

Effect of change in state funding of higher education on research output in South Africa¹

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1. Introduction

During the previous century government participation in the economy and also public spending on education increased considerably. Part of this increase in expenditure on education can be linked to the belief in the human capital model that was developed during the 1960s³. If this model is true, more education make people more productive and the market will thus be willing to pay a higher remuneration for better trained workers. These more productive workers will also increase production levels and thus stimulate economic growth. Many studies was undertaken that proofed that it is profitable for both the private and public sectors to invest in education.

The first part of the paper deals with the profitability of investment in education and the returns on higher education receives special attention. The experience of the changing in public funding of higher education in South Africa will then be discussed. Firstly, the period 1987 – 2003 will be investigated. During this period the South African Post Secondary School (SAPSE) subsidy formula was used to fund universities and technikons and the higher educational system in stayed fairly stable and unchanged. In 2004 and 2005 the HE landscape in South Africa changed completely with the merging of institutions which reduced the 36 HE institutions to 23. Obviously one cannot draw too many conclusions from the period after the merging of HE institutions took place. We will highlight the change in public funding of HE and the resulting effect on research will be dealt with in more detail.

2. Profitability of investment in education

There are more than one way to calculate the profitability of an investment in education, but most studies make use of cost benefit analysis to calculate the internal rate of return. One of the most comprehensive summaries is given by Psacharoupoulos and Patrinos (2002). They provide the results of studies that have been done in 98 countries during the period 1960-1999. These results are summarised in Table 1.

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³ Theodore Shultz, Edward Denison and Gary Becker did pioneering work in this field. See for example Rosen (1987) and Cohn and Geske (1990) for a good discussion of this period.

Table 1
Rate of return of investment in education

Region	Social			Private		
	Primary	Secondary	Higher	Primary	Secondary	Higher
Asia	16.2	11.1	11.0	20.0	15.8	18.2
Europe /Middle East/ North Africa	15.6	9.7	9.9	13.8	13.6	18.8
Latin America	17.4	12.9	12.3	26.6	17.0	19.5
OCED	8.5	9.4	8.5	13.4	11.3	11.6
Sub-Saharan Africa	25.4	18.4	11.3	37.6	24.6	27.8
South Africa (1980)	22.1	17.7	11.8	-	-	-
World	18.9	13.1	10.8	26.6	17.0	19.0

Source: Psacharoupoulos & Patrinos, 2002: 14 and Psacharoupoulos 1994

The results in Table 1 portray some clear tendencies. Firstly, the private rate of return is higher than the social rate of return for all levels of education for all the regions quoted in the table. On average for the world the private rate of return for primary education is 7.7 percentage points higher than the social rate of return, for secondary education it is 3.9 percentage points higher and for higher education it is no less than 8.2 percentage points higher than the social rate of return. In interpreting these results one has to remember that in some countries included in these studies HE is almost fully subsidised - resulting in artificially high private rates of return due to the small contribution individuals make towards their own education. The private rates of return is higher than the social rates of return for all educational levels, but the rates normally decrease as the level of education increases. In general the rates of return in developing countries are also normally higher for all levels of education than the rates in developed countries.

For the sub-Saharan Africa region (which South Africa forms part of) the rates of return (especially the private rates of return) for all levels of education are the highest of all regions in the world. This might be explained by the small existing stock of capital in this region. Not much research that used this calculation method has been done for South Africa. Psacharoupoulos (1994) quote social rates of return for South Africa that is higher than the average for the world for all levels of education (see Table 1). These rates are based on studies done in metropolitan areas in Kwazulu-Natal. It is debatable whether this is representative of the whole of South Africa. Since the social rates of return for South Africa are not so different from the rates for the sub-Saharan Africa region, this could point to also similar private rates, but there is no empirical evidence to proof it.

The rates of return in Table 1 can be interpreted in two ways. Firstly, it can be argued that the high private rates are an indication that private fees for education can be increased, but secondly the high social rates indicate that investment in education is also a profitable

investment for the state. In this way one can also argue for increased public expenditure on education.

Table 2
Rates of Return according to faculty

	Private	Social
Agriculture	7.6	15.0
Sosial Sciences	9.1	14.6
Economic and Business Sciences	12.0	17.7
Engineering	10.9	19.0
Law	12.7	16.8
Medicine	10.0	17.7
Physics	1.8	13.7
Sciences	8.9	17.0

Source: Psacharopoulos (1994: 1330)

Here we have to make a distinction between fields of study. According to Psacharopoulos (1994: 1330) the social rate of return on higher education is the highest in law (12.7%), economic and business sciences (12.0%) and engineering (10.9%). The highest private rate of return on higher education is in engineering (19.0%), economic and business sciences (17.7%) and medicine (17.7%). These rates indicate that there is a case to be made in favour of the introduction of differentiated class fees for different fields of study and that certain fields of study may be financed to a larger extend by the students themselves.

3. Public funding of higher education

It is a worldwide trend that it is expected of students to pay more of their educational costs themselves. In this trend it is also important that bursaries or loans are made available to help students from poor communities to afford higher education. For example, in Australia the Higher Education Contribution Scheme is used and in Britain an income-contingent loan scheme was introduced in 2006. In Australia they must start pay back their loans only if their income exceeds \$21 000 Australian per annum (Maslen, 2004) and in Britain if their annual income exceeds £15 000 (Jammed, 2004). Barr (2004: 273) motivates this type of schemes by stating that, “It shifts resources from today’s best-off (who lose some of their fee subsidy) to today’s worst-off (who receive a grant) and tomorrow’s worst-off (who, with income-contingent repayments, do not repay their loan in full).” As governments are expecting individuals to pay more for their higher education it is acknowledged that some form of financial assistance to students from poor communities must be provided.

The extent of public funding of HE differs much between countries. Total public expenditure in OECD countries varied between \$4 000 in Greece in 2003 to \$20 000 in the USA (OECD, 2003). Public expenditure on HE as a percentage of the GDP can be used as a yardstick to measure public sector involvement in education. Table 3 shows the total expenditure on higher education institutions and higher educational administration as a percentage of the GDP made by local, regional and national governments in 2001 for 84 countries. On average 0.81% of the GDP was spent on HE. According to another source public expenditure on HE was 0.90% of GDP in 2000 for 29 OECD countries (OECD 2004).

