

## *Chapter 7*

### *Universities and economic development in Africa*

Nico Cloete, Tracy Bailey, Pundy Pillay, Ian Bunting & Peter Maassen

During the post-independence period, every African country has struggled with the problematic of the role of higher education in development. Until the mid-1990s, the role of higher education in development programmes and policies in Africa was somewhat of an anomaly, with most education development projects focusing on primary school education. International donors and partners regarded universities, for the most part, as institutional enclaves without deep penetration into the development needs of African communities. As such, higher education was seen as a non-focal sector and even as a 'luxury ancillary', a view that was for many years promoted by the World Bank (Brock-Utne 2002; Hayward 2008; Maassen et al. 2007; Mamdani 2008; Psacharopoulos et al. 1986; Sawyerr 2004).

Dramatic declines in expenditure on higher education were associated with these policies: spending per student fell from USD 6 800 in 1980, to USD 1 200 in 2002, and later to just USD 981 in 33 low-income sub-Saharan African countries. Lack of investment in higher education delinked universities from development, led to development policies that had negative consequences for African nations, and caused the decline, and in some cases closure, of institutions and areas of higher education that are critical to development (Hayward 2008).

During the 1990s and early 2000s some influential voices (including the World Bank 1999, 2007, 2009) started calling for the revitalisation of African universities and for linking higher education to development. At a World Bank seminar in Kuala Lumpur in 1991, Manuel Castells argued that in an information or knowledge economy, the knowledge institution (university) will be ‘the engine of development’ (Castells 1991: see Chapter 3 above). This paper had, according to Jamil Salmi, contributed substantially to the recognition at the World Bank about the importance of knowledge, as their subsequent series of publications show: *Knowledge for Development* (1999); *Constructing Knowledge Societies: New challenges for tertiary education* (Salmi 2002); *The Knowledge Economy* (2007) and *Accelerating Catch-up: Tertiary education for growth in Sub-Saharan Africa* (2009).

Research during the last decade has suggested a strong association between higher education participation rates and levels of development, and considerable theoretical and empirical evidence has emerged about the importance of the university in producing high levels of what Castells calls ‘self-programmable’ skilled workers, and research and innovation (Carnoy et al. 1993; Castells 2001). However, this notion has also become something of an ideology: the European Commission and the OECD in particular, often beat this drum without empirical evidence and it is the current dominant discourse (Douglass et al. 2009).

Many rapidly developing nations such as Korea, China and India put knowledge and innovation policies, and higher education, at the core of their development strategies, based on the assumption that the ability to absorb, use and modify technology developed mainly in high-income countries will drive more rapid transition to higher levels of development and standards of living (Pillay 2010).

For Africa, the change in direction was clearly signalled when Kofi Annan, then Secretary-General of the United Nations, promoted the importance of universities for development in Africa, stating that: ‘The university must become a primary tool for Africa’s development in the new century’ (quoted in Bloom et

al. 2006: 2). This position was endorsed ahead of the UNESCO World Conference on Higher Education in 2009 when a group of African education ministers called for improved financing of universities and a support fund to strengthen training and research in key areas (MacGregor 2009).

*The Higher Education Research and Advocacy Network in Africa (HERANA)*

The Higher Education Research and Advocacy Network in Africa (HERANA) was established in 2008 with funding support from the US Foundation Partnership (Ford Foundation, Carnegie Corporation of New York, Rockefeller Foundation and Kresge Foundation) and from the Norwegian Agency for Research and Development (NORAD). It was managed by the Centre for Higher Education Trust (CHET) in South Africa.

The HERANA network consisted of eight African universities – the University of Botswana, University of Cape Town, University of Dar es Salaam, Eduardo Mondlane University, University of Ghana, University of Mauritius, Makerere University and the University of Nairobi – and more than 50 participating academics from Africa, Europe and the US.<sup>1</sup> The universities included in the study were selected primarily on the basis of previous collaboration, and because each was regarded as a national or flagship university.

