

CHAPTER 4

Financing Research in Higher Education



Financing Research in Higher Education

4.1 Introduction

South Africa is one of the few countries in Africa that has invested heavily in academic research, especially in the 2000s. In fact, South Africa's gross expenditure on research and development* (GERD) is currently considered to be the highest in Africa. In 2009 South Africa's GERD as a percentage of gross domestic product (GDP) was more than three times that of all other sub-Saharan African countries together (UNESCO, 2011). However, despite a significant increase in total expenditure on research and development, South Africa's GERD as a percentage of GDP is still relatively low when compared with some BRIC countries, such as Brazil, Russia and China.

As a country with the vision of becoming a knowledge-based economy, research and development play important roles in restructuring the economy in South Africa. The White Paper on Higher Education and Training acknowledges the crucial role of research in producing, advancing and disseminating knowledge, and developing high-level human resources. This landmark document considers research to be the principal tool for creating new knowledge. It also recognises the role of research in providing a mechanism for newly created knowledge to be disseminated through teaching at both undergraduate and postgraduate levels. The Department of Science and Technology (DST) also highlights the importance of research and innovation for South Africa, in its National Research and Development Strategy and Ten-Year Innovation Plan: Innovation towards a Knowledge-Based Economy, 2008–2018 (DST, 2007). The innovation plan was developed to help South Africa transform into a knowledge-based economy, in which the production and dissemination of knowledge drives economic benefits and enriches all field of human endeavours.

Yet despite the crucial role that research plays, research funding across all disciplines has not been given the attention it deserves, especially in developing countries. Many African countries have not made the necessary investment in research and innovation, which has resulted in these countries becoming largely consumers – rather than producers – of knowledge.

In 2004 South Africa introduced a new funding framework (NFF) for research and tuition in all institutions of higher education. According to the NFF, an institution's research output grant for any funding year is dependent on: (a) actual totals of research graduates and research publication units for the year $n-2$; and (b) total research outputs that an institution is expected to produce in terms of the national benchmarks (MHET, 2004). However, since the NFF was introduced in 2004, little research has been conducted to evaluate the funding framework's effectiveness, and whether the actual research outputs from universities and technikons have increased significantly.¹⁹

Therefore, the main aim of this chapter is to evaluate the effectiveness of the current government funding framework for higher education research. The chapter assesses whether the NFF for research has yielded the desired outcome of increasing research outputs in South Africa.

4.2 Performance of Higher Education Research in South Africa

In a bid to make research a key and valuable lever for the country's development, the White Paper on Higher Education and Training (DoE, 1997) and the National Plan for Higher Education identified a number of strategic policy priorities:

- Increasing the outputs of postgraduates, particularly Master's and doctoral graduates.
- Increasing research outputs.

* Total expenditure on research and development performed during a given period in a country.

¹⁹ This applies to both the research outputs produced from accredited publications, such as journal articles, books, book chapters and conference proceedings, as well as those from the Master's and doctoral degree graduates.

- Sustaining existing research capacity and strengths and creating new centres of excellence and niche areas in institutions with demonstrable research capacity or potential.

In the following subsections, the effectiveness of the NFF is evaluated, particularly its effect on stimulating performance of research in these priority areas.

4.2.1 Graduate Outputs

Since the NFF was introduced, the number of graduates and enrolments in Master's degrees at public universities has increased overall (see Table 12). During the period 2003–2011, the total number of enrolments in all public universities increased from 43 435 to 48 873, an increase of about 12.5 per cent. The number of graduates also increased, by 21.2 per cent, from 7 501 in 2003 to 9 690 in 2011. Despite an overall increase in the enrolment and graduation of both Master's and doctoral students during the period 2000–2011, the growth was not constant. For example, a significant decrease in the number of Master's enrolments during 2005–2007 led to a decrease in the number of graduates in 2006 and 2007. For doctorates, the number of enrolments decreased slightly in 2008, and graduate numbers decreased significantly in 2001, 2006 and 2008.

Table 12: Enrolments and Graduates with Research Master's Degrees (2000-2011)

Year	Total enrolments	% increase in total enrolments	Total graduates produced	% increase in total graduates produced
2000	31701	-	6096	-
2001	34868	9.99	6478	6.27
2002	39189	12.39	6919	6.81
2003	43435	10.83	7501	8.41
2004	45327	4.36	7890	5.19
2005	44315	-2.23	8018	1.62
2006	42899	-3.20	7883	-1.68
2007	41164	-4.04	7513	-4.69
2008	41711	1.33	7514	0.01
2009	43723	4.82	8112	7.96
2010	46699	6.81	8633	6.42
2011	48873	4.66	9690	12.24

Source: FFC own computations from the Department of Higher Education and Training (2012)

Following the introduction of the NFF, the total number of doctoral enrolments in all public universities increased significantly, by 54 per cent, from 8 315 in 2003 to 12 832 in 2011. The number of doctoral graduates also increased, from 1 045 in 2003 to 1 576 in 2011, which represents an increase of 50.8 per cent. Table 13 shows the doctoral enrolments and graduates in South African public universities during the period 2000–2011.

