The contribution of higher education institutions to the South African economy

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We present the direct and indirect contributions of higher education institutions in South Africa to certain macroeconomic indicators such as GDP and employment, with the ultimate purpose of establishing their importance for the country. Taking this a step further, funding of these institutions is crucial in order for them to continuously produce outcomes in terms of research and skilled graduates. Hence, we compare the South African research and development (R&D) expenditure with international best practice. Policy implications are also discussed, especially in the light of the new funding formula for universities to be announced by the Department of Higher Education and Training.

Introduction

Tertiary education contributes to social and economic development through four major missions: the formation of human capital, the building of knowledge bases (primarily through research and knowledge development), the dissemination and use of knowledge (primarily through interactions with knowledge users) and the maintenance of knowledge (inter-generational storage and transmission of knowledge).

Based on robust evidence that human capital is a key determinant of economic growth and on emerging evidence that higher education is also associated with a wide range of non-economic benefits such as better health and well-being, governments internationally support the sector financially. Investment in human capital and, by implication, higher education has moved to the centre stage of strategies to promote economic prosperity, fuller employment and social cohesion during the last decade).[1]

Universities have historically always been of importance in the domain of knowledge. However, since the rise of mass education after World War II, higher education has changed the character of universities and they have become crucial for employment, social mobility, economic growth and economic development. Today the importance of a vibrant higher education sector is recognised internationally.

The 1980 report[2], 'Technical Change and Economic Policy', is now widely recognised as the first major policy document to challenge the macroeconomic interpretations of the 1970's crisis and to emphasise the role of technology in finding solutions. For example, innovation can be more powerful than wage competitiveness in stimulating an economy[3] and universities play a crucial role in the process.

A substantial volume of literature on the topic indicates that the private returns of higher education institutions to R&D are strongly positive and higher than those for capital and that the social returns are even higher.[4] KPMG[5] reported that 'increasing university funding from its current level of 1.6% of GDP to 2% of GDP in Australia and increasing the share of Commonwealth government grants up to 50% from 42%, led to a 5.8% gain in real GDP and a 5.2% gain in living standards in the long term'. Similarly, Universities UK[6] showed that universities contributed 2.3% of the UK GDP in 2008 and 'that the effectiveness of the higher education sector in generating impact is relatively high compared to other sectors of the economy'.

The 2010 edition of *Education at a Glance*[7] shows that public resources invested in education ultimately receive returns in even greater tax revenues. On average, across Organisation for Economic Co-operation and Development (OECD) member countries, a person with a tertiary level of education will generate an additional USD119 000 in income taxes and social contributions over their working life compared to someone with only an upper secondary level of education. Even after subtracting the public revenue that has financed the degree, an average of USD86 000 remains – almost three times the amount of public investment per student in tertiary education. The returns to society are even larger because many benefits of education (e.g. in terms of health) are not directly reflected in tax income.

The importance of higher education has never been more evident than in the recent (2008) international recession and financial crisis. Countries set R&D expenditure targets and use R&D expenditure as a stimulus for economic recovery. For example, the European Union has urged member countries to increase investment in R&D and consider ways to increase private sector R&D investments. The US government, as part of the *American Reinvestment and Recovery Act of 2009*, has increased its spending on R&D related to climate change by USD26.1 billion and to energy by USD6.36 billion. In addition, USD10 billion was allocated to the US National Institutes of Health (NIH) for biomedical research and an additional USD2.3 billion was allocated for research funded by the National Science Foundation.[8] The OECD[3] stated: 'Despite the slowdown in economic growth and the resulting fall in tax revenue government investments in R&D have outpaced outlays in other areas. Government investments or spending and tax cuts, taken together, have represented on average more than 3% of GDP in the OECD area and up to 5% of GDP in the United States and Korea'.

In addition, looking at the impact of academic research output to the economic growth, a number of authors[9-15] have concluded that there is a certain level of causality, but they do not come to an overall agreement and conclusion with regard to the direction and size of the influence. Lee et al.[11] argue that the direction of the causality depends highly on the developmental stage of a country: a weaker or no relationship was found for the developed economies in their study and a stronger relationship was found for the developing countries. The unambiguity in the direction of causality found in the international literature can be attributed to a country's level of economic growth and development or different periods examined or dissimilar academic and research systems. In South Africa, after a

long period of decline and consolidation in the number of publications[16], appropriate incentives[17] have raised the universities' outputs[18].