At its inception, the broad aim of the project was to investigate the complex relationships between higher education and economic development in selected African countries with a focus on the contexts in which universities operate, the internal structure and dynamics of the universities, and the interaction between the national and institutional contexts. It

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1 Nelson Mandela Metropolitan University (NMMU) participated in the first two phases of HERANA and was included because of its comparability in terms of its size and profile to the other African universities. The University of Cape Town was added to the HERANA network at the request of other African universities who wanted to be compared to the flagship university in South Africa (UCT is the highest ranked university in South Africa). NMMU did not participate in the third phase of the HERANA project.

also aimed to identify factors and conditions that facilitate or inhibit universities' ability to make a sustainable contribution to economic development.

The first phase of the HERANA project began with a review of the international literature on the relationship between higher education and economic development. This was followed by case studies of three systems that have effectively linked their economic development and higher education policy and planning – Finland, South Korea and North Carolina State in the US (Pillay 2010).

In the second half of phase 1 of the HERANA project, data were collected at both the national and institutional levels in the eight African countries and HERANA universities.

In Phase 2 and 3 HERANA continued its focus on knowledge production, albeit at an institutional level only. Activities in Phases 2 and 3 included the collection of data on the academic core and the institutionalisation of data collection and analysis at the eight participating African universities in order to guide research-informed policy-making in support of creating research-intensive universities.

This chapter provides the findings and insights from Phase 1 of the HERANA project and shows how Castells's model of the four university functions and, in particular, the university function of knowledge production for development, shaped the early work of the HERANA project.

### *Notions of the role of the African university in development*

At a more systemic level, the HERANA project sought to establish how national and institutional stakeholders conceptualise the role of higher education and of the university in development. HERANA was keen to establish whether there was consensus or disjuncture between the national level and the universities included in the project. HERANA's analytical framework for addressing these interests comprised four notions of the relationship between higher education (especially universities) and national development; notions that draw loosely on Castells's proposition that there are

four historically determined and contradictory university functions. In particular, the notions of the university as ancillary and of the university as a critical producer of new knowledge that fuels its function as an engine of development, derive from Castells's thinking on the functions of universities, and his conceptualisation of self-programmable labour, innovation and the knowledge economy. The four notions are:

- *The university as ancillary*: When the starting-point for development is predominantly ideological, it is assumed that there is no need for a strong (scientific) knowledge basis for development strategies and policies. Neither is it necessary for the university to play a direct role in development since the emphasis is on investments in basic healthcare, agricultural production and primary education. The role of universities is to produce educated civil servants and professionals (with teaching based on transmitting established knowledge rather than on research), as well as different forms of community service.
- *The university as self-governing institution*: The knowledge produced by the university is considered important for national development – especially for the improvement of healthcare and the strengthening of agricultural production. However, this notion assumes that the most relevant knowledge is produced when academics from the North and the South cooperate in externally funded projects, rather than being steered by the state. This notion portrays the university as playing an important role in developing the national identity, and in producing high-level bureaucrats and scientific knowledge – but not directly related to national development; the university is committed to serving society as a whole rather than specific stakeholders. This notion assumes that the university is most effective when it is left to itself, and can follow institutional priorities, independent of the particularities of a context. It also assumes there is no need to invest additional public funds to increase the relevance of the university.
- *The university as instrument for development agendas*: In this

notion, the university has an important role to play in national development – not through the production of new scientific knowledge, but through expertise exchange and capacity building. The focus of the university's development efforts should be on contributing to reducing poverty and disease, to improving agricultural production, and to supporting small business development – primarily through consultancy activities (especially for government agencies and development aid) and through direct involvement in local communities.

- *The university as engine of development:* This notion assumes that knowledge plays a central role in national development – in relation to improving healthcare and agricultural production, but also in relation to innovations in the private sector, especially in areas such as information and communication technology, biotechnology and engineering. Within this notion, the university is seen as (one of) the core institutions in the national development model. The underlying assumption is that the university is the only institution in society that can provide an adequate foundation for the complexities of the emerging knowledge economy when it comes to producing the relevant skills and competencies of employees in all major sectors, as well as to the production of use-oriented knowledge.