(see Table 13 on page 50)

Table 13: Doctoral Enrolments and Graduates (2000-2011)

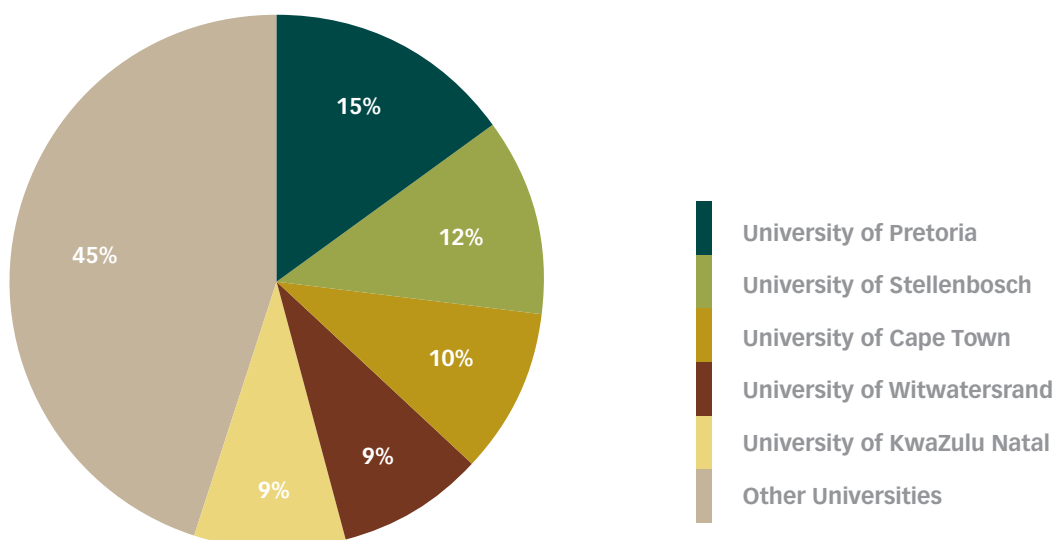
Year	Total enrolments	% annual increase in total enrolments	Total graduates produced	% annual increase in total graduates produced
2000	6423	-	961	-
2001	6996	8.92	897	-6.66
2002	7716	10.29	969	8.03
2003	8315	7.76	1045	7.84
2004	9104	9.49	1104	5.65
2005	9434	3.62	1189	7.70
2006	9828	4.18	1100	-7.49
2007	10048	2.24	1274	15.82
2008	9994	-0.54	1182	-7.22
2009	10529	5.35	1380	16.75
2010	11590	10.08	1421	2.97
2011	12832	10.72	1576	10.91

Source: FFC computations from the Department of Higher Education and Training (2012)

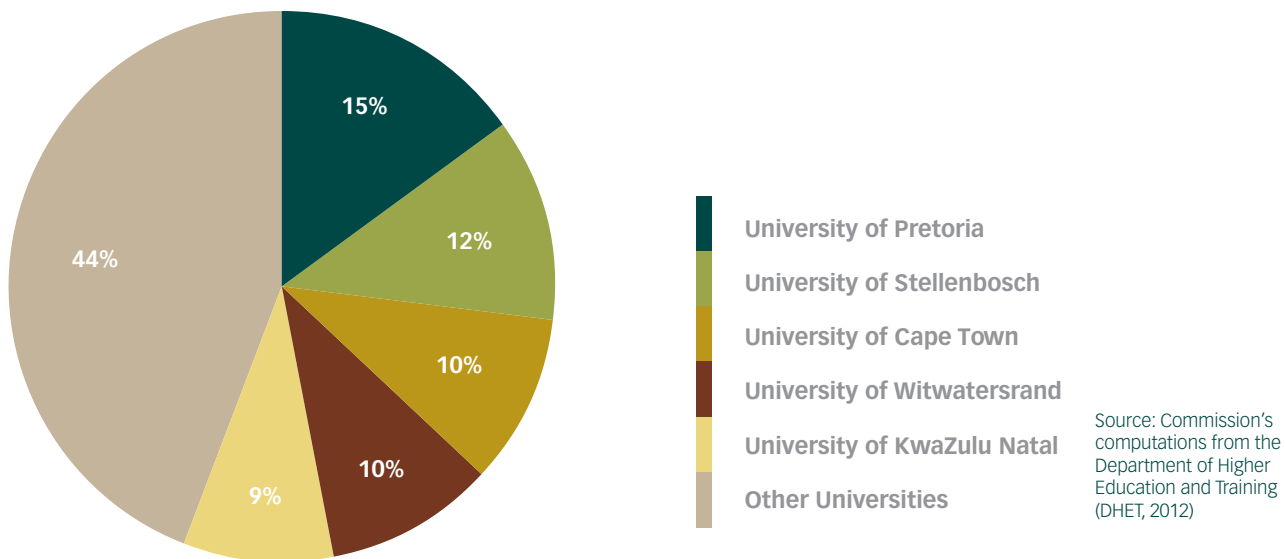
Despite an overall increase in the enrolment and graduation of both Master's and doctoral students during the period 2000–2011, the growth was not constant. For example, a significant decrease in the number of Master's enrolments during 2005–2007 led to a decrease in the number of graduates in 2006 and 2007. For doctorates, the number of enrolments decreased slightly in 2008, and graduate numbers decreased significantly in 2001, 2006 and 2008.

