



MINISTRY OF EDUCATION

*Te Tāhuhu o te Mātauranga*

# **What determines the research performance of staff in New Zealand's tertiary education sector?**

An analysis of the Performance-Based Research Fund  
Quality Evaluation

*What determines the research performance of staff in New Zealand's tertiary education sector? An analysis of the Performance-Based Research Fund Quality Evaluation*

**Report**

What determines the research performance of staff in New Zealand's tertiary education sector? An analysis of the Performance-Based Research Fund Quality Evaluation.

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## **1 Executive summary**

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Previously, analysis of the research performance of staff in the New Zealand tertiary education sector was limited by a lack of available data and universally accepted measures. However, the introduction of the Performance-Based Research Fund (PBRF) has resulted in a dataset that allows for more detailed analysis of the research performance of staff.

This report uses multiple regression to analyse the research performance<sup>1</sup> of tertiary education staff across a number of dimensions, using PBRF data. These dimensions include the quality of research outputs (RO), peer esteem (PE), contribution to research environment (CRE), an overall weighted measure of quality (OQS) and the probability of staff achieving a level of performance that attracts PBRF funding (staff that attract funding are referred to as 'quality weighted'). The advantage of using multiple regression is that it enables us to control for a subset of explanatory variables and examine the effect of a selected independent variable.

The PBRF dataset allows for the impact of a number of staff characteristics (ranging from demographic information to employment information) on research performance to be analysed, using logistic and ordinary least squares (OLS) regression. However, some factors that are likely to impact on research performance, such as teaching load, were unable to be included in this analysis. The impact of this is that factors included in the model may possibly capture the effects of the omitted variables, resulting in biased results.

The logistic regression analysis uses a dataset that includes 95 percent all PBRF-eligible staff. However, the OLS regression uses a dataset that only contains data for those staff that had evidence portfolios assessed by the review panels. This amounts to about 70 percent of PBRF-eligible staff. Therefore, the results of the OLS analysis should not be interpreted as being representative of the entire PBRF-eligible workforce, but are instead representative of staff that had evidence portfolios peer reviewed.

The regression analysis identified several factors that appear to impact upon the research performance of staff. The age of staff was a factor in research performance. After controlling for other factors, younger researchers aged in their early to mid-20s generally exhibited the lowest levels of research performance. As staff in this age bracket would have found it difficult to have established a strong record of research performance, this result is not surprising. Research performance then tends to increase rapidly with age before appearing to peak for staff aged in their late 30s and early 40s. There would then appear to be signs of a fall-off in research performance for staff aged over 40, before there is a slight upswing for staff aged in their mid-60s and over. A possible reason for the fall off in research performance for staff aged older than in their mid 40s is that administrative and/or supervisory tasks are likely to be greater for this age group, reducing the time available for research.

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<sup>1</sup> Note that research performance refers to the quality of research.

Subgroup analysis showed that associate professors exhibited a slight negative linear relationship between age and research performance. It also appeared that age had only a minor impact on the research performance of professors.

The gender of staff had an impact on the allocated OQS and RO score, with men achieving a slightly higher level of performance than women, holding other factors constant. This was especially the case for lecturers. Generally, gender had no statistically significant effect on the PE and CRE scores allocated to staff, although, in the case of associate professors and senior lecturers, women had a higher level of CRE score than men, once other factors (such as TEO, subject area and age) were controlled for.

Generally, ethnicity had no statistically significant impact on the RO scores and OQS allocated to staff, holding other factors constant. In the case of the allocated PE score, Māori staff performed better than staff from the other ethnic groups. Generally, Asian staff received lower PE and CRE scores than the other ethnic groups.

Analysis of the employment characteristics of staff showed that the higher the full-time equivalent (FTE) status of staff, the higher was the level of research performance, controlling for other factors. Additionally, positions with more of a focus on research generally had a higher level of research performance. Of the main positions, professors generally had the highest level of research performance, followed by associate professors, senior lecturers and then lecturers.

The performance of staff was influenced by the tertiary education organisation they were working at. Generally, staff at the more established metropolitan universities such as Auckland, Canterbury, Otago and Victoria had the highest level of research performance, once other factors had been controlled for. In contrast, the performance of staff at the newest university, Auckland University of Technology (AUT), was generally significantly lower than that of staff at longer-established universities. As AUT was only granted university status in 2000, it does not have the same research history as the older universities and the relatively weaker performance would be expected.

Overall, staff at the participating polytechnics, wānanga and private training establishments (PTEs), where degree teaching may form only a fraction of their teaching load, tended to perform less well than staff at the universities.

The subject area of staff was found to impact on research performance, keeping other factors constant. Overall, subjects in the science area generally had the highest level of research performance. In particular, staff in subjects such as ecology, evolution and behaviour, earth science, anthropology and archaeology and human geography performed well. A notable feature was the high relative performance of these staff in terms of the scores they received for PE and CRE. Staff in the areas of philosophy and Māori knowledge and development also performed well.

An additional finding was that staff in some subjects could perform well in one measure of performance, but not in others. For example, although staff in the area of visual arts and crafts performed well in terms of their RO score (especially males), they performed less well in their PE and CRE scores.

## **2 Introduction**

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Before the introduction of the Performance-Based Research Fund (PBRF), analysis of researcher performance<sup>2</sup> in New Zealand was limited by a lack of appropriate data and a lack of universally accepted measures. Past analysis, therefore, focused on measuring the average performance of staff at the universities. For example, measures such as research output per academic full-time equivalent (FTE) and research income earned per academic FTE have been used to compare the research performance of universities<sup>3</sup>. Other approaches have used points systems based on, for instance, page counts of papers in journals, weighted by the journal's status, as a measure of performance of academic departments<sup>4</sup>.

However, with the collection of data on individual staff performance and characteristics for the PBRF, there is now a dataset available for more advanced methods of analysis. In particular, this dataset allows for an analysis of how factors such as demographic characteristics, position, employment status and subject area impact upon staff research performance<sup>5</sup>.

The measurement of different aspects of staff research performance was undertaken through the 2003 PBRF Quality Evaluation. A total of 8,013 PBRF eligible staff were assigned a quality category that indicated their level of research performance<sup>6</sup>. Approximately 30 percent of these staff did not have evidence portfolios assessed by the peer review panels<sup>7</sup>. The quality categories assigned to staff were A, B, C and R, with an A indicating the highest level of performance and R the lowest.

This report uses multiple regression to analyse the impact of staff demographic and employment characteristics on research performance. The advantage of using multiple regression is that it enables us to control for a subset of explanatory variables and examine the effect of a selected independent variable. For example, this allows us to separate out the confounding effects of the age and position of staff on their research performance.

Firstly, logistic regression is applied to data for all PBRF-eligible staff to analyse the factors that impacted on a staff member being quality weighted (achieving an A, B or C quality category) or not (achieving an R quality category). This is of particular interest as only those staff who were quality weighted attracted funding for their tertiary education organisations (TEOs).

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<sup>2</sup> It is important to recognise that research is just one of the roles of degree teaching staff, along with teaching and service.

<sup>3</sup> See Ministry of Education (2002-2003) *New Zealand's Tertiary Education Sector: Profile and Trends*.

<sup>4</sup> See Bairam (1996) Research Productivity in New Zealand University Economics Departments, 1988-1995, *New Zealand Economic Papers* vol 30 (2), pp 229-241 and Gibson (2000) Research Productivity in New Zealand University Economics Departments: Comment and Update, *New Zealand Economic Papers*, vol 34 (1) June 2000, pp 73-88.

<sup>5</sup> Note that research performance in this report refers to the quality of research.

<sup>6</sup> Staff at all eight universities, two polytechnics, the four colleges of education and eight private training establishments took part in the 2003 Quality Evaluation.

<sup>7</sup> For universities, the proportion of PBRF-eligible staff that were not panel assessed was: 66 percent for Auckland University of Technology, 10 percent for the University of Auckland, 10 percent for Lincoln University, 24 percent for Massey University, 21 percent for the University of Waikato, 22 percent for the University of Otago, 12 percent for Victoria University of Wellington and 8 percent for the University of Canterbury.

Secondly, ordinary least squares (OLS) regression is used to analyse the impact of staff characteristics on the four quality scores allocated to panel assessed staff during the process of assigning quality categories. These quality scores include measures of performance in the areas of research output (RO), peer esteem (PE) and contribution to research environment (CRE). A weighted combination of these three measures, the overall quality score (OQS), is also analysed.

The OLS analysis should be treated with a degree of caution, as it uses information relating only to those staff whose evidence portfolios were panel assessed. If a TEO was more stringent in deciding which portfolios were forwarded to the panels for evaluation, their performance may be inflated, compared with TEOs that may have been less stringent. Therefore, any conclusions about the relative research performance of staff at TEOs or in the various subject areas should not be compared with analysis that includes all PBRF-eligible staff.



### **3 The process of assigning PBRF quality scores and categories<sup>8</sup>**

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The process of assigning quality categories and scores to PBRF-eligible staff in the 2003 Quality Evaluation followed a two-stage process. In the first stage, TEOs rated the research performance of their staff in a self-assessment exercise. The evidence portfolios of staff that were considered to be of an A, B or C quality category standard were forwarded to the subject panels for peer review. The peer review panels then assigned final quality categories to these staff. Staff, whose evidence portfolios were not forwarded to the panels, were assigned an R quality category automatically.

Three measures of research performance contributed to the quality category assigned to staff. These were the quality of research outputs (RO), the esteem in which the staff member was held by their peers (PE) and their contribution to the research environment (CRE). A staff member was assigned a score between 0 and 7 for each of these measures, with 7 representing the highest level of performance<sup>9</sup>. To obtain an overall measure of research performance, the OQS, a weighting of 70 percent was then applied to the research output score, 15 percent to the peer esteem score and 15 percent to the contribution to the research environment.

The OQS was calculated using the following formula that resulted in a score between 0 and 700 for each staff member:

$$\text{OQS} = 70 \times \text{RO} + 15 \times \text{PE} + 15 \times \text{CRE}$$

The OQS was used as an aid by the peer review panels in determining the quality category of staff who were panel assessed. A holistic approach to assigning quality categories was followed and the category could be altered from that indicated by the OQS. As a result, approximately 1 percent of the staff who were panel assessed received a quality category different from that indicated by their OQS.

Generally, an OQS score between 0 and 199 would earn an R quality category for a staff member, a score between 200 and 399 would earn a C quality category, a score between 400 and 599 a B quality category and a score between 600 and 700 an A quality category.

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<sup>8</sup> For more detail on how the Quality Evaluation was carried out see Tertiary Education Commission (2004) *Performance-Based Research Fund: Evaluation Research Excellence: the 2003 Assessment*.

<sup>9</sup> The panels could only assign a score that was a whole number; no fractions of a score were allowed.

## **4 Data**

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The dataset analysed in this study was sourced from the Tertiary Education Commission (TEC). It contained records for 8,013 PBRF-eligible staff. After data quality issues had been addressed, 7,752 records for individual staff were available for the logistic regression analysis of the characteristics that influenced a staff member being quality weighted<sup>10</sup>. The data available included the quality categories of staff, along with demographic variables such as age, gender and ethnicity. Information was also provided on the TEO at which staff were employed, their FTE status and their academic position, along with the subject area that they were engaged in.

A total of 5,641 individual staff member records were available for the OLS regression analysis of the research quality scores. Fewer records are available in this part of the analysis, as only staff that had evidence portfolios assessed by the peer review panels received the various moderated quality scores<sup>11</sup>. The available data included the various research quality scores, along with the staff characteristics identified above.

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<sup>10</sup> Some staff did not have age recorded in the staff census and were omitted from the analysis.

<sup>11</sup> Although all PBRF-eligible staff had RO, PE and CRE scores assigned as part of the self-assessment exercise, these scores were not moderated and hence were not used in this analysis.

## **5 Methodology**

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### **Regression analysis**<sup>12</sup>

Two forms of multiple regression analysis were used in this analysis<sup>13</sup>. Firstly, logistic regression was used to analyse the impact of staff characteristics on the probability that a staff member was quality weighted. Then, OLS regression was used to analyse the effect of staff characteristics on a variety of quality scores.

The advantage of using multiple regression is that it allows for the effect of multiple staff characteristics on research performance to be analysed. Specifically, the methodology enables us to control for a subset of explanatory variables and examine the effect of a selected independent variable. For example, if a TEO has a large proportion of young researchers on their staff, then this would tend to impact negatively on the TEO's research performance, as younger staff would not have had the opportunity to establish a strong research portfolio. Using multiple regression analysis allows for the impact of the age of staff on TEO performance to be controlled for, allowing the impact of the TEO on staff performance to be more accurately judged.

### **Dependent variables**

#### *Logistic regression model*

As a staff member was either quality weighted, or not, the dependent variable for the logistic regression is binary or dichotomous in nature<sup>14</sup>. If the staff member was quality weighted, the dependent variable was assigned a value of 1, otherwise 0. For the logistic estimation the dependent variable is the natural logarithm of the probability of the staff member being quality weighted divided by (1 minus the probability of being quality weighted). (See equation A in Appendix A.)

#### *OLS regression models*

The RO, PE, CRE and OQS scores received by staff were used as the dependent variables in the OLS analysis. The impact of staff characteristics on each of these scores was analysed separately.

### **Independent variables**

The independent variables selected in the regression models were determined by their relevance and by data availability. The independent variables used in the analysis are discussed in turn below.

#### *Age*

The age of a staff member was included as an explanatory variable in the regression model<sup>15</sup>. It might be expected that the older a staff member is, the more experience and skills he/she should have, which should boost their research performance<sup>16</sup>.

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<sup>12</sup> More detail on the regression methodology can be found in Appendix A.

<sup>13</sup> Stata 8.1 was used to estimate the parameters in the regression analysis.

<sup>14</sup> For the purposes of this analysis, binary logistic regression was used. Future research may involve undertaking an ordered logistic regression analysis to analyse the factors that influenced a researcher achieving a higher quality category.

<sup>15</sup> The age of staff in 2003 was used as the measure of age in this analysis.

<sup>16</sup> It would have been preferable to use the number of years of research experience of each staff member, but this data was not available. Therefore age is used as a proxy.

However, the number of confounding factors makes it difficult to isolate the effect of age on research performance from other staff characteristics. Therefore, a linear, quadratic and cubic functional form were trialled for the relationship between age and research performance in the various regression models. The functional form that provided the best fit of the data is the one reported in the results.

#### *Gender*

A dummy variable to capture the effect of gender on the research performance of staff was included in the model. The base category is females.

#### *Ethnicity*

A set of dummy variables was used to capture the effects of ethnicity upon the research performance of staff. Dummy variables were included for Māori, Pasifika, Asian and Other ethnic groups. In addition, a dummy variable for those staff who did not state their ethnic groups was included<sup>17</sup>. The base ethnic group is European.

#### *Employment status*

The FTE status of staff was included as an explanatory variable in the regression model. It was expected that the higher the FTE proportion, the greater will be the research performance of staff. This is due to the staff member having potentially more time to concentrate on producing research outputs or supervise research students and therefore gain higher scores in the Quality Evaluation.

In addition to their FTE status, the time that staff can devote to research will depend to an extent on the focus on research of their position. For example, staff that are in academic leadership roles would devote the majority of their time to the running of departments or schools of study, rather than being able to devote time to research. Similarly, lecturers would tend to have a higher teaching load than say research fellows and so would have less time available to devote to research. Therefore, although there is no variable that specifically measures teaching load in the regression models, the dummy variables for position act as a proxy variable for this<sup>18</sup>.

