an important part to play in the capital market as it facilitates the mobility of capital and attracts capital to the most profitable channels. But when the stock market is pervaded with a spirit of gambling on capital gains rather than on genuine investment, it can have a destabilising effect on the economy when the inevitable reaction comes. The Black Friday collapse of April 1937, which was primarily a sudden fall in the price of gold mining shares, must have had adverse economic effects particularly on private investment. There was little basis for this share collapse in actual fact. The price of gold had declined only slightly.

As gold mining investment, which is risky, has been South Africa's main field of investment, it has bred a capital market which is notoriously speculative and unstable, to be compared with Wall Street rather than the London Stock Exchange. While this spirit of enterprise and risk-taking has provided large sums of capital for mining in periods of optimism, the emphasis of many investors on capital gains rather than long term investment has led to violent reactions in the price of gold mining securities often as the result of unsubstantiated rumours. These periods of reaction have led not only to considerable depreciation in the market value of the assets of uncertain propositions, but also of reputable companies with good earning prospects and has often made it difficult for them to raise the additional capital needed to reach the producing stage.

What is likely to be the effect of the gold mining industry on South African business cycles in the future? This will depend on future trends in gold production and the relative importance of gold mining in the economy.

Several attempts have been made in the past to forecast the life of the gold mining industry and estimate future trends in gold production. These have all subsequently proved to have been gross underestimates.

In 1930 the Government Mining Engineer estimated that by 1940 the value of gold output would have fallen to £25.5 million. In fact it was £118 million. Again in 1947 the Government Mining Engineer made an estimate of the tonnage of ore that was likely to be milled in the future in the combined Witwatersrand and Orange Free State gold fields. His estimate shows a peak milling rate of 56.3 million tons in 1955 with a steady decline thereafter. In fact the milling rate climbed steadily to 78.4 million tons in 1963 and there is little sign of any falling off in the near future.

There are four important unknowns that make predictions of future gold output extremely hazardous. These are the price of gold, costs of production, scientific and technical advances, and the discovery of new mines. Devaluation in 1949, further technical advances in deep-level mining, the development of uranium as a by-product of gold mining and the discovery of further new gold deposits were all factors that could not be anticipated by the Government Mining Engineer in 1947. While the older mines of the Witwatersrand are gradually closing down new mines are opening to take their place.

The four new goldfields now account for over three quarters of total gold output. Although one cannot predict how long this process of regeneration of the industry will continue, its future as a major sector of the South African economy and hence also as a stabilizer seems assured for some time to come.

Notes

CHAPTER I

1. See A.H. Hansen: Business Cycles and National Income, W.W. Norton & Co., New York, 1951. p.4.
2. Examples of this type of study are:-
 M. Abramovitz: Inventories and Business Cycles, with special reference to manufacturers inventories, National Bureau of Economic research, New York, 1950.
 T. Hultgren: American Transportation in Prosperity and Depression, National Bureau of Economic Research, New York, 1950.
 T. Hultgren, Cyclical Diversities in the Fortunes of Industrial Corporations, National Bureau of Economic Research, Occasional Paper, No. 32, New York, 1950.
 R.A. Gordon: "Cyclical Experience in the Inter-war Period: The Investment Boom of the Twenties", in Conference on Business Cycles, National Bureau of Economic Research, New York, 1951.
 J.S. Duesenberry: Income, Saving and the Theory of Consumer Behaviour, Harvard University Press, Cambridge, 1949.
 F. Modigliani: "Fluctuations in the Savings-Income Ratio. A Problem in Economic Forecasting", in Studies in Income and Wealth, Vol. 11, National Bureau of Economic Research, New York, 1949.
 E.R. Dewey and E.F. Dakin: Cycles - The Science of Prediction, Henry Holt & Co., New York, 1947.
3. See the comments of M. Friedman and J. Schumpeter in Conference on Business Cycles, op.cit., pp. 114 and 154.
4. Op.cit., passim.
5. Op.cit., passim.
6. Hultgren, T: American Transportation, op. cit., pp. 157-163.
7. Cf. A.F. Burns: New Facts on Business Cycles 30th Annual Report of the National Bureau of Economic Research, New York, 1950, p.11
8. Dewey and Dakin, op.cit., p.43.
9. The electric power industry, for example, expanded continuously from 1897 to 1914. Cf. J.A. Schumpeter: Business Cycles, McGraw-Hill, New York, 1939, Vol.I, p. 411.
10. Cf. E. Dahmen: Entrepreneurial activity in Swedish Industry, 1919-1939, Stockholm, 1950.
11. Schumpeter was one of the few economists who demonstrated the importance of secular trend factors in the protracted depression of the 1930's.
 See J.A. Schumpeter, Business Cycles, McGraw-Hill Book Co. New York, 1939.
12. See, for example, J. Feilen - "Die Weltkonjunktur der Goldwirtschaft", Vierteljahrshefte zur Konjunkturforschung, 10 Jahrgang 1935, Heft 3, Teil A, P. 295.

