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Including excluded groups: The slow racial transformation of the South African university system

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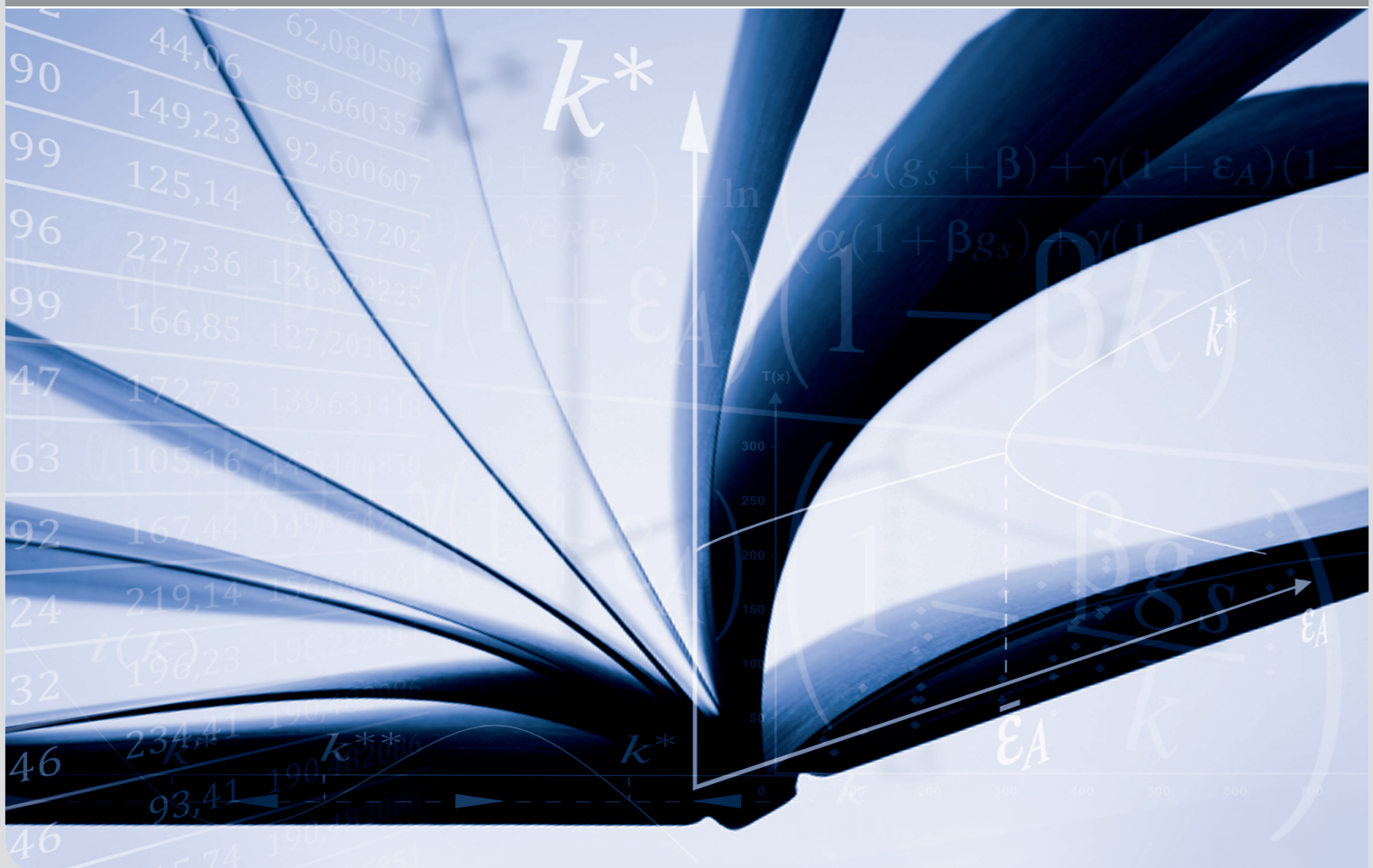
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**INCLUDING EXCLUDED GROUPS:
THE SLOW RACIAL TRANSFORMATION OF THE SOUTH AFRICAN
UNIVERSITY SYSTEM.**

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ABSTRACT. This paper looks at the inclusion of excluded groups, notably the racial transformation of the South African university system. Both demand-side factors — are qualified black people hired as faculty? — and supply-side factors — are there enough qualified black people who can be hired as faculty? — need to be aligned. Prior evidence suggests that demand and supply both have both a psychological and a structural dimension. Affirmative action-type regulations address the structural dimension of demand, but homophily (a "love for the own") can nonetheless limit the hiring of faculty in white-dominated hiring committees. On the supply side, the weak education system limits the structural supply of quality black potential academics. But the limited hiring of black academics and resulting limited role models mean that few black people even consider an academic career. This paper presents a model of hiring (either randomly or on a homophilic basis), calibrated with data from the South African university system from the end of Apartheid. Our evidence suggests that even a relatively small reduction of homophily increases the rate at which the excluded group enters the workforce, and also that the effects of homophily and feedback from previous hires are of a similar magnitude. Nonetheless, the conclusions from the model suggest that the relatively long duration of a research career and slow growth of the national university system will result in a slow process of racial transformation.

JEL codes: O15; O30; I2

Keywords: universities; racial transformation; South Africa; transformation; higher education access; segregation

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1. INTRODUCTION

The racial transformation of faculty is a topic that generates both public interest and academic debate. In 2015 the New York Times reported on student protests in South Africa, noting that at the country’s most prestigious tertiary institution, the University of Cape Town, less than 5 percent of its academic staff was black¹ — in a country where more than 80 percent of the population is black. A few months later the Washington Post asked about the US: “Where are all the black college faculty?”² In this paper, we propose a model to better understand the barriers to and enablers of the racial transformation of faculty. We consider both demand-side factors: are qualified black people hired as faculty; and supply-side factors: are there enough qualified black people who can be hired as faculty. Evidence suggests that both demand and supply have a psychological and a structural dimension.

This study focuses on South Africa. The South African case is an extreme one, but it is believed that the insights from this context can provide useful insights for other cases where minorities are seeking — often with limited success — to enter the academy. In 1994, when Apartheid ended, the academic instruction staff across the country was overwhelmingly male (69 percent) and especially white — 83 percent (Badat, 2010). This was not incidental. A differentiated education system in which black people played a limited role was key to Apartheid thinking (Reddy, 2004), and similarly, the transformation of the education system, including the university system, was an important post-Apartheid goal. This paper aims to understand not only to what extent such racial transformation has happened or not, but especially why.

This paper focuses on the racial transformation of the South African academy without suggesting that it is the only type of transformation that needs to take place and with acknowledgement of the insights of scholars working on other types of transformation, for example gender. In addition, the discussion of race is simplified to focus on whites and the black (African) majority. We recognise the racial complexities facing two smaller groupings in South Africa, mixed race (“coloured”) and Indian, and leave out their experiences in order to present a more stylized argument.

2. BACKGROUND

At the end of 2013, twenty years after a new constitution for South Africa was proposed, white faculty was still in a majority. Although faculty were more representative of the demographics of the country than in 1994, white males still predominated, with 55 percent of academics male and 52 percent white. Moreover, black faculty were predominantly found in the historically black universities that between them had less than 15 percent

¹<http://www.nytimes.com/2015/09/09/world/africa/student-protests-in-south-africa-highlight-dissatisfaction-with-pace-of-change.html?r=0>, accessed February 15, 2016. In fact, the most recent data on UCT indicates that the proportion of black faculty is less than 15 percent (not 5 percent).

²<https://www.washingtonpost.com/news/answer-sheet/wp/2015/11/12/its-2015-where-are-all-the-black-college-faculty/?postshare=3881447437351744>, accessed February 15 2016.

white faculty and more than three-quarters African black faculty.³ But these universities had only limited participation in knowledge production. At the seven universities⁴ that deliver three-quarters of the PhDs in South Africa, 62 percent of faculty were white. At the three most highly ranked South African universities, the Universities of Cape Town and Stellenbosch and Witwatersrand University, the number increased to 70 percent.

In South Africa, the appointments of associate and full professors follow international practice. Successful promotion requires evidence not only of teaching and service, but also of sustained research output. In the more research-intensive universities, research is concomitantly more important. But unlike in a region like North America, there is no tenure clock — faculty do not lose their appointments if they fail to be promoted within a set period. And numerous lower tiers (junior lecturer, lecturer and senior lecturer) are available, where faculty can be appointed even without doctoral degrees. This practice, together with the post-Apartheid commitment in South Africa to increase the intake of university students (Reddy, 2004) has led to a situation where less than 42 percent of faculty members country-wide have a doctorate.