These four notions are situated in the interaction between the following scenarios: (1) Whether or not a role is foreseen for new knowledge in the national development strategy; and (2) Whether or not universities, as knowledge institutions, have a role in the national development strategy.

Drawing on data gathered via interviews with national and university stakeholders, several insights emerged with regard to the envisaged or projected role of the university as knowledge producer in development.

At the national level, three main observations are made based on the data collected. Firstly, the instrumental notion was the strongest, followed by engine of development and self-governing. Secondly, the engine of development notion was to be found

mainly in science and technology policies and in national vision statements, but seldom in ministries of education – with the exceptions of Botswana and Mauritius. The references to the knowledge economy, and its importance in vision statements, seem to draw considerably from ‘policy-borrowing’, particularly from World Bank and OECD sources and websites. Thirdly, in the case of the instrumental notion, most national government officials felt that universities were not doing enough, but there were no policies that spelt out, or incentivised, this instrumental role.

Regarding the institutionally located notions, the following observations could be made. Firstly, self-governance and the instrumental roles were strongest, which reflect the traditional debates about autonomy and community engagement, respectively. Secondly, only within the universities of Ghana and Dar es Salaam was there still a traditional notion of the university producing human capital for the nation, and of the university ‘knowing best what is required’. Interestingly, the leadership of neither of these two institutions expressed a knowledge economy discourse. Thirdly, Mauritius was the only institution with the engine of development as the dominant discourse, and it corresponded with the view of government. At Makerere there was considerable agreement between government and the university, except that there was an increasing awareness at the university about the knowledge economy and the engine of development notion. Finally, at NMMU, which is an institution where a former ‘traditional’ university was merged with a technikon (polytechnic), all four notions were present and in contestation.

In terms of notions of the role of the university in development, at both national and institutional levels, the most obvious unresolved tension was between the self-governance and instrumental roles. This reflects the well-known tension between institutional autonomy, on the one hand, and engagement or responsiveness, on the other.

At the national level in most of the countries, the dominant expectation for higher education was an instrumental one, with a constant refrain that the university was not doing enough to

contribute to development – but often referring to social problems, and not economic growth. The engine of development notion was stronger amongst government stakeholders than within the universities, but it could be that government saw knowledge as a narrow instrumental, rather than an engine of development notion. It is nevertheless surprising that amongst university leadership the support for a knowledge economy approach was weak.

*The academic core of eight African universities*

The university's unique contribution to development is via knowledge – transmitting knowledge to individuals who will go out into the labour market and contribute to society in a variety of ways (teaching), and producing and disseminating knowledge that can lead to innovation or be applied to the problems of society and economy (research, engagement). Part of what impacts on a university's ability to make a sustainable contribution to development therefore focuses on the nature and strength of its knowledge activities, or in Castells's terms, its education and scientific functions.

According to Burton Clark (1998), when an enterprising university evolves a stronger steering core and develops an outreach structure, its heartland is still in the traditional academic departments, formed around disciplines and some interdisciplinary fields. The heartland is where traditional academic values and activities such as teaching, research and training of the next generation of academics occur. Instead of 'heartland', this study used the concept 'academic core' – it is this core that needs to be strong and relevant if flagship universities – such as those included in this study – as key knowledge institutions, are to contribute to development.

While most universities also engage in knowledge activities in the area of community service or outreach,<sup>2</sup> a key assumption is

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<sup>2</sup> See Chapter 9 of this volume for a more detailed account of the HERANA project's empirical work on university–community engagement, including outreach and



that the backbone or the foundation of the university's business is its academic core – that is, the basic handling of knowledge through teaching via academic degree programmes, research output, and the production of doctorates (those who, in the future, will be responsible for carrying out the core knowledge activities).

The eight participating HERANA universities are the leading knowledge-producing institutions expected to contribute to research and development in their respective countries. This is well expressed in the University of Botswana research strategy (2008: 3):

The university has the largest concentration of research-qualified staff and research facilities in the country and has an obligation to develop the full potential of these resources. By doing so, it can play a central part in the multiple strategies for promoting research, development and innovation that are now on the national agenda.

