

South African Reserve Bank

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**The optimal allocation of savings in the
South African economy and the role
of monetary policy**

By J.A. Lombard and J.P. van den Heever

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*An updated version of a paper delivered at the Biennial
Conference of the Economic Society of South Africa held in
Johannesburg on 6 and 7 September 1989

The views expressed in this paper are those of the authors and do
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Preface

Various of the Bank's departments are from time to time engaged in research regarding different aspects of the economy not only in connection with the Bank's own direct field of interest but also the economy in general. The Bank is of opinion that the results of these research projects deserve a wider audience. In the past many of the research results were made known through medium of the Bank's *Quarterly Bulletin*, in speeches by the Bank's governors and other senior staff members, etc.

In order to fulfill its functions regarding the dissemination of knowledge and information in a more systematic way, the Bank has decided to introduce a new publication series under the general title *Occasional Papers*. It is the Bank's intention to distribute these Papers not only to the academic community involved in economic and closely related matters, but also to bring them to the attention of other possible interested parties by means of appropriate announcements. In doing so the Bank not only aims to convey important information and views on key aspects of the economy to interested parties, but also to cultivate a better understanding of its main functions and mission and thus also of its policy measures.

C.L. Stals
Governor

December 1990

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by J.A. Lombard and J.P. van den Heever

1. Introduction

In the course of our research [1] on economic growth and the allocation of savings in the South African economy, we found that much of the sluggish growth and misallocation of savings that had been taking place since the middle of the 1970s might be explained by a long-run downward distortion of the user cost of capital relative to that of labour in the economy, and that this distortion could be traced back largely to the particular kind of monetary inflation experienced in South Africa since the middle 1970s, fuelled by a policy preoccupation with the short-run.

While this explanation would come as no surprise to most observers, its implication for the principles of economic policy seems to us to be of great importance. Monetary shocks to the economy and their influence on the level of employment have in recent years been discussed mainly in terms of Keynesian "trade-off" models between inflation and unemployment, symbolised by the famous "Phillips curve". The faithful saw the Phillips curve as fairly flat; the doubters regarded it as rather steep, even completely inelastic.

The argument was generally conducted around the short-run effects of anticipated versus unanticipated monetary shocks. The debate seemed, however, to have been preoccupied with the short-run cyclical behaviour of the economy. The long-run structural performance trend of the economy had been neglected. In particular, these cyclical trade-offs between inflation and unemployment generally assumed fixed factor combinations of capital, labour and output.

Keynesian analyses do not assume that these factor combinations are fixed in the long-run. The long-run simply did not interest the Keynes of the "General Theory". The fact is, of course, that factor combinations and resource allocations do change over longer periods. Whether one also calls such changes "structural" is perhaps a matter of definition rather than analysis. If such changes do not simply result from technological imperatives in production functions, but are also to a meaningful extent induced by the economics of factor pricing, and if factor price relationships in turn are distorted by monetary shocks, completely different views emerge about the trade-off between inflation and unemployment in the context of the determinants of the economic growth trend, as distinct from those that determine the cyclical movements around the trend.

The matter becomes even more exciting when one tries to define quite precisely what is really meant by the difference between long-run and short-run economic policies. If "the short-run" is the movement of employment along the swing of the cycle, while the long-run is reflected by the gradient of the trend line, the fundamental question is what the policy-maker has in mind when he takes decisions which at the same time affect both the swing of the cycle and the gradient of the trend line. It is wrong to reason that there are two independent decisions and that the short-run decision must be taken today while the long-run decision might be postponed until some other time in the future. There are, of course, times when policy-makers really face situations where there is an overwhelming need to avoid an immediate crisis by any means whatsoever. We have had some of them in South Africa in recent years. But in those cases the discipline of the longer-run constraints on policy freedom should be so strong that deviations preoccupied with the short-run will automatically be rectified by the policy-makers at the earliest possible opportunity. If this long-run discipline is weak or neglected on policy levels, or regarded as something to think about some other day, the gradient of the trend line becomes a function of the short-run policy preoccupations.

This neglect would not have been terribly important if the effects of policy measures on the cyclical upswings and the gradient of the trend line were, as a matter of functional complementarity, always in the same direction. This, in our view, is unfortunately not at all the case. Our proposition is, on the contrary, that the long-run effect of inflation on unemployment is upwards rather than downwards. The Keynesian "revolution" is, after all, precisely about this inversion of classical (supply side) expectations. Nominal wage rates are rigid – *in the short-run* – and resources for investment are in unlimited supply – *in the short-run*. Accordingly, low interest rates have – *in the short-run* – exactly the opposite effect from that expected by classical theory – *in the long-run*.

2. Monetary policy and inflation

We regard it as important to establish that the particular process of inflation that gave rise, in our view, to the weakened capacity of the formal economy of South Africa to create employment opportunities, was basically driven by excessive money creation. The relative factor price distortion which

induced the substitution of capital for labour, was initially caused by excessively low nominal prices for domestic loanable funds and foreign currency, and not by excessively high nominal wage rates. In the dynamics of inflation as it has taken hold of the South African economy since the middle 1970s, the exogenous inflationary shocks usually came from the financial side, while the real goods and services markets, including the labour market, usually reacted in defence of their real incomes by attempts to shift the effects of inflation backwards or forwards in the market on to someone else. Problems in the labour market as a further "exogenous" force, driving the wage-price spiral, became of considerable significance during the 1980s.

In the financial sector itself, the engine of inflation was the monetary authorities, partly by incorrectly handling the effects of exogenous shocks from the international financial theatre, partly by allowing government expenditure to expand beyond the Treasury's ability to finance these outlays in a non-inflationary manner, and more generally by not consistently gearing their discount window policies to combating inflation.

When determining the discount rate, the interaction between discount window policy and the magnitude of the fiscal deficit should be taken into consideration by the monetary authorities. This is especially valid in the South African system, in which the discount rate is used as the operational variable while the amount of accommodation is highly flexible. By not fully taking into account the magnitude of the fiscal deficit in determining the discount rate, the South African monetary authorities at times prevented crowding-out effects from running their full course by providing discount window accommodation to the banking system at too low a cost. Although the government deficit was financed by borrowing from the private non-banking sector and was therefore not inflationary finance in an accounting sense, the private non-banking sector could borrow from the banks, and the banks from the Reserve Bank (through the discount window). High government deficits combined with the open discount window and a relatively low Bank rate therefore could have brought about a disguised form of inflationary finance.

Some of the deficiencies in the handling of international financial shocks during the decade up to 1984 were discussed in great detail in the De Kock Commission Report on the monetary system and monetary policy in South Africa. Of particular significance is the extent to which the authorities used direct controls to depress interest rates below market clearing levels and the various attempts made to peg the exchange rate at unsustainably high levels. In this respect the great reliance placed on

exchange control over the transfer of financial balances from rand to other currencies was a central feature of the system. The tremendously inflationary effects produced by these direct controls when the price of gold began to rise and fall with such huge volatility between 1973 and 1983 are detailed in the Report, particularly in paragraph 15.53 to 15.59 (the so-called "ratchet effect"). In short the exchange controls captured too much liquidity inside the system when the price of gold was high, driving interest rates down to ridiculous levels, and encouraging the most unjustified kinds of expenditures. But when the price dropped again, which it invariably did, the South African Reserve Bank regarded itself compelled to avoid a domestic hard landing by creating the cash reserves required by the money market to replace the losses of liquidity through the foreign exchange market. In this way the gold and foreign exchange reserves of the banking system were heavily depleted to avoid domestic interest rates from rising "too much". Although this ratchet effect repeated itself three times in the period reviewed by the De Kock Commission, more or less the same thing occurred over the several gold price cycles in the 1980s. The reason for its continuation must be sought in the overriding political priorities of government. The outcome of the political ceilings exogenously placed on interest rates was that the period of stable positive real rates since 1954 came to an end in the early 1970s and was followed by a decade of decline to negative real rates, until the early 1980s, when a period of heavy fluctuations set in, but which had not yet succeeded in re-establishing a long-run expectation of steady and relatively high positive real rates of interest.

The policy applied in the period since about 1980 could be described as a serious effort to redress the distortion under very unstable national and international conditions.

Since about 1974, the effective exchange rate of the rand was determined by the monetary authorities by means of variable direct pegging to sterling or the US dollar at levels which frequently became overvalued in terms of purchasing power parities, and especially of the rapid rise in the ratio of domestic wage rates to those in South Africa's trading partners. Imports of capital goods into the domestic economy became inordinately cheap, while the cost of the foreign exchange risks involved in overseas funding of domestic capital formation was completely overlooked by producers because of the general faith in the value of the rand and/or inexperience in international financial transactions under a system of fluctuating exchange rates, and/or the frequent availability of forward cover at very low rates.

