EFFECTIVE PARTNERING BETWEEN SCIENCE COUNCILS AND THE PRIVATE SECTOR

1 Introduction

Public research institutions (PRIs), such as science councils, play a pivotal role in fostering innovation and technological progress. They typically conduct fundamental and applied industrial research, participate in the experimental development of innovative technologies, and provide training, consulting and other services. Their results are disseminated through publications, training and technology transfer.

One of their key functions is to partner with firms in the development of new products, processes and services. The aim of this PER was to assess the effectiveness of science councils in partnering with the private sector and explore how this could be improved. It covered the following PRIs:

- The Agricultural Research Council (ARC) under the Department of Agriculture, Forestry and Fisheries
- The Council for Geoscience (CGS) under the Department of Mineral Resources
- The Council for Mineral Technology (Mintek) under the Department of Mineral Resources
- The Council for Scientific and Industrial Research (CSIR) under the Department of Science and Technology
- The Human Sciences Research Council (HSRC) under the Department of Science and Technology
- The Medical Research Council of South Africa (MRC) under the Department of Health
- The Technology Innovation Agency (TIA), a funding agency under the Department of Science and Technology.

The PER was conducted between October 2013 and November 2014 by Rhizome Management Services. Some of its key outputs, insights and recommendations are summarised here. The full report and the costing model are available at www.gtac.gov.za/programmes-and-services/public-expenditure-and-policy-analysis.

2 International trends

Internationally, PRIs are either entirely or substantially publicly owned and/or are funded largely from public sources via block or contract funding. They are typically regulated to achieve public objectives, and any profits generated are reinvested in support of their main public research goal. PRIs generally assume the role of funder when technology risk is high, for instance in the very early stages of research and development (R&D). PRIs focusing on new industrial sectors (e.g. biotechnology) usually require more public grant funding, because technology risk is especially high.

Private sector funding typically increases as commercial and technical risks fall, such as when new inventions approach the final stages of commercialisation. Effective partnerships require a willingness and commitment by both parties to develop and fund innovation-based projects jointly. Many companies do not seek active partnerships with science councils, preferring to adopt in-house approaches. Worldwide, PRIs obtain less than 20% of their revenue from contract research for the private sector.

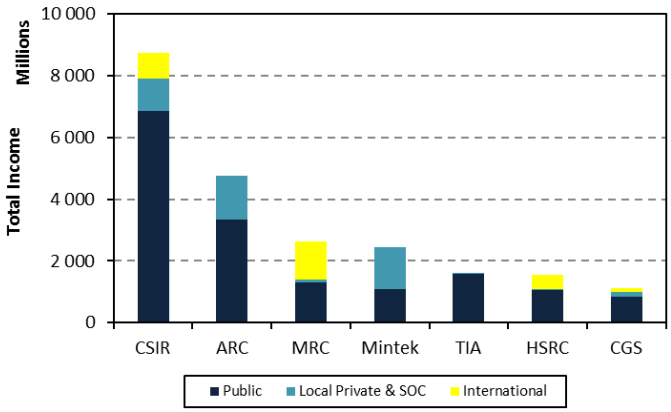
PRI business models vary considerably in their mix of research activities, their sectoral focus, the extent to which they have statutory or mandatory functions, and whether they offer technical and technology-based services to the public and private sectors. These differences are reflected in the mix of their funding sources, which include core funding, programmatic or ring-fenced funding, public competitive project funding, contract research income from the private sector, and royalty, licence and dividend income.

The share of government grants in PRI funding has been declining globally, compelling them to adopt mixed-income models, cut costs, close less-commercial units, and become more competitive. However, history shows that diluting core grant and ring-fenced funding below a critical level of 25% for developed countries and 40% for developing countries undermines PRIs' sustainability.

3 Benchmarking of science councils and funding agencies

The diversity of PRIs' income sources is apparent in the graph below, which shows the aggregate funding for each sampled PRI between 2008/09 and 2012/13.