Again, a pattern is evident. Less than 22 percent of the academic staff members at the historically and still predominantly black universities have doctorates. This increases to 52 percent for the seven universities that produce three-quarters of the doctorates in the country while at the three top ranked universities⁵ 62 percent of faculty members have doctorates. Where black faculty members are present in academia, they tend to occupy lower ranks. Prof Max Price, Vice-Chancellor of the University of Cape Town explained that many competent black students choose careers outside academia, limiting the pool of possible academics, and also that it takes about 20 years for an academic to move through the ranks to become a full professor.⁶ But a group of black academics at his university pointed out that such views “shift the shared burden of responsibility for crafting a transformed university community away from the university leadership onto the institution’s constituents.”⁷

In order to meaningfully transform the South African academy in terms of its racial composition, it is important to understand the current enablers and inhibitors of such transformation. The next sections deal with demand and supply factors in transformation respectively.

³The historically black universities are Fort Hare and Walter Sisulu University in the Eastern Cape, Mangosuthu Technical University and the University of Zululand in Kwazulu-Natal and the Universities of Limpopo and Venda, both in Limpopo. <http://chet.org.za/data/sahe-open-data>, accessed February 15, 2016. All data on the characteristics of the South African academia are from this site, and the most recent available year (2013) used.

⁴Northwestern University, University of South Africa (UNISA), University of Cape Town, University of Kwazulu-Natal, Witwatersrand University, Stellenbosch University and University of Pretoria.

⁵According to the Times Higher Education ranking 2015.

⁶<http://www.theguardian.com/world/2014/oct/06/south-africa-race-black-professors>, accessed February 15, 2016.

⁷<http://www.uct.ac.za/dailynews/?id=8829>, accessed February 15 2016.

2.1. Demand for black academics. In the immediate post-Apartheid era, the then Minister of Education S.M.E. Bengu was outspoken in his insistence that transformation of the university system was an “absolute obligation”. Universities started various transformation initiatives, among which attempts to redress the paucity of black faculty members in the South African academy. Affirmative action officers were employed, schemes to target potential black academics were instituted, and principles adopted such that if all else were equal, the black candidate should receive priority over the white one, and that black candidates with potential might be appointed on a lower rank than the advertised post (Hugo, 1998). But Fourie (1999) pointed out that although formal discriminatory practices were eliminated, many of the affirmative action interventions were informal, and that merit remained the central consideration.

Affirmative action or employment equity programmes are structural attempts to shift demand. Indeed, in his review of affirmative action studies in the US, Leonard (1990) finds that one of the main consequences of affirmative action was a shift in the demand for black and female workers in certain categories. But studies on racial transformation in South Africa showed that the ostensible emphasis on merit by recruiters often hid racial bias. Thaver (2006) identified four mechanisms that made it hard for black applicants to be fairly considered for appointments and promotions. First, the racial composition of selection committees remained largely white. Second, the criteria for selection were opaque and subtly racialized. Interviews with academics at both historically white and historically black universities lead her to conclude:

there is a racial conflation between on the one hand, notions of quality and whiteness; and on the other between that of capacity building and blackness (Thaver, 2006:30).

White academics often framed job requirements and suitability in terms of “universal” notions of quality and standards, while her black respondents tended to relate their knowledge base to their racial context. But although white academics invoked notions of quality, the experience of black academics often was that quality criteria were applied inconsistently, and that the third mechanism inhibiting black access to academia was that they were held to higher standards than white candidates. Mabokela and Mawila (2004), focusing on the interplay of race, gender and culture, found that quality standards (e.g. whether a candidate had a PhD or not) were applied inconsistently while Rabe and Rugunanan (2012) found evidence that black women were able to get initial support such as bursaries, but not permanent and senior positions in academia.

Thaver (2006) identified difficulties in doing research as the final mechanism preventing the advancement of black faculty members. She repeated a finding from Fourie (1999), that black faculty often had large teaching loads and struggled to find the time to do research. Another potential barrier was that research was increasingly shifting from an individual- to team-based activity, requiring of black scholars to access research teams. A final consideration was principally epistemological. Black scholars found it harder to have new areas of research accepted, and for example had to demonstrate greater engagement with prior literature than their white counterparts. Ironically, even an area like “Indigenous

Knowledge Systems” found greater acceptance when it was proposed by a white rather than black scholar. She concluded that the opportunities of black faculty members were still shaped by a “strong white power base of structures”. This was not necessarily visible to white academics. In a 2009 study, Thaver found that black academics at a historically white South African university experienced the existence of a strong but unspoken culture that was white, male, Western and rational. In contrast the white academics insisted that multiple cultures co-existed at their institution and that no culture dominated.

In 2005 in the US Bertrand, Chugh and Mullainathan proposed the concept of “implicit discrimination” where discrimination is not only unintentional, but also outside of the awareness of the decision maker. They argue that such discrimination is more likely to exist when there is inattentiveness to the task (a situation that is unlikely to occur in academic hiring contexts), and in cases where decision makers face a heavy cognitive load such as working under time pressure, or when situational cues are ambiguous. They based this assessment on a résumé experiment in which they demonstrated not only labour market discrimination against African-Americans, but also that better qualifications had only a very limited effect in mitigating such discrimination (Bertrand and Mullainathan, 2004).

Already in 1999 Fourie recorded that the impact of the transformation agenda on white faculty was “dramatic”, suggesting that the faculty who were hiring potential black faculty members may well have experienced a high cognitive (and emotional) load. But although the implicit discrimination argument essentially suggests that people will access the most available stereotype, it does not explain why the stereotypes of another group would be particularly negative. A suggestion of the underlying mechanism was offered in 2012 by Jacquemet and Yannelis who replicated the earlier study with a third experimental group. The fictional individuals who sent in résumés to actual job advertisements either had typically Anglo-Saxon, or typically African-American or recognisably “foreign” but white-sounding names like “Dziella Lousaper” (2012: 7). They found that foreign résumés were discriminated against virtually as much as those of African-Americans, suggesting the presence of ethnic homophily, i.e. that anyone who is not a member of one’s own ethnic group would be treated differently.

In their review paper on homophily, (McPherson, Smith-Lovin and Cook (2001) distinguished between “baseline homophily” and “inbreeding homophily”. This reflects an individualist versus structuralist (Mayhew, 1980) explanation for homophily, and is also sometimes termed “choice homophily” and “induced homophily” (Kossinets and Watts, 2009). Essentially, two mechanisms are at work and indeed mutually reinforcing. The first is an individual preference for one’s own racial group or gender. The second is the path-dependent fact that individuals are already “pre-sorted” into shared environments, and that those shared environments structurally constrain the choices that can be made. To the extent that those shared environments are the cumulative result of prior similar choices, opportunities to engage with people of different racial or gender groups may be limited. Indeed, Kossinets and Watts mention “the prohibitive cost of searching for and meeting” (2009: 434) people who are not in a proximate environment.

Race has been found an especially powerful divider of social worlds (McPherson, Smith-Lovin and Cook, 2001). Moreover, under Apartheid, there was a comprehensive agenda to

keep white and black people “apart”. Neighbourhoods, hospitals, schools, transportation and so on were all segregated. Thus even if white faculty members were free of individual homophily — unlikely, given their socialisation into a virtually exclusively white professional context — they found themselves in a world of extensive induced structural homophily. Although redress requirements attempted to shift demand, the countervailing effects of homophily did not receive much attention.

2.2. Supply of black academics. In addition to the barriers that potential black faculty faced in the hiring process, the supply of black faculty members — the availability of people who want to and can become academics — was also limited by both structural and psychological factors. A key structural consideration is the educational “pipeline” in South Africa. Under Apartheid, the education system was racially divided, and there was a deliberate underinvestment in the black sector with the argument (made by the then-president, Verwoerd) that education would create false aspirations among black people (Reddy, 2004). In contrast, the white part of the education sector benefited from extensive investment. Redress, increased access and equity were critical for the African National Congress when it came to power in 1994 but already in 2001, Gilmour highlighted how trade-offs and the practical formulation of goals within the context of the highly uneven schooling system were placing some policy goals in tension. Twenty years after the end of Apartheid, it was clear that the vast majority of historically black schools had failed to become places of learning (Sayed, Kanjee and Nkomo, 2013; Spaull, 2013). Parents in historically black areas who could do so often enrolled their children in the more distant previously white (or Indian or “coloured”) schools to realise better opportunities for their children, further contributing to an unequal schooling system (Hill, 2014).

This meant that a large number of black students had been inadequately prepared by the schooling system for tertiary education. The gap is already evident in enrolment: 68 percent of enrolled students at South African higher education institutions were black whereas they comprised 80 percent of the population.⁸ Of the enrolled students, the success rate was only 79 percent of black students versus 88 percent of white students. But even the eventual success rate hides racial discrepancies. Only 20 percent of black students who started their studies in 2006 completed their degree within the regulation time, compared to 44 percent of white students. Thus black students were less likely to enter university, more likely to drop out, and if they did eventually complete, more likely to take a longer time to do so compared with their white counterparts — so much so that the Council for Higher Education (2013:51) estimated that only about 5 percent of black youth will succeed at higher education.

Pipeline challenges remain at post-graduate level. Herman (2011) argued that especially good doctoral students were scarce, and that some institutions were recruiting doctoral students from undergraduate level. But important considerations mentioned by Herman are psychological rather than structural. Many potential black doctoral students did not see the need for the PhD degree or indeed an academic career.