A very important side effect of this frequent over-

valuation of the rand during the decade from 1974 to 1984 was the discouragement of the growth of the domestic secondary industry, which found it increasingly difficult to compete with the offer prices in rand of goods from abroad. As the industry's need for capital formation tapered off, the gap was taken up by the public corporations, whose output in most cases not only was not directly exported, but also required less domestic manpower.

What is more, the Reserve Bank offered these corporations fixed nominal premiums (and even discounts!) on long-term forward cover on long-term foreign loans. Under these propitious circumstances such foreign loans were obviously raised in the European capital markets with the lowest nominal interest rates, irrespective of the forward expectation for the exchange rate of the currency in which the loans were denominated. As is well known, the current losses for the account of the Treasury of those very favourable contracts are huge and reflect the extent of the subsidisation of investment in the capital intensive services of these corporations.

Fiscal policies over the past two decades have been less closely analysed for their inflationary effects than monetary policies, but one would be hard put to find any analyst who would disagree with a previous Treasury Chief, Dr Gerald Browne, that while fiscal policy could show impressive achievements over this period, its main failure had been in its inflationary bias. Inflationary pressures arose from both the real and the financial side of fiscal conduct. Rising expenditure by the general government in absolute terms or relative to the rest of the economy need not, of course, be inflationary. Even the rise from an average of 21 per cent of gross domestic product in the early 1970s to an average of 30 per cent over the past five years might have been in order *in the Keynesian short run*, if it had been financed in a non-inflationary manner. But this was indeed not the case. Four inflationary features in particular should be noted. The first is the heavy reliance on income from direct taxation through the operation of so-called "fiscal drag" or "bracket creep", the second is the taxation of nominal interest, the third is the financing of current expenditure by means of borrowing and the fourth is the direct prescriptions to financial institutions to invest in government securities (the so-called "captive market"). All these devices helped to balance the budget in a purely accounting sense, but in real economic terms they did not have the effect of reducing private expenditures commensurate with the proposed increase in real government expenditures. But in particular, they tended to discourage aggregate saving and to distort the allocation of investment.

3. Relative factor prices and structural change in the South African economy

Before dealing with the generation and the allocation of savings, it will be convenient to deal first with the drop in the productivity of investment in the South African economy, which we contend is largely due to the fact that capital was made so cheap in relation to labour. This decline is, we believe, of fundamental importance in the explanation of the sluggish performance of the economy since the middle 1970s. Together with the structural decline in the percentage of surplus national income available for reinvestment in growth, this productivity drop explains, in a Harrod-Domar fashion, the lower structural growth potential in the 1980s compared with the 1960s.

We follow the neo-classical proposition that changes in the cost of capital relative to the cost of labour is a central element in the explanation of changes in the capital/labour ratios in individual industries and in the economy as a whole. As production capacity is expanded, the falling cost of capital induces producers to change the combination of capital and labour in their production function so that for any given increase in output, the input of new capital rises by a considerably higher percentage than the input of new labour.

This means that the incremental output/capital ratio falls below the average ratio, while the incremental output/labour ratio rises above the average and even could become infinitely large when employment stops rising at all. It also means that the physical productivity of capital, both in terms of output and employment, has fallen. The theoretical possibilities are usually demonstrated in classrooms by means of the famous two or three dimensional equal output isoquants and shifts in the tangential relative cost lines in the case of factor substitution in a given industry, and production possibility isoquants in the case of inter-industry shifts of resources. In the latter case the moving relative costs refer, of course, to total cost per unit of output in the alternative industries, but a drop in relative capital costs would, *ceteris paribus*, cause a drop in the total unit costs of capital intensive industries relative to the total unit costs in labour intensive industries. In the present section we propose to demonstrate that the actual developments in South Africa during the past two decades are consistent with these neo-classical propositions.

3.1 Measurement of the user cost of capital

The user cost of capital is accordingly a central element of the neo-classical theory of factor allocation within and between industries. Following Jorgenson (1963) this cost is taken to consist of much more than the rate of interest (r); it also includes the depreciation of capital (d), and the initial outlay

price of the capital goods (P), while expected capital gains (or losses) (p^*) would reduce (increase) it.

The user cost of capital and the wage rate, both in nominal terms, as empirically calculated for South African manufacturing, are shown in Table A.1 in the Statistical Appendix. In view of the high correlation between the trend in outlay prices of capital goods in different industries, and the equally high inter-industry correlation in wage rates, the statistical series seems valid for all industries in South Africa.

The empirical approach can, of course, be refined further: A number of investment incentive schemes financed by the State which reduce the relative cost of capital, and others which reduce the effective cost of labour in certain regions could be taken into account. For a number of practical reasons this was not done, but partial information available suggests that, on balance, these schemes probably reduced the relative cost of capital. Another important element is various non-wage labour costs which had to be considered by producers, but practical considerations prevented proper measurement of these effects. The time series presented accordingly exclude these effects on relative costs at this stage of our study.

Firms choose between alternative production processes with different capital and labour intensities with due recognition that such a choice, once implemented, may be irreversible for years and even decades. Irregular values of the variables making up the user cost of capital and the cost of labour are therefore discounted. The more stable underlying perception of the relative costs of capital and labour, which finds expression in the eventual choices made by firms, was empirically approximated by a five year moving average of the user cost of capital relative to the wage rate. A

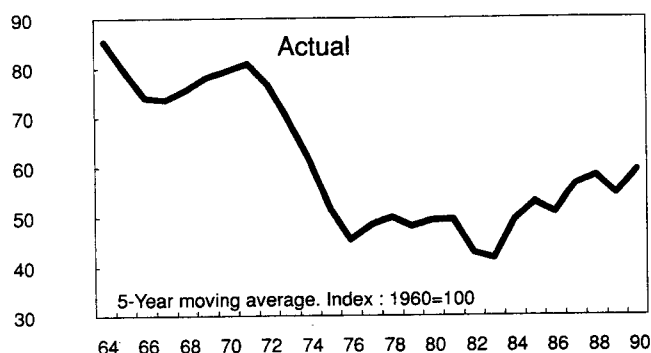
five year horizon at least smooths the cyclical fluctuations in the ratio. Unfortunately it also implies that a reversal to a structurally higher relative cost of capital would take several years before bringing about a preference for more labour intensive production techniques on any meaningful scale—except if the business community from the outset accepted as fully credible the policy change to a structurally higher relative cost of capital.

Table A.1 in the Statistical Appendix and Graph 1 show that the five year moving average relative user cost of capital, after having receded somewhat during the 1960s, fell sharply during the 1970s. Interest rates at or below the rate of inflation (causing p^* to neutralise r) offer the most important reason for the lower relative cost of capital, although purchase prices of capital goods also rose slower than the wage rate.

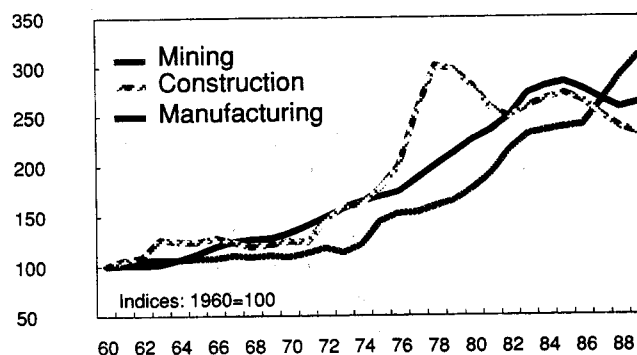
3.2 Shifts in factor combinations within industries

To illustrate the expected acceleration in the capital/output ratio over time within industries, employment data is unfortunately only available for a limited number of industries. It has also not been possible to determine empirically to what extent technological imperatives have, over time, forced particular changes in factor combinations upon particular industries without the choice of alternatives. This is a less likely situation in manufacturing, trade and construction than, perhaps, in power, communications and transport. Moreover, new capital intensive technological options were probably chosen or even sought precisely because of their cost-effectiveness in terms of the saving of labour costs as they appeared to the individual private producer, compared to the cost of financing the capital investment. The available time series for selected industries in respect of both the capi-

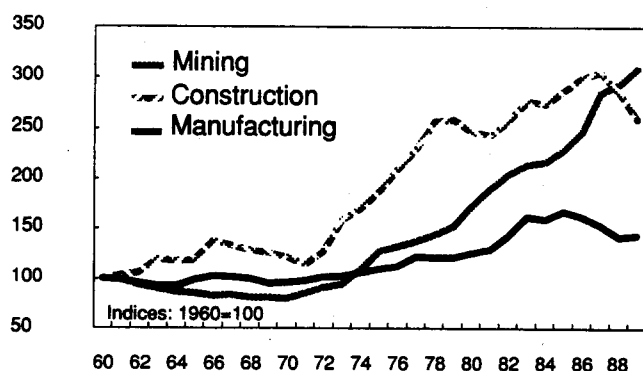
Graph 1: User cost of capital relative to wage rate in South African manufacturing, 1964-1990



Graph 2: Capital/labour ratios in selected South African industries, 1960-1989



Graph 3: Capital/output ratios in selected South African industries, 1960-1989



tal/labour as well as the capital/output ratios, are shown in Graphs 2 and 3 and in Tables A.2 and A.3 in the Statistical Appendix.