13. cf. W.J. Busschau, "Gold Mining Investment", South African Journal of Economics, March, 1937, p.18 and The Measure of Gold, Central News Agency, Ltd., South Africa, 1949, p.1.
14. Feilen is quite correct in not assuming gold production to be directly determined by the purchasing power of gold as expressed by an international wholesale price index. For the latter can only affect the production of gold, other things being equal, to the extent that it affects the money cost of producing gold.
15. For a rigorous mathematical treatment of the problems connected with stabilisation policies see:-
A. Tustin: The mechanism of economic systems, Heinemann, London, 1953, and A.W.H. Phillips. "Dynamic Models in Economics" (Unpublished Ph.D. thesis, London 1953).
16. Cf. J. Rueff: "The Fallacies of Lord Keynes' General Theory", Quarterly Journal of Economics, May, 1947, p.349.
17. See J.M. Keynes: The General Theory of Employment, Interest and Money, Macmillan and Co., London, 1936, p.230.
18. Ibid., p.130.
19. Cf. G. Cassel: The Theory of Social Economy, London, Benn, 1932, Vol. II, p.491.
20. Cf. W.W. Rostow, British Economy of the Nineteenth Century, London, Oxford University Press, 1948, Chap. VII.
21. Cf. Rostow, op.cit., pp.145-60.
22. See J.R. Hicks: A contribution to the Theory of the Trade Cycle, London, Oxford University Press, 1950, p.154.
23. Cf. Report No.11 of the Social and Economic Planning Council: Economic Aspects of the Gold Mining Industry, U.G. 32, p.15. Also C.G.W. Schumann: Structural Changes and Business Cycles in South Africa 1806-1936, King, London, 1938, pp. 332-36.

CHAPTER II

24. For a detailed treatment of this subject see W.J. Busschau The Theory of Gold Supply, London, Oxford University Press, 1936 and F.W. Paish: "Causes of Changes in Gold Supply", Economica, November, 1938.
25. Cf. John Martin: "Group Administration in the Gold Mining Industry of the Witwatersrand" Economic Journal, December, 1929.
26. Ibid., p.538.
27. From the preface to "Group Administration in the Gold Mining Industry of the Witwatersrand" by John Martin. Quoted by S.H. Frankel in Capital Investment in Africa, Oxford University Press, London, 1938, pp.81-2.
28. Cf. F.W. Paish, op.cit., p.380.

29. I am indebted to Professor F.W. Paish for permission to use this diagram taken from "Causes of Changes in Gold Supply", op.cit., p.386
Much of the analysis in this section is based on his excellent article.