⁸<http://www.dhet.gov.za/DHET%20Statistics%20Publication/Statistics%20on%20Post-School%20Education%20and%20Training%20in%20South%20Africa%202013.pdf>, accessed February 15, 2016.

This relates to the notion of “perceived occupational opportunity”, a set of work that evolved from the research that Gottfredson (1981) did on circumscription and compromise. Essentially, people look at a known universe and pursue occupations if they see that “people like them” are represented in them (Byars-Winston, Fouad and Wen, 2015; Chung and Harmon, 1999). Mabokela (2002) reports that many black women in South African universities struggle to understand the rules of the academic game not only generally (for example, requirements of research in historically teaching-oriented institutions), but also that women need to “constantly decipher new rules” (2002:193) specific to their institutions. Her respondents repeatedly requested some form of mentoring so that they could adequately locate themselves in the role.

3. EMPIRICAL ANALYSIS

We are primarily interested in the process towards equal participation in the South African higher education sector. The empirical analysis focusses on the racial composition of academic faculty in South African research universities, and how that is changed through the hiring process of new faculty members.

In detail, we focus on i) teaching and research staff with ii) permanent employment at iii) SA research universities iv) holding a Phd, and v) having SA citizenship (in the following focal academics). This focus sheds light on that part of the higher education sector where inertia of the past predominantly white system is highest, the career prospects for academics are best, the signal of (non-)equal participation to the society of the whole is strongest, and policy concerns are highest. Our focus on the integration of Blacks, rather than Coloured or Indians, is justified by the fact that Blacks are by far the most disadvantaged group considering their fraction in academia compared to their fraction in the overall SA population.⁹ We exclude foreigners from the analysis because the societal concern is equal opportunity among South Africans and not racial composition per se.¹⁰

The higher education data used for this analysis stems from the Department of Higher Education and Training (DoHeT) of the Republic of South Africa.¹¹ The data provide for each (technical) university the number of staff members by various characteristics over the period from 2000 to 2013. Sample restriction is based on nationality (SA), highest degree obtained (Phd), having permanent position as research/teaching faculty. We are

⁹In 2011, the population (research university faculty) consisted of about 80 percent (10 percent) Blacks, 9 percent (72 percent) White, 9 percent (6 percent) Coloured, 2.5 percent (10 percent) Indian, and ‘others’ (2011 SA Population census http://www.statssa.gov.za/census/census_2011/census_products/Census_2011_Census_in_brief.pdf and analysis data.

¹⁰The share of foreigners in research university faculties is about 25 percent while foreigners contribute only 10 percent to non-research university faculty in 2013. Foreigners in research universities raise the fraction of black faculty. In research universities, the fraction of black academics of foreign nationality increased from 5 percent in 1994 to about 30 percent in 2013, while the fraction of black South African academics increased from 1 percent in 1994 to about 10 percent in 2013. (Own calculation based on DoHeT data, see below.)

¹¹Made publicly available in a joint effort of the University of Johannesburg and the private company IDSC, downloaded from <http://www.idsc.co.za> in September 2015.

interested in the race, mostly the fraction of blacks, in the faculty and newly hired faculty members in a given year. The employment commencement year of a focal academic denotes the year when the person started to work for that institution potentially starting with a non-permanent position which turned into a permanent one during the observation period. We use the employment commencement year not only for the time of hiring decisions but also to infer on the racial composition of faculty from 1994 to 1999.¹² The overall analysis period then starts with the first elections after apartheid in 1994 and ends in 2013.

The data entails in total 47 South African higher education entities. Between 2002 and 2004, during the restructuring of the higher education system in SA, 24 entities ceased operation and 14 have been newly established. By the end of the observation period, 2013, the data entails 23 entities, among which we identify 7 research universities. While 5 research universities remained in existence throughout from 2000 to 2013, 2 research universities have been formally newly established through mergers.¹³ We consider the merging entities to be research universities but treat them as separate entities throughout the analysis. This way, aggregate statistics for research universities are not affected by mergers which redistribute existing staff among research universities. Disaggregated statistics on the level of the university are mainly on the current state of the focal entity and hence are also not affected by the restructuring in the mid 2000s.

Differentiating research universities from non-research universities divides the higher education system into two parts of similar size. Both increased staff in permanent research/teaching positions from about 2000 positions in the year 2000 to about 3000 positions in 2013.¹⁴ Growth is somewhat stronger for research universities and, consequently, we observe more hiring decisions in research universities (2558) than in non-research universities (1791). The number of hiring decisions in the whole system varies over years between 150 and 400. The distribution of hiring decisions across universities is uneven. Large research universities such as the University of Witwatersrand dominate the job market and hire up to 45 percent of total newly hired.

Figure 1 presents the results of the analysis. The lines describe the proportion of black PhDs over time, from 1994 to 2013, in three different populations. The lowest line, solid with black squares, provides the proportion of black academics in research universities. The upper line, solid with black triangles, gives the proportion black of PhDs that have

¹²We used another data set on the racial composition of teaching and research staff from 1994 to 1999, obtained from DoHeT, to evaluate the validity of our approach. We found that while we fall short in the obsolete number of staff due to retirements before 2000, the racial composition is accurate.

¹³The seven research universities are: University of Stellenbosch, University of Cape Town, University of Witwatersrand, University of KwaZulu-Natal, University of Pretoria, Rhodes University, University of Johannesburg. University of KwaZulu-Natal originates from a merger of University of Durban-Westville and University of Natal, University of Johannesburg originates from a merger between Rand Afrikaans University and the Technikon Witwatersrand. Technikon Witwatersrand is not in the data set but has also not been a research university.

¹⁴In the same period we observe about 2000 entrants into research university faculty. Consequently about 1000 should have retired. This makes sense when we partition faculty in the year 2000 into two age cohorts (of 1000 each): young researchers from 35 to 50 and seniors from 50 to 65. By the end of the observation period all seniors should have retired.

been present on the South African job market but have been hired either by research or non-research universities in the given year.¹⁵

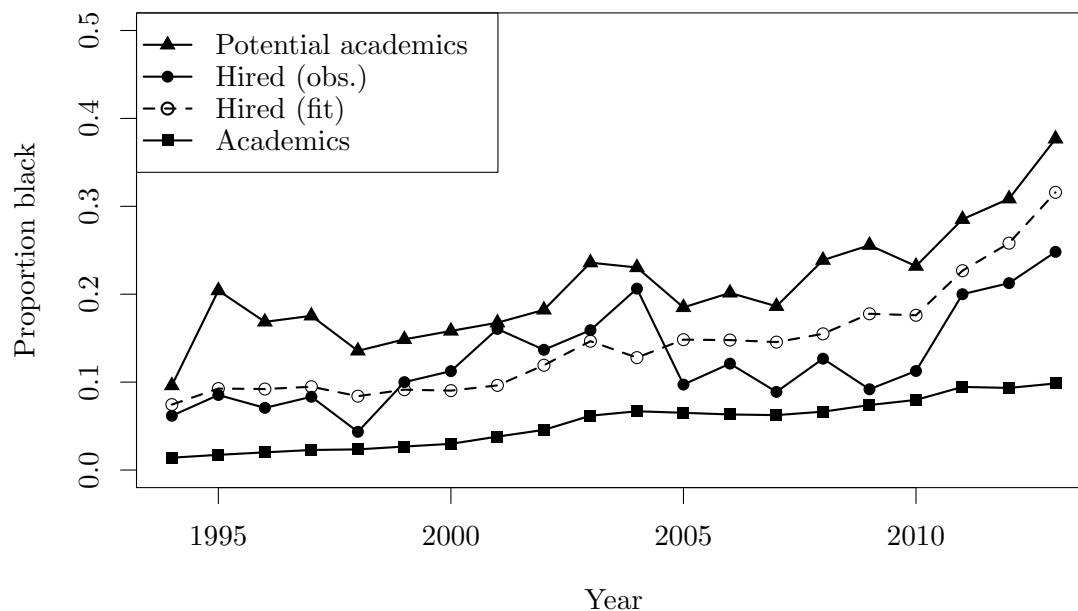


FIGURE 1. Proportions black in research universities among academics, newly hired academics into research universities (observed and fitted), and potentially hired academics.

