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# An assessment of the economic impact of South Africa's public universities

With the understanding that universities play multiple social purposes, we aimed to provide an estimation of the economic impact of the public universities in South Africa. Using models described in the literature, we estimated economic benefits from four university activities – university exports, research at universities, the production of graduates and universities as business entities. Comparative analysis shows that, as an economic sector, Higher Education contributes more to South Africa's gross value added than other economic sectors such as Wood and Wood Products, Textiles, Clothing and Leather Goods, or Paper and Paper Products. It is comparable to sectors such as Gold Mining, and Beverages and Tobacco. Taking into account a number of assumptions, which are explained in the text, for 2018 the total economic impact was estimated at about ZAR513 billion. Governmental expenditure on higher education in that year was ZAR66 billion. These figures produce a cost–benefit ratio for the sector of 1 : 7.7, considering only these four university activities.

**Significance:**

The South African public higher education institutions form a very significant economic sector within the national economy. In terms of the gross value added, it is very similar in size to the gold mining industry. Taking into account four activities of universities, this sector contributes about ZAR500 billion annually to the economy, which is likely to be an underestimate of the actual contribution. This finding opens the way for policymakers to understand the importance of the sector as an area of investment. Recognising the potential limitations of the use of the modelling developed for other economies, our study indicates the importance of further work to indigenise the economic modelling for local conditions.

## Introduction

Universities are knowledge-intensive social institutions. They are created by societies with the understanding and expectation that they play vital, complex roles in multi-layered democracies such as South Africa. Universities are special as knowledge-intensive institutions in the sense that they have students. They are expected to produce new generations of socially engaged professionals, experts, and intellectuals. In societies like South Africa, which are deeply unequal, they are expected to generate social mobility and a society that is more socially just; this, notwithstanding the fact that they are deeply embedded in the political economies in which they are located. They are expected to generate new knowledge that enhances the growth of society's understanding of itself, of nature, and of the universe. Universities are necessary for building social cohesion. They preserve, transmit and recreate culture. These are all non-tangible outcomes which are measured qualitatively. There are many other activities which bring benefits which are currently unmeasurable.<sup>1</sup>

On the other hand, there are tangible, quantitatively measurable outcomes of the work done by universities. The international literature identifies a number of university activities that may be characterised as bringing economic benefits to a society. They produce knowledge, data and information that are taken up by the economy for the purposes of product development which may be industrial, service-related, or of social relevance. They produce graduates who become business developers or are employed in higher paying jobs and contribute to the national personal income tax base. Furthermore, universities are substantial business entities in the contexts in which they find themselves. Universities South Africa (USAf), an umbrella body that represents public universities in South Africa, engaged in this study to develop a broad understanding of the contribution of its member universities to the national economy.

Internationally, economic impact assessments of universities are regularly undertaken in order to inform governments and society at large of the economic importance of the sector and to advocate for suitable public and private investments in higher education. When performed on longitudinal timescales, these analyses also help inform universities and university systems of the ways in which they impact society and how these may be further shaped by strategic interventions. Examples of these studies include those by Oxford Economics<sup>2</sup> for the UK, Biggar Economics<sup>3</sup> for the League of European Research Universities (LERU) and KPMG Econtech<sup>4</sup> for Australian universities.

The economic impact of higher education is defined by Beck et al.<sup>5</sup> as “the difference between existing economic activity in a region given the presence of the institution and the level that would have been present if the institution did not exist”. In an editorial of *Nature*<sup>6</sup>, it was stated that “every government and organization that funds research wants to support science that makes a difference”. Siegfried et al.<sup>7</sup> argue that the main purpose of the universities' impact studies is to express the value of an institution or the whole higher education sector, often to assist in sourcing funding, obtaining a subvention, or answering to criticism.

There are few published investigations related to the impact of the higher education sector in South Africa.<sup>8</sup> Furthermore, a number of investigations focus on one particular institution only. For example, Dyason<sup>9</sup> and Coetzee<sup>10</sup> investigate North-West University and Orr<sup>11</sup> Stellenbosch University.

Here we report the impact of South African public universities using methodologies developed for other systems of universities, all in the Global North. There are limitations related to this approach and where practical alternative approaches are suggested. Further, this analysis is based on 2018 data and therefore the impact of the COVID-19 pandemic is missed.

