Toward an Understanding of the Growth Absence: Reviewing the Evidence that can Account for the Poor Growth Performance of the South African Economy

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1 INTRODUCTION: THE CASE FOR A DEBATE ON GROWTH IN SOUTH AFRICA

South Africa's democratic transition now lies close to a decade in the past. The transition carried with it much by way of hopes in terms of greater access by its population, not only to an improved rights environment. It was envisaged that the political self-realization of all South African citizens would also bring with it access to improved economic well being. Employment, as well as rising *per capita* income, is an obvious indicator of progressive development for the population of a country.

In this paper, we consider the implications of evidence that has emerged over the past four years that carries insight into the growth and employment creation performance of the South African economy. The emphasis is explicitly on why limitations in the growth performance of the South African economy may have emerged. As such, the tone will have a tendency toward the gloomy. This should not obscure the considerable achievements on the economic policy front over the past decade. Success, particularly with regard to macroeconomic stabilization policy, is notable.

We begin with consideration of some evidence on the long-run growth performance of the economy, as well as the track record of employment creation in the economy. Growth in the South African economy is decomposed into its primary sources, in order to identify any fundamental structural changes in the source of economic development. The evidence will indicate that not only has growth and employment creation in South Africa been subject to long-term structural decline, but the source of economic growth has also shifted from capital accumulation to growth in total factor productivity (TFP) over time.

Section 2 of the paper is concerned with an analysis of the determinants of perhaps the most fundamental driver of long-term growth: investment in physical capital stock. The evidence suggests that rates of return on capital and the user cost of capital are fundamental to the determination of investment in fixed capital stock, but exert their influence subject to a powerful impact exercised by uncertainty. What is more, the evidence reviewed demonstrates that uncertainty is crucial not only for investment in physical capital stock, but also for the determination of the capital flows that are required to finance the short-fall of savings relative to investment expenditure in South Africa.

In the case of South Africa, uncertainty has strong institutional underpinnings, which Section 3 elaborates on. The evidence reviewed in Section 3 points to a number of crucial institutional dimensions that exercise an influence, not only on capital accumulation, but on employment creation, international trade flows, and the efficiency of output markets in South Africa.

Finally, in Section 4 of the paper, we consider evidence of the importance of factors identified by modern (endogenous) growth theory in determining South Africa's growth performance. While a number of different determinants are considered, the discussion focuses on the contribution of investment in human capital. The evidence suggests that

what counts increasingly is the quality of human capital investment rather than the quantity of such investment. In an extensive review of published evidence, we establish that in generating quality human capital, South Africa still leaves much to be desired.

1.1 A Brief Initial Overview

Let us begin by assessing where South Africa currently finds itself. In order to do so, we consider two fundamental indicators of its rate of development: the growth rate of output in the economy; and the level of employment generated in South Africa's labour markets.

In a third component of this introductory section, we consider evidence on the structure of output growth in South Africa by means of decomposition of output growth into the contributions of labour, capital and TFP.

1.1.1 Growth Performance

Growth continues to elude the South African economy. More seriously, South Africa's growth performance has been on a steady downward trend since the early 1970s. This downward trend is present when we consider the growth rate in real Gross Domestic Product (GDP), as well as when we consider the growth rate in real *per capita* GDP (see Figure 1).

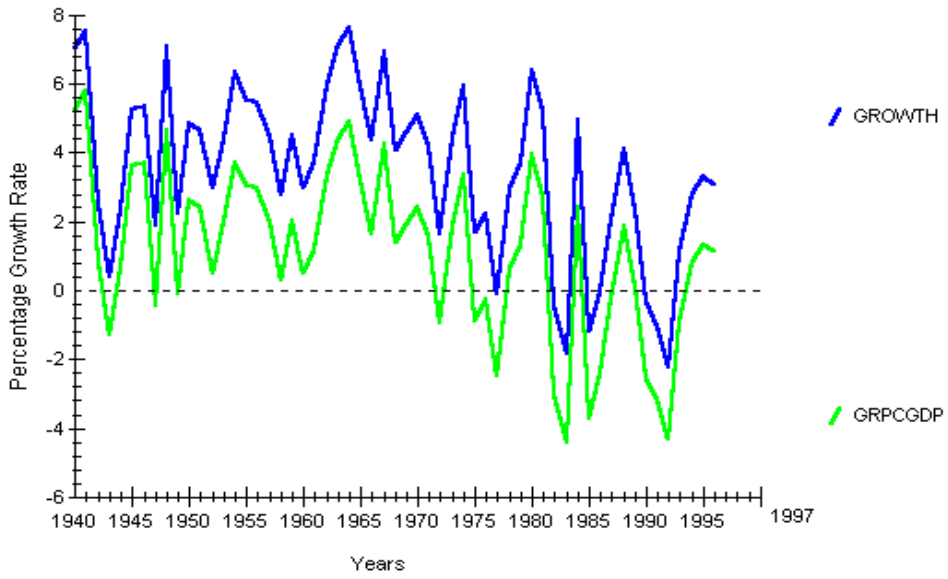

Figure 1: Growth Rates in Real Gross Domestic Product (GROWTH) and *Per Capita* Real Gross

What is alarming about the evidence in Figure 1 is not the declining trend in the two growth rates depicted. Such evidence is available for a number of countries, and was

central to the debate surrounding the long-term economic development of the US for the last twenty years (until the most recent upsurge in US growth). Instead, what is alarming about the South African evidence is the *extent* of the decline in the two growth rates. By the 1990s, the growth rates were frequently negative rather than positive. Certainly the evidence is of a long-term structural decline in growth rather than a sudden poor performance during the course of the 1990s.

The evidence of growth in real GDP is thus not reassuring. However, the evidence must be viewed in context. The declining growth performance of the South African economy mirrors declining growth rates elsewhere in the world. On the other hand, middle-income countries as a whole grew at 2.7% *per annum* on average over the 1980-90 period, and at 3.9% *per annum* on average over the 1990-98 period. In the case of East Asia, the acceleration was from 8.0 to 8.1% *per annum* over the same period. Thus South Africa, as a middle-income country, has performed well below the average maintained by its peer economies.

Two factors might give us reason to pause before accepting the evidence we have seen at face value. The first is that Figure 1 does show evidence of a recovery in growth performance in the mid-1990s, though it remains to be seen how sustainable the recovery will prove to be. The second is that one of the reasons that has been advanced for the sharp increase in the growth performance of the US economy is that GDP measurement has been improved in order to take better account of quality improvements in output in the economy, especially regarding the contribution of information technology to production methods. The question that then arises is whether, in the South African case, a similar impact might not become evident if such revised GDP figures were to be considered.

The South African Reserve Bank has made some attempts to correct its measures of GDP in order to bring the measure in line with revised international best practice. In Figure 2, we report the implied growth rates on both the "old" and the "new" measure of GDP. While it is evident that the revision of the GDP figures has indeed had an impact, the impact is not such as to allay significantly growth concerns for the economy. Moreover, on either measure of GDP, it emerges that South Africa has not been able to sustain the growth upsurge of the mid-1990s.

Therefore, regardless of which data we consider, growth must remain a central concern for policy makers in South Africa. Understanding the fundamental determinants of growth in South Africa is a pressing need.

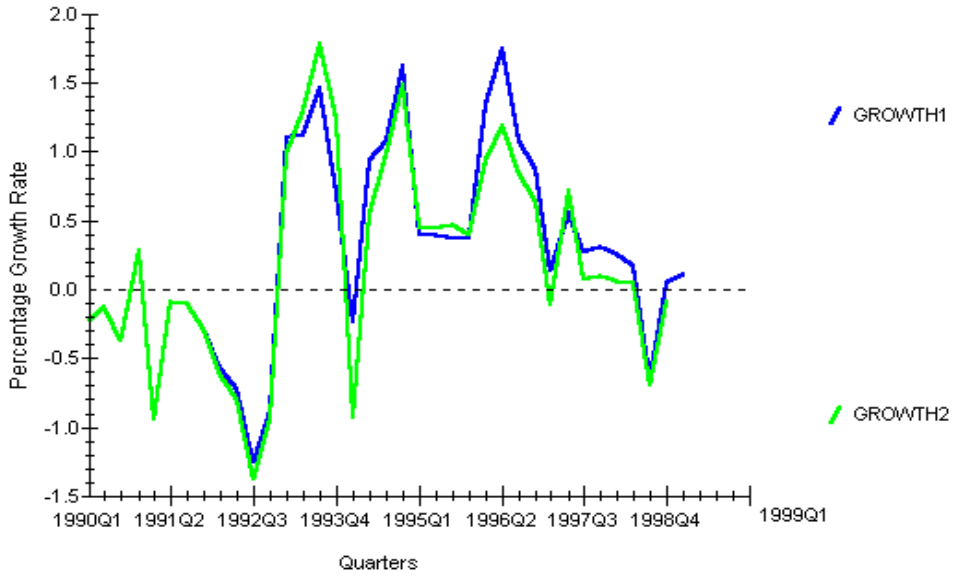

Figure 2: Growth Rate in Real GDP over the 1990s in terms of 'old' (GROWTH) and 'new' (GROWTH2) GDP measures

1.1.2 Employment Creation

In terms of employment in the economy, the evidence is both more reassuring – and more disturbing – than the evidence on economic growth. For example, consider employment in the formal sector of the South African economy, reported over the 1970-97 period (Figure 3).

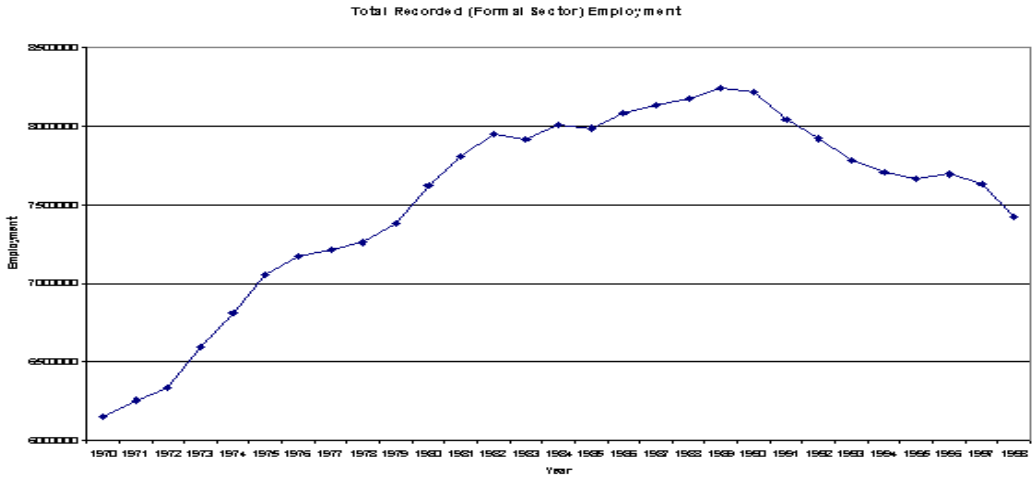

Figure 3: Total formal sector employment in South Africa, 1970-98

What is evident, in terms of aggregate employment, is that formal sector employment continued to expand through the 1970s and 1980s, despite the declining growth performance of the economy. What emerges equally is that the continued expansion of the labour market did not prove to be sustainable in the face of the ever-decreasing growth in output. Finally, beginning in the early 1990s, we have witnessed a very dramatic fall in the level of formal employment in the South African economy.

What also emerges from the evidence of Figure 3 is that just as the growth rate in output in the economy as a whole has been on a long-term downward trend, so too has the growth rate in employment trended down. In both output and employment creation, the evidence suggests a structural constraint in the South African economy.

Moreover, this poor performance in job creation during the course of the 1990s is almost universal in the South African economy if considered in terms of employment growth in principal sectors of the economy. Agriculture, forestry and fishing, mining, and to a somewhat lesser extent, manufacturing and services all show falling employment levels during the course of the 1990s. In the case of the mining sector, the fall is particularly dramatic.[1] Only an ever-expanding government sector has maintained a countervailing trend. This evidence is summarized in Table 1, which serves to confirm the negative average growth rates in all but the government sector during the course of the 1990s.

	1970s	**1980s**	**1990s**
AFF	-0.46	-1.29	-1.00
Mining	1.35	0.89	-6.37
Manufacturing	2.67	1.33	-1.20
Service	4.37	1.54	-0.84
Govt	5.87	3.47	0.41
TOTAL	**2.05**	**1.12**	**-1.15**

Table 1: Average Annual Growth Rates in Formal Employment by Major Economic Sector of the South African Economy

What is even more disturbing in terms of its welfare implications is that the labour shedding of the 1990s has been concentrated on that segment of the labour force that is most vulnerable: the unskilled. While the point generalizes across the economy, here we report the experience of only one sector of the economy, that of gold and uranium mining.[2] Given the very significant job losses reported by the mining sector (see Table 1), this proves to be indicative of the aggregate labour market experience in South Africa. Figure 4 demonstrates that labour shedding in the important gold and uranium mining sector of the economy has been concentrated not only in the 1990s, but that such concentration has been on unskilled rather than skilled labour. Thus, the inevitable

[1] See also the discussion in Fedderke and Pirouz (2000) for a more detailed analysis of the mining sector.
[2] See Fedderke and Pirouz (2000) for a more detailed analysis of this evidence.

welfare implication of the evidence is that labour shedding in the economy has been concentrated on that section of the population most vulnerable to income shocks.

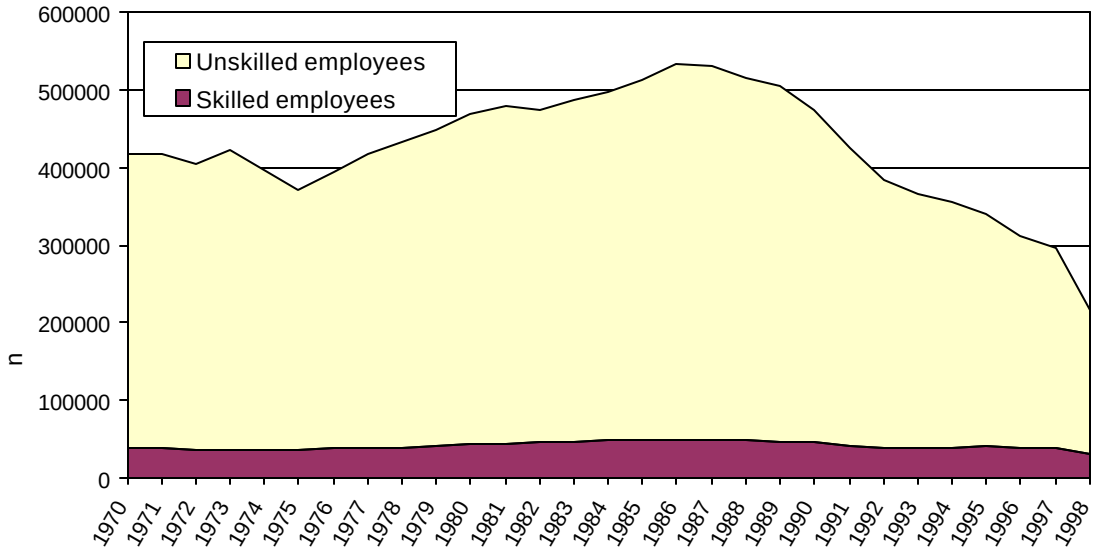

Figure 4: Skills Composition of the Labour Force: Gold and Uranium Mining
Source: Fedderke & Pirouz (2000)

That the entire private sector has been forced to shed labour over the past ten years has raised serious concerns about the health of South Africa's labour markets. Much as for the growth performance of the South African economy, serious questions face us concerning the *reasons* for the poor employment prospects of South Africa's labour force. Indeed, given the evidence presented above, questions surrounding the poor employment creation track record of the economy not only become overriding as regards the labour market, but the question of the extent to which the poor growth performance of the economy is linked to the poor labour market performance, also presents itself. This is particularly so since all sectors that have faced competitive pressures in any degree have shed labour during the 1990s, and have done so after facing declining growth rates in employment ever since the 1970s. The implication must be that a serious and *general* structural problem is impacting on the performance of the labour market, and that this constraint is a long-standing one that has only emerged in virulent form during the 1990s, preventing employment creation from taking place.