The solid and the dashed line with circles describe the proportion black of those PhDs that have been hired by research universities. While the solid line is observed, the dashed line has been fitted by a simple logit model. The logit model takes the individual hiring decision as basic unit of analysis. The modelled outcome is whether the PhD hired by the faculty of a research university is black or not. In the model, that decision depends on

¹⁵We consider this variable as a proxy for the racial composition of candidates in the job market in a given year. In case black PhDs are disadvantaged in the job market, the true proportion is actually higher due to the possibility of not getting hired at all. The alternative would be to consider PhD graduates but that suffers from the same issue with an opposite effect. If black PhDs are disadvantaged, they are less likely to present themselves on the academic job market. Furthermore, there is an indefinite time lag between graduation and entering the job market due to post doctoral positions which makes a difference during our observation period when the proportion of black PhDs increased considerably. We did the same analysis replacing hired PhDs by PhD graduates (with different lags) but obtained the same conclusions.

the proportion black in the hiring faculty (b_a) as well as the proportion black of potential academics (b_p). The estimated coefficients along with p-values in parenthesis are as follows:¹⁶

$$\Pr(\text{black academic}) = \text{logit} \left(\begin{array}{c} -2.9 + 11.24 b_a + 2.2 b_p \\ (0.002) \quad (0.020) \quad (0.352) \end{array} \right)$$

The variable b_p , proportion black among potential academics, is identical with the solid line with triangles in Figure 1. We obtain for this variable a positive coefficient (2.2) which is not significant and hence does not allow for rejection of the null hypothesis that the hiring decision is unaffected by the proportion of blacks being hired overall in a given year. The reason for the high p-value is the relatively small variation of the pool over years. We emphasise that the empirical evidence does also not support acceptance of the idea that hiring decisions are independent from the pool of potential candidates.

The variable b_a , proportion black among hiring faculty, is positive (11.24) and significant. The solid line with squares in Figure 1 corresponds to the weighted average of b_a across universities. The aggregate hides the fact that research universities differ considerably in terms of racial composition. While we see relatively little change in proportion black within individual universities, there are larger differences across faculty. Hence, the estimation draws mainly from the variation of b_a across university which creates 90% of the overall variation of that variable.

In order to get an intuition on what the estimate implies compare two extreme cases: the University of Stellenbosch with proportion blacks in faculty being zero in 1994 and the University of Johannesburg with a proportion blacks of 18 percent. Fixing the proportion in the pool of potential academics to 20 percent the former has a probability of hiring a black academic of 8 percent while the latter has a probability of 40 percent (according to the data Stellenbosch hired no black SA PhD until 1997 while Johannesburg hired 60 percent blacks — 9 black and 5 white academics — in 2011).

We note that the proportion of blacks hired by research universities always lies between the proportion of blacks in existing faculty and the proportion of blacks in the job market. The proportion of blacks hired into research university faculty can thus be expressed as a linear combination between the two. $B = hb_a + (1 - h)b_p$ with $0 \leq h \leq 1$. Solving for h and entering aggregated data yields values between 0.1 and 0.9, interquartile range of 0.4 to 0.7 and a mean and median of about 0.5 with no particular order over time.

We use these observations for the model in the next section.

¹⁶We use the one-year lag of b_a to keep the proportion of blacks in faculty unaffected by the outcome of the hiring decision. The proportion black of potential academics, b_p , can be safely assumed to be unaffected by the individual hiring decision. However, all hiring decisions of one university might considerably affect the racial composition in the pool. Therefore we remove all hiring decisions from the sample where one university hired more than 20 percent from the overall pool. This reduces our sample for estimation by 884 to 1674 observations. The fitted line in Figure 2 is based on all 2558 observations. p-values have been obtained from block-bootstrap with resampling on the level of universities as implemented in the function ‘cluster.bs.glm’ in the R-package ‘clusterSEs’.

4. THE BASIC MODEL

Consider a population consisting of two sub-populations: there are academics \mathcal{A} and potential academics, or PhD graduates, \mathcal{G} . The proportions black in the two populations are b_a and b_g respectively. Each period one academic retires and is replaced from the pool of graduates. We assume all academics and all graduates are of equal “academic quality”, so their only distinguishing feature is colour.

There are two forces driving the model: the racial composition of the supply of new academics, and homophily in the demand for new academics. In the model the academic population is changed through retirement and recruitment. Recruitment is modelled thus: an academic is chosen as the recruiter, uniformly at random from the existing academic population. Agents have a preference for recruiting colleagues of their own colour (blacks prefer to recruit blacks, whites prefer whites) but this preference may be stronger or weaker. This is captured by a parameter $h \in [0, 1]$. When $h = 1$, homophily is perfect, so whites only recruit whites, and blacks only blacks. If $h = 0$ homophily is completely absent, and all recruiters are colour blind, simply drawing randomly from the population of potential academics. In the simple, basic model all academics have the same degree of homophily, h . With this process, the probability that the recruited agent is black can be written as:

$$(1) \quad \Pr(\text{black academic}) = b_a (h + (1 - h)b_g) + (1 - b_a) ((1 - h)b_g)$$

If the recruiter is black (with probability b_a), with probability h he recruits a black and with probability $1 - h$ he draws randomly from the pool of recent graduates, and gets a black with probability b_g . If a white recruiter is chosen, $(1 - b_a)$, with probability $1 - h$ he draws randomly from the pool and gets a black with probability b_g .

Each period one academic, drawn randomly from the current population of academics, retires.

This describes a simple Markov chain, and we can write the elements of the transition matrix. The total population of academics is fixed¹⁷ so we can work as well with the number black in academia, denoted n_a which translates simply the proportion: $b_a = n_a/N_a$. The probability that in a period the number of blacks in academia increases by one can be written as:

$$(2) \quad \Pr(\Delta n_a = +1) = (1 - b_a)[b_a(h + (1 - h)b_g) + (1 - b_a)(1 - h)b_g].$$

This equation can be understood as follows: To increase the number of blacks in academia, a white must retire, $(1 - b_a)$, and a black must be recruited, which is equation 1, in square brackets.

Similarly we can write the probability of the number of blacks decreasing by one:

$$(3) \quad \Pr(\Delta n_a = -1) = w_a[b_a(1 - h)(1 - b_g) + (1 - b_a)(h + (1 - h)(1 - b_g))].$$

¹⁷The university system as a whole, including the formerly white research universities, has been expanding since 2000. In the model development we ignore this, for the sake of simplicity. We explicitly include it in section 6 below, when we calibrate the model.

These simplify nicely:

$$(4) \quad \begin{aligned} \Pr(\Delta n_a = +1) &= f(n_a) = (1 - b_a)[hb_a + (1 - h)b_g] \\ \Pr(\Delta n_a = -1) &= g(n_a) = b_a[h(1 - b_a) + (1 - h)(1 - b_g)] \end{aligned}$$

which we can interpret as follows: Each recruitment is either homophilous or non-homophilous. The former happens with probability h , and in this case a black is hired if (and only if) a black academic is drawn to recruit (which happens with probability b_a). Non-homophilous hiring takes place with probability $(1 - h)$ and produces a black academic with probability b_g .

Equation 4 contains the basic elements of the transition matrix for our markov chain. The transition matrix is diagonal, with the main diagonal being $1 = g(n) - f(n)$, the diagonal below the main diagonal is $g(n)$ the diagonal above the main diagonal being $f(n)$ and zeroes in every other cell:

$$(5) \quad M = \begin{bmatrix} 1 - f(0) & f(0) & 0 & 0 & \dots \\ g(1) & 1 - g(1) - f(1) & f(1) & 0 & \dots \\ 0 & g(2) & 1 - g(2) - f(2) & f(2) & 0 & \dots \\ \dots & & & & & \\ 0 & 0 & \dots & & 0 & g(N) & 1 - g(N) \end{bmatrix}$$

A closed form solution for the limit distribution is not readily available, but by setting N , h and b_p we can easily calculate the limit distribution as the first eigenvector of M .

4.1. Limit distribution. The limit distribution depends on the values of N , h and b_g . As might be expected, regardless of the values of these parameters, the mean of the limit distribution is equal to b_g .¹⁸ The modal value, however, can depart significantly from the mean. Figure 2 shows a plot of the modal value of the limit distribution versus the degree of homophily. In this example, the proportion black in the overall population is 90 percent. The mean value of the limit distribution is also 450 black academics in a population of 500, or 90 percent, as one would expect. However, it is clearly the case that as the degree of homophily increases, the modal value of the distribution departs quite radically from the mean value.¹⁹ We observe significant over-shooting. While, if we observe over a long enough time, the mean value of blacks in academia will equal the proportion in the population, at any time we are more likely to observe blacks over-represented in academia, as we are more likely to observe the modal value than any other. And this over-representation can be quite severe if homophily is high.

4.2. Transition dynamics. More interesting perhaps than the limit distribution, are the transition dynamics from the initial state towards that limit. In this simple model we present the transition dynamics through the iteration of the markov chain transition matrix (equation 5). This is shown in Figure 3. We assume an initial state in which ninety percent

¹⁸This is not true when homophily is equal to 1. In this case the system has two absorbing states: academia is either all white or all black. If, however, homophily is strictly less than one, the intuition holds.

¹⁹Again assuming homophily is strictly less than one.

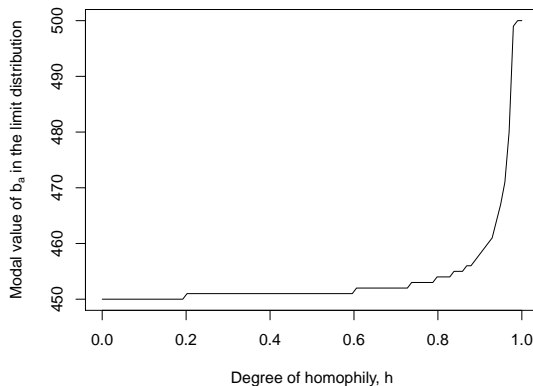


FIGURE 2. Modal values of the limit distribution, changing with degree of homophily h . Population size 500, proportion black in the pool of PhD graduates 90 percent.

of the academic population is white. In the population as a whole, the proportion black is unchanged over time at $b_p = 0.9$. As the transition matrix is iterated it shows the probability distribution of being in any state (proportion white in academia) in the periods as time passes.

