

P O L I C Y B R I E F

MAJOKWENI Z.P., KAHN A., KRUSS G., SITHOLE M. M. AND BUCHANA Y.
MARCH 2024

Promoting innovation collaboration in South Africa: unveiling patterns and barriers



Executive summary

As South Africa grapples with ever-increasing costs of living and high unemployment rates, innovation can play a pivotal role in the creation of new industries, businesses and job opportunities. Collaboration for sharing knowledge, technology and expertise is an important catalyst to foster and support firms' innovation activity. It has remained persistently low since the early 1990s, despite extensive government effort. This suggests the need for a fresh approach to inform the formulation, implementation and monitoring of policy interventions and strategies to achieve the objectives of the 2022 Science, Technology and Innovation (STI) Decadal Plan.

Globally, evidence shows that different categories of firms have distinct innovation needs, challenges and strengths. It is well-established that one-size-fits-all approaches to promote collaboration are neither possible nor desirable. It may be of greater value to identify problems experienced by different categories of firms and propose a wider range of solutions. Understanding how different kinds of firms collaborate for innovation can assist the Department of Science and Innovation to pinpoint where interventions are mostly needed, or likely to be most effective, and where existing strengths can be leveraged to create an enabling environment for all innovation-active firms.

This policy brief classifies groups of innovation-active firms in terms of their modes of collaboration, using evidence from the most recent Business Innovation Survey (BIS) 2019-21, to offer empirical evidence of existing patterns and trends of innovation collaboration as a foundation for policy action.

Introduction

Collaboration is vital for facilitating knowledge and technology flows, building capabilities and enhancing the economic and social effects of innovation. Unfortunately, the measurement of innovation over the past three decades has consistently shown low innovation collaboration between formal businesses and other actors in the South African National System of Innovation (NSI).

The White Paper on Science, Technology and Innovation (Department of Science and Innovation, 2019) recognises this challenge in that, previously, a narrow approach to innovation was adopted. The current policy environment does not incentivise diverse and transdisciplinary knowledge networks that support lifelong learning in firms and across the NSI (Department of Science and Innovation, 2022: 59). The Decadal Plan (2022) proposes mechanisms to address the challenge in new ways.

Implementation plans include involving all innovation actors, emphasising mutual learning, and promoting policy coherence. The establishment of new funding instruments, particularly a Collaboration Fund, is proposed as the main policy vehicle aimed at eliminating coordination failures in the system. The focus of the Collaboration Fund is to increase firm collaboration with knowledge producers, such as universities or government research institutions. To create an enabling environment and increase linkages as the Decadal Plan intends, the design of financial and other incentive and support mechanisms should be informed by evidence of how firms currently innovate, and with whom they are currently able to develop their innovations. Do firms collaborate with universities and science councils to innovate – or do they tend to collaborate with other firms, suppliers or clients, or in their business group? Do they interact with partners nationally or globally? Are firms in specific sectors likely to collaborate more or less?

This policy brief adopts an approach of classifying groups of innovation-active firms in terms of their modes of collaboration, using evidence from the most recent Business Innovation Survey (BIS) 2019-21. Such an analytical approach offers insights into existing patterns and trends for the sets of firms engaging in each mode of innovation collaboration, creating a more holistic understanding of how South African firms innovate, as a foundation for policy action.

The relationship between innovation and collaboration

Firm collaboration with other firms, actors and stakeholders has been shown to optimise innovation (Science Europe, 2023). Collaboration gives firms access to a wide pool of resources, knowledge, and risk-sharing opportunities. Collaboration is also essential to advance knowledge and maximise economic and societal impact (OECD, 2017).

Firm characteristics and innovation objectives influence how they collaborate. For instance, firms more focused on research and development (R&D) will tend to collaborate with research institutions (OECD, 2017). Levels of collaboration also differ between one country and another. Local collaboration can help to consolidate resources and knowledge in pursuit of shared objectives, challenges, and contextual needs. It can also play a role in building stronger intra-country relations, uniting different stakeholders towards collectively achieving common goals specific to their region or community. This ensures that solutions and strategies are better aligned with local factors, ultimately leading to more effective outcomes (Freeman et al., 2016; Melo, 2018). Some countries focus on national partnerships, while others combine this with international partnerships.