Several factors could have contributed to these fluctuations. (1) During this period postgraduate curriculums were re-aligned, which could have forced some universities to phase out some postgraduate programmes. (2) After merging, universities underwent a period of restructuring and right-sizing, which could have slowed down (to some extent) the recruitment of students and academic staff. (3) The way in which some universities implemented the NFF post-2003. For example, some universities introduced research incentives for accredited publications but failed to give research incentives for successful supervision, which became a disincentive for effective supervision of postgraduate students.

As expected, the top five universities dominate the overall Master's and doctoral research outputs: the universities of Pretoria, Stellenbosch, Cape Town, Witwatersrand and KwaZulu-Natal. Figures 4 and 5 give a breakdown of the contributions of the top five universities, compared with the other universities.

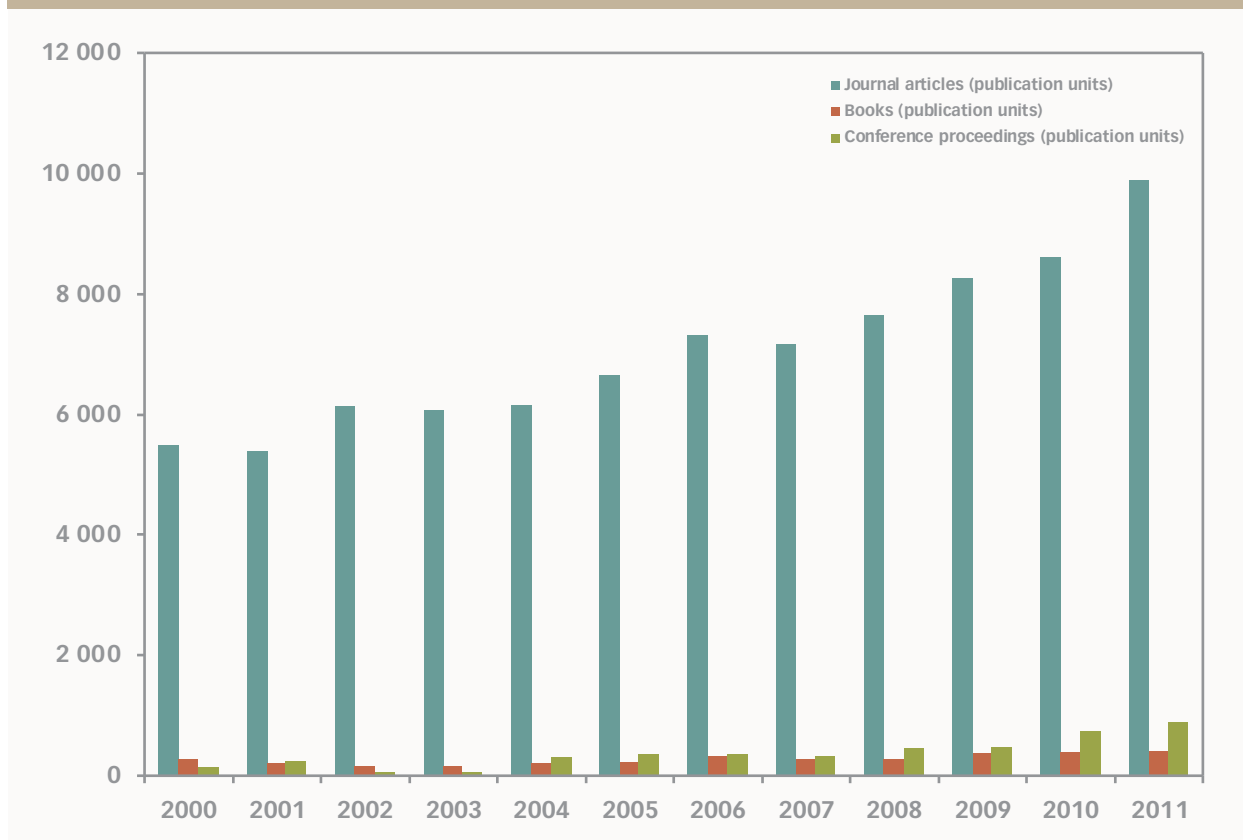
Figure 4: Distribution of Master's Graduates (2000–2009)

Source: Commission's computations from the Department of Higher Education and Training (DHET, 2012)

Figure 5: Distribution of Doctoral Graduates in South Africa (2000–2009)

4.2.2 Publications Outputs

Since the introduction of the NFF, publications in both local and international journals have increased significantly. During the past 12 years, South African public universities produced a total of 90 466 publications. Like for Master's and doctoral students, the top five universities produced the bulk (60.5 per cent) of the publications between 2004 and 2011. The remaining 39.5 per cent of the total outputs were shared among the other 18 universities. Figure 6 shows South African publications outputs, by articles, books and conference proceedings during the period 2000–2011