For smaller values of homophily the mean and mode of the distribution stay close together and converge relatively rapidly to the proportion black in the general population. For larger values of homophily, it takes much longer for the mean to approach the general population, and, equally striking, is that the variance of observed states increases dramatically. When homophily is very high, it is very difficult to predict what sort of path the system will take to its long run steady state distribution. But more striking is that the mean and mode depart from each other, the mode being larger than the mean. This is consistent with the result shown in Figure 2. When homophily is very high, the divergence between mean and mode happens very suddenly.

4.3. Evolving pool of potential academics. The analysis above has assumed that the proportion of blacks in the pool of potential academics is constant over time. To represent the South African case a little more closely, on top of the described endogenous change in the population of academics, we superimpose an exogenous change in the population or pool of potential academics, \mathcal{G} . Various policy measures have implied that the pool of potential academics is shifting away from being predominantly white, with the goal of becoming more and more representative of the population as a whole, that is, predominantly non-white. To capture this effect we model the proportion black in the population of potential PhD students \mathcal{P} , b_g , as a function of time, t :

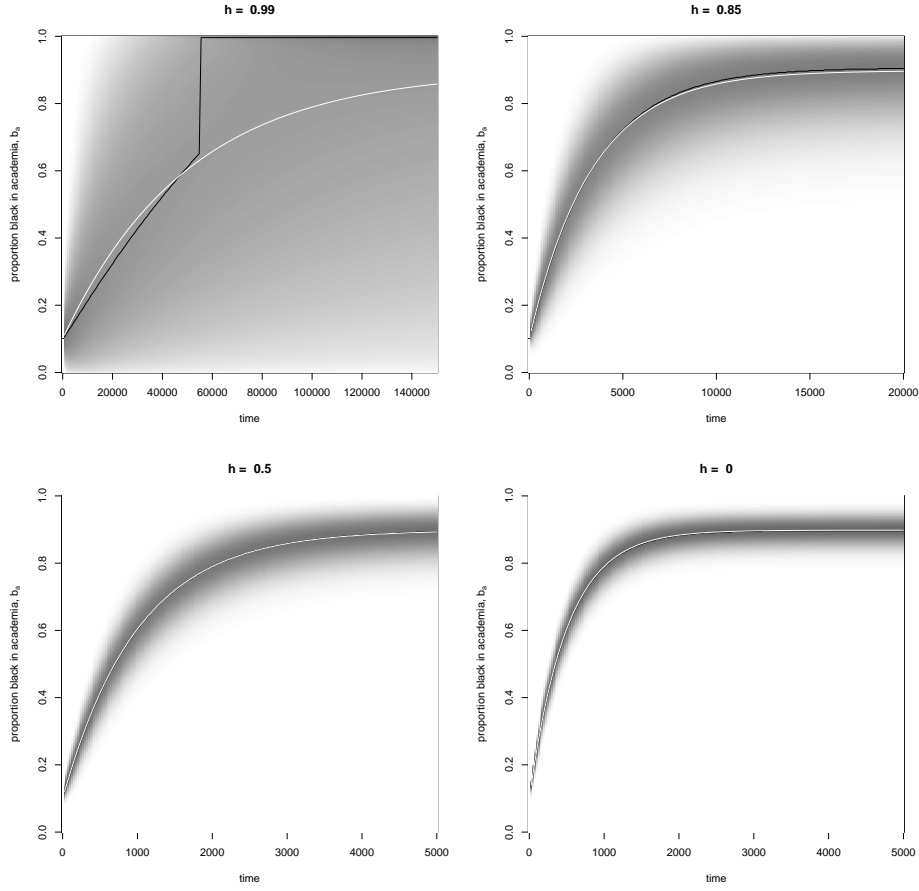


FIGURE 3. Distribution of possible states in the evolution of the model starting at $b_a = 0.1$, with $b_g = 0.9$. The horizontal axis is time; the vertical axis is number of blacks in academia (total size of academia is 500 people). Darker shades of grey indicate higher probabilities. The white curve represents the mean of the distribution, black is the mode, at each point in time. The four panels represent 4 values for h . Clockwise from the top left: $h = 0.99$, $h = 0.85$, $h = 0$, $h = 0.5$. Notice the different time scales.

$$(6) \quad b_g = 0.1 + 0.7 * \left(1 - \frac{0.8}{1 + \exp(-100(500 - t))} \right),$$

which starts at $b_g = 0.1$ and has a maximum value of $b_g = 0.8$, with the mid point occurring after 500 hires (which, at 25 hires per year (5 % of the size of academia), makes 20 years.

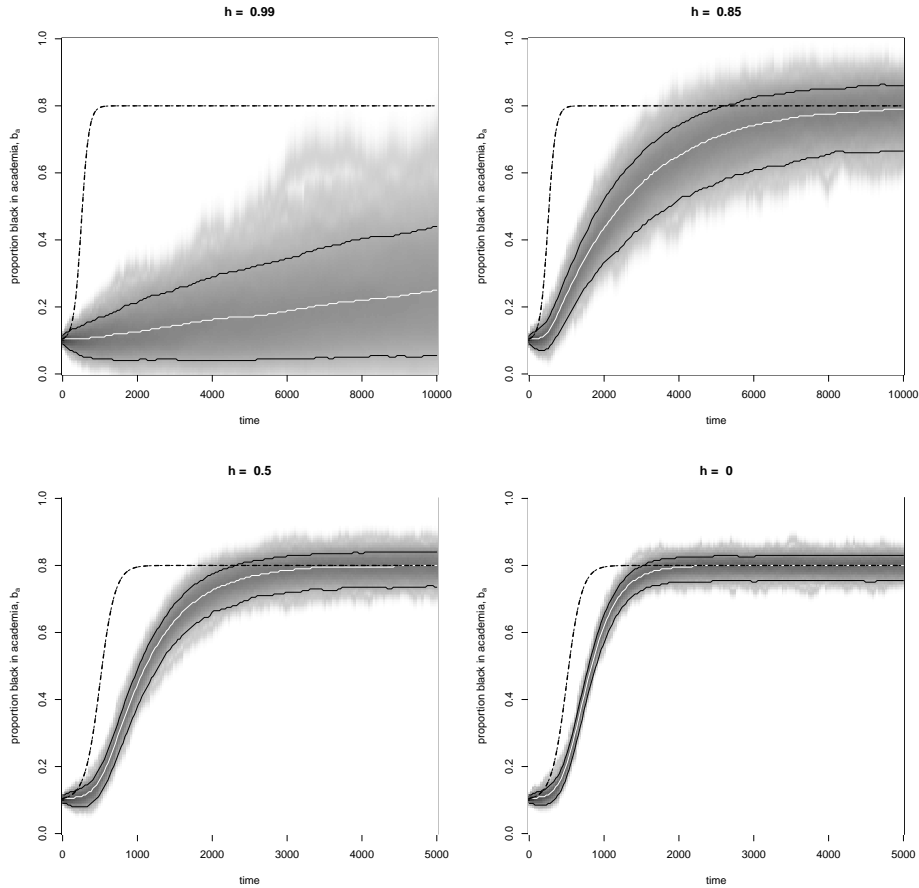


FIGURE 4. Time series of the proportion black in academia for 4 different values of homophily, $h = 0.99$, $h = 0.85$, $h = 0.5$, $h = 0$. Black dashed curves are the exogenously evolving proportion black in the pool; white curves are mean values, and black solid curves are 5 and 95% confidence intervals. The abscissa is measured in terms of hiring events. With a population of 500, and a retirement rate of 5% per year, one calendar year contains 25 hiring events.

This results in the patterns shown in Figure 4. Each panel shows the results of 800 runs of the model. A panel should be read as a relief map, with darker greys indicating more frequent observations over the 800 replications. The white curve is the median observation, the two thin black curves 5 and 95 percentiles; and the dashed black curve shows the proportion black in the pool of graduates. What we observe is consistent with Figure 3. With zero homophily, the composition of academia tracks relatively closely the composition of the population. What is somewhat striking is that this is true even when 85

percent of recruiting is homophilous. So even a relatively small amount of “colour-blind” hiring is enough to make academia track the population. This points to the importance of the composition of the pool of potential academics as one very important element of the integration process.

4.4. Feedback. As discussed above, the racial composition of the pool of potential academics is likely not to be independent of the racial composition of academics.²⁰ Schematically, Master’s graduates who consider opening the academic career path by starting a PhD decide whether it is a sensible option based on whether people “like them” succeed in this career trajectory.²¹ Thus while the secular trend we introduced in the previous section might well capture the effects of policy on Bachelor or Masters graduates, the evolution of PhD graduates (from which academia recruits) may not be so simple.