## Literature review

There is a multitude of investigations related to various aspects of the impact on economies of education in general and higher education in particular. Hanushek<sup>12</sup> identifies that cognitive skills can explain most of the differences in growth rates across countries. Psacharopoulos et al.<sup>13</sup> review investigations estimating the returns on primary, secondary and higher education. Bloom et al.<sup>14</sup> argue that, despite the encouragement of the international community that African countries should not neglect higher education the international community of the African governments, their research has identified that tertiary education has an important role in promoting economic growth and alleviating poverty. Tilak<sup>15</sup> found that different levels of education affect development outcomes differently; for some development outcomes, primary and secondary education may be more important than tertiary education, while for others such as income growth rate, tertiary education may be more important.

The above literature, although informative, does not focus on quantifying the impact of the various activities of higher education on the economy. The estimation of impact is not a straightforward process. As Bowen<sup>16</sup> mentions: "For individuals, the outcomes of higher education are harvested over their lifetimes averaging fifty to sixty years after graduation from college. For society the impacts may persist through centuries." For example, individuals benefit through the 'graduation premium' in the form of higher wages, while society at large benefits through enhanced economic growth, the provision of services of all kinds, and the benefits that accrue to particular local, provincial or national government structures or other social institutions.

Recent studies<sup>2,3,17,18</sup> have focused on only four activities amongst a plethora of university activities. These four activities are:

- The economic impacts of university exports (international students).
- The economic impacts of research at universities.
- The economic impacts of the production of graduates with enhanced knowledge and skills.
- The economic impacts of universities as business entities.

It is emphasised that researchers have chosen to focus on these particular activities of universities. There are others. The UK Department for Business, Innovation & Skills<sup>1</sup> identified more than 20 different concepts ranging from greater social cohesion, trust and tolerance, to increased entrepreneurial activity and productivity. What this means is that any estimation of economic benefits should be considered to be conservative.

## Methodology and results

Impact assessments of universities and university systems are developed through a range of different approaches and, generally, one would expect a composite picture to emerge. These assessments range from econometric approaches, qualitative analyses, national and international comparisons and the input-output modelling of the various domains in which higher education makes a contribution. Each approach is dependent on the underlying assumptions. For example, one of the major weaknesses of input-output models is that the relationships between sectors are assumed to be constant. This affects the estimation of multipliers used in these analyses.<sup>19</sup> The question that arises is how the uncertainty may be reduced.

Computable general equilibrium (CGE) modelling approaches allow for more elastic relationships between sectors and factors of production. However, because of the complexity of these CGE models, industrial detail is lost and modellers must at times make heroic assumptions to operationalise the model.<sup>20</sup>

There are two parts to this investigation. The first is the positioning of the university sector in the economy. For this we provide a number of comparative graphs which position the higher education sector alongside other industry sectors. The second, as has been pointed out above, is an estimation of the economic impact of four distinct industry operations. For this we utilise the modelling approaches used internationally, which we describe below. The four areas of university operation focused on are: university exports (as in international students); research and innovation activities; the production of graduates; and universities as business entities. As was pointed out earlier, there are indeed other activities that universities engage in which were not considered in this study. Examples of these are consultancy services, student residences, and service provision as in hospital services. There is limited methodological literature for those activities. If one considers the differentiation within South Africa's higher education system, the four areas that have been chosen reflect substantial areas of activity for all 26 public universities.