1.2 Evidence on a Changing Structure to South African Output Growth[3]

Evidence from developed countries has often pointed to the significant contribution of growth in TFP rather than growth in factor inputs to output growth.[4] One illustration of

[3] The discussion of this subsection draws substantially on the detailed evidence presented in Fedderke (2001f). Readers are referred to this source for any required detail both in terms of more detailed sectoral TFP decompositions, more detailed temporal decompositions, as well as real cost reduction computations.

this emerges when one considers the relative contribution of labour, capital and the remaining Solow residual or TFP to growth in real output. In effect, the growth in output in developed countries is difficult to explain by reference to growth in factor inputs, and instead the weight of expectation for economic growth begins to fall on the contribution of technological advance.

An important modulation relevant to developing countries has emerged from international evidence.[5] Evidence from developing countries has emphasized the possibility of a changing trajectory in output growth, beginning with a heavy reliance on capital-intensive output growth, shifting to TFP growth with rising *per capita* GDP.

In what follows, we briefly consider evidence on the structure of the South African growth experience over the 1970-97 period, employing standard growth accounting decompositions.

1.2.1 The Methodology and its Limitations

Computation of TFP growth is by means of the standard primal estimate given by:

$$TFP = \frac{\dot{Y}}{Y} - s_K \frac{\dot{K}}{K} - s_L \frac{\dot{L}}{L} \qquad (1)$$

Where s_K and s_L denote the shares of capital and labour in output respectively, Y denotes output, K capital, and L labour.

However, it is vital to realize that evidence to emerge from this simple growth accounting decomposition can only be understood to be broadly indicative. The literature on growth accounting since the contributions of Denison (1962, 1967, 1974) has provided further sophistication to the decomposition, and further extensions have emerged due to the developments in endogenous growth theory (for a useful overview of the developments see Barro 1998).[6] Since the potential limitations arising from the assumption of constant returns to scale are addressed in a separate study (see Fedderke 2001g), in the current context we proceed on the assumption that the simple decomposition can be invoked. In this, the study follows numerous others internationally.

1.2.2 TFP Evidence for South Africa

South Africa's aggregate experience mirrors that of many developing countries. Table 2 illustrates that the contribution of growth in TFP to South African growth in aggregate

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[4] See, for instance, Abramovitz (1956, 1986, 1993). For continued and more recent discussion of this evidence see also Fagerberg (1994) and Maddison (1987).

[5] See, for instance, Lim (1994).

[6] The crucial limitations of the simple decomposition approach are: (a) that factor inputs are not disaggregated into quality classes; (b) the assumption that factor social marginal products coincide with observable factor prices; and (c) the assumption that the production function is characterized by constant returns to scale. While Anderton (1999) has proposed an alternative methodology that addresses at least some of these concerns, currently data limitations in South Africa preclude its application.

output has been steadily rising since the 1970s. The 1970s and 1980s saw growth that was heavily led by growth in capital and labour inputs, with very little contribution by technology. In the 1990s, the situation is reversed: growth in the labour force input contributed negatively; and growth in the capital input contributed relatively weakly to growth in GDP. Instead, the single strongest contributor to output growth during the course of the 1990s is a strong augmentation in technology.

	Growth in Real GDP	**Of Which: Labour**	**Capital**	**Technology**
1970s	3.21	1.17	2.54	-0.49
1980s	2.20	0.62	1.24	0.34
1990s	0.94	-0.58	0.44	1.07

Table 2: Decomposition of Growth in Real GDP into the Contribution of Factors of Production and Technological Progress
Figures are in percent. Source: Fedderke (2001g)

Thus, the evidence suggests the presence of a strong structural break in the South African economy. While in the 1970s and 1980s output growth in the economy as a whole was driven by growth in factor inputs, the 1990s have seen a growing reliance on technological improvements and efficiency gains in the economy. Part of the reason for this is that the 1990s saw a decline in formal sector employment[7], such that growth in labour inputs could not possibly have added to the growth in real output of the economy. The declining contribution of capital to the growth performance of the South African economy is due to the declining investment rate that South Africa has experienced.[8] We are thus left with a finding that the contribution of technological progress to South African growth in aggregate has been steadily rising since the 1970s – though admittedly it has contributed a rising share to a declining growth rate in output.

The aggregate evidence hides strong sectoral differences, however. We report the summary evidence in Table 3. The implication of the evidence is that the principal South African economic sectors show strong differences in terms of the decomposition of their output growth. The only consistent feature across all four principal sectors of the South African economy is that the contribution of the labour factor input toward output growth has been on a downward trend from the 1970s through to the 1990s. In terms of the contribution of growth in capital stock, we find that in the agricultural sectors, the mining industry and the service industries, capital has been of declining importance as a contributor toward output growth, while for the manufacturing industry, it has assumed increasing importance.[9]

[7] See the more detailed discussion in Fedderke, Henderson, Mariotti and Vaze (2000).
[8] See the more detailed discussion in Fedderke (2001a), and Fedderke, Henderson, Kayemba, Mariotti and Vaze (2001).
[9] This is consistent with the evidence contained in Fedderke, Henderson, Kayemba, Mariotti and Vaze (2001).

Growth in Real GDP		Of Which:		
		Labour	Capital	Technology
Agriculture, Forestry and Fishing				
1970s	4.27	-0.10	2.00	2.37
1980s	4.30	-0.24	-0.56	5.10
1990s	2.40	-0.20	-0.92	3.52
Mining				
1970s	-1.08	0.51	3.81	-5.40
1980s	-0.55	0.18	3.90	-4.63
1990s	-0.60	-2.32	0.10	1.62
Manufacturing				
1970s	4.94	1.67	2.78	0.49
1980s	1.48	0.78	1.21	-0.52
1990s	0.43	-0.47	1.69	-0.79
Service Industry				
1970s	3.41	1.49	2.80	-0.88
1980s	2.81	0.82	1.28	0.71
1990s	1.50	-0.59	0.44	1.65

Table 3: Decomposition of Growth in Real Output into the Contribution of Factors of Production and Technological Progress; Evidence by Principal Economic Sectors
Figures are in percent. Source: Fedderke (2001g)

Finally, in terms of the contribution of technological progress, the strongest efficiency improvements have consistently been evident in the agricultural sectors, though the contribution declined during the 1990s. Mining, by contrast, while coming off a low growth rate of technological progress, has been on an upward trend, as has the service industry. The manufacturing industry has shown the weakest performance in terms of

technological progress in the South African economy[10] – at least during the course of the 1990s.[11]

The implication of the above evidence confirms our initial finding: that technology as a contributor to economic growth in the South African economy has become increasingly important, though sectoral differences cannot be neglected. In particular, the exception to this finding is in the manufacturing sector, specifically the 1990s, which has seen a process of restructuring, with a strong link between growth in capital stock and output growth, and a declining importance of technological innovation.

1.3 Implications of the Initial Evidence for the Explanatory Task that Lies Ahead

The evidence considered in this introductory section defines a clear set of questions in trying to come to terms with South Africa's (lack of) growth performance.

First, it should be evident that the need for an understanding of the determinants of long-run economic growth is pressing. Sustainable long-term welfare improvements in South Africa require economic growth rates comfortably in excess of those maintained by South Africa at least over the past 30 years.

Second, the changing *structure* of South African output growth deserves closer attention. Why has the growth in capital stock contributed in declining measure to the growth in output? What is it about the labour market that has led to the decline in employment creation, and hence to a virtual absence of labour as a positive contributor to output growth in South Africa?

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[10] The exceptional behaviour of the manufacturing sector deserves closer comment. The correlation between output growth and the contribution to output growth by the three sources of output growth changes dramatically from 1970 to 1997. In the 1970s and 1980s, the strongest correlation is between output growth and the TFP measure. In the 1990s, the strongest correlation is between output growth and the growth rate of capital stock. The implication is that, in the first two decades, sectors that experienced high growth rates in output were also likely to have a strong track record of technological innovation. In the 1990s, by contrast, this association has become less prevalent. Instead, strong output growth has become associated with a strong growth rate in physical capital stock. A number of explanations are possible for this transformation. The first is the evidence now accumulating that capital markets in South Africa underwent restructuring during the course of the 1990s (see, for instance, the discussion in Fedderke, Henderson, Kayemba, Mariotti and Vaze (2001)). The liberalization of the policy environment saw changed incentives and rates of return to investment activity, such that capital came to be reallocated from sectors with strong state involvement, to manufacturing industry. A further potential explanation for the changing profile in manufacturing sector output growth arises from the likely impact of the period of international isolation South Africa faced during the 1970s and 1980s. The period of isolation may have made access to international advances more costly, increasing the incentive for domestic innovation.

[11] In the more detailed evidence of Fedderke (2001f), we also present evidence on real cost reduction contributed by each economic sector, following the methodology of Harberger (1998). The implication of the findings is that technological progress in the manufacturing sectors is highly concentrated in individual sectors, rather than generalized across all manufacturing sectors. Moreover, the sectors contributing most significantly to economic growth prove to volatile across time, making the targetting of innovation incentives by policy makers difficult.

Third, what else besides growth in factor inputs might come to raise real output? The rising contribution of TFP growth gives us one indication, and raises a set of questions that arise from contributions made to new growth theory. How in particular are we to understand the role of human capital, and the contribution of explicit innovative activity (research and development) to TFP growth and hence output growth?

It is to this set of questions that we now turn our attention.

2 CONSIDERING THE FOUNDATION OF LONG-RUN GROWTH: INVESTMENT IN PHYSICAL CAPITAL STOCK

A core determinant of long-run economic growth is the investment rate in physical capital stock. Regardless of whether we are referring to classical theories of economic growth (e.g. Solow 1956, 1957) or modern endogenous theories of economic growth (e.g. Romer 1986, Romer 1990, Grossman and Helpman 1991, Aghion and Howit 1992), investment in physical capital is consistently a primary source of growth. Empirical investigations confirm the centrality of the investment rate in physical capital. Levine and Renelt (1992) famously established it as the single most robust variable in empirical cross-sectional growth studies. De Long and Summers (1993) confirmed its importance as the central motor behind long-run improvements in *per capita* GDP.

This provides us with an obvious starting point for any investigation of long-run growth determinants in the South African economy. An understanding of the drivers behind South African investment must form the most basic building block in understanding how we can augment South Africa's physical capital stock, and hence the growth rate of output.

In the discussion that follows, we draw on earlier work regarding the characteristics of South Africa's capital markets. We begin with a consideration of evidence on the determinants of investment expenditure.[12] Besides the econometric evidence, we also consider some descriptive evidence on the patterns of physical capital investment in disaggregated South African economic sectors, which suggests that conditions in South African domestic capital markets may have improved over the course of the 1990s.[13]

Finally, we extend our discussion of conditions in South African capital markets to a consideration of the importance of international capital flows for investment in South Africa. Considering the determinants of such international capital flows in South Africa is a natural extension with which to conclude our discussion of investment in physical capital stock.[14]

2.1 Econometric Evidence on the Determinants of Investment in South Africa

[12] In this instance we draw extensively on the discussion and evidence contained in Fedderke (2001a).
[13] Here we draw on the discussion in Fedderke, Henderson, Kayemba, Mariotti and Vaze (2001).
[14] For this evidence we draw on the discussion in Fedderke (2001b, 2001c).

The modern theory of investment expenditure has come to be focused on the impact of irreversibility and uncertainty. While there is recognition of the importance of these two determinants of the changing size of capital stock, recent contributions to the theory have provided a more comprehensive understanding of the issues. Most important of these insights has been the recognition that the impact of uncertainty on investment is ambiguous instead of unambiguously positive, as the early literature suggested.

Early work on the link between investment and uncertainty recognized that uncertainty is important whenever firms make irreversible commitments before the pay off that is to be generated by the commitment is realized. The main finding from this early literature was that under constant returns to scale production technology, and assuming uncertainty to attach to output price, the marginal product of capital is convex in the uncertain output price, such that rising uncertainty raises the marginal valuation of an additional unit of capital and hence stimulates investment.[15]

The modern literature has emphasized that such a result need not hold under asymmetric adjustment costs. The discussion is cast in terms of a stochastic dynamic environment. Irreversibility of investment decisions and the possibility of waiting mean that the decision not to invest at the present point in time can be thought of as the purchase of an option. The option has value, since waiting to invest in an uncertain environment also has information value, and hence investing now rather than tomorrow has an opportunity cost associated with it. Thus, the literature on uncertainty describes two countervailing effects on investment: a positive impulse through a rising profitability of investment (since investing may carry information); and a negative impulse arising from the opportunity cost of investing now rather than in the future (since waiting may carry information). The net effect of uncertainty on investment is thus ambiguous, and a matter to be empirically determined.[16]

Since modern theory examines the effect of uncertainty on the threshold at which investment is triggered, the focus of the theory is on the dynamics of the process, rather than on the long-run equilibrium. A rise in uncertainty raises the threshold at which investment will be triggered, suggesting a negative link between investment and uncertainty. However, uncertainty may also raise the volatility of profit flows, such that the higher threshold level of profitability is satisfied more frequently than in a certain environment, generating more frequent bursts of investment expenditure. In this case, the effect of increased uncertainty may be to raise investment expenditure on average. Thus aggregate investment expenditure during any discrete time interval may or may not increase, though it seems certain that the dynamics of the process will manifest greater lumpiness.

In the present discussion, we examine the determinants of investment expenditure in the South African manufacturing industry. Empirical applications of irreversible investment

[15] For a review of the early literature, such as Hartman (1972), Nickel (1978), and Aiginger (1987).
[16] A comprehensive coverage of the modern debate can be found in Dixit and Pindyck (1994), while Price (1995) also provides a useful introduction to the issues.

models must control for the impact of uncertainty on the user cost of capital.[17] One means of proceeding is to allow for an explicit impact of uncertainty on the investment relation. In the estimations that follow, we allow for an explicit impact on investment by both sectoral uncertainty as well as systemic uncertainty. Thus we have:

$$I_{it} = b_0 + b_1 d \ln Y_{it}^{e} - b_2 d \ln uc_{it} + b_3 \sigma^{2}_{sct,it} + b_4 \sigma^{2}_{sys,it} + \in_t \qquad (2)$$

where I_t denotes the investment rate, Y_t^e expected output as proxy for the expected rate of return on capital stock, uc_t the user cost of capital, and σ^2_{sys} denotes sectoral uncertainty. [18] The import of the preceding theoretical exposition has emphasized that the signs of the b_3 and b_4 parameters are ambiguous *a priori*, and are to be determined empirically.[19]

Results from estimation are presented in Table 4. Results confirm that standard theoretical expectations on the rate of return on capital and the user cost of capital are satisfied. A rising expectation on the rate of return on capital, and rising user cost of capital, serve to raise and depress the investment rate in physical capital stock respectively. In this regard, investment in physical capital stock in South Africa is thus susceptible to the standard policy levers associated with stimulating investment expenditure.

