



High-level key results

National Survey of Research and Experimental Development (2009/10 Fiscal Year)



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Preface

The National Survey of Research and Experimental Development (R&D) provides information on R&D funding and performance in South Africa. The survey collects data on flows of R&D funding by various sources, the level of expenditure on R&D performed by institutional sectors as well as data on human resources devoted to R&D. The data helps to profile the size and shape of the South African R&D landscape and supports the production of statistics for use in system-level planning, monitoring and evaluation.

Undertaken annually, the survey has become a regular feature of South Africa's science and technology landscape.

The 2009/10 R&D survey recorded that South Africa's Gross Expenditure on Research and Development (GERD) amounted to R20.9 billion, a nominal decrease of R86 million from the R21.0 billion recorded for 2008/9. With the GERD as a percentage of Gross Domestic Product (GDP) at 0.87%, the findings indicate a third consecutive decline in the ratio, from 0.93% in 2007/8 and 0.92% in 2008/9.

It is the first time over the past decade that the survey recorded a nominal decline in overall R&D expenditure. A decline of 9.7% in business sector R&D expenditure, a significant contributor to R&D investment, is the primary driver of this trend. Notwithstanding an overall increase of just over R 1.1 billion in expenditure within the public sector (i.e. government departments, higher education and science councils), this was not adequate to offset the decline of R1.4 billion in the business sector R&D and the not-for-profit sector expenditures.

At another level, these findings mirror the global trends of slowing growth in R&D investment in many parts of the world in the years 2009 to 2010 as a result of the global financial crisis. Further analysis indicates that South Africa, when compared to countries such as China, India, Brazil and other newly industrialised countries in the Asian continent, did not capture a large enough share of the shifting global R&D investments favoring developing countries, which have been unfolding over the past decade. The current focus of public policy to scale up

investment in boosting the human resource base for science, engineering and technology, enhancing and improving publicly-funded scientific facilities and creating the necessary conditions and incentives for encouraging private sector and international R&D investment should support efforts to increase overall levels of R&D investment in South Africa.

While GERD as a percentage of GDP is an important measure of any country's move towards a more knowledge based economy, it should be noted that it does not measure the quality, relevance and impact of research conducted in a country. South Africa, despite the challenge of declining expenditure on research and development, has made impressive advances in scientific research during the last few years. These include:

- biomedical stem cell technology, which is the first of its kind in Africa and has the ability to grow stem cells that allows the researchers to investigate and understand disease.
- information security (Fingerprint technology), which is the first in the world structural fingerprint classifier

that is able to correctly classify a fingerprint with only partial information from databases of millions of fingerprints at a very high speed.

- HIV/AIDS vaccine, where researchers discovered an antibody that is capable of killing a wide range of HIV strains.

We extend our appreciation to the Human Sciences Research Council's Centre for Science, Technology and Innovation Indicators project team for their efforts in conducting this survey each year, and the support of Statistics South Africa in recommending statistical quality control measures that will be used to certify the results of this survey. A special word of thanks goes to all the survey respondents, in government, the higher education sector, science councils, not-for-profit sector and the business sector, who gave their time so readily to make this survey a success.



Derek Hanekom
Minister of Science and Technology

Note on Methodology

This publication comprises the high-level key result of the 2009/10 Research and Experimental Development (R&D) Survey. This survey follows the Frascati Manual Guidelines developed by the Organisation for Economic Co-operation and Development (OECD). These guidelines provide best practice advice on how to define research and experimental development and the boundaries between the different R&D performers.

The 2009/10 R&D Survey comprised a census across higher education institutions, government and science councils, and purposive sample surveys across not-for-profit organisations and the business sector. In keeping with previous practice, state owned enterprises that sell their goods or services at market prices are included in the business sector.

The R&D Surveys are a component of Official Statistics and protected under the Statistics Act No. 6 of 1999. This imposes strict requirements on the survey regarding the confidentiality of responding organizations.

The Department of Science and Technology (DST), Statistics South Africa (Stats SA) and the Human Sciences Research Council (HSRC) reserve the right to collaboratively revise data, indicators and analyses, if deemed necessary, to improve the quality of this product. Revisions of data may arise from both internal and external data quality and consistency checks or amendments. Revisions to this publication may also result from changes in external data such as Stats SA revisions of national data series, for example Gross Domestic Product (GDP) estimates.

The full results of the 2009/10 R&D Survey are available at:
<http://www.dst.gov.za/index.php/resource-center/rad-reports>

More detailed data extracts beyond the above and that conform to the required standard of confidentiality are available on request to HSRC CeSTII.

