

The changing and challenging research landscape in South Africa

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Abstract

In this paper we critically examine the research landscape in South Africa. We do this by documenting the progression and transformation of the country's National Research Foundation (NRF)-rated researchers from 2005 to 2015. Results indicate that most NRF-rated researchers in South Africa are white and male but this trend is slowly changing with black Africans increasingly becoming rated. Significantly, the data indicate a clustering at the C-rating category and a paucity of black Africans at the highest A- and B-rating category. Explanations for the results are provided and future trends are discussed in the context of the recent dramatic scale-back of the Incentive Funding for Rated Researchers Programme (IFRRP) – an NRF programme which provided guaranteed funding annually to NRF-rated researchers for the duration of their rating (usually five years). The consequences of the withdrawal of this vital funding lifeline is unpacked in the context of an increasingly competitive global research environment.

Keywords: research; equality; South Africa; National Research Foundation

Introduction

The higher education sector in South Africa has experienced a number of well-documented challenges since democracy in April 1994. Chief among these are rapid massification (MacGregor 2014); high attrition rates (Zewotir and North 2015); mergers (Arnolds et al. 2013); growing internationalization (Rensburg et al. 2015); declining public funding (Wangenge-Ouma 2010); as well as numerous student protests including the most recent so-called #FeesMustFall protests (Mutekwe 2017). The latter refers to a series of violent student protests that took place at several of the country's universities during 2015 and 2016. The main cause of these protests was student dissatisfaction over the rising costs of higher education in the country's then 25 higher education institutions (HEIs). The protests severely disrupted the academic project in these years as protesters burnt, looted and vandalized university property until a freeze on tuition fees was announced by former president Jacob Zuma in 2017. According to the South African Department of Higher Education and Training (2016) the cost of damages to property at 18 of the 23 universities affected by the protests exceeded R500m (approximately £25m). Another more recent and uniquely South African challenge affecting HEIs and research institutions more broadly in the country is the need to transform. While the exact meaning, measurement and interpretation of transformation of the higher education sector in the country remains largely unclear (see Badat and Sayed 2014; Cloete 2014; Dunne 2014), the current narrative is that not enough has been done to 'Africanise' and decolonise existing curricula (Jansen 2017) as well as attain the transformation goals set out in various government policies since democracy (see Department of Education 1997; National Planning Commission (NPC) 2012; Department of Higher Education and Training (DHET) 2014).

Concurrent with these challenges is the need for HEIs in the country to maintain and/or improve their global university rankings. Indeed, as Muller (2017) notes, South African universities, encouraged by the DHET, have taken most enthusiastically to the idea of

competing in world university rankings, particularly in the last decade. Currently, the South African higher education system ranks alongside the Czech Republic, Hong Kong, New Zealand and Ireland according to the criteria outlined in the Academic Ranking of World Universities (ARWU) (2017)¹. Only five South African universities rank inside the top 500 with the University of the Witwatersrand (WITS) in Johannesburg the top-ranked university in the country but still ranked outside the top 200 globally. Whilst not without their critics (see Bowden 2000; Taylor and Braddock 2007), the popularity and visibility of university ranking systems remains undiminished particularly to university senior management for whom rankings provide a yardstick to gauge their status in an increasingly competitive local and global market. While a number of criteria used to rank universities are largely uncontrollable (i.e., such as the number of alumni of an institution winning Nobel Prizes and Fields Medals), one common controllable criterion that permeates throughout all ranking systems is the amount of research output generated and concomitantly, the amount of research outputs cited. Both quantity and quality is encouraged by all ranking systems as the more journal articles published in so-called high-impact journals, the more citations the researcher is likely to obtain. In a trickle-down effect, the researcher's academic department will, by association, fare better in the global departmental rankings and the better the researcher's university will fair in the global university rankings.

The National Research Foundation (NRF) in South Africa has been tasked with facilitating the development academics in the country while concomitantly increasing the global profile, reputation and rankings of South African universities. One of the main activities of this state agency is to facilitate the ranking of researchers at universities throughout the country into pre-defined categories (A through to Y). Although frequently criticised on both methodological (Callaghan 2018) and theoretical (Fedderke 2012) grounds, NRF ratings provide a useful indication of the quality of researchers in South Africa and form an integral component of the

submissions researchers make for promotions and/or for gaining new employment at South African universities and other research institutions. Paradoxically, they also provide a tacit assessment of the NRF itself and its ability to develop and nurture a research environment that allows HEIs and research institutions to generate internationally competitive researchers.

The main focus of this study is to examine the progression and transformation of NRF-rated researchers at HEIs and other research institutions throughout the country. More specifically, we examine how the demographic profile of NRF-rated researchers has changed in terms of gender, race and rank from 2005 to 2015. In undertaking this analysis, we also aim to critically analyse the role the NRF plays in driving the South African research agenda in the country. Recent cuts to an incentive funding programme which rewards NRF-rated researchers in the country based on their ranking is outlined and the potential consequences of these funding cuts on the South African academe are discussed in light of the results we present here.

The National Research Foundation (NRF) rating system in South Africa

The NRF was established in 1998 as an independent government agency through the National Research Foundation Act No. 23 of 1998. The government-instituted mandate of the NRF is to promote and support research through funding, human resource development and the provision of the necessary research facilities across the country's research and higher education institutions. Under the auspices of the Department of Science and Technology, the most recent strategic goals of the NRF include the need to the "transform the research landscape and focus on excellence, thereby ensuring global relevance" (NRF 2016, 2). One of the main activities of the NRF is to award ratings to South African researchers. There are three categories for established researchers: world leader (A), world participant and local leader (B), and local participant (C). For young researchers, i.e. within five years of obtaining their doctorate, there

are also three categories: potential world leader (P), potential local participant (Y) and latecomer (L). A more detailed description of the ratings categories awarded is shown in Table 1.

Table 1: Definition of NRF-rating categories used in the study

Category	Definition
A	Researchers who are unequivocally recognised by their peers as leading international scholars in their field for the high quality and impact of their recent research outputs.
B	Researchers who enjoy considerable international recognition by their peers for the high quality and impact of their recent research outputs.
C	Established researchers with a sustained recent record of productivity in the field who are recognised by their peers as having produced a body of quality work, the core of which has coherence and attests to ongoing engagement with the field as well as demonstrated the ability to conceptualise problems and apply research methods to investigating them.
Y	Young researchers (40 years or younger), who have held a doctorate or equivalent qualification for less than five years at the time of application, and who are recognised as having the potential to establish themselves as researchers within a five-year period after evaluation, based on their performance and productivity of quality research outputs during their doctoral studies and/or early post-doctoral careers.

Extracted from <http://www.nrf.ac.za/rating>

Note: There are sub-categories within the overall categories outlined above. For example, within the A category a researcher can be given an A1 or A2 rating. For the sake of simplicity, we aggregated the ratings categories for this research study

The rating application process involves the submission by researchers to the NRF of research outputs generated over the past eight years. Evidence in this instance is primarily peer-reviewed publications but can also include other research outputs such as books, conference

presentations, patents, policy or technical reports, and publications in the public press. It is important to note that ratings are not based solely on volume of outputs or citation rates but rather involves the peer-review of applicants by several nominated and appointed local and international reviewers. In their submission, each applicant submits the names of six potential reviewers where after members of an expert panel (appointed by the NRF on four-year terms) select three of these nominated reviewers. A further three independent reviewers not nominated by the applicant are added to review the application. The nominated and appointed reviewers submit their reports to the expert panel (with an assessor and a chairperson) which deliberate and make a final rating to the applicant. If consensus cannot be obtained, or when the recommendation differs by the reviewers, the decision is escalated to an executive evaluation committee. Finally, there is an appeals process for the cases where a researcher disagrees with an assigned rating. Researchers should apply to be reevaluated during the sixth and final year of their rating or their rating lapses.

