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Institutional 'gaming' involving staff turnover during recent research evaluation exercises by UK Russell Group universities

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Abstract

There is limited evidence on the extent to which UK universities institutionally 'game' the system with respect to periodic research assessment exercises (i.e. RAE/REF), that is, the hiring (and leaving) of staff before the cut-off census date to enhance institutional returns. Population panel data from the Higher Educational Statistical Agency (HESA) for 2004/05–2019/20 are used to consider the extent to which the numbers of 'starters', 'movers', and 'exits' specifically responded to the RAE/REF cycle. Confining the analysis to full professors, a random effects (RE) multinomial logit model was estimated that shows, after taking account of the importance of other covariates, strong evidence of a 2008 and (in particular) 2014 cycle, but no evidence of any upturn in overall hires (or declines in exiting) in the period preceding the 2021 REF census date. Institutional 'gaming' therefore seems to have been absent during the most recent REF.

Keywords: research assessment exercises; academic hiring; UK universities.
JEL classifications: I23; D22; J23; J78

1. Introduction

A significant body of literature examines how the Research Assessment Exercise (RAE) and its successor, the Research Excellence Framework (REF), have impacted on individual academics (and academia in general). However, considerably little has been written on how universities have reacted, specifically with respect to institutional 'gaming' the system (a major exception is Stern 2016a, although no empirical evidence is presented).[1] For present

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[1] The term institutional 'gaming' is used to distinguish it from individual (and other forms of) 'gaming' (such as unethical publication practices) which have been considered more widely in other studies, for example, Abramo, D'Angelo, and Di Costa (2019), Graf et al. (2019) and Groen-Xu et al. (2023).

purposes, the concept of 'gaming' with respect to performance measurement (PM) includes the hiring of staff to enhance institutional returns to each occurrence of the RAE/REF. This covers specifically entry-level staff who were previously not working in UK universities (labelled here as 'starters') and/or the movement of staff within the British university system (i.e. 'movers') leading up to the census date that establishes which staff are counted in the exercise and which are not. This hiring is also associated with practices such as employing particularly 'starters' on fractional (i.e. less than 100 per cent full-time) contracts and headhunting the most productive researchers (research 'stars') by offering significantly higher salaries. Associated with this is (to date) mostly anecdotal evidence that suggests that unproductive researchers are also pressured into early retirement ('exiting') and/or they are moved into teaching only contracts.

To the best of our knowledge, this study presents for the first time evidence using population panel data from the Higher Educational Statistical Agency (HESA) for 2004/05–2019/20 to consider the extent to which the numbers of 'starters', 'movers', and 'exits' (with the benchmark comprising the residual 'no change in status' or 'incumbents') specifically responded to the RAE/REF cycle. This is the main emphasis, and it involves statistical modelling that indeed shows the operation of a 2008 and 2014 RAE/REF cycle. However, there is no evidence of 'gaming' (as defined above) leading up to the 2021 REF. Note, the direct impact of evaluation exercises on who is selected (which until REF 2021, was at the discretion of the universities and thus open to potentially another form of 'gaming'); how research outcomes (publications, research environment and, since 2014, impact case studies) are assessed and then ranked; the wider impact on career advancement for various academic sub-groups; and the consequences for the development of academic research in general (e.g. interdisciplinary and other types of research), are outside the scope of this article (see Stern 2016b, who provides a comprehensive review of these areas).

From the viewpoint of those charged with the allocation of UK research funding and who therefore set the rules for periodic evaluation exercises, attempts by universities to maximize their rankings in the RAE/REF can introduce distortions. The role of such institutional 'gaming' is therefore important as it can have unintended consequences if it undermines some of the main reasons for undertaking each RAE/REF. This includes accurately identifying research excellence and developing and maintaining research elites across the UK HEI sector. It can also have resource consequences for individual universities leading to allocative inefficiencies. This can include paying inflated salaries to attract and retain highly performing researchers, thereby distorting the returns from investing in staff which in turn leads to dissatisfaction. The latter coincides with undermining performance incentives for especially incumbent academics. Large-scale disaffection with the REF going forward also undermines its credibility and consequently the ability of PM to achieve its stated objectives (as set out below).

The rest of this article comprises a discussion of recent research assessment exercises and their impact (Section 2), including changes to the rules post-2014. This is followed in Section 3 by a discussion of the data and whether there is any initial evidence of a RAE/REF cycle. Section 4 presents the empirical strategy adopted to test whether this occurred. Results are presented in Section 5. Finally, there is a summary and conclusion, which highlights the need for further research to understand the factors behind this change and its implications, not only for the UK but also as a potential model for other countries engaged with PM in academia.

2. Overview of the RAE/REF and its impacts
2.1 Background
The RAE/REF is an example of PM in the public sector, where 'PM refers to measuring of output, outcome, efficiency, effectiveness and equity … (in order to) visualise success'

(Siverbo, Cäker, and Åkesson 2019: 1801). Its use ' … rests on the assumption that coordinated, goal-congruent action in organizations does not take place automatically' (p. 1802). The first exercise was carried out in 1986 (labelled then the Research Selectivity Exercise) and its main purpose was to drive up research standards (i.e. efficiency) and thereby provide better value for public resources committed by government to support research (the House of Commons 2004: 6, summed this up as 'The RAE was introduced as a mechanism to direct funding at the best researchers').

Stern (2016b) provides a discussion of the RAE/REF since its inception, with each exercise to measure research performance being conducted by the four UK higher education funding bodies.[2] They are tasked by the UK Government to allocate some £2 billion per annum of what is termed quality research (QR) funding to HEIs. Each RAE/REF collects data on research outcomes[3] for each cycle by subject-specific units of assessment (UoAs); these outcomes are assessed and ranked by a panel of experts; and the grade point averages (GPAs) achieved by each UoA are published in league tables of results (by UoAs and overall university-level results). The rankings achieved set funding for a number of years (5 years in the case of the 2014 REF) until the next REF is carried out. Not only have the RAE/REF results been used to allocate QR funding to HEIs, they also feature as part of other league tables (e.g. the Complete University Guide—see CUG 2023) which affect reputation and such factors as student demand for university places (and thus future access to resources).

According to Hamann (2018), the overall aims of the RAE/REF have been to identify research excellence and to develop and maintain research elites by skewing funding allocations towards units of assessment with the highest ranked scores (i.e. highest GPAs).[4] In aiming to maximize research excellence in the UK, the PM system used has encouraged HEIs to maximize their RAE/REF outcomes (and hence QR income). This in turn has resulted in unintended consequences (at the UK level) that are partly linked to the increased competition and benchmarking that has resulted from such PM. We are assuming universities aim for an optimum hiring policy to maximize each UoA's funding score, which involves in particular both entering staff into the RAE/REF and hiring researchers with the highest GPAs (ie research 'stars'). This is likely to lead to above average salary offers to new hires, as well as increasing the salaries of incumbents who might potentially move to another institution. In the 2008 RAE and 2014 REF, staff who moved before the assessment census date took with them their publications, benefiting universities that hired (without the need to cover the full resource cost over a number of years of employing these 'movers'). This had a potentially significant negative impact on QR funding and on-going reputation in the universities who lost these staff. New hires could also be on 20–29 per cent fractional contracts, and while there was a need to demonstrate such staff were not being just 'bought in' for their publications, it is argued below that the rules applying to fractional contracts were less transparent and rigorously enforced compared to those applied in the 2021 REF.