In addition, those staff in positions such as professor and associate professor would have been appointed to them partly through their research performance over several years. The position dummy variables would therefore also be acting somewhat as a proxy for research ability. It would be expected therefore that staff in positions such as professor and associate professor would be more likely to achieve higher levels of research performance.

The effect of the position held by staff in their TEO was captured through a set of dummy variables. Staff were asked to list their position as part of the staff census. This resulted in a wide variety of positions being recorded<sup>19</sup>. For this analysis, these positions were recoded into 19 different positions. The focus of this report is on the four most common positions in numerical terms. These were senior lecturers, lecturers, associate professors and professors. The base position is professor.

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<sup>17</sup> Approximately 25 percent of staff in the dataset did not state an ethnic group.

<sup>18</sup> There is a potential endogeneity problem with using position dummies as independent variables to explain research quality. However, as the position of staff would have been determined over a relatively long period of time, the majority of which would lie outside of the PBRF measurement window, this problem would tend to be minimised. A lack of suitable instrumental variable to proxy for position makes a test for endogeneity impractical.

<sup>19</sup> It may be that different institutions have different job descriptions for staff in similarly named positions.

### *Provider*

The effect of the TEO where the staff member worked on that staff member's performance was captured through a set of dummy variables. The disparity in the average quality score per FTE for TEOs in the Quality Evaluation would suggest that there are characteristics unique to individual TEOs that may influence the research performance of staff. This could, for example, be the degree of maturity of the research culture at the TEO, with more established providers likely to have a higher level of research output (Abbott and Doucouliagos, 2004). Other factors, such as the teaching load of staff, geographical location and the level of resources made available for research, can impact on the research performance of institutions (Johnes and Taylor, 1990). The base TEO selected was the University of Auckland, the best performer on average of the participating TEOs in the 2003 Quality Evaluation<sup>20</sup>.

### *Subject*

The impact of the subject area the staff member was engaged in was captured through a set of dummy variables. Some subject areas, such as nursing, have only become established in the research area in recent times in New Zealand, so the performance of staff in these areas may be affected. It may also be the case that certain subject disciplines have staff that are producing a higher level of research output than others<sup>21</sup>. The base subject area selected was philosophy, the best performing subject area on average in the 2003 Quality Evaluation<sup>22</sup>.

### **Interaction effects**

It may be that there are differences in research performance among various subgroups. For example, there may be a difference in the research performance of men and women, or senior lecturers and lecturers. To allow for interaction effects among the independent variables, the regression analysis was repeated for selected subgroups of the dataset<sup>23</sup>. Separate regressions were carried out for males, females, professors, associate professors, senior lecturers and lecturers<sup>24</sup>. Analysis of the Māori and Pasifika ethnic groups was unable to be carried out due to the small size of these datasets.

### **Interpretation of regression output**

#### *Logistic regression*

The results of the logistic regression are presented in odds ratio form. These are intuitively easier to understand, especially for dummy variables, than when presented in logit form. However, it is important to illustrate the concept of odds ratios and how they should be interpreted. Odds ratios are not the same as probabilities and so the following section provides an example of how to interpret the results of the logistic regression equations.

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<sup>20</sup> Staff at the University of Auckland received the highest average quality score per FTE.

<sup>21</sup> Another possibility is that some of the variation is due to the various peer review panels using different standards of measurement. However, moderation procedures used in the Quality Evaluation would tend to minimise this effect.

<sup>22</sup> Philosophy was the subject area with the highest average quality score per FTE.

<sup>23</sup> An alternative approach of including interaction variables in the full dataset would prove problematic as a result of the large numbers of dummy variables leading to multicollinearity issues.

<sup>24</sup> In the case of professors and associate professors, undertaking a logistic regression was impractical due to the high percentage of staff in these positions that were quality weighted.

Suppose that 400 professors were quality weighted and 200 were not. The odds of a professor being quality weighted are  $400/200 = 2$ , or 2 to 1. In other words, the chances of a professor being quality weighted are reasonably good.

Suppose that 500 lecturers were quality weighted and 1,000 were not. The odds of a lecturer being quality weighted would be  $500/1,000 = 0.5$ , or 1 to 2. The chances of them being quality weighted are therefore significantly lower than for professors.

To calculate the odds ratio of a lecturer being quality weighted compared with a professor, the odds of a lecturer being quality weighted (0.5) are divided by the odds of a professor being quality weighted (2), which equals 0.25.

This result can be interpreted as the odds of a lecturer being quality weighted are 25 percent of those of a professor. Alternatively, taking the inverse of the odds ratio ( $2/0.5$ ), the odds of a professor being quality weighted are four times higher than for a lecturer. Therefore, it is more likely that a professor will be quality weighted than a lecturer.

This is not the same as saying that the probability of a professor being quality weighted is four times higher than that of a lecturer. Using the data in the above example, the probability of a professor being quality weighted is equal to the number of quality weighted professors divided by the total number of professors, quality weighted or not. The probability is found using the following calculation  $400/(400+200) = 0.67$ . In other words, the probability that a professor will be quality weighted is 67 percent.

For a lecturer, the probability that they are quality weighted would equal  $500/(500+1,000) = 0.33$ . In other words, the probability that a lecturer would be quality weighted is 33 percent.

Comparing the two results, the probability that a professor will be quality weighted is twice as great as the probability that a lecturer will be quality weighted ( $67/33$ ). This compares with the odds ratio that indicated that the odds of a professor being quality weighted were four times greater than for a lecturer.

The greater the difference in the probability of the events occurring, the larger is the magnitude of the odds ratio. The large odds ratios that are observed in the results of the logistic regression should therefore not be interpreted as indicating a large difference in probabilities.

To aid with the interpretation of the results and to help place the odds ratios in context, predicted probabilities are provided as a footnote for the variable in question. The predicted probability is calculated by substituting the modal values of the independent variables into the logit regression equations. This provides a reference group for which probabilities can be calculated. Then the actual value of the independent variable of interest is substituted into the regression equation. By doing so, the impact of the staff characteristic on the predicted probability can be calculated for this reference group. The characteristics of the reference group in this analysis were: age = 48, ethnic group = European, gender = male, TEO = University of Auckland, position = senior lecturer, and subject area = education.

It should be noted that the predicted probabilities are sensitive to the reference group selected. If another reference group was selected, then the value of the predicted probabilities would vary. However, those factors identified as having a statistically significant impact on research performance remain significant no matter what reference group is selected.

#### *OLS regression*

The coefficient values in the OLS models show how a one unit change in the independent variable will affect the dependent variable. For example, in the RO model for all staff, the coefficient value for FTE shows that an increase in the proportion of 0.1 would lead to an increase in RO score of 0.03, on average.

For dummy variables, the coefficient value shows how the dummy variable differs from the base category. For example, in the RO model for all staff, the coefficient value for gender of 0.16 indicates that a male will have an RO score 0.16 points higher than women, on average.

#### **Limitations to the study**

Although all of the possible independent variables from the dataset were used in the regression models, there is the risk of omitting important explanatory variables. This can lead to the problem of model misspecification. The consequence of omitting important explanatory variables is that their effects can be captured by the variables that are included in the model. As a result, the estimated regression coefficients may be biased.

It should also be noted that the OLS analysis uses a different dataset than was used in the logistic regression analysis. As moderated research scores were only available for those staff that had evidence portfolios reviewed by the peer review panels, there were a total of 5,641 staff in the dataset used for the OLS regression analysis. This compares with the 7,752 staff in the logistic regression analysis dataset. Therefore, the results of the OLS analysis should not be interpreted as being representative of the entire PBRF-eligible workforce, but are instead representative of staff that had evidence portfolios peer reviewed.

## **6 Results**<sup>25</sup>

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### **Summary statistics**<sup>26</sup>

The summary statistics for the dataset used in the logistic regression are discussed below.

The average age of staff in 2003 was 49.7 years and a majority of the staff were men (59 percent). The majority of staff identified themselves as European (56 percent). Māori (4 percent) and Pasifika (1 percent) made up a much smaller percentage of the dataset, while 25 percent of PBRF-eligible staff did not state an ethnicity.

Overall, university staff dominated the dataset with approximately 85 percent of staff engaged in this sub-sector. The University of Auckland (20 percent) was the TEO with the largest percentage of staff in the dataset.

In terms of employment status, senior lecturers (34 percent) were the largest group, followed by lecturers (28 percent) and professors (7 percent). The average FTE status of staff in the dataset was 0.93.

Staff in the education area were the largest subject grouping, with 13 percent of the dataset being engaged in this area. Computer science, information and technology was the next largest subject group with 5 percent.

Overall, 60 percent of staff were quality weighted. On a gender basis, a higher percentage of men (69 percent) were quality weighted, compared with women (47 percent). Of the main positions, associate professors were the highest performing with 98 percent of these staff being quality weighted, followed by professors (97 percent), senior lecturers (66 percent) and lecturers (37 percent).

The summary statistics for the OLS dataset are discussed below.

The dataset used for the OLS regression was broadly in line with the makeup of the logistic regression, although there was a slightly higher proportion of university staff and men. In addition, there was a lower representation of lecturers and higher representation of professors, associate professors and senior lecturers.

The average RO score achieved by staff was 3.6. Men (3.9) received a higher average RO score than women (3.1). In terms of the main positions, professors received the highest average RO score of 5.4, followed by associate professors (4.7), senior lecturers (3.5) and lecturers (2.8).

In terms of the PE score achieved by staff in this dataset, the average score was 3.1. Once again men (3.3) received a higher average PE score than women (2.6). By position, professors were the best performing with an average PE score of 5.4. They were followed by associate professors (4.4), senior lecturers (3.0) and lecturers (2.1).

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<sup>25</sup> The full regression results can be found in Appendix F and Appendix G. A summary of the statistical significance of staff characteristics is provided in Appendix E.

<sup>26</sup> See Appendix B, Appendix C and Appendix D for the full list of summary statistics.



Overall, staff received an average CRE score of 3.0. Men (3.2) received a higher average score than women (2.5). Professors were once again the best performing on average, with a CRE score of 5.1. They were followed by associate professors (4.2), senior lecturers (2.9) and lecturers (1.9).

The summary statistics for the OQS display a similar pattern to the research scores above, with men (373) receiving a higher average OQS than women (297). Similarly, professors (534) received the highest average score in terms of position<sup>27</sup>.

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<sup>27</sup> An analysis of the relationship between the various research scores used in the 2003 Quality Evaluation at the provider level can be found in Smart and Smyth (2005).

### The effect of staff characteristics on the probability of staff being quality weighted

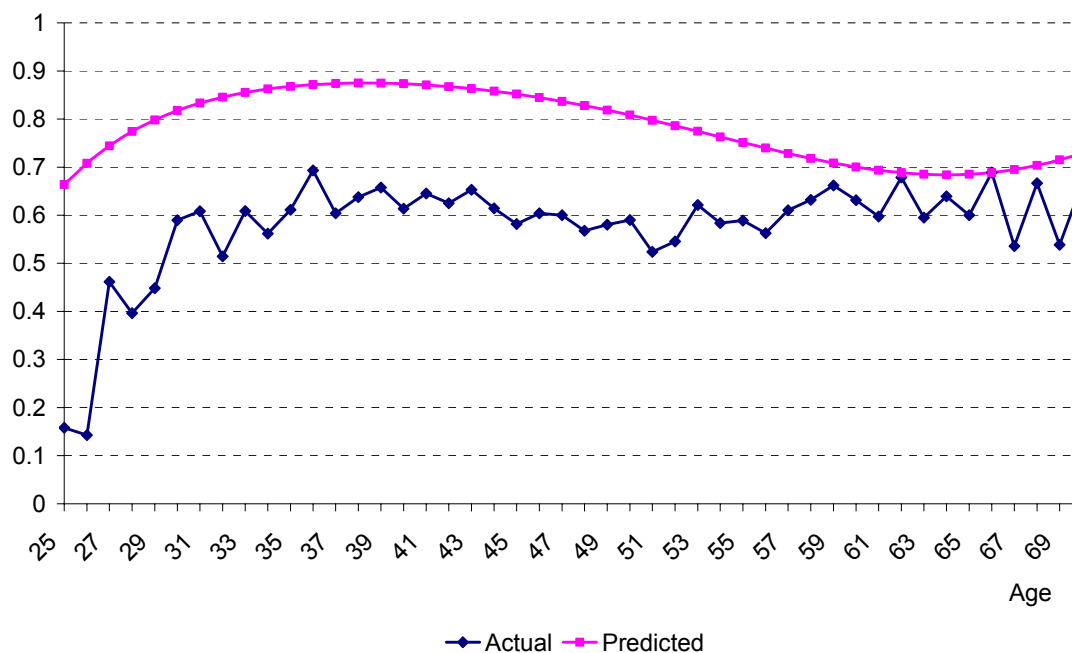
If a staff member was allocated an A, B or C quality category they were quality weighted and hence attracted funding for their TEO. The characteristics that impact on the probability of staff being quality weighted are explored below.

#### Age

The logistic regression results show that a cubic functional form provides the best fit of the dataset that includes all PBRF-eligible staff. Figure 1 below compares the actual probability of a staff member being quality weighted and the predicted probability of being quality weighted for the modal reference group<sup>28</sup>, by age. In comparing these two data series, it is important to note that it is the shape of the curves that should be compared, not the magnitudes.

After controlling for other factors, the probability of a staff member being quality weighted is lowest for the youngest staff in the dataset. However, the probability of being quality weighted then increases with age until it peaks at the age of about 39. From the age of 39 to 64 the probability of being quality weighted declines at a decreasing rate, before once again rising slightly for staff aged over 64.

**Figure 1: Probability of being quality weighted by age – all staff**



**Notes:**

1. The data for staff aged under 25 and over 70 has been omitted due to small numbers in these age ranges.
2. The predicted probabilities were calculated by inserting the modal values into the logit equation. The modal values in this case were: age 48, male, European, a senior lecturer, at the University of Auckland and subject area is education.
3. The magnitude of the predicted and actual probabilities should not be compared with each other. It is the shape of the relationship between age and the probability of being quality weighted that should be compared.

Sources: Ministry of Education, Tertiary Education Commission.

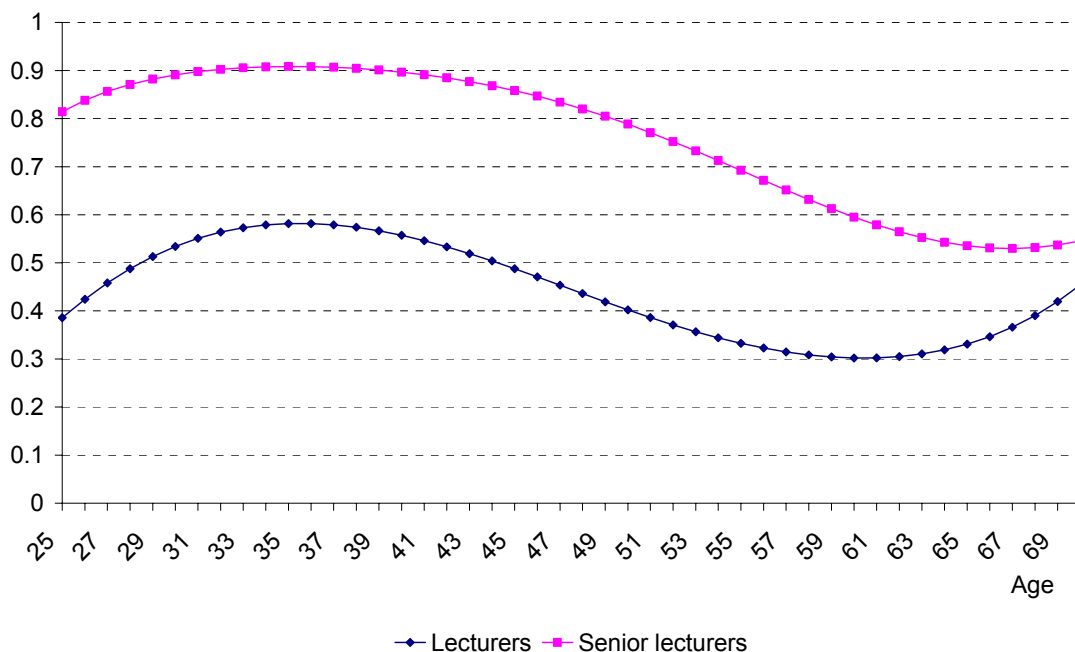
<sup>28</sup> The predicted probabilities were calculated by inserting the modal values into the logit equation. The modal values in this case were: age 48, male, European, a senior lecturer, at the University of Auckland and subject area is education.