## South African universities in terms of gross value added

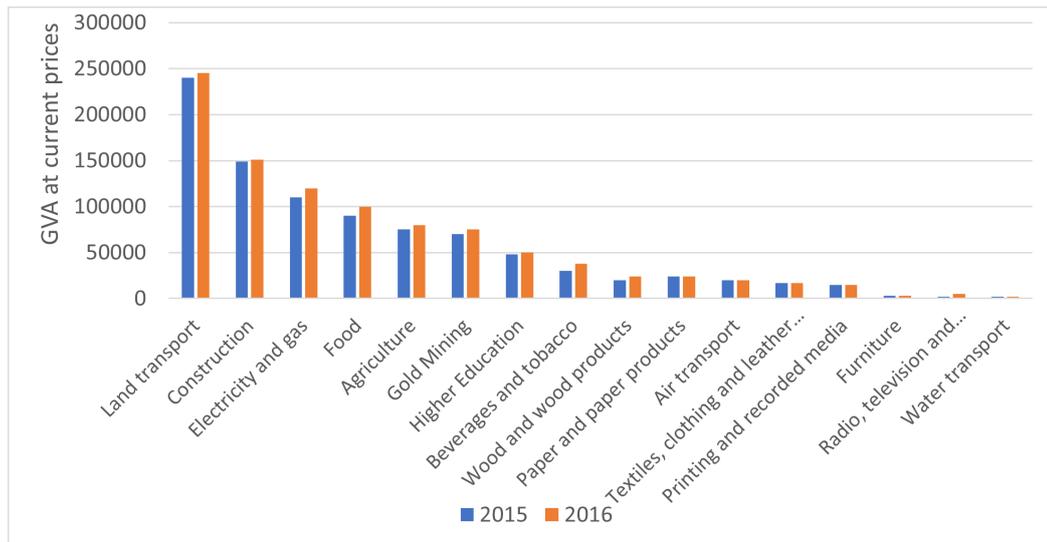
There are more than one (1) million students at the 26 public universities in South Africa. This represents a participation rate of about 21% of 18 to 24 year olds and the system produces more than 200 000 graduates a year. The unemployment rate of graduates is considerably lower than the general unemployment rate. In 2019, the university sector employed 162 865 individuals at all levels, of which 64 921 were permanent.<sup>21</sup> The university sector produces just less than 1% of the total research output of the world. It is a significant industry sector in the South African economy.

Even though the higher education sector in South Africa includes the Council on Higher Education (CHE), a number of other statutory and non-statutory bodies and a number of private institutions that offer higher education qualifications, for the purpose of these comparisons, the higher education sector refers just to the 26 public universities. To illustrate the position of the higher education sector in the economy relative to other economic sectors, we used data provided by the South African Reserve Bank to compare the gross value added (GVA) of the sector in Figure 1. GVA is one way to measure the contribution of a sector to the economy. The number represents "a quantitative assessment of the value of goods and services produced minus the cost of inputs and materials used in the production process"<sup>22</sup>. Figure 1 shows the GVA of a number of sectors for 2015 and 2016.<sup>23</sup> From this comparison, we can see that the contribution of the Higher Education sector to the country's GVA exceeds that of Wood and Wood Products; Textiles Clothing and Leather Goods; and Paper and Paper Products. It is comparable with sectors such as Gold Mining; and Beverages and Tobacco.

Figure 2 provides a measure of state spending on higher education as a percentage of GDP. This may not be the most effective measure, but it does allow a comparison with governmental expenditure in other national systems. As the graph indicates, as a percentage of GDP, the value of the higher education sector in South Africa in 2014 was 0.74%. This fell to 0.68% in 2018, and then increased somewhat following implementation of the recommendations of the Commission of Inquiry into Higher Education and Training, established by then President Jacob Zuma and chaired by Justice JA Heher. One of these recommendations was the need to raise the spend on higher education from 0.74% to 1% of GDP. For the 2019/2020 financial year, this figure was at about 0.9%. For the 2022/2023 financial year, the higher education block grant rose by just 0.9% on the previous year, significantly below CPI, and so we may expect another decline in this percentage.

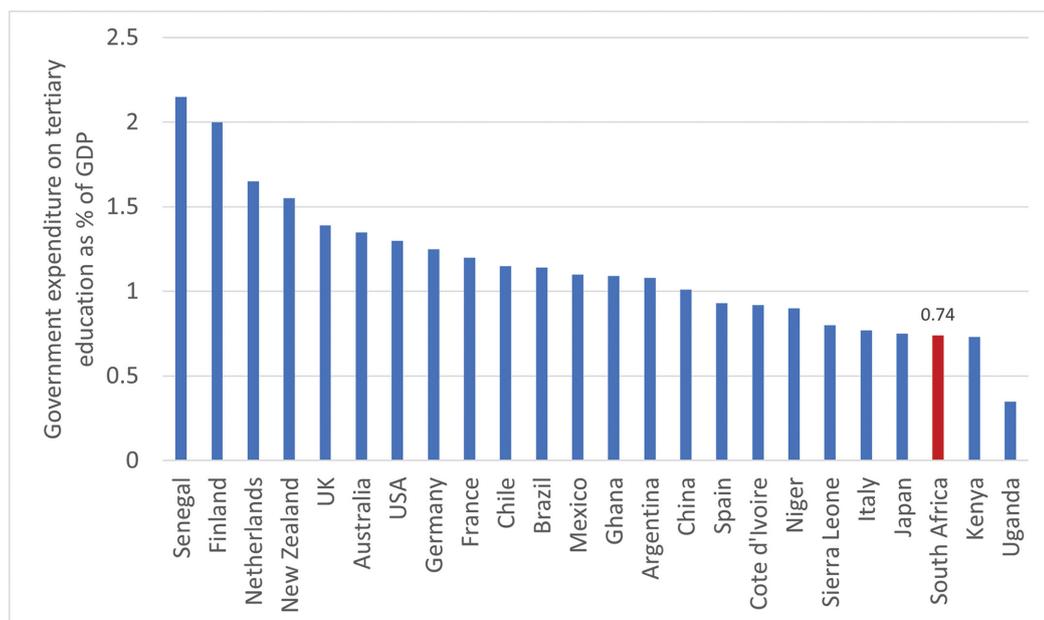
Figure 2 shows that South Africa ranks in a low position in terms of government expenditure to higher education, compared with not only developed countries but also some of the BRICS countries and other emerging and African countries. In this comparison, the countries in the sample, except for Uganda, show similar or higher shares of government expenditure to tertiary education in 2014. South Africa's low contribution is contrary to the National Development Plan which calls for significant growth in the sector.