Table 3
Total expenditure on HE by government as a percentage of the GDP for 2001
according to continent/region

Continent/region	Number of countries	% of GDP (Average)
Africa	15	0.85
North America	13	0.88
South America	6	0.85
Asia	24	0.64
Europe	21	0.95
Oceania	5	0.74
TOTAL	84	0.81

Source: UNESCO Institute of Statistics (2004): Table 11

The South African experience is summarised in Table 4. In the table total public expenditure on HE is given as a percentage of total state expenditure on education (EE), as a percentage of total state expenditure (TE) and as a percentage of the GDP. In 1995 the National Student Financial Aid Scheme (NSFAS) was introduced for needy students. It can be argued that not the full amount of NSFAS awards should be added in calculating public expenditure on HE. In the last column of Table 4 the HE expenditure of the state as a percentage of the GDP (probably the most informative of the three indicators) is also calculated when the NSFAS allocations are excluded. With the Medium Term Expenditure Framework (MTEF) that was introduced a few years ago, public departments not only budget for a specific financial year, but also for the next two years. This is why state allocations for 2007 and 2008 are already available.

Table 4
Relative state allocations to universities and technikons: 1987-2008

Year	Sector	State allocation (R million)	% of total state expenditure on education	% of total state expenditure	% of GDP	% of GDP excluding NSFAS
1987 ¹⁾	Universities	1 159.730	12.58	2.47	0.700	
	Technikons	263.071	2.85	0.56	0.160	
	Total	1 422.801	15.43	3.03	0.860	
1988 ¹⁾	Universities	1 210.187	11.79	2.25	0.590	
	Technikons	272.276	2.65	0.51	0.133	
	Total	1 482.463	14.44	2.76	0.722	
1989 ¹⁾	Universities	1 425.777	11.85	2.24	0.593	
	Technikons	334.985	2.79	0.53	0.139	
	Total	1 760.762	14.64	2.77	0.732	
1990 ¹⁾	Universities	1 648.529	10.67	2.29	0.608	
	Technikons	394.178	2.55	0.55	0.145	
	Total	2 042.707	13.22	2.84	0.753	
1991 ¹⁾	Universities	1 775.260	10.37	2.18	0.640	
	Technikons	478.158	2.79	0.59	0.170	
	Total	2 253.418	13.16	2.77	0.810	
1992 ¹⁾	Universities	1 948.650	9.55	1.85	0.582	
	Technikons	564.842	2.77	0.54	0.169	
	Total	2 513.492	12.31	2.39	0.751	
1993 ¹⁾	Universities	2 336.518	9.87	1.87	0.550	
	Technikons	692.676	2.93	0.55	0.160	
	Total	3 029.194	12.80	2.42	0.710	
1994	Universities	2 768.887	9.03	1.97	0.574	
	Technikons	795.484	2.60	0.57	0.165	
	Total	3 564.371	11.63	2.54	0.739	
1995	Universities	3 066.472	9.15	2.03	0.559	0.553
	Technikons	1 006.336	3.00	0.66	0.184	0.183
	Total	4 072.808	12.15	2.69	0.743	0.736
1996	Universities	3 850.804	9.22	2.19	0.623	0.589
	Technikons	1 356.458	3.25	0.77	0.220	0.205
	Total	5 207.262	12.46	2.97	0.843	0.794
1997	Universities	3 975.855	9.06	2.09	0.580	0.559
	Technikons	1 455.513	3.32	0.77	0.212	0.204
	Total	5 431.368	12.38	2.86	0.792	0.763
1998	Universities	4 336.687	9.71	2.15	0.584	0.558
	Technikons	1 663.101	3.73	0.83	0.224	0.210
	Total	5 999.788	13.44	2.98	0.808	0.768
1999	Universities	4 648.252	9.97	2.16	0.571	0.543
	Technikons	1 896.873	4.07	0.88	0.233	0.214
	Total	6 545.125	14.04	3.05	0.804	0.757
2000	Universities	5 001.196	9.95	2.13	0.542	0.515
	Technikons	1 976.701	3.93	0.84	0.214	0.194
	Total	6 977.897	13.89	2.97	0.757	0.709
2001 ²⁾	Universities	5 398.837	9.82	2.05	0.529	0.505
	Technikons	2 122.769	3.86	0.81	0.208	0.190
	Total	7 521.606	13.68	2.86	0.737	0.694

Table 4 (continued)

Year	Sector	State allocation (R million)	% of total state expenditure on education	% of total state expenditure	% of GDP	% of GDP excluding NSFAS
2002 ²⁾	Universities	5 707.815	9.22	1.96	0.488	0.465
	Technikons	2 215.857	3.58	0.76	0.190	0.171
	Total	7 923.672	12.80	2.72	0.678	0.636
2003 ²⁾	Universities	6 070.619	8.67	1.85	0.483	0.460
	Technikons	2 563.990	3.66	0.78	0.204	0.185
	Total	8 634.609	12.34	2.63	0.687	0.645
2004 ²⁾	Total	9 364	12.44	2.53	0.675	0.634
2005 ²⁾	Total	10 215	12.65	2.44	0.671	0.614
2006 ²⁾	Total	11 187	12.58	2.37	0.657	0.603
2007 ²⁾	Total	12 169	12.72	2.34	0.649	0.590
2008 ²⁾	Total	13 185	-	2.31	0.636	0.580

1) Excluding the TBVC states

2) Amounts include incorporation of teacher training colleges, but exclude NSFAS administration cost, provision for student fee differences at teacher training colleges, as well as funding for institutional restructuring in 2003-2008.

