Do research assessment exercises raise the returns to publication quality? Evidence from the New Zealand market for academic economists

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Many countries have introduced research assessment exercises to help measure and raise the quality of research in their university sector. But there is little empirical evidence on how these exercises, such as the Quality Evaluation of the Performance Based Research Fund (PBRF) in New Zealand and the recently aborted Research Quality Framework (RQF) in Australia, affect the signals that researchers observe in the academic labour market. Since these assessments aim to raise research quality, individual academics should perceive rising returns to publication quality at the expense of the returns to quantity. Data we collected on the rank and publication records of all New Zealand academic economists prior to the introduction of the PBRF and just after the second assessment round are used to estimate the changing returns to the quantity and quality of journal articles.

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I. Introduction

Many countries have introduced research assessment exercises to help measure and raise the quality of research carried out in their university sector. These include the Research Assessment Exercise (RAE) in the United Kingdom, which began in 1986, a similarly named assessment that began in Hong Kong in the early 1990s, and the Quality Evaluation of the Performance Based Research Fund (PBRF) in New Zealand, which started in 2003. Until recently abandoned, a similar exercise was planned for Australia, in the form of the Research Quality Framework.

Although these assessments differ in their details, a common aim is to enable research funds to be concentrated into more research active units (Cave, Hanney and Kogan 1991). According to the Tertiary Education Commission (TEC), who administer the PBRF in New Zealand, the goal is to "reward research activities of national and international excellence" with universities encouraged to "aim for depth rather than breadth in their research capacity" (TEC, 2004, p. 1). In New Zealand, the mechanism for achieving this goal is an allocation of funds, equivalent to over one-fifth of total university funding, on the basis of research quality. Since most of the money in the PBRF was previously paid to universities on the basis of enrolments, it largely involves re-allocating funds between universities, which may yield some static efficiency gains. For example, Hazledine and Kurniawan (2005) estimate a one percent increase in research output of the New Zealand university sector following the PBRF re-allocation.[1]

Since both direct costs and indirect compliance costs of research assessments are likely to exceed the value of extra research resulting from static efficiency gains, such assessments only make

[1] They also consider a hypothetical allocation designed to equate marginal productivity between the universities, which entails large reallocations of funding but still only raises research output by three percent.

economic sense if they also induce dynamic efficiency gains.[2] For example, Evans and Quigley (2006) predict that the PBRF will increase research volume and excellence due to greater competition between New Zealand universities, especially because the quality rating is akin to a tournament which should induce competitors to exert considerable effort. However, for such dynamic efficiency gains to be realized requires individual academics to respond to the incentives created by research incentives and the funding allocations derived from these.

Yet little is known about how research assessments change the signals that academics observe in the labour market and their response to these changed incentives. Studies of the RAE suggest that it did not induce a change in behaviour of either the research inactive or the most active researchers. Only those academics with a moderate interest in research devoted more time to research and less to activities outside the assessment (Talib, 2002). The only empirical estimates of the impact of research assessments on economists we are aware of are by Moore et al (2002). They provide empirical estimates of the effects of the RAE on academic economists in the UK based on 157 curriculum vitae obtained from a survey of 1,000 economists and from websites.[3] Their results suggest that individuals in highly ranked departments increased research output in higher-ranked journals, while those in lower ranked departments increased research output in other journals.[4] They provide evidence to suggest that the productivity increase occurred primarily amongst individuals who were just short of the number of publications required to be included in the RAE, and resulted mainly from existing facility rather than from new hires.

[2] Sastry and Bekhadnia (2006) estimate that the RAE has a cost of about £100 million over seven years, although they point out that this may be smaller than the costs of other funding allocation mechanisms. In New Zealand the total compliance and administrative costs of the 2003 Quality Evaluation were estimated to be equivalent to between 2-14 percent of the total allocated PBRF funding for the period 2004-2006 (WEB Research, 2004).
[3] The likelihood of response and inclusion of a CV on a website may be related to research performance.
[4] Moore et al (2002) define quality journals as those in a list of 60 top journals. Their model for highly ranked departments does not include publications in other journals.

In this paper we use data collected by the authors on the rank and publication records of all New Zealand academic economists both prior to the introduction of the PBRF and immediately after the second assessment round.[5] Since this assessment, like others, aims to raise research quality, individual academics should perceive rising returns to publication quality at the expense of the returns to quantity. We therefore test this prediction by regressing academic rank on indicators of lifetime quantity and quality of journal articles published by each academic. Surprisingly, the results indicate that the returns to the quantity of publications exceed the returns to quality in both periods, and difference-in-difference estimates suggest that the relative returns to quality have gone down rather than up.

The PBRF is well suited for this type of study because unlike the British RAE, where the unit of assessment is a department or group, in the PBRF the unit of assessment is the individual academic. According to one New Zealand vice-chancellor, who is also an expert on industrial relations, the unique feature of the PBRF is that it establishes a one-to-one relationship between the research performance of individual academic staff and the reputation and revenue of the institution (Walsh, 2004). Thus the impact of the PBRF should be quickly reflected in the relative rewards accruing to various academic activities, including the rewards for quality versus quantity of publications and we test this proposition with our empirical models.

Moreover, there has been high turnover in New Zealand universities, in part due to recruitment efforts to improve PBRF scores. For example, in the data described below only one-half of academics in New Zealand university economics departments in 2007 were present in 1999.