Figure 3 provides another measure of the state of government spending on higher education. While in real rand terms, there has been a steady increase in subsidies to higher education, as a percentage of the overall national budget, this spend has been completely steady in a range



Source: Stats SA<sup>23</sup>

Figure 1: Gross value added (GVA) at current prices for various economic sectors, 2015 and 2016.



Source: World Bank<sup>24</sup> under licence CC-BY 4.0

Figure 2: Government expenditure on tertiary education as a percentage of GDP (%), 2014.

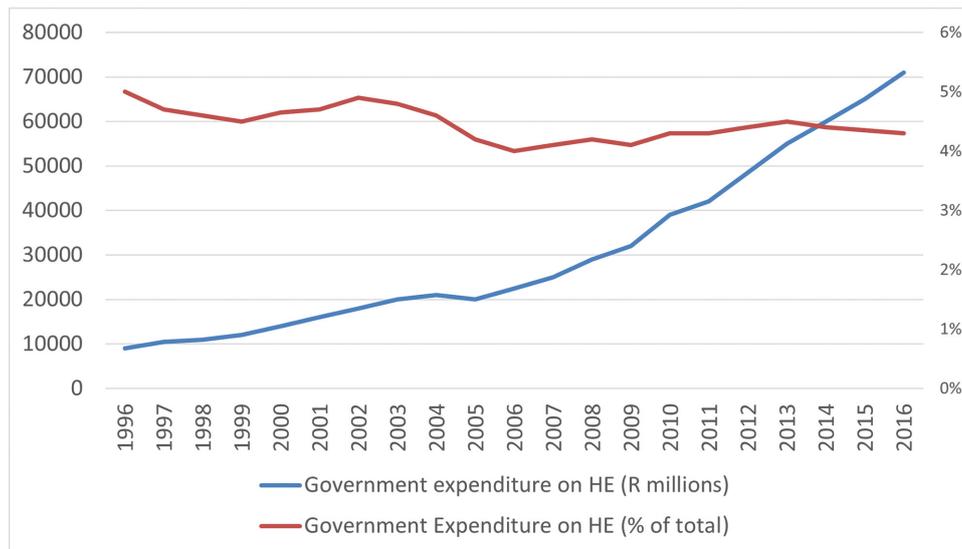
between 4% and 5%. This finding illustrates that national policymakers continue to see higher education as an area of expenditure rather than one of investment.

The rapid growth in actual funding is attributable to the very significant increase in national spending on the new student funding system (via the National Student Financial Aid Scheme (NSFAS)) introduced at the ANC Electoral Conference in December 2017. This figure grew from ZAR11.8 billion in 2017/2018 to ZAR37.0 billion in 2019/2020. In that year, higher education subsidies reached ZAR42.3 billion, indicating that we are fast approaching the point at which government spending on student funding for students from poor and working-class backgrounds will overtake government spending on universities via the block subsidy grant and earmarked grants. Furthermore, the annual shortfall in funding from the national Department of Higher Education and Training (DHET) to NSFAS has been compensated for partly out of the governmental subsidy and

earmarked grant allocation to universities, placing the medium- to long-term sustainability of the sector at great risk.