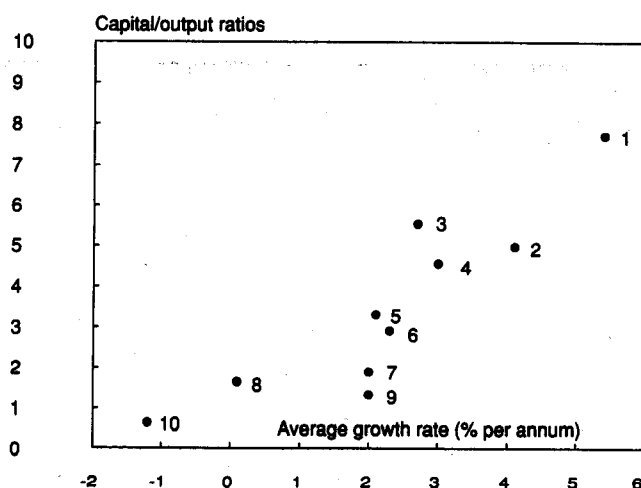
3.3 Shifts in the allocation of investment between industries

The accompanying table ranks various industrial sectors according to their capital intensity of output as measured by the capital/output ratio in each industry. It then compares the relative growth rates of these industries during the 1974-1989 period of secular stagnation of economic growth in South Africa. It is clear from the table and Graph 4 that capital resources shifted heavily into the capital

Sectoral capital/output ratios and growth rates

Sector	Capital/ output ratio in 1985	Average real growth rate	
		1960- 1974 %	1974- 1989 %
1. Electricity, gas and water..	7,72	7,2	5,4
2. Transport, storage and communication.....	5,53	6,4	2,7
3. Community, social and personal services.....	4,97	3,7	4,1
4. Finance, insurance, real es- tate and business services..	4,56	5,4	3,0
5. TOTAL.....	3,31	5,0	2,1
6. Agriculture, forestry and fishing.....	2,92	3,3	2,3
7. Manufacturing	1,89	8,0	2,0
8. Mining and quarrying.....	1,65	1,5	0,1
9. Wholesale and retail trade, catering and accommoda- tion.....	1,32	7,1	2,0
10. Construction (contractors)..	0,64	9,4	-1,2

Graph 4: Capital/output ratios and real growth rates, 1974-1989



intensive industries and away from the relatively labour intensive industries, with obviously depressing effects on the aggregate growth potential of the country.

This shift and the accompanying drop in the country's potential growth are consistent with our neo-classical expectations. There is, of course, the possibility that the shift was dictated by a changing pattern of specific demand towards the output of those industries, but that seems to be a highly unlikely idea in view of the considerable excess capacity experienced in recent years by Eskom, and in transport, while in "community and social services" there is no market criteria of demand. The suppliers (general government agencies) determine what the demand for their services should be. Even in telecommunications, the hugely costly introduction of certain electronic systems (despite

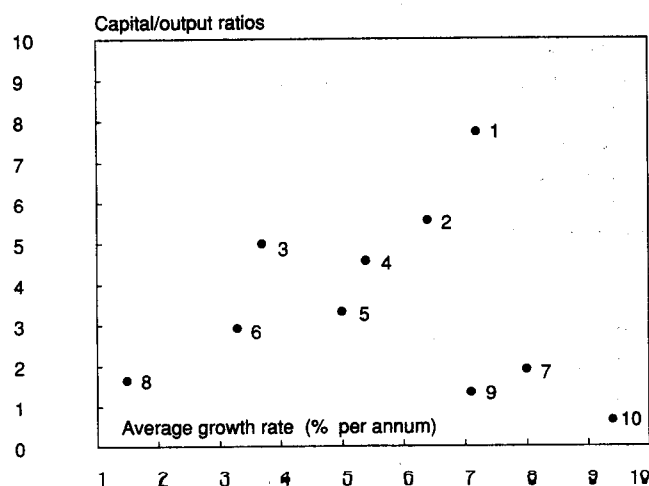
the drop in the relative prices of data processing and transmission equipment) was not a technological imperative and might not have been economically justified at this point in time in the maintenance of this service.

Our view that the shift was dominated by relative cost considerations is further strengthened by the completely different pattern of relative growth in the period 1960-1974 (see Graph 5) when, in general, a much higher relative cost of capital governed market decisions.

It should be very instructive to study the experience of the individual sectors in greater depth. As for power, transport and postal services, it has been noted earlier in the paper that the cost of finance to these industries was made particularly cheap by the extremely favourable long-term forward cover rates on foreign borrowing given to them by the Reserve Bank in the late 1970s and early 1980s. Among the financial institutions, the insurance industry gained hugely vis-a-vis other industries by the way in which the process of inflation distorted the incidence of our system of taxation in their favour.

The sectors of activity which were clearly most hurt by the structural changes since the middle 1970s were manufacturing, trade and construction. Manufacturing must have been particularly badly affected by the heavy over-valuation of the exchange rate on occasions between 1970 and 1983, since this industry is by its nature more sensitive to international competition and accordingly to incorrect domestic cost alignments compared to the patterns in the economies of South Africa's trading

Graph 5: Capital/output ratios and real growth rates, 1960-1974



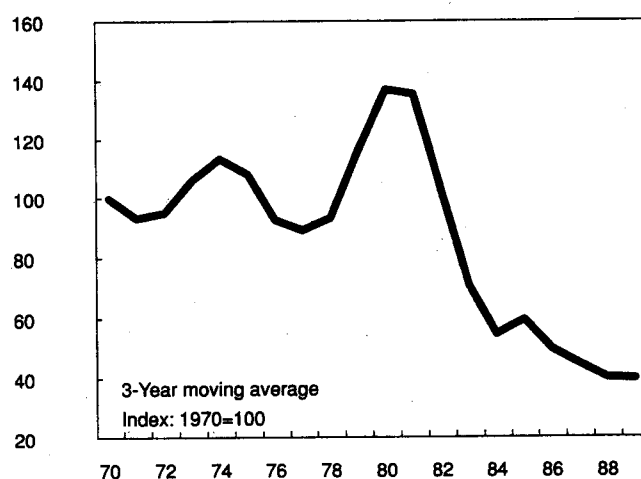
partners. This point will be developed somewhat further in Section 5 below.

4. The level and composition of domestic saving

We may now turn to the effects of the monetary inflation on the aggregate flow of savings and the composition of its sources.

Over the past two decades a strong structural, or long-run, decline took place in the propensity of the economy to produce a net surplus of income over consumption. The decline was quite notable in terms of the net national income itself, but was remarkably steep in relation to the increase in the economically active population of South Africa. This trend is shown in graph 6.

Graph 6: Ratio of real net domestic saving to increase in economically active population, 1970-1989



Production for the replacement of depreciation in the existing capital structure has been omitted from both the measure of net savings and net income. It should, however, be noted that this production for replacement as a percentage of gross domestic product increased enormously over the period under analysis. The main reason for this increase is the sharp increase in the capital-output ratio over the period. If the capital-output ratio had remained more or less what it was in the 1960s, the productive capacity of the economy would have been significantly larger and the level of net income, after provision for capital replacement, much higher. Both consumption and saving, any one of the two, could then have been larger, the outcome obviously depending upon the marginal propensity to save.

Another "structural" change in the flow of savings that may have had an important influence on its productive application is the shift in the source of savings from the household sector to the corporate sector. This happens, of course, when companies, the actors in the corporate sector, pay out less of its value added on wages, interest and dividends after taxation or when it manages to produce a larger operating surplus by paying less for its intermediate inputs or charging more for its gross outputs.