A review of the vision and mission statements of the eight universities reveals a number of common aims relating to both the nature and strength of their academic cores, as well as their contribution to development. These aims can be summarised as follows:

- To have high academic ratings, making them leading or premier universities – not only in their respective countries but also in Africa;
- To be centres of academic excellence which are engaged in high-quality research and scholarship; and
- To contribute to sustainable national and regional social and economic development.

The question HERANA poses is: Does the evidence support these ambitious aims for academic excellence? In other words, is there evidence that these universities have strong academic cores or, at the very least, are moving in that direction?

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community service, on the academic core of the university.

*Data on the academic core in African flagship universities*

CHET started to compile data on a group of African universities in 2007 as part of a project titled ‘Cross-National Higher Education Performance (Efficiency) Indicators’.<sup>3</sup> The data collected was discussed at a workshop in March 2009 where it emerged that although a basic data set had been compiled from institutional representatives and planners, most of the universities had experienced difficulties in completing the 2007 data templates. The first finding about the academic core was clear: there is a need to improve and strengthen the definition of key performance indicators, as well as the systematic, institution-wide capturing and processing (institutionalisation) of key data.

To evaluate empirically the strength of the academic core of the HERANA universities, eight indicators were identified, all of which refer to characteristics or activities that reflect the production of high-quality scholarship which, in turn, forms the basis of each university’s potential contribution to development. The eight indicators, and the rationale for their inclusion, are outlined below. They are divided into five input and three output indicators. Some of these indicators are based on traditional notions of the role of flagship universities (e.g. the production of new knowledge and the next generation of academics) while others (e.g. science, engineering and technology enrolments and student–staff ratios) are pertinent to the African context.

The five input indicators are as follows:

1. *Increased enrolments in science, engineering and technology (SET):* In African governments and foreign development agencies alike, there is a strong emphasis on SET as important drivers of development (Juma & Yee-Cheong 2005). Included in SET are

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3 See <http://www.chet.org.za/programmes/indicators/>

the agricultural sciences, architecture and urban and regional planning, computer and information science, health sciences and veterinary sciences, life sciences and physical sciences.

2. *Increased postgraduate enrolments*: The knowledge economy and universities are demanding increasing numbers of people with postgraduate qualifications.
3. *A favourable academic staff to student ratio*: The academic workload should allow for the possibility of research and PhD supervision.
4. *A high proportion of academic staff with doctoral degrees*: Research (CHET 2010) shows that there is a high correlation between staff with doctorates, on the one hand, and research output and the training of PhD students, on the other.
5. *Adequate research funding per academic*: Research requires government and institutional funding and ‘third-stream’ funding from external sources such as industry and foreign donors.

The three output indicators are as follows:

1. *High graduation rates in SET fields*: Not only is it important to increase SET enrolments, it is crucial that universities achieve high graduation rates in order to respond to the skills shortages in the African labour market in these fields.
2. *Increased knowledge production in the form of doctoral graduates*: There is a need for an increase in doctoral graduates for two reasons. Firstly, doctoral graduates form the backbone of academia and are therefore critical for the future reproduction of the academic core. Secondly, there is growing demand for people with doctoral degrees outside of academia (e.g. in research organisations and other organisations such as financial institutions).
3. *Knowledge production in the form of research publications in Web of Science journals*: Academics need to be producing peer-reviewed research publications in order for the university to participate in the global knowledge community and to contribute to new knowledge and innovation.

*The strength of, and changes in, the academic core*

The data indicate that, apart from NMMU and Ghana, each of the universities had at least one 'strong' rating (see Table 2 in Appendix 1) across the eight indicators. Cape Town was rated 'strong' for all eight indicators, Mauritius for four of the eight, Dar es Salaam and Nairobi for three of the eight, and Botswana, Eduardo and Makerere for two of the eight indicators.

A large number of 'weak' ratings appear in the scores of different universities. Eduardo was rated as 'weak' on six of the eight indicators; Botswana and Ghana on five of the eight indicators. Makerere and Nairobi were rated as 'weak' on four of the eight indicators, and Mauritius on three of the eight indicators. NMMU had two 'weak' ratings and Cape Town none.