Sources: Steyn (2002) for 1987 -1993

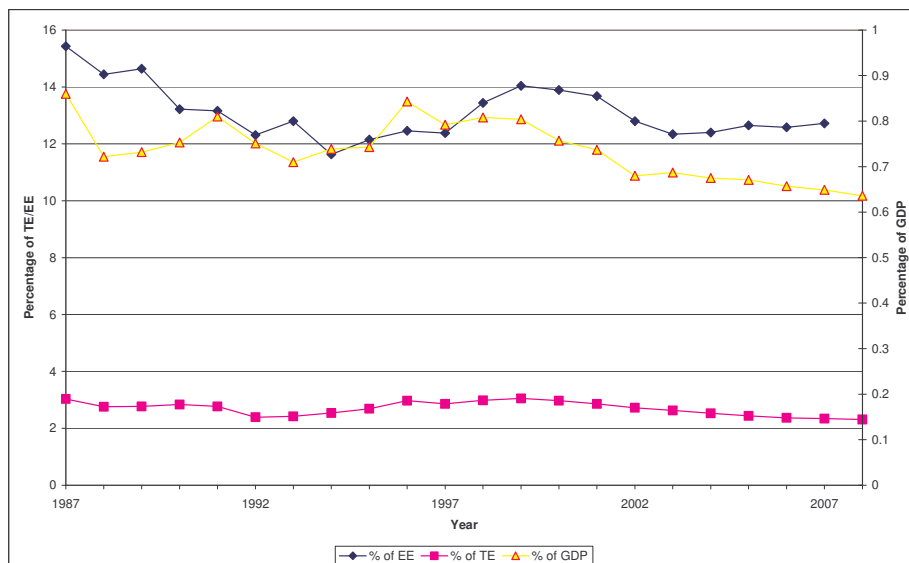
Department of Education budgets: 2001-2006

GDP for 1994 - 2005: SARB (2003 and 2006)

Projections of GDP for 2006-2008: BER (2006)

Figure 1 is a graphical representation of Table 4. The decreasing trend in public expenditure on HE in terms of all three criteria, especially after 1999, is evident.

Figure 1
Relative expenditure on universities and technikons: 1987-2008



How does South Africa compares with the experience internationally? The RSA expenditure on HE as a percentage of the GDP, namely 0.74 (or 0.69 if the NSFAS allocations are excluded) for 2001 is lower than both the average value for all 84 countries and the average

value for 15 countries in Africa, or when the RSA figure for 2000 (0.76% or 0.71% without NSFAS) is compared with the above-mentioned OECD average.

The following trends can be deduced from Table 4 and Figure 1:

- State allocations as a percentage of EE decreased from 15.43% in 1987 to 11.63% in 1994, then increased to 14.04 in 1999, but is projected to be 12.72% in 2007.
- State allocations to HE as a percentage of TE fluctuated in the earlier years of the period under discussion, then increased sharply to 3.05% in 1999, but then declined to 2.37% in 2006 and is projected to decrease even further to 2.31% in 2008.
- State allocations to HE as a percentage of the GDP mostly fluctuated between 0.7 and 0.8 for the period under discussion. A substantial decline from 0.80% in 1999 to 0.66% in 2006 took place, and is projected to even further decrease to 0.64% by 2008. When the NSFAS allocations are subtracted from the total allocations to the HE sector, this indicator declined to 0.60% in 2006, i.e. a decline of more than 18% in 7 years.
- The increases in the mid-1990s of the total state allocations HE are partly the result of the transfer of the HE institutions in the so-called TBVC states to the SA system during that time.

4. Future scenarios of government funding of higher education in South Africa

Will the financial situation in the HE system in South Africa continue to deteriorate? De Villiers and Steyn (2007) made some forecasts about future public funding of HE in South Africa. According to their scenarios the chances are slim indeed that public financing of HE will increase as a percentage of the GDP. Their different scenarios are summarised in Table 5. They used public spending on HE as percentage of GDP as a guideline for public sector involvement in HE. If public expenditure on HE stays constant in terms of GDP it means that public expenditure is growing at the same rate as the economy. In the discussion of their scenarios it should be kept in mind that in 2001 the international benchmark for 84 countries was 0.81% of GDP, with the average for 15 African countries even higher at 0.85% (see Table 3).

With *scenario 1* they assumed that public spending should be equal to the international norm of 0.81% of GDP. To put this in perspective it must be noted that average higher education expenditure in South Africa was 0.746% of GDP for the period 1987-2006 although NSFAS awards were included in these amounts since 1995. It is assumed that NSFAS awards will in future be equal to 0.054% of GDP (the same as the 2006 value). In other words 0.756% of GDP should be non-NSFAS HE expenditure. In Table 5 it is indicated that total HE expenditure in 2006 was R11 187 million and according to this scenario should increase to R15 188 million and R16 783 million in 2007 and 2008 respectively. This is clearly much

higher than the Treasury's MTEF estimate of only R12 169 million in 2007 and R13 185 million in 2008 Ministry of Education 2006). It seems hardly realistic to think that the international benchmark will be reached.

Table 5
Public expenditure on higher education: Different scenarios using higher education expenditure as percentage of GDP as yardstick (R million)

Year	Estimated nominal GDP ¹⁾	Formula & ad hoc allocations ²⁾	NSFAS awards	Total HE Expenditure
<i>Actual allocations</i>				
2003	1 257 026	8 102	533	8 635
2004	1 386 658	8 786	578	9 364
2005	1 523 255	9 351	864	10 215
2006	1 701 506	10 261	926	11 187
<i>MTEF Estimates</i>				
2007		11 056	1 113	12 169
2008		12 010	1 175	13 185
<i>Scenario 1: Keep HE expenditure at 0.81% of nominal GDP</i>				
2007	1 875 094	14 176	1 013	15 188
2008	2 072 027	15 665	1 119	16 783
2009	2 302 511	17 407	1 243	18 650
2010	2 569 048	19 422	1 387	20 809
2011	2 832 673	21 415	1 530	22 945
<i>Scenario 2: Keep HE expenditure at 0.746% of nominal GDP</i>				
2007	1 875 094	12 976	1 013	13 988
2008	2 072 027	14 338	1 119	15 457
2009	2 302 511	15 933	1 243	17 177
2010	2 569 048	17 778	1 387	19 165
2011	2 832 673	19 602	1 530	21 132
<i>Scenario 3: Keep HE expenditure at present 0.657% of nominal GDP</i>				
2007	1 875 094	11 307	1 013	12 319
2008	2 072 027	12 494	1 119	13 613
2009	2 302 511	13 884	1 243	15 127
2010	2 569 048	15 491	1 387	16 879
2011	2 832 673	17 081	1 530	18 611

1) GDP values for 2003-2005 as published by SARB (2006). For 2006-2011 BER (2006) estimates are used.