The shift in retained income (= savings) from households to business concerns is actually larger than the published national accounts would suggest because of the convention to regard mutual insurance companies and pension funds as an integral part of the household sector. To the extent that flows from households to these financial institutions are contractual, in the form of insurance premiums and pension fund contributions, households have limited discretion about the size or the destination of their savings. However, they have little real discretion in connection with the use of the operating surpluses generated by the investment of these savings by the institutions. If these operating surpluses only are reclassified as corporate rather than household saving, the latter aggregate becomes negative. [2]

Whether or not this pattern of allocation of aggregate income between consumption and saving or the shift of the locus of savings from households to corporations was economically optimal, is a complex question to answer, but we feel there are strong reasons to doubt this very much in the inflationary circumstances that existed over the past two decades. The pattern of rising consumer prices, low interest rates and taxation of nominal interest income, could not fail to discourage frugality in consumer expenditure, to encourage the demand for consumer debt and to support methods of saving which provide hedges against inflation or whose main attraction in fact is their ability to generate non-taxable capital gains from inflation, rather than create real productive capacity. There is in any case little doubt that households now no longer hold a position of great responsibility for generating or allocating the savings of the economy. They not only lost this responsibility but also the *feeling* of responsibility and the social independence from government and big business that accompany such a feeling. In this respect South Africa has moved away from the structural traditions of the great saving communities of the world.

5. The outflow of savings through the balance of payments

In the previous section the point was made that net savings available for domestic capital formation

(i.e. surplus income over consumption) was seriously depressed over the past two decades by the rapidly accelerating need to provide for the replacement of capital depreciation from a sluggishly growing gross output, the basic problem being the wasting of capital resources and the falling output productivity of capital formation, which in turn is explained by the huge subsidies on the user cost of capital in the 1970s. A main element in these subsidies was the negative real interest rates in the period.

A second drain on the domestic savings available for investment was the well known outflow of capital over the balance of foreign payments. Particularly since 1985 an incredibly large proportion of net domestic savings (41,5 per cent) has been applied to the reduction of foreign liabilities or the accumulation of foreign assets. The question must, accordingly, be asked to what extent interest and exchange rate policies and their effects on the productivity of domestic investment offered an explanation of this outflow of domestic savings to the rest of the world.

The process is, of course, so ridden with political perspectives and perceptions that it is hardly possible to test a purely economic hypothesis on the facts. It should, nevertheless, be noted that real interest rates in South Africa dropped substantially below those in this country's most important financial partners since the middle to late 1970s, as shown in Table A.5. It is, consequently, not surprising that South Africa's foreign liabilities increasingly shifted towards fixed interest bearing claims denominated in foreign currencies and away from equity commitments denominated in rand. At the same time real yields on capital in South Africa moved downwards over the past decade relative to real yields in the USA and Europe. The irony of the capital outflow from South Africa in recent years is, accordingly, that its immediate influence on the country's national income was probably positive, as distinct from the loss of domestic productive capacity and employment associated with the capital outflow.

The disinvestment from South Africa over the past decade should not be entirely ascribed to foreign political aversion of perceived social circumstances in South Africa, even though foreign disinvestors will usually present their actions in this mould. It is, after all, rational to kill two birds with one stone! To expect a profit before tax of even 50 per cent in nominal South African rands, hardly compares favourably with a pre-tax profit expectation of 30 per cent in the USA, for example, if company tax in South Africa is 20 per cent higher while the expected depreciation of the rand on the dollar is another 15 per cent over the period! In other words, the present discount on the financial rand,

as the vehicle for the transfer of foreign investments in and out of South Africa, is possibly a reflection of more than political risk perceptions; it might include an element reflecting the after-tax shortfall of real yields in South Africa below those in alternative investment regions.

As it is, the present system of parallel rand/dollar exchange rates, or the commercial rand through normal banking channels for the transfer abroad of current income by non-residents, and the financial rand at a huge discount for the movement of capital funds, obviously does not encourage such non-residents to retain their earnings in South Africa as part of this country's domestic savings. It pays much better to apply this income to the purchase of existing South African liabilities abroad.

One of the main reasons why it became impossible for the Reserve Bank to rid itself of its oversold forward dollar position to the domestic foreign exchange market, is the fact that real rates of interest in South Africa were too low in relation to those abroad. Since the forward-spot differential in the exchange rate tends to equate the differential between the respective nominal interest rates in the money markets concerned, a persistent inflation differential between the economies concerned would introduce an intrinsic discount in the spot rate, causing persistent losses on one side of the forward book. In the case of South Africa this discount would be reflected in a discount on forward rand or a premium on forward dollars. Consequently there is little interest in the market to offer forward dollars at premiums equal only to the current nominal interest rate differentials. Once the interest rate differentials reflect the inflation differentials the chances of a balanced forward market would obviously improve greatly.

Any serious effort by the Reserve Bank to withdraw from the forward market would, accordingly, have driven up domestic nominal interest rates quite substantially since 1985. Such a scenario would probably have dampened the 1988 boom, implying much lower imports and possibly a stronger rand; but the level of economic growth and employment would, of course, for the time being, have been lower. [3]

Economists outside the banking world approach this international transfer problem in terms of the so-called "real effective exchange rate" where the real basis of the concept is determined by wage rate rather than interest rate differentials between countries. The conclusions should, however, not deviate much from the reasoning above. Whereas the South African real interest rates were too low, its real wage rates were too high compared to the country's trading partners.

Put more fundamentally, the price ratio between capital and labour in South Africa simply did not

correctly reflect the international comparative advantage of production possibilities in South Africa, i.e. compared to the relative costs of capital and labour abroad. Accordingly, as the transfer value (effective exchange rate) of the rand drops in order to translate the country's comparative cost advantages into absolute price advantages, it is the capital intensive processes of production which become internationally competitive first. But precisely because the expansion of these types of processes are constrained by a lack of savings and investment from abroad, the production function of South Africa would be unduly inelastic with respect to a fall in the effective exchange rate of the rand.

Had the opposite situation prevailed, namely that the South African economy was characterised by high nominal interest rates relative to nominal wages, or by rising real interest rates as net savings become scarcer relative to the supply of usable labour, productive processes would structurally have become more labour-intensive or typically labour intensive processes would have attracted relatively more productive resources, including savings, for capital formation. The production function of South Africa would, by the same token, have been able to react with greater elasticity to a depreciation in the effective exchange rate of the rand.

Expanding on the analyses above, a number of areas for further investigation may be identified. They would include (i) the fiscal instruments determining the allocation of surplus net income from the private sector to government expenditure both on consumption and capital formation; and (ii) the structure of the markets through which savings and labour flow from sources to uses. Market structure and the effect of differential taxation on market structure may well have an influence on the user cost ratio of capital and labour, but these matters are still to be researched.

6. Measuring the lost opportunities

This paper has put forward the argument that the very sluggish rates of growth in output and particularly in employment in South Africa since the middle of the 1970s could largely be ascribed to a *serious decline in the proportion of the national income of South Africa made available for investment in the country, combined with a serious drop in the productivity of the remaining net capital formation*. The contention in the paper was that this serious deterioration in the two basic elements of growth was largely due to a dramatic downward distortion of the user cost of capital in relation to wages during the 1970s. As it should be illuminating to obtain some impression of the quantitative difference a less distorted cost relationship would

have made to output and employment, we performed a simple econometric experiment on the production functions implied in the ratios between capital, labour and output discussed in Section 3 above. Viewed from the supply side, a change in the nominal user cost of capital would *ceteris paribus* lead to a corresponding change in the factor price ratio. This would induce profit-maximising firms to alter their capital/labour ratios in order to restore equilibrium – where the quantity of each factor employed is such that the value of the factor's marginal product is equal to its cost.

The magnitude of the effect of the hypothetical new factor price ratios on the use of capital and labour is determined by the shape of the production function for the economy. In the course of this study a variety of Cobb-Douglas and constant elasticity of substitution production functions were estimated for various South African industries. Problems inherent in finding empirical approximations to the relevant theoretical variables, and multicollinearity between labour, capital and (where technological progress was modelled in this way) time, led to poor results where production functions were estimated with regression methods and without restrictions on certain parameters. Finally, it was decided to accept the restrictions of the Cobb-Douglas function with the exponents of labour and capital adding up to one. Average labour and capital shares in value added over the past three decades were used to establish these exponents in a function for total formal sector production in South Africa. Total real gross domestic product was used as output variable (Q); the fixed capital stock for the economy as a whole was used as capital input variable (K); and employment in the formal non-agricultural sector was used as labour input variable (L). The latter series was only available from 1970, and excludes significant numbers of employees in agriculture and domestic services as well as the self-employed. It also reflects numbers employed rather than hours worked. In the absence of capital utilisation figures for all industries, a capacity utilisation adjustment to the capital stock series was not undertaken.

The production function chosen for further analysis was:

$$\log(Q) = 0,570 \log(L) + 0,430 \log(K) + 0,102 \log(\text{GRADE}) + 3,281 \quad (1)$$

(5,70) (88,89)

$$R^2 = 0,643$$

$$DW = 0,658$$

t values in brackets; based on annual data from 1970 to 1989; where GRADE = average grade of ore milled in gold mining (g/t).

The exogenous variable GRADE (of which the values decreased considerably during the past two decades) reflects the changes in real output due to the increasingly deeper, lower-grade gold deposits left to mine, necessitating more labour and capital for the same output in terms of the final product, gold.