These results would reflect the fact that younger staff would find it difficult to have obtained high scores for research output, peer esteem and contribution to research environment in the Quality Evaluation, as they would not have had time to build up a strong research portfolio. The results suggest, however, that research performance then rises quite quickly for younger researchers.

The decrease in research performance for staff aged between 39 and 64 may be a result of staff in this age range taking on more responsibilities in areas other than research, such as administration or teaching. The slight rise in the probability of being quality weighted for staff in their mid-60s and over may reflect that the researchers remaining in the sector are top performers, while other possibly less able researchers may have retired.

At the subgroup level, both senior lecturers and lecturers showed there were gains in the probability of being quality weighted for the youngest researchers, with age. This was followed by a decline in the probability of being quality weighted for staff aged from their mid-30s (see Figure 2 below). In the case of senior lecturers the decline was quite significant, in that the predicted probability of being quality weighted fell well below what younger senior lecturers achieved. This would possibly reflect the fact that more able researchers in these positions would tend to get promoted to more senior positions. Therefore, the staff remaining in the older age groups would tend to have a lower level of research performance, on average.

**Figure 2: Predicted probabilities of staff being quality weighted by position and age**



**Notes:**

1. The data for staff aged under 25 and over 70 has been omitted due to small numbers in these age ranges.
2. The predicted probabilities were calculated by inserting the modal values into the logit equation. The modal values in this case were: age 48, male, European, at the University of Auckland and subject area is education.

### *Gender*

Although gender did not have a statistically significant impact on the probability of a staff member being quality weighted when analysing the full dataset, when repeating the analysis at the subgroup level the results showed that the odds of female senior lecturers being quality weighted were 1.5 times greater than their male counterparts.

### *Ethnicity*

Overall, the regression analysis showed that ethnicity had an impact on the probability of a staff member being quality weighted, controlling for other factors. The odds of European staff being quality weighted were two times greater than for Pasifika staff<sup>29</sup>. There was no statistically significant difference in the odds and therefore probability of European, Māori and Asian staff being quality weighted.

### *Employment status*

The higher the FTE status of the staff member, the greater was the probability that they would be quality weighted. Overall, each additional increase of 0.1 in the proportion of the FTE status of a staff member increases the odds of being quality weighted by 34 percent, controlling for the effect of other variables in the model<sup>30</sup>.

This result is not surprising, in that the more time that staff have available to engage in research the greater the likelihood of their being quality weighted.

At the subgroup level, the impact of an increase in the FTE status of staff on the probability of their being quality weighted was greater for males than for females and for senior lecturers than for lecturers.

The position of the staff member was a significant factor in determining whether he/she was quality weighted. The results showed that positions with more of a research focus were the best performing, controlling for other factors. Professors and associate professors were the most likely groups to be quality weighted overall. Other less senior positions had lower chances of being quality weighted. The odds of professors being quality weighted were 19 times and 80 times higher than for senior lecturers and lecturers, respectively<sup>31</sup>. Tutors had the lowest chance of being quality weighted, with the odds of a professor being quality weighted being over 400 times higher than for a tutor<sup>32</sup>.

At the subgroup level, analysis suggested that there were differences by gender. The odds of a female associate professor being quality weighted were 17 times higher than for a female professor. In comparison, there was no statistically significant difference in the likelihood that male professors and associate professors were quality weighted.

The fact that associate professors were either equally or more likely than professors to be quality weighted is not surprising. The extra administrative tasks that a professor

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<sup>29</sup> The predicted probability of a European staff member being quality weighted was 69.6 percent, compared with 53.6 percent for Pasifika staff.

<sup>30</sup> In terms of predicted probabilities, a staff member with an FTE status of 0.2 had a 46.4 percent chance of being quality weighted. Staff with an FTE of 0.5 had a 55.6 percent chance and staff with an FTE status of 1 had a 69.8 percent chance of being quality weighted.

<sup>31</sup> In terms of predicted probabilities, professors had a 97.8 percent chance of being quality weighted. This compares with a probability of 70.4 percent for senior lecturers and 36.0 percent for lecturers.

<sup>32</sup> The predicted probability of a tutor being quality weighted was 8.9 percent.

might engage in would tend to negate the impact of their seniority over associate professors. This might especially be the situation facing the relatively few female professors within the dataset<sup>33</sup>.

#### *Provider*

Staff at universities were more likely to be quality weighted than staff at other types of providers, holding other factors constant. Overall, staff at the University of Auckland, the University of Otago, the University of Canterbury and Victoria University of Wellington were the most likely to be quality weighted<sup>34</sup>.

Staff at the remaining universities were less likely to be quality weighted. For example, the odds of staff at the University of Auckland being quality weighted were 2.2 times higher than for staff at the University of Waikato, three times higher than for staff at Massey University, 3.2 times higher than for staff at Lincoln University and 16.7 times higher than for staff at the Auckland University of Technology (AUT)<sup>35</sup>.

The four top-performing universities, in terms of having staff quality weighted, all have a long history of research activity. In comparison, the lower level of relative performance by AUT staff may well reflect that it was only granted university status in 2000.

Staff at other types of providers, such as polytechnics, colleges of education (COEs) and private training establishments (PTEs), had a significantly lower chance of being quality weighted than staff at the University of Auckland. For example, the odds of staff at the University of Auckland being quality weighted were 19.7 times and 8.9 times higher than for staff at Unitec and the Auckland College of Education (ACE), respectively<sup>36</sup>. As degree teaching may form only a fraction of the teaching load of staff at some of these TEOs, the lower performance is not surprising.

Similar results were generally repeated at the subgroup level. However, at the senior lecturer level, staff at the University of Otago had the greatest chance of being quality weighted. They were 1.7 times more likely to be quality weighted than staff at the University of Auckland.

#### *Subject*

The subject area that the staff member was engaged in had an impact on the chances of their being quality weighted, controlling for other factors. Analysis, using data for all the PBRF-eligible staff in the dataset, showed that staff in the subject area of visual arts and crafts were the most likely to be quality weighted<sup>37</sup>. The odds of staff in these areas being quality weighted were 2.6 times higher than for staff in the subject

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<sup>33</sup> There were a total of 80 female professors in the dataset, compared with 495 male professors.

<sup>34</sup> There was no statistically significant difference in the predicted probability of staff being quality weighted at the University of Auckland (82.7 percent), the University of Canterbury (79.8 percent), the University of Otago (81.1 percent) and Victoria University of Wellington (80.6 percent).

<sup>35</sup> In terms of predicted probabilities, staff at the University of Waikato had a 68.9 percent chance of being quality weighted, staff at Massey University 61.5 percent, staff at Lincoln University 60.1 percent and staff at AUT 21.2 percent.

<sup>36</sup> In terms of predicted probabilities, Unitec staff had a 19.7 percent chance of being quality weighted and staff at ACE a 37.6 percent chance.

<sup>37</sup> Of those subject areas that were statistically significant.

area of philosophy<sup>38</sup>. The performance of visual arts and crafts staff may appear to be somewhat surprising, given its mid table ranking in the 2003 Quality Evaluation<sup>39</sup>. However, few of the staff involved in this area were in high-performing positions such as professor and associate professor. Additionally, a high proportion of these staff were at TEOs that had staff with relatively lower research performance than others. Controlling for these and other confounding factors places their performance in a better light.

Staff in areas like nursing and dentistry had a significantly lower chance of being quality weighted. For example, the odds of a staff member in philosophy being quality weighted were 37 times and nine times higher than a staff member in nursing or dentistry, respectively<sup>40</sup>.

At the senior lecturer level, staff in the area of ecology, evolution and behaviour were the most likely to be quality weighted. The odds of staff in this subject area being quality weighted were 8.8 times higher than for staff in the area of philosophy.

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<sup>38</sup> In terms of probabilities, staff in visual arts and crafts had a 98.0 percent chance of being quality weighted. This compares with a 95.1 percent chance of staff in the area of philosophy being quality weighted.

<sup>39</sup> Staff in the area of visual arts and crafts placed 28<sup>th</sup> out of 41 subject areas, in terms of average quality score per FTE.

<sup>40</sup> In terms of predicted probabilities, staff in the area of nursing had a 35.3 percent chance of being quality weighted and staff in the area of dentistry a 67.8 percent chance.

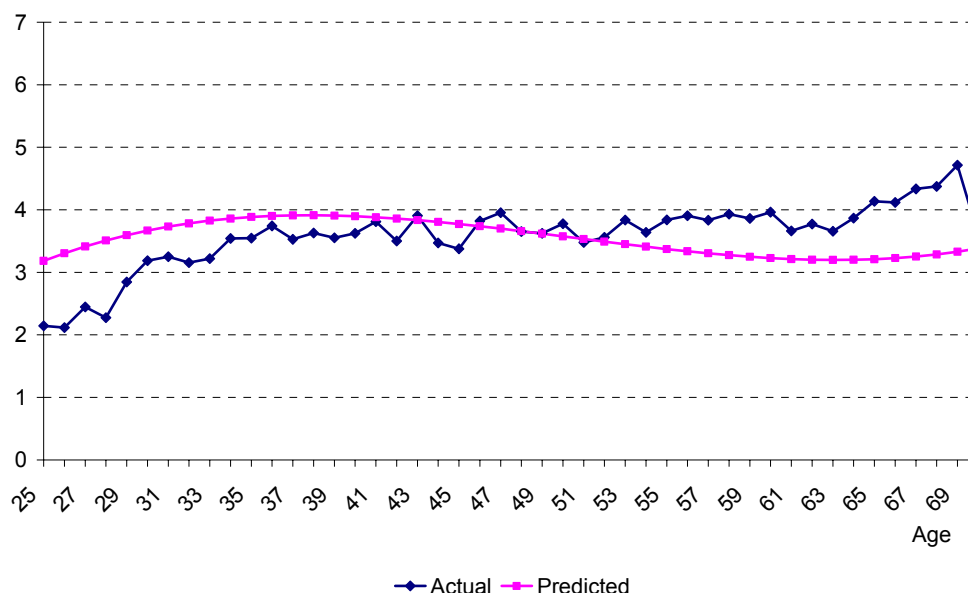
### The effect of staff characteristics on RO scores<sup>41</sup>

This section discusses the effects of staff characteristics on the RO score they achieved in the 2003 Quality Evaluation. The RO score measures the quality of the research outputs of staff over the period 1997 to 2002<sup>42</sup>. The RO score can take a value between 0 and 7, with 7 indicating the highest level of performance<sup>43</sup>.

#### Age

The relationship between age and research performance was assigned a cubic functional form in this analysis. As can be seen in Figure 3, initially the predicted RO score<sup>44</sup> earned by staff increases with age, but at a decreasing rate, controlling for other factors. The predicted RO score peaks for staff aged in their late 30s and then declines until staff are in their early 60s. At this stage, the predicted RO score is similar to that achieved by staff in their mid-20s. There is then a slight rise in the predicted RO score for staff aged over about 65.

Figure 3: Average RO score by age – all staff



Notes:

1. The data for staff aged under 25 and over 70 has been omitted due to small numbers in these age ranges.
  2. The predicted scores are calculated by inserting the modal values of the independent variables into the OLS regression equation. The modal values were: male, European, at the University of Auckland and in the education subject area.
  3. The magnitude of the predicted scores and actual scores should not be compared with each other. It is the shape of the relationship between age and the research score that should be compared.
- Sources: Ministry of Education, Tertiary Education Commission.

<sup>41</sup> The OLS analysis in this and the following sections uses a different dataset than was used in the logistic regression analysis. As moderated research scores were only available for those staff that had evidence portfolios reviewed by the peer review panels, there were a total of 5,641 staff in this dataset. This compares with the 7,752 staff in the logistic regression analysis dataset. Therefore, the results of the OLS analysis should not be interpreted as being representative of the entire PBRF-eligible workforce.

<sup>42</sup> The quality of research output was judged from four nominated research outputs and up to 50 additional research outputs submitted by staff to the peer review panels for evaluation.

<sup>43</sup> See Ministry of Education (2005) *Research Measures: Comparing Seven New Measures of Research Performance in Tertiary Education*, for more detail on the RO, PE and CRE scores achieved by TEOs.

<sup>44</sup> The predicted scores are calculated by inserting the modal values of the independent variables into the OLS regression equation. The modal values were: male, European, at the University of Auckland and in the education subject area.

At the subgroup level, professors, associate professors and lecturers exhibited a negative linear relationship between age and RO score. However, the effect of age on performance was not very strong. If the age of a professor increased by one year, the RO score declined by 0.03 points, on average. For associate professors and lecturers, the RO score decreased by 0.04 points and 0.01, respectively. For associate professors and lecturers, this may reflect that more able researchers may be promoted to higher positions as they get older. Therefore, the staff remaining in the older age groups may have a lower level of research performance, on average.

#### *Gender*

Overall, on average, men received an RO score 0.16 points above that received by women, holding other factors constant. This result varied slightly at the subgroup level. For example, at the professor, senior lecturer and associate professor level, there was no statistically significant difference in the score received by men and women. However, at the lecturer level, men received a score 0.24 points above women, on average.

#### *Ethnicity*

Overall, the ethnicity of staff members did not appear to influence the RO score they received in the Quality Evaluation, holding other factors constant. However, analysis at the subgroup level suggested that, in the case of females, European staff received a higher RO score than Māori staff<sup>45</sup>. Female Māori staff received an RO score 0.34 points lower than their European female counterparts, on average.

#### *Employment status*

Analysis showed that the greater the FTE status of staff, the higher was the RO score they were allocated, keeping other factors constant. This would suggest that the more time resource the staff member has at their disposal, the greater is the quality of their research output. The results showed that an increase in the FTE proportion of 0.1 led to an increase of 0.03 in the RO score of staff, on average.

At the subgroup level, an increase in FTE proportion of 0.1 increased the RO score of senior lecturers by 0.06 points, on average. Similarly, associate professors experienced an increase in their RO score of 0.09 for each 0.1 increase in FTE proportion and professors an increase of 0.07.

Overall, the more the position of the staff member was focused on research and the more senior the staff member, the higher on average was their RO score, controlling for other factors. Professors received the highest RO score, followed by associate professors, who received an RO score 0.75 points less than professors, on average. Senior lecturers received an RO score 1.88 points lower than professors and lecturers a score 2.7 points lower than professors.

The positions that received the lowest RO scores were assistant research fellows and senior tutors. Staff in these positions received an RO score 3.09 and 3.19 points below professors, respectively, on average.

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<sup>45</sup> Although the block of dummy variables for ethnicity was not statistically significant at the 5 percent level, it was significant at the 8 percent level and therefore the result has been commented on.



Similar results were found at the subgroup level in terms of the ranking of staff positions, although the range of scores varied slightly.

