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### The Selection of Economics Lecturers into the 2014 UK Research Excellence Framework Exercise: Outputs and Gender.

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#### Abstract.

In the UK, Lecturers have future career paths that are the most sensitive to early recognition of research quality. Nevertheless, only 49% of the Lecturers in economics were submitted to the latest national Research Excellence Framework (REF2014): 40% of women and 53% of men. Using a rich new data source, and controlling for a range of observable characteristics expected to determine submission probability, we find more than 70% of the variance in selection propensity is left unexplained; implying considerable arbitrariness. A substantial conditional gender gap of 9.7% is also found. Given the potential inequalities associated with accumulative advantage for the individual, we fear that without a fully inclusive selection rule, Lecturers in economics should be left out of the UK REF process.

JEL A10, A11, B40, D20, D70, J01 Key words: research excellence framework; gender; selection; outputs; quality; inclusivity.

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Several countries have introduced systems to evaluate the research produced by their university sector (Stern, 2016) using peer review and/or metric based criteria (Regibeau and Rockett, 2016). The UK has the longest running of these appraisal exercises beginning with the Research Selectivity Exercise in 1986. In its current incarnation, the UK Research Excellence Framework (REF) incorporates a range of measures but focusses largely on the quality of publications of individual staff members to judge the research quality of academic institutions. The REF process is crucially important to UK universities; the great majority of government research funding in this sector is based on REF outcomes, some £1.6bn in 2017/18 (HEFCE, 2017). Given the importance of a high REF ranking for an institution, one might expect the individual academics included in the submission would be those with the highest quality publications (subject to submission rules) regardless of unrelated observable characteristics.

Simply submitting those staff members with the most prestigious journal publications may not, however, be the first best rule for institutional ranking success. Stern (2016, page 11) discusses 'negative and perverse incentives' for institutions in the REF2014 process. Gaming with respect to recruitment policies and the selection of which academics are entered may have critical implications for research design, institutional policies, and the academic labour market. Submission restrictions can shift research away from important but risky topics towards areas that are more likely to produce a steady stream of outputs, potentially leading to less innovative thinking. Strategic employment for the purposes of boosting REF scores can negatively impact on investment and incentives for staff development and encourage rent-seeking behaviour among academics. These types of changes are likely to lower the quality of the stock of research available in the long term.

For individual academics, the inclusion, or not, in the institution's REF submission is a major indicator of success at producing high quality research outputs with implications for selfesteem and peer recognition. Who is included in the REF, and the outputs that are submitted, is general knowledge recorded in the public domain. The longer term careers prospects associated with inclusion (or exclusion) are debateable. In the simplest scenario, there may be no repercussion for the individual from inclusion (or exclusion); implying that their reputation, resource allocation and work load allocation all remain the same over time. With the additional resources available to the institution from a successful across unit REF entry, such obliviousness towards the individual is hard to believe. One might reasonably expect individuals with a strong research reputation to be allocated more resources (including time) to dedicate to future research projects. The conventional wisdom is that research and teaching are positively correlated and mutually enriching (Neumann, 1992; Robles, 2016), nevertheless, there is a tension between the time demands of research and teaching with newer academics viewing teaching as a secondary task impacting negatively on the quality of their research outputs (Serow, 2000).

Providing extra recognition and/or resources for those who are deemed research worthy can create an accumulated advantage effect in the long run, even if the original assessment was spurious (Merton, 1968). Discussion of alternative models of accumulated advantage, and potential feedback loops, are provided in Allison and Stewart (1974) and DiPrete and Eirich (2006). In a world of imperfect information, peers use reputation when choosing reading matter and allocating research resources (Merton, 1968). Virtuous circles arise when positive recognition for the individual motivates them to produce greater effort, increasing the support of their peers, and leading to further successes for the anointed (the "Matthew" effect). As well as this direct Matthew effect on the individual, positive reputation can also generate more resource allocation, enabling greater research output and further gains in recognition and success. Positive feedback loops of these kinds will generate increasing inequality as the cohort ages (Allison and Stewart, 1974). Levin and Stephan (1991) argue that these life-cycle effects are particularly sizeable when recognition is granted to young academics (as it often is in science).

Gender inequality in the recognition of research quality is a further important concern with potentially negative consequences for current and longer-term gender equity in academic institutions. HEFCE (2015) found that females were less likely to be entered into REF2014 and that this was true, on average, across all disciplines. The issue of gender inequality in research grading exercises is raised in Rees (2011) who discusses possible bias against female academics in selection, peer review and research design. Bayer and Rouse (2016) highlight that Economics, in particular, is an academic discipline behind others with respect to diversity concerns (see also,

Hamermesh 2013). It is well recognised that the halo effect (Thorndike, 1920), and unconscious bias (Nisbett and Wilson, 1977) generally work against women. If unconscious bias results in the research outputs of women being less valued (Brown and Yang, 2015) or the role of women in producing that research is undervalued (Sarsons, 2017), we might expect women to be less likely to be included in the REF implying potential negative resource allocation and feedback loops for female academics (Reskin and Hargens, 1979; Long and Fox, 1995). Furthermore, Boring (2017) finds that social science students (male and female) show bias against female Professors in online student evaluations suggesting that women need to put more effort into their teaching to match male rankings. The greater the proportion of teaching in the workloads of females, the larger is the potential relative disadvantage (and negative feedback loop) created by this unconscious bias.

These studies suggest that early recognition of research ability is important for the career paths of academics, Allison and Stewart (1974) find strong empirical support for the hypothesis of accumulated advantage in the Physics, Chemistry and Mathematics disciplines. Gould (2002) further argues that merely associating with those on a positive feedback loop can itself create welfare, in this case the status of the anointed can create a positive reputation (and positive feedback loop) for those associating with the anointed. For example, working in a highly ranked research department infers a reputation effect even on its least distinguished members.