Assuming the Cobb-Douglas form to be a reasonable approximation of the underlying production function, and assuming competitive economic behaviour, the percentage changes in the factor price ratio brought about by the policy-induced higher user cost of capital will cause equal percentage changes in the desired factor ratio, i.e. the ratio of K to L .

6.1 Modelling the effects on growth of changes in the factor price ratio

The Cobb-Douglas production function discussed above may be combined with other equations to produce a small-scale growth model. This can then be used to investigate the most important direct and indirect effects flowing from changes in the factor price ratio.

The following model was constructed and used in this study:

$$\log(Q_t) = 0,570 \log(L_t) + 0,430 \log(K_t) + 0,102 \log(\text{GRADE}_t) + 3,281 \quad (\text{repeat of equation 1})$$

$$K_t = K_{t-1} - \text{DEPR}_t K_{t-1} + I_t \quad (2)$$

$$L_t = \text{LKRATIO}_t K_t \quad (3)$$

$$S_t = \text{SRATIO}_t Q_t \quad (4)$$

$$I_t = S_t \quad (5)$$

where Q = real gross domestic product
 L = employment in the non-agricultural formal sector
 K = capital stock at constant prices
 GRADE = average grade of gold ore milled
 DEPR = fraction of capital stock depreciated during each year
 I = gross real fixed investment
 LKRATIO = ratio of labour to capital
 S = gross savings available for gross domestic fixed investment
 SRATIO = ratio of S to Q actually recorded

The variables GRADE, DEPR, LKRATIO and SRATIO are exogenous. LKRATIO is, however, used to feed policy changes affecting the factor

price ratio into the model. As stated above, a change in the factor price ratio of a certain percentage leads to an equal percentage change in the equilibrium factor ratio. LKRATIO may therefore be altered by policy changes which change the factor price ratio – such as higher or lower nominal interest rates.

It should be noted that the present model implicitly assumes an unlimited supply of labour; given the capital stock and (equilibrium) ratio of labour to capital (as determined by the factor price ratio), L fully adjusts to these circumstances. The savings ratio has deliberately been constructed in such a way that the leakage of savings through the balance of payments in recent years is taken into account. Only the portion of income available for gross domestic fixed investment, after consumption, the foreign sector and inventory investment have claimed their shares, is retained in SRATIO. Since the model is a long-run growth model with supply creating its own demand, I and S are equal.

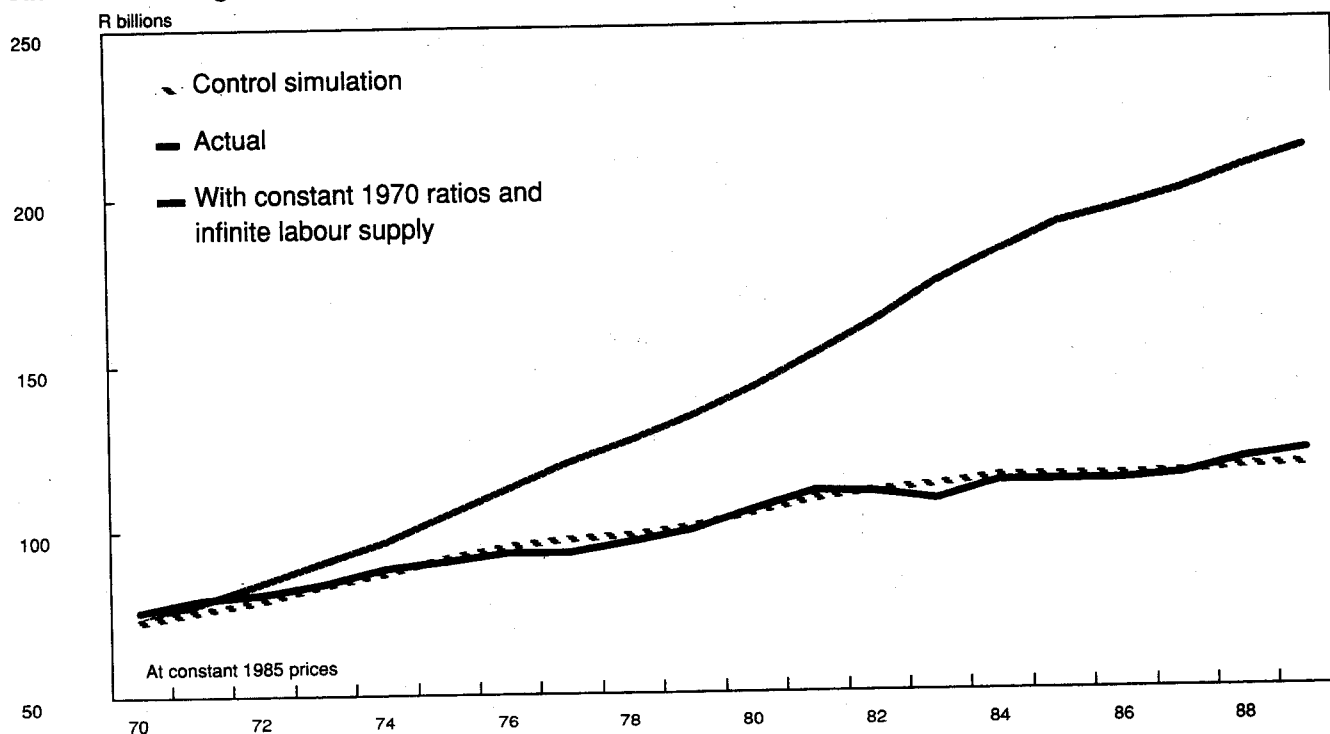
The limitations of this model must clearly be kept in mind. At most, its results could only be valid up to the point where labour bottlenecks set in. However, with foreign debt repayment currently a cen-

tral stumbling block to economic growth and less-skilled categories of workers undoubtedly available in abundant numbers, an illustration of the broad potential for enhanced growth through proper factor pricing seems relevant enough. If the broad policy directions indicated in this study would eventually result in managerial and highly skilled manpower, rather than capital, once again becoming the most important growth bottleneck, the authors would have reached their objective.

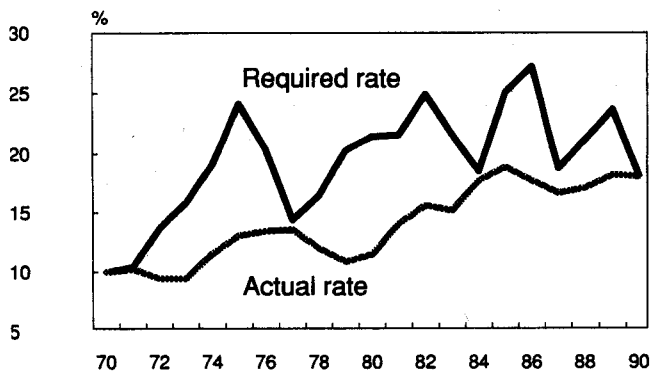
6.2 Policy experiments

The model outlined above was used, firstly, to investigate a scenario in which relative factor prices (and therefore the labour/capital ratio LKRATIO) are kept at their levels recorded in 1970 through the period from 1971 to 1989. Given the assumption of an unlimited potential labour supply, output rises from 1971 (because more labour is combined with capital). The higher output also feeds back through higher savings (with a fixed savings ratio applied to a higher real output level) into more rapid expansion of the capital stock; combined with still more labour, output increases further, and so on. The outcome of this process as far

Graph 7: Effect of constant 1970 factor price and capital/labour ratio on the real gross domestic product, 1970-1989



Graph 8: Long-term interest rate level required to keep factor price ratio at its 1970 level, 1970-1990



as real output is concerned is illustrated in Graph 7. Given this model and the assumed constant 1970 factor price ratio, real gross domestic product increases at a healthy compound growth rate of 5.8 per cent per annum from 1970 to 1989. This may be compared with the control simulation outcome (in which the actual values of LKRATIO are fed into the model) of 2.5 per cent growth per annum. The actual growth rate also amounted to 2.5 per cent per annum during this period.

The level of interest rates that would have been necessary in order to maintain the user cost of capital relative to the wage rate at its 1970 level, with all other factors constant, is shown in Graph 8.