We add a feedback to the model, wherein the proportion black in the pool of potential academics is a linear combination of the secular trend of highly educated students, \mathcal{H} , in which the proportion black is b_h , and the current academic population:

$$(7) \quad b_{gt} = \alpha b_{at} + (1 - \alpha) b_{ht}.$$

We set $\alpha = 0.8$.

The effect is shown in Figure 5. In each panel the thick black dashed curve represents the exogenously (to the model) determined pool of Masters graduates who might consider doing a PhD to follow an academic career. The white curve is the mean (over 800 runs) of the proportion, b_a the proportion black in academia in each period, solid black curves are 5 and 95 percent confidence intervals. The thin dashed black curve is the pool of PhD graduates b_g from which academics can be recruited.

What is clear is that this feedback can have a strong effect in delaying the transition. This is consistent with prior work finding that feedback effects can help entrench discrimination (Anderson, Fryer and Holt, 2006). When blacks perceive academia as a “white profession”, and so do not even present themselves as candidates, even with small values of homophily, the composition of academia remains very different from that of “masters graduates” for a very long time. It does eventually fall to look like the global population (indeed the mean of the limit distribution in this case is the proportion black in the population) but this can take a very long time. To illustrate the importance of this effect, Figure 6 presents two extreme cases: the left panel shows the simpler model with some amount of homophilous hiring but no feedback from academia to career choice; in the right panel all recruitment is colour-blind, but there is feedback from academia to career choice.

To the eye these panels are indistinguishable, and the clear observation here is that these two effects: homophilous hiring, or feedback from academia to career choice, can have very similar effects on the transition from a predominantly white academia to one that reflects the racial composition of the general population.

²⁰This is an observation that is also often made in the context of women in the labour force generally, and in academic science in particular.

²¹Of course, academia is not unusual in this respect.

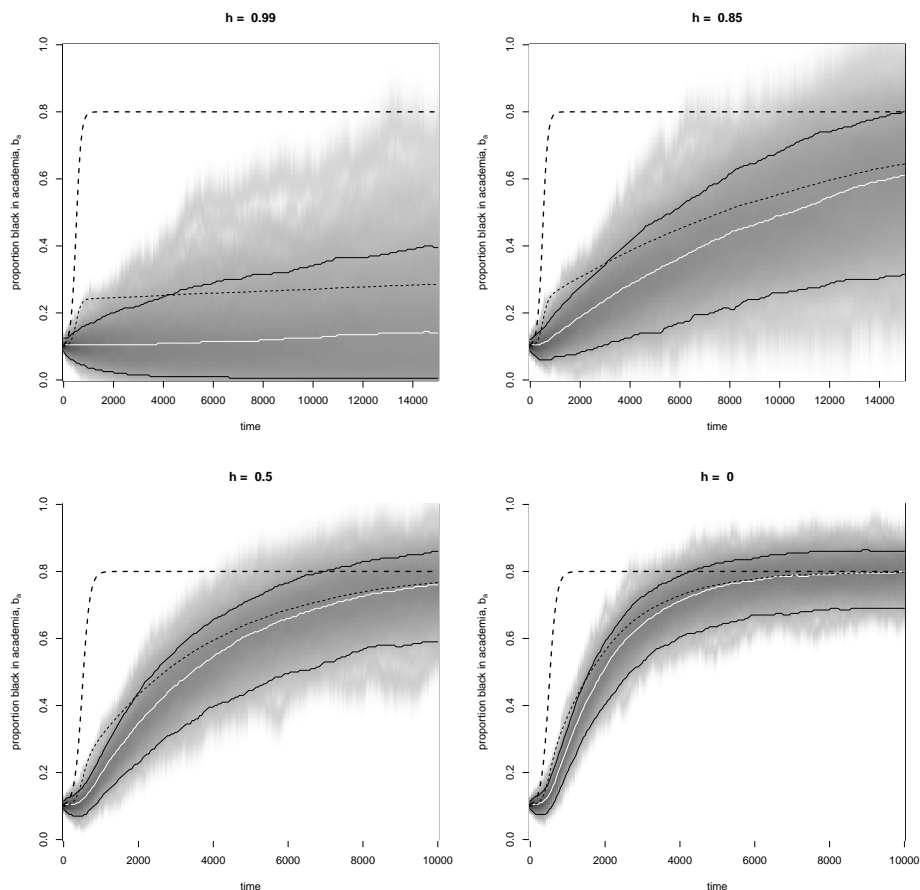


FIGURE 5. Time series of the proportion black in academia for 4 different values of homophily, $h = 0.99$, $h = 0.95$, $h = 0.85$, $h = 0.5$. Thick black dashed curve — exogenous pool of Master graduates; thin black dashed curve — pool of PhD graduates; white curve — mean over 800 runs of proportion black in academia; solid black curves — 5 and 95% confidence intervals.

5. ENDOGENOUS HOMOPHILY

To this point, the model has been structured at a very aggregate level, effectively treating academia as one monolithic entity. This is obviously a simplification — academia is disaggregated at many levels: universities, faculties, departments, disciplines and subdisciplines and so on. This disaggregation is particularly important in the context of South African history where there under apartheid the university system was as segregated as the rest of society. There were black universities and white universities, the two groups having little interaction, and very different treatments under education policy. Since the

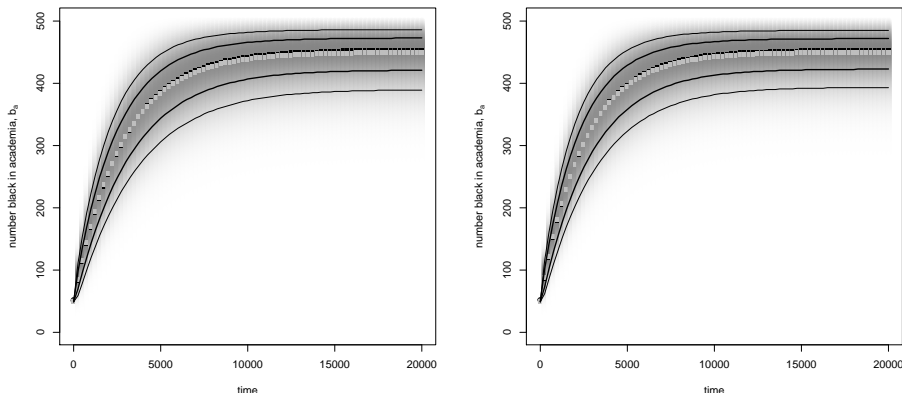


FIGURE 6. Time series of the number black in academia, with a total population of 500. Left panel, no feedback, $h = 0.82$; right panel, feedback $\alpha = 0.8$ with no homophily ($h = 0$). Shades of grey indicate probability of observing a state: darker greys indicate higher probabilities. Grey dots are the mean value; black dots the modal value; black curves are 1, 5, 95 and 99 % confidence intervals.

end of the apartheid era there have been major structural reforms aimed at undoing this legacy, but nonetheless, vestiges of it remain, and can be seen when disaggregating to the university level.

To capture some of this we do a similar disaggregation to the model, breaking academia up into separate institutions. This disaggregation permits addition of one more feature to the model, namely that homophily could evolve, even at the level of the individual.²² To introduce this we assume that retiring and hiring takes place at the institution level: When a person retires, he or she is replaced in the same institution. Further, if a (black) white is hired into an institution, we assume that the experience is a good one, and that all white (black) members of that institution become less homophilous in their recruiting. This has the effect of making the process non-Markovian, so we move directly to a numerical implementation.

We assume a population of 500 academics, divided into 20 equal-sized institutions. Homophily is defined at the individual level and evolves over time. Each period one (randomly chosen, probabilistically according to age) academic retires. He or she is replaced so his or her institution remains the same size. The replacement follows precisely the same process as in the basic model, the refinement being that the recruiter is in the same institution as the retiree. If the new recruit is (non-)white, the homophily of the whites(non-whites) in the institution changes according to $h'_{ij} = \beta h_{ij}$, where $\beta < 1$, $i \in \{\text{white, non-white}\}$

²²Cite Chapter 3 by Kuklinski and Cobb, in a book on racial attitudes here.