#### *Provider*

Staff at the longer-established metropolitan universities generally received the highest RO scores once other factors had been controlled for. Generally, staff at the University of Auckland and the University of Otago were the best performing<sup>46</sup>. Staff at the University of Canterbury received an RO score 0.16 points lower than those at the University of Auckland, followed by Victoria University staff with an average score that was 0.23 points lower, the University of Waikato staff with a score 0.31 points lower, Massey University 0.65 points lower and Lincoln University 0.77 points lower. Staff at AUT received a score 1.12 points lower than the University of Auckland, on average.

Staff at the COEs, polytechnics and PTEs generally received significantly lower RO scores than the top-performing universities, on average.

At the subgroup level the results were relatively similar, apart from at the lecturer level. For this subgroup, there was no statistically significant difference in the RO scores of staff at all the universities, with the exception of Massey. Lecturers at Massey University received an RO score 0.40 points lower than lecturers at the University of Auckland, on average.

It is important to note that these provider results should be treated with a degree of caution. As this regression analysis only uses data for staff who had evidence portfolios assessed by the peer review panels, the results should not be compared with measures of the research performance of TEOs that include the full PBRF-eligible dataset.

#### *Subject*

Overall, the subject area that staff were engaged in had an impact on their RO score, once other factors had been controlled for. Several subject areas received the highest RO score, on average. These areas included philosophy, Māori knowledge and development, music, literary arts and other arts, pure and applied mathematics, religious studies and theology, and visual arts and crafts<sup>47</sup>.

Staff with the lowest relative performance were engaged in the subject areas of nursing, sport and exercise science, and clinical medicine. Compared with philosophy, staff in these areas received RO scores that were 2.46, 1.71 and 1.44 points lower on average, respectively. The result in the area of clinical medicine can partly be explained by the nature of the staff involved in this subject area. Generally, they are part-time staff with commitments elsewhere, which limits their ability to achieve high levels of research performance.

As was the case with the provider results, these subject area results should be treated with caution. The results should not be compared with analyses of research performance of the various subject areas that use the full PBRF-eligible dataset.

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<sup>46</sup> There was no statistically significant difference in the RO scores achieved at these universities.

<sup>47</sup> There was no statistically significant difference in the RO scores achieved in these subject areas.

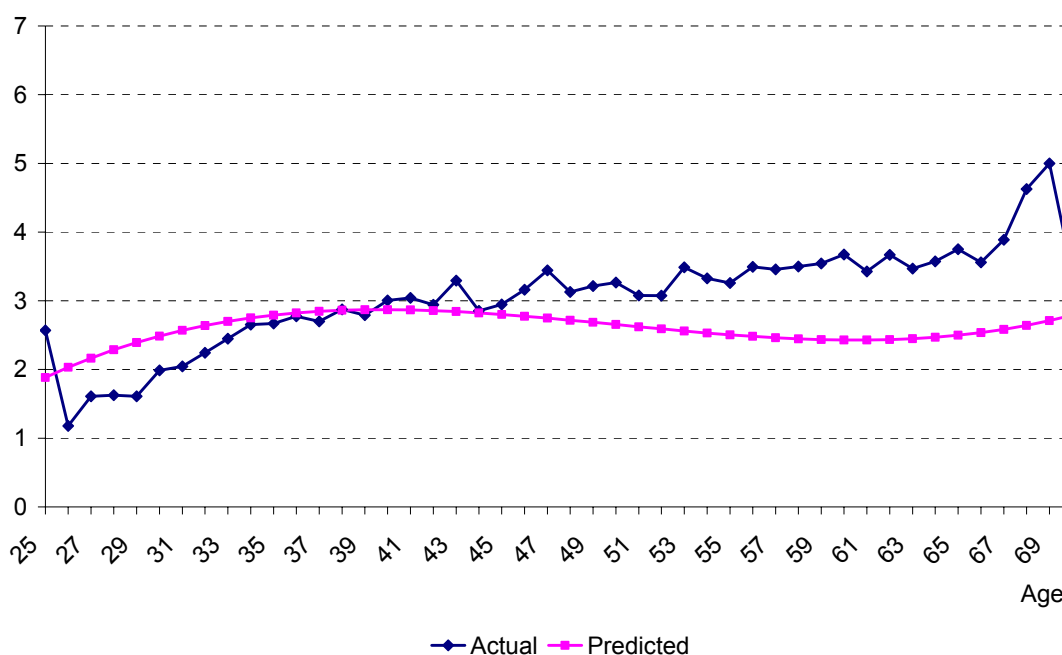
### The effect of staff characteristics on PE scores

This section discusses the impact of staff characteristics on the PE score they received. The PE score measures the recognition of a staff member's research by her or his peers<sup>48</sup>. The PE score can take a value between 0 and 7, with 7 indicating the highest level of performance.

#### Age

The relationship between PE score and age was assigned a cubic functional form. After controlling for other factors, the predicted PE score<sup>49</sup> is lowest for the youngest staff in the dataset, but then increases with age until it peaks for staff aged about 40. Between the ages of 41 and 60 the average score decreases, before rising slightly for staff aged 61 and older (see Figure 4).

Figure 4: Average PE score by age – all staff



Notes:

1. The data for staff aged under 25 and over 70 has been omitted due to small numbers in these age ranges.
  2. The predicted scores are calculated by inserting the modal values of the independent variables into the OLS regression equation. The modal values were: male, European, at the University of Auckland, a senior lecturer and in the education subject area.
  3. The magnitude of the predicted scores and actual scores should not be compared with each other. It is the shape of the relationship between age and the research score that should be compared.
- Sources: Ministry of Education, Tertiary Education Commission.

At the subgroup level, associate professors exhibited a negative linear relationship between age of staff and PE score. For each additional year of age, the PE score decreased by a very slight 0.04 points. Age did not appear to impact on the PE score received by professors.

<sup>48</sup> This was measured by, among other factors, invitations to present at conferences, prizes received and editorships of journals.

<sup>49</sup> The predicted scores are calculated by inserting the modal values of the independent variables into the OLS regression equation. The modal values were: male, European, at the University of Auckland, a senior lecturer and in the education subject area.

### *Gender*

Overall, the explanatory variable capturing gender effects did not appear to have a statistically significant impact on the PE score of staff, once other factors had been controlled for<sup>50</sup>.

### *Ethnicity*

The ethnic group of the staff member had an impact on the PE score allocated, controlling for other factors. Overall, Māori staff outperformed the other ethnic groups with a PE score that was 0.29 points higher than their European colleagues, on average. However, Asian staff received a PE score 0.24 points lower than European staff, on average.

Analysis at the subgroup level suggested that the gender of staff was also a factor. Although male Māori staff received a PE score 0.42 points higher than their European counterparts, there was no statistically significant difference between the scores achieved by female Māori and European staff.

### *Employment status*

The higher the FTE status of staff, the higher on average was their PE score, controlling for other factors. On average, an increase of 0.1 in the proportion of the staff member's FTE status led to a 0.04 point increase in PE score.

Analysis at the subgroup level showed that the effect on PE score of an increase in FTE status was strongest for associate professors and weakest for males. The FTE status of professors and lecturers did not appear to impact on their allocated PE score.

Staff in positions with more of a research focus generally received higher PE scores, all other factors remaining the same. For example, associate professors received a PE score 1.07 points lower than professors, senior lecturers a PE score 2.37 points lower and lecturers 3.26 points lower. Analysis at the subgroup level produced similar relative performance of staff by position.

### *Provider*

University staff generally received the highest PE scores, controlling for other factors. Staff at the University of Otago had the highest PE scores, with a score 0.14 points higher than the University of Auckland, on average. The university with the lowest PE score, relative to the University of Auckland, was AUT with a score 0.98 points lower, on average.

Analysis at the subgroup level showed that the strong performance of University of Otago staff was not constant across genders, with males receiving a higher PE score than their counterparts at other universities, but not females. Similarly, position was also a factor at Otago, with senior lecturers receiving higher PE scores than staff at other universities, but not lecturers and associate professors.

As with the analysis of RO scores, caution should be used when interpreting these TEO results. These regression results should not be compared with results of analyses that use the full PBRF-eligible dataset.

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<sup>50</sup> However, as can be seen below in the ethnicity and provider section, gender does appear to have an impact on research performance in combination with ethnicity and provider.

*Subject*

The subject area the staff member was involved in had an impact on their PE score, controlling for other factors. Generally, staff in the science area achieved the highest scores, along with subjects like philosophy and Māori knowledge and development<sup>51</sup>.

Staff in the areas of nursing and veterinary studies and large animal science received significantly lower PE scores than staff in the area of philosophy, of 1.95 and 1.85, respectively.

Analysis of the senior lecturer subgroup showed that staff in the area of Māori knowledge and development received the highest PE scores, on average.

Once again, a reminder that caution should be used in interpreting these subject area results. They should not be compared with results from analyses that use the full PBRF-eligible dataset.

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<sup>51</sup> There was no statistically significant difference in the scores received staff by these subject areas.

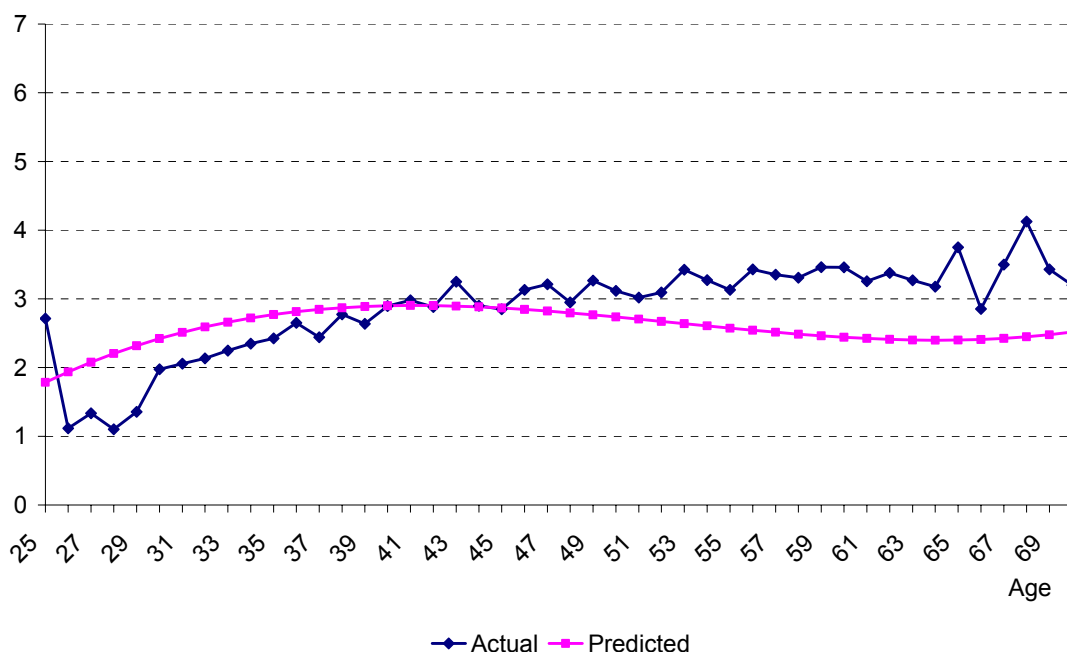
### The effect of staff characteristics on CRE scores

This section discusses the impact of staff characteristics on the CRE scores received by staff. The CRE score measures the contribution by a staff member to a vital, high-quality research environment<sup>52</sup>. The CRE score can take a value between 0 and 7, with 7 indicating the highest level of performance.

#### Age

The relationship between CRE score and age was assigned a cubic functional form in this analysis. As can be seen in Figure 5, after controlling for other factors, the predicted CRE score<sup>53</sup> is lowest for staff aged in their mid-20s and then increases with age until peaking for staff aged about 41. The predicted CRE score then decreases for staff aged between 42 and 63, before rising slightly for staff aged over this.

Figure 5: Average CRE score by age – all staff



Notes:

1. The data for staff aged under 25 and over 70 has been omitted due to small numbers in these age ranges.
  2. The predicted scores are calculated by inserting the modal values of the independent variables into the OLS regression equation. The modal values were: male, European, at the University of Auckland, a senior lecturer and in the education subject area.
  3. The magnitude of the predicted scores and actual scores should not be compared with each other. It is the shape of the relationship between age and the research score that should be compared.
- Sources: Ministry of Education, Tertiary Education Commission.

At the subgroup level, associate professors exhibited a slight inverse linear relationship between age and CRE score. For each extra year of age, the CRE score fell by 0.04 points, on average. Age did not appear to impact on the CRE score allocated to professors.

<sup>52</sup> The supervision of postgraduate research students and research grants were examples of measures used to determine the CRE scores of staff.

<sup>53</sup> The predicted scores are calculated by inserting the modal values of the independent variables into the OLS regression equation. The modal values were: male, European, at the University of Auckland, a senior lecturer and in the education subject area.

### *Gender*

Overall, gender did not have a statistically significant impact on the CRE score allocated to staff members once other factors had been controlled for. However, subgroup analysis showed that female senior lecturers received a CRE score 0.15 points higher than male senior lecturers. In addition, female associate professors received a CRE score 0.32 points higher than their male counterparts, on average.

### *Ethnicity*

Overall, the ethnic group of staff had an impact upon the CRE score allocated, controlling for other factors. Asian staff received a CRE score 0.3 points lower than European staff, on average. At the subgroup level, this finding was repeated for males but not for females. It also appeared that Māori professors received higher CRE scores and Asian professors lower CRE scores than European professors, on average.

### *Employment status*

The higher the FTE status of staff, the higher on average was their CRE score, holding other factors constant. Overall, an increase of 0.1 in the FTE proportion of staff led to an increase in their CRE score of 0.07 points. As staff with a higher FTE status would have more opportunity to supervise research students, one of the measures of contribution to the research environment, this result was as expected.

When examining this relationship at the subgroup level, the results showed that the positive effect of FTE status on CRE score was strongest for associate professors and weakest for males. The FTE status of professors and lecturers did not appear to impact on their allocated CRE score.

Overall, the more of a research focus the position of the staff member entailed, the higher was their CRE score, controlling for other factors. For example, on average, associate professors, senior lecturers and lecturers received CRE scores that were 0.96, 2.14 and 3.08 points lower than for professors, respectively.

### *Provider*

Overall, of the universities, staff at the University of Auckland, the University of Otago and the University of Waikato had the highest CRE scores, on average<sup>54</sup>. Staff at AUT had the lowest level of performance when compared with the University of Auckland. On average, the CRE score for AUT staff was 1.08 points lower than their counterparts at the University of Auckland. The relatively short period that AUT has been a degree-granting institution would be a factor in this score. In addition, as AUT has had relatively few doctoral students, the lack of opportunities to supervise research students would impact on the CRE score of staff.

Similar results were found at the subgroup level, with the exception of lecturers, where staff at the University of Otago received the highest CRE score, on average.

As with the analysis of RO and PE scores, caution should be used when interpreting these TEO results. These regression results should not be compared with results of analyses that use the full PBRF-eligible dataset.

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<sup>54</sup> There was no statistical difference in the scores achieved by these universities.

*Subject*

The subject area staff were engaged in had an impact on the CRE score they received, controlling for other factors. Staff in the area of earth science received the highest CRE score with a score 0.45 points higher than staff in the area of philosophy, on average.

Analysis at the subgroup level showed that male staff in the area of ecology, evolution and behaviour were the best performers in terms of subject area. Analysis by position showed that, for senior lecturers, Māori knowledge and development was the best-performing subject area.

Overall, staff in the areas of veterinary science (-1.66), accounting and finance (-1.56) and nursing (-1.32) received significantly lower CRE scores, on average, than staff in the subject area of philosophy.