International collaboration has a significant and positive impact on innovation performance (Badillo and Moreno, 2018; Haus-Reve et al., 2019), which can be attributed to the broadened access to new technologies and novel knowledge that may not be available in firms' home countries. With global value chains becoming more significant, so is the role of international partners in the

innovation process (OECD, 2017). At a country level, smaller countries are more likely to collaborate internationally due to limitations that may exist domestically. Having greater resources, larger firms are more likely to engage in international collaboration than SMEs (OECD, 2017).

Firms have distinct needs, challenges, and strengths and they engage in different types of innovation activities and collaboration depending on their characteristics and objectives. Understanding these patterns can inform more contextualised and targeted policies, to encourage and enable non-collaborating firms to collaborate, and to further support those that are already collaborating.

Identifying modes of innovation collaboration in South Africa

Based on global research that categorises modes of innovation (Arundel and Hollanders, 2008; Arundel and O'Brien, 2009), all innovation-active firms were assigned to one of four mutually exclusive groups. To convey a more granular understanding of the innovation and collaboration patterns of innovation-active businesses, they were characterised by whether they invested in acquiring formal knowledge – like R&D and securing patents (knowledge-driven) – or activity-based in other senses, such as investing in training or the acquisition of technology (activity-driven) and then, they were categorised in terms of whether they were collaborators or non-collaborators. Figure 1 explains the four modes of innovation activity that result, namely knowledge-driven collaborators and non-collaborators, or activity-driven collaborators and non-collaborators.