On the input side, Cape Town's overall rating was 'strong', and those of Dar es Salaam, Mauritius and Nairobi were about mid-way between 'strong' and 'medium'. Two universities, Makerere and NMMU, had overall input ratings which were close to the average 'medium' rating. Three universities – Botswana, Eduardo and Ghana – had overall input ratings mid-way between 'weak' and 'medium'. On the output side, Cape Town's average rating was 'strong', and no other university had output ratings of above 'medium', except NMMU had a 'medium' rating. The remaining seven universities had overall output ratings below the 'medium' rating.

From these scores the institutions can be broadly categorised into the following groups:

- Group 1: University of Cape Town, the only university which was 'strong' on all input and output ratings.
- Group 2: University of Mauritius, Makerere University and NMMU which had 'medium' or 'strong' ratings on both the input and the output sides.
- Group 3: The universities of Dar es Salaam, Nairobi and Botswana which had overall 'medium' and 'strong' ratings on the input side, but were 'weak' on the output side.

- Group 4: University of Ghana and Eduardo Mondlane which had ‘weak’ ratings on both the input and the output side.

The data indicate that, with the exception of Cape Town, the other universities do not have academic cores that live up to the high expectations contained in their mission statements. However, the data show considerable variance amongst the institutions in terms of input indicators, and some convergence regarding output indicators, again with the exception of Cape Town.

Two input indicators with considerable variation are student–staff ratios and permanent academics with doctorates. With regard to student–staff ratios, two institutions managed to decrease the instruction loads of their academic staff (Mauritius: ratio of 24:1 in 2001 to 16:1 in 2007; NMMU: 31:1 down to 28:1) (see Table 2 in Appendix 1). The student–staff ratio at Ghana increased substantially from 12:1 in 2001 to 31:1 in 2007, as did that of Botswana from 14:1 in 2001 to 27:1 in 2007. The ratios at other institutions increased, but not dramatically.

These ratios do not support the stereotype of ‘mass overcrowding’ in African higher education; certainly not at the flagship universities. While one institution (Ghana) had a ratio of over 30:1, six institutions were under 20:1. These gross figures do, however, obscure substantial variations within the fields of study offered by institutions. For example, at Nairobi, the student–staff ratio in 2007 in SET was 8:1 while it was 42:1 in business. More unfavourable examples are Ghana where the 2007 SET ratio was 9:1 and the business ratio was 68:1, and Makerere where the 2007 SET ratio was 11:1 and the business ratio 96:1. More ‘normal’ variations were observed at Cape Town which, in 2007, had a 22:1 ratio for SET and 42:1 for business, and Dar es Salaam which had 14:1 for SET and 22:1 for business.

A study by CHET (2010) on higher education differentiation showed that in South Africa there is a highly significant correlation of 0.82 between the proportion of the academic staff of a university that has a doctorate as their highest qualification and the research publications produced at that university. This

implies that it is only in exceptional cases that academics without a doctorate publish in internationally recognised peer-reviewed journals or books.

The data show that in 2007 three universities had proportions of permanent academics with doctorates of 50% or higher. They were Nairobi (71%), Cape Town (58%) and Dar es Salaam (50%). This is very strong capacity – in South Africa, only 3 of 23 universities in 2007 had a proportion of 50% or higher of permanent academic staff with doctorates. Ghana, Makerere, Mauritius and NMMU had, in 2007, proportions of permanent academic staff with doctorates in the band 30% to 49%. No trend data are available for this indicator to comment on whether the percentages of staff with doctorates are increasing or decreasing.

The three output indicators are SET graduation rates, doctoral graduates and publications in ISI-recognised journals. For SET graduation rates, an average annual ratio of 25% SET graduates to SET enrolments is roughly equivalent to a cohort graduation rate of 75%, a ratio of 20% is equivalent to a cohort graduation rate of 60%, and a ratio of 15% is equivalent to a cohort graduation rate of 45%. The SET graduation rates show that Botswana, Makerere, Mauritius and Cape Town all have rates of at least 60% of the cohort of students graduating, while Dar es Salaam's is just under 60%. The rest are under 50%. Eduardo Mondlane, which had the highest proportion of enrolments in SET (54% of its enrolments during 2001–2007), had the poorest graduation rate.