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[2] The Higher Education Funding Council for England (HEFCE), the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales (HEFCW), and the Department for the Economy, Northern Ireland.

[3] In the 2008 RAE, outcomes were measured in terms of the quality of research in three separately assessed areas: (1) publications by individual academics (each submitted publication ranked/scored on a scale from 4* to unclassified, with 4* denoting world-leading; 3* internationally excellent; 2* internationally recognised; 1* quality recognized nationally; and unclassified falling below recognised nationally standards); (2) research environment; and (3) esteem indicators. A GPA was calculated separately for each area which for outputs was achieved by adding together all the scores and dividing by the number of publications assessed, and then weighted (the latter were open to the discretion of each UoA—publications were weighted between 50%–70%, environment 5%–20%, and esteem 5%–10%). In the 2014 REF, the same rankings/scoring from 4* to unclassified was used, but assessment was undertaken separately for publications (weighted 65 per cent), research environment (weighted 15 per cent) and a new category of 'impact cases studies' (weighted 20 per cent). In the 2021 REF, publications were weighted 60 per cent and impact case studies were weighted 25 per cent.

[4] Stern (2016b, Table 4) shows that for the RAE's 1996-2008 and REF 2014, the RG universities in England received between 67 and 71 per cent of total QR funding from HEFCE.

2.2 Rule changes in REF 2021

It is important to note certain changes to the RAE/REF rules that occurred during the period covered here, which are likely to have influenced the staffing strategies adopted by universities over the assessment cycle. In RAE 2008 and REF 2014, universities chose the eligible staff who they wished to enter (submit),[5] and in RAE 2008 this was less than 100 per cent for many of the 24 universities that belong to the Russell Group (RG) of research-intensive institutions (https://russellgroup.ac.uk/about/).[6] In 2014, there was a greater probability of excluding staff judged to have REF profiles below a certain threshold level, but in REF 2021, given a change in the rules that all staff had to be submitted, research intensity recovered to mostly 100 per cent.

But along with discretion on who was to be submitted, the pre-2021 exercise was based on a researcher's best 4 outputs[7] and these outputs accrued only to the institution who employed the submitted individual on the census date (i.e. they were not 'portable'). In REF 2021 the number of publications was set at an average of 2.5 per person (maximum 5 and minimum 1 per individual) and they could be claimed by the institution named in the publication and the institution employing the researcher on 31 July 2020. The latter change was designed to make it less beneficial to hire high-calibre researchers near to the REF census date. The change in the number of publications meant that universities selected the best outputs first (e.g. 5 publications predicted to be 4* - world-leading—from those with such a profile) and often only one output (the best available) from individuals who had to be submitted but were deemed to contribute outputs likely to be judged, say, below internationally excellent (i.e. 3*). Consequently, the distribution of outputs was skewed to higher values, increasing the average value of GPAs, which lowered differences between the performance of the various university entries into each UoA.[8] This would have reduced the funding value attached to higher GPA scores and made the contribution to REF rankings of academics with (mostly) 4* outputs less valuable (cf Table 1). Again, this would have made it less beneficial to hire high-calibre researchers just before the REF census date.

Another important change included in REF 2021 was the need to demonstrate at the time of submission that staff on 20–29 per cent fractional contracts had a 'substantive connection' with the submitting unit.[9] It was made clear (e.g. paragraphs 123–124 in REF 2019) what constituted a substantive connection and that the consequences of this being judged as not being met would be removal of the relevant outputs from the REF submission.[10]

Together with this new form of 'selectivity' of publications, the portability of outputs across institutions, and a tougher approach to hiring staff on fractional contracts, REF 2021 also saw a significant increase in the importance of impact case studies (ICS) towards the final REF outcome (their weight increased to 25 per cent of the total REF submission, from 20 per cent in 2014, and impact was non-portable as it accrued only to the institution where it was generated). This greater importance (to final REF scores and thus QR

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[5] The HESA data available to this study do not identify which academic staff with a contract involving (some element of) research (i.e. eligible category A staff) were selected/not selected for the RAE/REF. It only shows which unit of assessment (UoA) staff were allocated to (even if they were ultimately not included in the exercise).

[6] Details are given in Supplementary Appendix Table A.1.

[7] This applied to most all staff, although there were concessions for early career researchers and those whose circumstances warranted a reduction (e.g., due to maternity leave, health issues).

[8] The overall percentage of outputs weighted 4* (4*+ 3*) by the REF UoA review panels rose overall from 22.9 per cent (71.9 per cent) in REF2014 to 36.3 per cent (82.7 per cent) in REF2021.

[9] Staff on <20 per cent FTE contract were ineligible for the RAE/REF.

[10] Specifically, REF (2019, par. 124) stated 'Staff who do not have a substantive research connection with the submitting unit will not be eligible for inclusion, such as those who hold substantive research posts at another institution (either within or outside the UK) **and** whose research is not clearly connected with the submitted unit'. Note, this was a significant expansion to the guidance and procedures adopted in REF 2014 (see REF 2011, par. 79d); the key difference was the requirement of a statement with evidence being specifically required in the 2021 REF for *all* 20%–29% fractional contracts.

funding) of non-portable impact case studies, the significant increase (of some 59 per cent) in the proportion of outputs graded 4*, and the associated decline in the QR value for 4* outputs in 2021 relative to 2014 are all likely, leading up to REF 2021, to have reduced the expected return from hiring top-ranked researchers.

Regarding this economic return from particularly hiring just before the RAE/REF census date, the value of hiring a top-ranked 4* academic has declined more recently, such that the financial return of higher QR funding is significantly lower than the full economic cost of such hires. Table 1 shows (for Business & Management) the additional funding that would have been obtained following RAE 2008 (i.e. funding allocated for 2009–10 onwards for 6 years), REF 2014 (5 years starting in 2016–7) and REF 2021 (which started with funding for 2022–3).[11] Note there are two scenarios: (1) one new person rated 4* added to the RAE/REF submission; and (2) the same as (1) *and* additionally one existing person upgraded from 3* to 4* due to spillover effects. This exercise shows that in Business & Management the median full cost of a 'starter' or 'mover' professor was more than the QR additional funding from hiring them, even under scenario 2, and that the gap was getting larger over time. This suggests that any hiring of top-ranked academic staff in the RAE/REF was not purely motivated by QR funding outcomes; rather the main motivations would have been for reputational reasons (rankings in the RAE/REF tables that highlighted the quality of research in each department that submitted to the assessment exercise).

