HSRC Human Sciences Research Council

policy brief

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February 2015

Trends in research and development expenditure in South Africa (2010–2013): Policy implications

Executive summary

Fostering and supporting high levels of expenditure on research and development (R&D) activity is an established and critical component in the efforts of countries to enhance their global competitiveness. The economic and science and technology policy community has adopted the R&D intensity ratio, which measures gross domestic expenditure on R&D (GERD) as a percentage of gross domestic product (GDP), as an indicator of the extent of support for R&D. In recent economic policy statements, the government of South Africa has set a target of achieving an R&D intensity ratio of 1.5% by 2019 and suggests that this is necessary as a contribution to achieving key developmental objectives. This is an ambitious target, particularly because in recent years R&D intensity has remained sluggish. For example, in 2009 GERD fell in both nominal and real terms. This coincided with a fall in R&D intensity, which despite recent recovery remains well outside the range of the new target. The pattern of declining R&D intensity in South Africa is mirrored by several other countries including Russia (one of the Brazil, Russia, India, China and South Africa (BRICS) grouping) and other members of the Organisation for Economic Cooperation and Development (OECD) grouping. However, South Africa has experienced a more pronounced slump than many comparator countries.

This policy brief seeks to present the trends in R&D expenditure drawing on data derived from the national R&D survey and will discuss the policy implications that may arise from these trends.

As the data will show, the continued decline in GERD is primarily due to decreased expenditure on R&D by the business sector. The 2009 decline was due to a drastic cutback by the South African business sector – including state-owned enterprises (SOEs) – in their investments in R&D. Respondents to the R&D survey suggest that these cutbacks were made in response to the global economic downturn, which sharply affected the South African economy. However, long-term trends suggest that there has been a more persistent declining share of the contribution of business to total spending on R&D over a decade.

The other R&D active sectors, such as higher education, have conversely experienced good growth in spending and related production of knowledge capital. Government-financed R&D in science councils has also increased steadily between 2007 and 2010. The differentiated rates of growth also mean that South Africa faces a challenge in terms of the capacity of the private sector to absorb the highly qualified personnel coming into the system.

Policy implications arising from these trends include a continuing need for the Department of Science and Technology (DST), as the lead actor in government, to maintain or increase levels of investment in the higher education and science council sectors where government has direct control, and to identify effective measures to encourage and support R&D investment in the private sector. The menu of options for the latter includes support for, and expansion of, the R&D tax incentives as well as measures to support funding of R&D.

Background

R&D activities are a well-known mechanism for knowledge production and the generation of new ideas. R&D plays an important role in innovation and economic development. The economic outputs produced through R&D include new goods and services; ancillary direct outputs such as research publications, patents and other forms of intellectual property (IP) protection; and indirect outputs that may be embodied in graduate students or researchers. These economic outputs, direct and indirect, contribute to and can be accounted

for as part of the economic output of a country through the national accounting system, which uses GDP as an indicator of economic size.

Nations use a number of key indicators to measure R&D activity, including GERD and the R&D intensity ratio. In recent times, the attention paid to investigating the economic impact of R&D has increased significantly, with the result that the most recent revision of the System of National Accounts has incorporated changes in how R&D is treated. In particular, national accountants are now required to treat expenditure on R&D as capital formation (EC et al. 2009) instead of intermediate consumption as in the past (EC et al. 1993). These schemas define research and experimental development as comprising 'creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications' (OECD 2002: 30). This development explicitly links the level of R&D expenditure to the future economic success of a nation. It also elevates GERD as a percentage of GDP to the level of a key economic indicator of R&D intensity that is arguably on a par with GDP growth, the inflation rate and the rate of unemployment in its importance to policy-makers in the economic cluster.

The importance of R&D expenditure and the expectations for these investments to enhance development prospects have coincided with or led to an expansion in the number and range of countries that are focused on science and technology policy and technology-led growth strategies. In the past, high levels of R&D investment were mainly associated with developed countries; however, in the last two decades developing countries such as Brazil, India and China have significantly increased their national investment in R&D.