Doctoral output is very low. Five of the universities (Botswana, Dar es Salaam, Ghana, Mauritius and Eduardo) produced 20 or fewer doctorates in 2007, while three universities (Makerere, Nairobi and NMMU) produced between 20 and 40, and Cape Town over 100. Most worrisome is that amongst all the institutions, the growth in doctoral graduations is below 10%, with the exceptions of Ghana, Dar es Salaam and Makerere, which grew from a very low base. At the University of Nairobi, doctoral enrolments declined by 17%.

The slow growth in doctoral enrolments is in sharp contrast to the 'explosion' of masters enrolments. At Dar es Salaam,

enrolment of masters increased by 23.5% (from 609 in 2001 to 2 165 in 2007). Three other universities (Mauritius, Makerere and Botswana) had average annual increases of higher than 10% between 2001 and 2007. At the other universities growth was below 10%, with Cape Town growing less than 1%.

As was indicated above, the fast growth in masters enrolments was not matched by a commensurate expansion in doctoral studies. For example, at Nairobi, masters enrolments between 2001 and 2007 grew at an average annual rate of 7.7% while doctoral enrolments declined. At Makerere, masters enrolments grew at an annual rate of 15.5% while doctoral enrolments grew at only 2.3%. The continuation rates from masters to doctoral studies seem absurdly low in certain cases. An ideal ratio of masters to doctoral enrolments should be at least 5:1, which is an indication that masters graduates flow into doctoral research programmes. In 2007, Cape Town, Mauritius and NMMU all had ratios of masters to doctoral students below 4:1. Botswana, Dar es Salaam and Ghana all had ratios between 10:1 to 23:1, while the other three – Eduardo Mondlane, Makerere and Nairobi – had ratios above 50:1.

Regarding research publications, it is assumed that a flagship knowledge producer must produce research-based academic articles that can be published in internationally peer-reviewed journals and/or books. The target for permanent academics was set at one research article in a Web of Science indexed journal to be published every two years, which translates into an annual ratio of 0.50 research publications per academic. In our sample, which deals with average ratios for the period 2001–2007, only Cape Town (with an average of 0.95) met this requirement. With the exceptions of NMMU (0.31) and Mauritius (0.13), the ratios of the other universities imply that on average each of their permanent academics is likely to publish only one research article every ten or more years.

From the above it is evident that particularly the output variables of the universities are not strong enough to make a sustainable knowledge production contribution to development. Nevertheless, there are some positive trends. The majority of

universities have strong input performance in academics with doctorates, student–staff ratios, and an increase in enrolments at the masters level. On the output side, the graduation rate of SET is quite strong for most of the institutions. There is also an increase in research output, albeit from a very low base. However, it should also be noted that even though the research productivity in terms of academic articles produced is increasing at the universities in the study, since the productivity in the rest of the world is increasing much faster, the relative position of Africa as knowledge producer is decreasing gradually. Sub-Saharan Africa contributes around 0.7% to world scientific output, and this figure has decreased over the last 15 to 20 years (French Academy of Sciences 2006).