2.3 Some other studies on 'institutional' gaming

The impact of institutional 'gaming' has often been mentioned in the extant literature (cf Court 1999; McNay 1999; Elton 2000; Hare 2003), although little evidence is provided of how this institutional response to the RAE/REF has impacted on the academic labour market. A large survey of the UK research community concerning their perceptions of the REF (Rand Europe 2021) indicated that respondents believed it had had a significant negative impact in the last four years. In comparison to a list of possible influences (e.g. the quantity of outputs, quality, integrity, relevance, novelty, etc), 'game playing' was rated as having had the highest significant influence (Rand Europe, op. cit., Table 1) with 50 per cent of respondents stating its impact had greatly increased. The responses were similar across disciplines, career stages, research intensiveness, with no statistically significant differences between respondent types; overall 'gaming' was seen as one of the main reasons for the overall negative attitudes towards the REF that came from the survey.

There has been little theoretical and empirical evidence of why institutional 'gaming' is pursued by universities. Agrawal, McHale, and Oettl (2017) consider the direct and indirect effects of a university department hiring a 'star' academic; the direct effect is on whether the productivity of existing staff (incumbents) improves, while the indirect effect is whether there is subsequent recruitment of relatively better-performing staff. Their theoretical model shows that incumbents working in the same research area directly benefit more from hiring the 'star', and this same group are also unambiguously (indirectly) strengthened from subsequent recruitment of staff working in the area. Empirical evidence of both direct and indirect benefits (especially where collaboration occurs) is found for evolutionary biologists. This formalizes the expectation that hiring 'stars' is beneficial from a RAE/REF perspective.

De Fraja, Facchini, and Gathergood (2019) develop a dual-maximization model where an academic department aims to maximize its income for spending on capital (e.g. laboratories) and two types of labour (good and superstar professors), subject to the research output it produces using the factor inputs capital and labour. Simultaneously, the university's objective is to maximize its weighted research output across all departments subject to the budget allocated by the government based on REF performance. The main purpose of the

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[11] The Supplementary Appendix provides details on how the values in Table 1 (and comparable Supplementary Appendix Tables A.2–A.4 for all UoA's based on the 2014 classification) were calculated.

Table 1. Additional funding from 1 extra 4* (world leading) FTE academic in RAE/REF, and professorial median salary costs, in Business & Management UoA (figures are £ sterling, nominal values, applying to English universities).

| Academic year | Additional QR funding | | | | | | Median annual FTE full economic cost (salary × mark-up[a]) | | | |
| | Scenario 1[b] | | | Scenario 2 | | | | | | |
	Outputs[c]	Impact & Environment[d]	Total	Outputs	Impact & Environment	Total	no change	starters	movers	exited
2009-10	43,208	n/a	43,208	67,898	n/a	67,898	87,330	94,710	89,790	84,870
2016-17	32,053	11,211	43,264	56,079	11,211	67,290	107,100	132,300	116,550	113,400
2022-23	16,395	7,551	23,946	28,692	7,551	36,243	116,160	114,840	108,240	120,120

[a]   salaries refer to end July of year before census date for RAE/REF (source HESA—details in section 3 below). Mark-ups are due to employers National Insurance and pension contributions, that is, 1.23, 1.26, and 1.32, respectively for salaries in 2006–7, 2012–3 and 2019–20.

[b]   See text for details on scenarios 1 and 2.

[c]   This figure is for an improvement in outputs only. It does not differ across universities in England submitting to a particular UoA.

[d]   This figure is the value of one additional person included in the REF but assuming no change in REF performance for impact and environment (impact only accrues to the university at which it takes place; it cannot be transferred-in through a new hire; environment is unlikely to be significantly affected by one relatively new member of staff). Note, REF performance for impact and environment is based on the Cambridge submission to UoA 17 (as a comparison, values for Durham were £5,274 and £7,551, respectively, in 2016–17 and 2022–23).

Source: HEFCE (various years).

model is to predict a positive correlation between the research performance of the department, the average salary of its staff, and inequality in departmental pay. Empirical analysis substantiates this correlation, though the pay–performance link is weaker in more research-intensive universities, while the inequality–performance link is stronger in this sub-sector. The empirical analysis also shows that departments that obtain a stronger REF result subsequentially experience relatively faster growth in both salaries and professorial headcounts. A main conclusion from the De Fraja, Facchini, and Gathergood (op. cit.) model is that 'when hiring or responding to outside offers prior to the REF census date, institutions should value more a researcher with a stellar publication record' (p.537).

3. Data and staff turnover during the REF cycle

The dataset used here comprises information on the population of individual staff on a teaching and/or research contract covering 2004/05–2019/20 supplied annually by 134 UK universities to the Higher Education Statistical Authority (see HESA 2022).[12] Individuals working in these HEIs each had a unique staff number, as well as information on the month and year their contract started and ended in each particular university, including whether they worked for a previous university prior to their start date, and this provided the necessary information that was used to determine the following four sub-groups: (1) who, in any year, was a 'starter' (evidenced by the month and year their staff number first appears in the HESA dataset);[13] (2) who was a 'mover' (a unique staff number changes HEI institution codes); (3) who 'exited' (evidenced by the last month and year their staff number appears in the HESA dataset); and (4) all others belonged to the 'no change' sub-group in year t. Note, non-academic support staff were excluded by us as well as those on 100 per cent administrative contracts (although the latter were initially included when determining the four sub-groups just defined). The HESA return for any academic year (comprising August to July) made by each university also records a fairly comprehensive set of characteristics for each academic (such as salary, full-time equivalent status, age,[14] ethnicity, gender, nationality, cost centre—see Table 2 for further details) as of the benchmark date of the 31st July each year (but not values on a month-by-month basis). Thus, it is not known which month (preceding the benchmark date) in the relevant academic year that salary increased, or hours were varied, etc. This has important implications for any modelling which also includes these characteristics as controls.

Using these panel data, limited to professors on a (teaching *and*) research contract who were employed by the RG, it is possible to determine the number of 'starters', 'movers', and 'exits' for the period January 2004 to July 2020 (Fig. 1). Other universities designated as belonging to the 'new' or 'old' sectors are excluded by us[15] because the data show that the total number of 'starters' and 'movers' was less important compared to the RG. Supplementary Appendix Figure A.1 also shows that the relative importance of starters' and 'movers' was much higher for Full Professors compared to Associate or Assistant

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[12] Data on 327 HEIs were made available by HESA, and of these 193 were excluded from most of the analysis (see Supplementary Appendix Table A.5 for a list of the excluded institutions) since they were very specialised in what they did.