The NRF rating system was initially established in the 1980s by the institutions predecessor, the Foundation for Research Development (FRD), in response to the perception among researchers in the country that funding was ‘spread too thinly’ and that its allocation was not based on well-defined and widely accepted criteria (Pouris 2007). Between 1984 and 2001 only researchers within the natural sciences and engineering were rated, but this was extended to other fields in 2002. The number of ratings applications received by the NRF since 1984 is 6744; with currently 3889 researchers holding a valid rating (Boshoff 2018). Of course, individual performance evaluation schemes are not unique to South Africa. Universities in New Zealand (Buckle and Creedy 2018), Australia (Perry 2018) and the United Kingdom (Watermeyer and Chubb 2018) among others, routinely undertake such assessments of their researchers and associated departments. The notion being that since universities in these countries are mainly public, these schemes are indirectly the government’s accountability

exercise to assess the quality and quantity of research being subsidized with public money. Relatedly, these measures also provide vital benchmarking information and establish reputational yardsticks for HEIs themselves while they provide governments and other associated higher education funding bodies with tangible evidence in future funding allocations, although more so in contexts outside South Africa. The current funding model in South Africa also uses a performance-based framework but is built more on student head-count as well as the cost of offering the qualifications and is skewed more towards historically advantaged institutions (Sogoni 2014). As a result, the individual research performance of South African researchers (in terms of their NRF rating) as well as their departments (in terms of the number of NRF-rated academics per department) is less often considered in government funding allocations.

Rather predictably, the NRF rating system in South Africa has been the subject of much debate. Researchers bemoan the biases and inconsistencies that underpin the rating system while the reliability and validating of the methodology used to ascribe ratings to researchers has also been brought into question (see Callaghan 2018; Fedderke 2012). In terms of the former, Fedderke (2012, 3) notes that on average, “C-rated scholars in the Biological Sciences have the same h-index as A-rated scholars in the Social Sciences”, and that ratings in the Business Sciences were the most difficult to attain for individuals with high h-indices, exceeded in difficulty only by those in the Medical and Biological Sciences. Others, however, attribute the vast growth in the number of research publications produced by South African universities (an increase from 5,540 in 1994 to 15,542 in 2014) to the rating system and its associated incentives (see Boshoff 2018). Indeed, besides institutional incentives, there are a number of individual incentives for researchers to obtain NRF rating. First, the prestige of being acknowledged by your peers as being a leading international scholar in a respective discipline based on the quality and impact of their research. Second, a number of universities

and research-performing organisations in the country use rating status as one of the criteria for purposes related to personal promotion, resource allocation, ‘performance’ awards, and employment retention. And finally, and perhaps the most important, the NRF provides funding to rated researchers who hold a valid NRF rating through its Incentive Funding for Rated Researchers Programme (IFRRP). Funding is provided on an annual basis for the duration of a researchers’ rating (five years) with monetary amounts allocated based on rating outcomes. Allocations typically range from R100,000 (£5,000) per annum for A-rated scientists to R20,000 (£1,000) per annum for Y-rated scientists. This funding is most often placed in a cost centre account which the researcher can use at their discretion for research purposes. Spending against these accounts is audited annually.

Data and method

The data used to analyse the progression and transformation of NRF-rated researchers in South Africa was obtained from annual performance reports of the NRF (see NRF, 2019, for an example). It is important to note that rated researchers can be researchers at parastatal research institutions (e.g., Council for Scientific and Industrial Research) or academic staff at HEIs who hold the rank of junior lecturer, lecturer, senior lecturer, associate professor and professor or it can include fixed-term contract/fulltime or part-time researchers employed at an NRF-recognised institution². The data obtained from the NRF included the gender, race and rank of NRF-rated researchers for the years 2005-2015 for all 25³ universities in South Africa (see Table 2). Two new universities, namely Sol Plaatje University and the University of Mpumalanga, were opened in 2014. The data from these universities are only included in the 2015 statistics.

Table 2: The 25 South African universities examined in the study.

University	Abbreviation
Cape Peninsula University of Technology	CPUT
Central University of Technology	CUT
Durban University of Technology	DUT
Mangosuthu University of Technology	MUT
Nelson Mandela University	NMU
North-West University	NWU
Rhodes University	Rhodes
Sol Plaatje University*	SPU
Tshwane University of Technology	TUT
University of Cape Town	UCT
University of Fort Hare	UFH
University of Johannesburg	UJ
University of KwaZulu-Natal	UKZN
University of Limpopo	UL
University of Mpumalanga*	UM
University of Pretoria	UP
University of South Africa	UNISA
University of Stellenbosch	US
University of the Free State	UFS
University of Venda	UV
University of the Western Cape	UWC
University of the Witwatersrand	WITS
University of Zululand	UZ
Vaal University of Technology	VUT
Walter Sisulu University	WSU

* These universities were established in 2014 and are only included in the statistics of 2015.

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We first graphed the change in the number of NRF-rated researchers at three separate time periods: 2005; 2010; and 2015, after which we graphed the individual gender, race and rating of rated researchers across the same three-time periods. We then disaggregated the data and graphed the change in the ranking of NRF-rated researchers by gender as well as the rating profile of researchers by racial group: black African, white, coloured, and Indian⁴. Again, this was done at three-time periods: 2005; 2010; and 2015. It is important to note that the L and P rating categories were excluded from the analysis because the latecomer (L) category has been discontinued and the potential world leader (P) category consistently comprises extremely low numbers. For example, in 2015 only 18 researchers held a P-rating – less than one percent of the total number of rated researchers - making it difficult to contrast against other rating categories. Finally, all foreign academic staff were not included in the analysis as the data from the NRF does not provide an indication of the racial group of academic staff categorised as foreign. While this may have some impact on the descriptive results, less than three percent of academic staff in South Africa are foreign in either 2005, 2010, or 2015, so the impact is likely to be minimal.

Results

The analysis of NRF-rated researchers from 2005 to 2015 yielded a number of interesting results. First, there has been a steady increase in the number of NRF-rated researchers since 2005 (see Figure 1). In fact, there has been over a doubling of rated researchers from 2005 to 2015 with the number of rated researchers increasing from 1568 in 2005 to 3373 in 2015. Despite this increase however currently only 11% of academics in South Africa hold a valid NRF-ranking; up from 7% in 2005. The rapid increase in the number of NRF-rated researchers in the country could be due to the individual-level incentives for obtaining NRF-rating as outlined previously and/or could also reflect the increasing pressure that HEIs place on their

academic staff to obtain an NRF rating. HEIs in South Africa are ranked annually based on their research output, reputation as well as the types of programmes offered. An increase in the number of NRF-rated researchers greatly increases the research performance and reputation of South African institutions although paradoxically has little, if any, impact on the amount of funding received from the national government. Regarding the latter, Habib and Phakeng (2018) have argued that the South African government should prioritise funding for research-intensive universities in South Africa. Although this strategy would direct a disproportionate allocation of funding to historically white universities, the researchers argue that these universities generate the vast majority of research output in the country and should therefore be prioritised in terms of funding for research while other universities should be given a greater teaching mandate and should be funded accordingly.

