

R&D the biggest business casualty of Covid-19?

Summary

While the overall economic impact of the Covid-19 pandemic is still unfolding, there are strong indications that it is causing the largest economic downturn since the 2008 financial crisis. In 2020, the South African government implemented lockdown regulations, to safeguard the population, but had adverse effects on businesses and economic activity at large. This brief assesses the effects on firms with research and development (R&D) activity, and appeals for action to protect the national system of innovation.

R&D, with its potential to generate solutions to health systems challenges and growth in new economic sectors, may hold the key to attenuating the impact of the coronavirus pandemic. Perpetually low levels of business R&D move South Africa into the group of developing countries when ranking economies according to knowledge intensity. Investment in Science, Technology and Innovation (STI) in developing countries has become increasingly important for these countries to meet their goals of inclusive economic development. In South Africa, the level of investment measured by the proportion of GDP accounting for R&D is below 1%, and has been at this level for at least a decade. This lies well below that of other emerging economies such as China.

Through an analysis of data from the Stats SA rapid response survey¹ conducted during lockdown level 4 between 1 and 31 May 2020, the brief finds that firms with R&D activity in all sectors and all size groups experienced significant declines in R&D expenditure. Of all businesses with R&D activity, an average of 40% decreased their R&D expenditure. Most disturbingly, R&D firms were affected more seriously than non-R&D firms by the epidemic, with significant numbers of researchers made redundant. More than 50% of R&D firms laid off staff, with most making up to 20% of their research staff redundant. The consequence is that R&D intensity will decrease in the long term, unless strong corrective action is taken.

Introduction

In this brief, we present evidence on the impact of the Covid-19 crisis on R&D activity in South African firms. We use firm data collected by Stats SA during the course of the pandemic. Due to business closures and remote working regimes adopted en masse, this data was the only large-scale survey of economic statistics that was feasible during the crisis. The survey included questions on R&D and innovation for the wave of the survey series conducted over the level 4 lockdown. Our interest is in the cohort of R&D performing firms. The expectation is that, by and large, the Covid-19 epidemic and the response to it would have a negative effect

on economic activity, including R&D activity. We conclude the brief with a set of policy recommendations, arising from the findings presented.

Science and technology is recognised as an important component of a country's economic competitiveness. The development and exploitation of research can demonstrate how public sector organisations, such as universities and government research organisations, working in tandem or side-by-side can develop new technologies and innovations with a significant impact on the economy, and ultimately, transform the life of the ordinary citizen. Economic development would take place at a much slower rate if the public purse did not subsidise the very high costs of research. The benefits of research would not be felt across the broader society without capable researchers, engineers, and other technically skilled people in firms to access the research, and if sales and marketing personnel are unable to introduce new technologies in the form of products to the ordinary citizen.

The bulk of research and development activity in any country takes place within large firms, many of them multinationals. Large firms are better able to absorb the high costs of research and can employ technically-able personnel at high enough levels to successfully use R&D as a business strategy. At the same time many small firms also rely on R&D as a competitive strategy or, indeed, as a core activity. Biotech firms, for example, typically fall into this category. The high cost of research is especially detrimental to small firms for which access to funding is arguably more difficult.

After World War II, high levels of expenditure on R&D have traditionally been associated with economically developed countries. Increasingly countries with emerging economies have realised the need for a strong science basis and the new millennium

has seen developing countries such as Brazil and China significantly increase their levels of R&D spending, with China now amongst the highest R&D spenders globally, with a historic high of 2,12% of GDP in 2017/18.²

In South Africa, the level of spending on R&D activity by the science and technology complex, consisting of public and private R&D performing organisations, is one of the highest in Africa. However, it is low when compared with the leading research countries. The proportion of GDP devoted to R&D in South Africa was 0,83% in 2017/18.³ It had been at around this level for the preceding decade. However, a distinct downward trend in the contribution of the business sector to R&D expenditure has been evident since the start of the new millennium.⁴ This trend has persisted. The proportion of business R&D to Gross Domestic Expenditure on R&D (GERD) declined to less than 50% in 2010/11, and has remained below that threshold value. Values of GERD below this (apparently) critical value are indicative of developing economies.