[13] Note, 'starters' comprise those not previously employed in UK HEIs (some will be academics from abroad, some will be academics who have retired and/or left academia for a spell and returned, as well as those never having worked previously in academia). Note, data on 'starters' is not left-censored given the actual start date (which is often pre-2004/05) when they first appeared in the UK HEI sector is known. In addition, information on 'movers' is also not left-censored for 2004/05 because the HESA database both records an individual's start date and previous HEI for those that moved institutions (e.g., someone in 2004/05 with a start date in that academic year would be a mover if their previous HEI was not the same as their 2004/05 HEI).

[14] HESA limits age to 65 years old, with anyone older 'capped' at 66 years. However, if they were present in the database at 65 years or younger, then it is possible to overwrite '66' with the correct age.

[15] Note, they were included when first defining the sub-groups 'starters', 'movers', and 'exits', but the analysis presented is limited to just RG universities.

Table 2. Definitions of variables and mean values 2004/05–2019/20: Professors in UK RG universities[a].

Variable[b]	Definition	No change	Started	Moved	Exited
Female	Coded 1 if academic classified as female	0.20	0.22	0.27	0.18
Salary (÷£20 thousand)	FTE earnings deflated by August CPI index (2004 = 1)	3.22	3.49	3.36	3.23
FTE (divided by 10)	Full-time equivalent (%) period employed in each year	9.30	5.36	9.26	3.98
Age in years (divided by 10)[c]	Age of academic	5.33	5.04	4.93	5.87
Fixed-term contract	Coded 1 in year academic employed on fixed-term contract	0.06	0.23	0.09	0.22
Teaching & research	Coded 1 in year academic classified as research & teaching	0.96	0.92	0.95	0.92
>1 HEI in any year	Employed in more than 1 HEI (coded 1 for that year)	0.01	0.00	0.60	0.07
>1 role in any year	Undertook more than 1 role (e.g. major administrative as well as academic with salary allocated to >1 cost code) (coded 1 for that year)	0.08	0.06	0.63	0.12
REF equivalent GPA	Grade point average awarded to unit of assessment in which academic resides in 2001, 2008, or 2014 RAE/REF (see text for details)	2.88	2.79	2.68	2.86
Proportion female (multiplied by 10)	Proportion of academics in year who were women, by cost centre (broad academic discipline) by university and by year	3.48	3.60	3.67	3.62
Ethnicity (benchmark: White)					
White	Coded 1 in year academic classified as White	0.91	0.02	0.02	0.05
Asian	Coded 1 in year academic classified as Asian	0.91	0.03	0.02	0.04
Black	Coded 1 in year academic classified as Black	0.91	0.03	0.02	0.04
mixed	Coded 1 in year academic classified as Mixed ethnicity	0.91	0.03	0.02	0.04
other	Coded 1 in year academic classified as other ethnicity	0.91	0.03	0.02	0.05
unknown	Coded 1 in year academic ethnicity unknown	0.86	0.06	0.00	0.08
National grouping (benchmark: UK)					
UK	Coded 1 in year legal nationality of academic classified as UK	0.92	0.02	0.02	0.05
USA	Coded 1 in year legal nationality of academic classified as USA	0.85	0.07	0.01	0.07
Canada	Coded 1 in year legal nationality of academic classified as Canadian	0.86	0.05	0.02	0.07
English medium in HEI	Coded 1 in year legal nationality of academic belonged to countries where English is the medium used in HEIs (and not covered in other sub-groups)[d]	0.90	0.03	0.02	0.05
EU pre-2004	Coded 1 in year legal nationality of academic belonged to 14 EU members states before 2004 (including Monaco, Norway, and Switzerland)	0.89	0.05	0.01	0.04

(continued)

Table 2. (continued)

Variable[b]	Definition	No change	Started	Moved	Exited
EU accession	Coded 1 in year legal nationality of academic classified as part of 10 countries joining EU in 2004	0.91	0.03	0.02	0.04
Muslim, Arabic countries	Coded 1 in year legal nationality of academic classified was a country where majority of population are Muslim (and not covered in other sub-groups)[e]	0.90	0.03	0.02	0.05
Rest of Africa	Coded 1 in year legal nationality of academic belonged to African countries not covered in other sub-groups	0.87	0.06	0.01	0.05
Central & S. America	Coded 1 in year legal nationality of academic belonged to Central and South American countries not covered in other sub-groups	0.87	0.03	0.02	0.07
China, HK, Taiwan, Macao	Coded 1 in year legal nationality of academic belonged to China, Hong Kong, Taiwan, or Macao	0.88	0.05	0.02	0.04
Japan, S Korea	Coded 1 in year legal nationality of academic belonged to Japan or South Korea	0.90	0.05	0.02	0.04
Rest Europe	Coded 1 in year legal nationality of academic belonged to European country not classified elsewhere	0.92	0.04	0.01	0.03
Russia, CIS	Coded 1 in year legal nationality of academic belonged to Russia or CIS	0.93	0.02	0.01	0.04
Rest Asia	Coded 1 in year legal nationality of academic belonged to rest of Asia not classified elsewhere	0.89	0.03	0.02	0.05
RoW, not known	Coded 1 in year legal nationality of academic belonged to other country not classified elsewhere	0.76	0.10	0.01	0.12
Cost centres	43 cost centre dummies (baseline: Clinical medicines; note Catering & hospitality management excluded from analysis due to small numbers)	–	–	–	–
N		171,481	4,604	2,898	9,750
N (proportion)		0.909	0.024	0.015	0.052

Source: Authors' calculations.
  a   Data limited to academics on a research or teaching & research contract (greater than 0 FTE).
  b   All variables are from the HESA annual return, except the REF equivalent data which are based on results reported by the Research Assessment Exercise and Research Excellence Framework (see Supplementary Appendix for details).
  c   Also squared-terms entered Equation (2). Note in Table 3 the marginal effect 'solves out' the overall impact of x where x also enters as x^2 (and where x enters interacted with another variable).
  d   See https://le.ac.uk/study/international-students/english-language-requirements/approved-countries.
  e   See https://www.nationssupplementary.org/oneworld/muslim-countries.htm#maj-muslim.