[5] These data supplement some that were previously collected and used for departmental ranking exercises by Gibson (2000) and Anderson and Tressler (2008).

Thus even if the remaining vestiges of a tenure system make it difficult for universities to change the labour market conditions of incumbent academics, the relationship between research productivity and rewards for the substantial number of new entrants should reflect the changed incentive structure. We use this feature of the New Zealand data to provide a further test of the hypothesis that research assessments raise the returns to publication quality relative to quantity.

In the next section we review the PBRF process and the outcomes of the 2003 and 2006 rounds, noting the emphasis placed on the quality of research outcomes. The empirical model and the data used are introduced in Section III. In Section IV we present our results and use these to show how the PBRF era influenced the academic labour market in New Zealand, concentrating in particular on changes in the importance of the quantity and quality of research. The key conclusions of the paper are summarized in Section V.

II. The Performance-Based Research Fund and the Quality Evaluation Assessments

The Performance-Based Research Fund (PBRF) was established in 2003 and now provides over one-fifth of university income in New Zealand. The primary goal is for excellent research in the tertiary education sector to be encouraged and rewarded. Specifically, the PBRF attempts:

- to reward and encourage the quality of researchers - 60 percent of the fund
- to reflect research degree completions - 25 percent of the fund
- to reflect external research income - 15 percent of the fund

Sixty percent of the PBRF allocation is based on a Quality Evaluation, which was first completed in 2003 with a second, partial, round in 2006. In the first evaluation, over 8000 academics selected a discipline (from a choice of 41) under which their research would be evaluated, and

submitted an Evidence Portfolio to one of 12 peer review panels (including one for "Business and Economics") summarizing their research activity from 1 January 1997 to 31 December 2002. These portfolios could list up to 50 research outputs, with the four self-nominated as most significant provided in full so panelists could read them. In addition, the portfolios provided indications of Peer Esteem (PE), such as awards and citations, and Contributions to the Research Environment (CRE), such as research student supervision. A grade for each academic was calculated by the panels, using a weighting of 70 percent for the research outputs, and 15 percent for each of the PE and CRE components. These grades of R (research inactive), C (good quality research), B (very good quality research), and A (world class research) were also converted into numeric points with values of zero (R), 2 (C), 6 (B) and 10 (A). These points were then averaged across reporting units and results for each department and university were publicized. The resulting rankings of universities, together with annual data on research degree completions and external research income provides the basis for the annual PBRF funding allocation.

In the first quality evaluation the panels assigned relatively few high grades, with only 5.7 (23.2) percent of PBRF-eligible staff receiving an A (B) grade and almost 40 percent getting an R (Boston, et al, 2005). The rankings in Economics were little better, with five percent receiving an A grade, 31 percent receiving a B and 34 percent an R. Scores were higher in the second evaluation, covering the six years from 1 January 2000 to 31 December 2005, although it is not clear if this resulted from changes in the rules,[6] more generous panels, better writing of evidence

[6] Two new grades were introduced for New and Emergent researchers, R(NE) and C(NE) and it was also possible for academics to carry forward their 2003 grade, making it only a 'partial' round. However, since most academics scored worse in 2003 than expected, a majority (two-thirds for economics) put forward new portfolios and were reevaluated.

portfolios, recruitment of more productive academics,[7] or from genuine improvement in research performance. Across all subjects, the number getting either an A or B rose from 29 percent in 2003 to 33 percent, while for economics, the second evaluation gave an A grade to seven percent, a B grade to 38 percent and the R grade to only 16 percent.

The research assessment for the PBRF is meant to be a quality-orientated exercise. This is apparent both from the low requirement for quantity – only two-thirds of an article per year is needed to assemble an evidence portfolio – and from statements of various sector leaders and researchers. For example, according to the Minister of Tertiary Education: "[T]he PBRF furthers government's aim of improving the average quality of research in the tertiary system and this funding increase will provide additional incentives for tertiary education organisations to strive for research excellence" (Mallard, 2005). The quality assessment is also likely to alter publication strategies. According to Boston et al (2005) the PBRF raises the risk that social scientists will be less inclined to pursue research of an applied nature and research with a strong New Zealand orientation, and that they will be less inclined to publish the results of their research in local journals. However these propositions about raising average quality and changing publication strategies have never been tested in any formal manner.

III. The Empirical Model

There is a substantial literature involving empirical studies of the academic labour market in general, and the market for academic economists specifically.[8] This research has been used to

[7] Of the 218 new A grades that were assigned in the 2006 Quality Evaluation (with 412 carried over from 2003), 48 of them (22 percent) were appointments from overseas, as universities used recruitment as a device to raise their quality score.

[8] Coupé (2004) provides a recent review of research on the market for academic economists.

consider the negative impact of seniority (Ransom, 1994, Moore et al, 1998, Bratsberg et al, 2003), the return to citations and publications (Moore et al, 2001, Hamermesh, 1989), co-authorship (Sauer, 1988, Moore et al, 2001, Hilmer and Hilmer, 2005), comparisons of returns to research productivity in the U.S. and U.K. (Moore et al, 2007) and economic journal and department rankings Gibson (2000). In this literature a standard approach is to estimate annual salaries as a function of various measures of research productivity and individual characteristics that might affect earnings such as experience (the number of years since receiving a PhD or publication of the first article if earlier), seniority (the number of years at the same institution), quadratic terms associated with experience and seniority, gender, rank administrative responsibility and other variables.