Viewed over the 16-year period 1997/98–2012/13, South Africa's investment efforts in R&D have been laudable and have expanded. This expansion can be attributed to the implementation of the 1996 White Paper on Science and Technology, the 2002 National Research and Development Strategy, and the 10-year innovation plan for South Africa (2008–2018). These strategic frameworks have purposefully guided the government in steadily increasing its funding for R&D over time, understanding that achieving substantive technical progress requires long-term government commitment. By continuing to invest in R&D, despite the pressures on the fiscus during and after the period of the economic crisis, the government has sent important signals about its commitment to making South Africa a competitive nation. South Africa's 10-year innovation plan, Innovation Towards a Knowledge-Based Economy (DST 2008), outlines five 'grand challenges', namely:

- the Farmer to Pharma value chain to strengthen the bio-economy;
- space science and technology;
- energy security;
- global-change science with a focus on climate change;
- human and social dynamics.

The National Development Plan (NDP) (NPC 2011) calls for greater investment in R&D, which has prompted the government to target an R&D intensity figure of 1.5% of GDP by 2019.

South Africa's ambitions in this regard, if achieved, would bring R&D intensity in line with the OECD average across public and private sectors, which was 2.34% in 2010. This excludes outliers such as Finland and Korea, which spend far more.

However, despite this desire for achieving levels that are in line with the OECD, recent data suggest that R&D expenditure remains sluggish, particularly in the business sector. The South African National Survey of Research and Experimental Development: Statistical Report 2012/13 (CeSTII 2014) shows that the R&D intensity ratio remained at 0.76% for the period 2010–2013, which is 11 basis points lower than it was in 2009 (0.87%) and 16 basis points lower than in 2008 (0.92%).

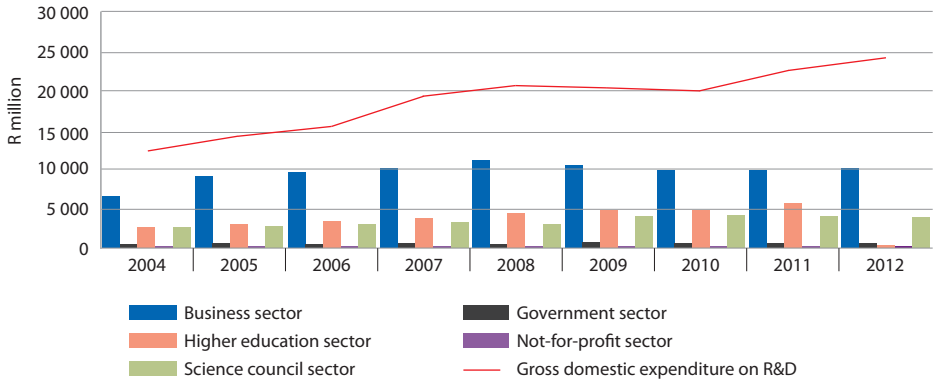
Trends in GERD

From 1993 to 2008, GERD had been increasing both nominally and in constant 2005 rand values (CeSTII 2014). This trend levelled off in 2009 and 2010 due primarily to decreased expenditure within the business sector. The South African economy has faced several external shocks, including eurozone tensions, global growth concerns and the downward pressure on commodity prices (World Bank 2012). These have all contributed to negative effects on the South African economy and in turn on R&D investment decisions. The sub-prime mortgage crisis that unfolded in developed countries in 2007 and 2008 had a knock-on effect on South Africa's economy, causing a downturn in 2009. GERD declined over the whole of the period 2008 to 2010 (Figure 1) and has not kept pace with the general economy since 2006 (Figure 2) (CeSTII 2014).

The relatively large increases in R&D expenditure in the science council sector and the higher education sector were not enough to offset the significant decreases in the business sector. Since 2010, GERD has increased again, but as discussed above R&D intensity has not recovered.

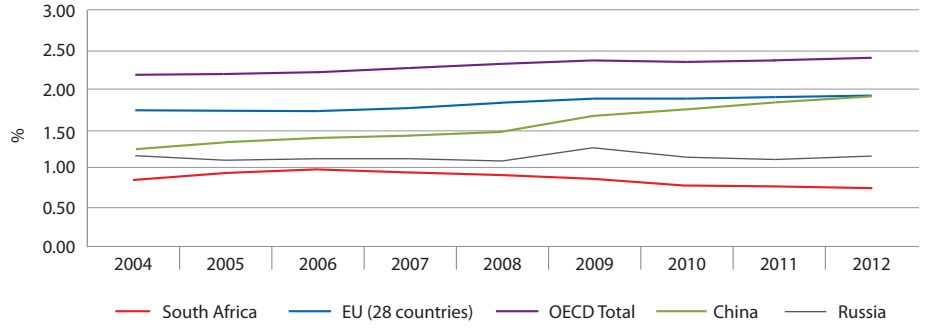
It is likely that the current decline in R&D expenditure in most sectors of the economy could partially be due to this diminished R&D investment strategy by organisations most affected by the economic downturn. Evidence for this contention is provided by the trend between 2007 and 2010 of the Rand Merchant Bank/Bureau for Economic