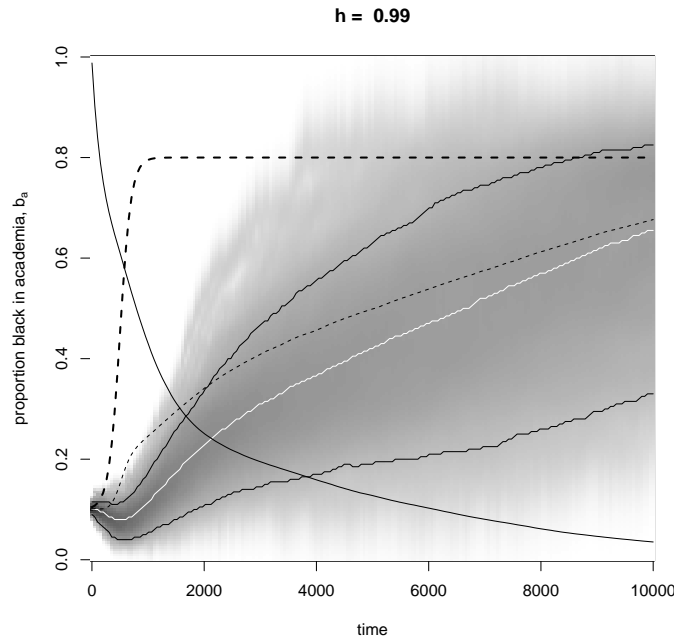


FIGURE 7. Distribution of proportion black in academia of observed evolution of 800 runs. Darker grey points indicate more frequently observed values of b_a . Smooth dashed black curve: secular trend of potential people seeking academic career (same for every run of the model); falling black curve is average homophily level averaged over 800 runs at each point in time; jagged dashed black curve is PhD graduates averaged over 800 runs at each point in time.

and j is the institution in which retirement and recruitment take place. (In the numerical treatment below, we set $\beta = 0.75$.) Evolution of the pool of graduates takes place as above, including feedback from the composition of academia to the composition of the pool of potential recruitees. We initialize the system so that the system as a whole contains ten percent blacks at the start.

Figure 7 shows the evolution of 800 runs of this system over 25000 periods. This is again to be read as a relief map: darker shades of grey indicate a more frequently observed value from the proportion black in academia at the given time period. The white curve is the median value; dashed black curves are 95 percent confidence intervals. The jagged black dashed line is the proportion black in the PhD graduate pool. The falling black curve is the average homophily level in the academic population.

What we can observe in this figure is that homophily falls quickly relative to the rate at which the system integrates.²³ The second thing to observe is that the actual pool of recruitees (jagged dashed black curve) lags significantly behind the secular trend of the population that might consider an academic career (smooth dashed black curve), due to the feedback between current composition of academia and its perceived attractiveness to different races. Finally, we observe that the average behaviour of the system tracks very closely the average behaviour of the population of PhD graduates. That is, the composition of academia lags the composition of PhD graduates by a relatively small number of periods. There will of course always be some lag, as the existing population of academics must age and retire, but in what we see here the lag is relatively short.

6. CALIBRATION

Using the analysis in section 3 above, we can calibrate this model to the current and recent past situation in South Africa. For this exercise we restrict our attention to the evolution of the 5 “research-oriented universities” in South Africa. We use the model as presented in section 4.4, that is, we include feedback from academia to the pool of potential academics, but do not include endogenous homophily. The reason is simply that we have no way of estimating that effect.

To recapitulate, there is a population of academics \mathcal{A} , which includes n_b blacks (forming b_a percent of the population). There is a population of potential academics, \mathcal{G} , of which b_g percent is black. There is a population of “highly educated” students, \mathcal{H} , who could consider a career in academia, the proportion black therein being b_h .

From the data, our estimates of retirement and hiring are that roughly 4 percent of the academic population retires and a number equivalent to 6 percent of the population is hired each year. This makes for an annual growth rate of 2 percent. We assume that continues for 50 years.

Our analysis, and so the calibration, has been restricted to what are known as the “research-oriented” universities, and this growth assumption refers to them. Practically, though, an obvious possibility would be from the government to expand the university system as a whole leaving the growth rate of the research universities as it is, with the intention of maintaining “quality” in those institutions. This would create a bigger pool of potential academics who would have posts in the less research oriented universities but might shift into the research ones. The evidence on the plausibility of such an intermediary strategy is not available, unfortunately, and one can only ask how many academics have been appointed at the “best” universities from those lower in the pecking order.

Estimates of homophily in hiring are that our parameter $h = 0.5$.²⁴

²³Of course precisely how fast homophily falls will be determined by the value of β we set, but the observation that it falls fast relative to other quantities in the model remains except for β values very close to one.

²⁴This estimate says nothing about the source of homophily, though we note that in making it we are assuming that homophily does not evolve over the period. The latter is probably incorrect, but we have no data with which to incorporate endogenous homophily into the calibration.

To estimate the composition of the pool of potential academics, we use all PhD graduates hired into the entire university system (encompassing both research universities, other universities and technikons).²⁵ For the secular trend of “highly educated”, we use PhD graduates. Assuming a logistic growth curve, we estimate the secular trend in the proportion black as $b_h = 0.8 * (1/(1 + \exp(2.52 - 0.149 \times t)))$.²⁶ Our parameter α in equation 7 we estimate to be $\alpha = 0.4$.

With these estimates we can simulate the model, and perform policy experiments. Figure 8 projects the transition for the next 200 years based on these estimates.²⁷ What we observe is a significant lag between the pool of potential academics and those finishing a PhD. This lag is largely driven by the feedback from the composition of academia to the decision to follow an academic career (parameter α). There is also a lag between the pool of potential academics and academia itself. This lag has two sources, homophily in hiring (h), and simply the duration of an academic career — to effect transformation through retirements and recruitments, many (white) people must retire to make way for new (black) people. Since an academic career lasts roughly 35 years, this will necessarily be a slow process.

In figure 9 we show the effects of eliminating homophily, and eliminating the feedback from academia to the pool. The latter implies that all “highly educated”, the composition of which is driven by a secular trend, go on to become potential academics. The base case is in the top left panel. What we observe is that eliminating homophily in hiring (bottom left panel) or eliminating demonstration effects in the decision to pursue an academic career (top right panel), have roughly the same effects. Each reduces the time to transformation by between 25 and 50 percent.²⁸ If we eliminate both (bottom right panel) time to complete transformation is reduced by roughly 75 percent, here being driven by two forces, the exogenous supply of highly educated South Africans, and the time it takes to turn over the stock of academics.

Finally we make one more set of experiments. We change the secular trend to the most optimistic possible, namely that starting immediately, the racial composition of the pool of highly educated reflects the racial composition of the population as a whole, namely 80 percent black. This is shown in figure 10. What we observe here is consistent with the patterns in Figure 9: homophily and demonstration effects are roughly similar in magnitude, and with neither in operation the transformation will take roughly 40 years.

²⁵Here, PhD graduates include all nationalities who graduated from a South African university. If the concern is with the intergration of black South Africans, rather than blacks of any nationality, the growth of the pool of “black” potential academics may be overestimated.

²⁶This estimate should be treated very carefully, as we are estimating a curve that spans 100 years based on the first 20 observations. We should also note that we eliminate the years 1990-1995, as they appear to be aberrations reflecting decades of pent up supply.

²⁷With these parameters, and in particular with low h , there is little variation from run to run, so we show only the results of a single run of the model.

²⁸Because of the randomness in the process, we cannot say exactly how many years the transformation will take. In the base case it appears to be roughly 200 years; in either of these two cases it appears to be between 100 and 150 years.

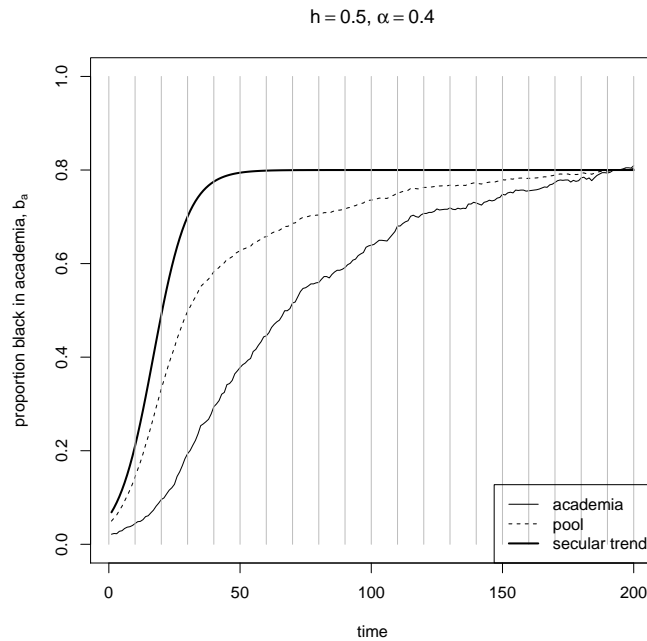


FIGURE 8. Evolution of academia under estimated parameter values.

The calibrated mode produces very long transition times. In that regard several things should be observed. The first is that of necessity, the values we estimated to use in the base case are derived from the data we have at hand. These data come from the period 1995-2013. It is well-known that to estimate a logistic curve based on the first 20 observations is fraught with peril. Thus the “exogenous” transition of the basic pool could be faster than we have estimated. This will reduce the time to transformation accordingly. Second, the estimates of the feedback effect, α , and homophily h are derived from annual data on hiring, and the composition the academy. These estimates vary considerably from year to year, and we have simply chosen an approximate mid-point of the 20 values for each of these parameters we estimated. With so few points it is difficult to give reliable confidence intervals on these parameter estimates, but the experiments shown in Figures 9 and 10 give a reasonably reliable indication about how the process would be sped up if feedback and homophily were less strong than we have estimated. Finally, there are likely other factors that can affect the decision to pursue an academic career - to move from “highly educated” to “potential academic” - such as the social and financial obligations that skilled black South Africans often have to an extended family (Chipkin and Ngqulunga, 2008). To the extent that such factors have a racial bias, they will be captured by α , the feedback parameter. Thus our value of α may be an over-estimate.