30. Cf. Low Grade Ore Commission, 1930, U.G. 16 '32, p.25, Section 28.

CHAPTER III

31. Miners' Phthisis contributions are the heaviest item in this Group. The figure of £800,000 in 1930 is entirely taken up by this item.
32. This includes the salaries of technical, administrative and clerical staff. Average annual income per employee is usually a reasonable substitute for rates of pay.
33. Although average annual income remained almost constant, rates of pay per shift increased from 20/11 in 1923 to 22/3 in 1929 (source: Annual Report of the Government Mining Engineer, 1933, p.21). There must have therefore been some reduction in the number of shifts worked by each worker.
34. Source: Low Grade Ore Commission, op.cit., p.19.
35. Source: Government Mining Engineer's Annual Report for 1930, p.27.
36. Quoted by S.H. Frankel, op.cit., p.83.
37. Cf. Report No.11 of the Social and Economic Planning Council, op.cit., Table IX, p.35.
38. Cf. Government Mining Engineer's Annual Reports.
39. Cf. C.W. Biccard Jeppe: Gold Mining in South Africa, Todd Publishing Group, London, 1948, p.32.
40. Ibid., p.32.
41. Ibid., p.32.
42. Cf. Low Grade Ore Commission, 1930, op.cit., p.31.
43. Cf. Report No.11 of the Social and Economic Planning Council, op.cit., p.30.
44. The only 2 figures we could find were 35/- to 40/- per ton for 1888 and 25/- to 30/- per ton for 1898. (Source, C.W. Biccard Jeppe, op.cit., p.35.)
45. Cf. Annual Report of the Tvl. Chamber of Mines, 1914.
46. Cf. Report of Low Grade Mines Commission (U.G. 34-20) p.6.
47. Cf. H. Oppenheimer: "The O.F.S. Gold Fields", South African Journal of Economics, June, 1950, p.150.
48. Cf. R.B. Hagart:- "The Changing Pattern of Gold Mining Finance", Optima, December, 1952, p.3.

49. Cf. W.P. De Kock: "Influence of the O.F.S. Goldfields on the Union's Economy"—South African Journal of Economics, June, 1951, p.144.
50. Since 1940/41 no separate estimate of net investment in gold mining has been published in the national income statistics. We have therefore had to estimate net investment in gold mining since the war from the figures for net annual addition to the items "Shaft and Mine development", "equipment", "boreholes, etc.," "stores, etc.," "estate property, buildings, etc.," from the capital statistics of the Annual Report of the Government Mining Engineer.

51. Cf. President's report - Annual Report of the Transvaal Chamber of Mines, 1929.

CHAPTER IV

52. Cf. W.W. Rostow, op.cit., p.42.
53. Cf. J. Schumpeter: "Business Cycles" New York, 1939, Vol.I, Ch. VII, pp. 325-351; and T. Hultgren, op.cit., passim.
54. Cf. C.G.W. Schumann: Structural changes and business cycles in South Africa, 1806-1936, London, King, 1938, p.105.
55. Because both diamonds and gold are almost entirely export commodities, a table of exports is a fairly good indicator of output.
56. As the price of gold was constant at £4.24773 per fine ounce during this period output and gross income increased at the same rate.
57. Cf. D.W. Gilbert: "Economic Effects of the Gold Discoveries upon South Africa. 1886-1910, "Quarterly Journal of Economics, August, 1933, p.592.
58. Food and drink imports averaged £6,446,000 for the years 1910-14 compared with exports of only £710,000 for the same period. Source: Official Year Book of the Union of South Africa, 1922, pp.710, 715, 717.
59. Cf. S.H. Frankel, op.cit., Table 14, p.95.
60. Cf. R.A. Lehfeldt: Gold, Prices and the Witwatersrand London, P.S.King, 1919.
61. Cf. G.R. Paish: "Great Britain's Capital Investment in other lands", Journal of the Royal Statistical Society, Vol.74, 1910-11, p.180.
62. The various kinds of mining investment are not specified. Apart from gold and diamonds, other forms of mining activity were only conducted on a small scale before Union. As diamond mining was largely internally financed the figure must largely apply to gold mining investment.
63. There is a gap, however, between 1911/12 and 1917/18. Strictly speaking the figures for 1911/12 are not comparable with those from 1917/18 onwards as the former have been arrived at partly by interpolation from later years. Also the Census of Industrial Establishments used by Professor Frankel in calculating the net contribution of manufacturing to national income in 1911/12 was conducted on a different basis to the Censuses after 1916/17.

64. The jackhammer drill, as we have already shown, was an important innovation in the 1920's. But its effect was to offset a rise in costs due to other factors.