Figure 1: Income sources of PRIs, 2008/09 to 2012/13



The public sector (including state-owned entities) is the dominant source of funding for the entities studied, except for Mintek, which relies mainly on private sector funding, and the MRC, which attracts significant international income. In all the others, public funding accounted for over 50% of income. Public investment in the entities amounted to R16.1 billion between 2008/09 and 2012/13, or 70% of their total income.

Given their highly diverse nature, comparing performance across the seven entities is of limited value. Instead, similar international counterparts were identified for each of them. In the case of the TIA, two local funding agencies were selected. For the sector-focused PRIs (the ARC, the CSIR, the MRC and Mintek), the benchmarking study revealed that:

- *Private sector (industry) income* is generally between 5% and 10% of total revenue, with the two notable exceptions of Fraunhofer in Germany (21%) and SINTEF in Norway (34%). This category of income is declining globally.
- *Royalty income* is typically between 1% and 4% of total revenue. Even Fraunhofer, with its very strong applied research expertise and patent portfolio, does not achieve more than 6% on a continuous basis.
- *Core grant income* is highly variable. In developed countries, the average value is about 30% (although CSIRO in Australia receives 50–60% of total income as a government grant). In

developing countries, up to 80% of total income may be in the form of performance-based block or core funding.

- In the *agricultural* sector, the proportion of core public funding is high (80–100%) in most countries, with national food security being the main motivation. Recent trends have included the application of a stricter public good argument; privatisation; the separation of research funding, priority setting and implementation; the decentralisation of agricultural research; increased stakeholder participation; and the strengthening of system linkages.
- As governments worldwide assume the major responsibility for *public health*, health R&D receives significant public funding —as much as 30% of the total public R&D budget. Health-related PRIs generally receive little private sector funding, despite the maturity of the pharmaceutical industry.
- In *social science* research, PRIs undertaking policy studies are generally university-based entities or independent not-for-profits, and receive only part of their income through a performance-based block grant (typically 30–50%).
- For *geoscience* councils, the opposite applies; they are mostly funded through core grants and their statutory mandates relate to the protection and control of mineral rights and assets.

4 Performance

4.1 Science councils

Establishing and sustaining partnerships between science councils and the private sector is one of the policy aims of the national system of innovation. Project-level expenditure information was used to identify science councils' expenditure on projects whose impact was expected to be felt through the private sector (referred to as PIP projects). Four partnership categories were identified:

- Human capital development (e.g. training, internships and secondments);
- Research, development and innovation;
- Products and services (e.g. analytical services and consulting); and
- Commercialisation (e.g. licencing of intellectual property and investment in new ventures).

PIP project expenditure is a financial measure of the level of effort that a science council devotes to private sector partnerships, but is only a rough proxy for its effectiveness. An accurate assessment would entail a detailed study of a council's impact on the longer-term innovation output and economic performance of its private sector partners, but this was beyond the scope of this PER.

Expenditure on PIP projects between 2009/10 and 2013/14 amounted to R7.2 billion (or 32% of total expenditure). The bulk of this was spent by the ARC (44%), followed by the CSIR (19%), the TIA (12%) and Mintek (11%). The ratio of income from the private sector to the expenditure on PIP projects was used to calculate an efficiency factor for each council from 2009/10 to 2013/14. It attempts to measure the effectiveness of private sector partnerships relative to a standardised benchmark for the sector, encompassing both the receptiveness of the private sector and the efforts of the science council.

The benchmark value for PIP efficiency is deemed to be 100% – for each unit of funding invested in a PIP project, there is a reasonable expectation of obtaining an equivalent unit of income from a private sector partner, equivalent to a co-funding ratio of 1:1. Excluding the TIA, the five-year average for PIP efficiency between 2008/09 and 2012/12 for the science councils is 72%. Measured annually, the ratio fell from a high of about 100% in 2008/09 to the 2012/13 value of 67%. While the PER did not examine precisely why this occurred, the trend matches the overall decline in

private sector R&D. It suggests a diminishing appetite for R&D and/or the decreasing relevance of public research. Further work on this crucial issue is required.