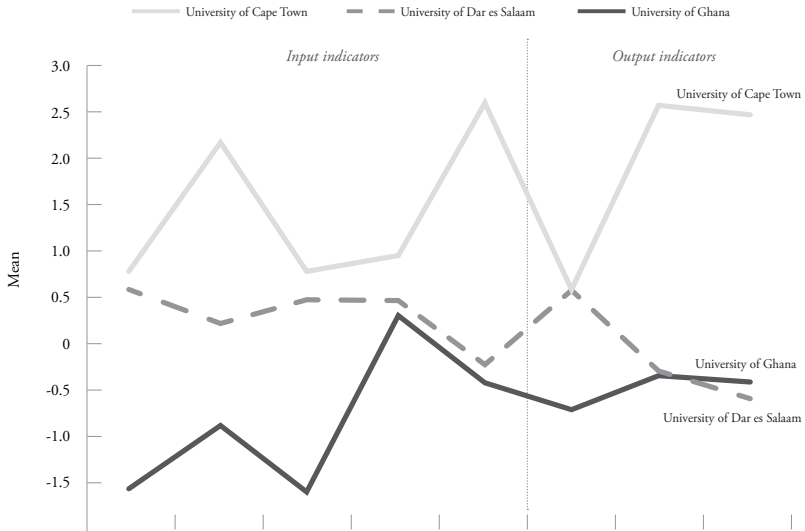
### *Capacity and productivity*

There is a long-held common-sense view that the lack of research output in African universities is simply a lack of capacity and resources. However, a closer inspection of the input and output indicators raises some interesting questions about this assumption. In order to explore this further, we selected Cape Town from Group 1, Dar es Salaam from Group 3 and Ghana from Group 4 as representatives of these groups and plotted a comparative graph based on standardised scores (see Figure 1).

The data show that there are surprising similarities between Dar es Salaam and Cape Town in terms of input indicators such as SET enrolments (Cape Town 41%, Dar es Salaam 40%), student–staff ratio (Cape Town 13:1, Dar es Salaam 14:1) and academics with PhDs (Cape Town 58%, Dar es Salaam 50%). Ghana, on the other hand, is only similar to the other two in terms of staff qualifications. On the input side, the big difference between Cape Town, on the one hand, and Dar es Salaam and Ghana on the other, is in percentage of postgraduate students (Cape Town 19% versus Dar es Salaam 9% and Ghana 7%) and research income per permanent staff member (Cape Town USD 47 700 versus Dar es Salaam USD 6 400 and Ghana USD 3 400).



Figure 1: Academic core indicators (standardised data) for three selected African universities, 2007



University	% SET majors	% masters + doctorates	Student:staff ratio*	% academics with doctorates	Research income per permanent academic ppp\$	SET graduation rate	Doctoral graduates as % of permanent academics	Research publications per academic
Cape Town	41%	19%	13	58%	47 700	21%	15.00%	0.95
Dar es Salaam	40%	9%	14	50%	6 400	19%	2.18%	0.08
Ghana	19%	7%	22	47%	3 400	16%	0.17%	0.11

\* In the data table the student:staff ratio is given, whilst the inverse of the student:staff ratio has been used in the graph representing the results of the k-means clustering. This was done because a high student:staff value is unfavourable and should thus reflect a low value in the k-means clustering. The University of Ghana has a high value for student:staff value in the table but the inverse shows a low value in the graph of the means for the clustering.

With regard to output indicators, Cape Town and Dar es Salaam have similar SET graduation rates (21% and 19%, respectively). The dramatic difference is in doctoral graduates (average for 2001–2007): Cape Town 15% of academic staff, and Dar es Salaam and Ghana less than 3% per academic staff member; and publications (2007): Cape Town 1 017, Ghana 61 and Dar es Salaam 70.

These data pose some intriguing issues for higher education in Africa. Cape Town and Dar es Salaam have remarkably similar

profiles in terms of SET (input and output), student–staff ratios, and staff with doctorates, but are not comparable regarding the production of doctorates and publications. What distinguishes Cape Town from the other institutions is much higher proportions of postgraduates, research income and knowledge production outputs.

In terms of input capacity, Cape Town and Dar es Salaam are surprisingly similar, with the exception of research income (resources). Does this mean that research income is the only factor that prevents Dar es Salaam from achieving the same level of outputs as Cape Town?

During interviews with senior academics, three factors emerged that raise questions and warrant further research. The first is the problem of research funding. Not only is there very limited research funding, but the cumbersome application procedures and the restrictions on what the research funds can be used for makes consultancy money much more attractive; in other words, consultancy money directly supplements academics' income, and the researchers also have much more discretion about how it is used. The negative side of consultancy funds is that there is no pressure or expectation to publish, nor to train postgraduate students. It thus affects negatively both aspects of knowledge production, that is, postgraduate training and publishing.