Table 1

Key Figures

INDICATOR	VALUE	
	2008/09	2009/10
Gross Domestic Expenditure on R&D - GERD (Rand Millions)	21 041.0	20 954.7
Gross Domestic Product (GDP) at market prices (Rand Millions)	2 283 822	2 395 967
GERD as a percentage of GDP	0.92	0.87
Civil GERD as a percentage of GDP	0.87	0.82
Total R&D personnel (FTE) ^a	30 801.5	30 891.3
Total researchers (FTE) ^b	19 384.3	19 793.1
Total researchers per 1000 total employment (FTE)	1.4	1.5
Total R&D personnel per 1000 total employment (FTE)	2.2	2.3
Total researchers (headcount)	39 955	40 797
Female researchers as a percentage of total researchers ^b	39.7	40.8

Source: 2008/09 Stats SA P0441. GDP: 2nd Quarter 2010 (most recent data available at the time when the figure was calculated). 2009/10 Stats SA P0441. GDP: 1st Quarter 2011 (most recent data available at the time when the report was compiled).

^a FTE = Full Time Equivalent

^b Following OECD practice, doctoral and postdoctoral students are included as researchers

Gross Domestic Expenditure on R&D (GERD) comprises research and experimental development (R&D) undertaken by the business enterprises, not-for-profit, government including science councils, and the higher education sectors. The 2009/10 R&D expenditure was at R20.955 billion, which represented a decrease of R86 million from the R21.041 billion recorded in 2008/09. GERD increased annually over the years prior to 2009/10. Considering the trend from 2001, the 2009/10 reference year is the first year to register a decrease in GERD, which amounted to -0.4% from the previous year.

Note: National R&D surveys were not undertaken in 1995 and 1999. Surveys were conducted on a biennial basis between 2001 and 2003. Since 2003, the National R&D survey is being undertaken on an annual basis.

Figure 1

Gross Domestic Expenditure on R&D (GERD): (South Africa, 1991/92 - 2009/10)



GERD/GDP ratio is used to indicate the intensity of R&D in the economy, an important aspect of national competitiveness. GERD accounted for 0.87% of GDP in 2009/10 which is a decrease from 0.92% recorded in 2008/09. This marked a third consecutive decrease in the R&D intensity since 2007/08.

Business expenditure on research and experimental development (BERD) decreased by 9.7% and this had a pronounced impact on GERD. Expenditure on R&D in higher education and science councils increased by 4.3 and 1.5 percentage points respectively but this was not sufficient to sustain the overall growth in GERD.

Source: Statistics South Africa P0441 Gross Domestic Product, First Quarter 2011.

Figure 2

GERD as a percentage of GDP (South Africa, 1991/92 - 2009/10)



Table 2

GERD of selected countries in billion current PPP\$

	GERD (billion current PPP\$)		
	2007	2008	2009
Sweden	10.8	11.7	10.8
Finland	6.2	6.6	6.4
Japan	139.3	137.7	125.8
Korea	38.9	41.7	44.3
United States	355.5 ⁱ	371.8 ⁱ	366.0 ⁱ
Total OECD*	856.6 ^b	887.0	872.6 ^{bp}
Australia	..	17.6	..
France	40.6	41.4	42.8
Total EU-27	250.9 ^b	262.8 ^b	262.9 ^{bp}
China	96.3	111.2	140.6
Spain	16.2	17.4 ^a	17.2
Russian Federation	22.2	21.9	24.2
South Africa	4.2	4.3	4.3
India**	24.8
Argentina***	2.2	2.5	3.5

By comparison, South Africa's level of R&D as a percentage of GDP (or R&D intensity) remained higher than that of many developing countries but lagged behind that of advanced economies. The average R&D intensity of the OECD countries was 2.4% in 2009. Within the OECD, countries such as Denmark, Finland, South Korea, Japan and Sweden recorded R&D intensity of above 3%. South Africa is amongst a few developing countries that have achieved ratios of GERD that are close to 1% of their GDP. With GERD of US\$4.6 billion, South Africa contributed about 0.4% to global R&D expenditure by 2008. The country has been growing its share of global R&D expenditure relatively slower than developing countries such as China, Russia and India*. In China, the R&D intensity increased to 1.7% in 2009.

Source: OECD Main Science and Technology Indicators, (2011/01 Edition); Argentina-RICYT, India-NSTMIS. *UNESCO Institute for Statistics Science Report 2011.

OECD Notes

^a Break in series with previous year for which data is available.

^b Secretariat estimate or projection based on national sources.

ⁱ Excludes most or all capital expenditure.