Using a rich new data source, collected by the authors, our paper contributes to the existing literature<sup>1</sup> addressing the recognition of research quality by examining the relationship between research outputs and REF inclusion for the Lecturer grade in academic Economics in the UK, paying particular attention to the quality and quantity of these outputs. Lecturers are typically the least experienced of those on standard academic contracts (combined administration, research and teaching) and they may be considered to have future career paths that are the most vulnerable to

<sup>&</sup>lt;sup>1</sup> There is also a small but growing literature using case study based analyses to consider how 'impact' is measured in the REF framework. In general, this literature tends to be critical of the framework adopted in REF2014, on the grounds of: monetary costs (Martin 2011); distorting incentives (Trevorrow and Volmer 2012; and Hicks 2012); potential threat to academic freedom and autonomy (Smith et al. 2011), consistency of individual reviewers on unit of assessment panels judging the quality of research (Tymms and Higgins 2017); difficulties with the efficiency and efficacy of measuring 'impact' (Ovseiko et al. 2012; and Parker and van Teijlingen 2012); and implications from negative coverage in the media (Murphy and Sage 2014). The issue of academic impact of published economics articles was further discussed in Azar (2008).

inclusion or exclusion from the REF process. We focus our study on this academic grade accordingly. In addition, we explicitly examine gender differences in submission rates.<sup>2</sup> The remainder of the paper is structured as follows: methodology and data are considered in section II; results are presented and discussed in section III; and conclusions are provided in the final section.

#### **II. METHODOLOGY AND DATA**

We are interested in the probability that an individual is selected for the REF process conditional on a range of observable characteristics expected to explain that probability. More formally, a series of probit regressions are estimated, with the unobserved latent dependent variable (the propensity to be submitted to the REF2014 exercise,  $S_i$ ) set equal to 1 if the individual Lecturer *i* was submitted to the REF process and zero otherwise.

$$Pr(S_i = 1) = \theta(\beta X_i) \tag{1}$$

where  $X_i$  is a vector of explanatory variables and  $\theta$  is the standard normal distribution function (Maddala 1992, 327).

It is clearly a gain to have information on all of the Lecturers rather than only a subsample which may suffer from some form of selection bias. We use annual data for UK academic Lecturers from 2008 to 2014 taken from the Royal Economics Society Women's Committee Survey (Mitka et al. 2015). From 2008 the Women's Committee Survey has harvested information from university department webpages on individual academic staff including grade of employment, gender, new hires and job leavers. These survey entries are emailed biennially to respective Heads of Departments for verification<sup>3</sup>, in 2014 some 88% of the institutions responded. This individual staff information is combined with detailed REF2014 submission records collected by the authors.

 $<sup>^{2}</sup>$  Our study is also related to Greenhalgh and Fahy (2015) who consider the assessment of research impact in the Health Sciences discipline; and Hole (2017) who uses the REF2014 outcome rankings to retrospectively assess the quality of specific economics journals.

<sup>&</sup>lt;sup>3</sup> Contact details for the Heads of Departments are obtained from CHUDE (the Conference of Heads of University Departments of Economics). CHUDE was established by the Royal Economic Society (RES) in 1987 in collaboration with the Association of University Teachers of Economics.

The REF2014 was a process of expert review assessing the quality of research across the UK higher education institutions (HEIs). Each of the 36 Units of Assessment (UoA) represented a separate research discipline and had its own sub-panel carrying out the assessment under the guidance of four main panels. Sub-panels could also refer submissions to other sub-panels for advice. Institutions were required to submit a common set of data to the UoA for those staff in post (of 0.2 full time equivalence or more) on the census date (October 31<sup>st</sup>, 2013) that the institution had selected for inclusion in the REF. The data were to include details of publications (and other forms of assessable output) these staff had produced between January 1<sup>st</sup>, 2008 and December 31<sup>st</sup>, 2013; up to a maximum of four outputs for each staff member. HEIs were told that the quality of submitted outputs would be assessed in terms of their "originality, significance and rigour" with reference to international quality standards. Early Careers Researchers (ECRs) were defined as those who had started their careers as independent researchers on or after the 1<sup>st</sup> of August 2009. ECRs could be submitted to the REF with fewer than four outputs without penalty according to a scale linked with tenure as an ECR (discussed further below).

The need for HEIs to explicitly consider issues of equality, diversity and the transparent selection of staff for inclusion into REF2014 was stressed at all stages (REF 2012; Berry 2012). Each HEI was required to develop and document how they implemented a fair and transparent selection process across staff. Figure 1 presents relative submission rates by job grade rank for the 28 departments who submitted to the Economics and Econometrics UoA in the REF2014 exercise (these departments are listed in Table A1 of the Appendix). Male and Female Professors show a very similar submission rate with some three quarters entered into REF2014 (fractionally more of the female Professors than the male). Submission rates drop dramatically at lower job grades with a little over 60% of the Readers/Senior Lecturers submitted and only 49% of the Lecturers. There are also substantial gender gaps in submission rates for job grades other than Professor; with the gender gap at the Lecturer level clearly the largest at 13.2 percentage points.

#### [Figure 1 around here]

Detailed publication data were gathered for the Lecturers including the date of their first publication, the number of assessable outputs in the period eligible for REF2014, the journals of

their publications and rankings of the journals based on various ranking lists, and co-author information (all discussed further below). The full dataset contains 327 Lecturers; however, 10 were not eligible for entry in the REF2014 because they were not research active prior to the REF entry cut-off; and a further 17 individuals (9 males and 8 females) were excluded from the analysis because they were submitted to the REF2014 with fewer than the required outputs relevant for their researcher status. These 17 Lecturers may have had allowances for periods of ill health or maternity leave, however, we do not have this additional information to make adjustments to REF outputs requirements accordingly and we exclude them from the sample. Consequently, 27 individuals were left out of the analysis and our estimation sample contains a total of 300 Lecturers (83 females and 217 males).