65. Industrial and Agricultural Requirements Commission 3rd. Interim Report, U.G. 40-1941, para. 46.

66. R.A. Lehfeldt, quoted in the "Report of the Economic and Wage Commission" U.G. 14-1926, para. 5.

67. Cf. D.C. Krogh, "An input-output analysis of the South African economy-1956/57," South African Journal of Economics, December, 1961.

68. See, for example, W. Leontief, The Structure of the American Economy 1919 - 1939, O.U.P., London, 1951.

69. Source: Official Year Book of the Union of South Africa, 1941, pp. 861, 914.

CHAPTER V

70. C.G.W. Schumann: Structural Changes and Business Cycles in South Africa, 1806-1936, op.cit.

71. J.C. Du Plessis: Economic Fluctuations in South Africa 1910-1949, Bureau for Economic Research, Stellenbosch, 1950.

72. J.C. van Zyl: Economic Fluctuations in South Africa 1946 - 1960. Unpublished M.A. thesis, University of Cape Town, 1962.

73. Schumann, op.cit., p.112.

74. G.T. Amphlett: History of the Standard Bank of South Africa, Robert Macle hose and Co. Ltd., Glasgow, 1914, p.109.

75. Cf. Biecard Jeppe: op.cit., p.32.

76. Cf. S.H. Frankel, op.cit., p.94.

77. Cf. Schumann, op.cit., p.88.

78. Ibid., p.89.

79. Source: Statistical Abstract for the British Colonies, 1904, (Cd. 1912), pp 212-13, 108-9.

80. Cf. Schumann, op.cit., p.90.

81. Cf. W.C. Mitchell: Business Cycles, National Bureau of Economic Research, New York, 1927, p.428.

82. Cf. Schumann, op.cit., p.90.

83. Ibid., p.91.

84. Cf. S.H. Frankel, op.cit., p.94.

85. Schumann, op.cit., p.91.
86. Cf. Statistical Abstract for the British Colonies, 1904, (Cd. 1912), pp.122-3, 128-9.
87. Cf. Schumann, op.cit., pp.92-93.
88. Cf. S.H. Frankel, op.cit., p.94.
89. Cf. D.W. Gilbert: "Economic Effects of the Gold Discoveries upon South Africa, 1886-1910", op.cit., p.563-5.
90. Cf. Schumann, op.cit., p.94.
91. ibid., p.94.
92. D.W. Gilbert, op.cit., p.577.
93. Source: Statistical Abstract for the British Colonies, 1910, p.112.
94. Cf. D.W. Gilbert, op.cit., p.580.
95. Source: Official Year Book of the Union of South Africa, 1910-16, p.640.
96. cf. W.L. Thorp and W.C. Mitchell, Business Annals. National Bureau of Economic Research New York, 1926. p.95.
97. W.C. Mitchell, Business Cycles, op.cit., p.443.
98. This summary is taken from J.C. Du Plessis: "Economic Fluctuations in South Africa 1910-1949", op.cit., p.50. The summary of turning points in this work is preferable to that given by Schumann on page 248 of "Structural Changes and Business Cycles in South Africa 1806-1936" as the former is based on more refined statistical techniques.
99. As Du Plessis' investigation only began in 1910, we are following Professor Schumann in dating the revival from the previous depression in 1909. Du Plessis' graphs also suggest that recovery may have come somewhat before the beginning of 1910 (cf. J.C. Du Plessis, op.cit., Graph 12, p.50.)
100. ibid., p.48.
101. Schumann, op.cit., p.248.
102. Only 6 series are used by Du Plessis in deriving the average cycle series in the period 1910-1919. They are imports, industrial share prices, bank clearings, railway revenue, transfer duty and coal sales. While transfer duty, imports, bank clearings and railway revenue show a fairly high correlation with the average of the 16 time series used in the remainder of the period 1910-1949, coal sales and industrial share prices show a rather poor correlation. (See Du Plessis, op.cit., p.53). In addition railway revenue is also a poor indicator in this cycle because of the principle laid down in the Union Constitution of 1910, that railway revenue should no more than cover expenditure. (ibid., p.48.). This accounts for the sharp fall in railway revenue from 1910 to early 1915 due largely to non-cyclical causes. Another weakness is that apart from coal sales (expressed in tons), all the series are in monetary terms. Schumann's calculations suffer from

the same weakness. He uses only 5 series for this period viz. the ones mentioned above, but does not include coal sales (cf. Schumann, op.cit., graph V, p.230.)