Figure 1: Four modes of innovation activity

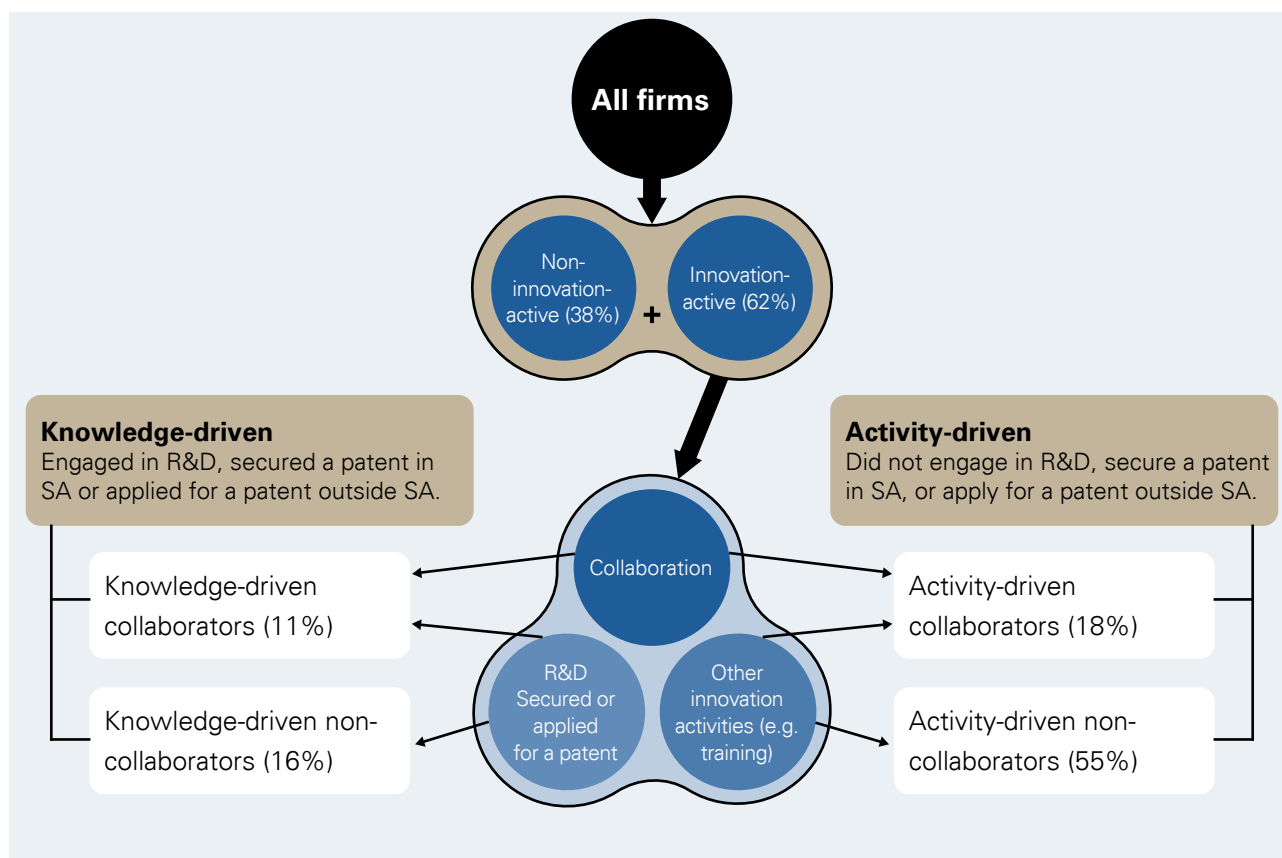


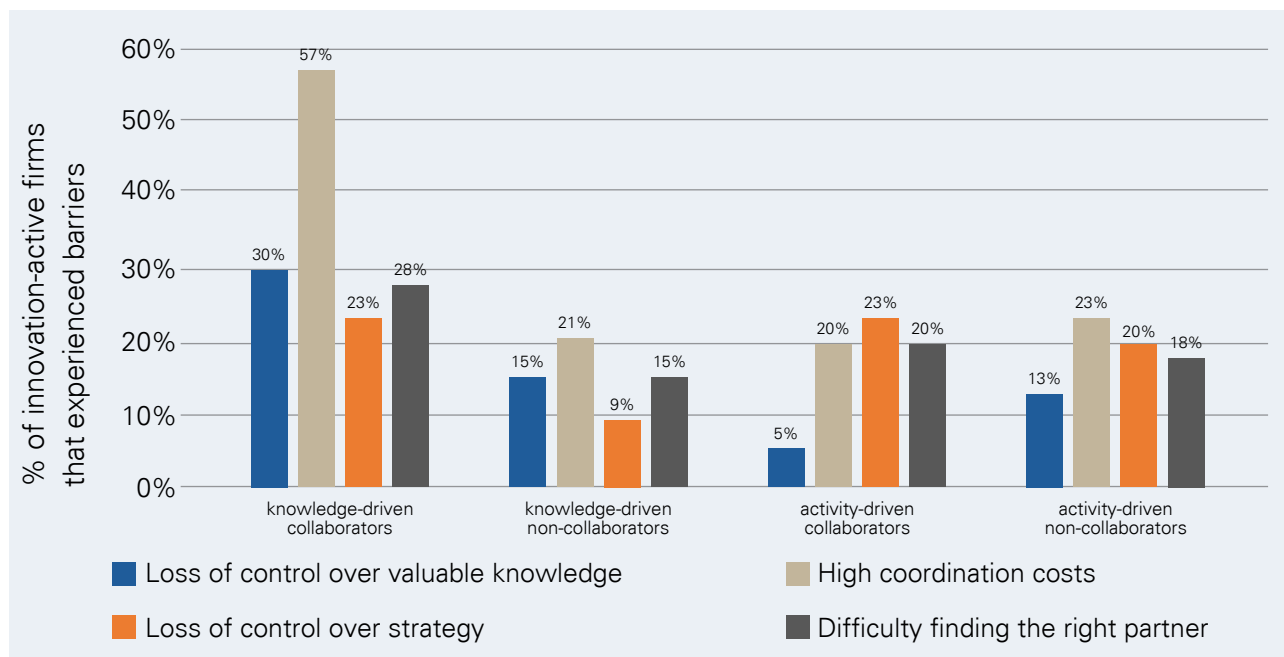
Figure 1 shows the BIS 2019-21 survey results, indicating that while the majority of South African firms are innovation-active (62%), there is a sizeable group that is not innovating at all (38%). In general, the levels of collaboration among innovation-active firms were low: only a total of 29% of all innovation-active businesses reported some coordinated collaboration activities with other parties towards common objectives.