The data available from the RES Women's Committee annual gender surveys allow us to establish early career researcher (ECR) status according to the REF2014 criteria for all of the Lecturers working in the relevant departments at the REF2014 census date. Column 1 of Table 1 provides the time periods specified in REF2014 for the different categories of ECRs. The Women's Committee Survey collects employment status in November of each year, this allows for reasonable approximation. We identify four groups, these are presented in column 3 of Table 1, and the REF2014 specified output requirements for each group are listed in column 2.

#### [Table 1 around here]

Columns 4 to 7 of Table 1 present the distribution across the ECR categories, by gender, for the Lecturers in the sample. On average, women make up 28% of these Lecturers, and women are relatively more likely to occur amongst the LECR (late ECR) group, although the numbers in each cell are not large. This is consistent with the historic under representation of women in UK academic economics: in 1996 women made up 17.5% of the academic economics workforce, by 2014 this had risen to 27% (Mitka et al. 2015).

Summary statistics for the remaining variables of interest are included in Table 2. The RAE grade is the department's awarded score in the 2008 Research Assessment Exercise (the previous equivalent to the REF) and is included as a control measure of the quality of the department and of

its long term commitment to the research quality assessment programme. There were 4 points on the RAE 2008 outcome scale, ranging from 1 (quality that is recognised nationally) to 4 (quality that is world-leading) in terms of "originality, significance and rigour" (RAE, 2008). There was also the very rarely used "unclassified". The departments in our sample ranged between an average staff RAE2008 grade of 2.65 (Brunel University and City University) and 3.55 (LSE). It may be the case that high ranked RAE departments place more priority on hiring ECRs likely to qualify for REF2014. These departments may also provide a more conducive environment encouraging ECRs to develop the outputs they need for submission. A positive relationship between RAE quality and REF2014 submission is expected.

#### [Table 2 around here]

The number of outputs (and the journal publication information) for Lecturers actually submitted to the REF2014 was taken from the REF submission records. For those people not submitted, detailed assessable output and journal publication data were gathered including the date of their first publication, the number of outputs in the period eligible for the REF2014, and the journals of their publications (detailed lists of journals for the ECR are available from the authors upon request).

For those Lecturers submitted into REF2014 the number of working papers is the number of working papers actually submitted and is taken from the REF records. For those not submitted to REF2014, it is the number of working papers they have produced in the time eligible for submission to the REF2014.

Analogously, for those submitted into REF2014, the total number of publications is the number of these registered submissions (journal publications, books, book chapters or conference proceedings). For those not submitted into REF2014, the total number of publications is the number of journal publications, books, book chapters or conference proceedings they have produced in the time eligible for submission to the REF2014. The maximum is capped at 4 with inclusion preference given to their highest quality journal publications, where the quality of each individual journal publication was measured using the Keele journal ranking list (Hudson 2013). There is no

official list of journal quality used across economics departments, nor is there a commonly accepted list.<sup>4</sup> We focus on the Keele list as it was widely available during the planning phases of the REF2014 exercise and was well known in economics departments. The Keele list provided a four point ranking scale for journals ranging from 1 for nationally recognised, 2 for internationally recognised, 3 for internationally excellent, to 4 for world leading. A positive relationship is expected between journal publication quality and REF submission.

Assessable outputs other than journal publications have no explicit quality measure in the data set that is observable to the researcher. The average quality of publications measure used here is: the average quality of the journal ranking for each journal publication (according to the Keele list), with other assessable outputs assumed to receive this average value as well. For example, if a Lecturer has one journal publication rated at 3, one rated at 2, and two book chapters (i,e. with missing quality), the average quality for this person would be 2.5. But if a Lecturer has all outputs as working papers, books, book chapters or conference proceedings their average publication quality is zero. We will return to further consider the implications of this assumption below.

Figure 2 plots average output quality by gender for all of the Lecturers. There is some evidence that females are more likely to have their publications in the 3 and above ranked journals, although there is no significant difference in the overall quality ranking between males and females (see also Table 2).

#### [Figure 2 around here]

Table 3 provides a breakdown of the major type of output (journal or working paper) by gender; on average 86% of the female output was journal publication whilst 74% of the male output was for the ECRs. Correspondingly, 14% of the outputs submitted by women were working papers, 27% of the male outputs were.

<sup>&</sup>lt;sup>4</sup> Examples of alternative lists are provided in Hudson (2013) and the Association of Business Schools ('ABS') list, we considered these and found the choice of list made little difference in the results in preliminary analysis (results available upon request). The Keele list has subsequently been amalgamated with the ABS list to form the Chartered Association of Business Schools Academic Journal Guide 2018.

#### [Table 3 around here]

The regional identifiers are for London, England excluding London, and Scotland. Despite the REF being a national exercise, virtually all of the departments submitted in the Economics and Econometrics Unit of Assessment were from English universities. There were only four departments submitted from Scotland and none submitted from either Northern Ireland or Wales.

It was widely believed that output submitted to the Economics and Econometrics Unit of Assessment would be penalised if it was co-authored by more than one person in that department's submission. Sarsons (2017) argues published co-authored papers send a weaker signal of quality when considering promotions compared with single-authored work, and that this weakening in signal is felt much more by female co-authors than male. This may be further exacerbated if women are more likely to co-author with other women. We include co-author information for those submitted, and those not submitted, for each department. Co-authorship in the same institution is not common in these departments (almost 90% of the Lecturers don't engage in it), women were more than twice as likely to have a co-author in the same department as males (19% and 9% respectively), although this difference is not significant at standard confidence levels. A negative relationship between within department co-authorship and REF2014 submission is expected.

#### **II.I** Heterogeniety across Early Career Status.

Whilst the LECR (late early career researcher) category has the highest proportion female (41% see Table 1), data from Table 2 reveal that the EECR (early ECR) has the greatest number of the women in it (48% of all of the women), perhaps not surprising when the numbers in this category make up more than half of the ECRs. Table 4 presents REF2014 submission information for each category of ECRs. Of the 84 NECR (not ECR) Lecturers, only 17% were submitted to the REF (9% of the female NECRs and 20% of the males). These figures are considerably higher for less experienced Lecturers with 67% of the EECRs submitted (71% of the males and only 58% of the females). With the exception of the LECRs, a greater proportion of males than females were submitted and this trend increased with less experienced categories.