Figure 1: Gross domestic expenditure on R&D (GERD) in current rand values by institutional sectors



Source: CeSTII (2014)

Figure 2: A comparison of GERD as a percentage of GDP among South Africa, EU-28, OECD Total, China and Russia



Source: CeSTII (2014) for South Africa and OECD (2014) for other countries

Research Business Confidence Index, which measures the level of optimism of a panel of 3 800 senior executives in companies in the building, trade and manufacturing sectors about current and expected developments regarding sales, orders, employment, inventories, selling prices, and so forth. This index (BER 2013) started declining rapidly from a high level of confidence in mid-2007 down to an extreme lack of confidence in 2010. The pattern and synchronicity of the decline in business confidence and in R&D expenditure suggest that lowered confidence among senior managers was expressed in investment strategies that manifested themselves in sharply decreased expenditure on R&D in 2009 and 2010.

R&D intensity

R&D intensity, calculated as GERD as a percentage of GDP, is a robust and widely used indicator across a number of countries. GERD lags GDP by one year in some countries and by 3–5 years in others (IDEA et al. 2008). When the R&D intensity ratio falls in periods of stable economic growth, this generally indicates that expenditure on R&D activities has not kept pace with growth in the economy. When it increases, this signals that R&D performance is picking up relative to the performance of the economy. However, this should also be assessed to check whether there has been a general fall-off in economic growth which has not yet been shadowed by a decline in expenditure on R&D. Figure 2 compares R&D intensity ratios for South Africa, EU-28, OECD Total, China and Russia. It shows that, with the exception of China, there has been a levelling off in R&D intensity since 2009. South Africa is therefore not alone in experiencing this challenge.

The countries and regions in Figure 2 mostly show only slightly increased R&D intensity relative to 2007. South African R&D intensity shows a decrease relative to 2007, which became more pronounced after 2009, somewhat similar to Russia. The non-OECD countries, with the exception of China, as illustrated in Figure 2, demonstrate a similar inclination towards decreasing R&D intensity.

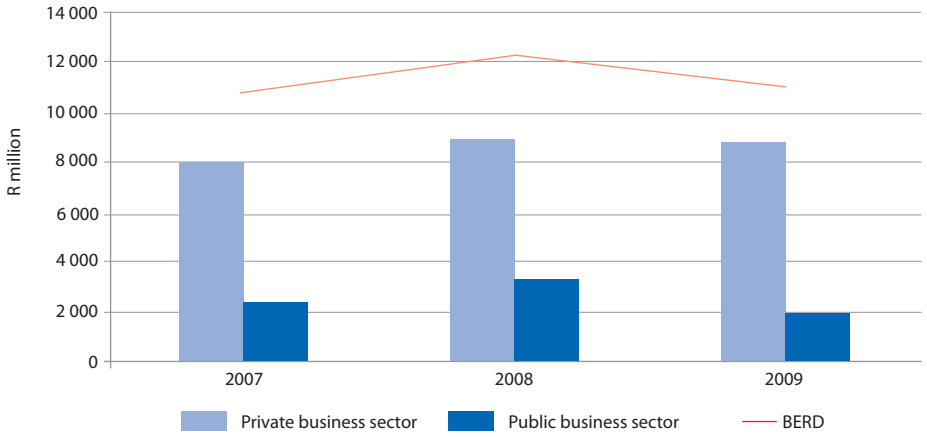
The roles of the public and private sectors in R&D investment

Figure 3 gives a breakdown of public and private sector contributions to business expenditure on R&D between 2007 and 2009.

