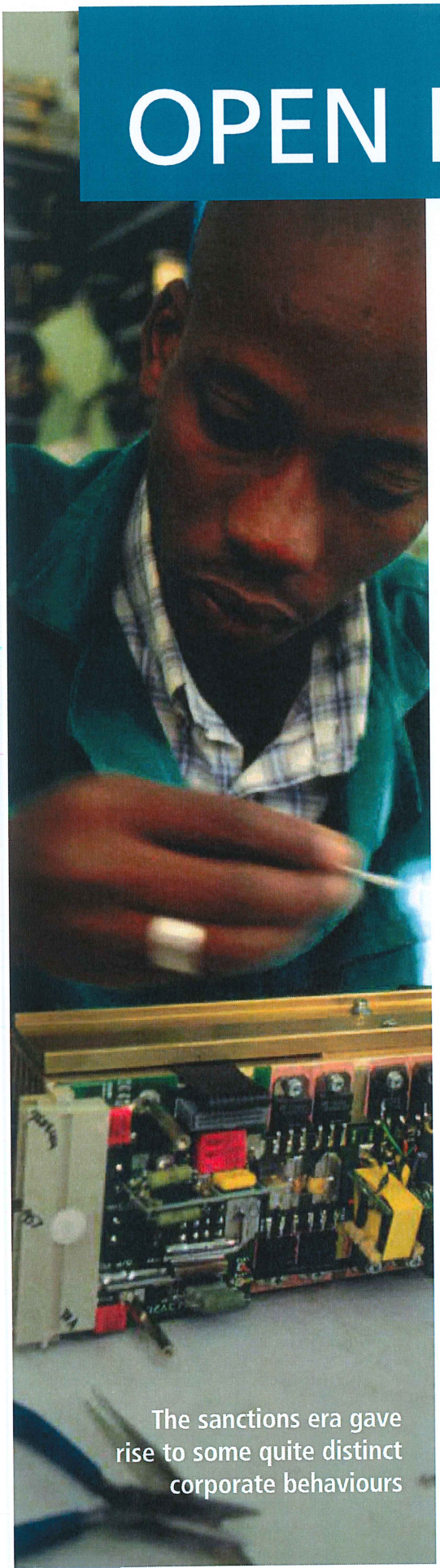
OPEN FOR BUSINESS:

observations on the R&D behaviour of South African firms

Some interesting paradoxes turn up in the way South African firms respond to challenges. MICHAEL KAHN, STANLEY NTAKUMBA, NKOSIKHO BATATU, JULIEN RUMBELOW and ANTHONY BURNS present their findings.



The sanctions era gave rise to some quite distinct corporate behaviours

South African firms have faced a new operating environment since 1990, as the economy has shifted from a relatively closed state to the open globalising regime of the World Trade Organisation. Firms seeking to compete globally in new markets require access to competitive technologies. These may be imported or developed in-house, and in both cases research and development (R&D) capability is required.

These challenges and the way firms in different industry sectors respond provide a research agenda that turns up interesting paradoxes. In trying to understand these responses, 'evolutionary economics' provides insights into so-called path dependence as well as the cumulative and non-linear character of learning in firms. History matters, and the more one knows the more one can know.

In the South African case the sanctions era gave rise to some quite distinct corporate behaviours. This history must be factored into the analysis. Foreign multinationals operating in the country often went the route of disinvestment and sold on to local management or other parties, thereby cutting the flow of new technology from the foreign parent. Some of these 'franchises' then set up a local research and development (R&D) capacity, as in software development and the automotive industry.

On the other hand, the mines, banks and insurers, SASOL and those companies organised in the ARMSCOR value chain, as well as the parastatals, could not disinvest. But they also faced the technology acquisition problem. This was met by both local R&D and technology importation, against very short timelines.

Both groups experienced distorted flows of tacit and embodied technologies. How can one begin to make sense of the way these behaviours have changed?