2) Amounts exclude institutional restructuring (merger) funding

With *Scenario 2* it was assumed that total HE expenditure should be equal to the average for the period 1987-2006 of 0.746% of GDP. They assumed the same NSFAS allocations as in Scenario 1. Even with this more conservative approach it was found that the HE expenditure of R13988 in 2007 and R15457 million in 2008 are much more than is currently budgeted for. For example, the amount for 2008 is R2.3 billion more than the MTEF budget.

With *Scenario 3* it was assumed that the present (latest confirmed value is for 2006) very unsatisfactory situation whereby state allocation to HE was only 0.654% of GDP will be maintained in future. It is rather disturbing that even under this scenario the HE expenditure in 2008 is R428 million more than what the state is currently budgeting for. In Table 4 it was indicated that state funding of HE is estimated to be 0.649% of GDP and it is expected to

decrease even further to 0.636% of GDP in 2008. This is a worrying trend in an economy that is plagued by skills shortages (RSA 2006). It therefore does not seem as though there will be much financial relief (if any) for the HE sector in the foreseeable future.

5. Impact of lower relative public spending on higher education in South Africa

In analysing the effect of the change in public funding of HE in South Africa, data concerning student enrolments, personnel numbers, as well as research publications were used that was supplied by the Department of Education (1998-2005 annual reports and 2005a). The first part of the analysis will focus on the period 1987-2003, while the period after that will be dealt with separately because the structure of HE in South Africa changed completely after 2004. For the sake of the analysis of the period 1987-2003, HE institutions in South Africa were split into four groups, namely historically advantaged universities (HAUs), historically disadvantaged universities (HDUs), historically advantaged technikons (HATs) and historically disadvantaged technikons (HDTs). Data of some institutions were so inaccurate and/or incomplete that they could not be incorporated in the financial analyses. All 11 HAUs (Cape Town, Natal, Free State, Port Elizabeth, Potchefstroom, Pretoria, Rhodes, South Africa, Stellenbosch, Witwatersrand and Rand Afrikaans), but only 5 out of 10 HDUs (Durban-Westville, Fort Hare, Western Cape, Vista and the North) were included in the analysis. Five out of the 8 HATs (Cape, Free State, Port Elizabeth, Pretoria and Peninsula), but only 2 of the 7 HDTs (Northern Gauteng and Peninsula) could be included in the study⁴.

5.1 Change in composition of income of HE institutions

Due to the relative decrease in real state appropriations to HE there was a clear shift in the income composition of HE institutions over period 1986-2003. As illustrated in Figure 2 state appropriations became less important as a source of income for HAUs as it dropped from 51% of their income in 1986 to about 40% in 2003. In real terms state appropriations per weighted full-time equivalent student (WFTES⁵) at HAUs decreased from R24 517 in 1986 to R169 697 in 2003 - a decrease of 32% (in constant 2000 prices). This loss in income from the state was compensated to a large extent by the levying of higher tuition fees. While only 13% of these institutions' income in 1986 was from tuition fees, it contributed 23% of their

⁴ See a more detailed summary of certain aspects in de Villiers and Steyn (2006) and a thorough discussion of this section with all the data attached in a report for the CHE by Steyn and de Villiers (2006).

⁵ The FTE value of a full time student that takes all the modules of an academic programme in a specific year will normally be about 1, but could differ depending on specific module choices. Weighted FTE students (WFTES) for an institution are equal to FTE contact tuition students plus 0.67×FTE distance tuition students (because the educational costs of distance education students are assumed to be 67% of the costs of full time students).

income in 2003. Real tuition income per WFTES increased from R6 351 in 1986 to R9 527 in 2003 - an increase of 50%. The contribution of NSFAS funds was negligible.

Figure 2
Composition of income of HAUs

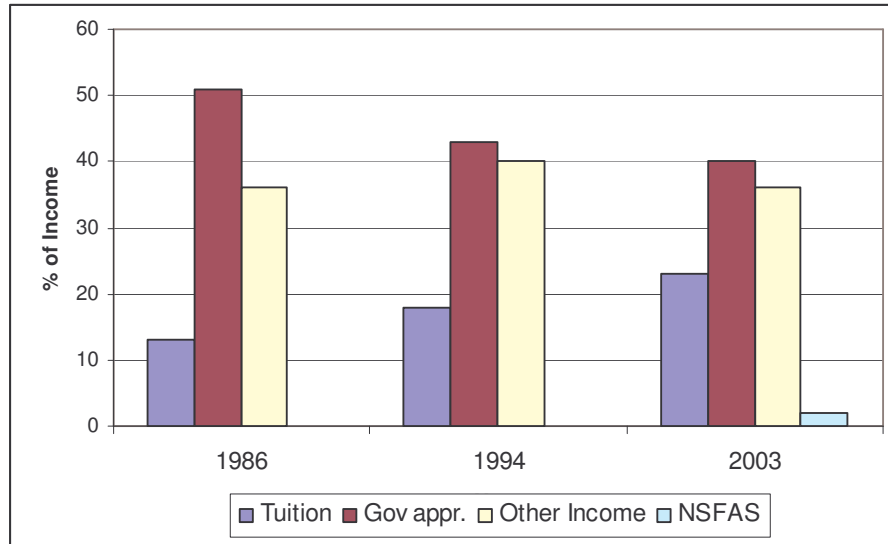
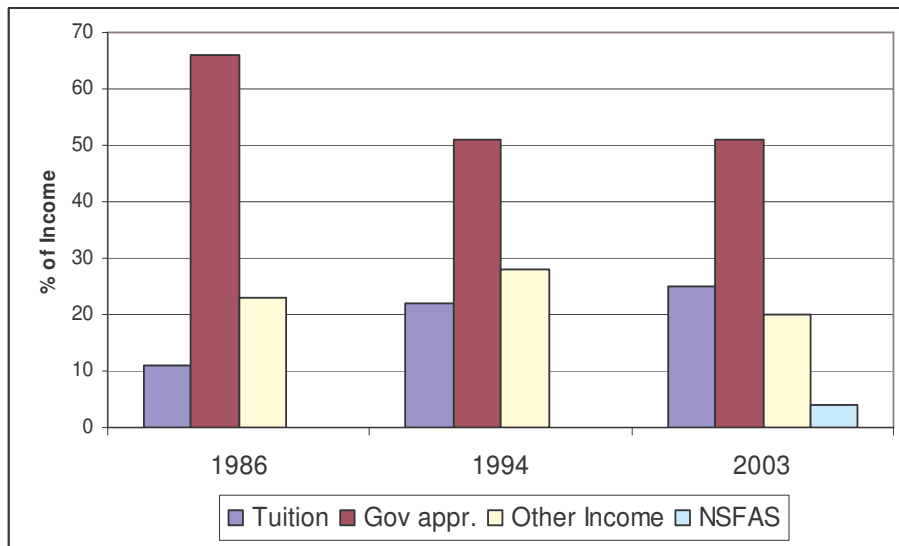