[Table 4 around here]

Table 5 provides additional information by listing for each of the ECR categories how many assessable outputs were observed in the data. Thus of the 84 NECR Lecturers in Table 5, only 52% had 4 outputs (57% of females and 51% of males). As this category was required to have 4 outputs for submission, ceteris paribus, we can begin to see at least one reason why the submission rates in Table 4 are not higher (further detail is provided in Tables A2 and A3 of the Appendix). Indeed, some 12% of the females and 10% of the males have no publications. Nevertheless, only 10% of the EECRs had less than the one output they required to be included in REF2014.

#### [Table 5 around here]

In summary, whilst the numbers in different categories are small and differences are often not significant at standard confidence levels, in UK academic economics less than half (49%) of the Lecturing grade were submitted to REF2014, only 40% of the women and 53% of the men (despite the women having on average a considerably higher ratio of journal publications to working papers, and a greater proportion of journal publications at 3 star level and above, than the men). We next consider the determination of the probability of being selected for submission into the REF2014 more formally.

#### **III. RESULTS**

As discussed above, a series of probit regressions are estimated with the unobserved latent dependent variable (the propensity to be submitted to the REF2014 exercise) set equal to 1 if the individual Lecturer was submitted to the REF process and zero otherwise. The explanatory variables we include are gender, number of publications, number of working papers, average quality of publications, if co-authors are present in the same institution, early career status, department location, and 2008 department RAE grade. All of these variables are defined and discussed in section 2 above. The estimation results are presented in Table 6. In general, the models presented in Table 6 are well defined. The overall fit is, however, low in absolute terms; the pseudo R-squared measures suggest the full pooled model (column 4) is only explaining some 29% of the REF2014 submission probability for the Lecturers; we will return to consider the implications of this finding further below. Interpreting the coefficient estimates from probit models are not straight

forward, the more intuitive marginal effects at the mean of the explanatory variables are instead reported in Table 6 along with differential effects for binary variables. (The coefficient estimates are available from the authors upon request.)

#### [Table 6 around here]

Considering the results in more detail, column 1 of Table 6 reveals the substantial unconditional gender gap in the probability of being submitted to REF2014 of 0.1324 (13.2%). Columns 2 and 3 present the estimated marginal effects for the full model for males and females, respectively. In aggregate these gender specific estimates are similar, both qualitatively and quantitatively which may be due to the relatively small numbers included in the analysis, especially of females. There are, however, some noteworthy differences. Reading down the columns we can see that the number of publications is not relevant for either gender. In contrast, having an extra working paper increases the chance of a female being included by 21%, twice that for males (10%). The average quality of publications is also important for both genders, again more so for females than males. The result for co-authorship is noteworthy, for both males and females having a coauthor in the department lowers the propensity to be submitted to REF2014; this relationship is qualitatively stronger for males than females. All ECR categories are more likely to be submitted than the longer tenured Lecturers (the not early career, NECR). And we find no regional differences. The RAE grade of the department has a strong significant relationship with selection probability for males but not for females. Indeed this is the strongest effect found for males, working in a department with a one unit higher RAE grade is associated with a 53% greater chance of selection into REF2014 for males.

These qualitative gender differences reported in columns 2 and 3 are not significant<sup>5</sup>, however, except for the propensity to submit Lecturers by higher ranked RAE departments. Column 4 of Table 6 presents results for the pooled (across gender) sample. This model includes an interaction term between being female and RAE 2008 grade to allow for more flexibility in modelling the difference between genders across different levels of RAE grades; this is our

<sup>&</sup>lt;sup>5</sup> Using the oglm test command provided in Stata, coded by Williams and explained in

https://www3.nd.edu/~rwilliam/oglm/RW\_Hetero\_Choice.pdf Results are available from the authors upon request.

preferred full model. After controlling for observable characteristics, being female is now found to be associated with 9.7% less chance of being submitted to REF2014, at a confidence level of 80%.

Considering the other findings reported in column 4 of Table 6, the average quality of journal publications is positively related to submission; a whole point increase in the average output quality implies the Lecturer is 15% more likely to be submitted. In contrast, having a co-author in the same institution reduces the probability of being included in the REF submission by some 20%, at the average. Perhaps surprising, the number of journal publications is not found to be significantly related to submission, however, the number of working papers is. An additional working paper is associated with 11% more chance of submission. We return to consider the link with working papers and submission more fully below. Shorter tenure as a Lecturer is also associated with a higher submission probabilities (compared to the omitted NECR, not early career researcher, category). There are no regional differences in the probability of Lecturers being submitted to REF.

Working in a department with higher RAE results in the 2008 research assessment exercise is strongly associated with a higher probability (37%) of a Lecturer being submitted in the REF. However, departments with higher RAE grades are also 39% less likely to submit female Lecturers than male Lecturers to the REF2014 process. However, in a non-linear model, such as the probit model used here, the marginal effect of the interaction term is not a single value calculated at the mean and so the interpretation is more problematic. A more useful approach is to compare the predicted probabilities. Further analysis of predicted submission probabilities suggests a complex selection decision. For example, going from the mean value of the RAE to its maximum value only decreases the probability of being submitted to the REF by 2% for females. In contrast, the pattern for males is in the opposite direction, going from the mean value of the RAE to its maximum value increases the probability of being submitted to the REF by 27% for males. These findings suggest higher ranked RAE 2008 departments strongly prefer to submit males, whereas females are being treated similarly by the higher RAE ranked departments as they are in the lower ranked departments. This may be indicative of ECR males receiving a reputation effect by association (Gould, 2002) in high status departments that is not available to women.