In this analysis, we discuss direct and indirect contributions of higher education institutions in South Africa to certain macroeconomic indicators such as GDP and employment. After establishing the importance of the higher education sector for the economy, we present interesting facts on the R&D expenditure to higher education in South Africa and then position the country internationally. Finally, we derive policy implications of the analysis and provide a discussion on the future of higher education institutions in South Africa.

Contribution of higher education institutions to the economy

The higher education institutions in the country produce, in addition to knowledge and skilled graduates, their own output and employ numerous employees in different professions and at various qualification and skills levels. Universities also generate additional output and employment in other economic sectors through secondary or 'knock-on' multiplier effects. These effects comprise two types of economic interaction:

1. Indirect effects – universities purchase goods and services from other sectors in order to support their own activity, thereby stimulating activity within those industries. The supplying industries also buy from other suppliers in order to fulfill university orders, and those suppliers in turn buy from others, so there is a ripple effect.
2. Induced effects – universities pay wages and salaries to employees, who in turn spend this income on consumer goods and services. This spending creates wage income for employees in other sectors, who also spend their income and so on, creating a ripple effect throughout the economy as a whole.

There are two approaches that can be taken in order to produce estimates of these 'knock-on' effects. Either an operational model of the national economy can be developed and used, or the gross output multipliers can be estimated from international estimates. The sectoral gross output multiplier is the ratio of total output to direct output. The gross output multiplier for UK universities is estimated to be 2.38 and we use it for our estimates.[6]

Table 1 shows the impact of the higher education sector (23 universities) on the country's economy. The total impact as a percentage of the GDP in current prices amounted to 2.1% in 2009.[19] The release by StatsSA identified that cash receipts from operating activities of higher education institutions amounted to R36 892 million during 2009.[19] Following the definition, this amount is approximately equivalent to the higher education sector's gross output. From this figure, we estimate the sector's value addition and then add the multiplier effects.

Table 1: Impact of the higher education sector on South Africa's economy in 2009

	Universities (Rand billions)
Output	
Direct output	R36 892
Secondary output	R50 910
Total output generated (direct+secondary)	R87 803
GDP	
Direct GDP	R23 350
Secondary GDP	R25 455
Total GDP generated (direct+secondary)	R50 805

It should be mentioned that additional economic impact is generated as foreign students spend resources in the country (outside of universities) which would not have been spent in the absence of universities. Similarly, expenditure generated outside the sector from international conferences, visiting academic staff, etc. is not included in the estimation.

The importance of the above StatsSA[19] figures becomes apparent when they are set in the national context. Figure 1 shows that the value added by the higher education sector is just less than the contribution of the gold industry and substantially higher than the contribution of forestry, textiles, clothing and leather products, hotels and restaurants, and others.

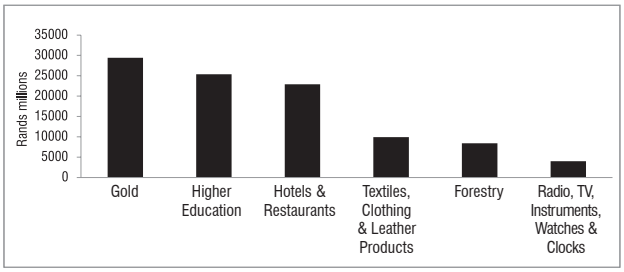


Figure 1: Value-added selected sectors for South Africa in 2009 (current values).

Table 2 shows that the university sector is a relatively high value added sector per employee. The sector's value added per employee is higher than that of the construction and agriculture sectors and just less than that of the manufacturing sector.

Table 2: Value added per employee

Industry	**Value added (Rand millions)**	**Employees**	**Value added/ employees**
Agriculture	R63 888	624 000	R102 384
Construction	R87 116	415 000	R209 918
Electricity, gas and water	R60 280	56 000	R1 076 428
Manufacturing	R330 310	1 185 000	R278 742
Transport, storage and communication	R199 065	359 000	R554 498
Universities	R25 350	113 000	R224 336

Source: StatsSA[19,22-23]

We have already mentioned that higher education makes an additional contribution to the economy through employment. In 2009, 112 797 staff (41 428 permanent and 71 369 temporary) were employed in public higher education institutions. This figure is up from 101 186 during 2004 and 108 697 employed during 2007. It should be emphasised that during the period 2008–2009 the rest of the economy lost 870 000 jobs.[20]

Estimating the total employment impact of the sector (direct and indirect), we identified that, during 2009, the sector employed 228 978 employees. This figure is substantially higher than the number of jobs

available in the utilities sector (98 000) and slightly lower than the number of jobs in the mining and quarrying sector (296 000 jobs).[20]

Funding of higher education institutions in South Africa

In 2010, a document entitled the 'New Growth Path'[21] was published in which the importance of higher education was recognised. It was suggested in this document that a main strategy to achieve the country's objectives is 'Greater support for R&D and tertiary education linked to growth potential and developing South Africa as the higher education hub for the continent'[21].