^p Provisional.

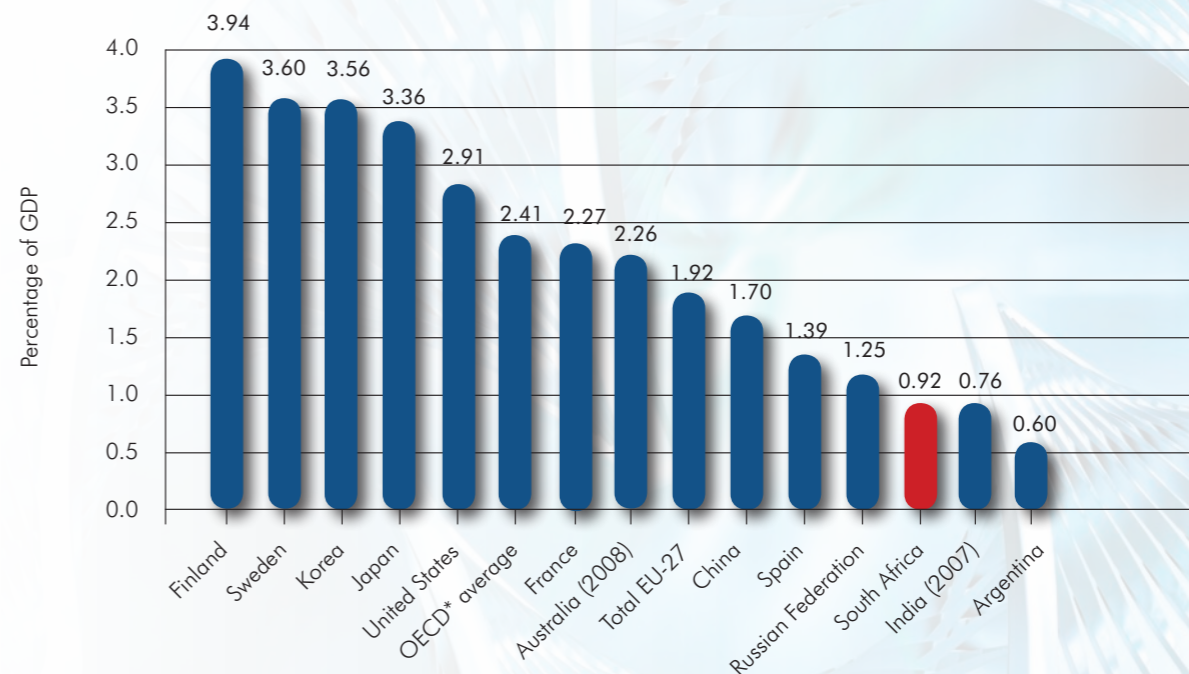
* Organisation for Economic Cooperation and Development

** Data from UNESCO Institute for Statistics

*** Data from RICYT, Argentina

Figure 3

GERD as a percentage of GDP for selected countries (2009 or latest year available)

