



BUILDING A KNOWLEDGE ECONOMY IN SOUTH AFRICA

South Africa is striving to become a knowledge-based economy but not all the essential building blocks are yet in place for a smooth transition in this regard, say WILLIAM BLANKLEY and IRMA BOOYENS.

New knowledge, innovation and technological change have become the drivers of progress, growth and wealth in the world's leading economies as they have evolved over the past two decades into knowledge-based economies, shedding their reliance on traditional resources such as labour and capital.

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Knowledge-based economies have the potential to stimulate economic growth, provide higher wages and greater employment opportunities, as well as enhance a country's competitiveness within the global environment.

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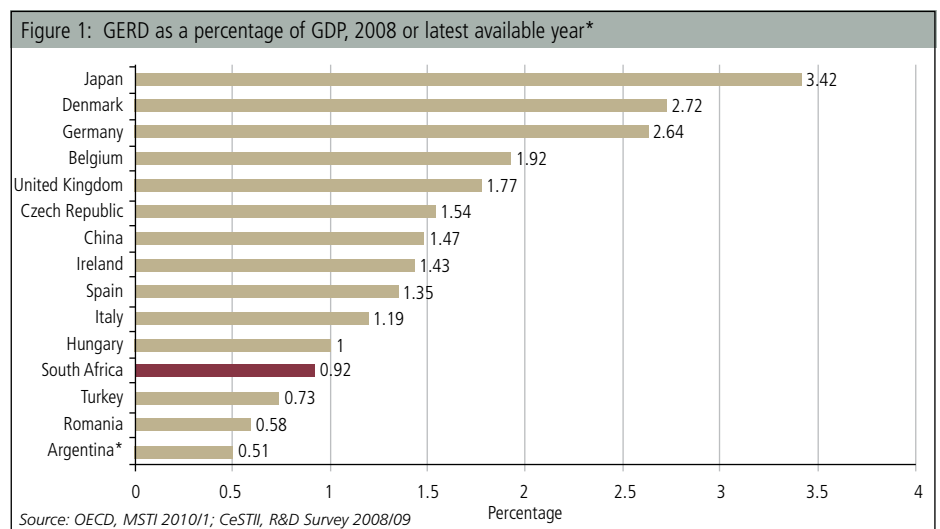
force and the creation of infrastructure for high-technology industries.

KNOWLEDGE ECONOMY INDICATORS

Knowledge economy indicators (KEIs) play a crucial role in national policy debates, and in South Africa, the Centre for Science, Technology and Innovation Indicators (CeSTII) of the HSRC helps inform these debates through the provision of indicators based on the results of the surveys they undertake. Yet even though science and technology indicator initiatives exist in South Africa, there are gaps between the conceptual and empirical

aspects of measuring the knowledge economy. The KEI project, initiated by the department of science and technology (DST), aims to expand the list of traditional indicators, such as research and development (R&D) and innovation indicators, patent data and bibliometric data on patterns of scientific publications and citations, as well as to incorporate new indicators.

Gross domestic expenditure on R&D (GERD) as a percentage of GDP reflects the intensity of R&D performance. This indicator is used by politicians to set targets, such as expenditure on R&D reaching 3% of GDP in the EU by 2010 and 1% in South Africa by



2008. However, these targets have not been achieved. South Africa's GERD as a percentage of GDP amounted to 0.92% in the financial year 2008/2009.

Figure 1 shows that South Africa compares well with middle- to-low income countries, such as Hungary, though it ranks well below other developing countries such as China (1.47%), but higher than Argentina (0.51%). We have a fairly strong investment in R&D intensive industries, including pharmaceuticals, electronics, aerospace, biotechnology, nanotechnology and open source software, and R&D in these industries accounted for about 22.9% of GERD in 2008.

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PATENTS AND PUBLICATIONS

Patents and publications are traditional science and technology indicators that are readily quantifiable and auditable and reflect the outputs of the national system of innovation. Publications generally represent the outputs of academic research while patents represent the technological outputs of industry.

South Africa applied for 265 patents at the US Patent Office in 2008 and was granted 91 patents in the same year while countries such as India and Brazil were granted 679 and 103 patents, respectively. In terms of triadic patent families (US, Europe and Japan), South Africa had 28 of these in 2008, compared with nine by Argentina and 63 by the Russian Federation.

In respect of publication outputs, South Africa ranked 38th out of all countries in all fields from 1999 to 2009, clearly lagging behind other developing countries such as China, India, Brazil and Argentina (Figure 2). However, country comparisons of the number of publications and citations should also take into account the population and the number of researchers.

Highly skilled human resources are the most critical component in building a knowledge-based economy. South Africa performs relatively poorly with only 1.4 fulltime equivalent researchers per 1 000 total employment, compared with 8.2 in the UK and more than 10 in Denmark and Japan (Figure 3).

Industry and global market indicators, such as foreign direct investment (FDI), measure competitiveness. FDI as a percentage of GDP fluctuated between 2005 and 2007 and remained quite low, although it increased to 4% of GDP in 2008. A large part of the FDI in South Africa comprises equity investments as opposed to fixed

productive investment.

The manufacturing trade balance and the high-tech manufacturing trade balance is negative and it is clear that payments for general imports and technology tend to be higher than receipts. This means that South Africa imports and buys more technology than it exports or sells. However, technology imports can have a positive effect if they are used productively or incorporated into new developments.

COMMITMENT AND TIGHTER POLICIES NEEDED

A specific framework of conditions is necessary to enable South Africa to make the transition towards a knowledge-based economy. It would include education and human capital development, an effective national system of innovation and a conducive business environment. Policies to enhance the knowledge economy should include economic development strategies built around innovation, education and learning, as well as policies to develop competitive structures and strong organisations able to deal with global competition and market forces.

The DST has set an R&D expenditure target of 2% of GDP by 2018. However, the business sector provides the greatest share of R&D expenditure. In 2007, South African R&D expenditure by business was nearly 58% of GERD. That means that either the government would have to invest in vast new R&D projects to achieve the new targets or alternatively would have to find new mechanisms to encourage business to increase its R&D expenditure. This would best be achieved as a partnership with government. To have reached the previous 1% target in 2008, South Africa would have required an extra R1.8bn in R&D expenditure. The target of 2% by 2018 therefore appears elusive.

South Africa's growth-orientated exposition of the knowledge economy, rooted in the notion of free competition and reliance on new technology and innovation, is insufficient in terms of promoting long-term human development. A knowledge-based economy will not necessarily ensure national economic prosperity, improved health and wellbeing, ecological sustainability and reduced inequalities. That means a balance between the expansion of the knowledge economy and sustainability, long-term growth and development are important policy considerations for South Africa. As they stand, the country's policies in support of a knowledge-based economy are too broad and attempt to simultaneously tackle growth and development when these essentially require distinct and specific policy emphases.

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