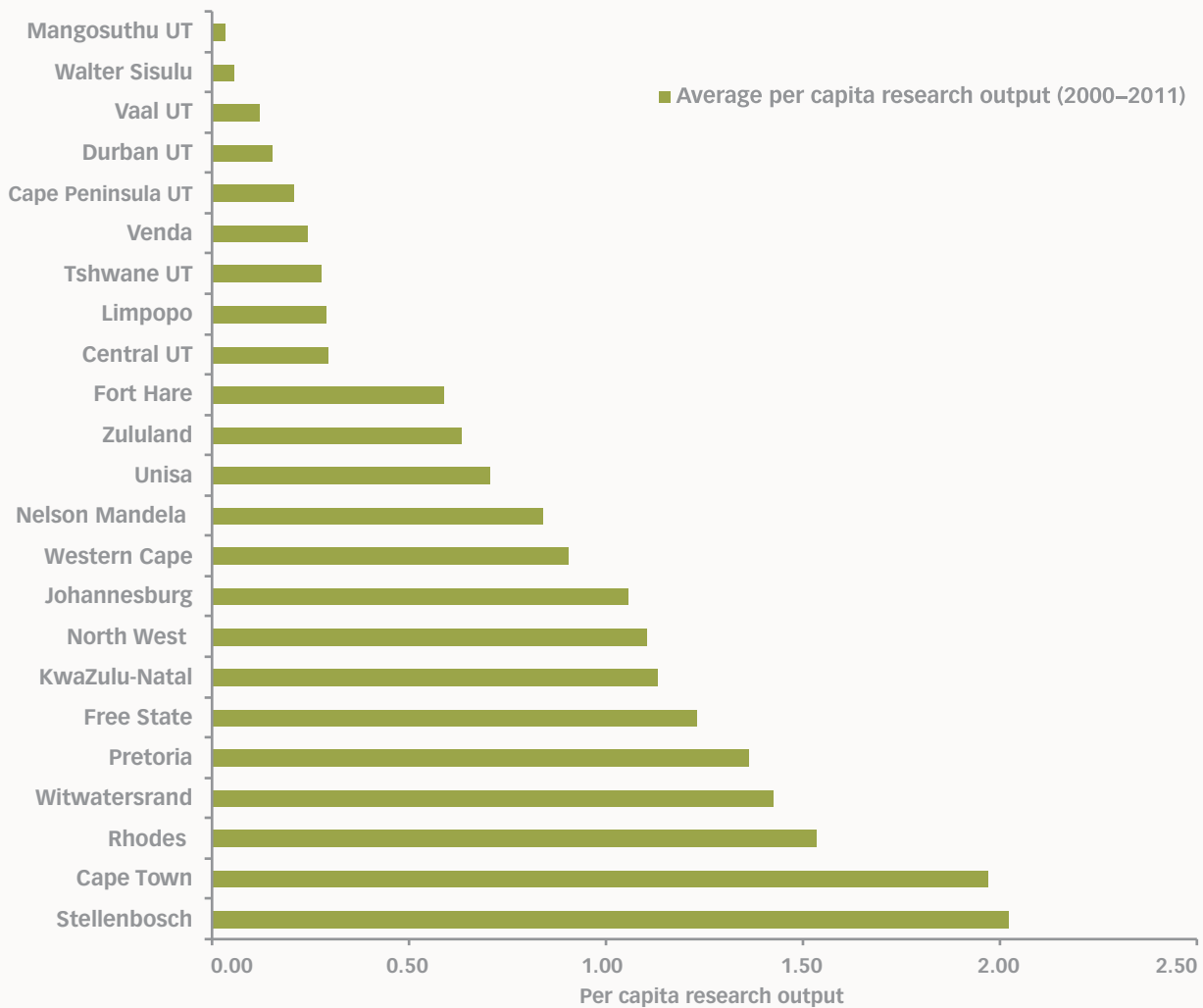
Figure 6: South African Publication Outputs (2000–2011)

Source: Commission's calculations from the DHET information (DHET, 2012)

4.2.3 Total Per Capita Research Output

In terms of per capita output, which is the most reliable indicator for measuring research outputs, the average research outputs of all public universities increased from 0.82 units in 2003 to 1.25 units per capita in 2011²⁰. The research output was consistently higher after the implementation of the NRF, at an average of 1.02 units per capita for the period 2004–2011. This includes outputs from Master's and doctoral graduates, as well as accredited publications. Figure 7 shows the average per capita research output by all public universities for the period 2000–2011.

Figure 7: Per Capita Publication by all South African Public Universities (2000–2011)



Source: DHET (2009; 2012)

4.2.4 International Visibility and Quality of South African Research Outputs

Apart from the significant increase in the quantity of research outputs produced, evidence suggests that the quality of South African publications has also improved since the introduction of the NRF. This is based on, among others, the number of citable documents published in internationally accredited journals, the number of newly National Research Foundation (NRF) rated researchers, and the quality of their ratings. The indicators shown in Table 14 may not be perfect for measuring the quality of these research outputs, but they do give some indication of the rigour of the research outputs.

²⁰ Per capita output, in this case, is measured by the total number of all research outputs produced by a university divided by the total number of permanent academic staff from the same university.

Table 14: Comparison of Indicators 2003/04 and 2011/12

Indicator	2003/2004	2011/2012
Number of citable documents published in Scopus-related journals	5 123	11 505
International ranking	37	35
Number of NRF-rated researchers	1 385	2 471
Number of 'A' rated researchers	50	89

Source: SCImago (2012);
NRF (2012)

4.3 Higher Education Research Expenditure Analysis

4.3.1 Expenditure from the DHET

According to the DHET's NFF, two parameters are used to determine an institution's research grant (Minister of Education, 2004):

- (i) Actual totals of research graduates and research publication units produced by a university during the year n-2; and
- (ii) Total of the research outputs that a university should produce in terms of the national benchmarks.