This already low spending is exacerbated by external economic shocks such as the global Covid-19 pandemic. The Covid-19 coronavirus, very easily spread during human interactions, has potentially fatal consequences for a large segment of the population once infected. This has led governments all over the world to implement measures that limit human interactions. To curb the pandemic, the South African government implemented lockdown regulations that limited human interactions, inclusive of business activities.⁵ The lockdown regulations meant that many businesses had to close, limit workforce presence at office buildings, or move to remote operations, with a detrimental effect on cash flow, and, in the case of R&D performers, their R&D activity. The extent to which R&D performing firms have been affected by

the pandemic and the response to it is the subject of this brief.

While the Covid-19 crisis has led to businesses cutting back on R&D expenditure, continued investment in R&D is essential during the crisis and its aftermath for South Africa to achieve the goals of the 2030 Agenda for Sustainable Development. Furthermore, R&D is crucial:⁶

- to develop and provide accurate data collection and dissemination during the Covid-19 crisis period
- to inform policies to mitigate the adverse impact of the pandemic on health and the economy
- to aid in the development of a vaccine and other preventive measures to combat the spread of the disease
- to provide an in-depth understanding of the nature of the novel coronavirus and its spread.

Thus R&D remains crucial, not only for development, but to find possible solutions for the pandemic underway.

Business R&D expenditure is at immediate risk as firms decrease or halt R&D activities to save costs amid dwindling demand and declining cash flow.⁷ By the same token, R&D is recognised by many businesses as part of the recovery solution. For many industries, recovery will not mean returning to pre-pandemic business as usual. Instead, they must innovate to survive and adapt to the 'new normal', with different ways of working and dramatically changed consumer demand.

The effect on business

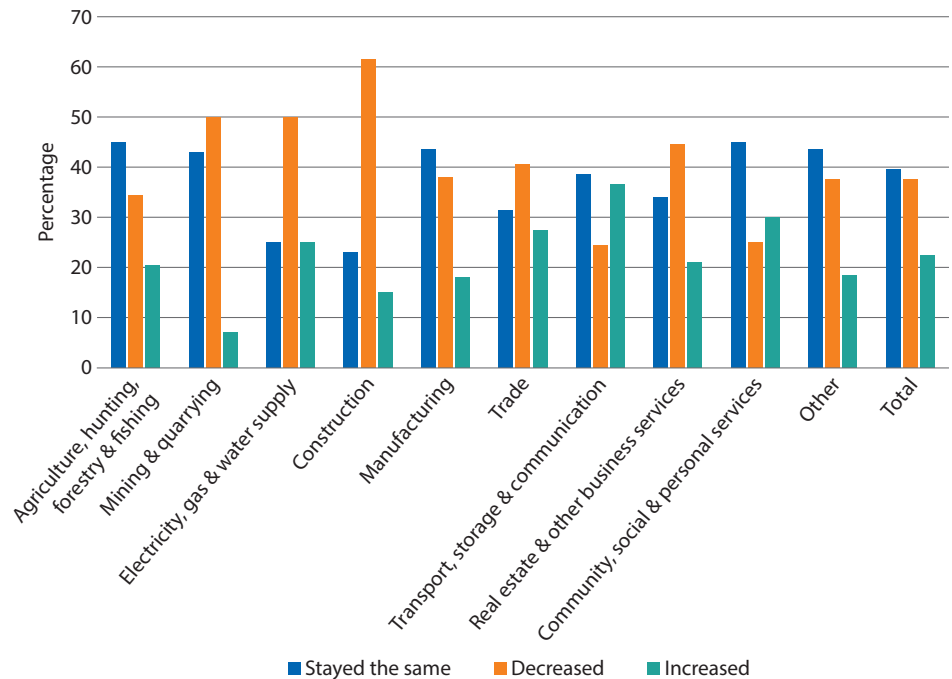
The data collected during the level four lockdown by Stats SA in their Covid-19 response survey⁸ showed that a significantly large number of businesses had cut back on R&D activity. About 38% of firms that responded to the questionnaire reported a decrease