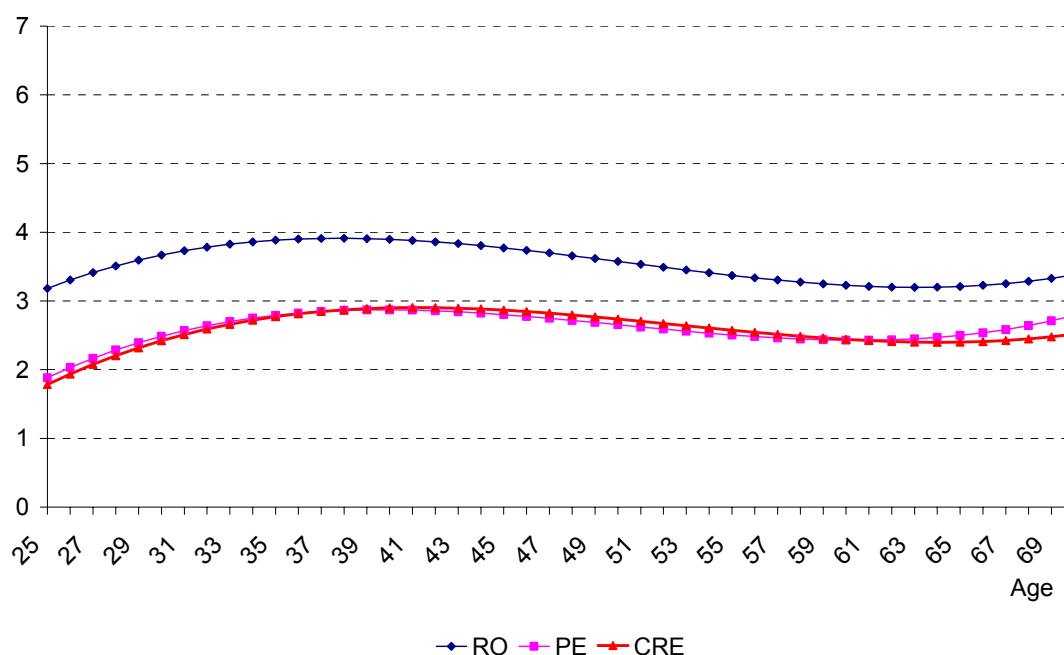
Once again, a reminder that caution should be used in interpreting these subject area results. They should not be compared with results from analyses that use the full PBRF-eligible dataset.

### Comparing the impact of age on RO, PE and CRE scores

The analysis of the relationship between age and the research scores showed that overall a cubic functional form was appropriate in all three cases, holding other factors constant. However, additional insight into the dynamics of the relationship between age and the research scores can be gained by comparing the predicted average scores for all three measures.

Figure 6 below shows the combined predicted scores across the three dimensions of performance for the modal reference group. It indicates that the RO score is the highest, followed by PE and then CRE, on average.

**Figure 6: Predicted research scores by age – all staff**



Note: The predicted scores are calculated by inserting the modal values of the independent variables into the OLS regression equation. The modal values were: male, European, at the University of Auckland, a senior lecturer and in the education subject area.

The gap between the average RO and CRE score is largest for the youngest staff in the dataset and narrows as staff are older. This narrowing trend in the margin between the scores is especially noticeable in the case of the gap between the RO and PE score for staff aged over 50.

There is also a difference in the turning point where the average scores begin to fall. The RO score is the first to start declining in terms of age, followed by the PE score and then the CRE score. The lag in the peaks of PE and CRE is not surprising. The factors that are included in these measures, such as prizes, invitations to conferences and supervision of research students would all flow on from the research performance of staff. Therefore, a lag in this turning point is to be expected.

Of the three measures, the fall-off in score following the turning point was the smallest for the PE score and the largest for the RO score. This would indicate that peer esteem is a measure that does not decline with age to the same extent as the other two measures.



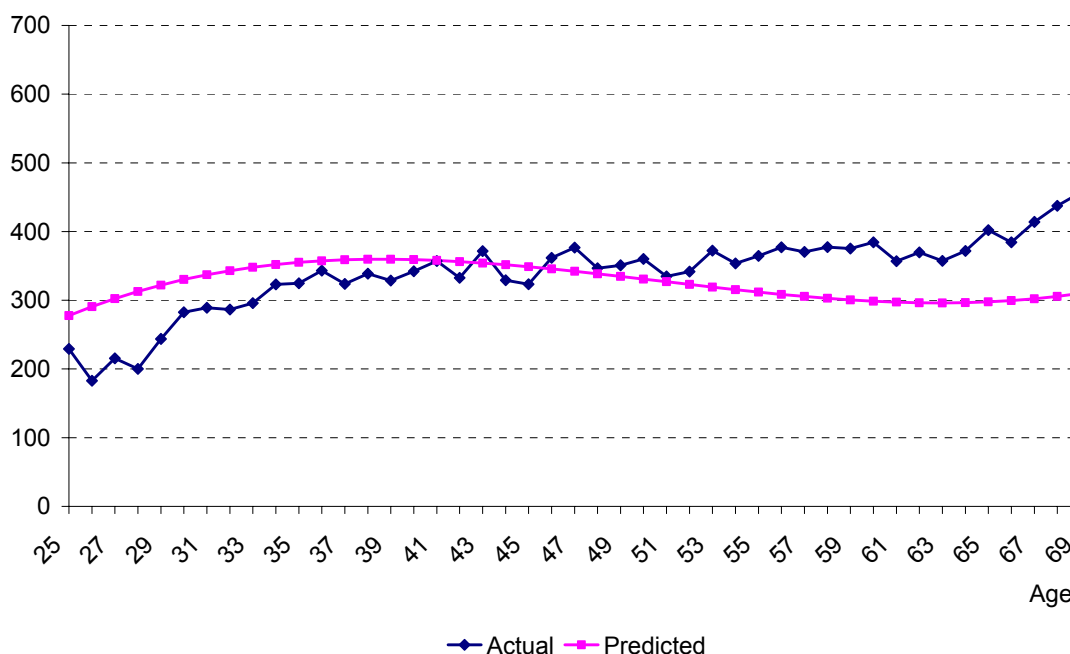
### The effect of staff characteristics on the OQS

This section discusses the effect of staff characteristics on the OQS allocated to staff. The OQS is a weighted average of the RO (70 percent), PE (15 percent) and CRE (15 percent) scores that was used to help allocate quality categories to staff in the Quality Evaluation. The OQS can take a value between 0 and 700, with 700 indicating the highest level of research performance.

#### Age

The relationship between the OQS and age was assigned a cubic functional form. As shown in Figure 7, initially the predicted OQS<sup>55</sup> increases with the age of staff until peaking for staff aged about 39, all other factors remaining constant. Between the ages of 40 and 64 the predicted OQS declines, before rising slightly for staff aged over 65. This slight upswing is likely to be a result of staff retiring, which may well result in only some of the better-performing staff remaining in this age group.

Figure 7: Average OQS by age – all staff



Notes:

1. The data for staff aged under 25 and over 69 has been omitted due to small numbers in these age ranges.
  2. The predicted scores are calculated by inserting the modal values of the independent variables into the OLS regression equation. The modal values were: male, European, at the University of Auckland, a senior lecturer and in the education subject area.
  3. The magnitude of the predicted scores and actual scores should not be compared with each other. It is the shape of the relationship between age and the research score that should be compared.
- Sources: Ministry of Education, Tertiary Education Commission.

At the subgroup level, professors and associate professors exhibited a relatively small inverse linear relationship between age and OQS. For each extra year of age, the OQS for professors and associate professors fell by 2.3 points and 4.3 points, respectively.

<sup>55</sup> The predicted scores are calculated by inserting the modal values of the independent variables into the OLS regression equation. The modal values were: male, European, at the University of Auckland, a senior lecturer and in the education subject area.

### *Gender*

Overall, holding other factors constant, men received a higher OQS score than women, although the margin was relatively small. On average, male staff had an OQS 10.7 points higher than women.

This finding was not uniform across subgroups. The effect of gender was largest for lecturers, where males received an OQS 17.1 points higher, on average, whereas there was no statistically significant difference in the OQS achieved by male and female associate professors and senior lecturers.

### *Ethnicity*

Overall, ethnicity had no statistically significant effect on the OQS received by staff, once other factors had been controlled for.

### *Employment status*

The higher the FTE status of a staff member, the higher on average was their OQS score, all other factors remaining constant. A 0.1 increase in the FTE proportion causes a 3.7 point increase in the OQS, on average. Analysis at the subgroup level suggested that a higher FTE status resulted in higher research performance in most positions. However, it appeared to have no impact on the score received by lecturers.

Overall, those positions with more of a focus on research and more senior status had a higher level of performance, holding other factors constant. The best performers were professors, followed by associate professors, who achieved OQS scores 82.7 points lower in comparison, senior lecturers with an OQS 199.4 points lower than professors, and lecturers an OQS 283.6 points lower than professors, on average.

### *Provider*

In general, staff at the universities received the highest OQS, controlling for other factors. Of the universities, staff at Auckland and Otago had the highest OQS score<sup>56</sup>. Analysis at the subgroup level suggested that gender also influenced the OQS score received by staff. Male staff at the University of Otago received the highest OQS, on average, whereas female staff at the University of Auckland, the University of Canterbury and the University of Otago received the highest scores, on average<sup>57</sup>.

As with the analysis of RO, PE and CRE scores, caution should be used when interpreting these TEO results. These regression results should not be compared with results of analyses that use the full PBRF-eligible dataset.

### *Subject*

The subject area the staff member was engaged in had an impact on their OQS, controlling for other factors. Overall, staff in several subject areas received the highest OQS. These included staff in the areas of Māori knowledge and development, philosophy, ecology, evolution and behaviour, psychology, pure and applied mathematics, religious studies and theology, and visual arts and crafts<sup>58</sup>.

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<sup>56</sup> There was no statistical difference in the scores achieved by these universities.

<sup>57</sup> There was no statistical difference in the scores achieved by these universities.

<sup>58</sup> There was no statistical difference in the scores achieved by these subject areas.

Overall, staff in nursing and sport and exercise science received the lowest OQS scores. Staff in the area of nursing received an OQS 221.4 points lower and staff in sport and exercise science a score 159.6 points lower than staff in the area of philosophy, respectively. Similar results were found in analysis at the subgroup level.

Once again, remember that caution should be used in interpreting these subject area results. They should not be compared with results from analyses that use the full PBRF-eligible dataset.

## **7 Conclusion**

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The implementation of the PBRF has created the first opportunity for an in-depth analysis of the research performance of tertiary education staff in New Zealand. Regression analysis of the data provided from the PBRF Quality Evaluation has the advantage of controlling for confounding factors, allowing us to analyse the effect of staff characteristics individually on research performance. The regression analysis identified a number of characteristics that appear to impact upon staff research performance.

The age of staff had an impact upon research performance. Generally, staff aged in their early to mid-20s had lowest levels of research performance, once other factors had been controlled for. As staff in this age bracket would have found it difficult to have established a strong record of research, this result is not surprising. Research performance then tends to increase rapidly with age before appearing to peak for staff aged in their late 30s and early 40s. Then there is a fall-off in research performance for staff aged from their early 40s to their early 60s. A possible explanation for this decline in performance is that as research is just one of the tasks of an academic, it is possible that older staff may devote more time to other job tasks, such as service or administration or teaching. This would tend to have a detrimental impact upon research performance. There was evidence of a slight upswing in research performance for staff aged older than their mid-60s. For associate professors, the results showed that research performance generally decreased slightly with age, whereas, for professors, age appeared to have little effect on research performance.

The gender of staff was a factor in research performance in some cases. Males had a slightly higher level of research performance overall, as measured by the OQS. This was mostly on the back of higher RO scores. However, females outperformed males in some areas, with female associate professors and senior lecturers receiving higher CRE scores than their male counterparts.

The ethnic group of staff impacted on research performance in some areas. Māori staff generally received higher PE scores and Asian staff lower PE scores than European staff. In addition, Pasifika staff were less likely to be quality weighted than their European counterparts. Overall, the ethnic group of staff did not appear to impact on the RO score they achieved, once other factors had been controlled for. However, in the case of females, Māori staff received lower RO scores on average.

In terms of the employment characteristics of staff, the greater the FTE status of staff, the higher was their research performance generally. This effect was less significant for women and lecturers.

One of the strongest indicators of research performance was the position of staff. Those positions with more of a research focus performed at a higher level. Not surprisingly, professors and associate professors generally had the highest level of research performance, followed by senior lecturers and then lecturers.

Staff at the longer established metropolitan universities generally had the highest level of research performance. Staff at other TEOs, such as polytechnics and PTEs, where

degree teaching may form only a fraction of their teaching load, tended to perform less well.

Overall, across all the measures of research performance, staff in the science subject areas were generally the best performing, especially in terms of the CRE and PE scores they achieved. Some subject areas, such as visual arts and crafts, performed well in some areas, such as RO score, but performed less well in others, such as CRE and PE score. Overall, staff in the area of nursing had the lowest level of relative research performance.

## **Appendix A      Regression methodology**

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### **Logistic regression**

As staff are quality weighted or they are not, the dependent variable is binary in nature and takes a value of 1 or 0. Use of ordinary least squares is not appropriate in this case as it will violate the assumption of normality and homoscedasticity of residuals and there is no assurance that the predicted value will lie between 0 and 1 (Ramanathan, 1998). Therefore, logistic regression is used to analyse the impact of the explanatory variables on whether a staff member was quality weighted.

Logistic regression applies maximum likelihood estimation after transforming the dependent variable into a logit variable. In this way, logistic regression estimates the probability of a staff member being quality weighted, or not.

The logistic regression equation took the form:

$$(A) \quad \ln[QW/(1-QW)] = \beta_1 + \beta_2 \text{ age} + \beta_3 \text{ age}^2 + \beta_4 \text{ age}^3 + \beta_5 \text{ gender} + \beta_6 \text{ FTE} + \beta_7 \text{ ethnicity}^* + \beta_8 \text{ provider}^* + \beta_9 \text{ position}^* + \beta_{10} \text{ subject}^* + \mu$$

Where QW is the probability of the staff member being quality weighted, age is the age of the staff member as at 2003, gender is a dummy variable (if male = 1 otherwise 0), FTE is full-time equivalent status of the staff member, ethnicity\* is a vector of dummy variables for the ethnicity of the staff member, position\* is a vector of dummy variables for the position of the staff member, provider\* is a vector of dummy variables for the 21 TEOs in the logistic regression analysis, subject\* is a vector of dummy variables for the subject areas that were used in the PBRF,  $\mu$  is an error term and ln is the natural logarithm.

### *Regression diagnostics*

The pseudo R<sup>2</sup>s for the logistic regression models ranged from 0.27 to 0.42. Considering the large number of observations and the cross-sectional nature of the dataset these pseudo R<sup>2</sup>s indicate that the models have a reasonable amount of explanatory power. However, there are obviously still other factors outside the scope of this analysis that impact on research performance.

Likelihood ratio tests indicated that at least one of the independent variables had a significant effect on the probability of a staff member being quality weighted. Similarly, Hosmer-Lemeshow  $\chi^2$  test results also suggest that at least one of the independent variables had an effect on the dependent variable in the regression models.

Likelihood ratio tests were also used to test the significance of the individual continuous variables and the various blocks of dummy variables (Hosmer and Lemeshow, 2000). The tests showed that the variables for age, FTE, provider, position and subject area were statistically significant in both the overall and subgroup regression analysis. Ethnicity and gender were statistically significant factors in some of the estimated models, specifically the overall and senior lecturer subgroup analysis, respectively.