Specifically, 18% of innovation-active firms are categorised as activity-driven collaborators, and 11% fall into the category of knowledge-driven collaborators. Most South African firms were non-collaborators, with 55% of innovation-active firms categorised as activity-driven non-collaborators and 16% as knowledge-driven non-collaborators.

The next sections map out the activities of each of these categories of innovation-active firms.

What are the barriers to firms' innovation collaboration?

Figure 2: Barriers or constraints to interacting with other parties in the production or exchange of knowledge



High coordination costs were one of the top factors hindering firms from engaging in innovation collaboration activities. This was the predominant barrier for knowledge-driven collaborators (57%), and all non-collaborators. The biggest barrier for activity-driven collaborators was the loss of control over their business strategy. Interestingly, knowledge-driven collaborators found this factor to be the least hindering compared to other barriers. Loss of control of valuable knowledge was understandably of greater concern for knowledge-driven collaborators and non-collaborators. The distinct trends suggest that firms face specific sets of barriers, depending on their mode of collaboration.

Who are innovation-active firms collaborating with?

Overall, knowledge-driven collaborators had a greater variety of collaboration partners compared to activity-driven collaborators, as a greater proportion of these firms reported each type of collaborative partner. Both knowledge-driven (70%) and activity-driven collaborators (44%) were most likely to collaborate with suppliers of equipment, while their collaborations with private research, public research and higher education institutions were relatively limited.

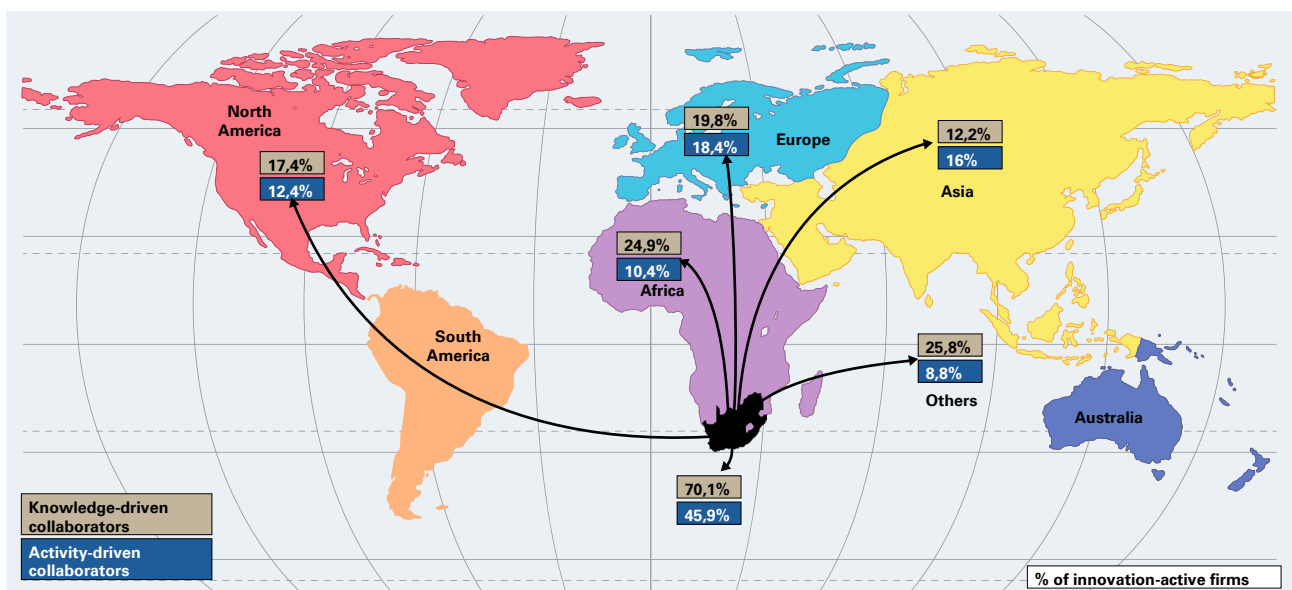
Figure 3: Type of innovation collaboration partner