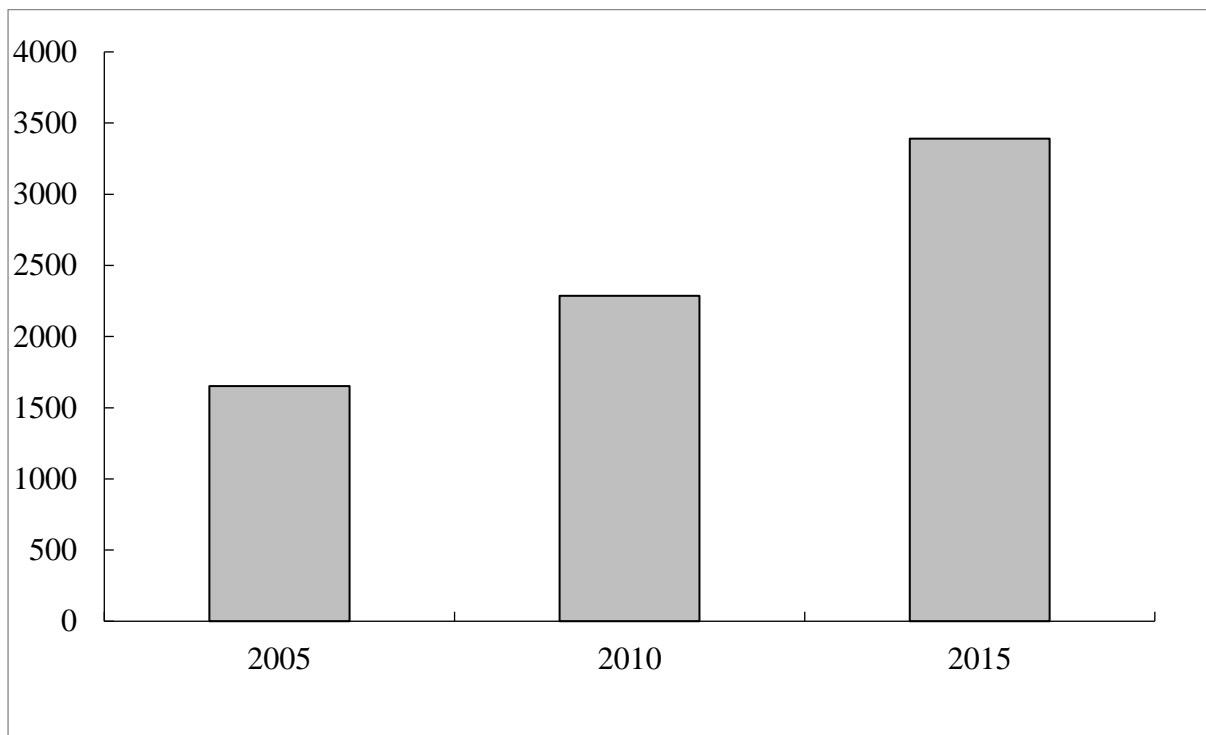


Figure 1: Number of NRF-rated researchers (2005-2015)

There is a big gender disparity in terms of the number of NRF-rated researchers in the country although this disparity is slowly changing (see Figure 2). Over 70% ($n = 1215$) of NRF-rated researchers in the country were male in 2005 which decreased marginally to 68% ($n = 2316$) in 2015. Female NRF-rated researchers increased from 23% ($n = 353$) in 2005 to 31% ($n = 1057$) in 2015. These results need however to be interpreted relative to the gender breakdown of academic staff throughout the higher education sector in the country in general. According to Breetzke and Hedding (2018) over 50% of all South African academics are male, but this number is decreasing steadily from 58% in 2005 to 53% in 2015 while the overall percentage of female academics have increased from 42% in 2005 to 47% in 2015. Given these percentages male academics in South Africa are nevertheless still grossly over-represented in terms of NRF-rating.

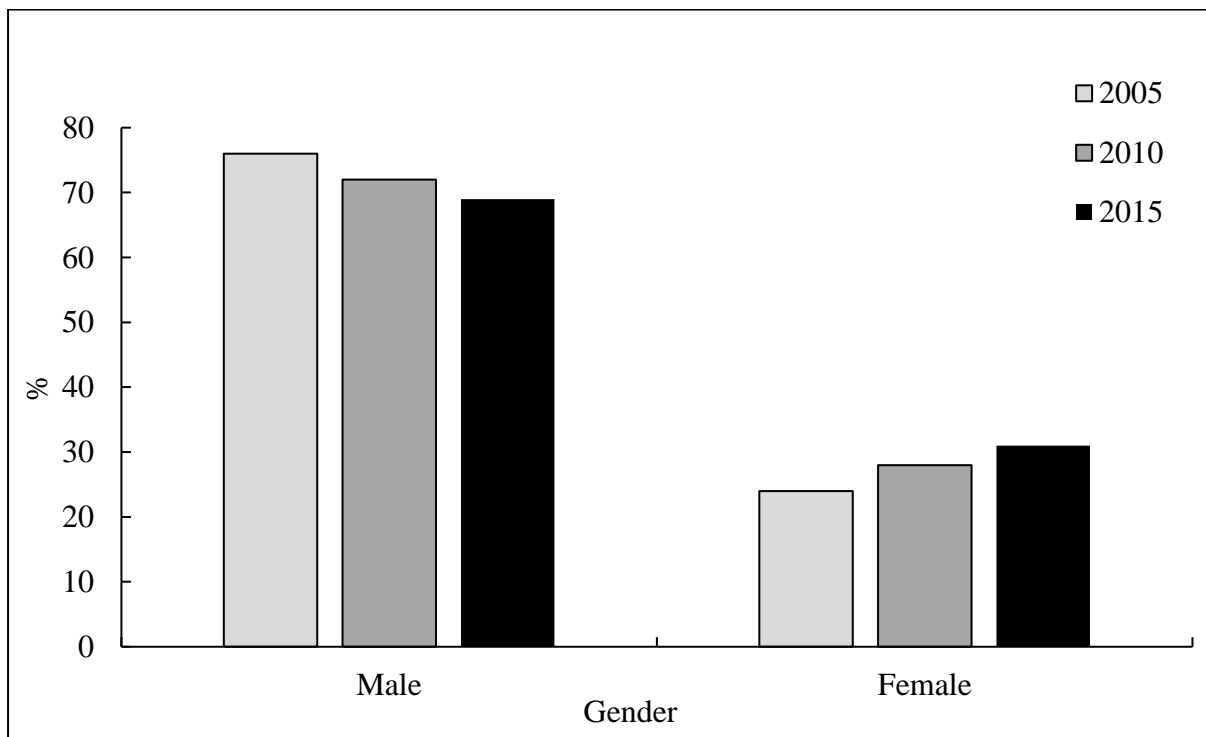


Figure 2: Gender of NRF-rated researchers (2005-2015)

The NRF-rating by race from 2005 to 2015 is shown in Figure 3. Notably, the percentage of black African academics who have an NRF-rating has increased steadily over the study period with currently almost 15% ($n = 524$) of all NRF-rated researchers being black African, up from five percent in 2005 ($n = 73$). This is in direct contrast with the percentage of NRF-rated researchers who are white which has dropped markedly over the same period from 90% in 2005 ($n = 1405$) to 74% ($n = 2496$) in 2015. The rating profile of both the coloured and Indian population groups mirror the black African trend albeit with lower overall percentages, broadly reflecting national demographics.

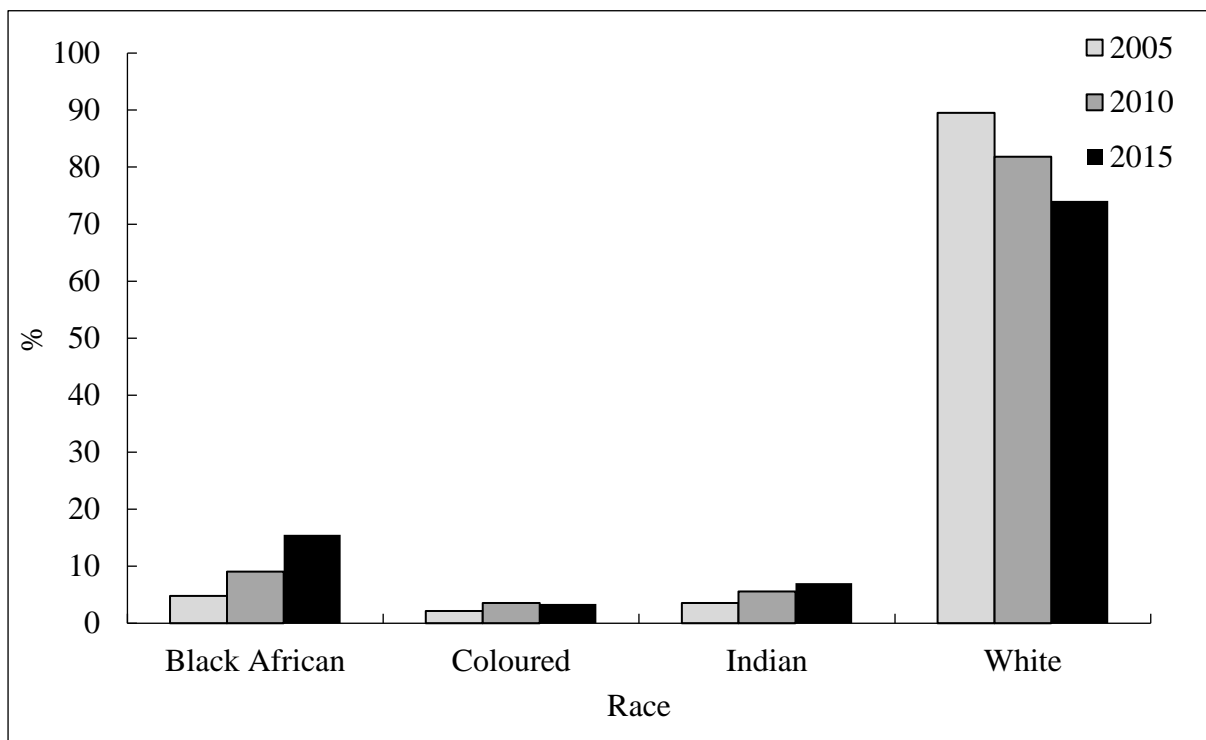


Figure 3: Race of NRF-rated researchers (2005-2015)

In terms of the rating itself, over half of all academics in the country in 2015 were C-rated (59%, $n = 1974$) in 2015 followed by B-rated (21%, $n = 703$), Y-rated (17%, $n = 578$), and A-rated (3%, $n = 118$) (see Figure 4). The number of Y-rated NRF researchers is on an upwards trajectory from 2005 which is consistent with work done by Breetzke and Hedding (2018) that

has shown how the academic staffing bodies in South Africa are young and getting younger. A Y-rating is most often conferred to younger applicants who do not meet the requirements for a C-rating or higher. Worryingly, the number of B-rated researchers is trending downwards. Of greater concern is the fact that the percentage of A-rated NRF-researchers has stagnated; consistently comprising between three to four percent of all rated researchers.