The most striking finding of the present section is that uncertainty exercises a statistically significant and strong (see the comparison afforded by use of standardized coefficients) effect on investment expenditure in the South African manufacturing industry. Moreover, the effect of uncertainty on investment is unambiguously such as to lower investment rates. Lastly, in establishing the impact of uncertainty on investment expenditure, it is vital that the impact of sectoral and systemic uncertainty be separated. Both systemic and sectoral uncertainty appears to be pertinent for investment – though systemic uncertainty has a stronger impact than does sectoral uncertainty.

One explanation for the poor investment performance of the South African economy is thus the pervasive uncertainty that has characterized, and continues to characterize, South Africa.

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[17] See for example Ferderer (1993), Guiso and Parigi (1999) and Price (1995).

[18] For the systemic uncertainty measure we employ the data set contained in Fedderke, De Kadt and Luiz (2001a). For the precise definition of the other variables deployed, the reader is referred to the discussion in Fedderke (2001a).

[19] Estimation was by means of dynamic heterogeneous panel data analysis, allowing us to explore the possibility of heterogeneous rather than uniform responses to uncertainty across economic sectors. Given the base of modern investment theory in dynamic stochastic processes, such an extension has immediate justification. To our knowledge no other such study exists at present. For a more detailed discussion of the estimation methodology see Fedderke (2001a).

	Investment	Stand. Coeff.
Expected Output	0.75*	0.30
	(0.23)	
Real User Cost	-0.10*	-0.05
	(0.03)	
Sectoral Uncertainty	-0.23*	-0.09
	(0.11)	
Systemic Uncertainty	-0.04*	-0.51
	(0.00)	
Speed of Adj. To Equil.	-0.72*	
	(0.10)	

Table 4: Long-run Equilibrium Investment Relation
Source: Fedderke (2001a)

2.2 Some Immediate Implications that Follow from the Investment Findings for Growth-Inducing Policy

Uncertainty appears to impact on investment rates in the South African manufacturing sectors. In particular, both sectoral and systemic uncertainty lowers investment rates in the South African manufacturing industry. This result is a consistent and robust finding regardless of which other variables are controlled for in estimation.[20]

The most immediate implication that emerges from the empirical findings is that the standard policy handles deemed important as a means of stimulating investment expenditure are found to be significant. Both the proxy for the rate of return on capital stock, as well as the marginal cost of investment come to determine long-run investment in South Africa. The implication of this is twofold. In the first instance, the impact of factors that change the user cost of investment (or rate of return on capital) – such as taxation rates for instance – can come to act either as deterrent or as enabler to investment. Since changes in the real user cost of capital influence the investment rate of manufacturing sectors, changes in the component cost elements that governments can influence will also carry with them long-run changes in investment rates. The corollary is that policy makers play a role in creating the appropriate conditions for rising investment rates through an alteration of the real user cost of capital.

Unfortunately, the uncertainty findings come to modulate this finding significantly. The uncertainty findings carry with them both *direct* and *indirect* policy implications. First, the direct policy implications arise from the direct (and large) negative impact of uncertainty on investment. Thus, stability at a systemic level appears crucial if investment rates in the South African manufacturing industry are to rise. This carries implications

[20] In estimation we also tested for the impact of credit rationing, openness of the manufacturing sectors to international trade, technological progress, the skills composition of the labour force, the real wage, and government crowd-in.

both for the conduct of macroeconomic policy and the need for an emphasis on price stability in its conduct, but also for the importance of creating a stable political environment that can pursue credible policy orientations over time. By the latter, we refer to the importance of creating a policy environment that renders the policy-making process predictable, rather than subject to problems of time inconsistency. Past political dispensations in South Africa with their associated large discretionary power vested in the state, made the prospect of arbitrary state intervention plausible. The move to a liberal democratic polity has lowered this source of uncertainty and we have seen sound economic reasons for guarding this political advance.

The importance of uncertainty to investment arises in more than the direct sense noted above. The evidence presented has affirmed the importance of uncertainty in *lowering* the investment rate in South African manufacturing. This confirms not only the importance of adjustment costs as determinants of investment expenditure, but also that uncertainty raises the threshold rate of return below which investment is unlikely to occur. At least two further important policy implications flow from this finding. First, it implies that any policy intervention designed to stimulate investment expenditure may face serious constraints in the sense that it may appear ineffectual due to the influence of the relatively high threshold below which investment is simply not triggered. Where an industry is operating below the threshold rate of return on investment, policy intervention may in fact alter the rate of return on investment and hence the incentive to invest, but may not trigger a physical investment response because the intervention has not been substantial enough to breach the threshold. Thus there may be considerable scope for changing investment incentives by means of policy intervention, without any consequent and appreciable change in the investment rate.

The second policy implication then follows as a corollary. Creation of a macroeconomic as well as a microeconomic environment that is stable, predictable and devoid of sudden and arbitrary intervention is a policy goal that emerges from the present study, not only because uncertainty has a direct negative impact on investment rates in manufacturing, but also because it serves to lower the threshold below which investment does not occur. In effect, lowering uncertainty carries both a direct positive stimulus to investment, and it serves to render other policy levers more effective in achieving their objective.

As a final caveat on the findings discussed in the present section, it is important to bear in mind that the effects identified above are long term in nature. Hence the conclusions drawn must constantly be modulated by the realization that adjustment to new equilibrium investment rates after any policy intervention will not be instantaneous, but subject to a dynamic adjustment path. Nevertheless, the policy implications for any concern with stimulating growth are clear.

For the time being we rest the case on uncertainty. What will become apparent from further evidence presented below is that the relevance of uncertainty is deeper than its immediate significance in the context of investment in physical capital stock.

2.3 Some Good News Regarding Investment: The Relevance of Market Distortions in Capital Markets?

The preceding discussion has emphasized the importance of investment expenditure for long-run economic development, and we have now seen evidence on the determinants of investment expenditure in South Africa with the associated policy conclusions. However, there is also some indicative evidence that emerges from a consideration of some descriptive evidence on the South African capital markets that suggests that conditions for investment rates in the South African economy are improving. In particular, the evidence suggests that the level of distortions in the allocation of capital in the South African economy has been declining significantly over the past decade.

Table 5 provides details of the average growth rates in the real stock of 'machinery and equipment' maintained by economic sectors in South Africa, reported in terms of decade averages.[21] The growth in the real stock of capital as measured by 'machinery and equipment' for the economy as a whole has shown a sharp downward trend over the 1970-97 period. While the 1970s saw an average[22] growth rate in real capital stock of 7.08%, this has declined to 3.77% and 1.4% in the 1980s and 1990s respectively.

[21] We employ decade averages since the growth rate of capital stock is subject to very strong fluctuations on an annual basis.

[22] Computed as an average across all sectors. It is thus unweighted for the relative size of capital stock in each of the sectors.

A high Rank, indicates a high growth rate	Avg. Growth 1970's	Avg. Growth 1980's	Avg. Growth 1990's	Rank70's	Rank80's	Rank90's
All Economic Activities	7.08	3.77	1.40			
Instruments	-2.33	2.23	-7.79	5	18	1
Gold & Uranium Ore Mining	8.04	8.94	-5.39	31	37	2
Other Maf & Recyc	-2.68	2.03	-4.95	4	16	3
Electricity, Gas & Water	10.96	7.03	-4.16	36	36	4
Agriculture, Forest. & Fish.	5.47	-2.94	-2.72	24	4	5
Wearing Apparel	1.32	2.34	-1.36	17	20	6
Construction	13.48	-1.11	-1.08	39	8	7
Machinery & Appara	0.49	2.47	-0.97	15	21	8
Mining & Quarrying	9.32	6.16	-0.45	34	33	9
Transport, Storage & Commun.	8.15	4.71	-0.13	32	28	10
Electrical Machine	5.58	0.67	-0.01	25	12	11
Textiles & Knit	-4.43	2.50	0.80	1	23	12
Footwear	0.38	0.26	1.45	14	10	13
Coal Mining	15.51	6.33	1.48	40	34	14
Other Chem & Fibre	7.61	0.32	2.07	30	11	15
Tobacco	-0.33	-4.69	3.88	10	2	16
Basic Chemicals	4.24	0.85	4.08	23	14	17
Petroleum Refined	11.02	2.72	4.16	37	25	18
Finance, Insurance, Real Est	5.72	5.86	4.90	26	30	19
Paper	-0.68	18.30	5.05	9	40	20
Furniture	-2.98	9.54	5.12	2	38	21
Diamond & Other Mining	10.00	2.48	5.55	35	22	22
Wholesale & Retail Trade	6.68	0.74	5.66	29	13	23
Fabricated Metals	4.09	-2.47	5.72	22	5	24
Wood	-2.73	2.65	5.98	3	24	25
Other N-Metal Minerals	0.31	2.23	6.45	12	19	26
Motor Vehi & Acces	-1.94	6.08	7.51	6	32	27
Manufacturing	3.99	1.06	8.00	21	15	28
Community, Soc & Per Service	11.49	3.78	8.96	38	27	29
Rubber	0.79	-0.11	9.61	16	9	30
Radio Tv & Communi	6.27	-1.27	9.99	27	7	31
Leather & Tanning	0.35	-2.01	10.44	13	6	32
Plastics	3.25	6.59	10.64	20	35	33
Food	0.12	2.84	10.74	11	26	34
Beverages	3.16	5.89	12.24	19	31	35
Basic Iron & Steel	8.38	-3.52	13.58	33	3	36
Publish & Printing	-1.61	5.66	14.15	8	29	37
Glass	-1.79	10.50	20.38	7	39	38
Bas N-Ferrous Meta	2.12	2.09	25.87	18	17	39
Transport Equipmen	6.47	-10.61	26.19	28	1	40

Table 5: Proportional Growth Rate: Machinery and Equipment. Figures are average annual percentage growth rates. Source: Fedderke, Henderson, Kayemba, Mariotti and Vaze (2001).

However, this aggregate trend inevitably conceals strong sectoral differences. In particular, the most noticeable structural change in the growth of capital to emerge is that manufacturing sectors that traditionally had relatively low growth rates in capital stock in comparison with other sectors in the economy during the course of the 1990s have shown the most rapid expansion of capital stock in the South African economy.

By contrast, the 1980s not only saw a very severe negative impact on numerous manufacturing sectors in terms of the growth of their capital stock, but saw a number of sectors with strong state involvement (electricity, gas and water), or strong mining presence (gold and uranium, coal) amongst the leading investors in capital stock.

The 1970s show an even more marked bias toward the strongest growth in capital stock for sectors with a strong mining bias, or heavy state involvement (the ten sectors with the strongest growth rate in capital stock during the course of the 1970s were: electricity, gas and water, transport, storage and communication, petroleum refining (hence SASOL), construction, gold and uranium, coal, diamond mining, community, social and personal services, basic iron and steel, and other chemicals and fibers).

The evidence suggests the plausibility of a distortion in the South African capital markets due to the heavy reliance on the mining of primary commodities during earlier phases of development of the South African economy, and the presence of substantial government-led investment in capital stock in a number of core sectors (electricity, gas and water, petroleum refining). The gradually reduced reliance on primary commodities in the South African economy and reduced state involvement in "strategic" investments plausibly has triggered a restructuring of the South African capital market. In particular, sectors whose access to capital might have been limited due to the demand emerging from mining and state sectors (both increasing the financial cost of entry into financial capital markets) have shown strong growth in their capital stock.

The evidence suggests that the 1990s, with their greater reliance on market forces and a decreased reliance on state-led investment, are leading to a restructuring of the South African capital markets. Since restructuring of capital markets inevitably takes time to accomplish, such a process is likely to be in its early phases. The encouraging implication of such a line of reasoning (if correct) is that one explanation of why investment expenditure in South Africa is currently at such low levels is simply that strong growth rates in capital stock are being maintained in sectors with low absolute levels of capital stock. Such sectors may have been prevented from increasing their capital stock from past distortions in the economy's capital markets. Over time, however, if the restructuring of the capital markets is in line with new patterns of development, and greater reliance on market forces is allowed to proceed, the absolute volume as well as the proportional increases in manufacturing sector capital stock may raise the aggregate growth rate of the economy's capital stock to more reassuring levels than are being currently maintained.

An alternative explanation might be that relative factor prices are forcing a switch to capital in place of labour.[23] However, since of the ten sectors with the strongest growth in capital stock, five experienced negative growth rates in real per labourer remuneration over the 1970-97 period,[24] and three[25] further sectors experienced growth rates in labour productivity that exceeded those of the real wage, this may not prove to constitute a general explanation of the structural change in capital employment noted.[26]

[23] In other words, a rising real cost of labour may be making it advantageous to switch from labour – to capital-intensive production.

[24] TV, radio and communications equipment, leather and leather products, basic iron and steel, publishing and printing, and transport equipment.

[25] Plastics, beverages , and basic non-ferrous metals.

[26] For a more detailed discussion of the labour market issues, see Fedderke, Henderson, Mariotti and Vaze (2000).

At the very least, both the move toward a smaller reliance on primary commodities in the South African economy over the 1970–1990 period, and greater emphasis on market forces in the policy environment of the 1990s, are plausibly the reason for the restructuring of the South African capital market.

Clearly more research will be required in order to establish with greater certainty whether the degree of distortion in South African capital markets has been declining. For purposes of the present discussion, however, the evidence presented above suggests that not all is unwell with South African capital markets. The reallocation of capital during the 1990s is a sign that despite the continued maintenance of relatively low aggregate investment rates in the economy, at least the quality of the investment that is being undertaken may have been improving.

2.4 The Importance of Capital Flows: The Return of Uncertainty

A long-standing structural constraint in the South African economy has been the shortfall of savings relative to the investment needs of the economy. In Figure 5, we illustrate by considering the private sector savings[27] and investment[28] rates for South Africa. Except for very brief periods in the 1960s and the early 1980s, South Africa's private sector has not produced sufficient savings to cover its demand for physical capital formation. The implication is that South Africa has been and remains reliant on capital inflows in order to finance its physical capital formation.[29]

Understanding the constraints on physical capital formation cannot therefore be divorced from an understanding of international capital flows in the South African economy. Fedderke (2001b, 2001c) provides some insight into factors governing capital flows into and out of South Africa.

[27] Defined as the sum of corporate saving (Unit: R millions, current prices (Period)) [Source: SARB Quarterly Bulletin (S-129)] and saving by households (Unit: R millions, current prices (Period)) [Source: SARB Quarterly Bulletin (S-131)], as a proportion of gross national product at factor cost (Unit: R millions, current prices (Period)) [Source: SARB Quarterly Bulletin (S-127)].

[28] Defined as the ratio of gross fixed capital formation at current prices by private business enterprises (Unit: R millions, current prices (Period)) [Source: SARB Quarterly Bulletin (S-116)] to gross national product at factor cost (Unit: R millions, current prices (Period)) [Source: SARB Quarterly Bulletin (S-127)].

[29] A factor that must also go some way toward explaining the relatively high interest rates the South African economy maintains.