In this paper we use a model in this class to determine whether there have been changes in the academic labour market in the PBRF era, considering in particular whether there have been changes to the returns to the quantity and quality of research. The relationship between some measure of the outcome in the market, income or academic rank, y_j and measures of research quantity and quality, n_1 and n_2 by academic j over their career is assumed to be:

$$y_j = \alpha_1 n_{1j} + \alpha_2 n_{2j} + \beta_1 x_{1j} + \Lambda + \beta_k x_{kj} + u_j,$$

where x_i (i=1,...,k) are control variables reflecting characteristics of individual j that might affect market outcomes and u_j is a random disturbance.

Our dependent variable is academic rank (Lecturer, Senior Lecturer, Associate Professor and Professor). This has a number of advantages compared with salary, which is the more typically used dependent variable. Academic rank is easily observable whereas individual salaries can

only be obtained from surveys, which are likely to be subject to both non-response and reporting biases. For example, previous surveys of academic economists obtain response rates as low as 13 percent (Moore et al, 2007) so robust inferences from such samples are unlikely. Also, Beil and Laband (1996) report that economists appear to understate their income when paying income-contingent professional memberships (to the AEA) so they also may mis-report when answering surveys.

As noted by Boyle (2006) the New Zealand academic system involves the four principal ranks within which there are a number of salary steps. The salary paid to an individual within each rank step is determined by collective agreement negotiated annually with the academic trade union. These salary levels are common to all disciplines except for medicine and dentistry. Academics on individual contracts are usually offered a salary directly related to that negotiated with the union. A salary premium over and above the standard scale is only occasionally paid. Thus academic rank is likely to be a good proxy for salaries in New Zealand.

Academic rank also may be better than salary as an empirical approximation to the utility term in academics' objective function. The problem with replacing the theoretical utility term with an (potentially) observable salary term is that academics are unlikely to be salary maximisers. The pecuniary returns to economists are much greater outside of academia so if it is only salary that academic economists were maximizing they would appear to be employed in the wrong sector. However, since academic rank also captures prestige and perhaps avoidance of unpleasant duties (e.g., teaching first year classes), it may be a more relevant dependent variable than is salary.

Research output is evaluated by considering all refereed articles published in journals included in the *EconLit* database by economists in New Zealand economics departments with a rank of lecturer or above. While it may be desirable to have information on publications other than refereed journals including books, monographs such data are not readily available. However, the bias from these omissions may not be too serious. For example, a previous study of academic economists in New Zealand estimated that the returns to publishing a sole-authored book were equivalent to those from publishing only four pages in a top journal or equivalently six pages in a second tier journal.[9]

Two datasets are used. The first covers members of New Zealand economics departments as at April 1999 and includes their lifetime journal articles, as recorded in *EconLit*, published up until 31 December, 1998.[10] Although originally collected for another purpose by Gibson (2000), this dataset is useful for our purposes because it corresponds to a period before the announcement and implementation of the PBRF. The second dataset is for members of New Zealand economics departments as at April 2007, which is just nine months after the Census date for the second PBRF quality evaluation, and this dataset includes lifetime journal articles published up until 31 December 2006.

Following the usual practice we use a "share and size adjusted page" as our unit of output. Multi-authored papers have shares allocated to individuals using the 1/n rule, where n is the number of authors. We also do not distinguish whether an individual is the lead author amongst

[9] These "top" and "second tier" journal groups had 12 and 23 members. The full list is reported by Gibson (2000) and is based on previous groupings made by Bairam (1996) and Towe and Wright (1995).
[10] The starting date for the electronic records in *EconLit* is 1969 and only two academics in New Zealand economics departments in 1999 had articles dating to that year.

co-authors for papers with multiple authors. Evidence in favour of these assumptions is provided by Sauer (1998), Hilmer and Hilmer (2005) and several other studies. Page sizes are adjusted to *Economic Record* page equivalents using correction factors derived from Towe and Wright (1995) and Gibson (2000) for 171 journals. These journals include all of the journals in the top three tiers of the four tier ranking used by Towe and Wright (1995) and also many from the bottom tier. The other journals for which size correction factors were not calculated are in the bottom tier and they are given the average size correction of bottom tier journals (0.60).

Four measures of research quality are developed based on journal weighting schemes commonly used in the literature. Mason, Steagall and Fabritius (1997) (MSF) develop a weighting scheme based on a 1993 survey of U.S. economic department chairs. Respondents were asked to rank journals on the basis of 'four' for the best to 'zero' for the worst. They provide weights for 157 journals. Kalaitzidakis, Mamuneas and Stengos (2003) (KMS) use 1998 citation counts to rank 143 journals. The weighting scheme used adjusts for the age and size of the journal, as well as self-citations and journal impact. Coupé (2003) uses a similar citation based methodology, but covers a broader range of 273 journals. We use Coupé's Impact Factor weighting scheme. Bauwens (1998) uses citation counts and impact factors to allocate journals to four groups, with all other journals placed in Group 5. The top group, Group One, is given a weight of 5 while a weight of 1 is given for Group Five.