Incentives to publish, as is the case in many countries, are a problem. After obtaining the professorship, publishing in international journals is not directly rewarded, but is rather a matter of prestige or 'institutional culture'. In order to incentivise this activity, universities in Africa might have to start exploring incentive systems. In South Africa, the national government subsidises each institution to the tune of about USD 45 000 per PhD graduate and USD 15 000 per accredited publication. But this is not a simple correlation. Two of the universities with the highest publication rates per permanent academic (Cape Town and Rhodes) do not pass a portion of the subsidy directly to the academic or the department, but put it in a pool which funds common research infrastructure, or where everybody can compete for it.

Another dimension that certainly warrants further exploration is the relationship between research and consultancy. A PhD study by Langa (2010) suggests that having a strong academic network link, with publications, is an entry for getting consultancies. So, it is not that academics choose research or consultancy; some do a balancing act between research and consultancy, while others seem to 'drift off' into consultancy and foreign aid networks.

A second problem that is affecting the production of doctorates, and associated research training and publication, is the huge increase in taught masters courses which do not lead to doctoral study. For example, the University of Cape Town had 2 906 masters enrolments and 1 002 doctoral enrolments in 2007. In contrast, in 2007 Dar es Salaam had 2 165 masters students and only 190 doctoral enrolments (see Table 3 in Appendix 1). This means that there is a serious 'pipeline' problem at universities like Dar es Salaam. This could be because the masters degree does not inspire sufficient confidence in students to enrol for the PhD, or because there are no incentives to do so, or because individuals are pursuing their PhD degrees abroad. Whatever the reason, the effect is a serious curtailing of PhD numbers and hence of an essential ingredient in the knowledge production process.

According to the discussions with interview respondents, the third factor that distracts academics from knowledge production is supplementary teaching. The new method of raising third-stream income – namely, the innovation of private and public students in the same institution, with additional remuneration for teaching the private students – has the result that within the university, academics are teaching more to supplement their incomes. In addition, the proliferation of private higher education institutions, some literally within walking distance of public institutions, means that large numbers of senior academics are 'double' or 'triple teaching'.

PhD supervision, in a context where the candidate in all likelihood does not have funds for full-time study and where there are no extrinsic (only intrinsic) institutional rewards, is a poor competitor for the time of the triple-teaching academic. The same applies to rigorous research required for international peer-

reviewed publication: it is much easier and far more rewarding to triple teach and do consultancies.

The implication of the above is that the lack of knowledge production at Africa's flagship universities is not a simple lack of capacity and resources, but a complex set of capacities and contradictory rewards within a resource-scarce environment.

### *Conclusions*

The main conclusion from the HERANA Phase 1 research is that the knowledge production output variables of the academic cores do not reflect the lofty ambitions expressed in their mission statements. With the exception of the University of Cape Town, none of the universities in the HERANA group seem to be moving significantly from their traditional undergraduate teaching role to a strong academic core that can contribute to new knowledge production and, by implication, to development.

Amongst the universities there is considerable diversity regarding input variables. The weakest indicators are the low proportion of postgraduate enrolments and the inadequate research funds for permanent staff, with the strongest input indicators in manageable student–staff ratios and well-qualified staff.

On the output side, SET graduation rates are generally positive. But there is a convergence around low knowledge production, particularly doctoral graduation rates and ISI-cited publications. The most serious challenges to strengthening the academic core seem to be the lack of research funds and low knowledge production (PhD graduates and peer-reviewed publications). The study also suggests that the low knowledge production cannot be blamed solely on low capacity and resources; the problematic incentive structures at these universities require further study.

These findings should be interpreted in a context that, according to the system-level analysis done by the HERANA project in Phase 1, there is inconsistency within and between African nations insofar as articulating the role of the university in development and

infrequent acknowledgement of the contribution of the university as a producer of knowledge to national economic development.

In terms of further research, there is a clearly identified need to improve and strengthen institution-wide capturing and processing (institutionalisation) of key performance indicator data and to focus more on key performance indicators more directly related to knowledge production.

For Castells, the education function, if injudiciously expanded, 'suffocates' the scientific research function. The market also offers competing rewards. Between teaching and the allures of consultancy, we can surmise that Castells's stern warning about balancing the functions for universities in developing countries is not heeded – and research consequently languishes.