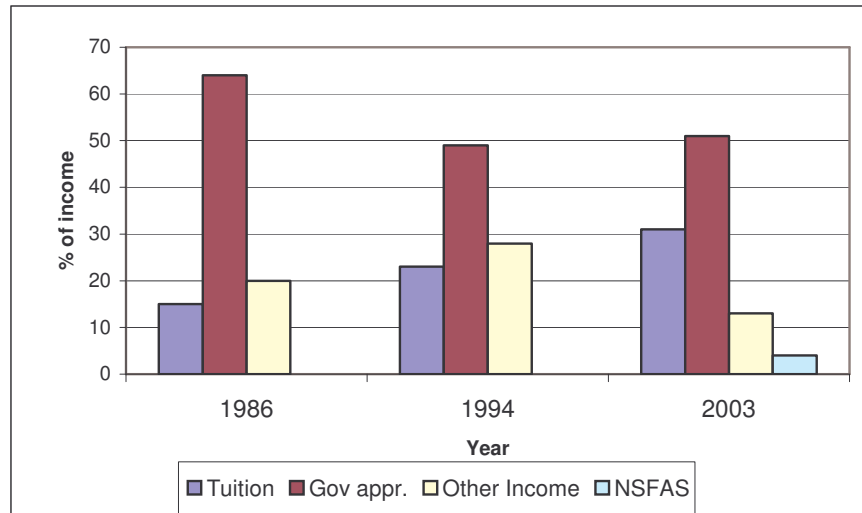
Figure 3
Composition of income of HDUs



At HDUs the change in the composition of their income was even more significant. State appropriations decreased from 66% to about 50% of their income (see Figure3). Real state appropriations declined from R24 517 in 1986 to R16 697 in 2003 - a decrease of 52%. On the other hand, real tuition fees per WFTES increased from R4 662 to R6 739 over the same

period - an increase of 45%. In the process tuition fees as a percentage of total income increased from 11% in 1986 to 25% in 2003. (in constant 2000 prices) increased from an average of R5 896 in 1987 to R8 535 in 2003 - an increase of 45%. Although NSFAS funds were not that an important source of income, it contributed between 4 and 5 per cent of their income.

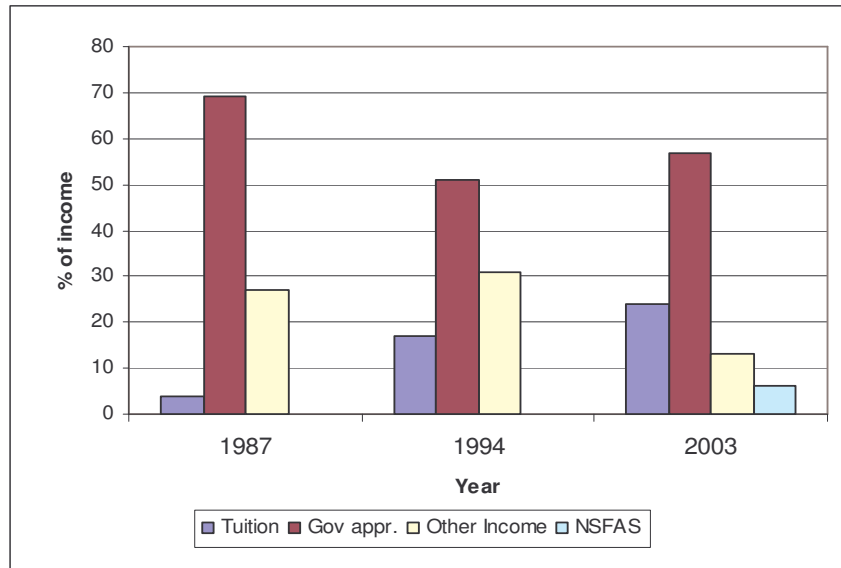
Figure 4
Composition of income of HATs



The same trends are observed at the technikons. In Figure 4 it can be deduced that state appropriations to HATs dropped from 64% of their income in 1986 to just over 50% in 2003. This was the result of the decrease in real state appropriations per WFTES (in constant 2000 prices) that declined from R17 537 in 1986 to R12 167 in 2003 - a decrease of 31%. Tuition fees increased from 15% of these institutions' income in 1986 to 31% in 2003. In the process it increased by 75% from R4 228 in 1986 to R7 393 in 2003. For these institutions NSFAS contributions accounted for about 4 per cent of their income.

When one looks at the situation at HDTs (as illustrated in Figure 5) the same trends are observed although it must be remembered that this sector was underrepresented in the analysis. Only the main trends are highlighted. State appropriations decreased from about 70% of these institutions' income in 1987 to about 57% in 2003. In the same period tuition fees increased from 4% of their income to 24%. In these institutions NSFAS contributions were more important and in 2003 were responsible for 6% of their income.

Figure 5
Composition of income of HDTs



In Figures 2-5 the so-called third money stream are also presented. It differs much between different type of institutions, but no clear trends were observed. There was definitely no clear increase or decrease in the relative importance of this income stream to total income of HE institutions. Although government appropriations became less important over time, it is still the single most important source of income of HE institutions and varied between 40 and 50 per cent of their income. With HE institutions coming under more financial pressure the question is how their performance changed over time.