#### **III.I** Subsequent publication of working papers

Arguably, including individuals with working papers in the REF2014 submission required institutions to make selection decisions in the face of greater uncertainty (without the quality signal journal publication provides). The literature on discrimination would suggest women would be negatively affected in this case (Bayer and Rouse, 2016). The results presented above do not suggest that the working papers of women were scaled down compared to men. It may be the case, however, that this result is influenced by the implicit assumption made so far that the quality of working papers is the same as the average quality of the individual's journal publications. The working papers may actually have been higher (or lower) quality than the existing journal publications for an individual. Institutions may have recognised this and judged the quality of the working papers themselves via peer review, making more informed submission decisions accordingly.

We address this possibility by changing the status for those working papers on the census date (October 31<sup>st</sup>, 2013) that were subsequently published in journals (by March 2017). Interestingly, subsequent publication of these working papers is still relatively rare more than three years on from the REF2014 census date. Of the 149 working papers in the sample at the REF cut-off date only 31 (21%) had subsequently been published, 19 (26%) by those submitted to REF2014 and 12 (16%) by those not submitted. For females the average quality of these subsequent publications was 3.5, for males it was 3.2.

Results including this *ex poste* publication information are provided for males, females and the full model in Table A4 of the Appendix. Including subsequent publication information has very little impact on the estimated effects in the models. Qualitatively the negative relationship between being female and being submitted is slightly higher (10.1% less likely to be submitted rather than 9.7%), the association between the number of working papers and submissions halves for both genders and the negative association found for co-authorship for males increases. None of these changes are significant, however, at standard confidence levels.

We also considered the extreme assumption that the perceived quality of all working papers was zero (results are provided in Table A5 of the Appendix). Whilst no significant differences are found, the gender gap increases to 12% and the average quality of publications are qualitatively similarly important for both genders.

#### **III.II** Excluding other assessable outputs

The analysis presented above allows for books, book chapters and conference proceedings to be included with working papers and journal publications as assessable outputs. It may be that this definition is too broad and the institutions only considered working papers and published journal articles when making their submission decisions. The models presented in Table A6 of the Appendix replicate those for Table 6 with the exclusion of these other outputs from the sample. There are no qualitative, nor significant quantitative, differences in the results implying that the simpler list of assessable outputs (working papers and journal publications) is a good approximation of the decision making information used by institutions when submitting to the Economics and Econometrics UoA. Various combinations of assessable outputs were also considered (results are available from the authors upon request), in none of these cases were the results found to be qualitatively or significantly quantitatively different to those presented in Table 6. Note that the proportion of variation explained by the model including the simpler list of assessable outputs (column 4 of Table A6) and for our preferred model (column 4 of Table 6) are essentially the same at 0.290 and 0.289, respectively.

#### **IV. CONCLUSIONS**

Using new data collected by the authors in combination with data from the RES Women's Committee annual surveys, we investigate the determinants of the probability of UK economics Lecturers being included in the Research Excellence Framework submissions of their universities in the most recent, 2014, assessment exercise. We focus the study on Lecturers because, in the UK, Lecturers are typically the least experienced of those on standard academic contracts (combined administration, research and teaching) and they may be considered to have future career paths that are the most vulnerable to inclusion or exclusion from the REF process. Less than half (49%) of these Lecturers were submitted to the latest REF exercise; 40% of women and 53% of men.

The quality of research publications and the number of working papers are found to be strong determinants of REF selection probability for Lecturers. The majority of the working papers

submitted in REF2014 were not subsequently published by 2017, however, adjusting the quality measure to include these late publications did not change the estimation results qualitatively. Similarly, using the more concise output grouping of just working papers and journal publications generated analogous results to the extended grouping which includes books, book chapters and conference proceedings; suggesting that institutions may have focussed on just these two output types (working papers and journal publications) when making their selection decisions.

A strong negative association found between REF submission and co-authorship is found within the institution, this relationship was qualitatively larger for males than females but not significantly so. A decline in co-authorship may indicate diminished within-department collegiality with longer term detrimental consequences for the career development of junior academics.

Controlling for Early Career Researcher status is found to be important. Institutions strongly prefer Lecturers with shorter tenure in their REF selection process; this may arise from a reaction to the relatively short qualifying period for outputs and the high number of outputs required by the REF process. The potential negative impact of this requirement on Lecturers being submitted may be more extreme in economics where the journal publication process is comparatively lengthy. Whilst we don't find regional differences in the results, there are no Welsh or Northern Irish departments amongst the departments who chose the Economics and Econometrics Unit of Assessment, raising serious issues as to the National context of the REF exercise.

In aggregate, there is an unexplained 9.7% gender gap in REF submission probability amongst the 28 CHUDE departments submitting to the Economics and Econometrics Unit of Assessment after we condition for factors expected to be associated with this submission decision. It is notable that we find no significant differences in the observable determinants of REF submission for men and women with one exception: there is evidence that higher RAE graded departments strongly prefer to submit males than females, suggesting an additional reputation by association feedback loop for men which is not available to women.

After controlling for early career status, research output quantity and quality, co-authorship, department research ranking and location, and gender; more than 70% of the variance in selection

probability is left unexplained. This implies a large degree of arbitrariness in the selection of economics Lecturers in to the REF process, inconsistent research quality recognition, and considerable potential for longer term detrimental career outcomes for the majority of these young academics. The primary recommendation of the Stern Report (Stern 2016) is that all research active staff be returned in the next REF in 2021. There is much discussion of how full inclusivity will limit poaching and gaming behaviour by institutions and how output portability across departments may be constrained. There is little discussion, however, of how this primary recommendation may be enforced for individual academics in ongoing employment contracts within departments. For example, it would appear that under the current guidelines (REF, 2017) institutions can choose to reclassify individual academics from research active to teaching focussed contracts before the REF2021 census date (July the 31<sup>st</sup>, 2020) without penalty.