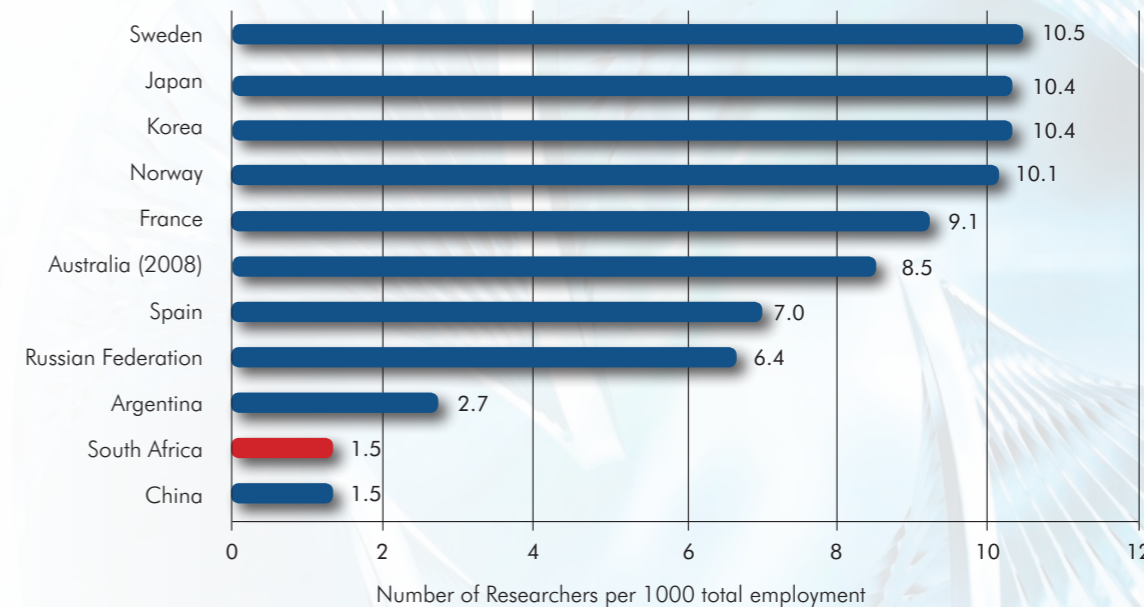


In 2009/10 South Africa had 1.5 FTE researchers per 1 000 total employed. This indicator for human resource potential for research has remained static over the past five years. South Africa has a lesser proportion of researchers in its workforce compared to advanced countries such as Sweden, Norway and Japan that had on average 10 researchers per 1000 employed. At this level, South Africa is on par with China except that China has a significantly larger headcount of researchers. Argentina on the other hand fared better than South Africa and China with 2.7 researchers per 1 000 total employed.

Source: OECD Main Science and Technology Indicators, (2011/01 Edition); Argentina-RICYT

Figure 4

Number of Full Time Equivalent (FTE) researchers per 1000 total employment (international comparison), (2009 or latest year available)

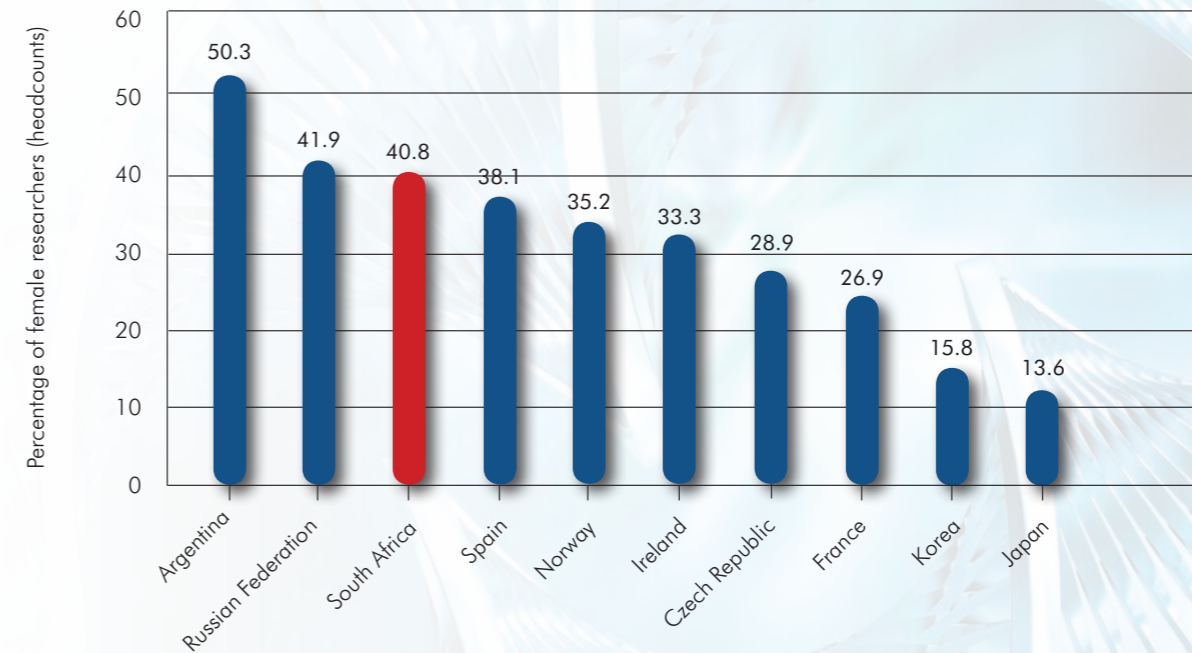


The number of female researchers as a percentage of total researchers in South Africa increased by 1.1 percentage points from 39.7% in 2008/09 to 40.8% in 2009/10. South Africa is amongst the leading countries which have high proportions of female researchers within its researcher workforce. It compared favourably with countries such as the Russian Federation and Argentina, which had 41.9% and 50.3% of female researchers respectively.