The data described for business expenditure on R&D (BERD) include R&D investment that has a public sector component since the private sector or business R&D includes the activities of SOEs. The decline in business sector R&D expenditure as a percentage of GDP from 2005 to 2012 (CeSTII 2014) demonstrates the absence of growth in R&D investment by both private and public companies. The sharp decline in R&D expenditure in 2009 was due to this lack of growth in private business sector investment and a decrease in public business sector (primarily SOEs) expenditure. Government's share of the funding of R&D activities declined between 2008 and 2010, but increased again in 2011 and 2012. Throughout the period 2008–2012, if one takes the higher education, science council and public business sectors, government has been the main source of R&D funding overall.

The lead shown by the science council and higher education sectors

Figure 3: Business expenditure on R&D (BERD) in current rand values by public and private business sectors



Source: CeSTII unpublished data. Data for other years are not currently available.

in maintaining and increasing their expenditure on R&D is encouraging and government should actively support this feature of the R&D landscape in South Africa.

Government has a number of policy initiatives to stimulate R&D activity, such as direct government grants for R&D, R&D partnerships and R&D tax incentives. The R&D tax incentives programme is one initiative meant to stimulate R&D activity within the business sector. However, the uptake of the R&D tax incentives programme has arguably been slow. In-depth analysis of the data from the South African national R&D surveys has shown that only 15% of firms took advantage of the R&D tax incentive in 2007, and by 2009 this had increased by one percentage point to 16%. These firms were mainly the large R&D spenders accounting for 34% of R&D expenditure in 2007 and 31% in 2009.

Conclusion

The social and economic cluster of government departments, which includes the DST, has identified attaining 6% economic growth by 2010 and halving poverty and unemployment by 2014 as key national targets. In response to the challenges posed by the NDP, government has set a target for R&D expenditure of 1.5% of GDP by 2019. However, the negative growth trend in business sector R&D expenditure, which has led to a decline in overall R&D intensity to 0.76%, suggests that achieving this policy target will be very challenging and requires a turnaround in the level of confidence and in R&D spending in the business sector (including both private sector firms and SOEs).

This policy brief advances the case that against this background, there is an opportunity for SOEs and the private sector to actively participate in R&D support and resourcing.

The analysis suggests that the decline in R&D intensity predicated by decreased GERD in real terms in 2009 can be attributed partially to government restructuring its investment in the public business sector. This decline came about in an arena in which government had some direct control; therefore, meeting the target of 1.5% R&D intensity will require consideration of a range of state activities and decisions.The decline in GERD in real terms is also an illustration of the complex nature of policy intervention. Policy in one area may impact on policy in another area, even if coordination mechanisms are in place.

Another significant contribution to the decline in R&D intensity was the decline in business confidence, which led to private firms not raising their level of R&D investment, a trend evident since 2004. Similar actions are observed in other countries. Expenditure in intangible areas such as R&D and advertising tends to be curtailed in periods of economic stress (Blankley 2007), but forward-looking businesses and organisations continue with R&D investments in challenging economic periods. This affords South Africa an opportunity for future competitiveness.

Recommendations

The recommendations that follow draw attention to the need for policy action led by the DST around integrated and enhanced funding for R&D in all sectors and for stimulating private sector activity through co-managed sector innovation funds, tax incentives and other policy measures. Such concerted efforts can result in lifting the levels of R&D investment, which is critical during this period of economic sluggishness.

1. Continue to maintain and increase levels of R&D investment in the higher education and science council sectors where government has direct control.
2. Maintain the current state of policy stability with respect to existing implementation tools such as R&D tax incentives and human resource development programmes, and expand the range of policy tools and measures in order to encourage both local and foreign investment in R&D.
3. Strengthen support to private firms in a cost-effective manner by marketing and promoting government support programmes for R&D.
4. Improve accessibility to R&D tax incentives, particularly for smaller

businesses, by collaborating with the private business sector – for example, banks – in the administration of start-up funds in tandem with tax incentive funds.

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Acknowledgements

The authors would like to thank Prof. Fred Gault, Prof. Demetre Labadarios and Messrs Madalitso Phiri and Godfrey Mashamba for advice and comments in the development of earlier drafts, and to acknowledge their comments on a later draft. Profs Alinah Segobye and Gillian Marcelle are thanked for coordinating the review and providing comments in the preparation of the final revised version of the policy brief.

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