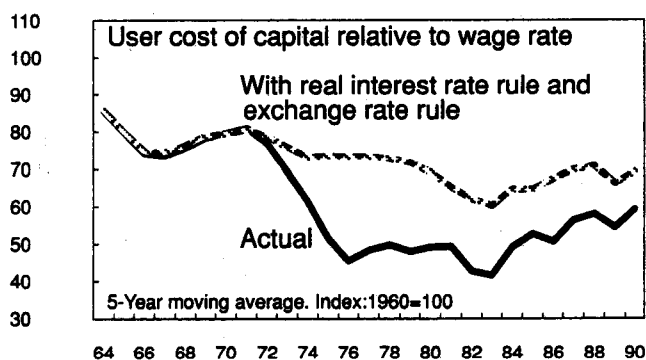
It should perhaps be stressed that the relatively high interest rate policy illustrated here would in due course significantly lower the rate of inflation. This would imply lower wage inflation as well as

capital goods purchase price inflation. The latter would cause the capital gains term (p^*) entering the user cost of capital to decrease. This would enable nominal interest rates to decline without lowering the user cost of capital relative to the wage rate. However, these spinoffs were not formally built into the model; for these policy simulations, inflation was assumed to continue, but with nominal interest rates allowed to compensate for inflation.

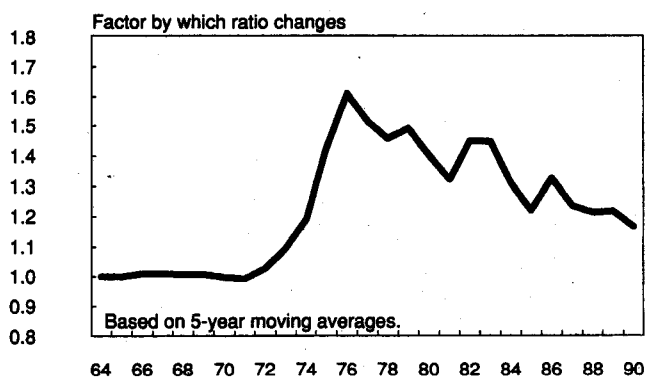
If interest rates had continuously been kept positive in real terms during the past two decades, the user cost of capital would have been correspondingly higher. In a second policy experiment, it was assumed that since 1960 the monetary authorities had used their discount rate and other instruments in such a way that the real rate on company debentures always exceeded 3 per cent per annum. (In years when the nominal rate anyway yielded more than 3 per cent in real terms, it was left unchanged.)

A further refinement was to assume that the authorities allowed the market to eliminate periods of "over-valuation" of the exchange rate or did so through their forex intervention. The effective exchange rate in 1979 – usually assumed to be a reasonably "normal" year, with approximate balance of payments equilibrium – was used as base. A purchasing power parity line with 1979 as its base was constructed. Whenever the actual effective exchange rate rose above this line, it was assumed that the market, or foreign exchange purchases by the Reserve Bank, brought the exchange rate back to the purchasing power parity line. Real over-valuation was therefore eliminated. By assuming unchanged foreign exchange-denominated prices of imported capital goods and multiplying these with the (now sometimes lower)

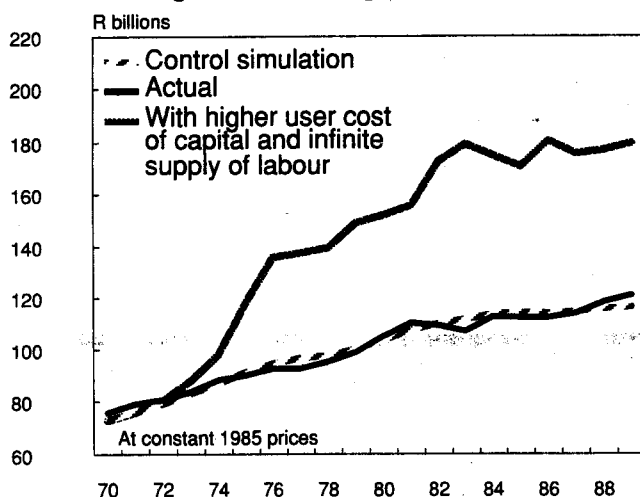
Graph 9: Effect of real interest rate and exchange rate rules on the factor price ratio, 1964-1990



Graph 10: Effect of real interest rate and exchange rate rules on the desired labour/capital ratio, 1964-1990



Graph 11: Effect of real interest and exchange rate rules on real gross domestic product, 1970-1989



exchange rate of the rand, an artificial imported capital goods price index was obtained. Imported capital goods carry an estimated weight of around 0,31 in total domestic fixed investment, with the remainder made up of domestically produced capital goods. Assuming unchanged prices in the latter component and ignoring indirect effects, an adjusted purchase price series for capital goods was constructed.

The result of these two measures is – since the early 1970s – a considerably more stable and higher user cost of capital, in absolute terms and relative to the wage rate, as is shown in Graph 9.

Finally, Graphs 10 and 11 illustrate the simulated effects this policy would have had on the desired labour/capital ratio and on the course of the real gross domestic product.

Once again, the higher relative cost of capital works to the benefit of the economy and enhances the level of real income.

6.3 A cautionary note

The analysis undertaken in this study is indicative and exploratory rather than definitive or exhaustive. Although the authors firmly believe that a positive real interest rate policy and higher relative cost of capital would have brought about significantly stronger real growth to the economy since the early 1970s, the magnitude of the projected changes in real output and other variables in the policy scenarios must be treated with caution.

The possibility also exists that further analysis and experience will show that the increases in the

capital/labour ratio experienced in South Africa were mainly due to technical progress inherently embodied in capital formation, that the elasticity of substitution between capital and labour is significantly less than one (the assumption of the Cobb-Douglas production function), and that the magnitude of the shift towards more labour intensive processes in reaction to a relatively higher user cost of capital will therefore be smaller than foreseen in this paper. Furthermore, uncertainty exists regarding the time lag between changes in the factor price ratio and changes in the capital/labour ratios actually chosen by decision makers; the five year moving average process used in this study is merely an assumption. A permanent shift towards a relatively higher user cost of capital may initially bring no reward in the form of higher employment per unit of capital, but show only the initial "Keynesian" effect of reduced output, investment and employment due to relatively higher interest rates. Nevertheless it seems that, if only through changing to double shifts or around-the-clock production, considerable scope for increasing the labour/capital ratio already exists even in the short-term.

Finally, in a rather sombre scenario, if certain labour movements were in future to continuously disrupt production on a significant scale, it might turn out that, for the affected sectors, the more capital intensive route was indeed the appropriate one!

7. Conclusion

A long-run analysis of the dynamics of economic growth leaves little doubt about the longer-run validity of the classical conception of the role of the rate of interest and other monetary and fiscal variables on the functional relationship between capital expenditure and the employment of labour. There is also little doubt about the fact that this relationship has been structurally distorted by monetary and fiscal policies which fuelled a process of inflation from the monetary side but led to the situation where nominal wage rates kept pace with the inflation, while nominal costs of capital investment lagged well behind. The degeneration came to an end in the early 1980s, when the monetary policy stance became basically supportive of positive real interest rates, although the very volatile national and international conditions in the latter period were reflected in similarly volatile movements in the opportunity costs of capital investment – in itself an uncertainty cost. The structural distortion has, however, not yet been redressed.

The analysis ascribes the nature of these distorting policies mainly to a tendency of the policy-makers to concentrate on the short-run, to the neglect of long-run considerations. This may have been due to the fact that the "direct control" school

of thought and the Keynesian way of thinking, both of which were very influential over the period, were both preoccupied with short-run policy issues.

We may perhaps be allowed to quote from an article written by one of us in 1972, sounding a warning about the neglect among the emerging policy elite in South Africa, of the classical principles of productivity:

"The foregoing thoughts have not been written in the hope or the intention of putting the clock back thirty years to pre-Keynesian principles of economic policy. That would be a ridiculous endeavour. At the same time, the South African experience in practical expenditure management (as distinct from theoretical ideal models), clearly suggests that the Keynesian approach cannot be relied upon as the exclusive set of policy principles

However, the facts before us, in particular the indications of a structural decline in our ability to maintain our position in international trade, suggest that the re-appraisal should go much further.

We have, in fact, allowed the elementary statistical framework of the Keynesian type of national accounts to overpower the careful, delicate and fundamental analysis of the operation of the market mechanism (or organism) produced during the almost two centuries of economic thought preceding Keynes. Instead, we should in our practical policies have recognised that the idea of stabilising aggregate demand through the artificial manipulation of domestic expenditure was a mere addendum to the basic principles of policy.

The classical economists and their modern successors studied the real engine of economic growth and distribution. To expand somewhat on this analogy, these men built a theory of the centrifugal water pump, while Keynes' most popular discovery was an easy way of *priming* the pump when it fails due to an air-lock! Perhaps he himself understood the operating principles of the system even better than his classical predecessors. But in order to drive his point home in practical politics, the early Keynesians claimed too much for it – presenting it as a "revolution", an *alternative* system of policy. It is as if too many influential Keynesian apprentices came to believe that the continuous priming of the pump is the real secret of getting water through the pipes; we came to believe that it was no longer necessary to pay much attention to the condition of the pump itself. Any old junkyard contraption might do, since the propulsion now came from the priming tanks rather than

from the dynamics of the motor. The time has clearly arrived for the engineers to overhaul the real engine of propulsion in the South African economy, namely its market mechanism and the economic order in which it operates. Pump priming should be recognised for the exceptional activity it should always have been."