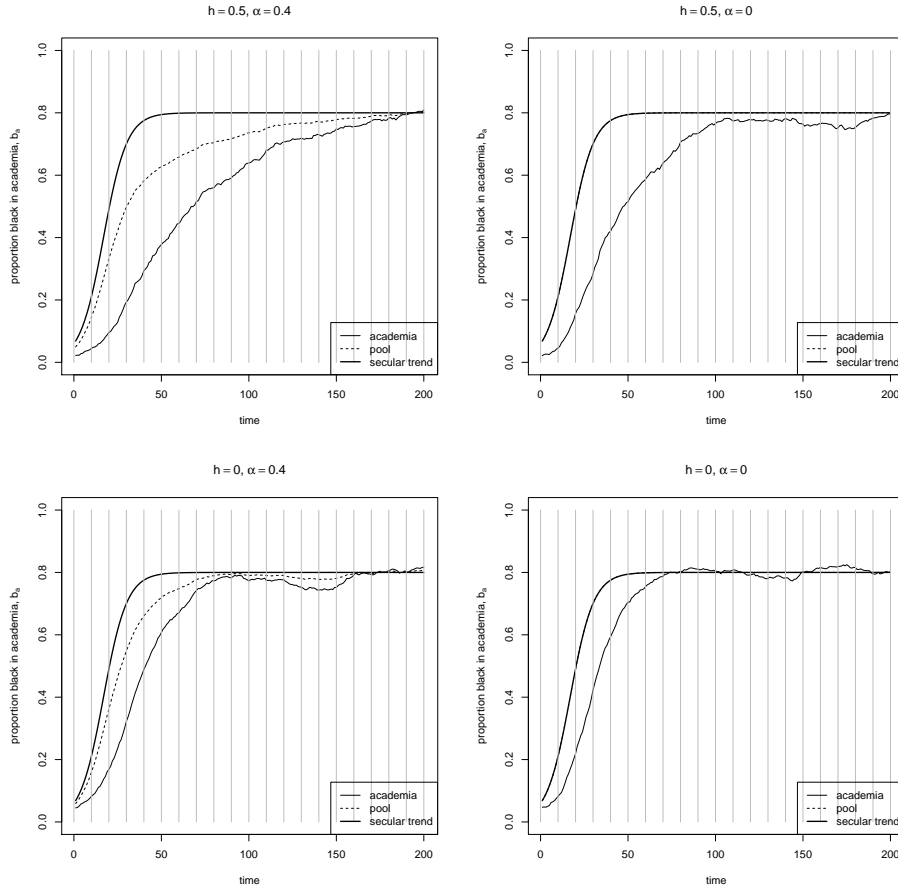


FIGURE 9. Evolution of academia under estimated parameter values, and three sets of alternative values.

7. DISCUSSION

The most visible and indeed most controversial mechanism to increase the participation of minorities in the workforce is arguably affirmative action. As a measure, it aims at a structural change in demand. But demand is shaped also by psychological factors, and supply is an equally important factor when attempting to increase black participation in academia. Moreover, there is a feedback effect between supply and demand: Ethnic homophily on the side of white academics limits the hiring of black academics, which leads potential black academics to decide that there are only limited opportunities for them in academia. However, addressing those other factors will be hard, and how they will be addressed will reflect fundamental ideological orientations.

The politically and economically preferred solution to the problem of an anaemic supply of black academics would be to overhaul the entire school system. Spaul (2013) still

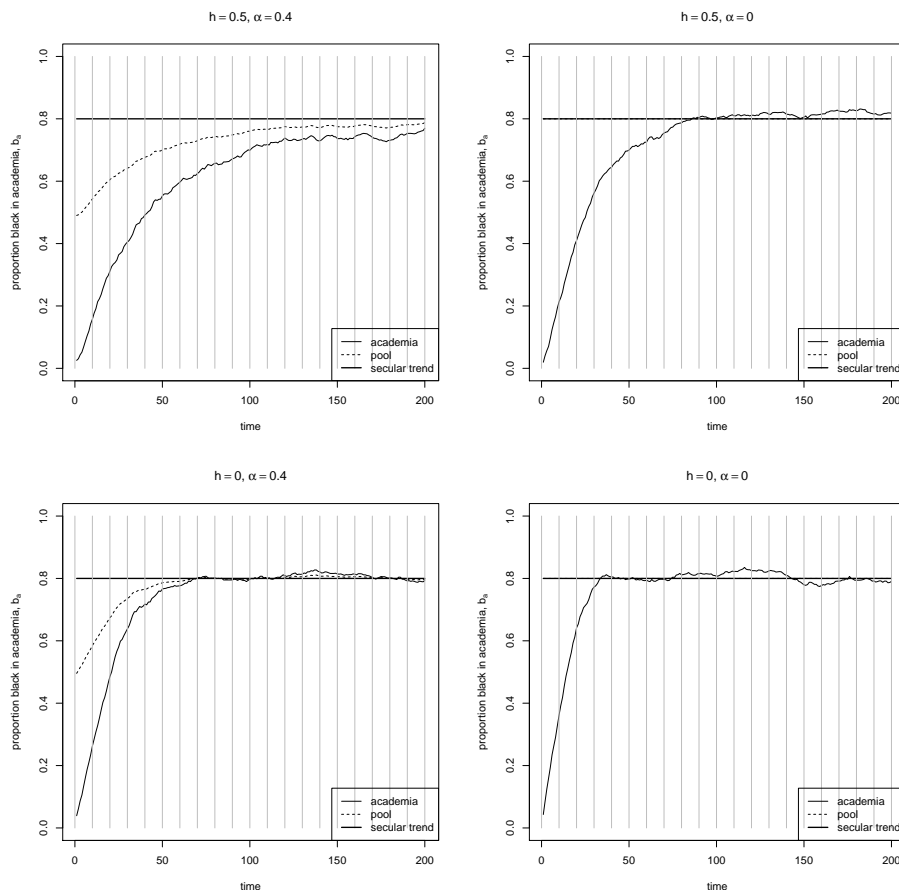


FIGURE 10. Evolution of academia assuming the population of highly educated is immediately representative of the general population, and four sets of values for h and α .

finds fundamental differences between the 25 percent wealthier schools (largely correlated with white schools under Apartheid) and the 75 percent poorer (almost exclusively black) schools, to such an extent that the predictors of school success are largely different. However, the experience of the US “No Child Left Behind” strategy provides some indication of how hard that is.

An alternative strategy would be to optimally use the limited pipeline. Universities have a limited ability to affect that happens at primary and secondary schools, but they can identify and support gifted black students from undergraduate level. Indeed, some universities are already experimenting with this strategy (Herman, 2011).

From a psychological perspective, the very presence of black academics is needed to challenge the (often unwitting) assumptions of the typically white academics who oversee

TABLE 1. Factors shaping black participation in academia

	Structural factors	Psychological factors
Supply	Pipeline of black candidates weakened by inadequately functioning primary, secondary and tertiary education system	Potential black academics perceive limited occupational opportunity in the field and choose other careers
Demand	Affirmative action / employment equity regulations encourage hiring of black academics	Homophily results in white incumbents preferring to hire other white academics, reinforcing the status quo

the appointments and promotions of faculty members. Social psychology scholars (e.g. Brewer, 1996) argue that inter-group contact triggers a series of adaptations from re-categorisation into a shared identity to personalisation. Bertrand, Chugh and Mullainathan (2005) argue that the presence of a black person in a decision-making context can help “mute” the stereotyped response. In fact, Baez (2000) pointed out that committee service by academics of colour can be seen as a strategic intervention used to redefine institutional structures. From the perspective of university administrators, that should clearly be done, but guarding against the well-documented risk (e.g. Mabokela, 2002) of burdening faculty of colour with administrative tasks without providing any academic credit or recognition.

In terms of the perceived occupational opportunity, strong black students are more likely to see themselves as academics if there are other black people in the academic system. It is perhaps not surprising that the racial composition of the faculty at the historically black universities most closely mirrors the demography of South Africa — for a student at one of those universities, black faculty role models do exist. However, the strong teaching orientation of those institutions means that black scholars remain largely absent in scholarship.

South African legislation is designed to help redress past wrongs against black South Africans. Faculty of colour from elsewhere in Africa or indeed the world do not receive any privileged consideration for appointments. In understanding the role they can play in universities it is important to consider how they are perceived by both black and white South Africans. It seems likely that black South Africans may not closely identify with them, as they may be perceived as not having suffered the kind of challenges that black South African scholars needed to overcome. But to the extent that white South African academics see international faculty of colour as comparable to black South Africans, they may be able to play an important role in transformation. As universities pursue the increasingly prominent imperative of internationalisation, black scholars from the rest of the world may increase the prominence of black academics in the still white-dominated South African university system.

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