Professors in RG universities.[16] Note, the data are smoothed by us, using a 12 monthly backward moving-average, because hiring and exiting are highly seasonal (e.g. the month

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16   Strictly speaking, the data can only identify Professors, Associate Professors and 'others' (the latter comprising Assistant Professors and researchers); see the explanation of the HESA dataset in the Supplementary Appendix.
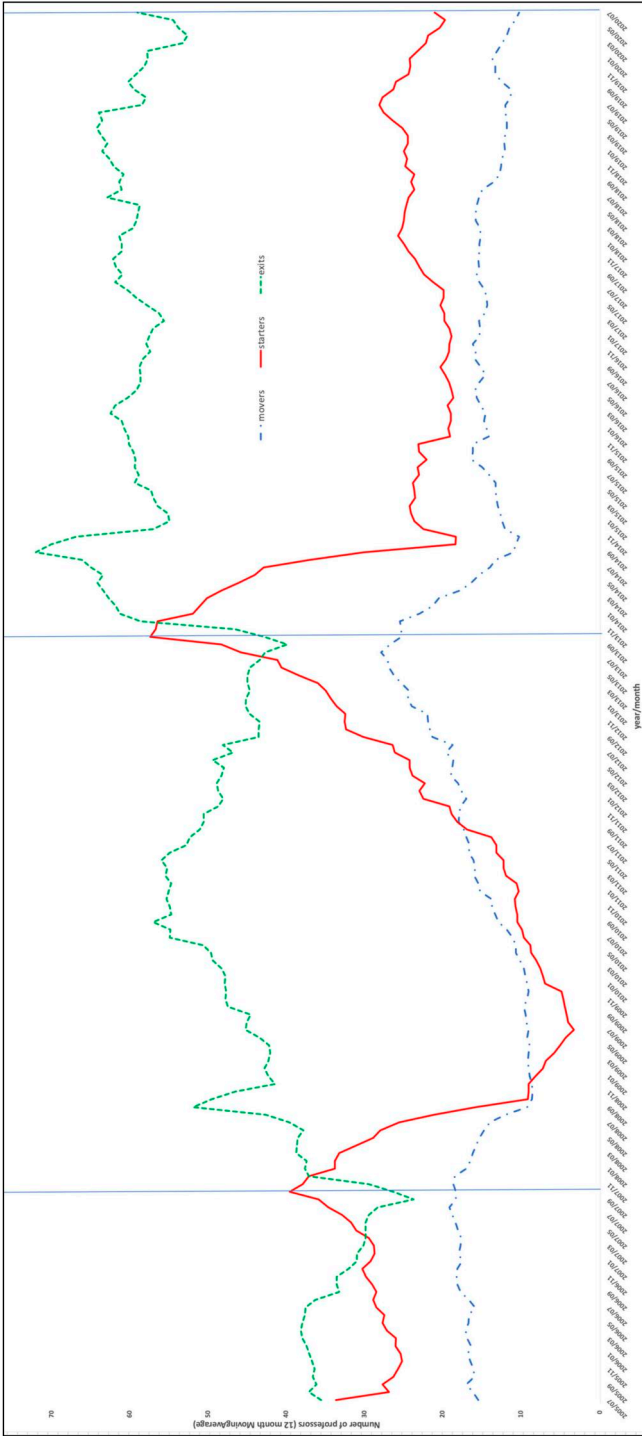
Figure 1. Entry, exit, and movement across UK RG, 2004/05–2019/20: Professors[a] (12 monthly backward moving-average data).

[a]Excludes those academics on teaching-only contracts. Vertical lines denote census date for inclusion of staff (31/10/2007 for RAE 2008; 31/10/2013, for REF 2014; 31/7/2020, for REF 2021).

of September has a lot of activity with regard to hiring, while December has very little). For comparison, the annualized version of Fig. 1 is presented as Supplementary Appendix Figure A.2 (alongside the actual numbers of professors in each sub-group in Supplementary Appendix Table A.6).

Figure 1 shows that in the period leading-up to the RAE 2008 and REF 2014 census dates (i.e. as part of the 'REF-cycle'—shown on the diagram using vertical lines), there is strong evidence that the hiring of professors increased (especially starters and for REF 2014). At the same time, the number of professors exiting (e.g. retiring) falls. Following the 2008 and 2014 census dates, hiring declines substantially while exiting increases. However, these same patterns are not evident leading-up to the 2021 REF, which is in line with the reasons set out in Section 2 with regard to the reduced expected return in hiring relatively more top-ranked researchers.

4. Empirical approach

To establish whether the patterns seen in Fig. 1 regarding the impact of the REF cycle on staff turnover are statistically significant, the following unobserved-heterogeneity model takes the form of:

$$U_{ijt} = \mathbf{x}_{it}\boldsymbol{\beta}_j + u_{ij} + \varepsilon_{ijt} \tag{1}$$

where U_{ijt} is the utility to a HEI (and where appropriate UoA within the institution) of the ith individual in terms of outcome j at time t; $\mathbf{x}_{it}$ is a vector of covariates (defined below) and $\boldsymbol{\beta}_j$ the associated vector of coefficients for outcome j; and u_{ij} is the panel-level heterogeneity (assumed normally distributed and uncorrelated with the $\mathbf{x}_{it}$) while ε_{ijt} is an observation-level error term (assumed to have a Gumbel type 1 extreme value distribution[17]). The resulting random effects (RE) multinomial logit model, denoting the probability that the HEI puts the ith individual into sub-group m at time t, to be estimated (after normalization) is:

$$\Pr\bigl(y_{it} = m | \mathbf{x}_{it}, \boldsymbol{\beta}_j, u_{ij}\bigr) = \frac{\exp(\mathbf{x}_{it}\boldsymbol{\beta}_m + u_{im})}{\sum\limits_{j=1}^{J} \exp(\mathbf{x}_{it}\boldsymbol{\beta}_j + u_{ij})} \tag{2}$$

The covariates $\mathbf{x}_{it}$ are listed in Table 2, along with their definitions[18] and mean values by sub-group m[19] The age of each academic was entered twice (age_{it} and age_{it}^2), full-time equivalent status was also allowed to be non-linear and interacted with whether someone was fixed-term of not ($FTE_{it} \times Fixed\text{-}term\ contract_{it}$ and $FTE_{it}^2 \times Fixed\text{-}term\ contract_{it}$)[20] as well as interacted with j year dummies ($FTE_{it} \times \sum_j year_j$ and $FTE_{it}^2 \times \sum_j year_j$); salary was also entered non-linearly and interacted with j year dummies ($Salary_{it} \times \sum_j year_j$ and $Salary_{it}^2 \times \sum_j year_j$). These year dummies (with 2008/09 chosen as the benchmark) were the basis on which to test if the difference between various pairs of years was statistically

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[17] I.e. $F(\varepsilon_{ijt}) = \exp(-\exp(-\varepsilon_{ijt}))$.

[18] More details about the HESA database are also provided after Supplementary Appendix Table A.5. Note, as a robustness test we have additionally re-estimated Equation (2) including twenty-three university dummy variables and this had little impact on the key results reported below (which omit university fixed effects).

[19] Supplementary Appendix Table A.7 provides information for the forty-four cost centres (including the baseline) not shown in Table 2.