It is stated in the New Growth Path that:

> *Our technology policy has four main thrusts:*
>
> - *Achieving targets for increased R&D: In line with current targets, raising public and private spending on R&D from 0.93% in 2007/8 to 1.5% in 2014 and 2% in 2018;*
> - *Increasing the number of patents from 91 in 2008 to 200 in 2014;*
> - *Increasing the number of professionals and technicians from the current seven per 10 000 people to 11.*
> - *This will require costed and phased proposals from the relevant departments (DST, DHET, EDD and NT)* (p.23)

Figure 2 shows the gross domestic expenditure on R&D for 1999 (points) and 2009 (columns) as a percentage of GDP for a number of OECD and non-OECD countries. South Africa was among the countries that spent the least on R&D based on their GDP (in 2001 and 2008). It can also be observed that there was no substantial change in this expenditure during the period from 1999 to 2009. We can see that countries such as Korea and Japan that have the highest percentages of the total OECD R&D expenditures are also those that have the highest percentage of GDP spent on R&D.

The specific higher education expenditure on R&D for 1999 and 2009 is presented in Figure 3. South Africa is at the lowest end of the group that spent less than 0.4% of GDP on higher education R&D.

It can be observed from Figure 4 that internationally the business sector is responsible for the majority of R&D expenditure and South Africa is no exception. For the majority of the countries, the next higher contributor is the higher education sector, whereas in South Africa, the higher education sector and the government contribute approximately the same to R&D expenditure in the country.

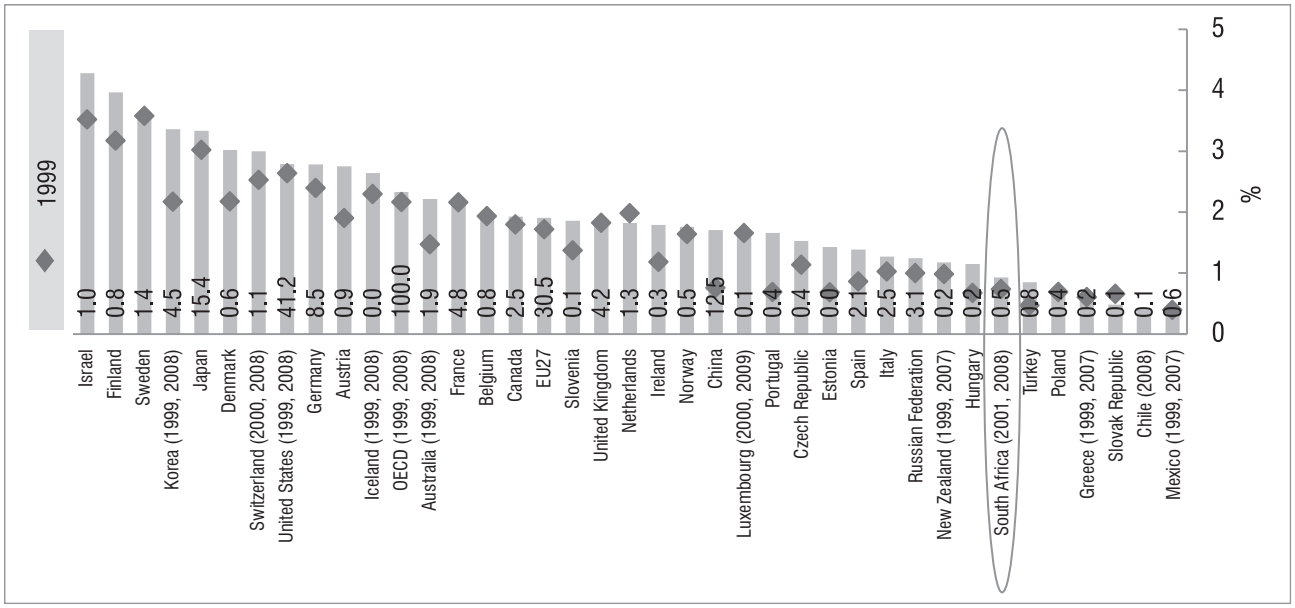
Policy discussion

Universities were identified as the main repository of knowledge in the country, producing more than 85% of the country's publishable research. Furthermore, it is estimated that the contribution of the higher education sector to the economy as it is manifested in the sector's added value is just less than the contribution of the gold industry and substantially higher than the contribution of the forestry, textiles, clothing and leather products, hotels and restaurants, and other sectors.