On the basis of these two parameters, the DHET's annual research grants to higher education institutions are divided into the research output grant and the research development grant. The research output grant – which forms the largest component of the total grant, is distributed to all universities in year n, according to their actual research outputs in year n-2. In contrast, the development grant is only distributed to universities that have underperformed, i.e. have not met their research output targets. The main motivation for introducing this development grant was to cushion universities, which have been underperforming in research (especially the historically disadvantaged universities), from huge subsidy losses occasioned by the introduction of the new funding formula. During the funding migration period (i.e. 2004–2006), the development grant allocated to universities was supposed to be automatically added to their block grants. However, after the migration period, every underperforming university – in terms of research outputs – was expected to submit an application to the DHET to use its research development grant.

Between 2004 and 2012, the DHET spent R14.83 billion on higher education research, of which R13.3 billion (89.7 per cent) was spent on actual research output grants, with the remaining R1.53 billion (10.3 per cent) for research development grants. The total research grant increased from about R1.1 billion in 2004/5 to about R2.4 billion in 2012/13, an overall increase of 118 per cent. Table 15 shows the increases in total research grants for this period.

(See Table 15 on page 54)

The top five universities received the lion's share of the research output grants, which is not surprising because this grant is directly linked to the actual research outputs produced by individual universities. Figure 8 shows the percentage of actual and research development grants allocated to public universities for 2004–2012. Research output targets across public universities (2004–2011)

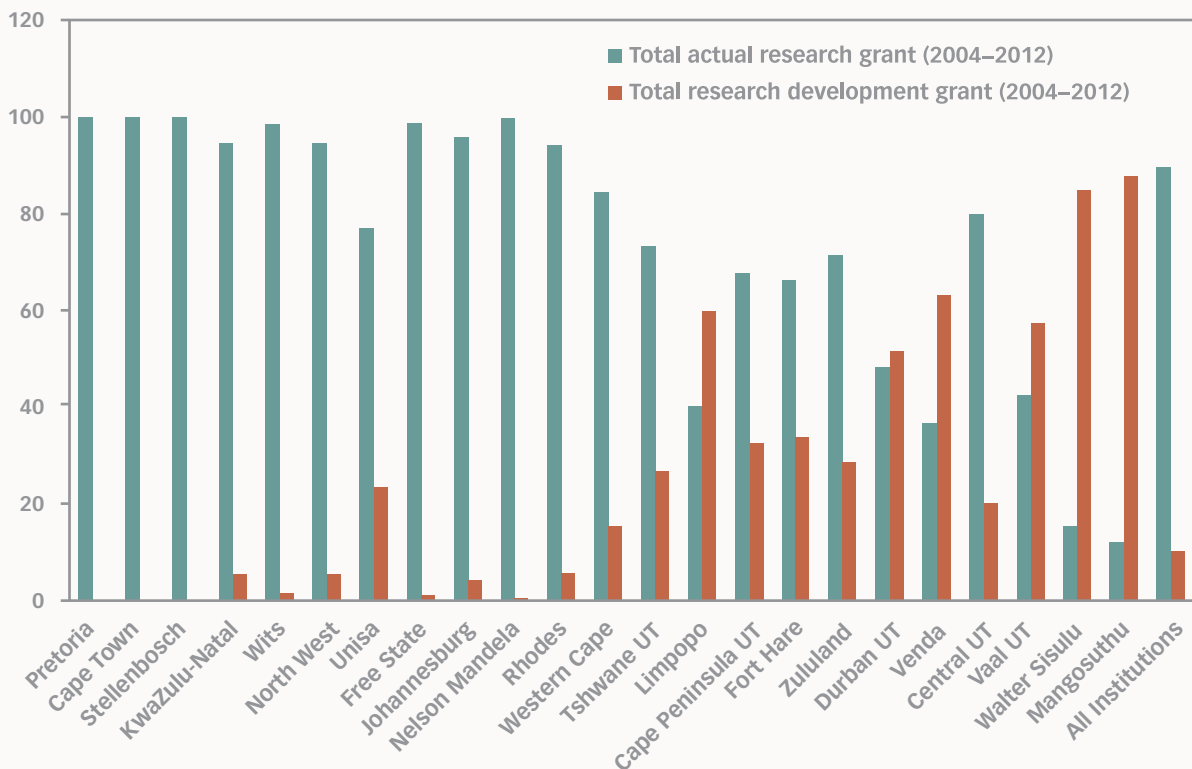
(See Figure 8 on page 54)

Table 15: Increase in Total Research Grants (2004–2012)

	Research output funds (R'000)	Research development grant (R'000)	Total grant (R'000)	% increase
2004/2005	849 966	244 950	1 094 916	-
2005/2006	945 073	222 697	1 167 770	6.65
2006/2007	1 088 087	192 215	1 280 302	9.64
2007/2008	1 236 836	148 364	1 385 200	8.19
2008/2009	1 347 782	174 105	1 521 887	9.87
2009/2010	1 540 604	197 358	1 737 962	14.20
2010/2011	1 836 716	166 281	2 002 997	15.25
2011/2012	2 224 568	6 808	2 231 376	11.40
2012/2013	2 226 579	176 822	2 403 401	7.71
Total	13 296 210	1 529 601	14 825 811	

Source: DHET (2009; 2012)

Figure 8: Actual and Research Development Grants Allocated to Public Universities (2004–2012)