Our results imply that institutions showed gender bias and arbitrariness when selecting amongst economics Lecturers for REF inclusion in 2014. In future research, we hope to track this cohort of Lecturers to consider the longer term promotion and research output implications of their inclusion (or exclusion) from REF2014 and later REF exercises. Given the potential inequality growth associated with accumulative advantage (or disadvantage) found for earlier cohorts of scientists (Allison and Stewart, 1974) we fear that the current best policy recommendation is all economics Lecturers are left out of the UK REF process unless a fully inclusive selection rule for academics that are research active in the census period can be established.

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Date academic began independent research	Required output for REF14	ECR status	Female	Male	%Female	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
On or before July 31, 2009	4	Not early career researcher (NECR)	23	61	27%	84
Between August 1, 2009 and July 31, 2010	3	Late early career researcher (LECR)	11	16	41%	27
Between August 1, 2010 and July 31, 2011	2	Middle early career researcher (MECR)	9	21	30%	30
Between August 1, 2011 and October 31, 2013	1	Early early career researcher (EECR)	40	119	25%	159
After October 31, 2013	N/A	Not eligible for REF				
Total			83	217	28%	300

Table 1. Researcher status and required outputs

### Table 2. Summary statistics

	Fer	Females		Males		genders
	mean	st. dev.	mean	st. dev.	mean	st. dev.
female	-	-	-	-	0.28	0.45
REF submission status	0.40	0.49	0.53	0.50	0.49	0.50
2008 RAE grade	2.97	0.25	3.01	0.27	3.00	0.26
nr. of outputs	2.23	1.46	2.05	1.37	2.10	1.40
nr. of journal publications	1.94	1.54	1.59	1.40	1.69	1.45
nr. of working papers	0.29	0.67	0.46	0.76	0.41	0.74
avg. quality of publication	2.55	1.33	2.65	1.20	2.62	1.23
England (excluding London)	0.67	0.47	0.71	0.45	0.70	0.46
London university	0.19	0.40	0.17	0.37	0.17	0.38
Scottish University	0.13	0.34	0.12	0.33	0.13	0.33
co-authors in same institution	0.19	0.40	0.09	0.28	0.12	0.32
NECR	0.28	0.45	0.28	0.45	0.28	0.45
LECR	0.13	0.34	0.07	0.26	0.09	0.29
MECR	0.11	0.31	0.10	0.30	0.10	0.30
EECR	0.48	0.50	0.55	0.50	0.53	0.50

## Table 3. Types of outputs for all ECRs entered in REF2014, by gender (% of total in parenthesis)

	females		males	
nr. of working papers	9	(14%)	49	(27%)
nr. of journal publications	54	(86%)	132	(73%)
total outputs	63		181	

Source: RES Women's Committee Survey 2014 (detailed publication supplement).

Tuble II LOIC status, by ILLI	submission stat	ub		
	not in REF	in REF	% in REF	Total
All lecturers				
NECR: 4 outputs required	70	14	17%	84
LECR: 3 outputs required	16	11	41%	27
MECR: 2 outputs required	14	16	53%	30
EECR: 1 output required	52	107	67%	159
Total	152	148	49%	300
Female lecturers				
NECR: 4 outputs required	21	2	9%	23
LECR: 3 outputs required	6	5	45%	11
MECR: 2 outputs required	6	3	33%	9
EECR: 1 output required	17	23	58%	40
Total	50	33	40%	83
<u>Male lecturers</u>				
NECR: 4 outputs required	49	12	20%	61
LECR: 3 outputs required	10	6	38%	16
MECR: 2 outputs required	8	13	62%	21
EECR: 1 output required	35	84	71%	119
Total	102	115	53%	217

#### Table 4. ECR status, by REF submission status

Note: output requirements may differ due to leaves of absence.

	number of outputs (% of row category total in parenthesis)										
	0		1		2		3		4		ave
All lecturers											
NECR: 4 outputs											
required	9	(11%)	15	(18%)	8	(10%)	8	(10%)	44	(52%)	2.75
LECR: 3 outputs								( <b>- - -</b> ()			
required	3	(11%)	3	(11%)	1	(4%)	10	(37%)	10	(37%)	2.78
MECR: 2	2	(100/)	Λ	(120/)	7	(220/)	10	(220/)	(	(200/)	2 40
EFCP: 1 output	3	(10%)	4	(13%)	/	(23%)	10	(33%)	0	(20%)	2.40
required	16	(10%)	85	(53%)	27	(17%)	12	(8%)	19	(12%)	1 58
Tatal	21	(1070)	107	(3570)	42	(1/70)	12	(070)	70	(1270)	2.10
Total	31	(10%)	107	(30%)	43	(14%)	40	(13%)	19	(20%)	2.10
Female lecturers											
NECR: 4 outputs										· · · ·	
required	3	(13%)	4	(17%)	2	(9%)	1	(4%)	13	(57%)	2.74
LECR: 3 outputs	1	(00/)	0	(00/)	1	(00/)	2	(270/)	(	(550/)	2 10
required	1	(9%)	0	(0%)	1	(9%)	3	(27%)	6	(55%)	3.18
MECK. 2 outputs required	1	(11%)	2	(22%)	1	(11%)	Δ	$(\Delta\Delta\%)$	1	(11%)	2 22
EECR: 1 output	1	(1170)	2	(2270)	1	(1170)	т	(++/0)	1	(1170)	2.22
required	5	(13%)	18	(45%)	8	(20%)	3	(8%)	6	(15%)	1.68
Total	10	(12%)	24	(29%)	12	(14%)	11	(13%)	26	(31%)	2 23
Totai	10	(1270)	27	(2)/0)	12	(1470)	11	(1570)	20	(3170)	2.25
Male lecturers											
NECR: 4 outputs	~	(100/)	1.1	(100/)	(	(100/)	-	(110/)	21	(510/)	0.75
required	6	(10%)	11	(18%)	6	(10%)	1	(11%)	31	(51%)	2.75
LECK: 5 Outputs	2	(13%)	3	(10%)	Ο	(0%)	7	(1/1)	1	(25%)	2 50
MFCR·2	2	(1370)	5	(1970)	0	(070)	/	(++/0)	-	(2370)	2.30
outputs required	2	(10%)	2	(10%)	6	(29%)	6	(29%)	5	(24%)	2.48
EECR: 1 output	-	(10/0)	-	(10/0)	Ū	()	Ũ	()	U	(21/0)	2.10
required	11	(9%)	67	(56%)	19	(16%)	9	(8%)	13	(11%)	1.55
Total	21	(10%)	83	(38%)	31	(14%)	29	(13%)	53	(24%)	2.05

Table 5. ECR status, by number	of outputs (including	all submitted and not
submitted to REF 2014)		

Note: output requirements may differ due to leaves of absence.