[20] This reflects the strong interaction between FTE_{it} and whether someone was on a fixed-term contract (see Table 2 which shows that on average 'starters' and 'exits' were much more likely to have worked on both fractional and fixed-term contracts).

significantly different to 0. Table 2 (last row) shows that, overall, 'starters', 'movers', and 'exits' comprised some 2.4, 1.5, and 5.2 per cent, respectively, of professors in RG universities over 2004/05–2019/20. Compared to 'starters' and 'exits', women were on average more likely to belong to the 'mover' sub-group. 'Movers' were also more likely to work longer hours, be on teaching & research (rather than research-only) contracts, work for more than one HEI (or have more than one role) in any year, and work in cost centres with higher proportions of women present. They were also relatively younger, less likely to be on fixed-term contracts, work in RAE/REF units of assessment with lower grade point averages, and were less likely to classified as 'white' ethnic and/or be a UK national. Compared to 'movers' and 'exits', 'starters' earned on average higher salaries. Further longitudinal differences between the sub-groups are presented in a series of diagrams in the Supplementary Appendix, that confirm 'starters' and 'movers' were relatively younger (Supplementary Appendix Figure A.3);[21] 'starters' were more likely to be of non-white ethnicity (Supplementary Appendix Figure A.5), be nationals from the USA, Canada, the EU pre-accession countries or from the rest-of-the-world/unknown (Supplementary Appendix Figure A.6), earn more (Supplementary Appendix Figure A.7), and work fractional contracts (Supplementary Appendix Figure A.8).[22] As shown in Table 2, there were fewer women belonging to any sub-group (relative to men), but the REF-cycle depicted in Fig. 1 for both genders was also experienced by females (Supplementary Appendix Figure A.9). As to 'movers' to RG universities, some 60 per cent of these came from other RG institutions, with around 30 per cent from the Old university sector (Supplementary Appendix Figure A.10). Lastly, Supplementary Appendix Table A.8 considers whether there is any evidence of widespread use of changes in contracts (and specifically to 'teaching only'), during the period covered; in particular, the small percentages of academics who changed from teaching and research or research only contracts to teaching only were outnumbered by those who moved in the opposite direction into contracts involving research.

5. Empirical results

The marginal effects from estimating Equation (2), conditional on controlling for various covariates associated with belonging to a particular sub-group, are presented in Table 3.[23] The key results relate to the year dummies for 'starters', 'movers', and those that 'exit', and in particular the results shown as the 'difference between certain years' related to the RAE/REF cycle. First, Fig. 2 shows that the predicted probabilities of belonging to each sub-group are in line with the actual proportions in each sub-group.[24] Secondly, with reference to the highs and lows of any REF-cycle, the results in Table 3 show that over the immediate periods following the 2008 RAE and 2014 REF census dates, the probability of belonging to the 'starters' sub-group declined by −0.048 and −0.027 for 2006/07–2008/09 and 2012/13–2014/15, respectively, which was a large effect, given that the average proportion of professors who were 'starters' over 2004/05–2019/20 was only 0.024 (Table 2, last row). During the same periods, the probability of being a 'mover' also declined by −0.007, which is about half the average proportion of professors who were 'movers' (0.015). At the same

[21] Although there was a small, but important, number of 'starters' that were aged '66' years, especially in the lead-up to RAE 2008 and REF 2014 census dates (Supplementary Appendix Figure A.4). See also Jump (2013).

[22] Those exiting also tended to move to fractional contracts in the year(s) before leaving academia.

[23] Broadly similar results, based on a multinomial logit model omitting u_{ij}, are reported in Supplementary Appendix Table A.9 in the supplementary appendix. Note also, we have included in the latter a sub-section (c)) headed 'robustness tests' where we re-estimate Equation (2) in univariate form (i.e. separately for 'starters', 'movers', and 'exiters') and we also estimate the hiring rate of professors using aggregated data, to confirm the results in Table 3 are robust.

[24] Supplementary Appendix Figure A.13 shows the impact of the RAE/REF cycle was very similar across genders, despite the smaller number of female professors relative to male (cf Supplementary Appendix Figure A.9).

Table 3. Marginal effects from a RE multinomial logit model: Professors in UK RG, 2004/05–2019/20.

	no change	started	moved	exited
Year effect (benchmark is 2008)				
2004	−0.054***	0.072***	0.001	−0.019**
2005	−0.040***	0.049***	0.007***	−0.016***
2006	−0.031***	0.048***	0.007***	−0.023***
2007	−0.028***	0.032***	0.007***	−0.011***
2009	−0.021***	0.010***	−0.001	0.012***
2010	−0.023***	0.017***	0.003**	0.004***
2011	−0.028***	0.029***	0.005***	−0.006***
2012	−0.022***	0.037***	0.007***	−0.023***
2013	−0.032***	0.030***	0.007***	−0.006***
2014	−0.005**	0.010***	−0.000	−0.005**
2015	−0.003	0.007***	0.005***	−0.009***
2016	−0.004*	0.007***	0.002	−0.005**
2017	−0.005**	0.008***	0.002*	−0.005**
2018	0.002	0.008***	0.001	−0.011***
2019	0.008***	0.001	0.002	−0.010***
Female	0.003	0.001	0.002***	−0.006***
Salary (÷£20 thousand)	−0.008***	0.009***	0.003***	−0.004***
FTE ÷ 10	0.042***	−0.015***	−0.001**	−0.026***
Age ÷ 10	0.014***	−0.029***	−0.007***	0.021***
Fixed-term contract	−0.007***	0.023***	0.003**	−0.019***
Teaching & research	−0.000	−0.004**	−0.006***	0.011***
>1 HEI in any year	−0.557***	−0.016***	0.261***	0.311***
>1 role in any year	0.013***	−0.010***	0.008***	−0.012***
REF equivalent GPA	0.008***	−0.002***	−0.003***	−0.003***
Proportion female × 10	−0.001	0.003***	0.000	−0.003***
Ethnicity (benchmark: White)				
Asian	−0.006**	0.003	−0.001	0.003
Black	0.016	−0.005	−0.001	−0.010
mixed	−0.016***	0.012**	0.003	0.001
other	−0.028***	0.034***	−0.011***	0.005***
unknown	0.004	0.004	0.002	−0.010
National grouping (benchmark: UK)				
USA	−0.033***	0.033***	−0.004**	0.004**
Canada	−0.038***	0.028***	0.001	0.009**
English medium in HEI	−0.015***	0.008***	−0.000	0.007***
EU pre-2004	−0.010***	0.017***	−0.003*	−0.003*
EU accession	−0.009	0.007	−0.001	0.002
Muslim, Arabic countries	−0.015	0.006	0.000	0.009
Rest of Africa	−0.017	0.041***	0.006	−0.030***
Central & S. America	−0.039***	0.005	−0.002	0.036***
China, HK, Taiwan, Macao	−0.040***	0.018***	0.003	0.019***
Japan, S Korea	−0.039**	0.025**	0.002	0.012
Rest Europe	0.001	0.017*	−0.003	−0.014*
Russia, CIS	−0.006	0.002	−0.000	0.004
Rest Asia	−0.033***	0.011**	0.001	0.020**
RoW, not known	−0.052***	0.018***	0.002	0.032***
43 Cost centres	Yes	Yes	Yes	Yes
Difference between certain years				
2008 − 2006	0.031***	−0.048***	−0.007***	0.023***
2014 − 2012	0.017***	−0.027***	−0.007***	0.018***
2012 − 2006	0.009*	−0.011**	0.000	0.000
2014 − 2008	−0.005*	0.010***	0.000	−0.005**
2019 − 2014	0.013***	−0.009**	0.002*	−0.005**
N		186,984		
Pseudo (McFadden) R^2		0.394		