Strategies to stimulate the rapid growth of gainful employment in South Africa should, accordingly, be based on a more appropriate practical synthesis of long-run and short-run insights into the dynamics of market economies. In facing the future, the long-run supply side structural strategy should be regarded as the basic discipline, while short-run demand side initiatives, when called for, must stay within the constraints of the long-run structural parameters as far as possible. Only when exogenously introduced crises compel immediately defensive action – which may admittedly be often – should governments be prepared to contemplate a temporary deviation from the structural constraints.

The long-run structural strategy would obviously have as its principal objective the generation of rapidly rising gainful employment, but might well include a number of more qualitative things connected with socio-economic development in general. In any case, *one of the fundamental economic principles of this strategy would have to be to accept that the rate of interest should be allowed to reflect the social productivity of capital investment in South Africa.*

In the final analysis, economic dynamics is a matter of people's expectations of the future as far ahead as they care to envisage. A synthesis between Keynesian and classical economics has long ago been achieved by the theorists. In theory there is no real conflict between what the Keynesian approach understands about the short-run and what the classical approach has to teach about the long-run. But in the "hearts and minds" of the actors in the market economy of South Africa, this synthesis between what to expect of the long-run and how short-run deviations from the trend should be viewed, is still far from achieved. This can, however, hardly be achieved if producers, consumers, employers and trade unions, importers and exporters etcetera, gain the impression that the economic policy-makers act as if there is no long-run to be taken into account in setting the constraints and the objectives of their daily management of their functions in the economy. The real synthesis between long-run and short-run perspectives, accordingly, starts in government.

Footnotes

[1] The technical assistance of colleagues in the South African Reserve Bank and particularly of its Economics Department is gratefully acknowledged.

[2] To illustrate: In 1988, "contractual savings" through these institutions amounted to about R22,1 billion, of which about R14,1 billion arose from investment income generated in the institutions themselves. Households borrowed (i.e. dissaved) a net amount of about R18,7 billion from institutions other than insurers and pension funds for consumption and to meet their contractual commitments under insurance policies and pension contributions, so that the saving by the "household sector" came to only R3,4 billion. However, if the net investment income generated in the contractual savings institutions themselves is considered as "corporate" savings, households dissaved to the tune of about R10,7 billion in 1988!

[3] Under the circumstances of the standstill on foreign debt repayments, an abrupt withdrawal would also probably have driven many South African holders of foreign currency denominated debt into repaying their debt into the PIC and funding transactions in the local money and capital markets. However, the rapid rise in domestic interest rates would have constrained this movement.

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Statistical Appendix

Table A.1 - The user cost of capital and the wage rate in South African manufacturing, 1960-1990

Year	Purchase price of capital	Interest rate	Depreciation	Capital gain	User cost of capital		Wage rate in manufacturing	User cost of capital relative to wage rate	
	P	r	d	p*	Value	Index	Index	Index	5-year moving average
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1960	1,000	0,065	0,110	0,000	0,175	100,0	100,0	100,0	-
1961	1,009	0,075	0,109	0,008	0,178	101,6	104,7	97,0	-
1962	1,038	0,065	0,111	0,026	0,156	89,2	108,1	82,6	-
1963	1,070	0,060	0,110	0,027	0,153	87,3	116,0	75,2	-
1964	1,100	0,065	0,107	0,025	0,161	92,2	126,5	72,9	85,5
1965	1,147	0,075	0,108	0,038	0,167	95,2	134,9	70,6	79,7
1966	1,204	0,075	0,111	0,045	0,170	97,2	141,9	68,5	74,0
1967	1,245	0,085	0,115	0,030	0,211	120,9	149,6	80,8	73,6
1968	1,269	0,085	0,120	0,017	0,239	136,6	159,8	85,5	75,7
1969	1,294	0,085	0,123	0,017	0,247	141,0	164,8	85,5	78,2
1970	1,365	0,100	0,124	0,048	0,240	137,2	178,2	77,0	79,5
1971	1,440	0,103	0,125	0,048	0,259	148,3	195,0	76,1	81,0
1972	1,575	0,095	0,124	0,083	0,215	122,7	208,8	58,7	76,6
1973	1,752	0,095	0,118	0,099	0,200	114,6	231,8	49,4	69,3
1974	2,001	0,116	0,115	0,126	0,210	120,0	267,3	44,9	61,2
1975	2,406	0,131	0,113	0,180	0,155	88,6	311,3	28,5	51,5
1976	2,809	0,135	0,115	0,148	0,286	163,5	357,5	45,7	45,5
1977	3,075	0,136	0,114	0,084	0,511	291,9	397,7	73,4	48,4
1978	3,425	0,120	0,111	0,101	0,444	253,6	444,3	57,1	49,9
1979	3,917	0,109	0,101	0,129	0,317	181,3	508,8	35,6	48,1
1980	4,466	0,115	0,093	0,127	0,361	206,2	599,1	34,4	49,2
1981	5,044	0,141	0,092	0,118	0,583	332,9	712,9	46,7	49,4
1982	5,866	0,156	0,093	0,148	0,594	339,5	847,8	40,0	42,8
1983	6,633	0,152	0,095	0,118	0,853	487,4	951,9	51,2	41,6
1984	7,204	0,177	0,097	0,078	1,414	808,2	1 090,9	74,1	49,3
1985	8,489	0,189	0,103	0,160	1,120	640,1	1 222,4	52,4	52,9
1986	10,373	0,177	0,106	0,198	0,877	501,4	1 391,0	36,0	50,7
1987	11,661	0,167	0,108	0,111	1,915	1 094,4	1 606,4	68,1	56,4
1988	13,384	0,171	0,109	0,132	1,985	1 134,4	1 877,2	60,4	58,2
1989	15,682	0,182	0,106	0,153	2,110	1 205,9	2 203,0	54,7	54,3
1990	17,301	0,181	0,106	0,092	3,368	1 924,6	2 503,8	76,9	59,2

(1) Deflator for gross fixed investment.

(2) Rate on long-term company securities (annual averages).

(3) According to national accounts assumptions.

(4) Calculated as $(1-d)$ multiplied by $(P_t - P_{t-1})/P_{t-1}$.

(5) $P(r+d-p^*)$.

Source of basic data for all tables:

Economics Department, South African Reserve Bank. Data for 1990 are estimates.

Table A.2 - Capital/labour ratios for selected industries, 1960-1989

Capital stock at constant 1985 prices - R per employee

Year	Mining and quarrying	Manufac- turing	Construction (contractors)
1960	15 243	11 972	2 381
1961	15 550	12 049	2 518
1962	16 094	12 060	2 587
1963	16 229	12 208	3 014
1964	16 125	12 702	2 958
1965	16 414	13 377	2 934
1966	16 357	14 304	3 060
1967	16 884	14 914	2 933
1968	16 591	15 151	2 815
1969	16 840	15 258	2 891
1970	16 552	15 820	2 962
1971	17 153	16 724	2 933
1972	17 970	17 831	3 461
1973	17 271	18 810	3 778
1974	18 528	19 520	3 831
1975	22 014	20 229	4 223
1976	23 207	20 798	4 745
1977	23 300	22 421	6 052
1978	24 195	23 986	7 162
1979	25 059	25 468	7 061
1980	26 854	27 054	6 682
1981	29 321	28 247	6 146
1982	32 782	29 801	5 916
1983	35 284	32 605	6 170
1984	35 722	33 430	6 355
1985	36 187	33 983	6 481
1986	36 587	33 171	6 304
1987	40 165	31 868	5 953
1988	44 094	30 883	5 655
1989	47 257	31 331	5 522

Table A.3 – Capital/output ratios for South African industries (3-year moving average)