in R&D expenditure. This could be the result of decreased cash flow due to low demand during the period surveyed. On the other hand, the change in working environment from the office to remote working implied that firms had to incur additional expenditure including internet costs, subscriptions to software such as Zoom and Microsoft meetings, and computers and other hardware to enable remote working environments. Around a third of firms reported an increase in the use of virtual connections. On the other hand, a proportion of firms (12%) took the opportunity to go online and offer their services via e-commerce platforms, and a small section of far-sighted firms (2%) invested in equipment to produce new products or expand existing product lines.

Which R&D firms were affected negatively by the crisis?

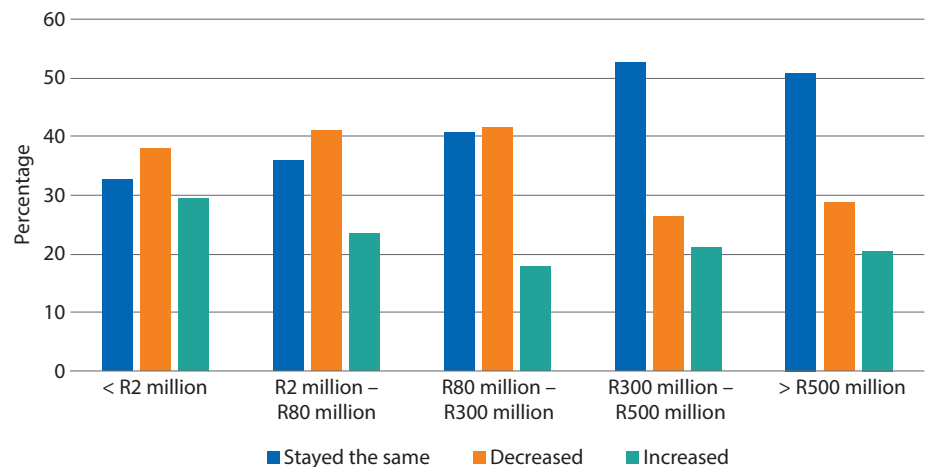
All firms were affected negatively by the crisis, as were the R&D performers. Figure 1 shows that across almost all industries, more businesses decreased R&D expenditure than those that increased R&D expenditure in response to the changing circumstances. The only industry that used the opportunity to ramp up R&D was the transport, storage and communication sector.⁹ The largest number of firms that cut back on R&D activity were in the mining and quarrying sector, construction, and the electricity, gas and water supply sector, where 50% or more of firms decreased expenditure on R&D. The community, social and personal services sector, which houses sections of the health sector, saw 25% of firms decrease their expenditure on R&D. The much beleaguered manufacturing sector was also badly affected, with 38% of firms curtailing their expenditure on R&D. These figures are alarming, as the R&D in these industries is crucial for economic recovery from the Covid-19 pandemic, as well as for finding a vaccine or a potential cure.

Figure 1: Proportion of firms that changed their R&D expenditure in response to the Covid-19 crisis, by industry



Source: Authors' calculations. Stats SA (2020) Business impact survey of the Covid-19 pandemic in South Africa.

Figure 2: Change in R&D expenditure in firms in response to Covid-19, by size groups



Source: Authors' calculations. Stats SA (2020) Business impact survey of the Covid-19 pandemic in South Africa.