Estimating the direct and indirect economic impact of the country's 23 universities, it was identified that they contributed 2.1% of the country's GDP in 2009. In terms of added value, the contribution of the 23 universities is just less than the contribution of the gold industry and substantially higher than the contribution of the forestry, textiles, clothing and leather products, hotels and restaurants, and other sectors.

South Africa's 23 universities employed (directly and indirectly) 228 978 people in 2009. This figure is substantially higher than the number of jobs available in the utilities sector (98 000) and just less than the number of jobs in the mining and quarrying sector (296 000 jobs) in the country. Importantly, while the economy was shedding 870 000 jobs during the 2008–2009 period, the higher education sector showed a 3.8% increase in direct employment.

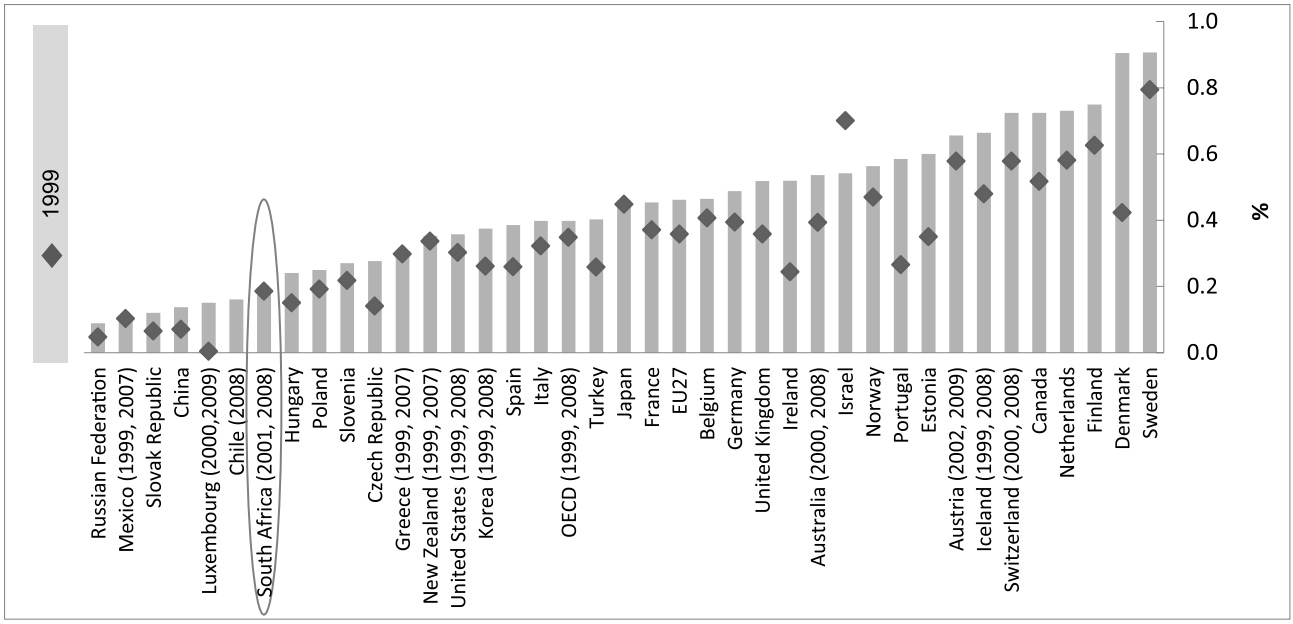
Universities are recognised internationally as cornerstones of knowledge-based societies and governments support them even during recessions or crisis periods. In the USA during the recent crisis, the government, as



Source: OECD[24]

Note: The figures at the bottom of the columns denote % of total OECD R&D expenditure, 2009; the rhombus symbols denote the 1999 values.