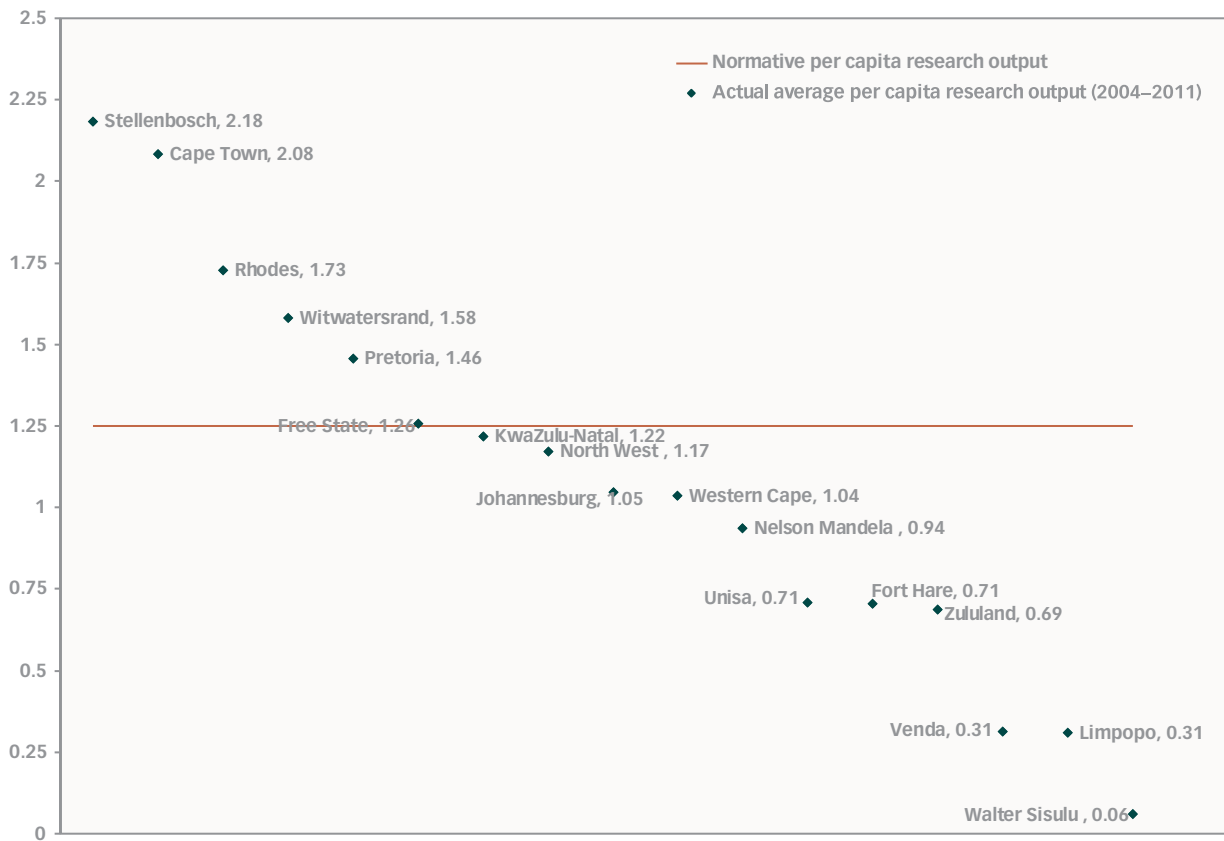


Source: Computed from the DHET Report (2013)

Research output targets across public universities (2004–2011)