5.2 Change in personnel and student numbers

As a result of the decrease in the real value of public spending on HE, personnel in this sector did not keep up with the increase in student numbers. Over the period 1986-2003 WFTES numbers increased from 183 604 to 442 962 (an increase of 141%), but over the same period FTE instructional/research personnel only increased from 14 036 to 21 510 (equivalent to an increase of 53%)⁶. In Figure 6 the WFTES per FTE instructional/research personnel member for universities is portrayed. Although there are fairly large fluctuations the increasing trend in the student/lecturer ratio is evident. For universities in total the ratio increased from 12.7 in 1986 to 18.0 in 2003. This is equal to an increase of 42%. Part of the difference between HAU and HDU can be explained by the different trends in the number of enrolled students at these institutions. Figure 7 indicates an even more significant increase in the WFTES per FTE instructional/research personnel member for technikons. The ratio for all technikons

⁶ See Steyn and de Villiers (2006) for a complete series for all the years.

increased from 14.9 in 1986 to 29.0 in 2003 (after reaching an all time high of 36.8 in 1997). Not surprisingly, these ratios show some resemblance with the WFTES numbers in these institutions.

Figure 6
WFTES per FTE instruction/research personnel member for universities: 1986-2003

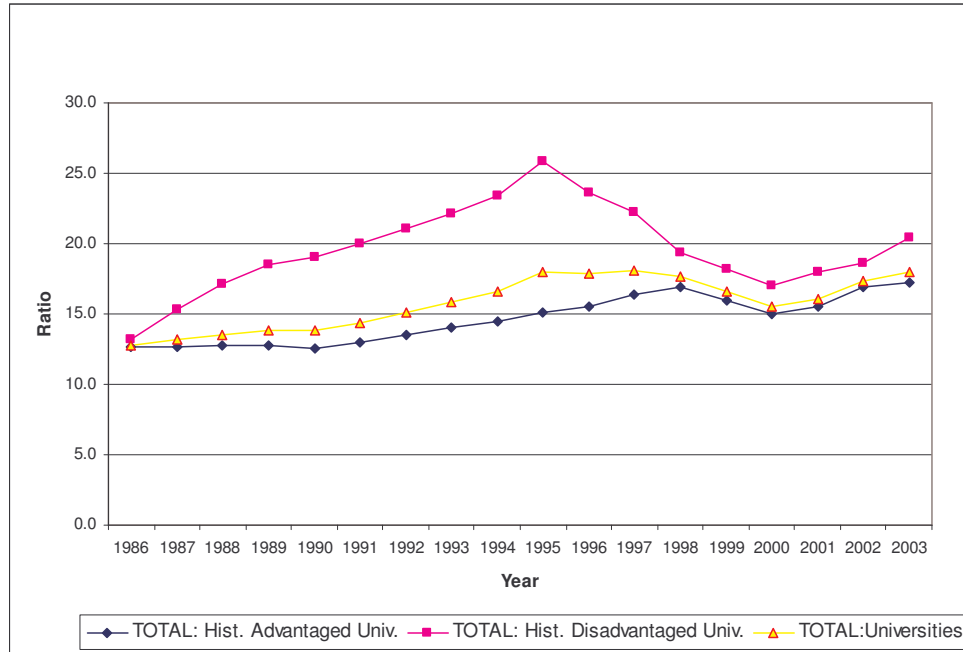
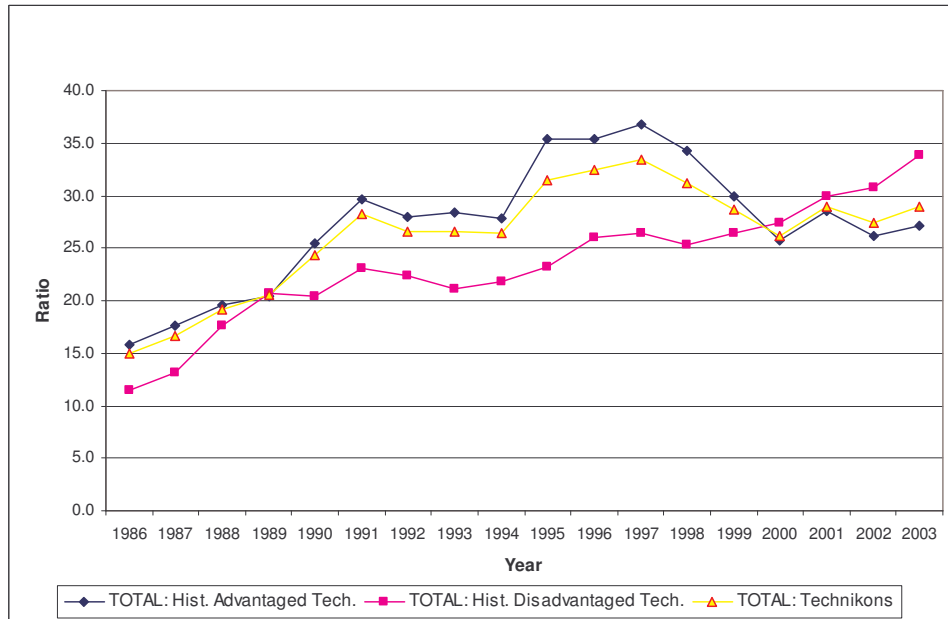


Figure 7
WFTES per FTE instruction/research personnel member for technicians: 1986-2003