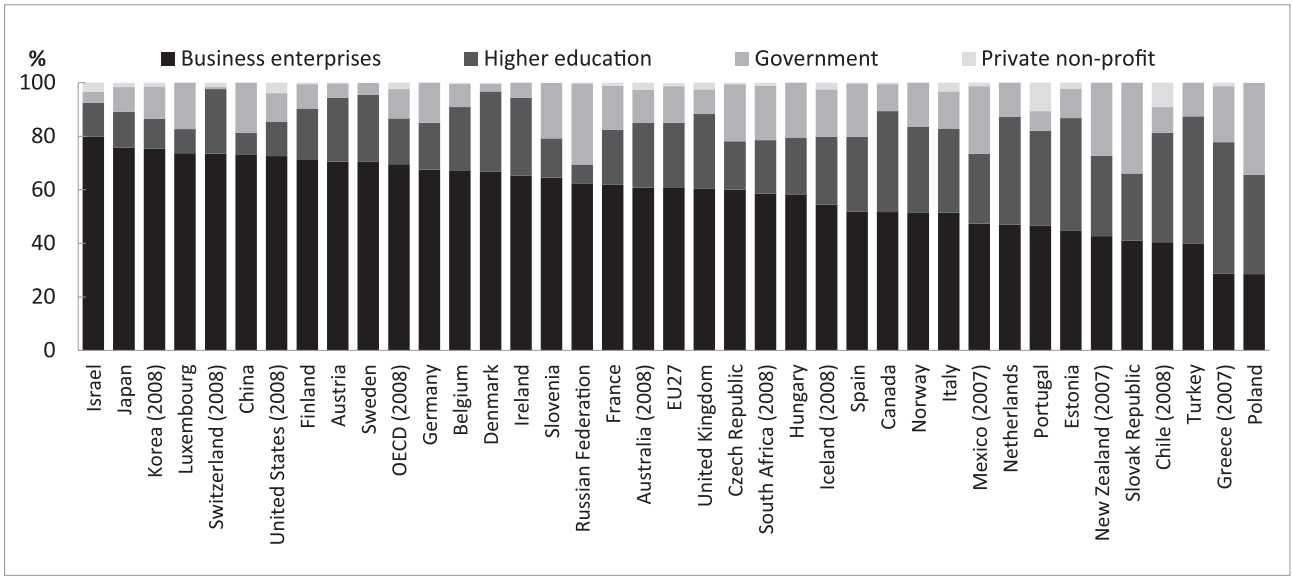
Figure 2: Gross domestic expenditure on R&D (% of GDP) in 1999 and 2009.



Source: OECD[24]

Note: the rhombus symbol denotes the 1999 values.

Figure 3: Higher education expenditure on R&D in 1999 and 2009.



Source: OECD[7]

Figure 4: R&D expenditure by performing sectors in 2009.

part of the A*merican Reinvestment and Recovery Act of 2009*, increased its spending on R&D related to climate change by USD26.1 billion and to energy by USD6.36 billion. In addition USD10 billion was allocated to the US NIH for biomedical research and an additional USD2.3 billion was allocated for research funded by the National Science Foundation.

Despite the multitude of socio-economic benefits offered by the sector and evidence from international best practice as manifested in the actions of OECD countries, the South African government is neglecting the higher education sector.

A comparison of South Africa with the OECD countries identified the following:

- South Africa's low R&D intensity, the relative low figure in targeting and the lack of relevant budgetary appropriations indicate that the science authorities in the country, despite the evidence from international best practice, need to accept in the future that without bold undertakings in the field of science and technology they undermine the country's socio-economic future.
- Government expenditure to universities in South Africa is well below the OECD average. If the country wishes to reach the OECD average the university allocations should be increased by at least 40% of the 2007 values, and if the country wishes to be among the top quartile of the OECD countries, the investment to universities should be doubled (from the 2007 levels).
- South Africa's higher education R&D intensity of 0.18% of GDP is well below half of the OECD intensity. This intensity should be increased by 100% if the country wishes to be comparable

with the average OECD country. This would require an additional investment of R3 billion per annum for R&D dedicated for the higher education sector.

- A total of 20.7% of R&D expenditure in the higher education sector arises from the local business sector. To put this figure in context, the country's science councils (Council for Scientific and Industrial Research, Medical Research Council, Agricultural Research Council, etc.) receive only 9.7% of their R&D expenditure from the business sector. Similarly, industry funds 6.2% of higher education's R&D activities in the OECD countries and 6.6% in the 27 countries of the European Union (EU-27).

The above findings raise a number of policy questions. For example, why does the government fund higher education institutions only to a limited extent although they produce 85% of the country's publicly available research? Is the current model of supporting R&D according to international best practice or it is the result of historical misalignment? What are the benefits from the current government support for private sector research?

The challenge for South Africa is clear. But so is the solution: evidence shows – consistently, and over time – that countries and continents that invest heavily in education and skills benefit economically and socially from that choice. For every rand invested in attaining high-skilled qualifications, taxpayers get even more money back through economic growth. Moreover, this investment provides tangible benefits to all of society – and not just to the individuals who benefit from the greater educational opportunities. The Department of Higher Education and Training is in the process of adjusting the funding formula for universities. It may be a unique opportunity for the country to recognise the benefits that the higher education institutions offer to the country and make appropriate decisions.

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