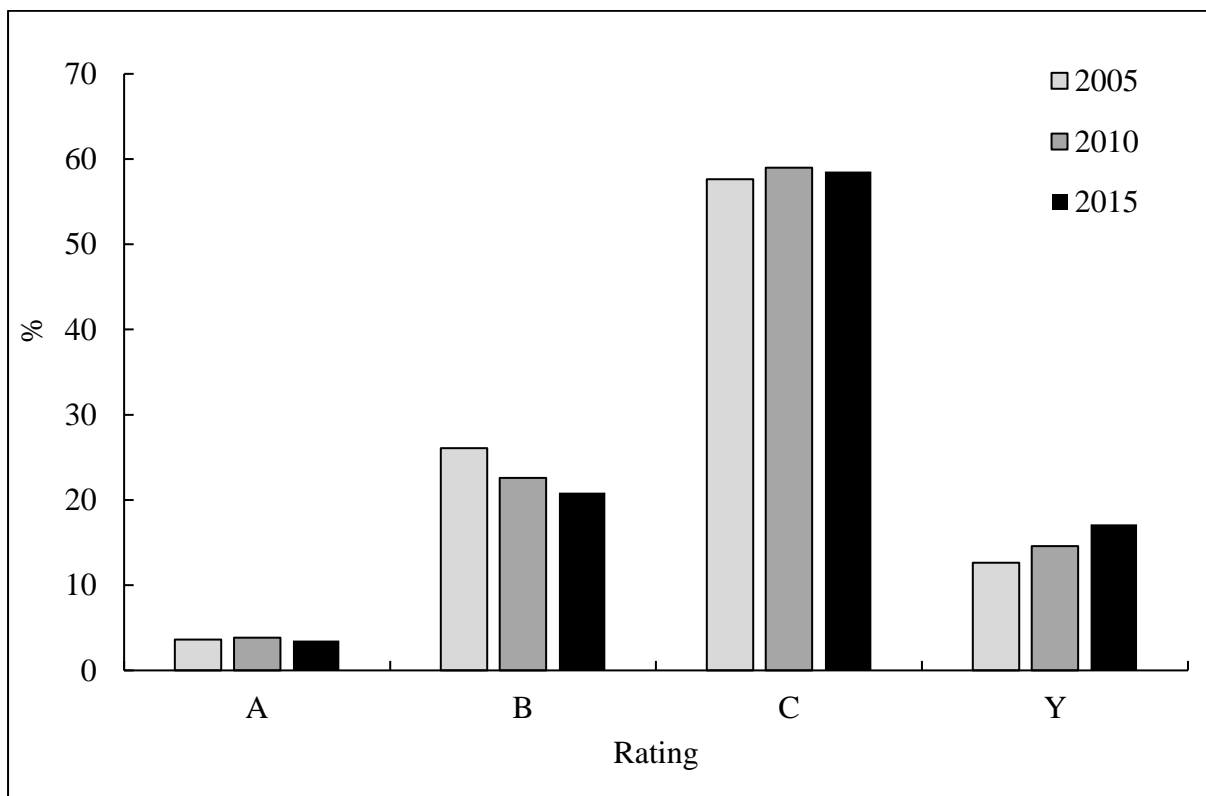


Figure 4: Ranking of NRF-rated researchers (2005-2015)

The changing NRF-rating profile of researchers by gender and race from 2005 to 2015 are shown in Figures 5 and 6. A number of results warrant attention. First, the percentage of female NRF-rated researchers has increased from 2005 to 2015 across all ranking categories. For example, the percentage of C-rated female researchers is currently almost 34% ($n = 652$); up from 23% ($n = 218$) in 2005 while the percentage of A-rated female researchers has increased from five percent ($n = 3$) in 2005 to 17% ($n = 20$) in 2015, although admittedly from a low

base. In contrast, the percentage of C-rated male researchers, for example, has declined from 76% ($n = 686$) in 2005 to 67% ($n = 1322$) in 2015. In fact, the female trends of NRF-rated researchers are the direct opposite of male researchers with the percentage of male NRF-rated researchers decreasing uniformly across all categories.

Last, in terms of race there is an upwards trajectory of black African researchers across all ratings from 2005 to 2015, although again from a low base. In fact, there is an over 20% jump in the percentage of black African Y-rated researchers over the study period and a 10% jump at the C-rating category (see Figure 6). The number of A-rated black African researchers has increased from zero in 2005 to four in 2015. Conversely, there is a downwards trajectory of white NRF-rated researchers across all ranking categories. Thus, whilst the vast majority of researchers in each rating category are white, their dominance is decreasing beginning at the lower ranking categories. The biggest different between racial groups is at the highest NRF category where 91% ($n = 107$) of A-rated researchers are still white compared to three percent ($n = 4$) black African. Similarly, 90% ($n = 629$) of B-rated researchers are white compared to four percent ($n = 28$) black African. However, black Africans are trending upwards in this regard, although at a slower pace than at the lower ratings (i.e., 5% ($n = 43$) of C-rated researchers were black African in 2005 compared to 16% ($n = 319$) in 2015).

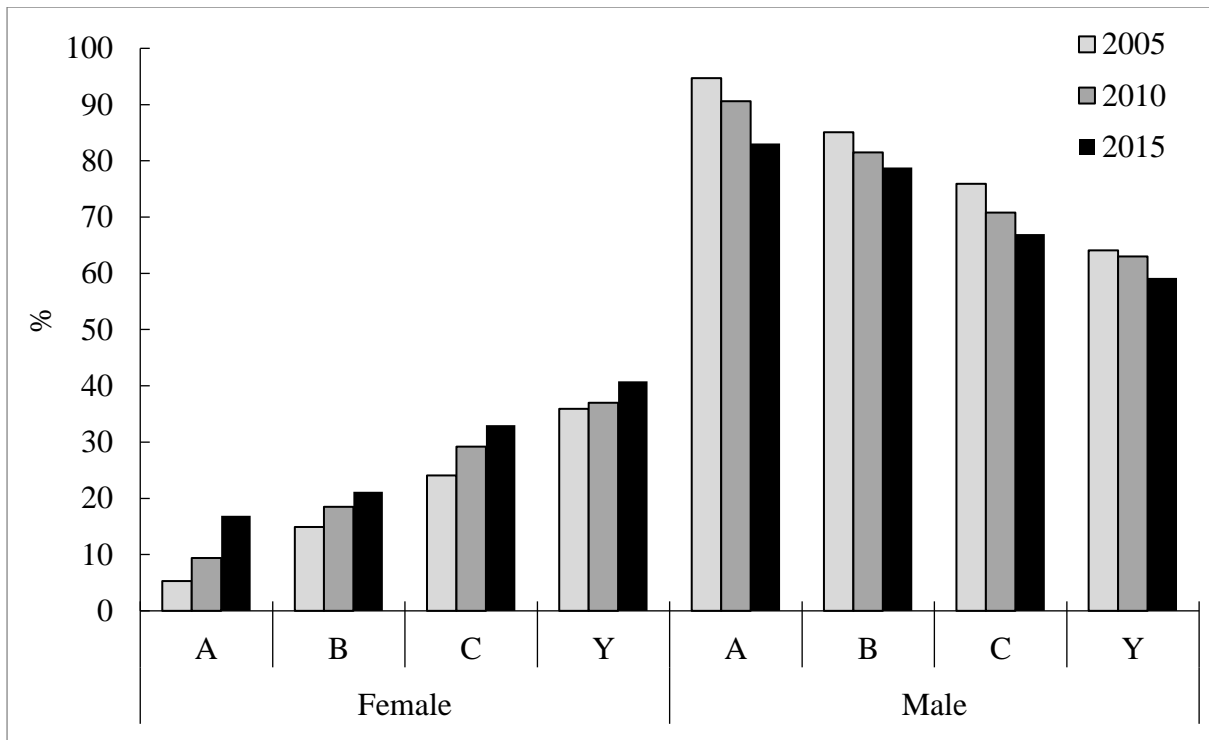


Figure 5: Gender-rating breakdown of NRF-rated researchers (2005-2015)