Source: OECD Main Science and Technology Indicators, (2011/01 Edition). Argentina-RICYT

Figure 5

Female researchers as a percentage of total researchers (headcount) 2009 or latest year available



The higher education sector was the largest employer of researchers among the sectors employing 28 552 researchers (or 70.0% of the total researchers in South Africa) during 2009/10. The postdoctoral and doctoral students made up 40.4% of the researchers in the higher education sector. The business sector was the second largest employer of researchers, employing 20.5% of the total researchers, followed by the government sector with 3 655 (9.0% of total) researchers in 2009/10.

About 74.9% of all the female researchers are employed in the higher education sector. This is followed by the business sector, with 15.3%. The remaining 9.8% are in government, science councils and not-for-profit sectors.

Source: South African National Research and Experimental Development Survey 2008/09 and 2009/10.

Figure 6

Number of male and female researchers (Headcounts) per sector (South Africa, 2009/10)

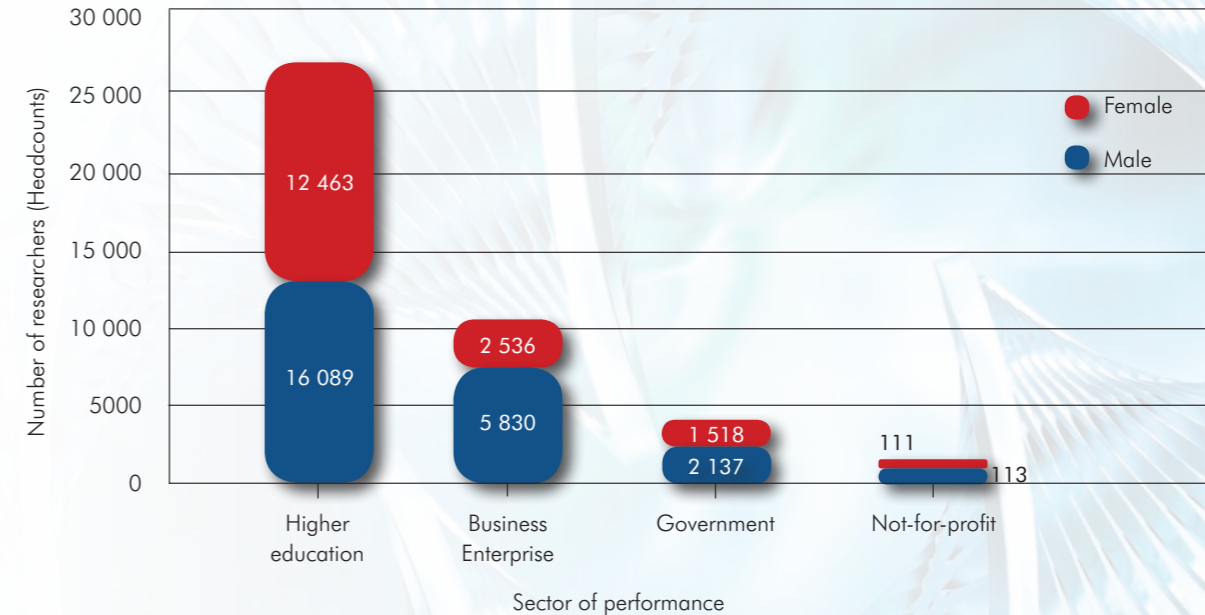
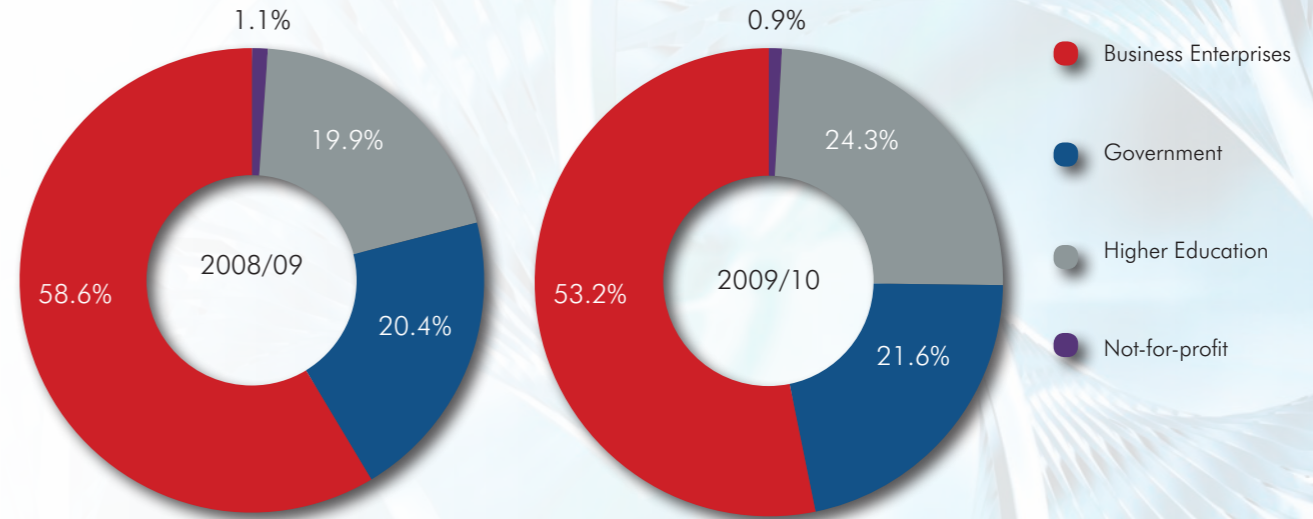