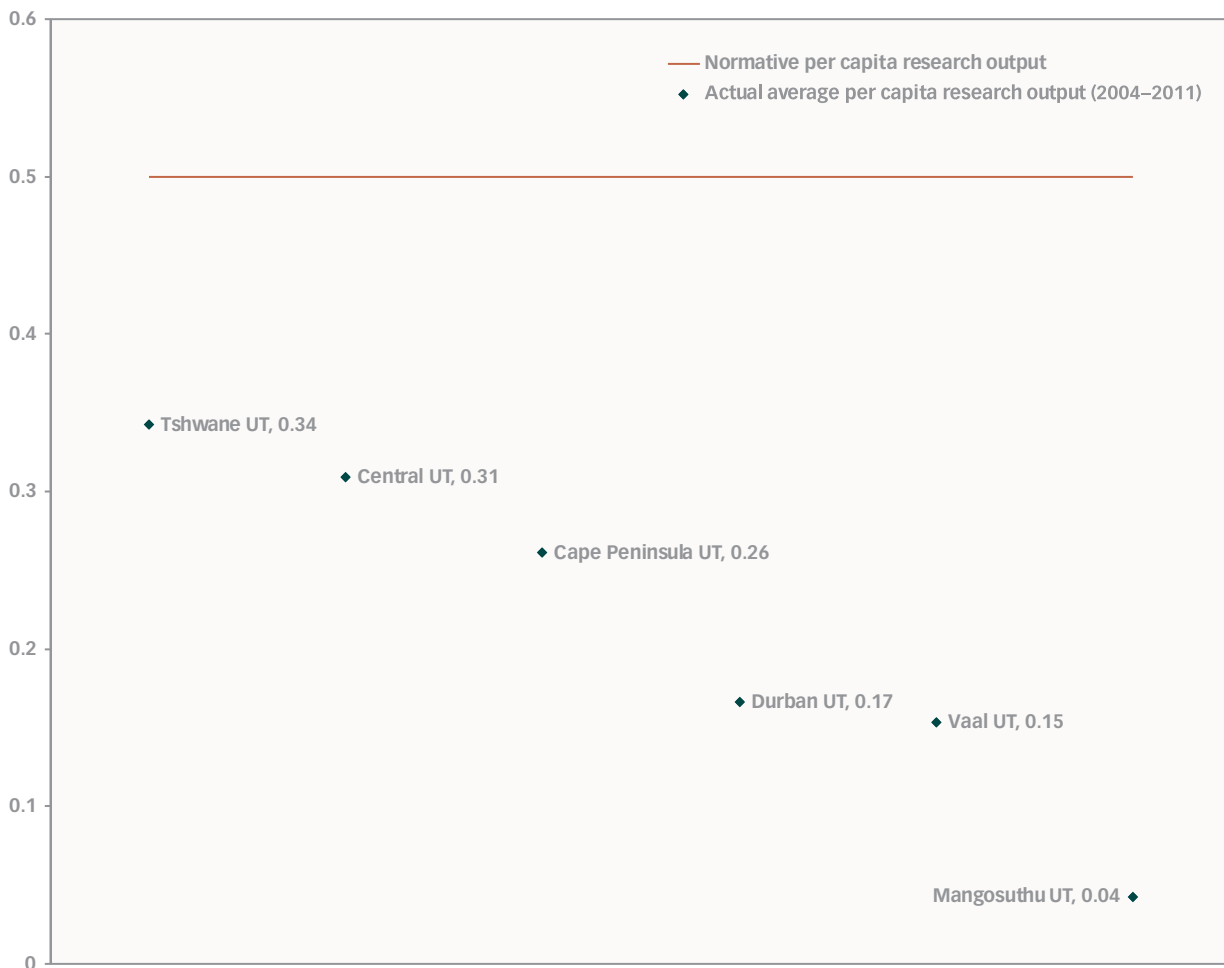
Although the NFF has led to a significant increase in the number of research outputs, the majority of public universities are not meeting their targets. As a result, some universities received a research development grant that was higher than the actual (earned) output grant – a clear indication of their underperformance in research outputs. During 2004–2011, only six out of the 17 public universities produced an average of 1.25 research outputs per capita. These were the University of Stellenbosch, the University of Cape Town, Rhodes University, the University of Witwatersrand, the University of Pretoria, and the University of the Free State. The situation was even worse for the universities of technology, as none of them reached the target of 0.50 research outputs. The best performing universities of technology were the Tshwane University of Technology and the Central University of Technology, with per capita research outputs of 0.34 and 0.31, respectively. Figures 9 and 10 illustrate the deviations of the average per capita research output from the expected normative per capital output, for universities and universities of technology respectively.

Figure 9: Actual Average Per Capita Research Outputs for Universities (2004–2011)



Source: Computed from the DHET Report (2000-2009)
 Note: Per capita research output is computed as: Per capita output = Total research outputs [i.e. M&D graduation units + All accredited publication units]/Total number of permanent academic

Figure 10: Actual Average Per Capita Research Outputs for Universities of Technology (2004–2011)



Source: Computed from the DHET Report (2000-2009)
 Note: Per capita research output is computed as: Per capita output = Total research outputs [i.e. M&D graduation units + All accredited publication units]/Total number of permanent academic

Limitations of the NFF

Although the current research-funding framework is (in all fairness) more transparent and accommodating than most of the previous funding formulas, it is not without its shortcomings. The first, and the most striking, limitation is that the formula does not incorporate the academic rank and/or academic qualification of permanent academic staff into the equation. Yet, research output in the academic fraternity is known to be a function of academic rank and qualification. For example, a junior staff member with an Honours degree may not be able to produce the same research outputs as a full professor with a doctorate. Many universities have linked research output targets expected from academics to academic rank, which depends among other things on the academic qualification. However, the DHET's normative (expected) research outputs remains per academic staff (1.25 units for universities, 0.5 units for the universities of technology, and both 1.25 and 0.5 for comprehensive universities), irrespective of the academic rank of the staff members employed by these institutions.

The second drawback is that the normative output only takes into consideration the number of permanently employed academic staff and does not include contract academic staff. Yet, some institutions, especially the historically disadvantaged institutions, rely partly on contract staff. These performance-based teaching contracts may be as long as five years and renewable multiple times. As a result, these institutions' total normative research output is reduced by the formula, which negatively affects their research development grant.

The third shortcoming is that the development research grant is a residual grant that depends on the number of actual publications produced by all universities, as well as the DHET budget allocation to the higher education sector. This makes the output-based research grant uncertain, unreliable and unpredictable. Moreover, since the research development grant is usually allocated after the actual research output grant has been distributed, the DHET might run short of these funds when many universities, especially the historically advantaged institutions, exceed their normative targets.

4.3.2 Expenditure from the Department of Science and Technology

Apart from the funding received from the DHET, higher education institutions also receive funding for research from the DST. The DST also funds research at national research councils and other public entities, with the aim of enabling these institutions to train scientists, engineers and technologists, and to produce publications and patents. About 60 per cent of the DST's budget goes to public entities, but the greatest portion of the DST expenditure on research and development is geared to the natural, medical and health sciences.

Unlike the DHET, which provides funding directly to universities based on their actual and normative outputs, the DST channels the bulk of its research funding to higher education institutions through the NRF.