Dependent variable: REF = 1 if individual entered in REF2014, 0 if not entered					
	(1)	(2)	(3)	(4)	
	pooled	females	males	pooled <sup>3</sup>	
female	-0.1324**			-0.0972	
	0.0635			$(0.0743)^{\#}$	
nr. of publications <sup>1</sup>		0.0013	-0.0037	-0.0009	
		(0.0556)	(0.0400)	(0.0322)	
nr. of working papers		0.2095*	0.1036*	0.1120**	
		(0.1139)	(0.0552)	(0.0497)	
avg. quality of publications <sup>2</sup>		0.1900***	0.1409***	0.1489***	
		(0.0515)	(0.0330)	(0.0268)	
co-authors in same institution		$-0.1792^{\#}$	-0.2481*	-0.2027**	
		(0.1317)	(0.1450)	(0.1032)	
Researcher status (baseline is NECR	)				
LECR	, 	0.6668***	0.2710**	0.3944***	
		(0.1354)	(0.1330)	(0.0948)	
MECR		0.3671#	0.4602***	0.4472***	
		(0.2300)	(0.0726)	(0.0796)	
EECR		0.6452***	0.5607***	0.5829***	
		(0.1285)	(0.0817)	(0.0681)	
Location (baseline is England exclud	ling London)				
London university	<b>C</b> <i>i</i>	-0.1272	0.008	-0.0267	
-		(0.1480)	(0.1196)	(0.0962)	
Scottish university		0.1700	0.043	0.0691	
		(0.2111)	(0.1221)	(0.1050)	
2008 RAE grade		0.1871	0.5281***	0.3732***	
		(0.2765)	(0.1651)	(0.1387)	
female*2008RAE		(0.2,00)	(******)	-0 3926*	
				(0.2226)	
Observations	300	83	217	300	
Pseudo R-squared	0.010	0.330	0.287	0.289	
AIC	415.602	96.803	235.869	321.480	
BIC	423.010	123.410	273.048	369.630	

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Table 6	Prohit	regression	marginal	etterte g	nt meanel
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Standard errors in parentheses. # p<0.20 \* p<0.10 \*\* p<0.05 \*\*\* p<0.01.

<sup>1</sup> Includes journal papers, books, book chapters, and conference proceedings.

 $^2$  Computed using Keele journal ranking, working papers and non-journal publications are not included in the calculation, journal papers not on the Keele list are also not included.





#### 

#### **Appendix** – intended for online provision.

## TableA1. List of Universities with CHUDE economics departmentssubmitting to Economics and Econometrics Unit of Assessment

Brunel University; City University London; London School of Economics and Political Science; Queen Mary University of London; Royal Holloway University of London; University College London; University of Aberdeen; University of Birmingham; University of Bristol; University of Cambridge; University of East Anglia; University of Edinburgh; University of Essex; University of Exeter; University of Glasgow; University of Glasgow; University of Glasgow; University of Leicester; University of London Birkbeck; University of Manchester; University of Nottingham; University of Oxford; University of Sheffield; University of Southampton; University of St Andrews; University of Surrey; University of Sussex; University of Warwick; University of York

	EECR le	cturers	LECR le	LECR lecturers		MECR lecturers		NECR lecturers	
nr. of outputs	female	male	female	male	female	male	female	male	
0	5	11	1	2	1	2	3	6	
1	1	7	0	3	2	2	4	11	
2	6	6	1	0	0	1	2	6	
3	2	4	1	2	3	1	1	7	
4	3	7	3	3	0	2	11	19	

#### Table A2. Outputs of lecturers NOT submitted to REF 2014

Table A5. Number of outputs, by KEF submission status								
number of outputs	not in REF	in REF	% in REF	Total				
<u>All lecturers</u>								
0	31	0	0%	31				
1	30	77	72%	107				
2	22	21	49%	43				
3	21	19	48%	40				
4	48	31	39%	79				
Total	152	148	49%	300				
<u>Female lecturers</u>								
0	10	0	0%	10				
1	7	17	71%	24				
2	9	3	25%	12				
3	7	4	36%	11				
4	17	9	35%	26				
Total	50	33	40%	83				
Male lecturers								
0	21	0	0%	21				
1	23	60	72%	83				
2	13	18	58%	31				
3	14	15	52%	29				
4	31	22	42%	53				
Total	102	115	53%	217				