Figure 7

R&D expenditure by sector of performance (South Africa, 2008/09 and 2009/10)

The business sector performed 53.2% of GERD in 2009/10. Despite the proportionate decrease from 58.6% that was recorded in 2008/09, the business sector remained the largest performer of R&D in South Africa. Higher education's share rose to 24.3% from 19.9% in 2008/09 while the government's share increased from 20.4% in 2008/09 to 21.6% in 2009/10. The not-for-profit sector's share of R&D performance dropped from 1.1% of the total in 2008/09 to 0.9% in 2009/10.

Source: South African National Research and Experimental Development Survey 2008/09 and 2009/10



- Business Enterprises
- Government
- Higher Education
- Not-for-profit

Government was the largest source of domestic funds for R&D in South Africa in 2009/10, contributing 44.4% (R9.313 billion) of the total funding. The government sector, higher education and science councils received 84.2% of the total government funding while the business sector received 15.4% of this funding. The business sector was the second largest funder of R&D, financing 42.5% of all R&D performed in the country. Business sector financed 91.4% of its own R&D activities and 8.2% of funds from this sector supported R&D performed in government, higher education and science councils. Foreign funding of R&D increased from R2.394 billion in 2008/09 to R2.538 billion in 2009/10 and the business sector received 60.6% of this funding.

Source: South African National Research and Experimental Development Survey 2009/10

Figure 8

Major flows of funding for R&D (South Africa, 2009/10) (R millions)