If one considers that the gross domestic expenditure on research and development (GERD) has continued its precipitous decline as a fraction of GDP and that, more specifically, private sector spend on research and development (R&D) has declined to the extent that government spending on R&D has now overtaken private sector spending, this flat line in state investment in higher education (as a fraction of national budget spend) is of deep concern.<sup>24</sup>

There will have been some shift in the position of the Higher Education sector in the national economy in recent years, especially with the impact of COVID-19 and the subsequent impact on the funding of higher education, admission statistics and cuts in funding for research and innovation. Future analyses will detect these.



Source: Stats SA<sup>23</sup>

Figure 3: Government expenditure on the Higher Education (HE) sector (millions of rands and % share of total).

### The economic impact of universities

In this section, as was pointed out above, we estimate the impact of four activities of universities on the national economy. It has to be emphasised again that there are other operations and activities that universities engage in which may require different estimation approaches. Here we focus on university exports, the impacts through the research done at universities, the impacts of human capital development and the impacts of universities acting as business entities.

#### Impacts through university exports

The assessment of educational exports refers to money spent in the country by international students at South African universities. Approximately 7% of the students at the 26 public universities are not South African, and are predominantly from other southern African countries.<sup>25</sup> While the proportion of international students in other higher education systems in the Global North is much higher, it still makes sense for us to include this analysis. The Southern Africa Development Community (SADC)<sup>26</sup> education protocols (1997) commit universities to charge local fees for students from member states on the basis that they are subsidised by the South African state to the same extent as local students.

The literature shows that there are two approaches to this analysis, depending on the availability of data. Combining the individual fee income of international students with the number of students enrolled in a particular year provides an approach to calculating the total tuition fee income. Making assumptions on average study duration we can calculate the tuition fee income per overseas student from start to completion of studies. Subsequently, the values can be used to estimate the present value. This approach is used when we would like to estimate the export value of a particular type of education over its total time of duration. Alternatively, we can estimate the educational exports for a particular year. Students should be distinguished as undergraduates or postgraduates as the tuition fees and duration of study might differ. For the purpose of this analysis we used the second approach.

In addition to the tuition fee income that foreign students generate, they incur expenditures on non-tuition related items whilst studying, including general expenses (e.g. on mortgage/rent, food and household supplies, utilities, transport costs, medical and health costs, communication costs) as well as study-related expenses (e.g. on textbooks, stationery, non-tuition university fees). Similarly, visits from relatives and friends contribute to exports by the universities.

Our estimates are based on data derived from DHET<sup>27</sup> which show that in 2018 there were 62 326 undergraduate, just under 10 000 doctoral,

and a similar number of other postgraduate non-South African students registered at South African universities.

The estimated average tuition fee for undergraduates was ZAR41 911 during 2018. Average postgraduate fees were estimated at ZAR40 000 per year. Apart from the tuition fees, students face non-tuition-related fees. The average cost for a year of study was estimated at ZAR122 545.<sup>27</sup> On the basis of these assumptions, it was estimated that the total income from international students is ZAR10 billion per annum, while undergraduate and postgraduate international students generate ZAR7.8 billion and ZAR2.2 billion per annum, respectively. The expenditure of family and friends who visit international students in South Africa must then be taken into account. It is assumed that these expenditures are due to the presence of international students. For this investigation we assumed that each undergraduate student received three friends/family members per year who in turn spent three (3) days in South Africa. It was estimated that this expenditure amounts to just over ZAR1 billion.<sup>28</sup> In summary, the direct impact associated with the expenditure of international students and their families was estimated to be ZAR11.0 billion pa.

In relation to the indirect and induced effect (or knock-on effect) of the international students on the South African economy, we utilised the approach of benefit-transfer as described by London Economics<sup>17</sup>. The approach is used to estimate economic values for ecosystem services by transferring available information from studies already completed in another location and/or context. Estimates of the economic multipliers relating to the expenditures of universities in other countries (e.g. Australia) show that the multiplier is 1 : 3 for resources spent within the university sector. The multiplier for off-campus expenditure is 1 : 3.14. That is, for ZAR1 million of expenditure at the universities, a total of ZAR3 million output is generated through the rest of the economy.<sup>17</sup> Transferring these multipliers for South Africa, the total impact (direct + indirect + induced) for expenses within universities is ZAR33 billion. This assumes that the multipliers developed for the Australian case hold for the South African case.