Science councils whose private sector income forms a larger share of their total income have a higher PIP efficiency. This correlation may simply reflect the importance of strong partnerships with key customers; for instance, a PRI that depends on the private sector for 60% of its income will be more incentivised to offer relevant expertise, products and services to these customers, and hence have a higher PIP efficiency. Partnerships with the aim of developing products and services are more important in entities with high private sector income (such as Mintek).

The analysis suggests that effective partnering between science councils and the private sector depends on two variables:

- The degree to which a council interprets private sector partnerships as part of its mandate; and
- The effective demand from the industry or sector in which the science council functions for the 'products' that it offers.

This is in turn determined by factors such as the structure of the industry in which the science council operates and the council's own efforts to maintain good partnerships.

- *The structure of the industry:* Industries such as mining, which are mature and relatively homogenous and in which profitability pressures limit individual R&D, have different demands than do industries such as the pharmaceutical sector. In the latter industries, competition is high and they need to protect intellectual property and undertake extensive in-house R&D to remain competitive. Such industries would therefore be less interested in partnerships with science councils.
- *The science council's level of effort and investment to maintain good partnerships* (reflected in the resources it directs to PIP projects): This study explicitly sought to understand the investment PRIs make in projects whose impact is predominantly through the private sector.

There was considerable variation among the science councils, both in the degree to which each chose to pursue private sector partnerships and in the effective demand from the private sector. It is clear from the study that partnerships with the private sector have not been a sufficiently explicit policy objective.

While this objective can fruitfully be pursued in a number of cases, it might not be an appropriate approach for all science councils. Although there are strong economic arguments supporting public investment in R&D, in practice this investment may not always deliver the expected returns, particularly in respect of stimulating private sector innovation.

4.2 Technology Innovation Agency

Given that the TIA's core mandate is to be a funding agency, the costs of its operations in relation to the actual level of funding disbursed is a more pertinent measure of its operational efficiency. The administration ratio is defined as the percentage of administrative costs relative to total turnover (disbursements plus administration).

In similar organisations, this ratio typically ranges from 6% to 12%, with an upper limit of 15%. The TIA's administration ratio, by contrast, averaged about 30% between 2008/09 and 2012/13. After the implementation of a turnaround strategy, the ratio fell considerably, reaching a reasonable level of 7% in 2012/13.

5 Findings

There are significant opportunities for science councils to improve the effectiveness of their private sector partnerships. For every R1 that government invests the science councils as a group, R0.72 in private income is generated. (For Mintek, this ratio is 1:1.71 and for the CSIR, 1:1.04.) The international norm for this efficiency ratio is 1:1. Although the definition of private income in this PER included income from state-owned companies, on aggregate this comprises less than 1% of the income of the PRIs in the sample.

It is important to remember that the public policy objective of government funding for PRIs is not solely the pursuit of private partnerships or the generation of income from the private sector. PRIs play a complex role in the national system of innovation and a significant amount of funding and effort is directed towards public-good activities as well as very early-stage, high-risk R&D investment in innovation that promotes economic competitiveness. The level of private income is not the only measure of the effectiveness of partnerships, and must also be assessed against the resources used to generate such income.

A clearer articulation of the 'partnering with the private sector' policy objective is needed, since this objective is implicitly rather than explicitly articulated in government policy statements. Accordingly, the response to the objective varies across the science councils. If PRIs are to be held accountable for performance in this regard, the objective needs to be made explicit. It may need to be applied in a selective manner, since some PRIs (given their functions and location) are better able to pursue such partnerships than others with a public service function or regulatory mandate.

The role of PRIs is complex and context-specific; therefore, the pursuit of private income may not always be a desirable policy objective or a useful measure. Trying to understand PRIs' level of investment in and return from PIP projects is a more fruitful approach. Financial and project accounting practices should be reviewed to enable more effective tracking of PIP projects. Further qualitative research on partnering with the private sector should be considered, for instance through firm-level surveys or engagements, as well as an assessment of the longer-term economic returns from PIP investments.