These findings align with the practical necessities of innovation. Suppliers of equipment may possess specialised technical knowledge and resources that can significantly contribute to the innovation process, while research institutions might have different priorities, regulations, or methodologies that could deter firms from collaborating. Additionally, public research institutions might not always have the immediate commercial focus that firms seek in collaborations, which could result in fewer interactions.

Where are collaboration partners located?

Figure 4: Collaborators by geographical location¹



1. Firms could have collaboration partners in multiple locations.

The highest proportions of both knowledge- and activity-driven collaborators had local collaboration partners (70,1% and 45,9% respectively). Beyond South African borders, both knowledge-driven and activity-driven collaborators embarked on innovation collaboration activities with partners largely situated in Europe, a recognition of Europe’s robust innovation eco-system and potential for knowledge exchange. Knowledge-driven collaborators prioritised partnerships with entities in the rest of Africa (24,9%), while activity-driven collaborators also had a notable share of collaborations in Asia (16%). Asia offers a diverse supplier base for raw materials, components, and technology. This diversity can be crucial for activity-driven collaborators looking to optimise their supply chains and reduce production costs.

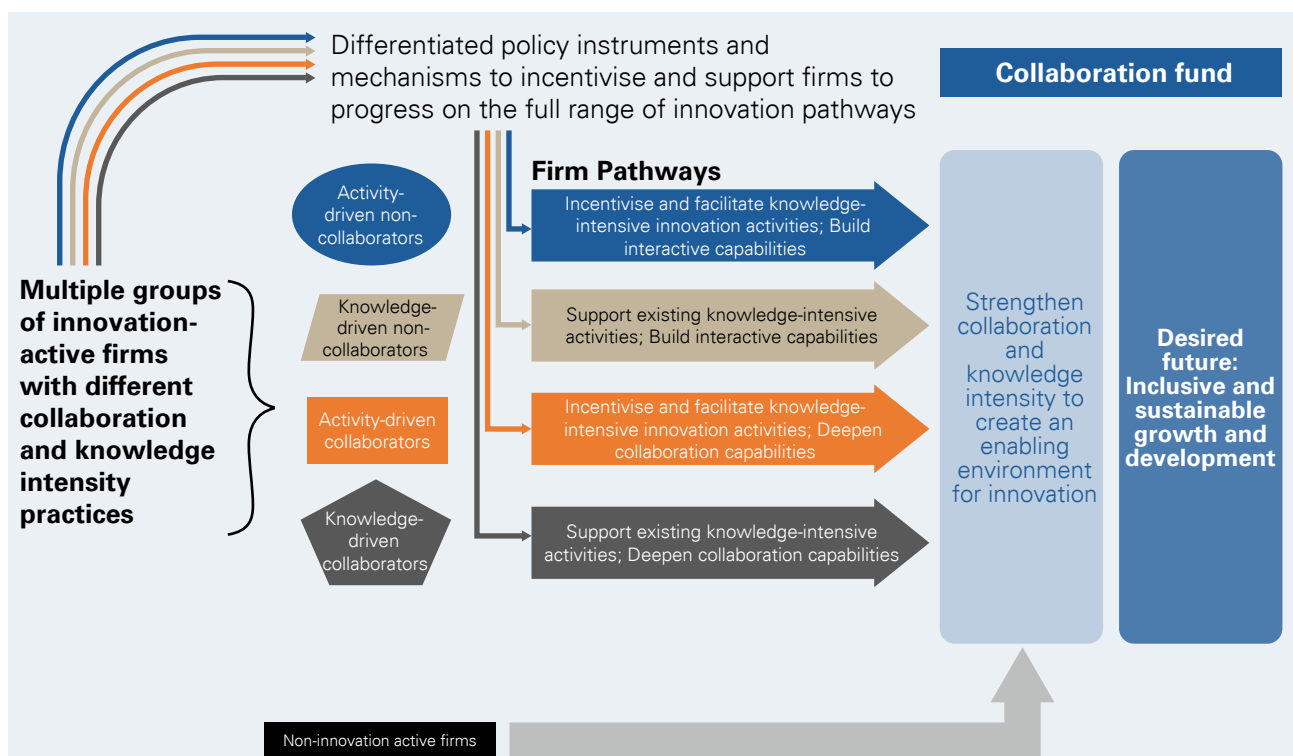
Conclusions and policy implications

The Decadal Plan proposed several funding interventions and support mechanisms, particularly to incentivise collaboration between firms and knowledge institutions. By identifying groups of firms based on their innovation modes, we highlight the potential value of a wider range of policy solutions for firms with diverse needs for innovation incentivisation and support. In the context of this brief, firms with varying levels of engagement in knowledge-intensive and collaborative activities require different types of support:

- Activity-driven firms require incentives to engage in knowledge-intensive activities while knowledge-driven firms require support to strengthen their existing knowledge-driven activities.
- Collaborators require support to deepen their existing collaborations and interactive capabilities while non-collaborators require interventions to build their interactive capabilities.

Figure 5 emphasises that to design effective policy instruments to assist different types of businesses along their pathways, there needs to be an understanding of what these businesses are capable of currently. What do they need to help them change or progress towards the policy goal of strengthened knowledge-intensity and collaboration to help support innovation efforts?

Figure 5: A model to inform policy engagement



- On the far right-hand side, the DSI's desired future of innovation-led inclusive and sustainable growth and development is presented as the ultimate outcome. This outcome is reached through action towards various policy goals. In this instance, the policy goal of interest is to strengthen collaboration and knowledge intensity, to create an enabling environment for innovation.