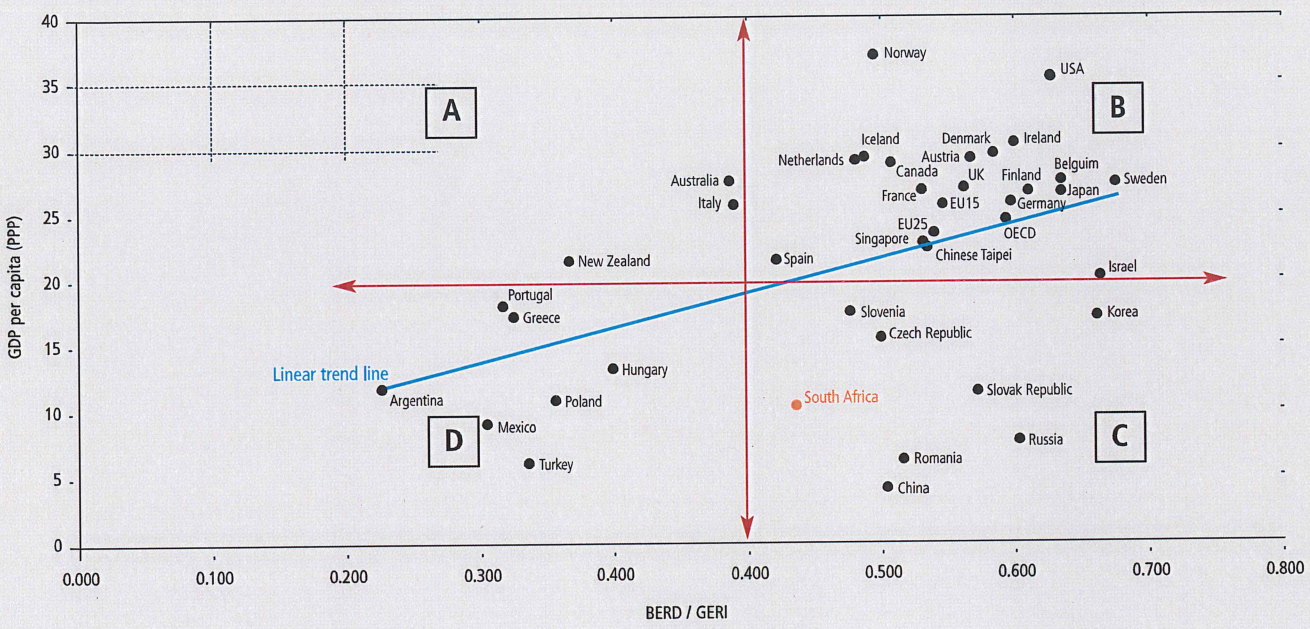
One approach is through the time series of R&D surveys that show R&D spending since the 1980s at around 0.75% of GDP, with the business sector spending half the total.

Using new data from the R&D surveys of 2001/02 and 2003/04, as well as historic data, the Centre for Science, Technology and Innovation Indicators (a unit of Knowledge Systems) seeks to understand the above corporate dynamics with the view to inform decision-making by government as it seeks to better support the various actors in the national system of innovation.

The European Union (EU), through its Barcelona Declaration, has set the target of spending on R&D at 3% of GDP by 2010, with the business sector expected to account for 67% of the spend. The question these benchmarks pose is this: with the EU average GDP/capita of $25 000, are these at all relevant to policy in a country with GDP/capita of $10 000 purchasing power parity? The problem is sharpened yet further when one notes that the average EU Gini coefficient is 0.3 compared with our high value of 0.6. Are we attempting to punch above our weight when handicapped by the Gini drag? The accompanying graphic (diagram 1) positions country business expenditure against GDP/capita, and shows that we keep interesting company, as we are in the quadrant of previously closed economies of the various communist states.

What else can we say about the R&D behaviour of business? Well, SA business generally funds its own R&D. In other words, there are

Figure 1: GDP/capita in relation to Business share of national R&D (BERD)



weak financial linkages to the other major R&D players, namely the universities and government laboratories. Compared with the EU member states and the larger Organisation for Economic Co-operation & Development, this financing behaviour by our firms, at 56%, is slightly above the average value of 50%. This then constitutes one of the paradoxes: in a low GDP/capita environment, our firms appear to show R&D behaviour like their more advanced peers abroad. In this sense, SA business is 'normal': it finances its own R&D and utilises the flow of human capital from the universities as a source of new technological knowledge.

Let's examine this a little more closely. An important measure of country (and corporate) competitiveness is the volume of patent applications and patents awarded at the US Patents and Trademark Office (USPTO). For South Africa, the volume of patent awards is low, and almost static, at around 120 per year. This low historic value may be a legacy of the closed economy; it may also be a reflection of the low country spend on R&D and its limited stock of high-level human capital. Before one leaps to these conclusions, one must look at the patent application data, bearing in mind the shifts described above. But here too the data disappoint: USPTO patent applications are also static.

However, South Africa's transnational corporations, as part of their globalisation strategies, are filing patent applications in the countries where they trade or manufacture, as a defensive strategy. To prosper globally, one must protect one's intellectual capital.

Preliminary findings show four different R&D investment behaviours for firms

The patent databases tell the story one way. The other way to gain insight into R&D behaviour is by examining the R&D expenditures at corporate level.

A panel of firms across mining, resources, manufacturing and electronics, for which at least four records exist across the selected time period, is now under scrutiny. The panel includes 12 large R&D performers drawn from the 30 firms with (2003/4) R&D expenditures greater than R50 million a year. Another 27 are medium to small spenders, ranging down to R4 million annual R&D expenditure, drawn from the 120 firms in this category.

Preliminary findings show four different R&D investment behaviours for firms. These may be categorised according to firms active only in the domestic market, firms subject to the resources commodity cycle, firms that have been subject to (foreign) takeover and firms that have acquired significant foreign market share.