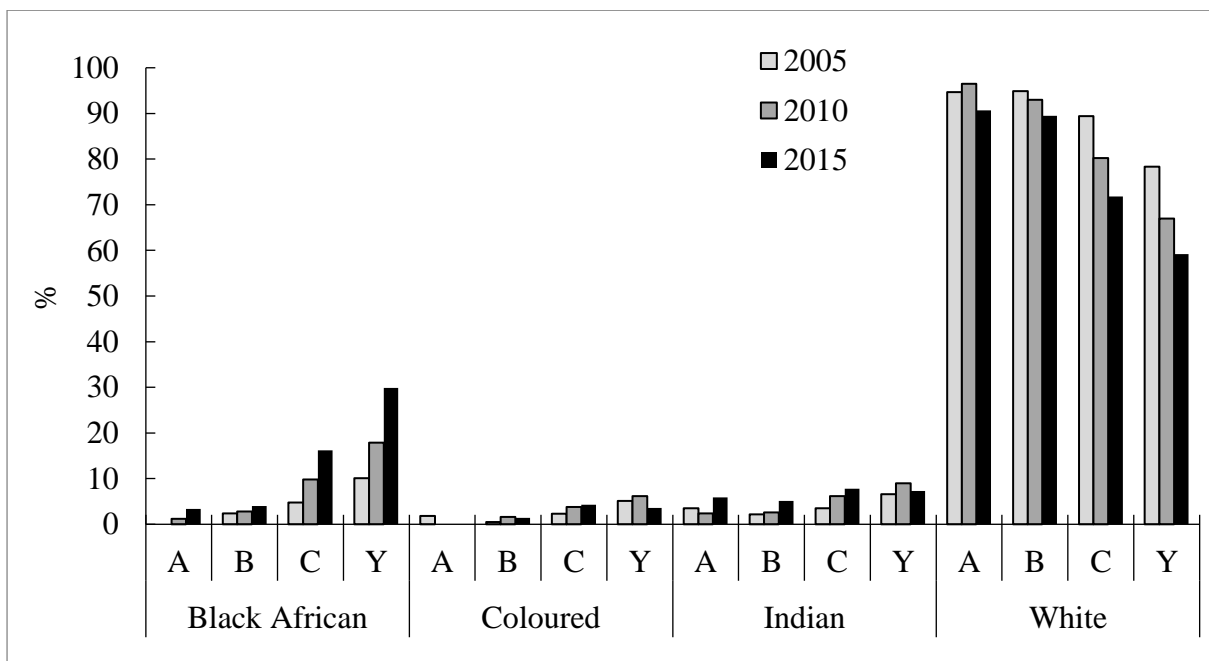


Figure 6: Race-rating breakdown of NRF-rated researchers (2005-2015)

Finally, an important aspect of our work that we did not consider was whether the trends that we have observed occur uniformly throughout all research institutions in the country or whether

they are predominantly occurring among certain institutions. It could be, for example, that the biggest ‘gains’ in terms of the number of NRF-rated researchers has been made at historically white universities such as the University of Cape Town whereas historically black African universities such as the University of Limpopo have remained relatively stagnant in terms of the number of NRF-rated researchers. Unfortunately, the NRF does not have historical data pertaining to the rating of researchers by institution. Based on previous research (see Breetzke and Hedding 2018) it seems likely that the trends we observed in this analysis will vary substantially by institution. It should also be noted that we were unable to disaggregate the NRF-rating by discipline. It could be that the changes we find are occurring only within certain fields (i.e., Sociology or Zoology) and are not uniformly occurring throughout academic departments. Future research could investigate whether the trends we observe are unique to certain disciplines or are applicable to institutions as a whole.

Discussion

The rating of researchers in any country is fraught with controversy. Notwithstanding the biases, inconsistencies and ethical concerns (see Cherry and Gibbons 2007; Fedderke 2012), researchers often see rating as an assessment of their ability in their respective discipline (Callaghan 2018; Lewis and Ross 2011). These issues are further complicated in a country such as South Africa which is desperately trying to create a more equitable higher education sector. Current academic staffing bodies in the country are disproportionately white (see Breetzke and Hedding 2016; Breetzke and Hedding 2018) and although this distribution is changing, the pace is slow. Similarly, the results of this study indicate that the clear majority of NRF-rated researchers are white. In fact, almost 70% of NRF-rated researchers are white with these racial disparities increasing markedly the further one progresses up the NRF rating categories. More

positive news, however, from a transformation perspective is that these trends are changing. For instance, almost a third of Y-rated researchers in the country are black African (and these percentages are increasing) up from 10% in 2005 which indicates that this cohort of researchers are the fastest growing in the country. Moreover, the percentage of C-rated black Africans has more than tripled from 2005 to 2015. It is anticipated that these researchers will, in time, progress to higher ratings. The contrast with white NRF-rated researchers could not be more startling: the percentage of NRF-rated researchers that are black African are increasing whilst the percentage of NRF-rated researchers that are white are decreasing. In fact, the percentage of NRF-rated researchers that are black African are increasing in number across all rating categories most notably at the lower ratings whilst the white cohort are decreasing in percentage terms across all ratings, also notably at the lower ratings. The percentage of NRF-rated researchers that are coloured and Indian are also more accurately represented in South Africa when considering their national representation. Despite this, however, these two racial groups are also increasing their representation, albeit at a slightly slower rate.

Of course, there are trends that are of concern. Two observations, in particular, stand out. First is the clustering at the C-rating category. As previously mentioned, over 50% of all NRF-rated researchers in the country are C-rated however this percentage has remained relatively consistent since 2005. Interestingly, this clustering appears to impact both genders as well as all racial groups equitably. The fact that most rated researchers in the country are C-rated seems remarkably high although somewhat predictable. According to the NRF (2018) C-rated researchers are ‘established researchers’ with a sustained recent record of research productivity. The main difference between obtaining a B-rating as opposed to a C-rating is that all or the overriding majority of the reviewers must agree that the applicant enjoys considerable *international* recognition for their research outputs in order for a B-rating to be conferred. To be considered an ‘established researcher’ (C-rated) is an achievement in and of itself as it

reflects the fact that the researcher has produced a large body of quality work and has active ongoing engagement within their field. It is important to note that the NRF-rating system is not a promotion system per se where researchers automatically progress their way up the ratings categories. Indeed, the vast majority of researchers in the country never obtain an A, nor B rating. Explanations for the clustering at this category are speculative but could be related to the fact that administrative responsibilities generally increase for mid- to senior level research staff who are most likely to be in this rating category limiting the amount of time spent on research and concomitantly their ability to progress up the ratings. A more malevolent explanation could be that researchers in this category are publishing in lower quality and/or in local journals reducing their international exposure and their ability to gain an international reputation or profile.