- The curved arrows at the top left signify that the nature of diverse groups of firms informs the design of a mix of policy instruments and support mechanisms geared towards the needs.
- The shapes and colours on the left-hand side represent the four mutually exclusive groups of innovation-active businesses with varying collaboration and knowledge intensity practices, as analysed above. The associated horizontal arrows represent the unique pathways along which each of the four types of innovation-active businesses will need to advance, to achieve the collaboration policy goals.
- The curved arrows feeding into the horizontal arrows from above represent the mix of policy instruments that are needed to support firms to progress along each pathway, based on their patterns of innovation capabilities and activities.

Instruments, such as the proposed Collaboration Fund, can be informed by this empirical reality, of where firms are and what different support mechanisms they might need. The instrument should consider the results of the analysis as follows:

1. By far the highest proportion (55%) of innovation-active firms were **activity-driven non-collaborators**. Policy instruments targeted at this particular group of firms should focus on (1) incentives for firms to engage in knowledge-intensive innovation activities, and (2) build interactive capabilities.
2. 18% of innovation-active firms were **activity-driven collaborators**. Policy interventions aimed at this group should focus on (1) deepening their existing collaborations and interactive capabilities, and (2) incentivising and facilitating knowledge-intensive innovation activities. In addition, the analysis indicates that:
 - Sizable portions of these firms reported that their interactions with other parties were constrained by loss of control over strategy (23%), high coordination costs (20%) and difficulties finding the right partner (20%). They would benefit from interventions that help to further strengthen their interactive capabilities, assist with the costs associated with collaboration, and widen their pool of potential collaboration partners. As only 10% of these firms collaborated with partners elsewhere in Africa, these interventions could focus on connecting more firms to the rest of Africa.
 - Compared to knowledge-driven collaborators, these firms had less variety in terms of types of partners. They had particularly low levels of collaboration with public and private research institutes, including universities. Interventions could help to facilitate collaborations with these types of partners, which could also help to promote more knowledge-intensive innovation activities.
3. **Knowledge-driven non-collaborators** constituted 16% of innovation-active firms. These firms require interventions to deepen their existing knowledge-driven activities and to facilitate and incentivise collaboration with other parties. In addition:

- Over a fifth of these firms reported that high costs associated with interacting with other parties in the production or exchange of knowledge acted as a barrier to collaboration. Interventions to facilitate and incentivise collaboration among these firms should, therefore, consider financial constraints.
4. Only 11% of innovation-active firms were **knowledge-driven collaborators**. These firms require interventions to further strengthen and support their existing knowledge-driven collaborations. The trends presented above also suggest the following:
- Compared to other firms, they were more likely to be constrained by high coordination costs when interacting with others in the production or exchange of knowledge. These firms would benefit from policy interventions that focus on reducing the cost burdens associated with knowledge-intensive collaboration.
 - Internationally, these firms were most likely (25%) to have collaboration partners situated in the rest of Africa, while they were least likely (12%) to have collaboration partners in Asia. These firms would benefit from support to strengthen their existing partnerships in Africa, while building new partnerships in Asia.
5. Finally, there is a sizable group of businesses that are **not carrying out innovation activities at all**. There is a need for general horizontal support, through instruments that focus on facilitating collaboration in ways that can be used to build wider capabilities to engage in innovation.

The model depicts a process whereby an appropriate mix of targeted policy instruments can be informed by analysis of the needs of different groups of firms as they evolve along their unique pathways toward the desired policy goals.

References

- Arundel, A. and Hollanders, H. (2008). Innovation scoreboards: indicators and policy use. In: Nauwelaers, C. and Wintjes, R. (eds.) *Innovation policy in Europe: measurement and strategy*. Edward Elgar Publishing, Cheltenham, pp. 29-51.
- Arundel, A. and O'Brien, K. (2009). *Innovation Metrics Framework Project*. Australian Government.
- Badillo, E.R. and Moreno, R. (2018). Does Absorptive Capacity Determine Collaboration Returns to Innovation? A Geographical Dimension. *The Annals of Regional Science*, 60(3), pp. 473-499.
- Department of Science and Innovation. (2021). Science, Technology and Innovation Decadal Plan 2022-2032.
- Department of Science and Technology. (2019). *White Paper on Science, Technology and Innovation*.
- Freeman, C., Wisheart, M., Hester, K., Prescott, D. and Stibbe, D. (2016). Delivering on the Promise: in-country multi-stakeholder platforms to catalyse collaboration and partnerships for Agenda 2030. *World Vision International and The Partnering Initiative*.
- Haus-Reve, S., Fitjar, R.D. and Rodríguez-Pose, A. (2019). Does Combining Different Types of Collaboration Always Benefit Firms? Collaboration, Complementarity and Product Innovation in Norway. *Research Policy*, 48(6), pp. 1476-1486.
- Melo, V. (2018). Collaborative Efforts for Sustainable Development: Surveying the Literature on Multi-Stakeholder Initiatives to Realize the Sustainable Development Goals. *Task Team on CSO Development Effectiveness and Enabling Environment*, 10.
- OECD (2017). OECD Science, Technology and Industry Scoreboard 2017: The Digital Transformation, OECD Publishing.
- Science Europe. (2023). Science Europe Statement. <https://www.scienceeurope.org/media/4k5him32/2023-hlw-statement.pdf>

Acknowledgements

The South African Business Innovation Survey 2019-21, on which this policy brief is based, was funded by the South African Department of Science and Innovation (DSI). The authors would also like to express their gratitude to the firms that responded to the survey carried out in the study, as well as the reviewers of the policy brief – Gerard Ralphs and Dr Michael Gastrow – for their valuable inputs.

Policy brief authors

Majokweni Z.P., Chief Researcher; Centre for Science, Technology and Innovation Indicators, Human Sciences Research Council.

Kahn A., Research Specialist; Centre for Science, Technology and Innovation Indicators, Human Sciences Research Council.

Kruss G., Executive Head; Centre for Science, Technology and Innovation Indicators, Human Sciences Research Council.

Sithole M.M., Research Director; Centre for Science, Technology and Innovation Indicators, Human Sciences Research Council.

Buchana Y., Senior Research Specialist; Centre for Science, Technology and Innovation Indicators, Human Sciences Research Council.