Indices: 1962 = 100

Year	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas and water	Construction (contractors)	Wholesale and retail trade, catering and accommodation	Transport, storage and communication	Finance, insurance, real estate and business services	Community, social and personal services	Total
1962.....	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
1963.....	95,5	96,7	97,6	97,9	105,2	97,4	99,4	98,3	102,5	98,7
1964.....	98,7	92,2	95,5	95,0	107,8	93,5	97,0	96,2	105,5	96,4
1965.....	103,0	88,9	96,7	91,8	109,2	89,7	95,6	95,2	109,5	95,2
1966.....	107,0	86,2	100,0	90,8	111,8	89,1	95,2	95,5	113,1	95,5
1967.....	99,8	85,3	102,9	91,2	115,7	88,1	96,2	96,5	115,9	96,4
1968.....	96,7	83,9	103,5	93,0	118,4	86,3	96,8	96,3	117,8	97,5
1969.....	94,7	83,0	101,1	94,2	115,7	83,9	95,9	94,7	121,6	97,8
1970.....	102,2	81,6	99,7	94,4	113,1	83,0	92,9	94,1	126,9	98,5
1971.....	100,5	82,5	98,8	94,5	109,2	84,2	90,5	95,8	133,9	99,9
1972.....	100,0	86,2	101,1	93,1	109,2	86,5	90,3	99,0	140,8	103,2
1973.....	102,5	91,2	103,2	91,4	119,7	87,9	91,8	101,3	148,0	107,1
1974.....	102,0	99,5	105,9	88,4	135,5	88,4	91,6	102,7	154,5	110,5
1975.....	104,6	111,0	108,3	86,8	152,6	86,7	91,8	104,4	159,2	114,0
1976.....	102,1	124,7	111,3	87,9	167,1	87,0	94,1	106,5	161,8	117,9
1977.....	104,3	134,4	116,6	91,9	185,5	90,9	99,1	108,7	164,4	123,6
1978.....	101,8	140,3	120,2	97,2	206,5	96,0	102,0	110,1	166,5	127,9
1979.....	98,9	144,9	122,9	101,7	222,3	101,3	100,8	109,9	169,3	130,8
1980.....	96,4	155,9	123,5	104,2	227,6	100,0	97,0	107,9	171,3	130,8
1981.....	94,4	172,0	126,1	103,7	223,6	95,8	92,6	105,4	173,4	130,3
1982.....	95,1	190,3	133,0	103,2	223,6	91,1	92,5	104,4	173,9	132,4
1983.....	107,7	205,0	144,9	105,6	232,8	89,7	96,7	104,7	172,9	138,1
1984.....	116,1	213,7	154,4	110,0	244,7	89,1	99,7	105,6	170,3	142,8
1985.....	113,6	221,5	162,5	113,5	253,9	89,7	100,7	106,5	169,5	146,5
1986.....	98,7	231,6	161,9	113,7	259,2	91,8	99,5	107,1	169,6	148,0
1987.....	86,4	248,6	158,9	111,9	264,4	94,6	100,2	106,8	169,6	150,2
1988.....	81,3	265,1	149,7	108,1	260,5	94,4	99,4	106,6	167,7	149,5
1989.....	74,9	285,1	143,8	102,3	248,7	92,9	96,1	106,8	166,2	147,7

Table A.4 - Indices of savings, labour supply, capital/labour and output/labour ratios, 1970 to 1989

Year	Real net domestic saving*	Increase in economically active population	Ratio of real net domestic saving* to increase in economically	Average capital/labour ratio	Average output/labour ratio
1970	100,0	100,0	100,0	100,0	100,0
1971	97,2	104,0	93,4	105,8	103,0
1972	103,0	108,2	95,2	112,1	103,4
1973	119,3	112,5	106,1	118,7	106,6
1974	132,4	117,0	113,2	120,9	106,9
1975	131,6	121,7	108,1	127,3	107,2
1976	117,2	126,5	92,6	134,5	108,9
1977	117,3	131,6	89,1	140,0	107,6
1978	127,4	136,9	93,1	141,2	107,0
1979	164,8	142,3	115,8	141,6	107,2
1980	202,3	148,0	136,7	145,6	111,7
1981	208,6	154,0	135,5	145,4	111,2
1982	163,8	160,1	102,3	147,7	106,7
1983	118,5	166,5	71,2	148,3	100,7
1984	94,5	173,2	54,5	148,1	102,3
1985	106,9	180,1	59,4	147,2	98,4
1986	93,0	187,3	49,7	146,4	96,3
1987	87,3	194,8	44,8	145,0	95,7
1988	80,9	202,6	39,9	143,2	97,2
1989	83,8	210,7	39,8	142,1	97,1

*3 year moving average. Price index used: GDP deflator.

Table A.5 - Real long-term bond rates in South Africa and selected industrial economies

Average during	South Africa	Japan	United Kingdom	United States	West Germany
1970	2,9	-0,4	2,7	1,3	4,7
1971	2,6	0,9	-0,4	1,8	2,6
1972	1,8	1,7	1,7	2,8	2,3
1973	-1,6	-3,9	1,4	0,6	2,2
1974	-2,3	-11,3	-0,9	-3,1	3,2
1975	-3,3	-2,3	-7,9	-1,1	2,4
1976	-0,7	-0,6	-1,9	1,8	3,3
1977	-1,1	-0,8	-2,7	0,8	2,4
1978	0,2	1,8	3,9	0,8	3,0
1979	-3,4	3,8	-0,2	-1,6	3,2
1980	-3,2	1,4	-3,6	-1,8	2,9
1981	-1,9	3,5	2,5	3,2	3,8
1982	-1,1	5,3	3,9	6,4	3,5
1983	0,3	5,4	5,9	7,6	4,5
1984	3,2	4,4	5,5	7,9	5,2
1985	0,5	4,2	4,3	6,8	4,6
1986	-1,9	4,3	6,2	5,6	6,2
1987	-0,7	4,2	5,1	4,6	5,5
1988	3,1	3,5	4,2	4,6	4,9
1989	1,9	2,7	1,6	3,5	4,2

Note: Real rates obtained by adjusting nominal rates with historical 12-month consumer price inflation rates

Table A.6 - Data used in the growth model

	Q Rm 1985 prices	L Index 1980=100	K Rm 1985 prices	GRADE g / t	S=I Rm 1985 prices	DEPR Fraction	LKRATIO Fraction	SRATIO Fraction
1970	75 749	76,8	173 744	12,51	19 185	0,0480	0,000442	0,2532
1971	79 005	79,2	186 521	12,41	21 259	0,0488	0,000425	0,2690
1972	80 474	80,2	199 913	12,41	22 501	0,0488	0,000401	0,2796
1973	83 705	84,9	213 744	11,24	23 676	0,0492	0,000397	0,2828
1974	88 223	89,0	228 575	9,98	25 222	0,0486	0,000389	0,2858
1975	89 921	92,9	245 074	9,49	27 683	0,0489	0,000379	0,3078
1976	92 451	94,7	260 193	9,16	27 341	0,0498	0,000364	0,2957
1977	92 501	93,7	272 742	9,12	25 711	0,0505	0,000344	0,2779
1978	95 177	93,6	283 918	8,48	24 998	0,0506	0,000330	0,2626
1979	98 932	95,6	295 676	8,15	26 040	0,0503	0,000323	0,2632
1980	104 962	100,0	311 268	7,21	30 487	0,0503	0,000321	0,2904
1981	110 217	104,3	327 702	6,83	33 217	0,0539	0,000318	0,3013
1982	109 507	106,1	342 754	6,42	32 503	0,0532	0,000310	0,2968
1983	107 162	105,2	355 777	6,46	31 352	0,0534	0,000296	0,2925
1984	112 859	106,8	367 509	6,14	30 885	0,0538	0,000291	0,2736
1985	112 448	106,2	376 602	5,87	28 715	0,0533	0,000282	0,2553
1986	112 459	106,7	380 399	5,40	23 493	0,0522	0,000280	0,2089
1987	114 220	107,7	384 861	5,09	22 929	0,0485	0,000280	0,2007
1988	118 558	109,0	389 548	5,09	24 977	0,0527	0,000280	0,2106
1989	121 116	109,5	395 405	4,99	26 330	0,0525	0,000277	0,2173

Table A.7 - Policy simulation results

Real gross domestic product at constant 1985 prices

Year	Actual Rm	Control simulation Rm	Simulation with fixed 1970 factor price and factor ratios Rm	Simulation with real in- terest rate and exchange rate rules Rm
1970	75 749	72 924	72 924	72 847
1971	79 005	76 174	78 165	75 872
1972	80 474	78 947	84 274	80 310
1973	83 705	83 107	89 923	88 217
1974	88 223	86 725	95 793	97 972
1975	89 921	91 381	103 729	117 832
1976	92 451	94 769	111 679	136 063
1977	92 501	96 503	119 544	137 821
1978	95 177	97 612	126 063	139 708
1979	98 932	100 219	133 406	149 065
1980	104 962	103 644	141 481	152 213
1981	110 217	107 673	151 187	155 754
1982	109 507	110 218	161 060	172 631
1983	107 162	111 955	172 415	179 440
1984	112 859	113 965	181 771	175 096
1985	112 448	114 386	190 248	170 577
1986	112 459	114 273	194 469	180 715
1987	114 220	114 760	199 303	175 737
1988	118 558	115 940	205 438	177 145
1989	121 116	116 414	211 918	179 659