A second noticeable observation from our study is the paucity of A-rated black Africans. In fact, there are only four A-rated black Africans in the country compared to 107 A-rated whites. The scarcity of this demographic in the A-rating category in South Africa dovetails with the lack of black African professors in the country. Currently only 15% of professors employed at South African HEIs are black African compared to 75% of professors who are white (Breetzke and Hedding 2018). The scarcity of this demographic in the professorial ranks at HEIs in South Africa has been the focus of much recent rigorous debate (see Mangcu 2014; Price 2014) with numerous governmental programmes recently being implemented to increase the amount of senior black African academic staff (see Nzimande 2015). The ability of these, and other, programmes and frameworks to address this imbalance is unknown but as Breetzke and Hedding (2018) motivate, the transformation of academic staff, and by association, the increase the percentage of senior black African academic staff is likely to take a considerable amount of time. Finally, the fact that only three percent of A-rated researchers are black African yet 15% of professors at all HEIs in South Africa are black African (see Breetzke and Hedding,

2018) refutes the commonly held notion in the country that NRF-rating plays an important role in the promotions process, particularly at the higher rankings. A general rule of thumb at South African HEIs is that an A, B or high C-rating (i.e, C1) greatly increases the likelihood of promotion to the professorial ranks. Based on the evidence presented here, this does not seem to be the case. In fact, this disparity is greater when one considers HEIs collectively. For example, in 2015 there were 2823 full professors in the country yet only 118 A-rated and 703 B-rated researchers respectively⁵. This means that roughly 70% of professors in the country have neither an A- nor a B-rating. Of course, an NRF-rating is awarded to an applicant based solely on their research outputs whereas an academic promotion to the professorial ranks considers an individuals' application more broadly and includes other criteria pertaining to teaching, community engagement, and administrative duties, among others. Regardless, this finding questions the importance placed on research in the appointment of senior academic positions in the country and demonstrates that some universities in South Africa may prioritise teaching as a key performance area for academic staff in terms of promotion to more senior ranks. The experiences of the authors are that promotions criteria vary considerably by institution in South Africa, with NRF-rating playing a more important role in historically white institutions but playing a lesser role in historically black African and 'new and merged' institutions. We are also aware of numerous professors and associate professors in the country that do not have an NRF-rating at all. These varying standards across HEIs in the country results in a lack of credibility as well as increased uncertainty regarding what exactly constitutes a professor and/or what the actual requirements are regardless of the promotions policy directives provided by each respective institution. Interestingly, Jansen (2018) notes that a number of former Afrikaans universities buckled under the pressure of 'Afrikaaner' nationalism in apartheid to hastily promote white academics to the rank of professor to create

a sense of scholarship. This, according to the researcher, has sadly continued in the post-apartheid era with black nationalists doing exactly the same thing for the same reasons.

Unintended consequences: Changes to the NRF's Incentive Funding for Rated Researchers Programme (IFRRP)

The overall results of the study are encouraging and indicate that progression and transformational change in terms of the gender and racial profile of NRF-rated researchers is occurring in South Africa, albeit slowly. One recent development has however we believe the potential to not only reduce these gains but to render the whole NRF-rating system obsolete. In October 2017 the NRF announced a revision of the IFRRP which provides guaranteed funding annually to NRF-rated researchers for the duration of their rating (usually five years). Citing budgetary constraints and a need to “re-align its investments to more strategically advance its mandate” (NRF 2018, 1) the NRF announced that from 2018 onwards, the large majority of rated researchers will receive a greatly reduced once-off grant followed by no additional funds. For example, A-rated researchers will see their funding decline from up to R100,000 (£5,000) a year per year over five years to a one-off payment of R50,000 (£2,500), and no funding thereafter. The essential termination of incentive funding for rated researchers has been labelled as catastrophic and a huge slap in the face for South Africa's top level scientific researchers (see Wild 2018) many of whom use this vital funding source to supplement their main research grants, support their post-graduate students and/or international visitors as well as to travel locally and abroad. As previously mentioned, one main incentive for researchers in South Africa to obtain NRF-rating is to obtain this annual allocation of incentive funding. We argue that the potential consequences of this ‘revision’ and the essential redaction of incentive funding cannot be overstated.

First, the withdrawal of incentive funding we believe is likely to lower the overall research quality emanating from South Africa and as a result lower the number of A- and B-rated researchers in the future. This is largely due to the fact we believe that current lower rated researchers will increasingly look for alternative and easier ways to obtain funding to support their research; most likely through existing publication incentives, since their IFRRP funding has effectively been withdrawn. Unlike most countries in Europe and North America, the South Africa government has an incentive scheme which funds universities for articles published in a list of accredited journals (mainly Web of Science) released annually⁶. Individual institutions decide how the incentive funds are spent but, in most instances, through a trickle-down effect, a portion of funds reaches the individual author and is placed in the researchers' cost centre account to be used for research purposes⁷. While notionally these incentive funds should only be used for research purposes some universities in South Africa have begun paying these publication incentives directly into the researchers' bank accounts with no guarantee that they will be used for research (see Hedding 2019). In South Africa the large increase in the amount of publications over the past decade has been attributed to the provision of publication incentives supplemented by the incentive fund of the NRF. Indeed, the country's publication output in the Web of Science has increased from 3,668 publications in 2000 to 15,550 in 2016 which translates into an average annual growth rate of 2.9% (Mouton and Blanckenberg 2018). We argue that the withdrawal of the incentive funding is likely to temper that future growth rate as academic staff, particularly at the lower NRF-ratings, may increasingly aim to obtain funding through publication incentives. It is important to note at this juncture that the list of accredited journals provided and updated annually by the DHET includes a list of journals, mainly local, that are not on the Web of Science, Scopus or any other academic database but are nonetheless still eligible for incentive funding. These 'lower hanging' journals are likely to be increasingly targeted by early-career researchers due to the perceived ease at which the

article is likely to be accepted for publication. Indeed, the current publication subsidy model in South Africa has already led to ‘an overabundance of weak journals’ (see Koenig 2006) while previous researchers have argued that the low impact factors of local journals, a fact compounded by economic incentive schemes to local authors, has greatly reduced the quality and quantity of submissions to these journals (see Gibbs 1995; Lee and Simon 2018). We argue that the large-scale redaction of incentive funding is likely to result in an increase in submissions to local or lower ranked journals as authors increasingly search for eased access to funding. The current Chief Executive Officer of the NRF, Dr Molapo Qhobela has already indicated that the effects of the changes to the IFRRP are most likely to hit early-career researchers the hardest (see Wild 2018) with many being severely underfunded relative to their research needs.

Of course, the possibility of an increase in the number of publications in predatory journals cannot be discounted too as early career researchers, in particular, increasingly look for fast and easy ways to obtain funding through publication. Indeed, predatory publishing has gained traction particularly in the Global South and lower-income economies as mainly early-career academics are placed under increasing pressure to ‘publish or perish’. South Africa has not been immune to this scourge (Hedding 2019). Over 4200 South African articles published between 2005 and 2014 were deemed probably or possibly predatory based on Bealls’ (2016) classification (see Mouton and Valentine 2017). Indeed, between R100–R300 million (£5–£15 million) has been paid to South African universities from 2005 to 2014 for publications that have appeared in predatory journals (Mouton and Valentine 2017). With incentive funding largely redacted we envisage a possible acceleration in submissions to predatory journals, either wittingly or unwittingly, and a concomitant increase in the number Y-rated researchers in the country or at the very least a long-term stagnation in this category as publications in

predatory journals do not enable researchers to build an international, or even local research profile.

It is important to note that the provision of incentives (financial or otherwise) to publish is not unique to South African HEIs. Indeed, increased incentives provided by countries outside the United States has been provided as a reason for the decline in submissions to *Science* by US-based researchers since 1995 (see Franzoni et al. 2011). Moreover, the individual cash-based incentives provided to South African researchers for publishing in high-ranking accredited journals has been adopted in various forms in countries such as Turkey (Turkish Academic Network and Information Center 2008), China (Yimin 2001) and Korea (Fuyuno 2006). At the institutional level countries such as Australia and the United Kingdom already have policies in place that provide more funding for institutions that perform better in terms of research than lower-performing institutions. Whether incentives increase the quality and quantity of research output as well as increase the impact of a country's research globally is open to debate. In Australia Butler (2003) noted that the introduction of output-based funding in the country in the 1990s stimulated researchers to publish more but at the same time less quality papers, lowering the total impact of Australian research. While later research refuted her work (see van den Besselaar et al. 2017), available evidence remains unclear exactly how both individual and institutional incentives impacts research behaviour such as increasing the risk of 'salami-slicing' practices, at least in an international context. With the redaction of the IFRRP, individual 'cash'-based (research) publication incentives will remain as the only available option for acquiring research funding for the majority of South African researchers which we believe may lead to questionable publishing practices.