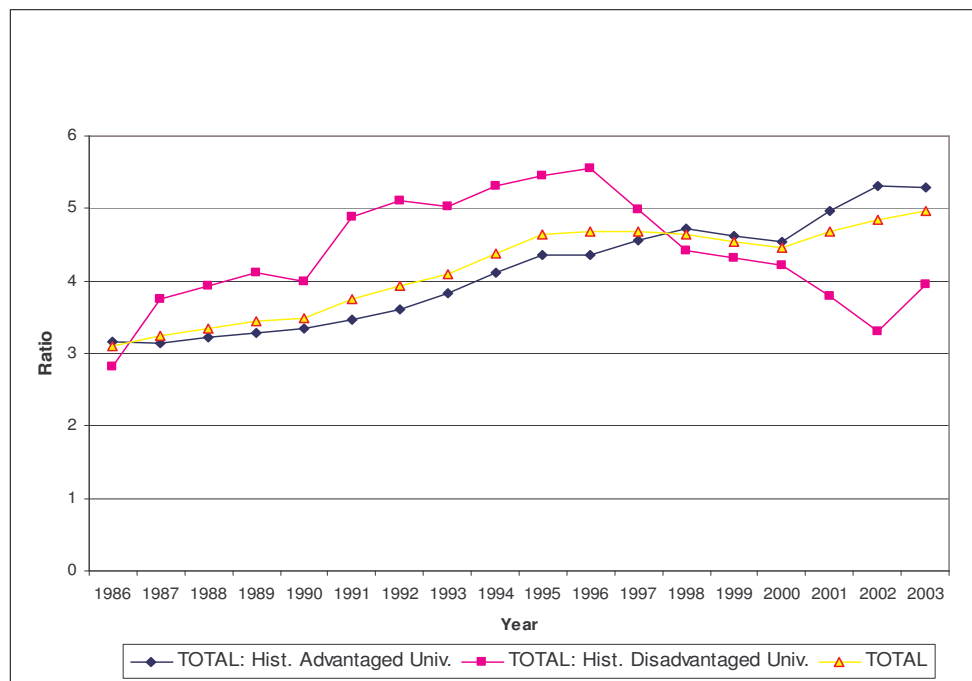


5.3 Change in qualifications awarded to students

The primary purpose of HE institutions is to provide graduates to society that have the skills that the economy requires. The number of qualifications awarded annually by HE institutions is important to measure their success in doing this. This section shed some light on the change in qualifications awarded to students per FTE research/instructional personnel member.

Figure 8

Number of qualifications awarded per FTE instruction/research personnel member for universities: 1986-2003



The situation at universities (as indicated in Figure 8) improved over time as the number of these qualifications increased from 3.10 in 1986 to 4.97 in 2003. Although the ratio for the whole university sector increased over time the ratio for HDUs was lower in 2003 than in 1995. This is the result of the decrease in the number of students attending those institutions. Figure 9 illustrates the master degrees awarded per FTE research/instructional personnel member. Although the HDUs lag far behind the HAU's there is a clear increasing trend for the period under discussion. In general it does seem as though the change in public funding of HE did not negatively impact on the HE institutions to provide graduates to the economy. The same increasing ratio is also present in the technician sector. In Figure 10 this increasing trend can clearly be observed. One could argue that the HE sector actually became more

efficient in delivering trained students to the economy. The one aspect, however, that is not dealt with is whether academic standards are still on acceptable levels.

Figure 9

Number of masters degrees awarded per FTE instruction/research personnel member (M/L ratio) for universities: 1986-2003

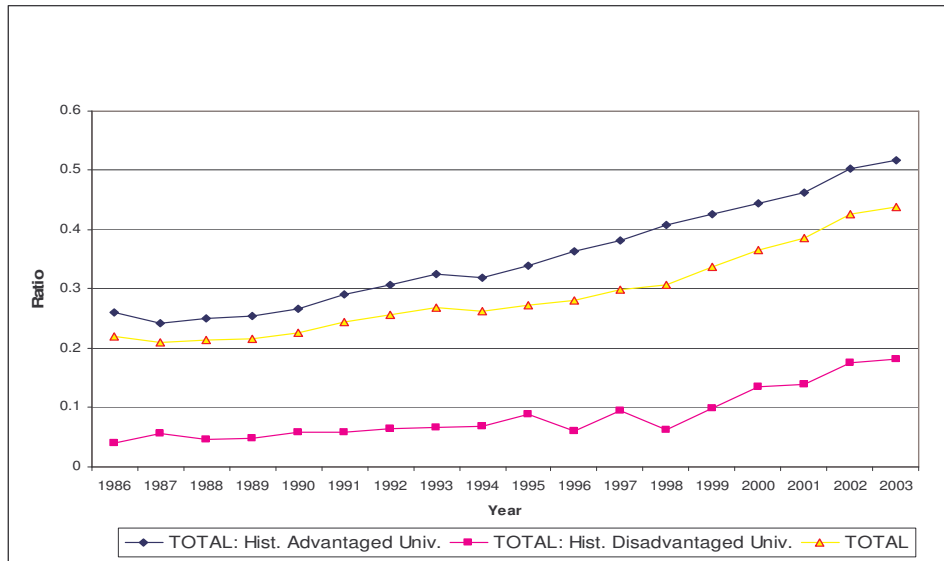
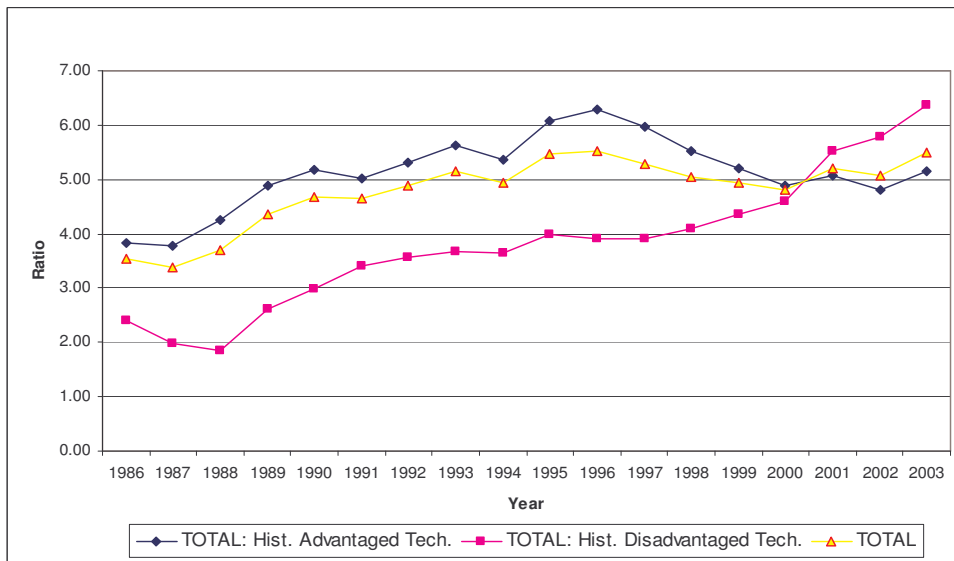


Figure 10

Number of qualifications awarded per FTE instruction/research personnel member for technicians: 1986-2003



5.4 Change in high-level research activities at HE institutions

It seems as though normal degrees at universities and diplomas awarded at technikons were not adversely affected by the change in public funding of HE. The question is whether the increases in student numbers without an accompanying increase in academic personnel numbers resulted negatively on high-level research at HE institutions. One way to evaluate the situation is to look at the number of doctoral degrees awarded per FTE research/instructional personnel member. The number of doctoral degrees awarded almost doubled from 534 in 1986 to 1 024 in 2003. In Table 6 the increasing trend in doctoral degrees per FTE research/instructional personnel member can be clearly observed. However, the big differences in the ratios between HAUs and the HDUs is a reason for concern.