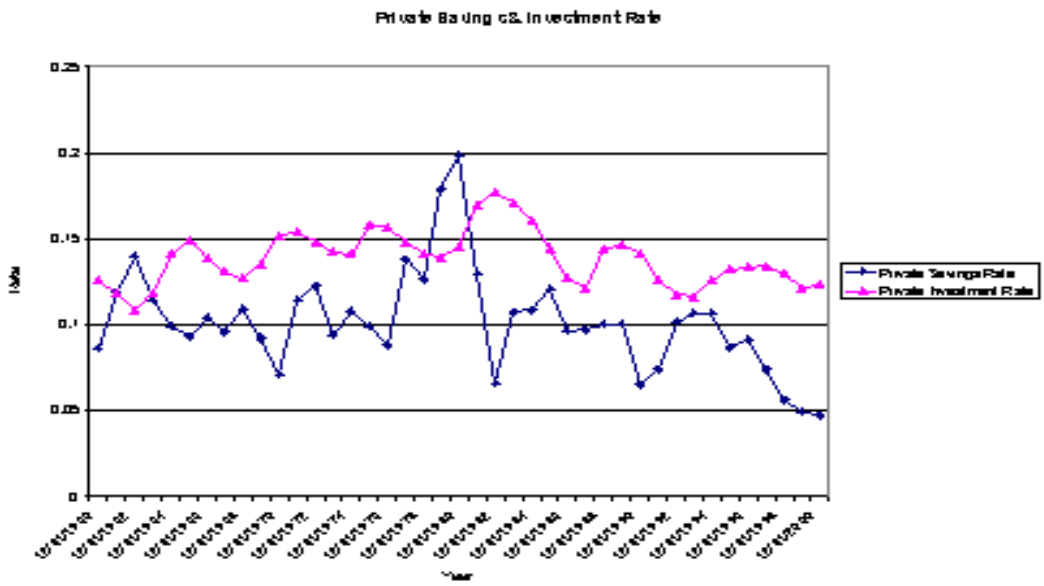

Figure 5: Private Sector Savings and Investment Rates

Following the theoretical exposition given in Fedderke (2001b) in specifying a model identifying determinants of capital flows,[30] the relevant relationship is given by:

$$\nu_I = \left(\frac{p - \left(p + \frac{4d}{d} \right)}{p - \left(p^2 + \frac{4b(1-p_d)}{b} \right)^{\frac{1}{2}}} \right)^{\frac{1}{2}} \left(\frac{K_0^f - \overline{K^f}}{K_0^d - \overline{K^d}} \right) e^{\frac{1}{2}t\left[\left(p^2 + \frac{4b(1-p_d)}{b} \right)^{\frac{1}{2}} - \left(p^2 + \frac{4d}{d} \right)^{\frac{1}{2}} \right]} \qquad (3)$$

where p denotes the rate of time discount, α, β, parameterize the marginal rate of return on domestic assets, γ, δ the marginal rate of return on foreign assets, a, b, the marginal cost of adjusting domestic asset holdings, c, d, the marginal cost of adjusting foreign asset holdings, and π_d denotes the risk of expropriation that attaches only to domestic assets.

The implication of equation 3 quite straightforwardly is that we would expect:

$$\textit{Capital Outflow} = (\textit{Risk}^+, \textit{Foreign}^+ \textit{ Return}, \textit{Domestic}^- \textit{ Return}) \qquad (4)$$

[30] While Fedderke (2001b) identifies characteristics of the ratio of domestic to foreign assets both in intertemporal equilibrium as well as the optimal adjustment path to intertemporal equilibrium, since we are here concerned with capital flows, it is the latter with which we must be concerned.

The crucial findings to emerge from estimation[31] are presented in Table 6. Estimations are for the standard short and long-term capital flow measures reported in the balance of payments (TNORM)[32], three measures of capital flight constructed according to the indirect method (KFIND),[33] the balance of payments method (KFBOP),[34] and the derived method (KFDRV).[35] We have two proxies for the rate of return on a capital asset portfolio, with DIDIFFL denoting the change in the exchange rate adjusted interest differential,[36] and GROWTH denoting the percentage change in GDP. As risk proxies we employ DOVAL defined as the change in the degree of over/undervaluation of the exchange rate in terms of PPP, DlnPOL1 defined as the change in an index of political rights, [37] and lnPOL2, which is the index of political instability we have already encountered in the investment discussion above.

	TNORM	KFIND	KFBOP	KFDRV
DIDIFFL	-0.22	-0.11	-0.45	-0.64
GROWTH	0.36	0.39	0.70	0.54
DlnPOL1	-0.30	-0.11	-0.19	0.59
InPOL2	-0.53	-0.60	-0.18	-0.13
DOVAL(+1)	0.25	-0.15	0.25	1.10

Table 6: Standardized Long-Run Coefficients from ARDL Estimation

The crucial point to emerge is that the results do conform to the portfolio theoretic expectations generated by the theoretical discussion contained in Fedderke (2001b). Thus an improved rate of return on assets and reduced risk on assets will increase capital inflows into South Africa – though the magnitude depends on the various rate of return and risk dimensions.

The second point to note is that capital flows (irrespective of the "normal flows"/"flight" distinction) in South Africa prove to be sensitive to political risk. We note that both changes in the level of political rights – and the level of political instability – impacts on capital flows. Higher instability and political liberalization in South Africa both served to stimulate capital outflows. We note further that it is difficult to argue that the three capital "flight" measures are more responsive to risk than the "normal" capital flow measures of the balance of payments – with the exception of the KFDRV measure.

The risk dimensions that proved to be crucial for investment in physical capital stock in South Africa directly transfer their importance to one of the crucial enabling conditions

[31] Estimation is by ARDL cointegration techniques. See the detailed discussion in Fedderke (2001c). Detailed descriptions of the variables employed in estimation can be found in the paper.
[32] We adopt the convention throughout that a positive magnitude denotes capital inflows, a negative magnitude capital outflows.
[33] See the discussion in World Bank (1985).
[34] See Cuddlington (1987)
[35] See Dooley (1988).
[36] Defined as the difference between the foreign and the domestic interest rate. Thus a positive DIDIFFL should trigger capital outflows.
[37] See Fedderke, De Kadt and Luiz (2001a) for a detailed description of the index underlying this variable.

for investment in South Africa. Given the shortfall of private savings relative to investment expenditure, we continue to rely on capital inflows into the economy. Therefore, short of achieving an increase in the social savings rate, South African reliance on capital inflows strengthens the need to minimize any source of uncertainty that may detract from investment, or from capital inflows. Transparency, predictability and credibility of political processes will serve a crucial role in determining whether the process of democratization in South Africa brings about economic as well as political benefits for the majority of the South African population.

Furthermore, to the extent that the aggregate growth measure contributes to the long-run determination of capital flows, the implication is that capital inflows follow from the creation of favourable growth prospects. Capital inflows are thus potentially secondary stimuli to economic growth, in the sense that they themselves respond to already favourable growth performance. Of course, the additional capital inflow may further enhance growth in output.

Capital flows and flight have become more favourable to South Africa since the early 1990s. However, lowering political uncertainties, and the need to offer healthy rates of return to potential investors, should continue to be a central concern of policy makers.

3 FURTHER REFLECTIONS ON SOME INSTITUTIONAL FACTORS RELEVANT TO LONG-RUN DEVELOPMENT PROSPECTS

In the discussion thus far we have encountered the importance of institutional determinants, both of investment in physical capital stock, as well as capital flows into the South African economy. Uncertainty arising from the nature and instability of the South African political dispensation of the past has undoubtedly had significant impacts on the process of physical capital formation in the South African economy, as well as its ability to attract capital inflows.

An obvious extension to this line of inquiry is whether the need for consideration of institutional factors as determinants of long-run growth prospects is necessary, in the sense that institutional dimensions may exercise an influence on growth directly, as well as indirectly via capital formation and capital flows.

3.1 Direct Institutional Impacts on Output Growth?

The possibility of a link between social and political institutions and long-run economic development has been the subject of an extensive literature. From modernization theory[38] – with its postulated positive association between economic and political development, emphasis on property rights as foundational to long-run development in the work of North (1981, 1990) and North and Thomas (1970, 1973), and emphasis on the importance of the credibility of political dispensations[39] – to the recent introduction of social

[38] See, for instance, the classic Lipset (1959), while Diamond (1992) provides a useful overview of subsequent developments.
[39] See, for instance, Borner, Brunetti and Weder (1995).

capital,[40] explorations of the possibility of a link between institutions and economic development are recurrent themes. Theoretical forays have been accompanied by a growing body of empirical evidence.[41]

Interpretations of the evidence should be undertaken with some measure of care, however. The theory underlying the link between institutions and economic growth is still under development, and as a consequence, interpretation of empirical specifications is not without ambiguity.[42] Moreover, there is no reason to suppose that the nature of the link between institutions and output is homogeneous across countries.[43] If so, there is considerable scope for further explorations of the link between institutions and economic development in more detailed clinical examinations of country-specific case studies.

Fedderke, De Kadt and Luiz (2001b) represents one such attempt for the case of South Africa, exploring the role of political instability, political rights and property rights[44] in South African growth processes in a time series context employing long runs of data. In the process, questions outlined in the introduction of this section are explored in greater detail. Which institutional dimensions are important to the growth process in South Africa, and are the channels of influence direct or indirect?

Results obtained through the econometric investigations do suggest some clear patterns of association between the institutional and economic variables incorporated in the study. Figure 6 summarizes the findings, which are consistent with the evidence already presented on the investment function above, but also include additional nuance.[45] First, note that the crucial *impact* of the institutional dimensions on economic growth in South Africa appears to have been on the capital-labour ratio. Moreover, the empirical evidence suggests that both political instability *and* property rights are important determining factors of capital accumulation in the South African economy. Thus the evidence suggests that it may indeed be a range of institutional dimensions that are important for long-run capital accumulation, rather than just a single isolated aspect of the institutional environment. This represents a potentially important extension to the findings noted on the investment rate, as noted above. In particular, we should note that the policy need identified regarding increased sensitivity to perceptions of stability surrounding the policy making process requires further modulation.

Second, given the long-term nature of physical capital commitments, it would indeed be strange if property rights were not of foundational importance to economic agents who can anticipate the pay-off to their activity only some (often considerable) time in the future, which can be subject to considerable risk quite apart from any ambiguity they face in ownership. Where the agent – who is responsible for setting the rules of the game that

[40] See Coleman (1988, 1990), Putman (1995) and Fukuyama (1995a, 1995b).
[41] Barro (1991) is the classic reference that perhaps triggered the rush.
[42] See, for instance, the discussion in Fedderke and Klitgaard (1998).
[43] Fedderke (2001d) demonstrates not only that the steady state characteristics of growth processes are highly sensitive to the nature of the postulated link between institutions and production, but that there is strong empirical evidence to suggest that the link differs fundamentally between countries.
[44] These institutional indicators are again drawn from Fedderke, De Kadt, and Luiz (2001a).
[45] The reader is referred to the paper for the detailed estimation results that underlie these conclusions.

constitute the institutions – is not seen to be fully and *credibly* committed to those rules that confer ownership in the pay-off agents obtain for the risk they undertake, confidence and hence investment is inevitably going to be compromised.

Third, little evidence emerges suggesting that the institutional variables directly impact on output in addition to the indirect link via the investment rate. Instead, we find that economic development as measured by the level of real *per capita* output comes to drive institutional development both in terms of the rights structure within the political realm, as well as in terms of the level of political instability that prevails in South African society.

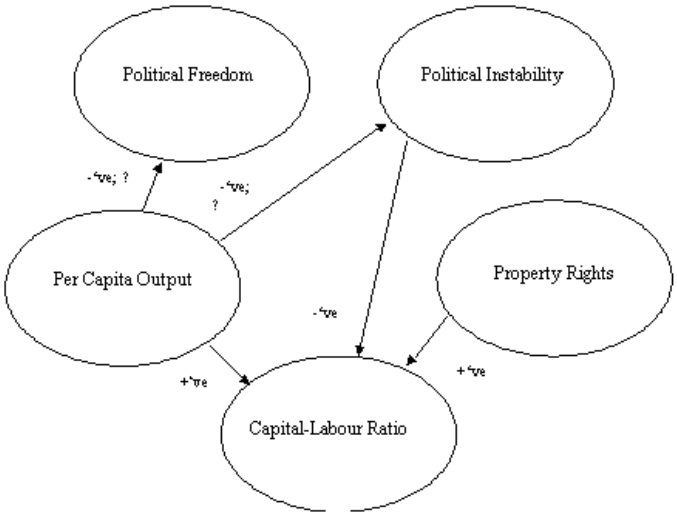

Figure 6: Patterns of Association

Finally, it is worth emphasizing once again the fundamental significance of the findings reported above and in the section on investment for the conduct of economic policy. On the basis of evidence that has emerged both for the domestic economy and internationally[46], there is little doubt that the pursuit of macroeconomic stability is vital as part of growth-enhancing economic policy. However, macroeconomic stability is only a part of the story, and one might argue the easy part. Far more demanding is the need to establish that the policy commitment is credible, and that the institutional framework within which it is achieved is one that will itself hold and allow economic agents to realize the fruit of their labour.

[46] See the discussion in Mariotti (2001) for evidence on the impact of macroeconomic policy on South African long-run economic growth, as well as Barro (1991) and Fischer (1991, 1993).

Where institutional stability requirements are not met, we stand to lose the benefits that should accrue due to the commendable and considerable achievements that South Africa has realized through its strict macroeconomic discipline.

3.2 A Further Set of Considerations: The Impact of Market Distortions

The discussion of capital markets in South Africa has already pointed to the potential importance of capital market distortions in the allocation of capital in the South African economy. Yet, what may apply to capital markets may well also be relevant to other markets in the economy. In effect, my concern here is with perhaps the single most important institution for long-run economic development of all: the market. Evidence is beginning to accumulate that the functioning of the market mechanism in South Africa leaves considerable room for improvement.

For purposes of the present discussion I would like to emphasize three points.

3.2.1 Trade Liberalization

The 1990s have seen a laudable first attempt on the part of South African policy makers to initiate trade liberalization. One need not dwell on the well-known reasons why economists would welcome the removal of the distortions that trade barriers introduce in this context. Rather, what gives cause for concern is that the extent of trade liberalization in South Africa during the 1990s has been somewhat less comprehensive than is often thought. In considering effective protection rates of South African economic sectors, Fedderke and Vaze (2001) show that sectors responsible for approximately 50% of South African GDP have experienced *increased* effective protection over the 1988-98 period. A further 35% of GDP has experienced little or no change in effective protection, leaving only 15% of GDP subject to significant liberalization. What is more, evidence to suggest that lowering of protection has led to increased import penetration is ambiguous at best, while there is far stronger evidence suggesting that those sectors subject to significant liberalization have also been those realizing the strongest successes in improved export performance in the economy.

The point here is simple: the distortionary impacts of trade barriers matter, and we have some way go in removing these impediments to improved efficiency and productivity in the South African economy.

3.2.2 The Labour Market

We have already seen from the discussion in the introduction to this paper that the lack of employment creation in South Africa carries implications beyond the direct welfare losses that attach to foregone work opportunities. Lack of utilization of the labour factor of production also means foregone growth opportunities. For this reason the lack of attention paid to mispricing and hence resource misallocation, as well as the labour market rigidities that characterize South African labour markets, is astonishing.