All four weighting schemes are scaled so that the *Economic Record* is 1.0. The quality measures are the difference between the total of weighted and unweighted share and size adjusted pages. Thus the addition of a page published in the *Economic Record* would not raise an individual's

quality score, while if they publish in higher ranked journals their quality score increases and publishing in a journal ranked below the *Economic Record* lowers the quality score.[11]

In addition to publication in refereed journals, academic rank is likely to depend on qualifications, experience, seniority, and possibly other research outputs and achievements in teaching and service. To obtain information on some of these factors, the university *Calendars* were checked to see how many years each economist had been with their current university, whether they held a PhD, and where and when that PhD was from. The quality of the PhD granting institution is measured by a binary variable, which equals 1 if the department was one of the top thirty contributors to one or more of five premier journals in economics (Bairam, 1994).[12] While it might be desirable to have information on other outputs including teaching and service, data on these were not available.

Table 1 presents descriptive statistics on the two datasets. In the first year, before PBRF, there was a 70:30 split in academic rank, with 70 percent being either a Senior Lecturer or Lecturer and only 30 percent being either an Associate Professor or Professor. Eight years later, after the second PBRF assessment, there was a 60:40 split as the number of Associate Professors and Professors increased and the number of Senior Lecturers decreased. The average quantity of research output, as measured by share-and-size-adjusted-pages was one-third higher in 2007 while average quality was somewhat lower using three of the quality measures and higher using the fourth (Coupé weights). Despite this change in academic ranks, the demographic structure was largely the same

[11] We initially considered using *New Zealand Economic Papers* (NZEP) as our numeraire since it is the most popular publishing outlet for New Zealand economists (*Economic Record* is third) but NZEP is not ranked in some of these journal weighting schemes so the quality-weighted pages would be zero given the implicit quality weight of zero for NZEP.

[12] The five journals are the *American Economic Review*, *Econometrica*, the *Economic Journal*, the *Journal of Political Economy*, and *the Quarterly Journal of Economics*.

in terms of experience (13.9 versus 14.8 years), seniority (10.3 years in both periods), gender (86 percent male versus 78 percent male) and whether holding a PhD (83 percent versus 90 percent) and whether that PhD was from a ranked department (36 percent versus 31 percent). This stability in demographic characteristics occurred despite high turnover, with slightly less than one-half of the academics in 2007 also present in New Zealand economics departments in 1999.

The estimation is carried out using ordered logit models where the probability of observing outcome *i* (e.g., holding Professorial rank) corresponds to the probability that the estimated linear score function, plus random error, u_j is within the range of *cut points* established for the outcome:

$$\Pr\left(\text{outcome}_j = i\right) = \Pr\left(\kappa_{i-1} < \alpha_1 n_{1j} + \alpha_2 n_{2j} + \beta_1 x_{1j} + \Lambda + \beta_k x_{kj} + \sum_{m=1}^{8} \delta_m + u_j \le \kappa_i\right)$$

where the α and β coefficients are estimated together with the cut points, κ_1, κ_2, and κ_3.[13] These cut points give the required value of the score function needed to move from one academic rank to the next. There are also a set of fixed effects δ_m included, for the (m=8) universities since academic rank may also be influenced by the characteristics of the employing institution. For example, some institutions may have to offer applicants a higher academic rank to compensate for some drawbacks of the working environment.

IV. Results

Table 2 contains the ordered logit results for the determinants of academic rank in New Zealand economics departments in 1999, prior to the implementation of the PBRF. There are four sets of estimates, alternately using the Bauwens, Coupé, KMS and MSF weights for journals when

[13] An ordered probit model was also used and gave similar results. Ordered logit assumes that u_j is logistically distributed while ordered probit assumes that it is normally distributed.

constructing the measure of lifetime publication *Quality*. However, the patterns amongst the coefficient estimates are similar with all four sets of weights.

The probability of holding higher academic rank rises with increases in both the quantity and quality of publications. Since the coefficients are not directly interpretable a set of marginal effects for one standard deviation increases in either quantity or quality are calculated and reported along with their bootstrapped standard errors in Table 3. There are four of these marginal effects for each of these ordered logit regressions, since the dependent variable has four outcomes. For example, according to the ordered logit regression when the quality measure uses Bauwens weights, a standard deviation increase in the quantity of (share-and-size-adjusted) journal pages reduces the probability of being a Lecturer (Senior Lecturer) by an average of 9.5 (7.7) percentage points while increasing the probability of being a (Associate) Professor by (3.8) 13.4 percentage points. In comparison, the responses to the standard deviation increase in quality are always slightly smaller in absolute value, at -8.0 (-5.8) percentage points for being a Lecturer (Senior Lecturer) and (3.1) 10.6 percentage points for being a (Associate) Professor.

The pattern of slightly larger marginal effects for increases in quantity than for increases in quality holds regardless of the set of journal weights that are used. However, for the Bauwens, Coupé and KMS weights, not only are the differences in the marginal effects for quality and quantity usually small, with absolute values averaging 1.1 percentage points, they are also not statistically significant. But when the MSF weights are used the difference is more substantial with marginal effects for quantity 11.3 percentage points more than marginal effects for quality at the Professorial level. Moreover, for three of the four levels of academic rank (Associate

Professor is the exception) the difference is statistically significant. Thus it appears that prior to the PBRF and its quality evaluation exercises the New Zealand labour market for academic economists may have rewarded quantity by slightly more than it rewarded quality, although the hypothesis of equal returns cannot be rejected when using some sets of quality weights.