### Table A3. Number of outputs, by REF submission status

Dependent variable: REF = 1 if individual entered in REF2014, 0 if not entered						
	(1)	(2)	(3)			
	females	males	pooled <sup>3</sup>			
female			-0.1006#			
			(0.0752)			
2008 RAE grade	0.1357	0.5237***	0.3589**			
	(0.2690)	(0.1669)	(0.1395)			
nr. of publications <sup>1</sup>	0.0054	0.0015	0.0063			
	(0.0541)	(0.0387)	(0.0315)			
nr. of working papers	0.0848	0.056	0.0577			
	(0.1080)	(0.0552)	(0.0490)			
Researcher status (baseline is NECR)						
LECR	0.6311***	0.2891**	0.3980***			
	(0.1437)	(0.1321)	(0.0948)			
MECR	0.3594#	0.4491***	0.4350***			
	(0.2271)	(0.0755)	(0.0812)			
EECR	0.6040***	0.5479***	0.5694***			
	(0.1337)	(0.0837)	(0.0693)			
Location (baseline is England excluding Lond	on)					
London university	-0.1630	0.019	-0.0277			
	(0.1408)	(0.1196)	(0.0963)			
Scottish university	0.1553	0.046	0.0764			
	(0.2020)	(0.1250)	(0.1062)			
avg. quality of publications <sup>2</sup>	0.1481***	0.1508***	0.1466***			
	(0.0441)	(0.0314)	(0.0254)			
co-authors in same institution	-0.1334	-0.3263**	-0.2260**			
	(0.1407)	(0.1340)	(0.1014)			
Observations	83	217	300			
Pseudo R-squared	0.295	0.305	0.295			
AIC	100.678	230.494	319.220			
BIC	127.285	267.673	367.370			

# Table A4. Probit regression (marginal effects at means) including *ex poste* working paper publication rankings.

Standard errors in parentheses. \* p<0.10 \*\* p<0.05 \*\*\* p<0.01.

<sup>1</sup> Includes journal papers, books, book chapters, and conference proceedings.

<sup>2</sup> Computed using Keele journal ranking, working papers published post REF2014 are given the Keele ranking of the publication (if available), other working papers and non-journal publications are not included in the calculation, journal papers not on the Keele list are also not included.

<sup>3</sup> Model includes an interaction term between 'female' and '2008 RAE grade'.

Dependent variable: REF = 1 if individual entered in REF2014, 0 if not entered						
	(1)	(2)	(3)			
	females	males	pooled <sup>3</sup>			
female			-0.1191 <sup>#</sup>			
			(0.0749)			
2008 RAE grade	0.2154	0.5488***	0.3838***			
	(0.2729)	(0.1673)	(0.1395)			
nr. of publications <sup>1</sup>	0.0018	-0.0177	-0.0058			
	(0.0555)	(0.0409)	(0.0326)			
nr. of working papers	0.2150*	0.1755***	0.1739***			
	(0.1138)	(0.0583)	(0.0519)			
Researcher status (baseline is NECR)						
LECR	0.6776***	0.2568*	0.3965***			
	(0.1308)	(0.1366)	(0.0944)			
MECR	0.3669#	0.4667***	0.4489***			
	(0.2307)	(0.0710)	(0.0795)			
EECR	0.6469***	0.5381***	0.5687***			
	(0.1280)	(0.0845)	(0.0697)			
Location (baseline is England excluding London	n)					
London university	-0.1219	-0.007	-0.0249			
	(0.1480)	(0.1218)	(0.0969)			
Scottish university	0.1755	0.043	0.0737			
	(0.2111)	(0.1237)	(0.1060)			
avg. quality of publications <sup>2</sup>	0.1912***	0.1833***	0.1771***			
	(0.0521)	(0.0394)	(0.0305)			
co-authors in same institution	-0.1709#	-0.2615*	-0.2086**			
	(0.1312)	(0.1421)	(0.1020)			
Observations	83	217	300			
Pseudo R-squared	0.326	0.302	0.299			
AIC	97.241	231.307	317.601			
BIC	123.848	268.486	365.750			

## Table A5. Probit results (marginal effects at means) with quality of working papers valued at 0.

Standard errors in parentheses. \* p<0.10 \*\* p<0.05 \*\*\* p<0.01.

<sup>1</sup> Includes journal papers, books, book chapters, and conference proceedings.

<sup>2</sup> Computed using Keele journal ranking, working papers are assigned a quality of zero, nonjournal publications are not included in the calculation, journal papers not on the Keele list are also not included.

<sup>3</sup> Model includes an interaction term between 'female' and '2008 RAE grade'.

Dependent variable: REF = 1 if individual entered in REF2014, 0 if not entered			
	(1)	(2)	(3)
	females	males	pooled <sup>3</sup>
female			$-0.0984^{\#}$
			(0.0751)
2008 RAE grade	0.2279	0.5274***	0.3794***
	(0.2736)	(0.1652)	(0.1388)
nr. of publications <sup>1</sup>	0.0364	-0.0059	0.0102
	(0.0543)	(0.0412)	(0.0331)
nr. of working papers	0.2314**	0.1030*	0.1164**
	(0.1123)	(0.0551)	(0.0495)
Researcher status (baseline is NECR)			
LECR	0.6792***	0.2707**	0.3965***
	(0.1348)	(0.1327)	(0.0949)
MECR	0.3982*	0.4602***	0.4504***
	(0.2272)	(0.0724)	(0.0792)
EECR	0.6747***	0.5593***	0.5913***
	(0.1196)	(0.0814)	(0.0669)
Location (baseline is England excluding London)			
London university	-0.1243	0.007	-0.0255
	(0.1460)	(0.1193)	(0.0962)
Scottish university	0.2054	0.043	0.0731
	(0.2123)	(0.1221)	(0.1048)
avg. quality of publications <sup>2</sup>	0.1797***	0.1419***	0.1445***
	(0.0514)	(0.0335)	(0.0272)
co-authors in same institution	$-0.1888^{\#}$	-0.2479*	-0.2054**
	(0.1271)	(0.1449)	(0.1028)
Observations	83	217	300
Pseudo R-squared	0.333	0.287	0.290
AIC	96.361	235.857	321.387
BIC	122.969	273.036	369.536

# Table A6. Probit results (marginal effects at means) excluding additional assessable outputs.

Standard errors in parentheses. \* p<0.10 \*\* p<0.05 \*\*\* p<0.01.

<sup>1</sup> Includes journal papers, books, book chapters, and conference proceedings.

 $^2$  Computed using Keele journal ranking, working papers and non-journal publications are not included in the calculation, journal papers not on the Keele list are also not included.

<sup>3</sup> Model includes an interaction term between 'female' and '2008 RAE grade'.