R&D expenditure by size of enterprises

Further interrogation of the data shows that the largest proportion of businesses decreasing their R&D expenditure were small to medium sized businesses, with a turnover of up to R220 million. The proportion of businesses that decreased

their R&D expenditure was an average of 40% of all R&D performers. Large R&D firms tended to be more persistent in maintaining R&D activity. Taking these two points together, the proportions are probably roughly similar across all size classes. In summary, the expectation is

that government's long-term target of GERD/GDP of 1.5% would be adversely affected. This is so because recovery in R&D activity will be harder to achieve than overall economic recovery in the long term, due to the specialised nature of research.

Staff in R&D firms have been affected more seriously by Covid-19

Firms have responded to the crisis by laying off staff or decreasing the working hours of staff members retained. The data in Figure 3 shows that in comparison with non-R&D performing firms, more R&D firms have laid off staff and decreased the hours of remaining staff.

Within R&D firms, more than half have made researchers redundant. Most of these firms made up to 20% of their research staff redundant, trying to limit the damage by keeping the bulk of their R&D teams going. This would leave these firms with a reduced ability to compete in a post-Covid business environment. Over and above the decreases in R&D expenditure displayed in Figure 2, Table 1 shows, disturbingly, that the long-term capacity for R&D in the business sector has already dropped significantly.

Table 1: Redundancies of researchers in R&D firms

Researchers made redundant	Percentage
0–20%	44%
21–40%	2%
41–60%	1%
61–80%	1%
81–100%	4%
Not applicable	48%

It is conceivable that R&D firms may cut back further in anticipation of still more financial losses. The potential to capitalise on R&D requires the availability of a skilled workforce capable of accessing advanced knowledge and utilising it for practical benefit. Therefore, the potential for radical high-technology innovations would be stymied by further cutbacks of this nature.

Conclusion

South Africa is not alone in facing challenges in stimulating investment in STI, as a recent UNCTAD policy brief highlighted:

Even though developing countries as a group have recorded continued growth in R&D

expenditure over recent years, the absolute levels remain small and their STI capabilities limited. It is therefore crucial for developing countries to reinforce their commitments to protect investment in STI and to design recovery packages that leverage technology and innovation for sustainable development.¹⁰

One of the lessons of the 2008 financial crisis was that those countries with low R&D intensity tended to respond to the crisis with austerity measures such as streamlining budgets and consolidating policies. The outcome was to leave already weak STI systems in a weaker state than before the crisis, which lowered long-term expectations.¹¹ The response by public sector decision-makers this time around needs to be far more focused and forward looking.

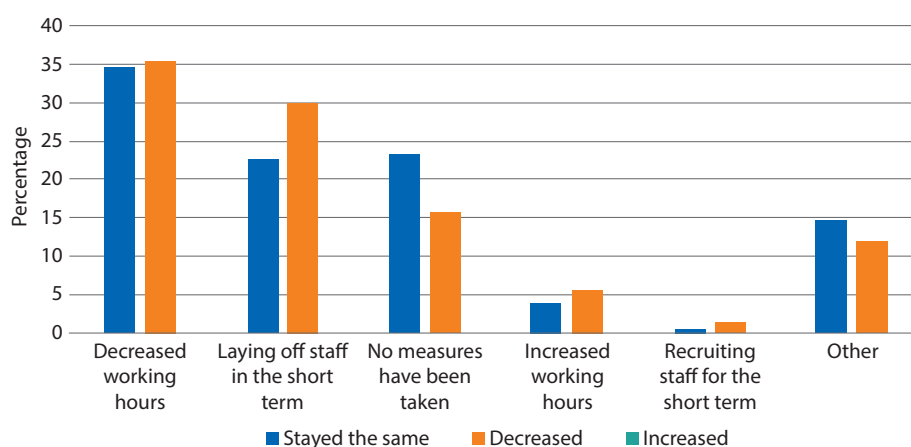
The number of research staff made redundant at R&D firms presents the national system of innovation with an extraordinary challenge. Researchers will be lost to the system either by finding employment in other fields or by leaving the country.