Source: Authors' calculations. ***,**, and * significant at 1, 5, and 10 per cent levels, respectively.
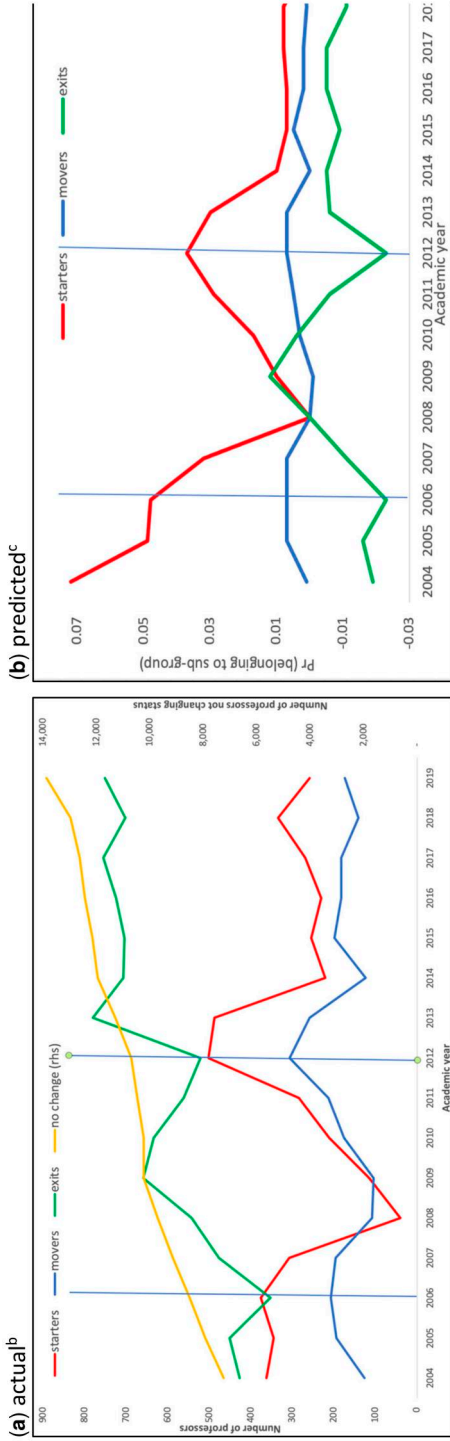
Figure 2. Entry, exit and movement across UK RG, 2004/05–2019/20: Professors[a] (annual data) actual and predicted.

[a]Excludes those academics on teaching-only contracts. Vertical lines denote August–July academic year just prior to census date for inclusion of staff into the RAE/REF.

[b]Equivalent to Fig. 1 (annualized)—see Supplementary Appendix Figure A2.2.

[c]Obtained from estimating Equation (2)—see Table 3.

time, the probability of exiting increased by 0.023 and 0.018, respectively, for 2006/07–2008/08 and 2012/13–2014/15 (the average over the whole period was 0.052).

Comparing what happened overall between the 2008 RAE and REF 2014 census dates, it can be seen that the post-RAE decline in the probability of belonging to the 'starter' and 'mover' sub-groups was largely cancelled out, since in both 2006/07 and 2012/13 these conditional probabilities were mostly similar (thus, the change between 2006/07 and 2012/13 was small and insignificantly different to 0).[25] With regard to REF 2014, the increase in the probability of being a 'starter' or 'mover' in the lead-up to the REF census date between 2008/09 and 2012/13 (and the decline in the likelihood of 'exiting') was largely mitigated by falls (and in the case of 'exits' an increase) between 2012/13 and 2014/15 (cf Fig. 2b), such that for the whole period 2008/09–2014/15 the change for these sub-groups (as shown in Table 3) was much smaller (statistically 0 in the case of 'movers', although 'starters' did increase by 0.010 during this period[26]). In contrast to the above results confirming the workings of a RAE/REF cycle for the 2008 and 2014 evaluation exercises, in the lead-up to REF 2021. Table 3 and Fig. 2b show that there were no large changes in the probabilities between 2014/15 and 2019/20, indicating a lack of any upturn in overall hires (or declines in exits) in the immediate period preceding the 2021 REF census date (e.g. in contrast to the change between 2008/09 and 2012/13—see footnote 34 and above discussion).

The remainder of Table 3 shows the probability of belonging to sub-group m for the different characteristics of the ith individual. Cet. par., female professors were more likely to belong to the 'movers' sub-group, and less likely to exit, although these effects are small (as confirmed in Supplementary Appendix Figure A.13). As expected, higher salaries were associated with starting and moving and discouraged exiting[27] (Supplementary Appendix Figure A.14 provides more details, including showing that, as expected, these impacts were larger in 2006/07 and 2012/13). Having contracts that involved working longer hours was linked to belonging to the 'no change' sub-group with only those that exit (and to a lesser extent 'starters') being more likely to have fractional contracts in the year they left (started in) the HEI sector (cf Supplementary Appendix Figures A.8 and A.15, the latter showing larger impacts in 2006/07 and 2012/13). The additional effect of being on a fixed-term contract (having, especially, controlled for contract hours) increased the probability of being a 'starter' by 2.3 per cent while decreasing 'exiting' by 1.9 per cent, but had only a small impact on 'movers'.[28] Younger professors were relatively more likely to be 'starters' (and to a lesser extent 'movers'), while those with teaching and research contracts (as opposed to just research) had a higher propensity to 'exit'. Working for more than one HEI in any year resulted in a relatively high likelihood of moving institutions or exiting (26 and over

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[25] Put differently, the change between 2008/09 and 2012/13 (see Fig. 2b and the results for the 2012 dummies in Table 3) was large and significant (0.037, 0.007 and −0.023, for 'starters', 'movers' and 'exits', respectively) and enough to mostly cancel out the post-RAE changes between 2006 and 2008.

[26] Figure 1 and Supplementary Appendix Figure A.2 show that post-2014/15 average number of 'starters' had 'moved-up' to a new (more stable) level compared to the 2008/09 level.

[27] Given the potential endogeneity of this variable, when salaries are omitted, the results obtained for other variables alter very little.