The National Research Foundation

In 1998 the NRF was established through the National Research Foundation Act (Act No. 23 of 1998), following a review conducted for the former Department of Arts, Culture, Science and Technology. The main goals of the NRF are to: (i) promote internationally competitive research as a basis for a knowledge economy; (ii) grow a representative science and technology workforce in South Africa; (iii) provide cutting-edge research, technology and innovation platforms; (iv) operate a world-class evaluation and grant-making system; and (v) contribute to a vibrant national innovation system. The bulk of the NRF funding is directed towards supporting academic research, developing high-level human resources, and supporting the nation's national research facilities.

The current mandate of the NRF is to: (i) build research-capable human capacity within the country; (ii) to support the advancement of key fields of study; and (iii) to address priority areas of socioeconomic development. However, unlike the DHET, the bulk of the NRF research funding is provided on a competitive basis and uses a peer-review system to arrive at decisions. Table 16 shows NRF investment in strategic pipeline programmes during 2009/10–2011/12.

Table 16: NRF Funding to Strategic Pipeline Programmes (2008/9–2011/12)

R'million				
	Sep-08	Oct-09	Nov-10	Dec-11
Studentship support	183.2	183.53	307.34	223
Thuthuka PhD track	5.65	4.90	4.18	5
Postdoc	23.09	27.41	48.30	40
Thuthuka Post-PhD track	2.38	1.96	2.41	6
Thuthuka rating track	5.67	5.98	5.75	6
Competitive funding (un-rated researchers)	-	3.02	5.21	5
Incentive Funding for rated researchers	10.50	44.41	70.98	84
Competitive funding for rated researchers	-	-	5.10	15
Blue-sky research	-	2.92	3.54	8
SARChI programme	100.01	108.43	141.43	156
Centres of Excellence (CoE)	51.15	63.84	68.77	72
Total	381.65	446.4	663.01	620

Source: NRF Annual Performance Plan (2012); NRF Annual Report (2012)

4.3.3 Expenditure from the Department of Health

The Department of Health (DoH) is another key government department that funds research in higher education institutions. However, unlike the DST and the DHET, the DoH provides research funds to benefit mainly medical institutions, with the bulk of these funds disbursed through the Medical Research Council (MRC).

The Medical Research Council (MRC)

Legislated in 1991, the main objective of the MRC is to promote the improvement of the health and the quality of life of the population of South Africa, through research, development and technology transfer (MRC, 2012). The MRC has four strategic goals: (i) to promote health and the quality of life through research; (ii) to promote health and the quality of life through innovation, technology development and transfer; (iii) to collaborate with sub-national, national, supra-national and global partners to improve health outcomes for South Africans and citizens of collaborating partners; (iv) to improve organisational performance as a health research organisation (MRC, 2012).

Apart from supporting collaborative research by universities with the capacity and infrastructure to conduct medical research, the MRC also provides research grants to individual researchers on a competitive basis. This is currently facilitated through a research programme known as self-initiated research (SIR) grants. These grants are mainly allocated to health-related research and made available to researchers at higher education institutions and, to some extent, other research institutions, such as the National Health Laboratory Services, the National Institute for Communicable Diseases and the National Institute for Occupational Health (MRC, 2011; 2012). Table 17 shows the SIR grants made between 2007/08 and 2011/12.

(Please see Table 17 on page 58)

Table 17: SIR Grants from the MRC (2007/8 – 2011/12)

Year	Annual SIRs grants	Percentage increase
	R'million	
Aug-07	12.55	-
Sep-08	14.7	17.1
Oct-09	15.9	8.2
Nov-10	16.9	6.3
Dec-11	18.8	11.2
Total	78.85	

Source: Computed from MRC Annual Report (2012)

In 2011/12, grants worth R18.80 million supported a total of 158 researchers, an increase from 139 researchers in 2010/11.

4.4 Conclusion

Since the implementation of the NFF in 2004, the number of Master's and doctoral enrolments and graduates has increased overall, and the number of publications from South African public universities has also increased significantly. Also of note is the increase in citable documents published by South African researchers in international and local journals, the improvement in the country's international research ranking and the increase in the number of NRF-rated researchers.

Although, many South African higher education institutions have increased significantly their research outputs, the majority of these institutions have not been able to meet their per capita targets. In fact, between 2004 and 2012, only six out of the 17 universities met or surpassed the target of 1.25 research outputs per capita, while none of the universities of technology met their target of 0.5 units per capita. This suggests that the targets set by the DHET in 2004 were too high for some institutions, especially historically disadvantaged universities.

Although universities that fail to meet their targets receive research development grants based on the shortfalls, the study found that the research development grant in its present form is a very unreliable and unpredictable subsidy. This is because the research subsidy is a residual grant that depends on the number of actual publications produced by all universities and the DHET budget allocation to the higher education sector. Moreover, since the research development grant is usually allocated after all the actual research output grants have been distributed, the DHET may run short of these funds, when many universities, especially the historically advantaged institutions, exceed their normative targets.

4.5 Recommendations

With respect to **financing research in higher education**, the Commission recommends a review of the current funding framework for higher education and that the DHET:

- Redesigns and allocates specific funds in the MTEF budget to the research development plan.
- Reassesses the appropriateness of targets and, if necessary, adopts different targets for each university/university of technology.
- Revises the formula used to calculate research outputs to take into consideration the profile (rank and qualification) of academic staff at the universities.