Second, we believe the withdrawal of incentive funding is likely to lead to a continuation of the clustering we observed at the C-rated category or, more malevolently, the collective dissipation of this category altogether. As previously mentioned, in order for a B-rating to be

conferred to an applicant, the reviewers must collectively agree that the applicant enjoys considerable international recognition for their research outputs. Thus, for South African researchers to gain an international reputation, it is vital to not only publish high quality and impactful research but also to travel to international conferences, workshops and symposia. The latter allows local researchers to network and forge international collaborations which are vital in intellectually-isolated countries such as South Africa who have less economic prowess and capacity to access and disseminate advanced knowledge. The weak currency (the Rand) also restricts the ability of researchers in the country to travel internationally and thus establish these vital networks resulting in a lack of international exposure, and associated recognition. The withdrawal of IFRRP funding is likely to further reduce the ability, especially of lower rated researchers, to travel particularly internationally and gain valuable exposure to the international academe. Of course, external funding options are available to all researchers in the country to support their research through travel and conference attendance but in an increasingly competitive and constrained funding environment the probability of success is low. Ironically, the chances of obtaining external research funding is most often greatly increased if the local applicant is part of an international research team.

A third and final potential consequence of the withdrawal of IFRRP funding is the reduction in the number of applicants applying or re-applying for rating. Historically, one of the main reasons for obtaining an NRF-rating in South Africa was that it greatly increased and/or guaranteed funding from an NRF funding programme. As Cherry and Gibbons (2007, 179) note:

“There was a near exponential link between a scientist’s rating and the grant awarded to her/him. Grant applications were considered by an awards committee and grants were effectively conferred on the basis of a fairly loosely motivated request for money. A and B-rated scientists were eligible for monies

to fund staff who could assist their endeavours, whereas C-rated scientists were provided only partial support (their host institution being required to provide the balance).”

From 2003/4 onwards, however, the automatic allocation of large grants to highly rated researchers and a direct link between rating and funding was no longer the case and in 2008 the IFRRP came into effect which provided annual monetary allocations to researchers based on their rating category. Currently, a scientist’s rating makes no direct contribution to the assessment of a candidate’s grant application to the NRF (Cherry and Gibbons 2007) making a mockery of the NRFs own system of providing a credible assessment of a researchers’ pedigree and associated ability to undertake future funded research. Another common argument from South African universities is that NRF-rating is *sine quo non* for personal promotion, ‘performance’ awards, and employment retention. We argue that this holds true mainly for early-career researchers who are attempting to forge their own academic path. For more senior academics (i.e., professors), many of whom have an A, B or high C NRF-rating these ancillary incentives are less appealing as they cannot be promoted further and are most often earning at the top of the salary scale. Their international networks and collaborations are well-established with many holding external research funding. Convincing this cohort to re-apply for NRF-rating will be rather more difficult without an additional financial incentive provided by their institution. The result we envisage is a reduction in the amount of A and B rated scientists – a trend we have already noticed although this we believe has mainly been driven by resignations and retirements. Of course, for HEIs in South Africa to improve their international profile they require more A- and B-rated researchers although this category has, and we believe, will continue to stagnate and ultimately decline if current practices and standards of rating instituted by the NRF are maintained.

The results of our research indicate that whilst there is progression and transformation of NRF-rated researchers throughout the country, the pace is slow. This does, however, lend some credibility to the rating system itself as academic advancement is neither easy nor timely for any gender or racial group. We believe, however, that the future progression and transformation of NRF-rated researchers and concomitantly the ability of the country's universities to improve their global ranking are at risk as a result of the withdrawal, or rather the 're-strategising', of the IFRRP. We believe that this incentive scheme was a key driver in the substantial strides that South African universities have made over the past two decades in improving their global stature and status. Indeed, the country has improved its ranking among all countries across all research fields from 34 in 2000 to 28 in 2016 (Mouton and Blanckenberg 2018). Moreover, international collaboration is also up with currently over 50% of South African papers published in the Web of Science including an international co-author, up from roughly 30% in 2000 (Mouton and Blanckenberg 2018). These improving statistics are at risk. Wingfield and Vaughan (2017) believe that the NRF's rating system has been a victim of its own success with the NRF simply not having enough money to keep pace with the growing number of individuals who qualify for funding under the current incentive system. That may be true but the NRF's total budgetary allocation from the South African government has more than doubled in the last eight years increasing from R1.46 billion (£73million) in 2010/11 to R3.68bn (£184million) in 2018/19 (Wild, 2018). While most of this budget has been designated for other programmes like the South Africa Research Chairs Initiative and its Centres of Excellence programmes, the 'necessary' withdrawal of the incentive funding scheme may be seen in the future as short-sighted at best, and foolish, at worst. Of course, the true impact of the dramatic scale back of the IFRRP will only be felt in the next decade or so. In the interim it is hoped that that quality of South Africa's research output is not comprised nor corroded.

Notes

1. There are a number of university ranking systems available including the Times Higher Education ('THE') and Quacquarelli Symonds ('QS') systems, both of which incorporate some form of bibliometric measures in the creation of their rankings. The ARWU rankings is however generally regarded as one of the most consistent and transparent lists and was therefore used in this paper.
2. NRF recognised research institutions are declared (and gazetted) by the Department of Science and Technology and include Public South African (SA) Higher Education institutions (HEIs), Science Councils and other research performing public institutions. The list is available on the NRF Submission System at: <https://nrfs submission.nrf.ac.za/nrfmkii/>
3. There are now in fact 26 universities in South Africa. The most recent university, Sefako Makgatho Health Sciences University, opened in April 2015 but was excluded in this analysis.
4. The South African population is still officially classified into racial groups. Black Africans represent the descendants of western and central African populations. The 'white' population group represent the descendants of mainly Western and Eastern European populations. The 'Indian' population group represent the descendants of south Asian populations. The 'coloured' group comprise a mixed population including the descendants of the indigenous Khoisan population, imported Malay slaves, and people born out of mixed-race relations.
5. We did not have data pertaining to the number of researchers by sub-categorisation (i.e., C1, C2, and C3).
6. Funding is also provided for publication in other accepted outlets such as books and conference proceedings, although this is increasingly being revised by most HEIs in the country.
7. It is important to note that there is considerable variation among HEIs regarding the provision, and amount, of subsidy provided to researchers who publish in accredited journals. In some institutions, for example the University of Cape Town, researchers get no subsidy for publishing.

References

Academic Ranking of World Universities. 2017. *Methodology*.

<http://www.shanghairanking.com/ARWU-Methodology-2017.html>.

Arnolds, C. A., R. N. Stofile, and R. Lillah. 2013. "Assessing the Outcomes of the Higher Education Mergers in South Africa: Implications for Strategic Management." *Acta*

Commercii 13 (1) Art. #175. <http://dx.doi.org/10.4102/ac.v13i1.175>

Badat, S., and Y. Sayed. 2014. "Post-1994 South African Education: The Challenge of Social Justice." *Annals of the American Academy of Political and Social Science* 65 (1): 127-148.

doi:10.1177/0002716213511188.

Beall, J. 2016. *Beall's List of Predatory Journals and Publishers [homepage on the Internet]*.

<http://beallslist.weebly.com/>

Boshoff, C. 2018. "Chris Callaghan's Criticism of the National Research Foundation's Rating Methodology: A Rebuttal." *South African Journal of Science* 114 (7/8): Art. #a0278. doi:

[org/10.17159/sajs.2018/a0278](http://dx.doi.org/10.17159/sajs.2018/a0278).

Bowden, R. 2000. "Fantasy Higher Education: University and College League Tables."

Quality in Higher Education 6 (1): 41-60. doi.org/10.1080/13538320050001063.

Breetzke, G. D., and D. W. Hedding. 2016. "The Changing Racial Profile of Academic Staff at South African Higher Education Institutions (HEIs), 2005–2013." *Africa Education Review*

13 (2): 147-164. doi: 10.1080/18146627.2016.1224114.

Breetzke, G. D., and D. W. Hedding. 2018. "The Changing Demography of Academic Staff at Higher Education Institutions (HEIs) in South Africa." *Higher Education*, 76 (1): 145-161.

doi: 10.1007/s10734-017-0203-4

Buckle, R. A., and J. Creedy. 2018. "The Evolution of Research Quality in New Zealand Universities as measured by the Performance Based Research Fund Process." *New Zealand Economic Papers* doi: 10.1080/00779954.2018.1429486.