Inappropriate pricing and rigidities in South African labour markets are arguably two of the most widely documented characteristics of the South African economy to have emerged during the course of the 1990s. The wage elasticity of employment has time and again been found to be negative in empirical studies. Supporting descriptive evidence points to continuing rigidities, which create obstacles to employment creation. Readers who require additional evidence are referred to discussions in Lewis (2001), Arndt and Lewis (2000), Nattrass (2000), and Fields (2000). Fedderke and Pirouz (2000) deal with the case of the South African mining sector that has been subject to particularly heavy labour shedding during the course of the 1990s. Similarly, Fedderke, Henderson, Mariotti and Vaze (2001) show that employment gains in South African labour markets have been realized only in sectors in which productivity gains have outstripped increases in the real wage rate.

It is also worth mentioning that the problem is *not* trade liberalization. As the discussion above has reminded us, trade liberalization in South Africa has been imperfect at best. Even accepting that trade liberalization has impacted on South African labour markets, Fedderke, Shin and Vaze (2000) show that the demand effects have, if anything, stimulated demand for labour. Instead, what has damaged employment prospects have been increases in wage demands not mandated by technology and globalization effects.

Let us be clear about what is being said: wage rates matter for employment in South African labour markets. This is not to deny that there are not additional problems in South African labour markets. Without doubt, informational asymmetries, segmentation of the labour market, poor skills distributions, and many other factors complicate the story. In the first instance, there is no evidence that could explain how these factors can account for the consistently worsening employment creation capacity of the South African economy since 1970. Moreover, even if such evidence emerges, such factors are long-term structural constraints. There is no excuse for continuing to hold up reforms on those factors that might make an immediate differenc: the price of labour is first and foremost amongst these.

3.2.3 Output Markets: The Significance of Mark-Ups Over Marginal Cost

Inefficiencies are not restricted to labour markets in South Africa. Output or product markets appear to be associated with considerable pricing power on the part of producers. Fedderke and Schaling (2000) suggest that the mark-up over unit labour cost in South Africa is several orders of magnitude greater than that found in similar studies for the US. If correct, the strength of the mark-up creates problems not only for the successful conduct of macroeconomic stabilization policy (inflation targeting in particular – see the discussion in Fedderke and Schaling 2000), it also creates scope for continued mispricing of labour through inappropriate forms of wage settlement between big business and organized labour in the economy, with the attendant employment implications. The presence of pricing power in South African output markets also suggests that the level of competitive pressure in output markets is not sufficiently high, lowering the international competitiveness of South African production.

3.2.4 Some conclusions

The significance of the discussion is that it suggests that the market mechanism in South Africa is by no means as healthy as it should be in order for resource allocation to be optimal for the production and augmentation of output over time. Furthermore, the suggestion is that rigidities are widespread, covering not only the often-cited labour market inflexibilities, but extending to output markets in the economy, as well as the opportunities and incentives to trade in the economy.

Efficiency losses generated by imperfectly functioning markets translate into foregone growth opportunities. Further trade liberalization, lowering labour market rigidities, and ensuring proper competitive pressure is exerted on producers in the economy all emerge as appropriate policy concerns for the future.

4 INNOVATION, HUMAN CAPITAL, AND THEIR RELEVANCE TO THE SOUTH AFRICAN CONTEXT

Modern growth theory has placed increased emphasis on innovation as a long-term driver of economic growth, with explicit attention focusing on the source of technological innovation in the economy. As we saw in an earlier section of this paper, such focus is not inappropriate for the South African context.

What is common to many approaches to endogenous growth theory is the presumption that innovation is the outcome of an explicit devotion of resources to technological advance. Where contributions differ is in their identification of the nature and impact of such resources. For Romer (1986) type models, the source of innovation are spillovers attaching to investment in physical capital stock. For the Lucas (1988) variant, the spillovers can be argued to emanate from investment in human rather than physical capital stock. Finally, in variants of the Schumpeterian approach to long-run growth, innovation is the explicit outcome of the devotion of resources to technical advance, rather than the production of final output.[47]

4.1 The Impact of Endogenous Growth Processes in South Africa

The crucial question for our purposes must first be whether endogenous growth processes are present in South Africa, and secondly, what form such endogenous growth processes might take. The latter is crucial given the divergent policy implications that the alternative conceptions carry. Fedderke (2001g) addresses this set of questions econometrically.[48]

[47] For a non-technical discussion of the generic approaches to endogenous growth theory, and their implications for economic as well as institutional development, see Fedderke (2001e).

[48] The methodology applies dynamic heterogeneous panel analysis to the South African manufacturing sectors.

Estimation is of: $TFP = \frac{\dot{A}}{A} + \beta \frac{\dot{X}}{X} + \sum_{i=1}^{m} \gamma_i Z_i$ (5)

Where $\frac{\dot{A}}{A}$ denotes exogenous technological change, $\frac{\dot{X}}{X}$ denotes either growth in physical capital stock (for the Romer (1986) type of approach), growth in human capital (for the Lucas (1988) type of approach), or growth in intermediate inputs or quality ladders (under Romer (1990) or Grossman and Helpman (1992) type approaches), denotes a range of additional regressors suggested by the literature.[49]

Here we skip the range of estimation issues that arise, and directly proceed to salient estimation results. Since the results are symmetrical, we focus discussion on those for the spillover specification in Table 7, though the additional modulations to emerge from the Schumpeterian findings are also touched upon. More detailed discussion of these results, including the Schupeterian case, can be found in Fedderke (2001g). WENROL denotes the primary and secondary school enrolment rate for "whites," TOTENROL denotes the primary and secondary school enrolment rate for all population groups, MATHPRP denotes the proportion of matriculants sitting mathematics, DEGREE denotes the total number of degrees issued by universities, NESDEG denotes the number of degrees issued in the natural, engineering and mathematical sciences (NES), NESDEGPRP denotes the proportion of NES degrees issued, APPCAP denotes the *per capita* apprenticeship contracts issued, PATENT denotes the number of patents registered, and R&D denotes an indicator of research and development expenditure.

While the results confirm the presence of spillover effects for South African manufacturing, it is important to note that the confirmation is not unconditional. In the first instance, we should note that to the extent that spillover effects are corroborated, they take the form suggested by Lucas (1988) rather than Romer (1986). The coefficient on the growth rate of the capital stock is consistently negative (even where we control for investment in human as well as physical capital) and statistically significant. Since the coefficient of the capital growth rate should control for the positive contribution of capital stock over and above that implied by its income share due to spillovers, this constitutes a rejection of Romer-type spillover effects in South African manufacturing industry.

On the other hand, Lucas-type spillover effects do find some support, in the sense that at least some of the human capital investment variables indicate positive and significant coefficients. However, even here the support for Lucas spillovers is circumscribed. In particular, only very specific types of investment in human capital contribute positively to productivity growth. The proportion of matriculation students sitting mathematics, and the proportion of NES degrees in total degrees, are the only two human capital variables

[49] Fedderke (2001g) elaborates.

that provide a positive and significant contribution to productivity growth in South African manufacturing industry over the 1970-97 period.

By contrast, the total school enrollment rate, and the total number of degrees issued by South African universities, while significant, contributed negatively to TFP growth, while the white school enrollment rate, the total number of NES degrees, and the number of apprenticeship contracts *per capita* prove to be insignificant.

What counts for purposes of the innovative activity that is coupled to long-run output growth in South African manufacturing, is not so much the production of human capital *per se* but the production of quality human capital, as proxied by the math and NES degree proportions. There are at least two good reasons that make this finding plausible: quality human capital is simply more likely to have the positive spillover effects identified by Lucas (1988), while poor quality human capital does not; and a second interpretation of the evidence might point to an improved quality of screening by an educational system (both primary and secondary, and tertiary) with rising math and NES degree proportions. This is turn would reduce the risk faced by producers wishing to hire human capital for purposes of innovative activity.

The results of estimations testing the Schumpeterian hypothesis confirm the presence of a positive impact of research and development expenditure on growth in TFP, as postulated by Schumpeterian theory. Thus the findings confirm the presence of the positive impact on output growth of innovative research and development activity undertaken by the private sector. Results from the range of human capital indicators again point to the possibility of a positive impact of human capital spillovers on productivity growth. However, just as for the spillover results, the particular dimension of human capital investment controlled for proves to be crucial. The positive impact on productivity growth emerges from the NES degree proportion variable (as it did for the spillover discussion), while a number of human capital variables prove to be negative and significant (WENROL, APPCAP) or insignificant. The interpretation of this evidence remains much the same as for the spillover results above. While the human capital dimension can legitimately be argued to have a positive impact on long-run productivity growth, it is above all the *quality* dimension of human capital that exercises this effect rather than the quantity of human capital.

The empirical evidence from the South African manufacturing industry thus appears to point to a positive impact from both explicit R&D activity, as well as the human capital dimension, particularly the quality dimension of the latter.

4.2 South Africa's Legacy of Human Capital Creation

We have seen that human capital creation makes a difference to economic growth prospects in South Africa. In addition, we have seen that it matters what *sort* of human capital investment is undertaken. It is not just a matter of the quantity of human capital generated – the quality of the human capital is of the essence. In this section, we consider the legacy of South Africa's human capital creation. Just how good has it been – or

perhaps more appropriately, just how bad, given the findings above on what does and what does not make a difference?

Needless to say, the issue of South Africa's legacy of human capital creation is a vexed one. It was one of the principal vehicles through which the policy of apartheid significantly skewed the opportunities facing its citizens, and thereby seriously damaged the long-term developmental capacity of the economy. It is here more than anywhere else in the study that the legacy of apartheid is not only evident historically, but continues to exercise its influence to the present day.

In the discussion that follows, we focus on the educational system in South Africa, and its performance. This is not to say that the other dimensions of human capital are less significant: the focus is merely determined by data availability considerations.

The discussion that follows draws substantially on earlier published findings on the South African educational system.[50] In the earlier work, we addressed the performance both of South Africa's schooling system, as well as various components of its tertiary educational system. In the discussion that follows, we simply highlight some of the more salient features that emerge from the data.

4.2.1 A Characterization of the Performance of South Africa's Schooling System

That all is not well with South Africa's schooling system is not news. Performance or lack of it in various parts of the schooling system is the focus of much anecdotal evidence, and debate surrounding the issue intensifies annually on publication of matriculation pass rates.

However, it is possible to be precise about the nature of the schooling system's performance.[51] In Figure 7, we report matriculation pass rates in the South African schooling system, distinguishing between "white" and "black" matriculation pass rates.[52]

While the white matriculation pass rate (WpasRat) shows an unambiguous trend improvement over the entire 1911-1993 sample period, for black matriculation the evidence is mixed. While black pass rates (BpasRat) increase from 1955 through to 1976, they then decline steadily until 1993. In the period for which we have separate figures for both black and white pass rates (1963-1993), with the singular exception of 1976 when the black matriculation pass rate approaches the white, the black rate consistently falls below the white rate by a considerable degree. During this period, the white pass rate stays within the 75-95% range, while the black pass rate – with few exceptions – falls below 60%. The difference, in the worst years for black education, lies in the region of 60 percentage points.

[50] See Fedderke, De Kadt and Luiz (2000, 2001b).
[51] For a fuller discussion of these results see Fedderke, De Kadt and Luiz (2000).
[52] For purposes of precision and consistency, we have followed the classificatory conventions deployed by the South African authorities during both the pre-apartheid and apartheid periods.

A further distinguishing feature of the two pass rates is that the black pass rate fluctuates wildly. By contrast, the white pass rate fluctuates in an almost equivalently wild fashion only during the very early period of political and societal consolidation after Union (1910-1923).[53] The black schooling system thus not only produced pass rates that lie considerably below those of the white system, but the black system also appears to have been more prone to either a series of shocks, or did not serve as a consistent screening mechanism – or both. Either reason for the fluctuations in pass rates is likely to have proved damaging for any positive incentive mechanisms present for black pupils, lowering the likelihood that what human capital accumulation was on offer to pupils in the black schooling system would be absorbed.

Dependent Variable: Growth in Total Factor Productivity			
Regressors	Spill-Over Effects	Regressors	Schumpeterian Effects
$\frac{\dot{K}}{K}$	-0.004* (.000)	R&D	0.02* (.01)
WENROL	-0.03 (0.34)	WENROL	-0.67* (0.30)
TOTENROL	-0.12* (0.04)	TOTENROL	-0.09 (0.05)
MATHPRP	0.11* (0.04)	MATHPRP	0.02 (0.04)
DEGREE	-0.1 $X10^{-4*}$ ($0.1X10^{-5}$)	DEGREE	-0.1 $X10^{-5}$ ($0.1X10^{-5}$)
NESDEG	0.00 (0.00)	NESDEG	-0.1 $X10^{-5}$ ($0.1X10^{-5}$)
NESDEGPRP	0.79* (0.32)	NESDEGPRP	1.00* (0.39)
APPCAP	13.82 (15.13)	APPCAP	-50.75* (19.52)
LnPATENT	0.01* (0.004)	LnPATENT	0.02* (0.00)

Table 7: Testing for Spillover Effects.
Figures in round parentheses denote standard errors. *denotes significance.

[53] The distinction becomes evident from a comparison of the standard deviation that attaches to the percentage change in matriculation pass rates for whites and blacks: 8.85 and 16.57 respectively.

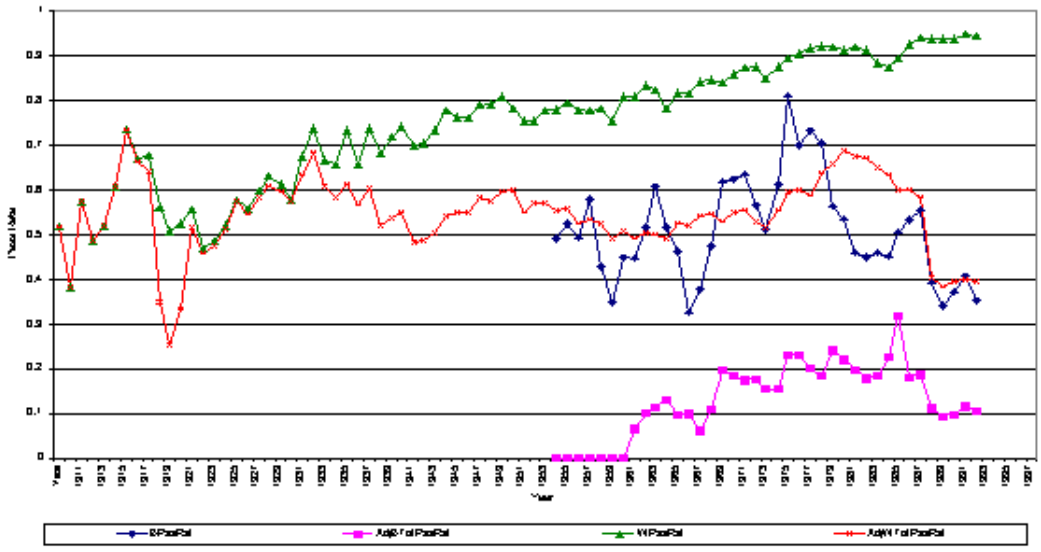

Figure 7: Matric Pass Rates.
Source: Fedderke, De Kadt and Luiz (2000)

Raw matriculation pass rates form a legitimate standard of comparison of the alternative schooling systems only if the two examination standards are comparable. Anecdotal evidence makes this assertion questionable. We therefore weight the matriculation pass rates of white and blacks by the proportion of total matriculation candidates sitting mathematics (in either higher or standard grade).[54] In Figure 7, we report the results as AdjWTotPasRat and AdjBTotPasRat for white and black candidates respectively. The implication of weighting the pass rates is that the divergence between the measures of white and black schooling system output is further exacerbated. At no point in time does the weighted black pass rate approach the weighted white pass rates – with the minimum differential at approximately 30 percentage points.