Recommendations

Following the findings of this brief, we recommend the following:

1. The **Department of Science and Innovation** needs to provide **funding support to R&D firms in critical sectors** to mitigate the negative impact of Covid-19 on cash flow, revenue and employment. With the pandemic, loans and revenues have become difficult to acquire, thus, a cushion from DSI will support firms' cash flows. Those firms need to be made aware that such support will be long-term and stable in order to generate buy-in and a renewed commitment to R&D activities. Even in the current economic climate, this is not an impractical suggestion.

Figure 3: Measures taken by R&D firms compared with non-R&D firms to weather the Covid-19 storm



Source: Authors' calculations. Stats SA (2020) Business impact survey of the Covid-19 pandemic in South Africa.

Most developed countries and many developing countries have subsidised businesses to protect the income of workers left unemployable due to the crisis.

2. Far more importantly, the **DSI needs to rapidly develop a programme to retain research staff lost** to the business sector, either by subsidising their re-employment in the business sector or finding posts in the public sector. This could mean increasing support for public sector R&D in universities and science councils. Support schemes should be designed for firms with staff that are assigned to critical sectors or tasks, so that they can effectively return to their original employer after the crisis.
3. Lastly, it is also crucial to **step up investment in new and safe ways of working, including through the acceleration of digital skills at enterprise and worker level**. The DSI could lead the drive to promote remote working within the public sector.

References

1. Stats SA (2020) *Business impact survey of the Covid-19 pandemic in South Africa*. Report no. 00-80-01 (1–31 May). Accessed 20 October 2020, <http://www.statssa.gov.za/publications/Report-00-80-01/Report-00-80-01June2020.pdf>
2. OECD (2020) *Main science and technology indicators: 2020/1*. Accessed 6 October 2020, <http://oe.cd/msti>
3. CeSTII (2019) *South African national survey of research and experimental development: Statistical report 2017/18*. Pretoria: Department of Science and Innovation
4. Mustapha N, Blankley W, Makelane H and Molotja N. (2015) *Trends in research and development expenditure in South Africa (2010–2013): Policy implications*. Cape Town: HSRC Press, Policy Brief
5. Sekyere E, Bohler-Muller N, Hongoro C, and Makoae M (2020) *The impact of Covid-19 in South Africa*. Wilson Center, Africa Program Occasional Paper
6. Sirimanne S (2020) *Need to protect science, technology and innovation funding during and after the Covid-19 crisis*. United Nations Conference on Trade and Development Policy Brief No. 80, May
7. Royal Academy of Engineering (2020) *Covid-19 immediate impact on R&D-intensive businesses*. Accessed 15 September 2020, raeng.org.uk/covid19
8. Stats SA (2020) *Business impact survey of the Covid-19 pandemic in South Africa*. Report no. 00-80-01 (1–31 May). Accessed 20 October 2020, <http://www.statssa.gov.za/publications/Report-00-80-01/Report-00-80-01June2020.pdf>
9. It is not known whether this formed part of a pre-existing trend in the transport storage and communication sector, prior to the onset of Covid-19.
10. Sirimanne S (2020) *Need to protect science, technology and innovation funding during and after the Covid-19 crisis*. United Nations Conference on Trade and Development Policy Brief No. 80, May
11. Sirimanne S (2020) *Need to protect science, technology and innovation funding during and after the Covid-19 crisis*. United Nations Conference on Trade and Development Policy Brief No. 80, May

Acknowledgements

The authors wish to thank Dr Glenda Kruss and an unknown reviewer for insightful comments.

POLICY BRIEF AUTHORS

Atoko Kasongo, PhD; Statistician, Centre for Science, Technology and Innovation Indicators, HSRC

Nazeem Mustapha, PhD; Chief Research Specialist, Centre for Science, Technology and Innovation Indicators, HSRC

Enquiries to:

AKasongo@hsrc.ac.za