Although an individual dummy variable within a block of dummies may be statistically significant, if the block of dummy variables was insignificant as a whole, then the individual dummy was also considered to also be statistically insignificant.

#### *Independent variable selection*

Although variables, or blocks of variables, were found to have a statistically insignificant effect on research performance in some of the estimated models, they have been retained in the reported results. This was done so that the results of the various analyses can be compared. In addition, although not statistically significant, these variables may still play a role in controlling for these characteristics.

#### **OLS regression**

OLS regression was used to analyse the effect of staff characteristics on the four scores of research performance<sup>59</sup>.

The four OLS regression models took the following forms:

$$(B) \text{ RO score} = \beta_1 + \beta_2 \text{ age} + \beta_3 \text{ age}^2 + \beta_4 \text{ age}^3 + \beta_5 \text{ gender} + \beta_6 \text{ FTE} + \beta_7 \text{ ethnicity}^* + \beta_8 \text{ provider}^* + \beta_9 \text{ position}^* + \beta_{10} \text{ subject}^* + \mu$$

$$(C) \text{ PE score} = \beta_1 + \beta_2 \text{ age} + \beta_3 \text{ age}^2 + \beta_4 \text{ age}^3 + \beta_5 \text{ gender} + \beta_6 \text{ FTE} + \beta_7 \text{ ethnicity}^* + \beta_8 \text{ provider}^* + \beta_9 \text{ position}^* + \beta_{10} \text{ subject}^* + \mu$$

$$(D) \text{ CRE score} = \beta_1 + \beta_2 \text{ age} + \beta_3 \text{ age}^2 + \beta_4 \text{ age}^3 + \beta_5 \text{ gender} + \beta_6 \text{ FTE} + \beta_7 \text{ ethnicity}^* + \beta_8 \text{ provider}^* + \beta_9 \text{ position}^* + \beta_{10} \text{ subject}^* + \mu$$

$$(E) \text{ OQS} = \beta_1 + \beta_2 \text{ age} + \beta_3 \text{ age}^2 + \beta_4 \text{ age}^3 + \beta_5 \text{ gender} + \beta_6 \text{ FTE} + \beta_7 \text{ ethnicity}^* + \beta_8 \text{ provider}^* + \beta_9 \text{ position}^* + \beta_{10} \text{ subject}^* + \mu$$

Where age is the age of the staff member as at 2003, gender is a dummy variable (if male = 1 otherwise 0), FTE is full-time equivalent status of the staff member, ethnicity\* is a vector of dummy variables for the ethnicity of the staff member, position\* is a vector of dummy variables for the position of the staff member, provider\* is a vector of dummy variables for the 22 TEOs in the OLS analysis, subject\* is a vector of dummy variables for the subject areas that were used in the PBRF and  $\mu$  is an error term.

#### *Regression diagnostics*

The R<sup>2</sup>s of the OLS regression models ranged from 0.26 to 0.53. Considering the large number of observations and the cross-sectional nature of the dataset, the R<sup>2</sup>s indicate that the OLS models have a reasonable amount of explanatory power. However, there are obviously factors outside the scope of this analysis impacting on research performance.

F tests indicated that for all models estimated, at least one of the independent variables had a significant effect on the research quality scores. Individual tests of significance showed that FTE status and age were generally important factors in determining research performance. Block F tests were applied to test the significance

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<sup>59</sup> Tobit regression was trialled as it might be argued that the research scores are censored at 0 and 7 and 0 and 700. However, as relatively few scores were at the censor points, the Tobit regression had little effect on the results.

of the vectors of dummy variables. The results showed that the provider, subject area and position of the staff member had an impact on all research scores. The dummy variables for ethnicity only had a statistically significant impact upon the PE and CRE scores.

Although an individual dummy variable within a block of dummies may be statistically significant, if the block of dummy variables was insignificant as a whole, then the individual dummy was also considered to also be statistically insignificant.

*Independent variable selection*

Although variables, or blocks of variables, were found to have a statistically insignificant effect on research performance in some of the estimated models, they have been retained in the reported results. This was done so that the results of the various subgroup analyses can be compared. In addition, although not statistically significant, these variables may still play a role in controlling for these characteristics.



## Appendix B Summary statistics for logistic regression dataset

**Table 1: Summary statistics of age and FTE status**

| Variable | Summary measures |         |     |     |
|----------|------------------|---------|-----|-----|
|          | Mean             | Std dev | Max | Min |
| Age      | 46.9             | 9.9     | 77  | 20  |
| FTE      | 0.93             | 0.18    | 1   | 0.2 |

Note: These statistics are for the 7,752 staff used in the logistic regression analysis.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 2: Summary of staff characteristics**

| Variable                          | No.   | %    | Variable                                                                                     | No.   | %    |
|-----------------------------------|-------|------|----------------------------------------------------------------------------------------------|-------|------|
| Quality weighted                  | 4,640 | 59.9 | Accounting and Finance                                                                       | 211   | 2.7  |
| Not quality weighted              | 3,112 | 40.1 | Agriculture and Other Applied Biological Sciences                                            | 158   | 2.0  |
|                                   |       |      | Anthropology and Archaeology                                                                 | 60    | 0.8  |
| Men                               | 4,553 | 58.7 | Architecture, Design, Planning and Surveying                                                 | 174   | 2.2  |
| Women                             | 3,199 | 41.3 | Biomedical                                                                                   | 173   | 2.2  |
|                                   |       |      | Chemistry                                                                                    | 193   | 2.5  |
| European                          | 4,356 | 56.2 | Clinical Medicine                                                                            | 286   | 3.7  |
| Māori                             | 352   | 4.5  | Communications, Journalism and Media Studies                                                 | 94    | 1.2  |
| Pasifika                          | 70    | 0.9  | Computer Science, Information Technology, Information                                        | 396   | 5.1  |
| Asian                             | 360   | 4.6  | Services                                                                                     |       |      |
| Other                             | 687   | 8.9  | Dentistry                                                                                    | 53    | 0.7  |
| Not stated                        | 1,927 | 24.9 | Design                                                                                       | 101   | 1.3  |
|                                   |       |      | Earth Science                                                                                | 140   | 1.8  |
| University of Auckland            | 1,517 | 19.6 | Ecology, Evolution and Behaviour                                                             | 176   | 2.3  |
| University of Canterbury          | 605   | 7.8  | Economics                                                                                    | 143   | 1.8  |
| University of Otago               | 1,306 | 16.8 | Education                                                                                    | 1,023 | 13.2 |
| Victoria University of Wellington | 543   | 7    | Engineering and Technology                                                                   | 369   | 4.8  |
| University of Waikato             | 562   | 7.2  | English Language and Literature                                                              | 118   | 1.5  |
| Massey University                 | 1,299 | 16.8 | Foreign Languages and Linguistics                                                            | 207   | 2.7  |
| Auckland University of Technology | 586   | 7.6  | History, History of Art, Classics and Curatorial Studies                                     | 191   | 2.5  |
| Lincoln University                | 191   | 2.5  | Human Geography                                                                              | 61    | 0.8  |
| Others                            | 1,143 | 14.7 | Law                                                                                          | 228   | 2.9  |
|                                   |       |      | Management, Human Resources, Industrial Relations, International Business and Other Business | 328   | 4.2  |
| Academic                          | 91    | 1.2  | Māori Knowledge and Development                                                              | 141   | 1.8  |
| Academic leadership role          | 432   | 5.6  | Marketing and Tourism                                                                        | 172   | 2.2  |
| Assistant research fellow         | 64    | 0.8  | Molecular, Cellular and Whole Organism Biology                                               | 390   | 5.0  |
| Associate professor               | 667   | 7.2  | Music, Literary Arts and Other Arts                                                          | 130   | 1.7  |
| Lecturer                          | 2,130 | 27.5 | Nursing                                                                                      | 168   | 2.2  |
| Postdoctoral fellow               | 168   | 2.2  | Other Health                                                                                 | 264   | 3.4  |
| Professor                         | 575   | 7.4  | Philosophy                                                                                   | 66    | 0.9  |
| Research fellow                   | 282   | 3.6  | Physics                                                                                      | 108   | 1.4  |
| Research officer                  | 74    | 1.0  | Political Science, International Relations and Public Policy                                 | 95    | 1.2  |
| Researcher                        | 63    | 0.8  | Psychology                                                                                   | 231   | 3.0  |
| Senior lecturer                   | 2,602 | 33.6 | Public Health                                                                                | 211   | 2.7  |
| Senior research fellow            | 101   | 1.3  | Pure and Applied Mathematics                                                                 | 143   | 1.8  |
| Senior teaching fellow            | 99    | 1.3  | Religious Studies and Theology                                                               | 57    | 0.7  |
| Senior tutor                      | 179   | 2.3  | Sociology, Social Policy, Social Work, Criminology and Gender Studies                        | 240   | 3.1  |
| Teaching fellow                   | 45    | 0.6  | Sport and Exercise Science                                                                   | 88    | 1.1  |
| Technician                        | 25    | 0.3  | Statistics                                                                                   | 86    | 1.1  |
| Tutor                             | 83    | 1.1  | Theatre and Dance, Film and Television, and Multimedia                                       | 75    | 1.0  |
| Visiting academic                 | 66    | 0.9  | Veterinary Studies and Large Animal Science                                                  | 75    | 1.0  |
| General                           | 6     | 0.1  | Visual Arts and Crafts                                                                       | 129   | 1.7  |

Note: These statistics are for the 7,752 staff used in the logistic regression analysis.

Sources: Ministry of Education, Tertiary Education Commission.

## Appendix C Summary statistics for OLS regression dataset

**Table 3: Summary statistics of age and FTE status**

| Variable | Summary measures |         |     |     |
|----------|------------------|---------|-----|-----|
|          | Mean             | Std dev | Max | Min |
| Age      | 46.9             | 9.8     | 77  | 23  |
| FTE      | 0.94             | 0.16    | 1   | 0.2 |

Note: These statistics are for the 5,641 staff used in the OLS regression analysis.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 4: Summary of staff characteristics**

| Variable                          | No.   | %    | Variable                                                 | No. | %   |
|-----------------------------------|-------|------|----------------------------------------------------------|-----|-----|
| Men                               | 3,615 | 64.1 | Anthropology and Archaeology                             | 55  | 1.0 |
| Women                             | 2,026 | 35.9 | Architecture, Design, Planning and Surveying             | 113 | 2.0 |
|                                   |       |      | Biomedical                                               | 161 | 2.9 |
|                                   |       |      | Chemistry                                                | 171 | 3.0 |
| European                          | 3113  | 55.2 | Clinical Medicine                                        | 233 | 4.1 |
| Māori                             | 199   | 3.5  | Communications, Journalism and Media Studies             | 58  | 1.0 |
| Pasifika                          | 36    | 0.6  | Computer Science, Information Technology, Information    | 271 | 4.8 |
| Asian                             | 263   | 4.7  | Services                                                 | 29  | 0.5 |
| Other                             | 545   | 9.7  | Dentistry                                                | 41  | 0.7 |
| Not stated                        | 1,485 | 26.3 | Design                                                   | 135 | 2.4 |
|                                   |       |      | Earth Science                                            | 167 | 3.0 |
| University of Auckland            | 1,359 | 24.1 | Ecology, Evolution and Behaviour                         | 116 | 2.1 |
| University of Canterbury          | 556   | 9.9  | Economics                                                | 487 | 8.6 |
| University of Otago               | 1,033 | 18.3 | Education                                                | 303 | 5.4 |
| Victoria University of Wellington | 488   | 8.7  | Engineering and Technology                               | 94  | 1.7 |
| University of Waikato             | 445   | 7.9  | English Language and Literature                          | 141 | 2.5 |
| Massey University                 | 988   | 17.5 | Foreign Languages and Linguistics                        | 174 | 3.1 |
| Auckland University of Technology | 202   | 3.6  | History, History of Art, Classics and Curatorial Studies | 55  | 1.0 |
| Lincoln University                | 171   | 3.0  | Human Geography                                          | 187 | 3.3 |
| Others                            | 399   | 7.1  | Law                                                      | 256 | 4.5 |
|                                   |       |      | Management, Human Resources, Industrial Relations,       | 29  | 0.5 |
| Academic                          | 66    | 1.2  | International Business and Other Business                |     |     |
| Academic leadership role          | 315   | 5.6  | Māori Knowledge and Development                          | 76  | 1.4 |
| Assistant research fellow         | 44    | 0.8  | Marketing and Tourism                                    | 131 | 2.3 |
| Associate professor               | 660   | 11.7 | Molecular, Cellular and Whole Organism Biology           | 344 | 6.1 |
| Lecturer                          | 1,173 | 20.8 | Music, Literary Arts and Other Arts                      | 115 | 2.0 |
| Postdoctoral fellow               | 152   | 2.7  | Nursing                                                  | 59  | 1.1 |
| Professor                         | 565   | 10.0 | Other Health                                             | 144 | 2.6 |
| Research fellow                   | 249   | 4.4  | Philosophy                                               | 59  | 1.1 |
| Research officer                  | 54    | 1.0  | Physics                                                  | 94  | 1.7 |
| Researcher                        |       |      | Political Science, International Relations and Public    |     |     |
|                                   | 47    | 0.8  | Policy                                                   | 76  | 1.4 |
| Senior lecturer                   | 2,054 | 36.4 | Psychology                                               | 198 | 3.5 |
| Senior research fellow            | 96    | 1.7  | Public Health                                            | 175 | 3.1 |
| Senior teaching fellow            | 29    | 0.5  | Pure and Applied Mathematics                             | 104 | 1.8 |
| Senior tutor                      | 62    | 1.1  | Religious Studies and Theology                           | 38  | 0.7 |
| Teaching fellow                   | 10    | 0.2  | Sociology, Social Policy, Social Work, Criminology and   | 177 | 3.1 |
| Technician                        | 21    | 0.4  | Gender Studies                                           |     |     |
| Tutor                             | 23    | 0.4  | Sport and Exercise Science                               | 55  | 1.0 |
| Visiting academic                 | 16    | 0.3  | Statistics                                               | 77  | 1.4 |
| General                           | 5     | 0.1  | Theatre and Dance, Film and Television, and              |     |     |
|                                   |       |      | Multimedia                                               | 42  | 0.7 |
|                                   |       |      | Veterinary Studies and Large Animal Science              | 56  | 1.0 |
| Accounting and Finance            | 138   | 2.5  | Visual Arts and Crafts                                   | 100 | 1.8 |
| Agriculture and Other Applied     |       |      |                                                          |     |     |
| Biological Sciences               | 136   | 2.4  |                                                          |     |     |

Note: These statistics are for the 5,641 staff used in the OLS regression analysis.

Sources: Ministry of Education, Tertiary Education Commission.

## Appendix D Research performance of selected groups

**Table 5: Percentage of staff quality weighted for selected groups**

|                      | %    |
|----------------------|------|
| All staff            | 59.9 |
| Males                | 68.9 |
| Females              | 47.1 |
| Professors           | 97.2 |
| Associate professors | 97.8 |
| Senior lecturers     | 66.2 |
| Lecturers            | 37.0 |

Note: These statistics refer to the dataset used for the logistic regressions.  
Sources: Ministry of Education, Tertiary Education Commission.