Notwithstanding the pressure for places in the South African higher education sector, this estimation of the impact of international students on the South African economy opens the way for a more rigorous analysis of whether the number of students from other countries should be expanded without jeopardising the participation of South Africans in higher education.

#### Impact of research activities

The economic impact of research activities at South African universities was estimated by combining information on the research-related income accrued by the universities available in a particular year, with estimates from the wider economic literature on the extent to which



public investment in research activity results in additional productivity (i.e. positive 'productivity spillovers').

Assuming that the direct economic impact of research generated by South African universities is equal to the funding that these universities receive for the purposes of research-related activities each year, the direct effect of the research activities of South African universities can be derived from the reports of the Department of Science and Innovation (DSI) and the Human Sciences Research Council (HSRC).

The total university sector research and development (R&D) expenditure during 2017 was ZAR12.6 billion.<sup>29</sup> In addition to the direct impact of research activities in terms of the income derived by universities (and subsequent expenditure), the wider academic literature indicates that investments in intangible assets, such as R&D, may induce positive externalities in the broader economy. Strong evidence of the existence of market sector productivity spillovers from public R&D expenditure is provided in the international literature.<sup>17,30</sup> These reports estimate that the elasticity of market sector productivity with respect to public spending on higher education R&D stands at 0.175. In other words, at the margin, previous findings suggest that a 1% increase in public spending on university research is associated with an increase of 0.175% in the rest of the economy.

Using this approach, others<sup>17</sup> have inferred an average spillover multiplier of 9.76 associated with certain Australian universities. Using the value transfer approach, we assumed that for every ZAR1 invested in university research, an additional economic output of ZAR9.76 is generated across the rest of the South African economy. In order to test the order of magnitude of the multiplier for the South African economy we utilised the assessment of the Technology and Human Resources for Industry Programme (THRIP).<sup>31</sup> THRIP provided government incentives to the private sector to generate research and innovation partnerships between industry and the higher education sector. Among the approaches used in the assessment was a survey of business stakeholders who had invested in the programme. On the question "how much revenue is your company expected to earn from selling goods or services incorporating THRIP technology?", the median respondent (50%) answered that 5 years after the completion of the project the expected revenue would be ZAR5 million. The average of the responses was R24 million. Looking at the 10-year horizon after completion of the projects, the predicted median revenue increases to ZAR40 million and the average to R224 million. The present average value of ZAR24 million of 5 years in the future, with an interest rate of 5%, is ZAR18.8 million. Taking into account that the average THRIP investment per project was ZAR1.5 million, the multiplier is 12.5, which is close to the value used according to the value transfer mentioned above of 9.76. It must be emphasised that these were grants made to support the strengthening of the research–innovation nexus and, therefore, to support a special category of projects.

To summarise, the direct impact of research activities at universities is ZAR12.6 billion. Using the multiplier developed for Australian universities, the spillover impact plus the direct impact is about ZAR123 billion.

### Impact on human capital

To measure the economic benefits that accrue from the production of graduates by higher education institutions, we utilised the Wilkins report.<sup>32</sup> This approach uses as 'treatment' group those individuals in possession of the qualification of interest (as their highest qualification), and the 'counterfactual' group consists of individuals with comparable personal and socio-economic characteristics but with the next lower (adjacent) level of qualification.

The central feature of this calculation is that the private return on education, as documented by PricewaterhouseCoopers and Wilkins<sup>32,33</sup>, is that graduates can expect higher lifetime earnings as a result of their investment in their education, and the tax authorities will receive substantially more in taxes from those higher educated. We used a discount rate in order to transform future streams of benefits into current values.

Using the lifelong benefits approach<sup>32</sup> for bachelor's degrees transformed into South African rands with purchasing power parity<sup>34,35</sup>, we obtained a value of ZAR1 450 000 with a 7% discount rate (and ZAR3 784 500 with

a discount rate of 3.5%) per graduate. This approach considers that, as graduates go up the academic ladder, their income increases and their contribution to the fiscus via taxation and via direct spending increases.

In 2018 there were 100 740 students who graduated with a bachelor's degree or equivalent, producing an economic impact of ZAR146 billion using a 7% discount rate (ZAR381 billion for a discount rate of 3.5%) over a period of 30 years. The South African higher education system produces in excess of 200 000 graduates per annum, far in excess of the 100 740 considered here but the rest are qualifications which are not easily comparable to those used in the Bergstrom model. What this means is that this figure is a significant underestimate of the economic impact of the human resource outputs of universities.