The weighted pass rates for whites further suggests that the improvement in the white schooling system has been considerably less dramatic than implied by the unweighted rate. Indeed, while there is some improvement in the weighted pass rate post-1975, the 1930-1975 period does not manifest any consistent trend. Moreover, weighted black pass rates also manifest somewhat different trend patterns from the unweighted series. The improvement in weighted pass rates runs through the late 1980s, declining thereafter to the end of the sample period. Thus the decline sets in a decade later than implied by the unweighted pass rates.

[54] We choose mathematics for the following reasons. Mathematics has as clearly identifiable objective performance standards as any subject available to matriculation candidates, and therefore application of subjective standards of assessments are minimized. Moreover, we consider mathematics to be foundational to a wide range of cognitive activities and vocational skills. Lastly, mathematics (and science) was used as the central indicator of the quality of the educational system in the Hanushek and Kim (1995) growth study – and proved a more significant predictor of long-run economic performance than the quantity of education.

The maths-weighted matriculation pass rates further prove to manifest considerably higher volatility for both whites and blacks. In the case of blacks, the standard deviation of the percentage change of the pass rate increases from 16.57 to 30.37, while for whites the increase is from 8.85 to 13.09.

In terms of weighted pass rates, even the best schooling system in South Africa is thus subject to severe quality constraints. Indeed, a consideration of the proportion of black and white pupils taking mathematics in either higher or standard grade reinforces the point. For whites, the proportion of total matriculation candidates sitting mathematics has been in steady decline since the 1930s, accelerating during the course of the 1980s, to reach a low of 40% of all white matriculation candidates (see Figure 8). By contrast, the proportion of black candidates writing maths rose until the late 1980s, though the trend has been reversed since, and has come to lie at the 30% level in 1993.

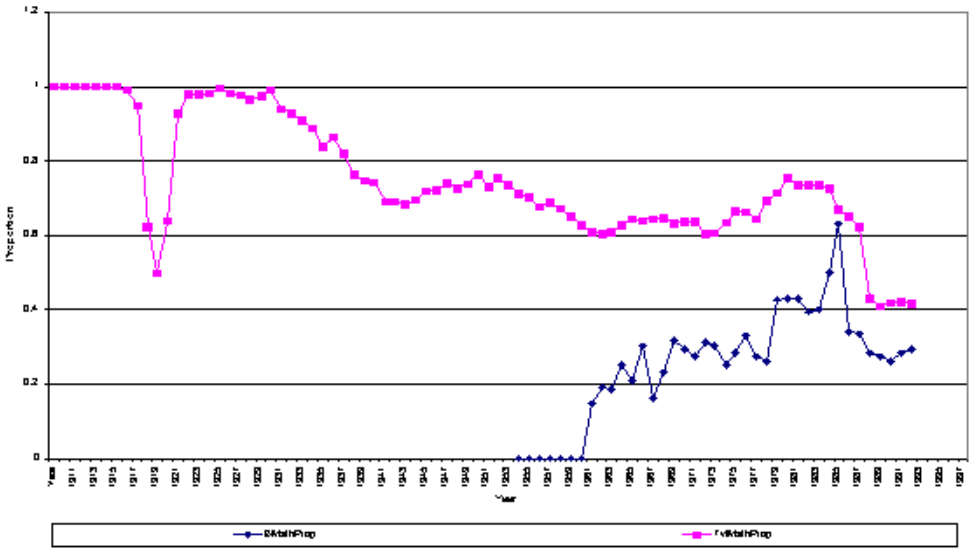

Figure 8: Proportion of Matric Candidates with Maths.
Source: Fedderke, De Kadt and Luiz (2000)

So the performance of the schooling system in South Africa is poorer than we might wish for. Can we provide some insight as to why this might be the case? Part of the answer lies with the nature of the inputs into the schooling system. Where inputs into the human capital creation process are poor, it is hardly surprising that the output will suffer in terms of its quality.

Evidence that inputs into the schooling process have suffered from poor quality emerges in at least three distinct dimensions. *First*, a comparison between pupil-teacher ratios in white and black schooling suggests that the educational opportunities in the two schooling systems were not equal. Figure 9 reports the pupil-teacher ratios for both public

and private schools for whites and blacks.[55] The most salient point to emerge from an examination of the data is that white educational opportunity, regardless of whether the opportunity arose in public or private schools, is consistently and considerably better than black educational opportunity. White public school pupil-teacher ratios (WpubPupTch) never rise above the mid-20 level (the very highest ratio is 24.06 in 1952), while the best black pupil-teacher ratio is provided by the private schooling system (BPvtPupTch) in 1941 at a ratio of 31.61. Case and Deaton (1999), on the basis of cross-sectional survey evidence from South Africa, note that while differences in pupil-teacher ratios in the 10:1 to 40:1 range may not significantly determine the educational performance of pupils, an increase in pupil-teacher ratios from 30:1 to 60:1 is a statistically significant determinant of educational performance. In this context it is noteworthy that the pupil-teacher ratio for black public schooling (BpubPupTch) remained in the range from 50:1 to 70:1 for a protracted period from 1957 to 1993, while black private schooling over the same period did not do significantly better.

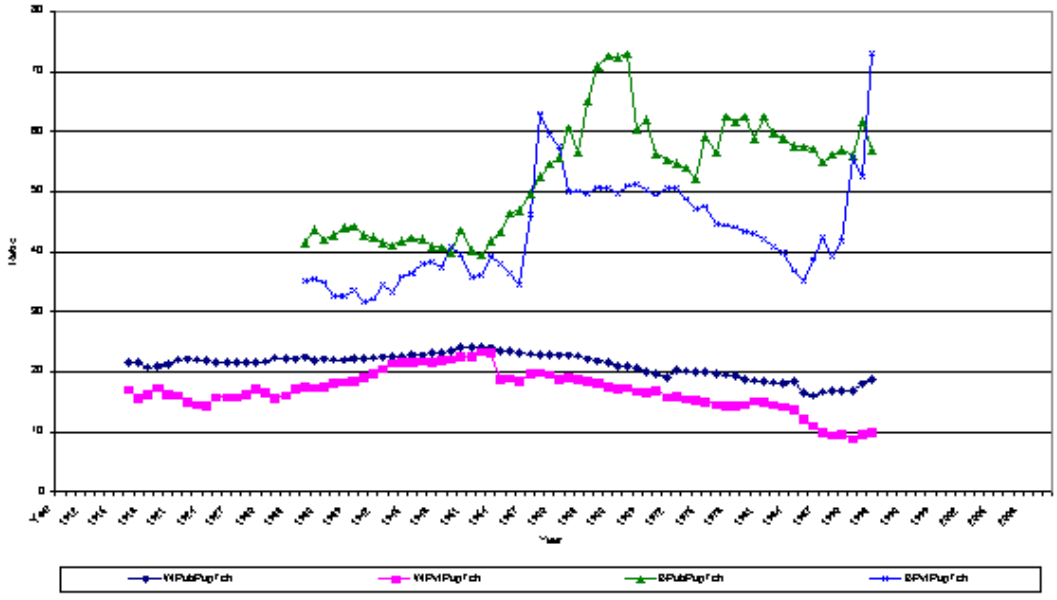

Figure 9: Pupil-Teacher Ratios for Black and White Public and Private Schools
Source: Fedderke, De Kadt and Luiz (2000)

Second, real expenditure per pupil showed wide disparities between the racially defined schooling systems. In Figure 10, we report the *per capita* expenditure figures by racial grouping. While in absolute terms real expenditure on black schooling increased dramatically throughout the 1980s, this did not translate into a strong increase in real *per capita* expenditure per pupil. On these figures, white per pupil expenditure (RealWperCap) remains at least at seven times the level of that for blacks (RealBPerCap), and almost twice that for Coloureds and Asians (RealC&APerCap). Thus

[55] For a fuller discussion of these results, see Fedderke, De Kadt and Luiz (2000).

the rapid increase in real expenditure on black education has not allowed black schooling to eliminate the backlog with white education. Moreover, a closer examination of black per pupil expenditure suggests that, over the 1983-93 period, per pupil expenditure remained virtually stagnant in real terms.

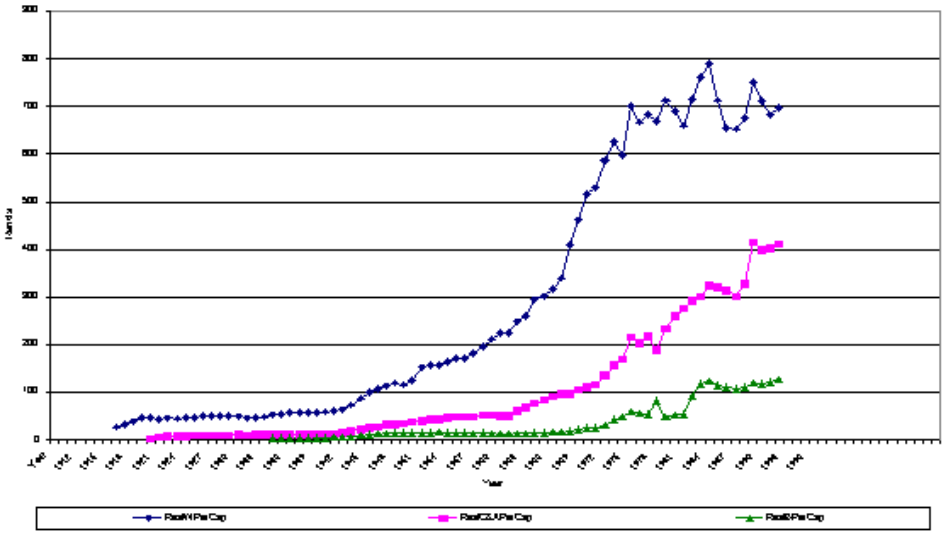

Figure 10: Real per Pupil Expenditure by Race
Source: Fedderke, De Kadt & Luiz (2000)

The divergence of quality between the white and black schooling systems is thus potentially even more dramatic than suggested by the pupil-teacher ratios examined above. The ratio of 7:1 on real per pupil expenditure is several orders of magnitude greater than the ratio of 2:1 we reported with respect to pupil-teacher ratios.

Third, differentials in teacher qualifications similarly point to large disparities in the quality of inputs into the schooling process between black and white schooling. We consider the percentage of teachers in public schools who fall into one of two limiting categories. The first, which we label iUNQLRAT, denotes the proportion of the total teacher body for the racial category i that holds a matric qualification or less. The second, which we label iSPUQLRAT, denotes the proportion of the total teacher body for the racial category i that holds a tertiary qualification. They represent respectively "under"-qualified and "super"-qualified teachers.[56]

Figure 11 reports both categories of teachers for both white and black racial groups. Surprisingly, the iUNQLRAT category of teachers is fairly similar between the white and black schooling systems, with approximately 20% of teachers proving to be unqualified. The only significant difference to emerge is that the proportion falls to approximately

[56] "Tertiary" education denotes either a degree or a diploma.

10% for the white schooling system almost a decade earlier than it does for the black schooling system.[57]

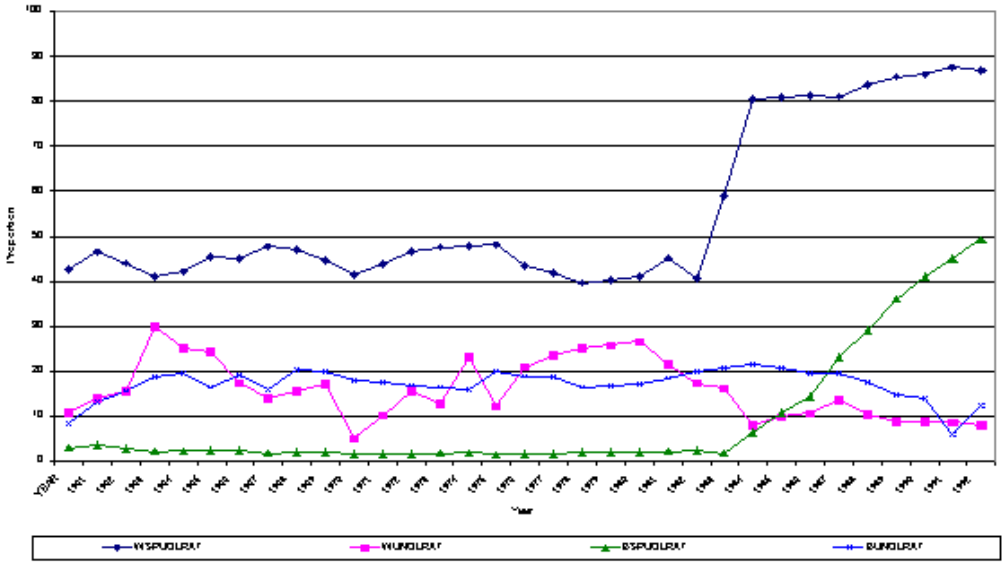

Figure 11: Teacher Qualifications
Source: Fedderke, De Kadt and Luiz (2000)

For South Africa's schooling system, the evidence is of large quality differentials in the output of the schooling system, attributable to poor inputs into the schooling process, and to inappropriate governance structures. Recall that the evidence suggests that even the best parts of the system could be doing better.

The upside of the evidence is that at least we know what is going wrong, though we need even more information for appropriate intervention, and therefore what the appropriate forms of policy intervention should be if we wish to improve schooling performance.

4.2.2 A Characterization of the Performance of South Africa's Tertiary Educational System

The next question to ask is whether the poor schooling system in South Africa has translated into a poor tertiary educational system, and whether the patterns that were evident at the schooling level have been reproduced for tertiary institutions. The data considered in this section cover only the university system in South Africa.[58]

[57] In a more detailed econometric exploration, Fedderke and Luiz (2001) confirm that the inputs into education matter for educational attainment, though the institutional constraints on educational deliver turn out to matter also.

[58] In this case we draw substantially from Fedderke, De Kadt and Luiz (2001c), which is also concerned with the technikon, teacher college, and apprenticeship contract data for South Africa. The restriction to the university sector in the current context is because it is the most significant tertiary educational sector both in terms of student numbers, and in terms of its anticipated innovative capacity. Since it is the supposed

In tertiary education, we find the patterns of performance to be somewhat different from those we found for schooling. For universities, the distinction between the historically white universities and universities historically designated for other race groups, is not in terms of the quality of inputs as measured by student-lecturer ratios, or by expenditure per student.[59] Indeed, real expenditure per student for universities was higher in the black universities than it was for whites. Nevertheless, our findings show that the quality of output of black universities in terms of the degrees they issued and their research output lay considerably below that of the universities designated white.

Only the teacher training college system emulates the results we found for South African schooling. Here again, inputs as well as outputs of the teacher colleges prove to be of considerably lower quality for blacks than for whites.[60]

In technical training, the differential between whites and blacks emerges primarily in the form of poor access to such training by blacks, rather than in the form of poor inputs into black technical training as measured by student-lecturer ratios and real per student expenditure. A more general finding to emerge from our data on technical education in South Africa is that significant under-investment in technical forms of human capital has been maintained over the sample period, and for all population groups.[61]

In the university system, student-staff ratios show relatively little variation across race groups (see Figure 12). Indeed, during the course of the 1960s and 1970s, the student-staff ratios at the black, coloured and Asian (BCA) institutions lay below that maintained in the white university system.[62] This pattern only changes after 1980, when the student-staff ratio of all parts of the university system begins to demonstrate an upward trend. During the course of the 1980s, the student-staff ratio of both the coloured and Asian universities is of essentially the same order as of the white universities, though there also appears to be greater cyclical variability in Asian and coloured student-lecturer ratios. However, the strongest change during the course of the 1980s concerns the student-staff ratio in black universities, which rises dramatically to approximately double that in the white university system.