**Table 6: Average research scores of staff for selected groups**

|                             | Mean  | Std dev | Min | Max |
|-----------------------------|-------|---------|-----|-----|
| <i>All staff</i>            |       |         |     |     |
| RO                          | 3.6   | 1.6     | 0   | 7   |
| PE                          | 3.1   | 1.8     | 0   | 7   |
| CRE                         | 3.0   | 1.8     | 0   | 7   |
| OQS                         | 345.3 | 153.8   | 0   | 700 |
| <i>Males</i>                |       |         |     |     |
| RO                          | 3.9   | 1.6     | 0   | 7   |
| PE                          | 3.3   | 1.8     | 0   | 7   |
| CRE                         | 3.2   | 1.8     | 0   | 7   |
| OQS                         | 372.7 | 153.2   | 0   | 700 |
| <i>Females</i>              |       |         |     |     |
| RO                          | 3.1   | 1.5     | 0   | 7   |
| PE                          | 2.6   | 1.6     | 0   | 7   |
| CRE                         | 2.5   | 1.6     | 0   | 7   |
| OQS                         | 296.5 | 142.3   | 0   | 700 |
| <i>Professors</i>           |       |         |     |     |
| RO                          | 5.4   | 1.2     | 1   | 7   |
| PE                          | 5.4   | 1.2     | 0   | 7   |
| CRE                         | 5.1   | 1.4     | 1   | 7   |
| OQS                         | 534.4 | 116.6   | 100 | 700 |
| <i>Associate professors</i> |       |         |     |     |
| RO                          | 4.7   | 1.2     | 0   | 7   |
| PE                          | 4.4   | 1.3     | 0   | 7   |
| CRE                         | 4.2   | 1.4     | 0   | 7   |
| OQS                         | 458.5 | 111.9   | 75  | 700 |
| <i>Senior lecturers</i>     |       |         |     |     |
| RO                          | 3.5   | 1.4     | 0   | 7   |
| PE                          | 3.0   | 1.5     | 0   | 7   |
| CRE                         | 2.9   | 1.5     | 0   | 7   |
| OQS                         | 335.1 | 133.1   | 0   | 670 |
| <i>Lecturers</i>            |       |         |     |     |
| RO                          | 2.8   | 1.3     | 0   | 7   |
| PE                          | 2.1   | 1.3     | 0   | 7   |
| CRE                         | 1.9   | 1.3     | 0   | 6   |
| OQS                         | 253.8 | 116.7   | 0   | 685 |

Note: These statistics refer to the dataset used for the OLS regressions.  
Sources: Ministry of Education, Tertiary Education Commission.

## **Appendix E Statistical significance of staff characteristics**

In this appendix, the staff characteristics that were found to have a statistically significant impact on research performance at the 5 percent level are indicated in the tables below.

**Table 7: Statistical significance of staff characteristics on research performance by regression model – all staff**

|              | <b>Logistic</b>  | <b>OLS</b> |    |     |     |
|--------------|------------------|------------|----|-----|-----|
|              | Quality weighted | RO         | PE | CRE | OQS |
| Gender       |                  | √          |    |     | √   |
| Ethnicity    | √                |            | √  | √   |     |
| Age          | √                | √          | √  | √   | √   |
| FTE status   | √                | √          | √  | √   | √   |
| Provider     | √                | √          | √  | √   | √   |
| Position     | √                | √          | √  | √   | √   |
| Subject area | √                | √          | √  | √   | √   |

Notes:

1. 'RO' is the research output score for each staff member.
  2. 'PE' is the peer esteem score for each staff member.
  3. 'CRE' is the contribution to research environment score for each staff member.
  4. 'OQS' is the overall quality score for each staff member.
  5. 'Quality weighted' is the name given to a staff member who achieved an A, B or C quality category and hence attracted PBRF funding.
  6. A tick indicates the characteristics were statistically significant at the 5 percent level.
- Sources: Ministry of Education, Tertiary Education Commission.

**Table 8: Statistical significance of staff characteristics on research performance by regression model – males**

|              | <b>Logistic</b>  | <b>OLS</b> |    |     |     |
|--------------|------------------|------------|----|-----|-----|
|              | Quality weighted | RO         | PE | CRE | OQS |
| Ethnicity    |                  |            | √  | √   |     |
| Age          | √                | √          | √  | √   | √   |
| FTE status   | √                | √          | √  | √   | √   |
| Provider     | √                | √          | √  | √   | √   |
| Position     | √                | √          | √  | √   | √   |
| Subject area | √                | √          | √  | √   | √   |

Notes:

1. 'RO' is the research output score for each staff member.
  2. 'PE' is the peer esteem score for each staff member.
  3. 'CRE' is the contribution to research environment score for each staff member.
  4. 'OQS' is the overall quality score for each staff member.
  5. 'Quality weighted' is the name given to a staff member who achieved an A, B or C quality category and hence attracted PBRF funding.
  6. A tick indicates the characteristics were statistically significant at the 5 percent level.
- Sources: Ministry of Education, Tertiary Education Commission.

**Table 9: Statistical significance of staff characteristics on research performance by regression model – females**

|              | Logistic         | OLS |    |     |     |
|--------------|------------------|-----|----|-----|-----|
|              | Quality weighted | RO  | PE | CRE | OQS |
| Ethnicity    |                  |     |    |     |     |
| Age          | √                | √   | √  | √   | √   |
| FTE status   | √                |     | √  | √   | √   |
| Provider     | √                | √   | √  | √   | √   |
| Position     | √                | √   | √  | √   | √   |
| Subject area | √                | √   | √  | √   | √   |

Notes:

1. 'RO' is the research output score for each staff member.
2. 'PE' is the peer esteem score for each staff member.
3. 'CRE' is the contribution to research environment score for each staff member.
4. 'OQS' is the overall quality score for each staff member.
5. 'Quality weighted' is the name given to a staff member who achieved an A, B or C quality category and hence attracted PBRF funding.
6. A tick indicates the characteristics were statistically significant at the 5 percent level.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 10: Statistical significance of staff characteristics on research performance by regression model – professors**

|              | OLS |    |     |     |
|--------------|-----|----|-----|-----|
|              | RO  | PE | CRE | OQS |
| Gender       |     |    |     |     |
| Ethnicity    |     |    | √   |     |
| Age          | √   |    |     | √   |
| FTE status   | √   |    |     | √   |
| Provider     | √   | √  | √   | √   |
| Subject area | √   | √  | √   | √   |

Notes:

1. 'RO' is the research output score for each staff member.
2. 'PE' is the peer esteem score for each staff member.
3. 'CRE' is the contribution to research environment score for each staff member.
4. 'OQS' is the overall quality score for each staff member.
5. Due to a lack of observations a logistic regression analysis was unable to be carried out.
6. A tick indicates the characteristics were statistically significant at the 5 percent level.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 11: Statistical significance of staff characteristics on research performance by regression model – associate professors**

|              | OLS |    |     |     |
|--------------|-----|----|-----|-----|
|              | RO  | PE | CRE | OQS |
| Gender       |     |    | √   |     |
| Ethnicity    |     |    |     |     |
| Age          | √   | √  | √   | √   |
| FTE status   | √   | √  | √   | √   |
| Provider     | √   | √  | √   | √   |
| Subject area | √   | √  | √   | √   |

Notes:

1. 'RO' is the research output score for each staff member.
2. 'PE' is the peer esteem score for each staff member.
3. 'CRE' is the contribution to research environment score for each staff member.
4. 'OQS' is the overall quality score for each staff member.
5. Due to a lack of observations a logistic regression analysis was unable to be carried out.
6. A tick indicates the characteristics were statistically significant at the 5 percent level.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 12: Statistical significance of staff characteristics on research performance by regression model – senior lecturers**

|              | Logistic         | OLS |    |     |     |
|--------------|------------------|-----|----|-----|-----|
|              | Quality weighted | RO  | PE | CRE | OQS |
| Gender       | √                |     |    | √   |     |
| Ethnicity    |                  |     |    |     |     |
| Age          | √                | √   | √  | √   | √   |
| FTE status   | √                | √   | √  | √   | √   |
| Provider     | √                | √   | √  | √   | √   |
| Subject area | √                | √   | √  | √   | √   |

Notes:

1. 'RO' is the research output score for each staff member.
2. 'PE' is the peer esteem score for each staff member.
3. 'CRE' is the contribution to research environment score for each staff member.
4. 'OQS' is the overall quality score for each staff member.
5. 'Quality weighted' is the name given to a staff member who achieved an A, B or C quality category and hence attracted PBRF funding.
6. A tick indicates the characteristics were statistically significant at the 5 percent level.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 13: Statistical significance of staff characteristics on research performance by regression model – lecturers**

|              | Logistic         | OLS |    |     |     |
|--------------|------------------|-----|----|-----|-----|
|              | Quality weighted | RO  | PE | CRE | OQS |
| Gender       |                  | √   |    |     | √   |
| Ethnicity    |                  |     |    |     |     |
| Age          | √                | √   | √  | √   | √   |
| FTE status   | √                |     |    |     |     |
| Provider     | √                | √   | √  | √   | √   |
| Subject area | √                | √   | √  | √   | √   |

Notes:

1. 'RO' is the research output score for each staff member.
2. 'PE' is the peer esteem score for each staff member.
3. 'CRE' is the contribution to research environment score for each staff member.
4. 'OQS' is the overall quality score for each staff member.
5. 'Quality weighted' is the name given to a staff member who achieved an A, B or C quality category and hence attracted PBRF funding.
6. A tick indicates the characteristics were statistically significant at the 5 percent level. Sources: Ministry of Education, Tertiary Education Commission.

## Appendix F Logistic regression results

**Table 14: Logistic regression results of the impact of staff characteristics on the probability of staff being quality weighted - all staff**

| Variables                                         | Coefficient | Variables continued                                                                          | Coefficient |
|---------------------------------------------------|-------------|----------------------------------------------------------------------------------------------|-------------|
| Constant                                          | -10.516**   | Biomedical                                                                                   | -0.678      |
|                                                   |             | Chemistry                                                                                    | -0.078      |
|                                                   |             | Clinical Medicine                                                                            | -1.465**    |
| Age                                               | 1.013**     | Communications, Journalism and Media Studies                                                 | -0.541      |
| Age <sup>2</sup>                                  | -0.021**    | Computer Science, Information Technology, Information Services                               | -0.863*     |
| Age <sup>3</sup>                                  | 0.000**     | Dentistry                                                                                    | -2.227**    |
| Gender (base = females)                           | 0.050       | Design                                                                                       | -1.989**    |
| FTE status                                        | 1.225**     | Earth Science                                                                                | 0.532       |
|                                                   |             | Ecology, Evolution and Behaviour                                                             | 0.692       |
| <i>Provider (base = University of Auckland)</i>   |             | Economics                                                                                    | -0.832      |
| University of Canterbury                          | -0.196      | Education                                                                                    | -1.400**    |
| University of Otago                               | -0.116      | Engineering and Technology                                                                   | -0.025      |
| Victoria University of Wellington                 | -0.149      | English Language and Literature                                                              | -0.680      |
| Lincoln University                                | -1.162**    | Foreign Languages and Linguistics                                                            | -1.089*     |
| University of Waikato                             | -0.773**    | History, History of Art, Classics and Curatorial Studies                                     | -0.286      |
| Auckland University of Technology                 | -2.884**    | Human Geography                                                                              | 0.409       |
| Massey University                                 | -1.102**    | Law                                                                                          | -1.299**    |
| Unitec                                            | -2.974**    | Management, Human Resources, Industrial Relations, International Business and Other Business | -1.253**    |
| Wintec                                            | -3.503**    | Māori Knowledge and Development                                                              | -0.581      |
| Auckland College of Education                     | -2.078**    | Marketing and Tourism                                                                        | -1.200**    |
| Wellington College of Education                   | -4.927**    | Molecular, Cellular and Whole Organism Biology                                               | -0.335      |
| Christchurch College of Education                 | -3.308**    | Music, Literary Arts and Other Arts                                                          | 0.361       |
| Dunedin College of Education                      | -3.133**    | Nursing                                                                                      | -3.576**    |
| Bible College of New Zealand                      | -4.352**    | Other Health                                                                                 | -1.570**    |
| Te Wānanga o Aotearoa                             | -1.455*     | Physics                                                                                      | -0.568      |
| Carey Baptist College                             | -3.511**    | Political Science, International Relations and Public Policy                                 | -0.919      |
| Whitecliffe College of Drama and Arts             | -4.044**    | Psychology                                                                                   | -0.048      |
| AIS St Helens                                     | -3.477**    | Public Health                                                                                | -0.891*     |
| Te Whare Wānanga o Te Pihopatanga o Aotearoa      | -2.083*     | Pure and Applied Mathematics                                                                 | -0.940*     |
| Anamata                                           | -1.464      | Religious Studies and Theology                                                               | 0.453       |
| Bethlehem Institute of Education                  | -           | Sociology, Social Policy, Social Work, Criminology and Gender Studies                        | -0.380      |
|                                                   |             | Sport and Exercise Science                                                                   | -1.296**    |
| <i>Position (base = Professor)</i>                |             | Statistics                                                                                   | -0.582      |
| Academic                                          | -2.710**    | Theatre and Dance, Film and Television, and Multimedia                                       | -0.189      |
| Academic leadership role                          | -2.480**    | Veterinary Studies and Large Animal Science                                                  | -1.574**    |
| Assistant research fellow                         | -5.082**    | Visual Arts and Crafts                                                                       | 0.944*      |
| Associate professor                               | 0.229       |                                                                                              |             |
| Lecturer                                          | -4.387**    | <i>Ethnicity (base = European)</i>                                                           |             |
| Postdoctoral fellow                               | -4.135**    | Māori                                                                                        | -0.307      |
| Research fellow                                   | -3.664**    | Pasifika                                                                                     | -0.683*     |
| Research officer                                  | -3.523**    | Asian                                                                                        | -0.116      |
| Researcher                                        | -3.726**    | Other                                                                                        | -0.020      |
| Senior lecturer                                   | -2.943**    | Not stated                                                                                   | -0.213      |
| Senior research fellow                            | -1.788**    |                                                                                              |             |
| Senior teaching fellow                            | -5.764**    | Log likelihood                                                                               | -3,061.0    |
| Senior tutor                                      | -6.181**    | Hosmer-Lemeshow $\chi^2$                                                                     | 11.75       |
| Teaching fellow                                   | -6.184**    | Pseudo R <sup>2</sup>                                                                        | 0.414       |
| Technician                                        | -3.848**    | Number of observations                                                                       | 7,752       |
| Tutor                                             | -6.136**    |                                                                                              |             |
| Visiting academic                                 | -4.405**    |                                                                                              |             |
| General                                           | -2.427*     |                                                                                              |             |
| <i>Subject (base = Philosophy)</i>                |             |                                                                                              |             |
| Accounting and Finance                            | -1.984**    |                                                                                              |             |
| Agriculture and Other Applied Biological Sciences | 0.069       |                                                                                              |             |
| Anthropology and Archaeology                      | 0.814       |                                                                                              |             |
| Architecture, Design, Planning and Surveying      | -0.647      |                                                                                              |             |