Using the same approach for the 6801 master's and 1810 doctoral students who graduated during 2018 and who are South African, we estimated the economic impact of the master's graduates to be ZAR2.6 billion (ZAR6.8 billion for a discount rate of 3.5%) and that of the doctoral graduates to be ZAR0.5 billion (ZAR1.3 billion for a discount rate of 3.5%). Hence, the aggregate economic benefit is about ZAR149 billion (and ZAR387 billion for a discount rate of 3.5%).

The above estimates must be adjusted to consider the high mobility of the educated population and the potential for them to immigrate before their retirement. Emigration statistics in South Africa are not reliable. However, a number usually quoted is that 20 000 professionals at different stages of their careers leave the country every year. This is about 21% of the cohort of 2018 if it is assumed that the emigration patterns pertain to graduates with bachelor's degrees or equivalent. The impact of emigrations is catered for by reducing the aggregate economic benefit by 10.5%. With the 7% discount rate, this leaves the aggregate output as approximately ZAR134 billion (ZAR347 billion with a discount rate of 3.5%).

### Universities as economic entities

Traditionally, the estimated economic impact of universities has almost exclusively been based on the direct, indirect and induced impact of universities on their local, regional or national economies. These approaches consider a university as an economic entity creating output within the local economy by purchasing products and services from different industries/suppliers and hiring employees.

The sum of the direct, indirect and induced effects constitutes the *gross* economic impact on the local economy. Using data for 2018<sup>23</sup> we identified that universities had an expense cash flow of ZAR66 billion of which ZAR40 billion was compensation for employees. Based on this, the total direct impact associated with the universities' expenditures (in terms of monetary output) was estimated at ZAR66 billion. To determine the full economic impact of this expenditure, we used the value transfer method.<sup>17</sup> Multiplying the gross expenditure by 3.0 (as a multiplier) gives ZAR198 billion.

The above estimates must be adjusted in order to avoid double counting. Hence, from the direct impact we must reduce the total research income (ZAR12.67 billion) as this was included in the estimate of research impact. Similar care must be exercised with regard to university exports. Hence, we reduce the tuition-fee income generated from students who are not South African nationals and the on-campus non-tuition-fee income generated from these students; this is ZAR4.4 billion. Hence, the direct impact is closer to ZAR49 billion which produces a total impact of ZAR147 billion.

### Aggregate economic impact of universities

This is a first attempt at understanding the extent to which South Africa's public universities contribute to the national economy through four activities: the education of international students, the extent of performance and production of research, the education of students and the production of graduates, and the extent to which universities contribute as business entities. Care has been taken to avoid double-counting because of obvious overlaps between these activities.

The total impact is estimated at just more than ZAR510 billion. In 2018 the inputs into the sector were of the order of ZAR66 billion, and this produces a cost–benefit ratio of 1 : 7.7.



It must be noted that there are a number of limitations to this study. First is its dependence on modelling done for other economies, all of which are developed economies. This urges the undertaking of research that would provide the basis for the development of multipliers that apply to the South African economy. Second is the use of sometimes disjointed data sets. The development of the National Education Research Database being undertaken by DHET in partnership with the University of the Witwatersrand will help with this. Third is the absence of a counterfactual condition. What if the universities did not exist? Would South Africa have exported its students to other university systems and what would the cost–benefit analysis of that have been?

## Concluding remarks

We report the results of an effort to position the public higher education sector in the South African economy and to identify the cost–benefits of the sector. We identified that the contribution of the public Higher Education sector to the country's value added exceeds that of Wood and Wood Products; Textiles, Clothing and Leather Goods; and Paper and Paper Products. It is comparable with sectors such as Gold Mining and Beverages and Tobacco. Estimation of the cost–benefits of the sector identified a ratio of 1 to 7.7.

We argue that, in addition to its many non-tangible contributions, the university system is an important economic sector that contributes significantly to the national fiscus and should be seen as an area of investment rather than as an area of expenditure. Areas for further research have been identified. This study should be repeated regularly with the provision that research is engaged in to satisfy its indigenisation.

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## Competing interests

We have no competing interests to declare.

## Authors' contributions

A.C.B.: Conceptualisation, data analysis, validation, secondary writer of initial draft, writing – revisions, project leadership, funding acquisition. A.P.: Conceptualisation, methodology, data collection, data analysis, validation, writing – the initial draft, secondary writer of revisions, project management, funding acquisition.

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