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pinnacle of the tertiary system, it is also held to be indicative of the health of the sector as a whole. However, Fedderke, De Kadt and Luiz (2000c) note some crucial differences between the various parts of the tertiary system.

[59] We note at the outset that for universities the distinction between "white" and "black" makes less sense than elsewhere in the educational system. Since student bodies always tended to be mixed, the designation cannot be taken to reflect the racial composition of the institutions being referred to so much as a series of historically determined labels. For reasons that will become clear from the ensuing discussion, "historically advantaged" and "historically disadvantaged" is also misleading. All labels in the current context are thus misleading, and we therefore stick to the historical ones. At least these give a sense of continuity and contiguity with past usage.

[60] The full results are available in Fedderke, De Kadt and Luiz (2001c).

[61] The full results are available in Fedderke, De Kadt and Luiz (2001c).

[62] This is true even where we employ the white university student enrolment figures, which do not count the students of other races attending these universities. Where the adjusted student enrolments for white universities are employed, there is a further though marginal upward adjustment in the student-lecturer ratio at white universities.

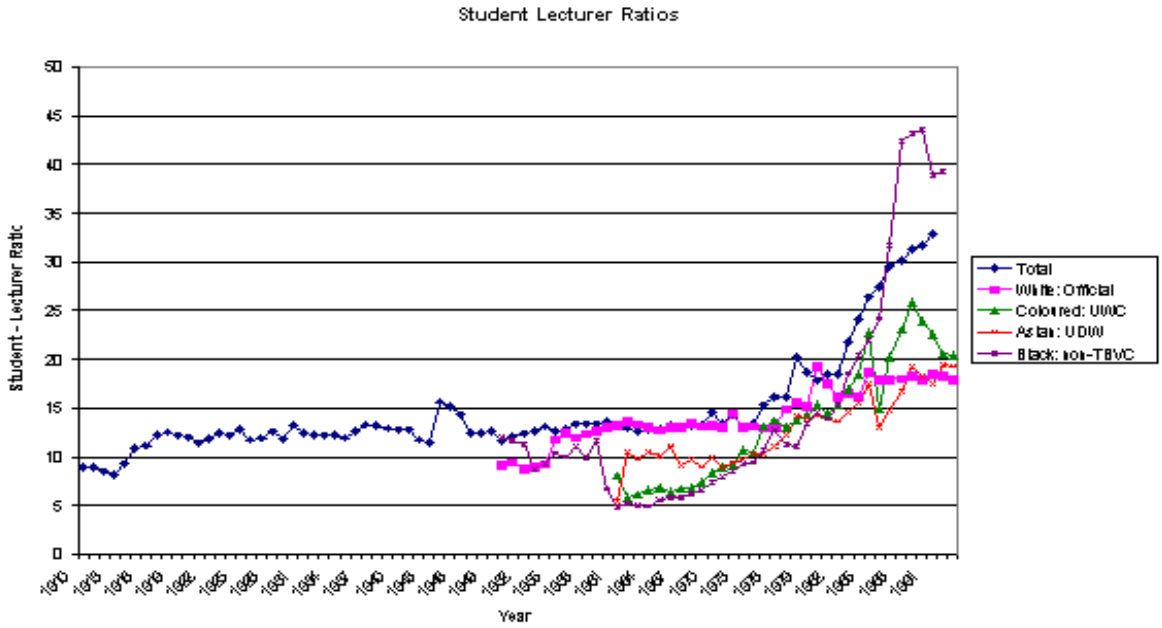

Figure 12: Student-Lecturer Ratios: Universities
Source: Fedderke, De Kadt and Luiz (2001b)

There are three immediate and important implications that emerge from the evidence provided by student-lecturer ratios. First, the low student-lecturer ratios in BCA universities during the pre-1980 sample is likely to be influenced by the poor performance of the BCA schooling systems, detailed above. Thus the ability of the BCA tertiary education system to attract sufficient student intake is likely to have suffered from a supply-side constraint, making it difficult to attract students in sufficient numbers.

Second, it becomes likely that student-staff ratios for universities may well not be a reliable indicator of quality of learning environment,[63] particularly since we know the student intake to have been poorly prepared for tertiary education. This is quite unlike the case for the South African schooling system, where pupil-teacher ratios were found to show strong variation across the racially defined schooling systems, and this variation was found to exert strong influence on educational attainment.

A third implication of this evidence is that the development of separate university systems for the distinct ethnic groupings of South Africa's population was an extraordinarily inefficient use of scarce resources. Universities are notoriously expensive in terms of start-up costs. To develop entirely new universities with a generally poorly prepared student body, and with low student-staff ratios, may well have prevented the

[63] The ratio of students to lecturers does not control in any way for the quality of the lecturing staff employed in the respective sets of institutions. Ideally, the ratio should be appropriately weighted for the quality of lecturing input. Unfortunately, no ready statistics were available to enable such a quality adjustment

already existent universities from improving their quality. A more rational approach to the development of the tertiary educational system would have been to take advantage of economies of scale in incorporating BCA students into their historic student body.[64]

The real expenditure per student data, presented in Figure 13, further strengthen the patterns observed in Figure 10. For historically white universities, real per student expenditure has remained essentially constant over the 1910-1993 period, though the 1980s and early 1990s have seen some decline from the height of per student expenditure achieved during the course of the 1970s. For all other racial groupings in the university system, per student expenditure during the course of the 1960s and 1970s was higher than for the white university system, though the 1980s saw convergence between the expenditure figures for the various sections of the university system.

The black university system did not differ from coloured and Asian universities in this respect. For black universities, real per student expenditure consistently lay above that for the white university system during the 1960s and 1970s, and it is only the sharp increase in student numbers at black universities during the 1980s that drives down per student expenditure below that of other parts of the university system.

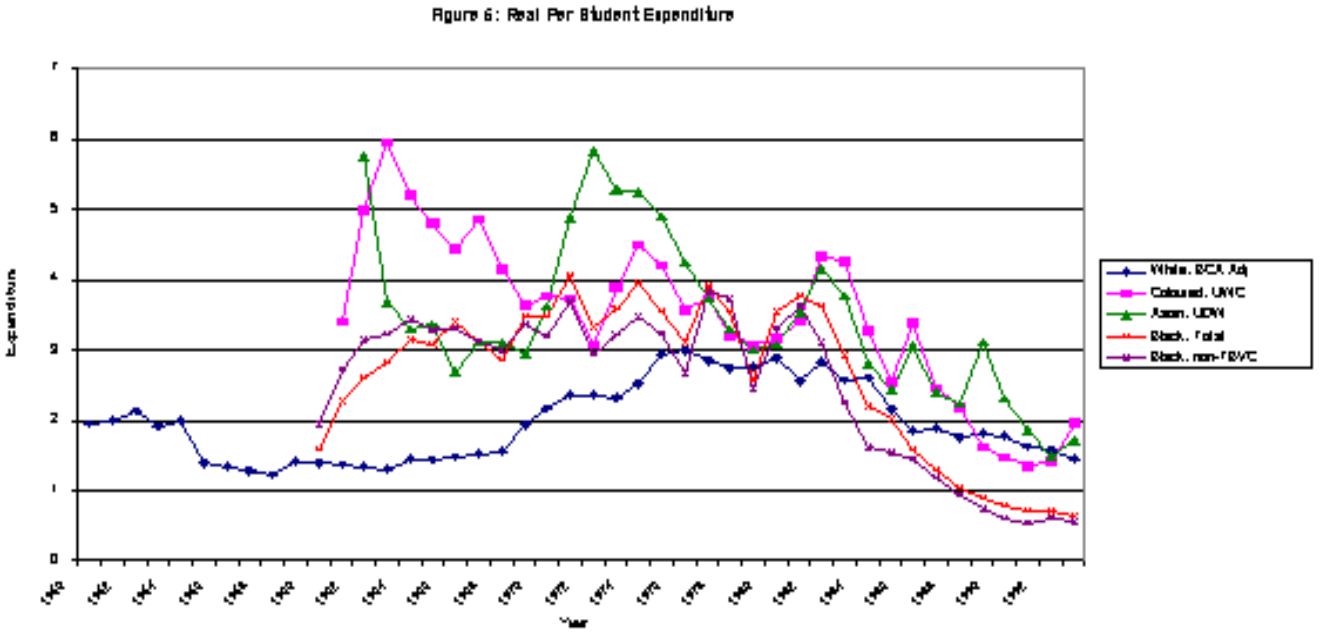

Figure 13 : Real per Student Expenditure: Universities
Source: Fedderke, De Kadt and Luiz (2001b)

[64] This is a point that generalises across the tertiary educational system in the apartheid era in South Africa.

A number of explanations account for these data patterns, and a number of implications follow. First, the high per student expenditure figures in the BCA universities can be accounted for by the start-up costs of any new university system. Again, consistent with our suggestions emerging under the discussion of the student-lecturer ratio, the difficulty likely to have been experienced by the BCA universities is the recruitment of a suitable student body. Thus, the investment in infrastructure and the high level human capital required to start up a new set of universities was for a small student body, who were in consequence funded to a disproportionately high level on a *per capita* basis. Only during the course of the 1980s does a quality differential come to be indicated in per student expenditure levels at universities.

This evidence corroborates that the educational system imposed by the apartheid ideology was wasteful of scarce resources. The resources expended in developing an entirely new university sector in parallel with an already existing system might have been far more efficiently employed in expanding the capacity of the existing system, with the associated economies of scale that might have been realized in the process. As it was, the educational system was starved of a large body of resources, which might have been more appropriately employed in improving the quality of the primary and secondary schooling system feeding the universities, or in expanding existing universities.

The evidence on inputs into the university system suggests that the patterns of inequality that characterized schooling in South Africa, and which in turn resulted in large differentials in performance by pupils in schools, are not repeated for the university system in South Africa. The question now must be whether the more equal allocation of resources in the university system managed to produce an undifferentiated level of excellence throughout. Anecdotal evidence suggests that this was not the case, but what do the hard data tell us?

Figure 14 reports the absolute output of university degrees in South Africa. Absolute output measures of the university system suggest a steady and, since 1960, sometimes steep increase in the total degrees granted by universities. The evidence suggests that the white universities dominate the university system as a whole in output terms, despite the growing degree output of black universities, particularly during the course of the 1980s.

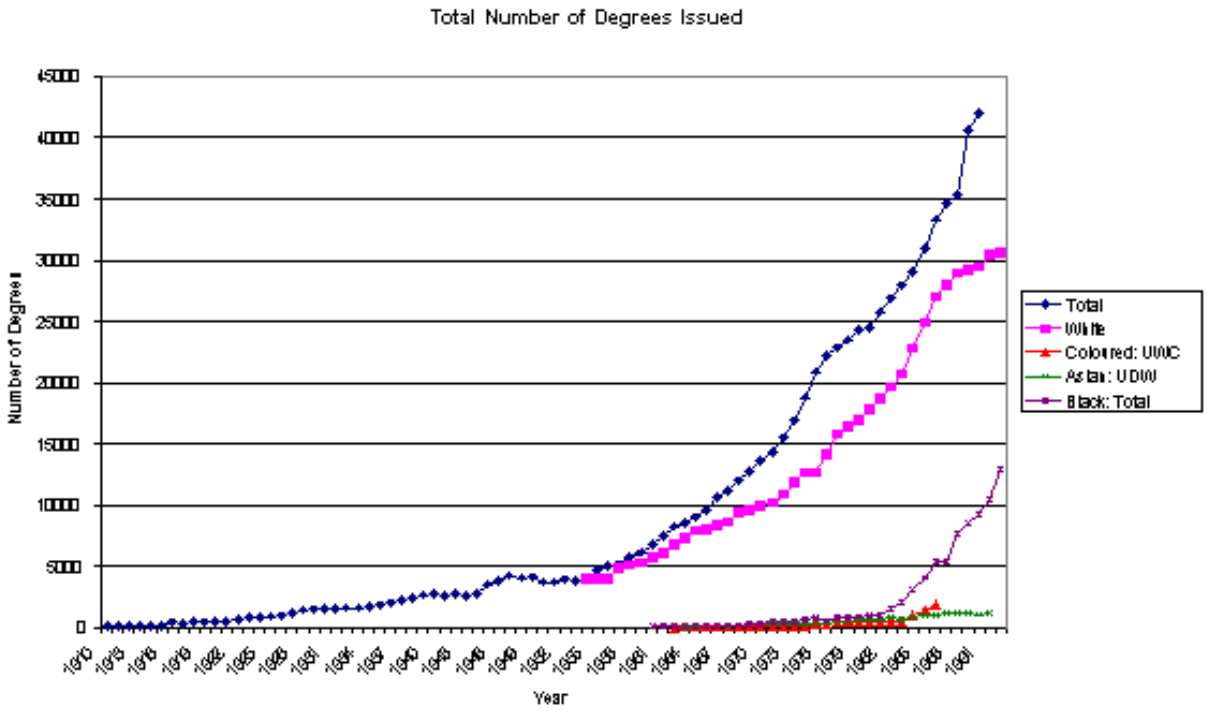

Figure 14: Total Number of Degrees Issued: Universities
Source: Fedderke, De Kadt and Luiz (2001b)

While the absolute output of degrees suggests that black universities were expanding their output as the number of students entering the system increased during the 1980s, absolute numbers of degrees do not yet control for the quality of the output being generated.

In Figure 15, we report the proportion of total degrees issued by the various university systems that emerge in the natural and engineering sciences (NES). For the white and Asian university systems, the proportion of NES degrees falls from a high point of 20% in the mid-1960s, to a little under 10% in the early 1990s. While the black university system initially had a similar proportion of NES degrees conferred, during the course of the 1980s, at precisely the time when student enrolments were expanding rapidly, the NES proportion fell rapidly, and by 1993 had reached a low of 2%. While the trend for both systems has been downward, the performance of the black universities in producing science graduates is far poorer than that of the white university system. Moreover, while the strong increase in student numbers in the black university system in the early 1980s was matched by an increasing conferral of degrees, this was clearly achieved by an expansion of students reading toward degrees other than science degrees. Figure 15 demonstrates a sharp decline in the proportion of science graduates precisely at the point at which both student numbers and total degrees conferred were experiencing sharp growth.