Before turning to how the returns to quality and quantity had changed by 2007 it is worth considering the results for the other variables. According to Table 2, the probability of holding higher academic rank in 1999 rose with years of experience but at a declining rate. Seniority in terms of the number of years employed at the current university had no significant effect once experience is controlled for. There was a large effect of holding a PhD, with the magnitude of the coefficient on this single variable being about one half of that needed to move either from Lecturer to Senior Lecturer or from Senior Lecturer to Associate Professor. There is weak evidence to suggest that economists with PhDs from more highly ranked departments were less likely to hold higher academic rank and there was no significant effect of gender. Amongst the fixed effects the only significant variables are for Lincoln, where academic rank was higher than would be predicted by the other variables and Canterbury where it was lower (but the effect is statistically significant only with the Bauwens weights).

Table 4 contains the ordered logit results for the determinants of academic rank in New Zealand economics departments in 2007, just after the second PBRF Quality Evaluation. While the pattern of results is generally similar to those for 1999 in Table 2 there are several key differences. First, the coefficients on the quality variable are smaller, regardless of the weighting scheme used, and less statistically significant (falling from significant at the one percent level to

the ten percent level when using the KMS weights and from one percent to the five percent level when using the Coupé weights). Second, there is now a negative return to seniority, which is statistically significant at the five percent level in three of the four regressions; this finding is consistent with Ransom (1994) who explains it in terms of the monoposony power of universities that enables lower salaries to be paid to less mobile academics. As Bratsberg et al (2003) note, negative returns could also be the result of "raiding" as high-quality faculty are bid away.[14] Thus the increased significance of a negative return to seniority could be the result of the impact of PBRF on faculty turnover. Third, the premium for being male becomes (weakly) statistically significant in two of the regressions. Finally, the pattern of fixed effects has changed with the only university where academic rank was (statistically significantly) higher than would be predicted by the other variables being the new entrant, AUT, and Victoria being the only one where it was significantly lower (in two of the four specifications).[15] The shifting nature of these fixed effects suggests that it is not possible for individual departments in New Zealand to deviate in the long run from average norms for the productivity level of particular academic ranks, since migration of academics to better rewarded departments should erode any premia.

The marginal effects for quality and quantity in 2007 are reported in Table 5. In comparison with the results in Table 3, the marginal effects for quantity are larger (in absolute terms) than the corresponding values in 1999 for 15 of the 16 combinations (the exception is for the probability of being an Association Professor when using the MSF weights). In contrast, for 12 of the 16 combinations, the marginal effects for quality are smaller (in absolute terms) in 2007 than in

[14] Moore et al argue that the estimated negative returns may be the result of a failure to control for the quality of faculty research Moore et al (1998). In contrast Bratsberg et al argue that a failure to control for the positive impact of matching is likely to cause the negative impact of seniority to be underestimated.
[15] The statistically negative fixed effects for Victoria persist even if observations from AUT are dropped from the estimation sample.

1999. Across all sets of weights and levels of academic rank, the gap between the marginal effects for quantity and those for quality in 2007 average 7.6 percentage points, compared with an average gap of 2.5 percentage points in 1999. Furthermore, nine of the 16 differences in marginal effects for quantity and quality in Table 5 are statistically significant whereas only three of 16 were in Table 3, further suggesting that there were significantly higher returns to the quantity than to quality of research in 2007, whereas such a gap was less apparent in 1999.

The differing returns to quality and quantity in 2007 are especially apparent at the Professorial level. Using either the Bauwens, KMS or MSF weights, a standard deviation increase in the total number of pages published raises the probability of being a Professor by at least 10 percentage points more than a similarly sized increase in the quality of publications, averaged over all academics in New Zealand university economics departments. Using the MSF weights, the gap in marginal effects is twenty percentage points (with a standard error of six percentage points).

Corroborating evidence that there has been a rise in the returns to quantity but not to quality comes from comparing the determinants of academic rank for "incumbent" and "new" faculty in New Zealand economics departments. The logic of this comparison is that while it may be hard for universities to change the labour market conditions of incumbents (unproductive Professors are not demoted to Senior Lecturer), the relationship between research productivity and rewards for new entrants should better reflect contemporary changes in incentive structure. One-half (65/131) of the academic economists in 2007 were not faculty in New Zealand economics departments in 1999 so the ordered logits for 2007 are augmented with an interaction term for these "new" faculty. Although these new faculty have less experience than the incumbents

(Table 6, column 1), only one-third were Lecturers, and almost one-quarter were Associate Professors or Professors since there was a lot of recruitment at senior levels in the PBRF era.

The results reported in Table 6 show that a considerable premium for *quantity* but not quality accrued to academics that were relatively new arrivals to New Zealand university economics departments in 2007. Using all four weighting schemes, the (Quantity × New) interaction term is statistically significant and large, compared with the quantity term for the incumbents. Thus, a share-and-size adjusted page published by new entrants to New Zealand university economics departments increases the linear score function determining academic rank by much more than does the same page for incumbents. In contrast, the (Quality × New) interaction is always close to zero and is statistically insignificant, indicating no quality premium accruing to the new entrants. In terms of marginal effects, the difference-in-differences:

$$\left((\Delta P/\Delta X)_{QUAN} - (\Delta P/\Delta X)_{QUAL}\right)_{NEW} - \left((\Delta P/\Delta X)_{QUAN} - (\Delta P/\Delta X)_{QUAL}\right)_{INCUMBENT}$$

average 14.3 percentage points across all four academic ranks and all four weighting schemes.[16] To the extent that the relationship between productivity and academic rank for new entrants better reflects current incentive structures than does the relationship for incumbents, it appears that contrary to the professed aims of the PBRF there has been an increased reward for quantity but not for quality amongst academic economists in New Zealand.