Table 6
Doctoral degrees awarded per FTE research/instructional personnel member for universities: 1986-2003

Institution	1986	1990	1995	2000	2003
HAUs	0.054	0.055	0.062	0.064	0.073
HDUs	0.007	0.012	0.010	0.019	0.029
Total	0.045	0.046	0.048	0.053	0.063

Perhaps a better yardstick to measure high-level research is to look at the the number of articles published in accredited journals (also known as publication units) by research/instructional personnel members. Reliable data on publication units for HE institutions are not available for the whole period under discussion, but only from 1993. During the period 1993-2003 these units for universities were on average 5 357 and in 2002 an all-time high of 5 606 units were recorded (see Tables D.10 and D.11 in Steyn and de Villiers 2006 for a complete series of the data used in this section). Although research/instructional personnel members at universities increased by almost 23% and at technikons by 67% there is no indication of an increasing trend in the number of publication units over the period under discussion. On average the number of publication units by the HAUs were almost nine times more than the publication units of the HDUs. Add to this the fact that although the total number of publication units of technikons increased from a very low base of base of 55 units in 1993 to 230 in 2003, it is clear that high-level research in South Africa are mainly done at HAUs. Of the HAUs the Universities of Cape Town, Natal, Pretoria, Stellenbosch and Witwatersrand are responsible for between 61-63 per cent of publication units for all universities for any specific year for the period 1993-2003. Pouris (2003) determined that the HE sector is responsible for 80% of the country's visible research output. These five universities where most research are done is thus generating almost half of the worthwhile research in South Africa.

Perhaps a better measure is to take the size of the personnel at HE institutions into account. By calculating the publication units per FTE research/instructional personnel member a better picture is portrayed of whether the higher teaching load has led to a decrease in publication units by lecturers. Table 7 is a summary of the situation at universities as well as technikons. As was pointed out in the above paragraph, technikons are not responsible for a substantial contribution to publication units. Their situation changed from 1 publication unit per FTE research/instructional personnel member at technikons every 56 years in 1993 to 1 publication every 22 years by 2003. It is clear although the situation improved over time, there is still much room for improvement. An interesting observation is that if this measure is used the performance of the HDTs improved much more than the HATs, but that their performance is still unsatisfactory.

Table 7

**Publication units per FTE research/instructional personnel member at HE institutions
in South Africa: 1993-2003**

Year	HAUs	HDUs	Total Universities	HATs	HDTs	Total Technikons
1993	0.465	0.143	0.393	0.022	0.004	0.018
1994	0.488	0.156	0.411	0.026	0.003	0.020
1995	0.467	0.156	0.383	0.024	0.002	0.017
1996	0.476	0.152	0.385	0.041	0.009	0.030
1997	0.479	0.150	0.381	0.037	0.011	0.028
1998	0.430	0.141	0.343	0.039	0.013	0.030
1999	0.422	0.142	0.344	0.040	0.013	0.032
2000	0.414	0.143	0.346	0.041	0.013	0.033
2001	0.402	0.147	0.341	0.035	0.026	0.032
2002	0.423	0.151	0.358	0.053	0.020	0.044
2003	0.391	0.127	0.330	0.048	0.036	0.045

It is more important to look at the university sector where more than 90% of publication units of the HE sector are produced. The disturbing fact is that neither the HAUs or the HDUs show an increasing trend. The highest number of publication units per research/instructional personnel member of 0.381 (translating to 1 article every 2.2 years) was recorded in 1997. Since then it decreased to 0.330 in 2003 which means 1 publication unit every 3 years. The publication units for HDUs in 2003 was in actual fact lower than in 1993. The most concerning factor is the decrease from 0.479 units in 1997 to 0.391 units per research/instructional personnel member at HAUs. This means that where 1 publication unit was produced every 2 years in 1993 in dropped to 1 publication unit every 2.6 years – equivalent to a decrease of no less than 18.4%. If we look at the situation of the 5 HAUs that is responsible for most of the publication units it dropped from 0.535 (1 article every 1.8

years) in 1997 to 0.418 (1 article every 2.4 years) in 2003 – a decrease of about 22% in 6 years!

A positive trend is the steady increasing number of doctoral degrees awarded per FTE instructional/research personnel member at both HAUs and HDUs for the years under discussion. The HDU ratio is still much smaller than the HAU ratio, but it is increasing and the gap between the ration for HAUs and HDUs is decreasing. This is a very positive sign. The greater problem is clearly to increase high quality research output. It is necessary that more funds are made available for the universities to ensure that more research will be done in those institutions where most publication units are generated. It must be ensured that the ever increasing student/lecturer ratio do not hamper research activities. The lower publication units per lecturer with which was dealt with in this section section seems to indicate that is is already happening.

7. Conclusions

Since higher education displays characteristics of both private and public goods, it is difficult to scientifically determine the magnitude of the total private gain (direct and indirect) derived from higher education. The private and public advantages of higher education are yet to be quantified. Available rates of return do however indicate that private investment in higher education is profitable, although research in specific developing countries in this regard is very limited.

Although government spending increased in the previous century, government's share of the funding of higher education relative to the private contribution is currently decreasing world-wide. Europe especially seems to be looking for ways in which to increase private contributions to higher education. Government funding still remains the most important source of income for higher education institutions world-wide. All countries make provision for students from poor communities in various ways. The income-contingent loan scheme of the UK has application potential for South Africa, especially if something similar could be implemented on the postgraduate level initially.

At first glance it may look as though the higher education sector in South Africa became more efficient because graduates are 'produced' at lower real costs than before. This is, however, a direct result of the relative decrease in the share of the budget that is devoted to higher education. There are definite indications that it is becoming increasingly difficult for lecturers to maintain their teaching and research activities at HE institutions. Academic standards in respect of teaching could also be jeopardized. According to the MTEF of the government the situation in higher education will not improve in the near future. This is the

case despite the AsgiSA initiatives which acknowledge the shortage of skills as the main factor that may result in lower economic growth rates being realised. However, if funded properly HE could play a major role in this initiative.

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