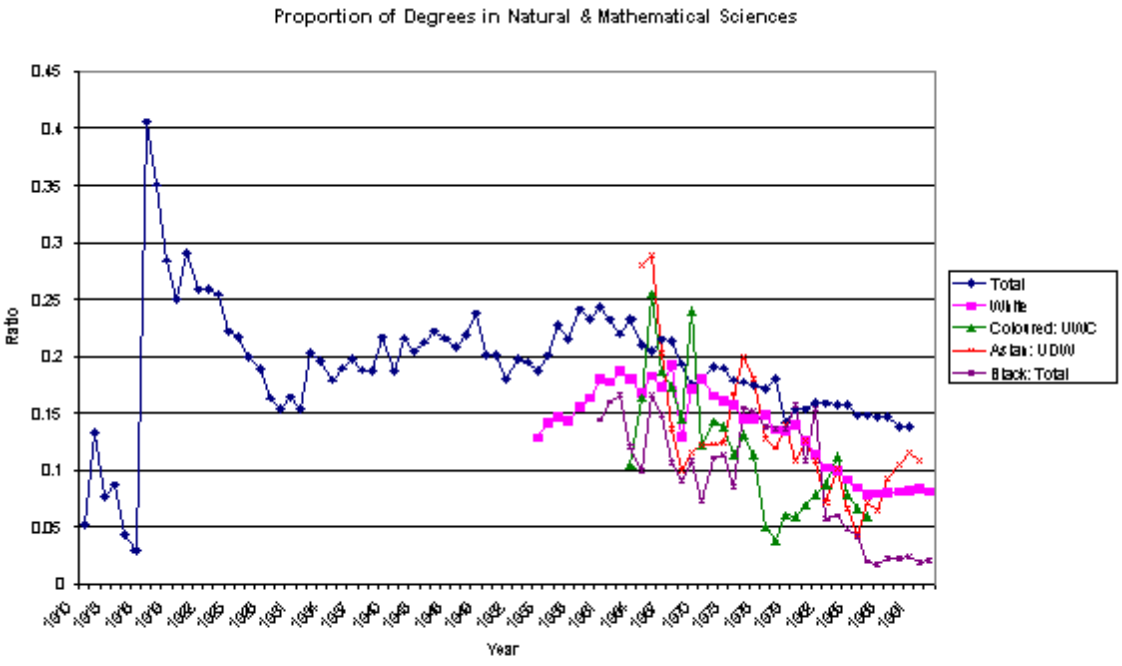

Figure 15: Proportion of Degrees in Natural and Mathematical Sciences: Universities Source: Fedderke, De Kadt and Luiz (2001b)

This evidence carries the implication that the black university system, while beginning to absorb increasing numbers of black students emerging from the black schooling system, was unable to translate the increased enrolment into NES graduates with the same facility as the rest of the university system – though recall that even the "good" part of the university system does so with poor facility. While this may point to the poorly prepared student intake that the black university system had to contend with, it is also indicative of a low capacity within the black university system to generate NES graduates.

Similar implications emerge from student throughput rates, and real expenditure per degree data. All sections of the university system saw an increase in the cost per degree produced over the course of the 1980s. However, the increase has been the most dramatic in the black university system, to the extent that the cost per degree in the black university system in 1993 had reached one and a half times the level maintained in the white universities.

White and black university systems also have significantly different throughput rates. For white universities, approximately 17% of the total student body in 1993 was receiving a degree, and the trend for the white university system was upward. By contrast, black universities – while sharing an upward trend in the total degree throughput rate since the early 1980s – had reached a throughput rate of only 10% in 1993, significantly below that of white universities. In the case of the throughput of NES degrees, black universities reported close to 0.002 in 1992, while white universities reported 0.01. While the NES throughput rate is particularly poor for both university systems, it is evident that matters

have been far worse in the BCA university system. The sharp uptake in additional students through the 1980s has not been translated into an improved university sector performance.

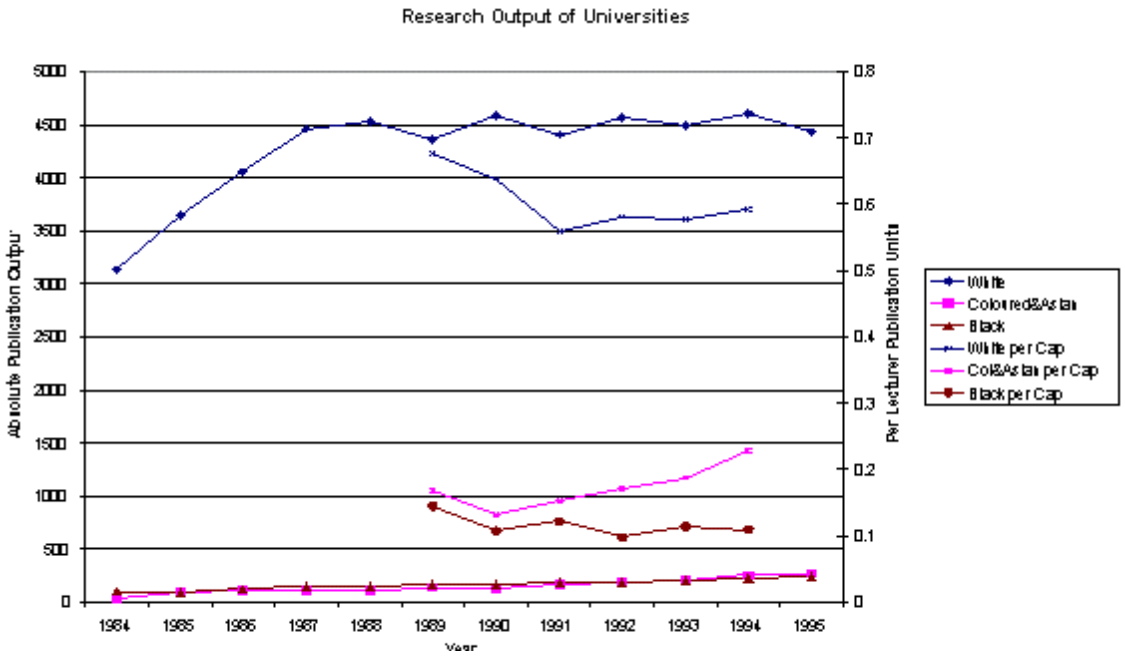

Figure 16: Research Output of Universities.
Source: Fedderke, De Kadt and Luiz (2001b)

There is a final indicator of the differential quality of South African universities. Universities are distinguished from other forms of tertiary educational institutions by virtue of the expectation that they be engaged not purely in teaching activity, but that they contribute to the advancement of knowledge through the publication of original research. Given our discussion of endogenous growth theory, and the empirical findings we have already shown on the growth impact of research and development, this feature of the university system has additional significance.

In Figure 16, we report both the absolute level of research unit output of the racially categorized universities, as well as their per lecturer research unit output. The evidence confirms the suggested quality differential that we have already established as existing between the white universities and BCA universities. Not only is the absolute level of research output in white universities considerably higher than in BCA universities, but this is translated into considerably higher *per capita* research output also.

But again, while BCA universities essentially produce no research output to speak of at all, note that even the white university system produces less than one publication per lecturer per annum. Something is amiss even in the "good" part of the system.

Moreover, we note that even the best part of the university system in South Africa has at the very least manifested declining quality over time. First, the white university research output has ceased to increase in absolute terms from the late 1980s, and in per lecturer output terms, the output declined through to the early 1990s, though it has since stabilized. In addition, most research in South Africa is done in a very small number of universities (see Tables 7 and 8).

	1989	1990	1991	1992	1993	1994	Rank1989	Rank1994
Wits	1.17	1.09	0.78	0.83	0.74	0.84	1	3
Cape Town	1.04	0.98	0.93	0.93	0.89	0.91	2	1
RAU	0.92	0.82	0.71	1.03	1.00	0.89	3	2
Natal	0.68	0.59	0.58	0.49	0.65	0.56	4	5
Rhodes	0.59	0.56	0.49	0.47	0.43	0.47	5	6
Stellenbosch	0.55	0.49	0.45	0.51	0.50	0.65	6	4
Pretoria	0.51	0.50	0.43	0.47	0.48	0.45	7	7
Free State	0.41	0.43	0.41	0.37	0.40	0.39	8	8
Potch	0.40	0.45	0.35	0.41	0.36	0.36	9	9
UPE	0.38	0.29	0.34	0.33	0.22	0.28	10	10
Medunsa	0.26	0.14	0.23	0.07	0.16	0.12	11	15
UNISA	0.24	0.25	0.24	0.25	0.23	0.25	12	11
UDW	0.20	0.19	0.21	0.22	0.18	0.24	13	12
Vista	0.15	0.10	0.11	0.11	0.09	0.09	14	17
UWC	0.14	0.09	0.11	0.13	0.20	0.22	15	13
Zululand	0.14	0.08	0.12	0.14	0.12	0.16	16	14
North	0.10	0.11	0.08	0.08	0.11	0.10	17	16

Table 7: Per Capital Publication Unit Output by University, 1989-94.

Top Ranked: Per Lecturer	Mid Ranked: Per Lecturer	Bottom Ranked: Per Lecturer
Cape Town	Stellenbosch	Port Elizabeth
RAU	Natal	UNISA
Wits	Rhodes	Durban-Westville
	Pretoria	Western Cape
	Free State	Zululand
	Potchefstroom	Vista
Top Ranked: Absolute Output	**Mid Ranked: Absolute Output**	**Bottom Ranked: Absolute Output**
Wits	Stellenbosch	Rhodes
Pretoria	Natal	Potchefstroom
Cape Town	UNISA	Western Cape
	RAU	Durban-Westville
	Free State	Port Elizabeth
		North
		MEDUNSA
		Vista
		Zululand
		Fort Hare

Table 8: Ranking of Universities in terms of Research Output

The declining per lecturer and static absolute levels of research output during the late 1980s and 1990s may well be attributable to the increased resources devoted to the development of the BCA university system. In the preceding discussion, we have already suggested that the expenditure on BCA universities proved to be an expensive way of obtaining relatively low quality degree output. The evidence on research output suggests that an additional cost may have been a declining capacity of the front ranking research universities in South Africa to continue to fulfill their vital research function. The reallocation of funds to the development of the BCA university system therefore had opportunity costs, not only in terms of foregone development opportunities in the already existent university system, but potentially also in preventing the resourcing of growing research capacity in the South African university system. In the light of the wider evidence on the importance of research and development on growth presented in a preceding section, this finding is of particular concern for South Africa.

In a broader developmental context, it raises the important question of whether it is desirable for a society to concentrate solely on devoting resources to a broad-based mass tertiary educational system premised on the lowest common quality denominator, or whether it is desirable to have at least some tertiary education devoted to the production of both high quality degrees, as well as world quality research. If the latter route is chosen – and the experience of the East Asian countries may be taken to at least suggest that it is not entirely unfruitful, as long as the right type of educational output is emphasized – the implication would be for the identification of a small number of core institutions, properly funded, and with appropriate incentive structures designed to encourage greater attention to research activity.

Finally, in this regard, it is possible to identify a strong inter-institutional difference in terms of research output between white universities. The evidence suggests the presence of a three-tier structure to the university system, as indicated in Table 8.

Such a structure might provide some guidance as to how a functional differentiation between universities might come to be structured. The three-tier system might be identified with "ivy league" research universities, state universities or liberal arts colleges, and finally community colleges. The concern here is not to identify what university should fulfill each of these functions. Nor is it to denigrate any one of the three functions. Instead the suggestion is that the existing capacity within the university system is not such as to place all universities on an equal footing, and that it may therefore be sensible to develop the existing structures into institutions that fulfill different pedagogical functions, all of which are important. As the evidence makes clear, the system as it is has strong functional differences; we might as well recognize them, and reward them appropriately.

In concert with the earlier evidence presented on the South African university system, the implication of the present section is that the black university system proved not only to generate output that was of poor quality, but that it proved to be poor output that was expensive. While the poor preparation of pupils passing through the black schooling system is sure to have played its role, the poor design and implementation of a duplicate black university system intended to run in parallel with the white, is likely to have contributed not insignificantly in its own right.

Moreover, the suggestion above has been that the development of the human capital creating institutions in South Africa has been such as to inhibit the development of a strong capacity to stimulate the research and development activity so vital to long-run economic growth.

4.3 Some Final Synoptic Remarks on the Innovation – Human Capital Nexus

We noted at the outset that econometric evidence on South Africa establishes that there exists a growth impact that attaches to investment in human capital. What was also evident from the evidence was that the growth impact attaches to investment in quality human capital, rather than human capital in general.

What emerges from the rest of the discussion in this section is considerable evidence that the educational system in South Africa has placed full weight on widening access, and very little emphasis on improving the quality of the training that it provides. Regardless of whether we are talking of the schooling or the university system in South Africa, even the supposedly best part of the system performs relatively poorly in generating the sorts of output that come to count in long-run economic development.

Historically, therefore, the educational system design in South Africa has not been optimally geared as part of South African economic developmental challenges. Indeed, the evidence suggests that not only was the output of the educational system poorly suited to growth needs, but the means of achieving what output there was, in the case of the university system, proved to be expensive both in direct resource requirements as well as

in some implied foregone opportunities for improvement in what excellence there was in the university system.

Finally, and perhaps what is most worrying of all, is that current policy directions in education appear to be doing little to address and correct the fundamental problems identified above in the delivery of the core competencies required for long-run development. It is high time that South Africa began to think of education as an integral part of its long-run economic strategy.

5 CONCLUSIONS AND EVALUATION

The implications that emerge from the preceding discussion can be grouped into a number of clear propositions. First, we know from growth theory and evidence that accumulation of physical capital stock is core to long-run economic development. One of the central reasons for South Africa's structurally declining growth rate is its declining investment rate in fixed capital.

In Section 2 of this paper, we emphasized that South Africa's investment rate was not extraordinary. It assumed the same structure that can be found elsewhere in the world. First, it responds to the rate of return on and the real user cost of capital, providing policy makers with some immediate policy levers. What proves to be central to investment expenditure is uncertainty, and uncertainty that arises from institutional dispensations. In particular, uncertainty in South Africa proved to be crucial not only to investment in physical capital stock, but also to the capital flows that are required to meet the short-fall of private sector savings relative to private sector investment expenditure. It is also worth noting that the impact of uncertainty is not only directly on investment, but also such as to lower the effectiveness of the policy levers that the rate of return on capital and the user cost of capital provide.

Second, we noted that market distortions in the South African economy can be shown to be present in capital, labour and output markets, and that distortions continue to be prevalent in the South African trade dispensation. The prevalence of such distortions suggests that a great deal remains to be done in improving microeconomic policy directions designed to improve the efficiency of resource allocation in the South African economy. The continued level of protectionism in the economy and the size of the mark-up over marginal cost of production give considerable cause for concern if South African production is to become globally competitive. Perhaps the most enduring concern has to be the now well-documented distortions that attach to South African labour markets. Mispricing and inflexibility in labour markets is coming to carry a long-term developmental opportunity cost that requires urgent redress.

Third, the paper recalled evidence suggesting that endogenous growth processes – particularly positive growth impacts from investment in human capital – are present in South Africa. Unfortunately, these positive impacts attach to the quality dimension of human capital investment; the evidence considered in this paper demonstrates that in these dimensions the South African educational system is poor. Even the best parts of the

schooling and university systems do not produce the sort of educational output required for long-term economic growth, and yet it does so at relatively high cost.

The evidence presented in this paper thus identifies three fundamental structural challenges that underlie the growth conundrum confronting South Africa. There is little point in pretending that these are easy challenges. However, it is worth reiterating the opening paragraph of this paper, and to be conscious of the fact that much has been achieved over the past decade, not least of which is the macroeconomic stabilization necessary for long-run growth strategy. The good news is that none of the obstacles to growth identified is insurmountable: they just require work and clear-headed thinking.

[W]e are living in a dessert age. We want things to be sweet; too many of us work to live and live to be happy. Nothing wrong with that; it just does not promote high productivity. You want high productivity? Then you should live to work and get happiness as a by-product.

Not easy. The people who live to work are a small and fortunate elite. But it is an elite open to newcomers, self-selected, the kind of people who accentuate the positive. In this world, the optimists have it, not because they are always right, but because they are positive. Even when wrong, they are positive, and that is the way of achievement, correction, improvement, and success. Educated, eyes-open optimism pays; pessimism can only offer the empty consolation of being right. Landes (1998: 523-4)

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