103. Cf. Monthly bulletins of Union trade - Department of Customs and Excise, 1910-15.
104. Source: Official Yearbook of the Union of South Africa, 1910-1922, p.918.
105. Ibid., Chap. XIX.
106. Source: Annual Reports of the Government Mining Engineer.
107. Nos. of Union of S.A. Africans employed by gold mines.
Jan. 31st 1914 - 43,759.
" 1915 - 63,399.
" 1916 - 90,099.
Source: Tvl. Chamber of Mines Annual Reports.
108. Cf. S.H. Frankel and H. Herzfeld, op.cit., p.118.
109. Cf. Standard Bank of South Africa Monthly Review, June 1929.
110. Source: Official Year Book of the Union of South Africa, 1941, p. 864 and J.C. Du Plessis, op.cit., p.74.
This index was compiled by the Union Office of Census and Statistics with July 1925 = 1000 as base. An index of employment is an imperfect measure of changes in the level of activity as it does not take into account changes in the size of the working population. Unfortunately no index of unemployment is available for this period. In addition the above index is limited by the fact that it only includes employment in mines, transportation and certain secondary industries. It therefore gives no indication of the employment situation in the agricultural sector.
111. Even in 1936, in spite of the considerable movement of population from the land to the towns that had taken place during and after the depression, 64.08% of the total working population were still engaged in Agriculture, Forestry and Fishing (see Table 11).
112. Source: Annual Reports of the Government Mining Engineer.
113. Source: Australian Year Books.
114. Cf. C.L. Read: "Union Natives and the Witwatersrand Gold Mines". South African Journal of Economics, Dec., 1933, p.399. These figures apply only to Witwatersrand mines.
115. Cf. Report of the Low Grade Ore Commission, op.cit., p.22.
116. Report of the Select Committee on the Gold Standard - S.C.9 - '32.
117. Ibid., p.933.
118. Cf. C.S. Richards "The Boom in Kaffirs", South African Journal of Economics, 1933.

119. While the number employed in June 1934 was equal to that of April 1929, there was still quite a good deal of unemployment because of the secular increase in population and under-employment in the still relatively depressed agricultural sector.
120. See evidence of J.E. Holloway and H. Miller: Select Committee on the Gold Standard, op.cit., p.930 and Appendix A.
121. See J.R. Hicks, op.cit., p.121., for an elaboration of the distinction between "autonomous" and "induced" investment.
122. See J.C. Du Plessis, op.cit., pp. 69-75.
123. See J.R. Hicks., op.cit., passim.
124. Cf. J.C. Du Plessis, op.cit., p.49.
125. See J.C. van Zyl, op.cit., page 80. We are following van Zyl in ignoring the brief recession of 1946/47 for the purpose of this chronology. These turning points have all been arrived at by calculating deviations from trend and therefore generally precede the turning points in the original data used. Attention, however, has already been drawn in Chapter III to van Zyl's warning that little precision can be given to turning points in South African cycles because of the paucity of suitable statistics.
126. Cf. R.L. Ward "Are the mines overtaxed?" South African Journal of Economics, March, 1936.
127. Figures for the distribution of gold mining dividends inside and outside the Union are to be found in the Year Books. But these figures show only where the dividends are paid. They therefore include payments into the Union banking accounts of persons resident abroad and do not allow for payments to financial houses in the Union that finally find their way overseas. In 1939, for example, the percentage of dividends paid abroad was 58.4, but for the reasons mentioned, the percentage finally going abroad was probably greater.

CHAPTER VI

128. See Low Grade Ore Commission of 1930 op.cit.
129. See Report No.11 of the Social and Economic Planning Council. op.cit., p.16.

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