V. Conclusions

Research assessment exercises like the Quality Evaluation for New Zealand's Performance Based Research Fund typically aim to increase the quality of research in the university sector.

[16] To save space these marginal effects estimates are not reported but can be obtained from the authors.

Such exercises can also be expected to impact on the operation of the academic labour market and the signals that researchers observe. If research exercises are successful in increasing the quality of research we would expect this to be indicated by an increase in the importance of quality in determining academic salaries or rank.

In this paper we have provided empirical estimates of the impact of the PBRF research assessment exercise on the academic labour market using data on the rank and publication records of all New Zealand academic economists employed by economics departments both prior to the introduction of PBRF and immediately after the second assessment round in 2006. Contrary to expectations, our results suggest that the introduction of the PBRF process has decreased the importance of quality and increased the importance of quantity in determining the academic rank of New Zealand economists. Amongst the other estimated changes in the New Zealand market is an increase in the statistical significance of a negative return to seniority, possibly associated with increased turnover of economists.

If the results in this paper are representative of the impact of the PBRF for other disciplines and for other evaluation exercises, then they throw further doubt on the likelihood that static or dynamic gains could outweigh the direct and indirect costs of such assessments. Since our methodology does not rely on specialized surveys, and instead uses an electronic bibliography, *EconLit* that is agreed upon as a measure of most research within the discipline, it would be possible for future studies to follow our approach both for other disciplines in New Zealand and for economists in other countries. Firmer conclusions might then be drawn about whether research assessment exercises actually do raise returns to quality in academic labour markets.

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Table 1: Variable Definitions and Means (Standard Deviations)

Variable	1999	2007	Description
Dependent Variables			
Professor	0.139	0.199	Academic is a Professor (=1), otherwise =0
Assoc. Professor	0.157	0.199	Academic is an Associate Professor (=1), otherwise =0
Senior Lecturer	0.519	0.420	Academic is a Senior Lecturer (=1), otherwise =0
Lecturer	0.185	0.183	Academic is a Lecturer (=1), otherwise =0
Explanatory Variables			
Quantity	46.407	62.056	Lifetime quantity of *Economic Record*-sized journal pages published (adjusted for number of co-authors)
	(54.390)	(76.463)	
Quality measures			
Bauwens	2.819	-0.455	Difference between impact-weighted (using Bauwens weights) lifetime pages published and *Quantity*
	(25.270)	(27.726)	
Coupé	30.380	36.066	Difference between impact-weighted (using Coupé impact factor) lifetime pages published and *Quantity*
	(88.417)	(112.305)	
KMS	69.085	45.632	Difference between impact-weighted (using KMS impact factors) lifetime pages published and *Quantity*
	(261.613)	(189.830)	
MSF	-20.211	-32.772	Difference between impact-weighted (with MSF perception based weights) lifetime pages published and *Quantity*
	(31.478)	(48.804)	
Demographic controls			
Experience	13.917	14.817	Years since receipt of highest degree (or publication of first article if earlier)
	(7.715)	(9.916)	
Seniority	10.287	10.344	Years of employment at current university
	(7.413)	(8.704)	
PhD?	0.833	0.901	Highest degree is PhD
	(0.374)	(0.300)	
Ranked PhD?	0.361	0.313	PhD is from a department in top 30 contributors to one or more of the leading five journals (from Bairam, 1994)
	(0.483)	(0.465)	
Male	0.861	0.779	Person is male (=1) or female (=0)
	(0.347)	(0.417)	
In Previous Data?	...	0.496	Person was in the 1999 dataset (=1)
		(0.502)	
Observations	108	131	

Table 2: Determinants of Academic Rank: New Zealand Economists, 1999

	Weighting Scheme for Journal Impact Factors			
	Bauwens	Coupé	KMS	MSF
Quantity	0.036	0.026	0.027	0.057
	(5.24)**	(4.32)**	(3.71)**	(4.02)**
Quality	0.063	0.015	0.005	0.058
	(3.88)**	(2.82)**	(2.75)**	(3.36)**
Experience	0.563	0.513	0.512	0.581
	(3.66)**	(3.34)**	(3.36)**	(3.62)**
Experience squared	-0.010	-0.008	-0.007	-0.010
	(2.21)*	(1.55)	(1.49)	(2.15)*
Seniority	0.080	0.024	0.015	0.058
	(1.08)	(0.23)	(0.16)	(0.68)
PhD?	3.133	2.672	2.935	3.268
	(3.17)**	(3.05)**	(3.40)**	(3.51)**
Ranked PhD?	-1.526	-1.275	-0.814	-1.140
	(1.74)+	(1.56)	(1.10)	(1.41)
Male	0.934	0.649	0.088	0.153
	(1.44)	(1.15)	(0.15)	(0.26)
Fixed Effects				
Canterbury	-1.786	-1.726	-1.296	-1.311
	(1.88)+	(1.57)	(1.30)	(1.27)
Lincoln	1.898	1.801	2.208	1.793
	(2.28)*	(2.25)*	(2.61)**	(2.00)*
Massey	0.285	0.539	0.780	0.730
	(0.26)	(0.50)	(0.69)	(0.68)
Otago	-0.322	0.106	0.562	0.220
	(0.41)	(0.14)	(0.65)	(0.22)
Victoria	0.068	0.303	0.925	0.678
	(0.09)	(0.43)	(1.27)	(0.86)
Waikato	-0.058	0.344	0.736	0.010
	(0.05)	(0.36)	(0.83)	(0.01)
Cut Points				
Senior Lecturer	7.098	6.085	6.429	6.914
Associate Professor	13.040	11.557	11.700	12.320
Professor	15.325	13.693	13.801	14.596
Pseudo-R^2	0.505	0.470	0.456	0.479
Zero-slopes χ^2 test	80.40**	85.68**	71.27**	68.78**