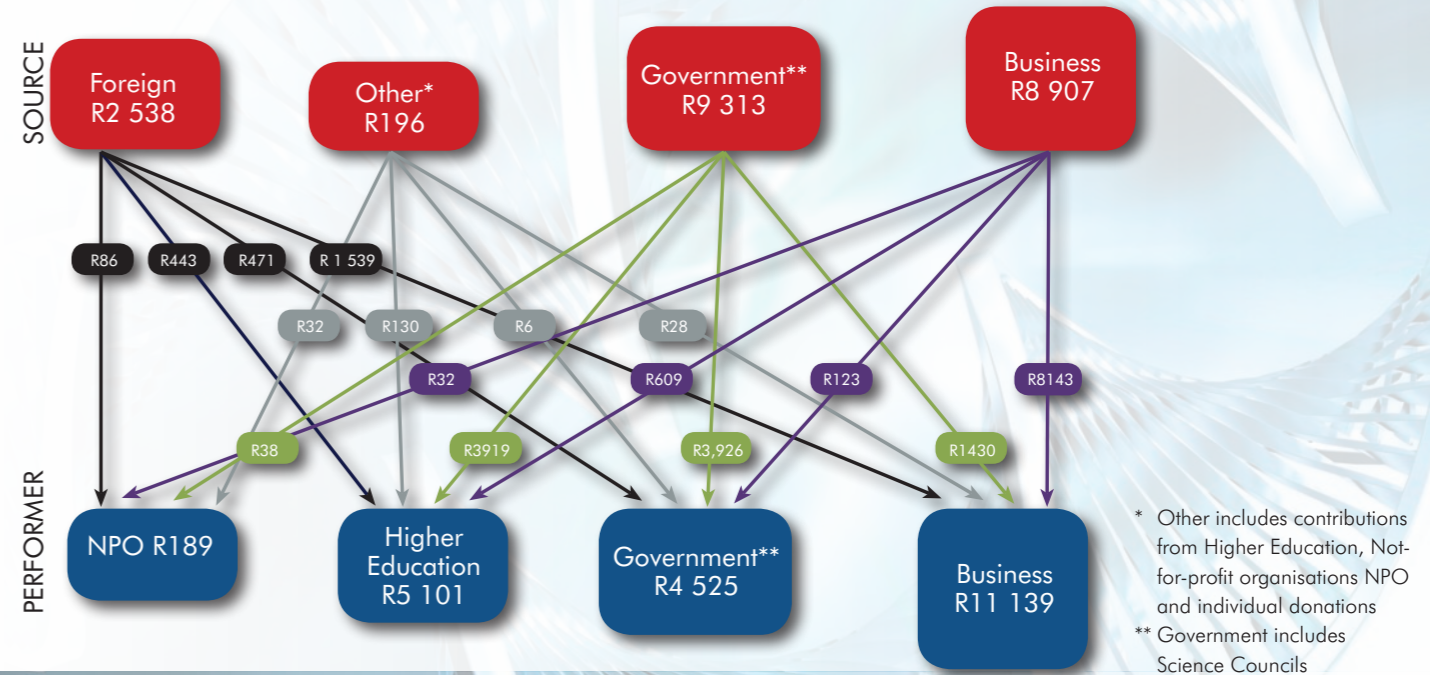


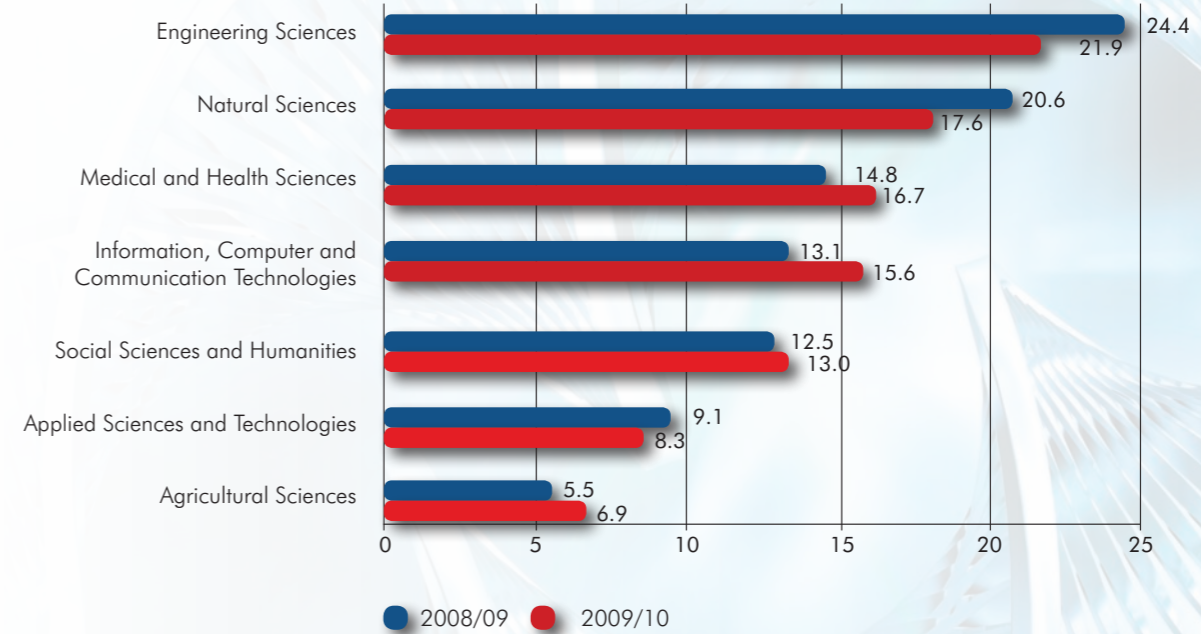
Figure 9

GERD by major research field (percentage), South Africa, 2008/09 and 2009/10

The proportion of expenditure in the fields of Medical and Health Sciences, ICT, Social Sciences and Humanities, and Agricultural Sciences showed increases, while there were declines in the Engineering Sciences, Natural Sciences, and Applied Sciences compared to the 2008/09 survey. The fields of engineering sciences, natural sciences and medical and health sciences constituted the dominant scientific fields for South Africa's R&D activities in 2009/10.