[28] Supplementary Appendix Figure A.8 shows both 'starters' and 'exits' were on average more likely to work fractional contracts; Table 2 also shows both sub-groups were more likely to work on fixed-term contracts. However, the (conditional) interaction between FTE and fixed-term status was quite different for these two sub-groups: as shown in Supplementary Appendix Figure A.11, for 'movers' there were small but, significant, average marginal effects associated with being fixed-term and FTE hours, but these generally cancel-out; but for 'exits', both fixed-term status and working on a fractional contract are important (e.g., for those on a 30 per cent or lower fractional contract—as Supplementary Appendix Figure A.12 shows this accounted for the overwhelming majority of all *fixed-term* 'exitors' – the probability of exiting was between −0.21 and −0.297, or around −26 per cent on average). In contrast, those on a fixed-term *and* on (very) low-hours had a relatively high probability of belonging to the 'starters' sub-group. Supplementary Appendix Figure A.12 shows the different FTE contract hours worked depending on fixed-term status, while Table 2 shows the proportions of workers who were fixed-term by status. See also footnotes 29 and 31.

31 per cent more likely, respectively).[29] Professors involved in more than one role (invariably administrative) were less likely to be 'starters' or 'exiting', but there is some evidence that the probability of moving is higher (presumably to reduce administrative duties). The better the performance in the REF of the unit of assessment to which a professor belongs, the more likely they were to belong to the 'no change' category; this was also found when the proportion of female academics in the academic work environment was greater. The association with ethnicity is generally weak, with the strongest results being that (vis-à-vis the benchmark sub-group) those identifying as 'non-white' are, cet. par., more likely to be 'starters'. Similarly, the link between nationality and sub-group status shows that certain non-UK nationalities were much more likely to be 'starters' (relative to the benchmark, this is especially true for nationals from the U.S., Canadian, EU pre-2004 countries, rest of Africa, and Asia), while certain nationalities (e.g. particularly those from Central and South America, the rest of Africa, the rest of Asia and the rest-of-the-world or of unknown nationality) were relatively more likely to 'exit'.

In summary, the empirical analysis outlined in Table 3, and the predicted probabilities depicted in Fig. 2, corroborate the patterns expected from the RAE/REF cycle, showcasing the shifts in the 'starters', 'movers', and 'exits' sub-groups over distinct evaluation periods. Notably, the decline in the probability of belonging to the 'starter' and 'mover' sub-groups post-2014, aligning with the Stern Review's policy changes, suggests a curbing effect on institutional 'gaming'. The increase in the probability of 'starters' in the lead-up to REF 2021 was observed but was considerably smaller compared to earlier cycles, reinforcing the notion of a diminishing impact. These trends underscore the effectiveness of recent reforms in mitigating distortions in staff turnover dynamics associated with the RAE/REF system.

6. Discussion and conclusions

The main emphasis of this study has been to present evidence, using population panel data from the HESA for 2004/05–2019/20 to consider the extent to which the numbers of 'starters', 'movers' and 'exits' (with the benchmark comprising the residual 'no change in status') specifically responded to the RAE/REF cycle. The panel dataset used comprised the population of individual staff on a teaching and/or research contract covering 2004/05–2019/20 supplied annually by 134 UK universities to the Higher Education Statistical Authority (see HESA 2022). Confining the analysis to full professors employed in RG universities, graphing the data showed that hiring and exits linked to the RAE/REF cycle was strongest for them. It was possible to show that in the first half of the cycle (the period leading-up to the RAE 2008 and REF 2014 census dates) there was strong evidence that the hiring of professors increased while at the same time the number of professors exiting fell. After the 2008 and 2014 census dates (the second half of the cycle), hiring declined substantially while exiting increased. However, these same patterns were not visually evident leading-up to the 2021 REF which suggest that the rule changes made after the 2014 REF, to combat institutional 'gaming', had the desired effect.

To establish whether these RAE/REF cycle patterns of hiring and exiting (as predicted by the theoretical model presented) were statistically significant, a RE multinomial logit model was estimated. Year dummy variables were included for testing if the difference between various pairs of years was statistically significantly different to 0 for 'starters', 'movers', and 'exits', and thus the existence of a cycle. The results from estimating the model showed, after taking account of the importance of other covariates, strong evidence of a 2008 and (in particular) 2014 cycle, but no evidence of any upturn in overall hires (or declines in exits) in the immediate period preceding the 2021 REF census date.

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[29] For the 'moved' sub-group, many of them maintained some (e.g., teaching and/or research) link with their previous institution, while for those exiting it reflects mostly those retiring from academia (they take on some short term, less than 12 months—duties with a different HEI prior to full withdrawal).

Thus, institutional 'gaming' of the type investigated here, leading to distortions and unintended consequences in earlier evaluation exercises (e.g. encouraging rent-seeking by individuals and institutions as well as reducing the accuracy of measured research quality in the UK HEI system), seems to have been conspicuously absent during the most recent REF. Investigating the reasons behind this absence, whether it signifies a shift in the financial incentives associated with 'gaming', or if specific rule changes (largely stemming from the Stern Review and its subsequent aftermath, particularly concerning the 'portability' of publications across universities) have effectively curbed such practices, warrants further (qualitative) research.

In conclusion, this study provides useful implications for policymakers. To prevent gaming practices in the research evaluation system, institutions and authorities do indeed have recourse to actions and measures to eliminate selective hiring practices aimed at artificially boosting evaluation outcomes. The outcome of the Stern Review points to this capability. The commissioning by the UK government of a review was in part to reduce distortions resulting from the REF; and with the help of a panel of experts (supported by a high-level advisory group) and the collection of evidence, the Stern Review was able to make a series of recommendations (not all of which were supported) that then led to the changes discussed in Section 2.

Finally, Stern (2016a) noted that '(t)hirty years ago, the UK became the first country to undertake an assessment of the quality of research undertaken in universities. It remains a leader in the field' (p. 8). Performance measurement has now been widely adopted by many countries, leading Jonkers and Zacharewicz (2016) to conclude that ' … many countries inside and outside Europe have learned from the evolution (design and improvements) of the RAE and REF in the UK which was the first country to introduce a funding allocation system based on peer review assessments in Europe' (p. 41). However, there are significant differences in approach across countries, as well as differences in experiences in terms of the unintended outcomes of PM, making it difficult to generalize the lessons from this study. Little if any literature points to other countries experiencing staff turnover patterns in academia similar to those shown to have been experienced in the UK prior to the 2021 REF. It is possible this has been occurring elsewhere and that future studies could benefit from looking for evidence of any institutional 'gaming'. Thus, this study's implications for other countries are that it highlights the potential for similar institutional strategies and practices related to staff turnover to occur in academia worldwide, likely to lead to distortions in research assessment systems. Additionally, the UK's approach to addressing these issues through the Stern Review and subsequent rule changes offers a model for other countries to consider when dealing with similar challenges in their own PM systems.

Supplementary material

Supplementary material is available at the Oxford Economic Papers Journal online. These are the data and replication files and the Supplementary Appendix. The data used in this article are described in data.zip which contains a 'Read First document' explaining the data, how to obtain it, and STATA code that produces the results contained in the article.

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