Note: Robust *t*-statistics in ( ), with statistical significance at 10%, 5% and 1% level denoted by +, *, **. *N*=108. The excluded dummy category is a female without a PhD at Auckland. The cut-points give the value that needs to be exceeded by the linear index (plus random error) to allocate the *j*th person to a particular academic rank.

Table 3: Marginal Effects for Quantity and Quality, 1999

	Quantity		Quality		Abs. difference	Std
	$\Delta P/\Delta X$	std error	$\Delta P/\Delta X$	std error	(Quant – Qual)	error
Prob of being a:			*Bauwens weights*			
Lecturer	-0.095	0.025	-0.080	0.026	0.015	0.019
Senior Lecturer	-0.077	0.044	-0.058	0.041	0.019	0.027
Assoc. Professor	0.038	0.035	0.031	0.030	0.007	0.014
Professor	0.134	0.038	0.106	0.042	0.027	0.034
Prob of being a:			*Coupé weights*			
Lecturer	-0.079	0.025	-0.075	0.026	0.003	0.025
Senior Lecturer	-0.054	0.032	-0.050	0.033	0.004	0.032
Assoc. Professor	0.036	0.032	0.034	0.028	0.002	0.016
Professor	0.097	0.025	0.091	0.037	0.006	0.042
Prob of being a:			*KMS weights*			
Lecturer	-0.082	0.023	-0.072	0.027	0.010	0.026
Senior Lecturer	-0.059	0.041	-0.047	0.053	0.012	0.035
Assoc. Professor	0.037	0.027	0.032	0.028	0.005	0.016
Professor	0.104	0.035	0.087	0.051	0.017	0.045
Prob of being a:			*MSF weights*			
Lecturer	-0.141	0.032	-0.095	0.027	0.045	0.018
Senior Lecturer	-0.169	0.073	-0.075	0.046	0.094	0.042
Assoc. Professor	0.074	0.042	0.048	0.030	0.026	0.025
Professor	0.236	0.072	0.122	0.046	0.113	0.046

Notes:

The marginal effects, $\partial P/\partial X$, are the change in the predicted probabilities following a one standard deviation increase in either Quantity or Quality, with all other variables held at their original position and using the coefficients in Table 2 to generate the predictions. The reported values are averaged over all observations. The standard errors are calculated from 100 bootstrap replications.

Table 4: Determinants of Academic Rank: New Zealand Economists, 2007

	Weighting Scheme for Journal Impact Factors			
	Bauwens	Coupé	KMS	MSF
Quantity	0.033	0.023	0.025	0.044
	(6.33)**	(4.82)**	(4.09)**	(3.51)**
Quality	0.045	0.008	0.003	0.030
	(3.60)**	(2.43)*	(1.90)+	(2.21)*
Experience	0.335	0.372	0.380	0.377
	(3.43)**	(4.11)**	(4.34)**	(4.16)**
Experience squared	-0.004	-0.005	-0.005	-0.005
	(1.69)+	(1.91)+	(2.06)*	(2.02)*
Seniority	-0.084	-0.109	-0.115	-0.112
	(1.62)	(2.21)*	(2.38)*	(2.22)*
PhD?	1.722	1.804	1.840	1.738
	(2.01)*	(2.16)*	(2.19)*	(2.06)*
Ranked PhD?	-0.838	-0.646	-0.760	-0.495
	(1.21)	(0.85)	(1.03)	(0.75)
Male	0.759	0.746	0.730	0.686
	(1.68)+	(1.68)+	(1.64)	(1.53)
Fixed Effects				
AUT	2.134	1.885	1.905	2.010
	(2.17)*	(2.18)*	(2.32)*	(2.12)*
Canterbury	-0.714	-0.878	-0.663	-0.604
	(0.90)	(1.02)	(0.78)	(0.74)
Lincoln	0.981	0.741	0.763	1.035
	(0.98)	(0.77)	(0.80)	(0.98)
Massey	1.185	1.043	1.002	1.129
	(1.59)	(1.36)	(1.22)	(1.44)
Otago	-0.855	-0.825	-0.763	-0.837
	(0.97)	(0.95)	(0.86)	(0.97)
Victoria	-1.364	-1.353	-0.868	-0.984
	(2.13)*	(2.11)*	(1.40)	(1.59)
Waikato	0.495	0.377	0.474	0.511
	(0.57)	(0.44)	(0.57)	(0.58)
Cut Points				
Senior Lecturer	3.195	3.236	3.360	3.282
Associate Professor	7.284	7.187	7.305	7.205
Professor	9.686	9.509	9.527	9.494
Pseudo-R^2	0.449	0.429	0.416	0.422
Zero-slopes χ^2 test	120.71**	102.38**	76.51**	77.53**

Note: Robust *t*-statistics in ( ), with statistical significance at 10%, 5% and 1% level denoted by +, *, **. *N*=131. The excluded dummy category is a female without a PhD at Auckland. The cut-points give the value that needs to be exceeded by the linear index (plus random error) to allocate the *j*th person to a particular academic rank.