Source: South African National Research and Experimental Development Surveys 2008/09 and 2009/10

ICT - Information and Communication Technology

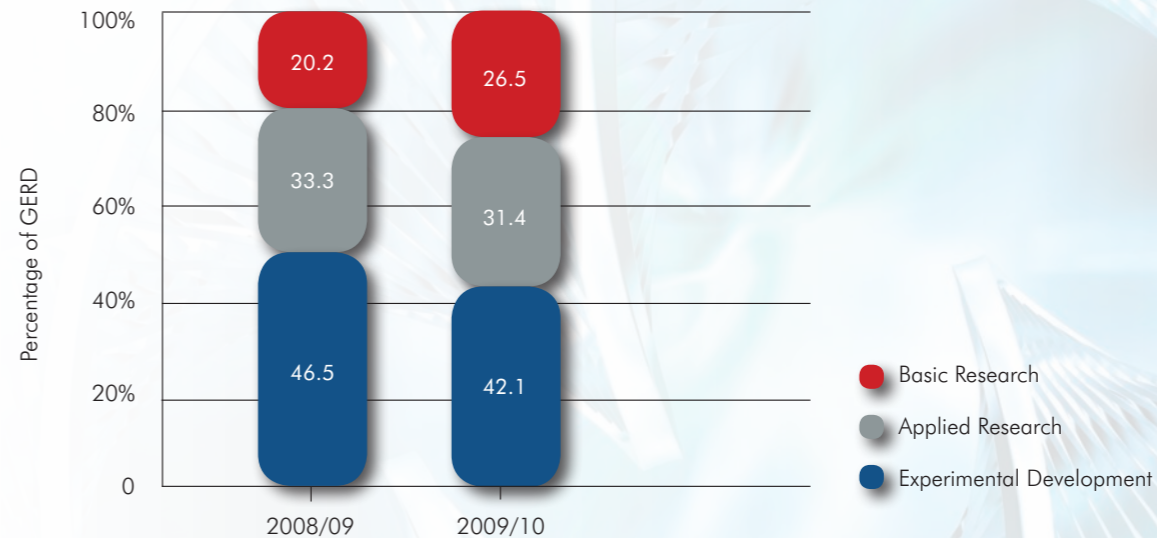


R&D expenditure on experimental development accounts for the largest portion of expenditure comprising 42.1% in 2009/10, though it is a decrease compared to the 46.5% reported in the 2008/09 survey. The other categories of GERD in 2009/10 comprise 31.4% on applied research and 26.5% spent on basic research.

Source: South African National Research and Experimental Development Surveys 2008/09 and 2009/10

Figure 10

GERD by type of R&D (South Africa, 2008/09 and 2009/10)

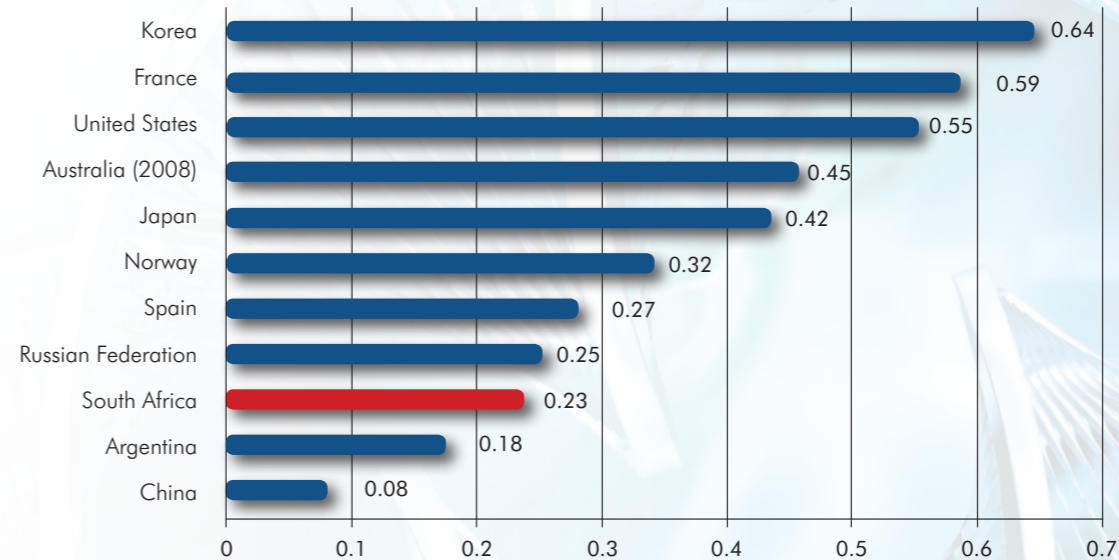


South Africa spent R5.5 billion in basic research in 2009/10. This translates to 0.23% of GDP of the same year, which is low compared to most of the advanced economies but higher than that of developing countries such as China and Argentina. Basic research expenditure as a percentage of GDP in South Africa increased from 0.19% in 2008/09 to 0.23% in 2009/10.

Source: OECD Main Science and Technology Indicators, (2011/01 Edition). Argentina-RICYT

Figure 11

Basic research expenditure as a percentage of GDP (2009 or latest year available)





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