Butler, L. 2003. "Explaining Australia's increased share of ISI publications—The effects of a funding formula based on publication counts." *Research Policy* 32: 143–155.

doi:10.1016/S0048-7333(02)00007-0.

Callaghan, C. 2018. "A Review of South Africa's National Research Foundation's Ratings Methodology from a Social Science Perspective." *South African Journal of Science* 114 (3-4). doi:10.17159/sajs.2018/20170344

Cherry, M. I., and M. J. Gibbons. 2007. "Rating the NRF's Rating System." *South African Journal of Science* 103 (5/6): 179-181.

Cloete, N. 2014. "A New Look at Demographic Transformation: Comments on Govinder et al. (2013)." *South African Journal of Science* 110 (1/2): 15-18. doi:10.1590/sajs.2014/a0048

Department of Education. 1997. "Education White Paper 3: A Programme for the Transformation of Higher Education." Government Gazette No. 18207.

Department of Higher Education and Training. 2014. *White Paper for Post-School Education and Training: Building an Expanded, Effective and Integrated Post-School System*. Pretoria: Department of Higher Education and Training.

Department of Higher Education and Training. 2016. "Commission of Enquiry into Higher Education and Training to the President of the Republic of South Africa."

<http://www.dhet.gov.za>

Dunne, T. 2014. "On Taking the Transformation Discourse for a Ride: Rejoinder to a Response (Govinder et al. 2014)." *South African Journal of Science* 110 (5/6): 1-4.

doi:10.1590/sajs.2014/a0068

Fedderke, J. 2012. "The Objectivity of National Research Foundation Peer Review Based Ratings in South Africa." ERSA Working Paper 300.

https://econrsa.org/system/files/publications/working_papers/wp300.pdf.

Franzoni, C., G. Scellato, and P. Stephan. 2011. "Changing Incentives to Publish." *Science* 333 (6043): 702-703. doi:10.1126/science.1197286.

Fuyuno, I., and D. Cyranoski. 2006. "Cash for Papers: Putting a Premium on Publication." *Nature* 441: 792. doi: 10.1038/441792b.

Gibbs, W. W. 1995. "Lost Science in the Third World." *Scientific American* 273 (2): 92-99. doi:10.1038/scientificamerican0895-92.

Habib, A., and M. Phakeng. 2018. "Funding Research-Intensive Universities should be a Priority." Times Live, 7 October. <https://www.timeslive.co.za/sunday-times/opinion-and-analysis/2018-10-06-funding-research-intensive-universities-should-be-a-priority/>

Hedding, D.W. 2019. "Payouts Push Professors to Predatory Journals" *Nature* 565: 267. doi: 10.1038/d41586-019-00120-1

Jansen, J. 2017. "The Lost Scholarship of Changing Curricula." *South African Journal of Science* 113 (5/6): #a0209. doi:10.17159/sajs.2017/a0209.

Jansen, J. 2018. "Degrees of Deceit: SA's Professors of Academic Fraud." Times Live, 17 May. <https://www.timeslive.co.za/ideas/2018-05-17-degrees-of-deceit-sas-professors-of-academic-fraud/>.

Koenig R. A. 2006. "A Call to improve South Africa's Journals." *Science*. 312: 831. doi:10.1126/science.312.5775.831b

Lee, A. T. K., and C. A. Simon. 2018. "Publication Incentives based on Journal Rankings Disadvantage Local Publications." *South African Journal of Science* 114 (9/10): 1-3. doi:10.17159/sajs.2018/a0289.

Lewis, J. M., and S. Ross. 2011. "Research Funding Systems in Australia, New Zealand and the UK: Policy Settings and Perceived Effects." *Policy & Politics* 39 (3): 379-398. doi:10.1332/030557310X520270.

MacGregor, K. 2014. "The Massification of Higher Education in South Africa." University World News. <http://www.universityworldnews.com/article.php?story=2014062015083621>.

Mangu, X. 2014. "Ripping the Veil off UCT's Whiter Shades of Pale." <http://www.uct.ac.za/dailynews/?id=8891>.

Mouton, J., and A. Valentine. 2017. "The Extent of South African Authored Articles in Predatory Journals." *South African Journal of Science* 113 (7/8): 1-9. doi: 10.17159/sajs.2017/20170010.

Mouton, J., and J. Blanckenberg. 2018. "How well is South African Science Doing?" University World News. <http://www.universityworldnews.com/article.php?story=20180621152125458>.

Muller, S. M. 2017. "Academics as Rent Seekers: Distorted Incentives in Higher Education, with reference to the South African case." *International Journal of Educational Development* 52: 58–67. doi:10.1016/j.ijedudev.2016.11.004.

Mutekwe, E. 2017. "Unmasking the Ramifications of the Fees-Must-Fall-Conundrum in Higher Education Institutions in South Africa: A Critical Perspective." *Perspectives in Education* 35 (2): 142-154. doi: 10.18820/2519593X/pie.v35i2.11.

National Planning Commission. 2012. *National Development Plan 2030 - Chapter 9: Improving Education, Training and Innovation*. Pretoria: The Presidency.

National Research Foundation. 2016. "NRF Strategy 2020."

www.nrf.ac.za/sites/default/files/documents/NRF%20Strategy%20Implementation.pdf

NRF. 2018. "NRF Ratings Categories." <https://www.nrf.ac.za/document/09-rating-categories>.

National Research Foundation. 2018. "Annual Performance Reports."

<https://www.nrf.ac.za/information-resources/annual-performance-reports>.

Nzimande, B. 2015. "Foreword by the Minister'." <http://www.dhet.gov.za/ssauf/home.html>.

Perry, L. B. 2018. "Assessing the Performance of Educational Research in Australian Universities: An Alternative Perspective." *Higher Education Research and Development* 37 (2): 343-358. doi:10.1080/07294360.2017.1355893.

Pouris, A. 2007. "The National Research Foundation's Rating System: Why Scientists let their Ratings Lapse." *South African Journal of Science* 103 (11/12) 439-441.

Price, M. 2014. "Addressing the Shortage of Black and Women Professors."

<http://www.uct.ac.za/dailynews/?id=8891>.

Rensburg, I., S. A. David, and S. Motala. 2015. "Internationalization of Higher Education: A South African Perspective." *Frontiers of Education in China* 10 (1): 91-109.

doi:10.1007/BF03397054.

Sogoni, E. 2014. "Financial Resources Distribution to Universities and Colleges: Department of Higher Education and Training and National Student Financial Aid Scheme briefing."

<https://pmg.org.za/committee-meeting/16861/>.

Taylor, P., and R. Braddock. 2007. "International University Ranking Systems and the Idea of University Excellence." *Journal of Higher Education Policy and Management* 29 (3): 245-260. doi:10.1080/13600800701457855.

Turkish Academic Network and Information Center. 2008.
<http://www.ulakbim.gov.tr/cabim/ubyt/>.

Van der Besselaar, P., U. Heyman, and U. Sandström. 2017. "Perverse effects of output-based research funding? Butler's Australian case revisited." *Journal of Informetrics* 11 (3): 905-918. doi.org/10.1016/j.joi.2017.05.016.

Wangenge-Ouma, G. 2013. "Funding and the Attainment of Transformation Goals in South Africa's Higher Education." *Oxford Review of Education* 36 (4): 481-497.
doi:10.1080/03054985.2010.491181.

Watermeyer, R., and J. Chubb. 2018. "Evaluating 'impact' in the UK's Research Excellence Framework (REF): Liminality, Looseness and New Modalities of Scholarly Distinction." *Studies in Higher Education*. doi:10.1080/03075079.2018.1455082

Wild, S. 2016. "South African Researchers Bemoan Slashed Funds." *Nature*.
doi:10.1038/nature.2017.22816

Wingfield, B., and K. Vaughan. 2017. "Money Woes force South Africa to Revisit how it Rewards Researchers." *The Conversation*. <https://theconversation.com/money-woes-force-south-africa-to-revisit-how-it-rewards-researchers-86151>.

Yimin, D. 2001. "In China, Publish or Perish is Becoming the New Reality." *Science* 291(5508): 1477-1479. doi: 10.1126/science.291.5508.1477.

Zewotir, T., and D. North. 2015. "Analysis of Attrition and Retention Rates using the Generalized Linear Model." *South African Statistical Journal* 49 (2): 259-271.