Those firms that have globalised aggressively show a growth in R&D expenditure that far exceeds economic growth rates. These R&D aggressive firms include those that are most active in patenting their inventions. The domestic market firms show R&D expenditure over time that follows economic growth; the resources firms demonstrate an erratic pattern that appears to follow the domestic resources price (resources are dollar denominated); firms subject to takeover appear to curtail their local R&D considerably.

This short digression raises many more questions than it answers. To be sure, the most compelling questions relate to how the country will reach the 1% R&D spending target that the 2002 R&D Strategy has set. If indeed business is punching above its weight, is the implication that government, and the publicly funded sector with the universities, are in the lightweight category? It may well be that to reach the 1% target it is government that has to put on weight. There is an historic case to be made: when one looks at the top 20 R&D performers, the unassailable truth is that only 5 are in the business sector. If one moved back 15 or 20 years, the number of large business players might have been only two. This suggests the role of the state as a technology incubator if not midwife. It is this nursery role that might want enlargement through a recommitment to state funding of R&D. Back to the future? •

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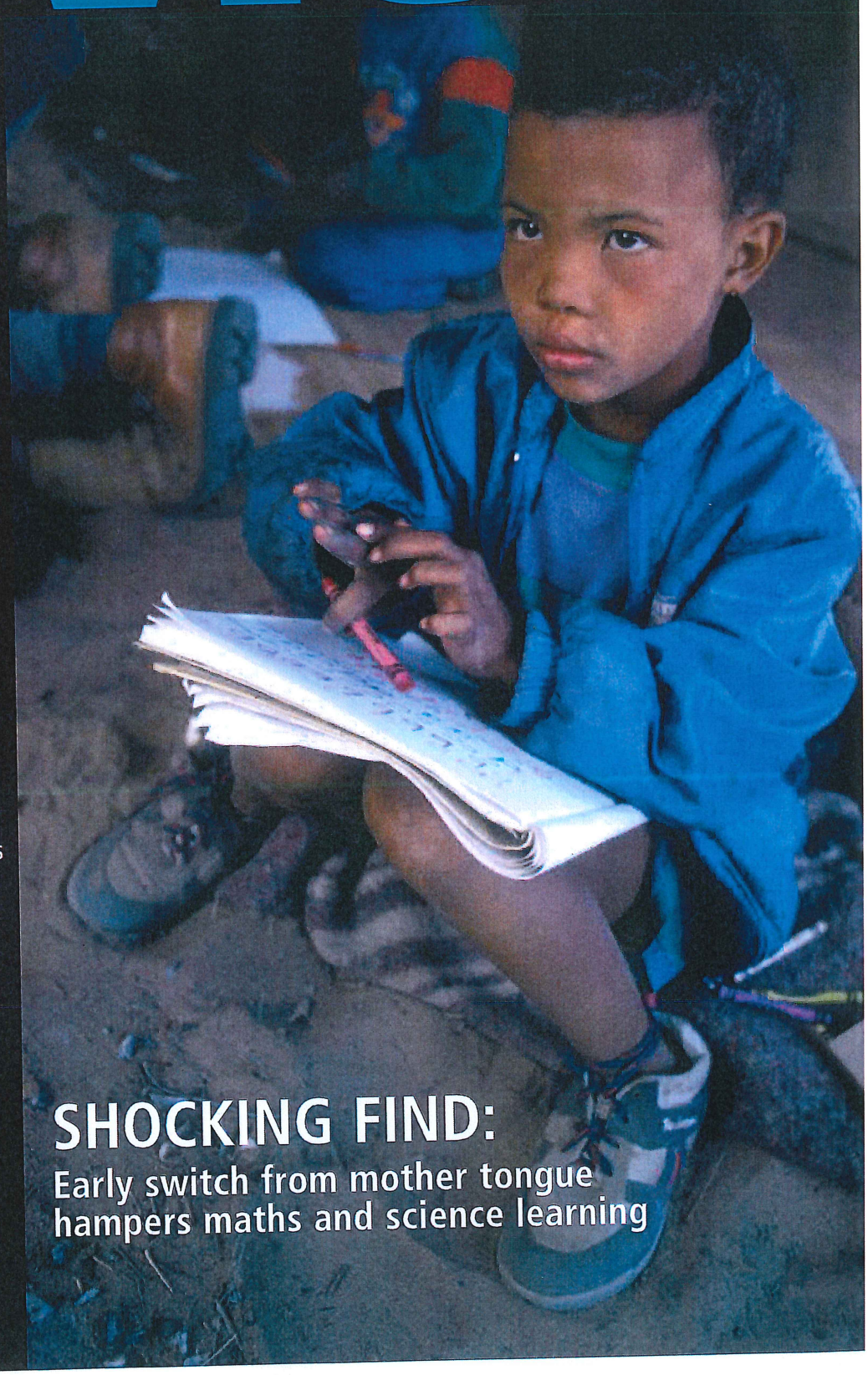

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