Table 5: Marginal Effects for Quantity and Quality, 2007

	Quantity		Quality		Abs. difference	Std
	$\Delta P/\Delta X$	std error	$\Delta P/\Delta X$	std error	(Quant – Qual)	error
Prob of being a:			*Bauwens weights*			
Lecturer	-0.136	0.036	-0.081	0.030	0.055	0.027
Senior Lecturer	-0.141	0.059	-0.051	0.041	0.090	0.045
Assoc. Professor	0.072	0.043	0.044	0.030	0.028	0.030
Professor	0.205	0.053	0.089	0.038	0.116	0.048
Prob of being a:			*Coupé weights*			
Lecturer	-0.109	0.035	-0.063	0.030	0.046	0.039
Senior Lecturer	-0.086	0.042	-0.033	0.036	0.053	0.050
Assoc. Professor	0.056	0.034	0.031	0.024	0.025	0.032
Professor	0.139	0.045	0.064	0.040	0.075	0.060
Prob of being a:			*KMS weights*			
Lecturer	-0.118	0.033	-0.038	0.025	0.079	0.038
Senior Lecturer	-0.096	0.044	-0.016	0.018	0.080	0.043
Assoc. Professor	0.052	0.032	0.016	0.015	0.035	0.032
Professor	0.162	0.048	0.038	0.026	0.125	0.052
Prob of being a:			*MSF weights*			
Lecturer	-0.162	0.036	-0.098	0.039	0.063	0.035
Senior Lecturer	-0.212	0.084	-0.068	0.060	0.144	0.051
Assoc. Professor	0.060	0.047	0.050	0.034	0.011	0.046
Professor	0.314	0.103	0.117	0.069	0.197	0.060

Notes:

The marginal effects, $\partial P/\partial X$, are the change in the predicted probabilities following a one standard deviation increase in either Quantity or Quality, with all other variables held at their original position and using the coefficients in Table 4 to generate the predictions. The reported values are averaged over all observations. The standard errors are calculated from 100 bootstrap replications.

Table 6: Differences Between Incumbent and New Faculty in the Determinants of Academic Rank: New Zealand Economists, 2007

	Means Incumbent (New)	Weighting Scheme for Journal Impact Factors			
		Bauwens	Coupé	KMS	MSF
New (not in 1999 data)	0.496	-1.485	-1.222	-0.931	-1.014
		(0.55)	(0.46)	(0.35)	(0.38)
Quantity	80.817	0.028	0.017	0.018	0.038
	(43.413)	(4.10)**	(3.42)**	(3.37)**	(3.21)**
Quantity × New		0.039	0.040	0.051	0.059
		(2.12)*	(2.28)*	(3.02)**	(2.11)*
Quality	46.948	0.052	0.010	0.003	0.035
	(44.296)	(3.23)**	(2.32)*	(1.59)	(2.19)*
Quality × New		-0.001	-0.000	0.003	0.018
		(0.02)	(0.00)	(0.95)	(0.56)
Experience	21.939	0.051	0.118	0.091	0.063
	(7.585)	(0.24)	(0.59)	(0.45)	(0.31)
Experience × New		0.320	0.265	0.185	0.285
		(1.03)	(0.88)	(0.60)	(0.93)
Experience squared	538.697	0.002	0.001	0.002	0.002
	(92.108)	(0.48)	(0.28)	(0.44)	(0.48)
Exper squared × New		-0.012	-0.011	-0.009	-0.010
		(1.35)	(1.19)	(0.93)	(1.05)
Seniority	16.893	-0.092	-0.121	-0.107	-0.084
	(3.692)	(1.65)+	(2.28)*	(2.00)*	(1.49)
Seniority × New		-0.007	0.014	0.114	-0.039
		(0.03)	(0.07)	(0.60)	(0.21)
PhD?	0.864	3.488	3.499	3.639	3.477
	(0.938)	(3.17)**	(3.26)**	(3.37)**	(3.26)**
PhD? × New		-3.363	-3.359	-3.675	-3.529
		(2.09)*	(2.12)*	(2.33)*	(2.23)*
Ranked PhD?	0.318	-2.212	-1.854	-1.590	-1.446
	(0.308)	(2.67)**	(2.28)*	(1.88)+	(1.90)+
Ranked PhD? × New		2.076	1.777	1.047	1.296
		(1.81)+	(1.58)	(0.88)	(1.20)
Male	0.848	1.590	1.396	1.301	1.245
	(0.708)	(1.89)+	(1.71)+	(1.59)	(1.51)
Male × New		-1.384	-1.087	-1.203	-1.133
		(1.25)	(1.01)	(1.11)	(1.05)
Pseudo-R^2		0.500	0.477	0.473	0.479
Zero-slopes χ^2 test		172.84**	164.48**	163.35**	165.32**

Note: Models also include fixed effects for each university, which are not reported. The means for incumbent and new faculty reported in the Quality row are using the KMS weights.
Other notes see Table 4.