Note: \*\* Significant at the 1 percent level \*Significant at the 5 percent level.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 15: Logistic regression results of the impact of staff characteristics on the probability of staff being quality weighted - males**

| Variables                                         | Coefficient | Variables continued                                                                          | Coefficient |
|---------------------------------------------------|-------------|----------------------------------------------------------------------------------------------|-------------|
| Constant                                          | -12.437**   | Biomedical                                                                                   | -0.553      |
| Age                                               | 1.160**     | Chemistry                                                                                    | 0.082       |
| Age <sup>2</sup>                                  | -0.025**    | Clinical Medicine                                                                            | -1.450**    |
| Age <sup>3</sup>                                  | 0.000**     | Communications, Journalism and Media Studies                                                 | -0.222      |
| FTE status                                        | 1.486**     | Computer Science, Information Technology, Information Services                               | -0.847      |
| <i>Provider (base = University of Auckland)</i>   |             | Dentistry                                                                                    | -2.465**    |
| University of Canterbury                          | -0.141      | Design                                                                                       | -2.221**    |
| University of Otago                               | 0.147       | Earth Science                                                                                | 0.516       |
| Victoria University of Wellington                 | 0.335       | Ecology, Evolution and Behaviour                                                             | 1.454*      |
| Lincoln University                                | -1.180**    | Economics                                                                                    | -0.247      |
| University of Waikato                             | -0.510**    | Education                                                                                    | -1.378**    |
| Auckland University of Technology                 | -2.852**    | Engineering and Technology                                                                   | 0.001       |
| Massey University                                 | -1.012**    | English Language and Literature                                                              | -0.528      |
| Unitec                                            | -2.873**    | Foreign Languages and Linguistics                                                            | -0.878      |
| Wintec                                            | -4.061**    | History, History of Art, Classics and Curatorial Studies                                     | -0.049      |
| Auckland College of Education                     | -2.285**    | Human Geography                                                                              | 0.125       |
| Wellington College of Education                   | -           | Law                                                                                          | -1.364*     |
| Christchurch College of Education                 | -2.856**    | Management, Human Resources, Industrial Relations, International Business and Other Business | -1.279*     |
| Dunedin College of Education                      | -2.537**    | Māori Knowledge and Development                                                              | -0.556      |
| Bible College of New Zealand                      | -4.031**    | Marketing and Tourism                                                                        | -1.180*     |
| Te Wānanga o Aotearoa                             | -1.562      | Molecular, Cellular and Whole Organism Biology                                               | -0.334      |
| Carey Baptist College                             | -2.614*     | Music, Literary Arts and Other Arts                                                          | 0.486       |
| Whitecliffe College of Drama and Arts             | -4.228**    | Nursing                                                                                      | -2.653**    |
| AIS St Helens                                     | -3.189**    | Other Health                                                                                 | -1.236*     |
| Te Whare Wānanga o Te Pihopatanga o Aotearoa      | -0.045      | Physics                                                                                      | -0.480      |
| Anamata                                           | -a          | Political Science, International Relations and Public Policy                                 | -0.999      |
| Bethlehem Institute of Education                  | -           | Psychology                                                                                   | 0.110       |
| <i>Position (base = Professor)</i>                |             | Public Health                                                                                | -0.750      |
| Academic                                          | -2.309**    | Pure and Applied Mathematics                                                                 | -0.792      |
| Academic leadership role                          | -2.295**    | Religious Studies and Theology                                                               | -0.055      |
| Assistant research fellow                         | -5.694**    | Sociology, Social Policy, Social Work, Criminology and Gender Studies                        | -0.053      |
| Associate professor                               | -0.230      | Sport and Exercise Science                                                                   | -0.736      |
| Lecturer                                          | -4.546**    | Statistics                                                                                   | -0.413      |
| Postdoctoral fellow                               | -4.568**    | Theatre and Dance, Film and Television, and Multimedia                                       | 0.029       |
| Research fellow                                   | -3.957**    | Veterinary Studies and Large Animal Science                                                  | -1.283*     |
| Research officer                                  | -3.497**    | Visual Arts and Crafts                                                                       | 0.811       |
| Researcher                                        | -3.028**    | <i>Ethnicity (base = European)</i>                                                           |             |
| Senior lecturer                                   | -3.142**    | Māori                                                                                        | -0.353      |
| Senior research fellow                            | -2.076**    | Pasifika                                                                                     | -0.384      |
| Senior teaching fellow                            | -5.700**    | Asian                                                                                        | 0.086       |
| Senior tutor                                      | -5.983**    | Other                                                                                        | 0.069       |
| Teaching fellow                                   | -6.812**    | Not stated                                                                                   | -0.245*     |
| Technician                                        | -4.108**    |                                                                                              |             |
| Tutor                                             | -6.389**    |                                                                                              |             |
| Visiting academic                                 | -3.979**    |                                                                                              |             |
| General                                           | -4.259*     |                                                                                              |             |
| <i>Subject (base = Philosophy)</i>                |             |                                                                                              |             |
| Accounting and Finance                            | -2.086**    | Log likelihood                                                                               | -1,698      |
| Agriculture and Other Applied Biological Sciences | 0.159       | Pseudo R <sup>2</sup>                                                                        | 0.394       |
| Anthropology and Archaeology                      | 0.726       | Number of observations                                                                       | 4,534       |
| Architecture, Design, Planning and Surveying      | -0.639      |                                                                                              |             |

Notes:

1. \*\* Significant at the 1 percent level \*Significant at the 5 percent level.
  2. An 'a' indicates that the results have been withheld due to a small number of observations.
- Sources: Ministry of Education, Tertiary Education Commission.



**Table 16: Logistic regression results of the impact of staff characteristics on the probability of staff being quality weighted - females**

| Variables                                         | Coefficient | Variables continued                                                                          | Coefficient |
|---------------------------------------------------|-------------|----------------------------------------------------------------------------------------------|-------------|
| Constant                                          | -8.529**    | Biomedical                                                                                   | -0.922      |
|                                                   |             | Chemistry                                                                                    | -0.411      |
| Age                                               | 0.924*      | Clinical Medicine                                                                            | -1.595*     |
| Age <sup>2</sup>                                  | -0.019*     | Communications, Journalism and Media Studies                                                 | -1.028      |
| Age <sup>3</sup>                                  | 0.000*      | Computer Science, Information Technology, Information Services                               | -1.217      |
| FTE status                                        | 0.966**     | Dentistry                                                                                    | -2.103*     |
|                                                   |             | Design                                                                                       | -1.914*     |
| <i>Provider (base = University of Auckland)</i>   |             | Earth Science                                                                                | 0.652       |
| University of Canterbury                          | -0.338      | Ecology, Evolution and Behaviour                                                             | -0.296      |
| University of Otago                               | -0.440      | Economics                                                                                    | -2.262**    |
| Victoria University of Wellington                 | -0.700*     | Education                                                                                    | -1.742*     |
| Lincoln University                                | -0.824*     | Engineering and Technology                                                                   | 0.547       |
| University of Waikato                             | -1.092**    | English Language and Literature                                                              | -0.944      |
| Auckland University of Technology                 | -3.130**    | Foreign Languages and Linguistics                                                            | -1.408*     |
| Massey University                                 | -1.286**    | History, History of Art, Classics and Curatorial Studies                                     | -0.650      |
| Unitec                                            | -3.344**    | Human Geography                                                                              | 0.427       |
| Wintec                                            | -3.189**    | Law                                                                                          | -1.389      |
| Auckland College of Education                     | -2.112**    | Management, Human Resources, Industrial Relations, International Business and Other Business | -1.340      |
| Wellington College of Education                   | -4.842**    | Māori Knowledge and Development                                                              | -0.767      |
| Christchurch College of Education                 | -3.739**    | Marketing and Tourism                                                                        | -1.413      |
| Dunedin College of Education                      | -3.538**    | Molecular, Cellular and Whole Organism Biology                                               | -0.437      |
| Bible College of New Zealand                      | -5.105**    |                                                                                              |             |
| Te Wānanga o Aotearoa                             | -1.625      | Music, Literary Arts and Other Arts                                                          | 0.030       |
| Carey Baptist College                             | -           | Nursing                                                                                      | -4.581**    |
| Whitecliffe College of Drama and Arts             | -3.904**    | Other Health                                                                                 | -2.015**    |
| AIS St Helens                                     | -           | Physics                                                                                      | -0.754      |
| Te Whare Wānanga o Te Pihopatanga o Aotearoa      | -           | Political Science, International Relations and Public Policy                                 | -0.842      |
| Anamata                                           | -           | Psychology                                                                                   | -0.337      |
| Bethlehem Institute of Education                  | -           | Public Health                                                                                | -1.217      |
|                                                   |             | Pure and Applied Mathematics                                                                 | -1.334      |
| <i>Position (base = Professor)</i>                |             | Religious Studies and Theology                                                               | 1.670       |
| Academic                                          | -3.577**    | Sociology, Social Policy, Social Work, Criminology and Gender Studies                        | -0.746      |
| Academic leadership role                          | -2.945**    | Sport and Exercise Science                                                                   | -2.543**    |
| Assistant research fellow                         | -4.907**    | Statistics                                                                                   | -0.981      |
| Associate professor                               | 2.883*      | Theatre and Dance, Film and Television, and Multimedia                                       | -0.580      |
| Lecturer                                          | -4.564**    | Veterinary Studies and Large Animal Science                                                  | -2.222*     |
| Postdoctoral fellow                               | -4.000**    | Visual Arts and Crafts                                                                       | 1.178       |
| Research fellow                                   | -3.692**    |                                                                                              |             |
| Research officer                                  | -3.944**    | <i>Ethnicity (base = European)</i>                                                           |             |
| Researcher                                        | -4.273**    | Māori                                                                                        | -0.296      |
| Senior lecturer                                   | -2.934**    | Pasifika                                                                                     | -1.366*     |
| Senior research fellow                            | -1.647      | Asian                                                                                        | -0.410      |
| Senior teaching fellow                            | -6.330**    | Other                                                                                        | -0.042      |
| Senior tutor                                      | -6.826**    | Not stated                                                                                   | -0.170      |
| Teaching fellow                                   | -5.848**    |                                                                                              |             |
| Technician                                        | -3.285*     |                                                                                              |             |
| Tutor                                             | -6.565**    |                                                                                              |             |
| Visiting academic                                 | -4.980**    |                                                                                              |             |
|                                                   |             |                                                                                              |             |
| <i>Subject (base = Philosophy)</i>                |             |                                                                                              |             |
| Accounting and Finance                            | -1.938*     | Log likelihood                                                                               | -1,285.3    |
| Agriculture and Other Applied Biological Sciences | 0.096       | Pseudo R <sup>2</sup>                                                                        | 0.417       |
| Anthropology and Archaeology                      | 0.909       | Number of observations                                                                       | 3,187       |
| Architecture, Design, Planning and Surveying      | -0.468      |                                                                                              |             |

Note: \*\* Significant at the 1 percent level \*Significant at the 5 percent level.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 17: Logistic regression results of the impact of staff characteristics on the probability of staff being quality weighted - senior lecturers**

| Variables                                                      | Coefficient | Variables continued                                                                          | Coefficient |
|----------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------|-------------|
| Constant                                                       | -11.959**   | Ecology, Evolution and Behaviour                                                             | 2.163*      |
|                                                                |             | Economics                                                                                    | 0.213       |
| Age                                                            | 0.961**     | Education                                                                                    | -1.204      |
| Age <sup>2</sup>                                               | -0.021**    | Engineering and Technology                                                                   | 0.224       |
| Age <sup>3</sup>                                               | 0.000**     | English Language and Literature                                                              | -0.378      |
|                                                                |             | Foreign Languages and Linguistics                                                            | -1.000      |
| Gender (base = females)                                        | -0.409**    | History, History of Art, Classics and Curatorial Studies                                     | -0.235      |
|                                                                |             | Human Geography                                                                              | -0.036      |
| FTE status                                                     | 1.921**     | Law                                                                                          | -1.004      |
|                                                                |             | Management, Human Resources, Industrial Relations, International Business and Other Business | -0.828      |
|                                                                |             |                                                                                              | 2.163       |
| <i>Provider (base = University of Auckland)</i>                |             | Māori Knowledge and Development                                                              | 0.389       |
| University of Canterbury                                       | -0.194      | Marketing and Tourism                                                                        | -0.267      |
| University of Otago                                            | 0.570*      | Molecular, Cellular and Whole Organism                                                       | 1.360       |
| Victoria University of Wellington                              | 0.220       | Biology                                                                                      |             |
| Lincoln University                                             | -1.738**    | Music, Literary Arts and Other Arts                                                          | 0.970       |
| University of Waikato                                          | -0.505*     | Nursing                                                                                      | -4.070**    |
| Auckland University of Technology                              | -3.703**    | Other Health                                                                                 | -1.228      |
| Massey University                                              | -1.147**    | Physics                                                                                      | -0.144      |
| Unitec                                                         | -3.985**    | Political Science, International Relations and Public Policy                                 | 0.009       |
| Wintec                                                         | -4.865**    | Psychology                                                                                   | 0.297       |
| Auckland College of Education                                  | -           | Public Health                                                                                | -1.494      |
| Wellington College of Education                                | -           | Public Health                                                                                | -0.736*     |
| Christchurch College of Education                              | -4.309**    | Pure and Applied Mathematics                                                                 | 0.091       |
| Dunedin College of Education                                   | -2.817**    | Religious Studies and Theology                                                               | -0.027      |
| Bible College of New Zealand                                   | -           | Sociology, Social Policy, Social Work, Criminology and Gender Studies                        | -0.802      |
| Te Wānanga o Aotearoa                                          | -           | Sport and Exercise Science                                                                   | 0.370       |
| Carey Baptist College                                          | -           | Statistics                                                                                   | -0.500      |
| Whitecliffe College of Drama and Arts                          | a**         | Theatre and Dance, Film and Television, and Multimedia                                       | -0.652      |
| AIS St Helens                                                  | -           |                                                                                              | 1.360       |
| Te Whare Wānanga o Te Pihopatanga o Aotearoa                   | -           | Veterinary Studies and Large Animal Science                                                  | 0.970       |
| Anamata                                                        | -           | Visual Arts and Crafts                                                                       | -4.070      |
| Bethlehem Institute of Education                               | -           |                                                                                              | -1.228      |
|                                                                |             | <i>Ethnicity (base = European)</i>                                                           |             |
| <i>Subject (base = Philosophy)</i>                             |             | Māori                                                                                        | -0.779*     |
| Accounting and Finance                                         | -1.549*     | Pasifika                                                                                     | 0.001       |
| Agriculture and Other Applied Biological Sciences              | 1.058       | Asian                                                                                        | -0.077      |
| Anthropology and Archaeology                                   | 1.227       | Other                                                                                        | -0.031      |
| Architecture, Design, Planning and Surveying                   | -0.106      | Not stated                                                                                   | -0.387      |
| Biomedical                                                     | -0.245      |                                                                                              |             |
| Chemistry                                                      | 0.042       |                                                                                              |             |
| Clinical Medicine                                              | -1.619*     |                                                                                              |             |
| Communications, Journalism and Media Studies                   | 0.615       |                                                                                              |             |
| Computer Science, Information Technology, Information Services | -0.573      |                                                                                              |             |
| Dentistry                                                      | -3.169**    | Log likelihood                                                                               | -1,001.4    |
| Design                                                         | -2.494*     | Pseudo R <sup>2</sup>                                                                        | 0.393       |
| Earth Science                                                  | 0.656       | Number of observations                                                                       | 2,586       |

Notes:

1. \*\* Significant at the 1 percent level \*Significant at the 5 percent level.
  2. An 'a' indicates that the results have been withheld due to a small number of observations.
- Sources: Ministry of Education, Tertiary Education Commission.

**Table 18: Logistic regression results of the impact of staff characteristics on the probability of staff being quality weighted – lecturers**

| Variables                                                      | Coefficient | Variables continued                                                                          | Coefficient |
|----------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------|-------------|
| Constant                                                       | -12.756**   | Ecology, Evolution and Behaviour                                                             | 0.372       |
|                                                                |             | Economics                                                                                    | -1.439*     |
| Age                                                            | 0.972**     | Education                                                                                    | -1.771      |
| Age <sup>2</sup>                                               | -0.022**    | Engineering and Technology                                                                   | 0.349       |
| Age <sup>3</sup>                                               | 0.000**     | English Language and Literature                                                              | -1.162      |
|                                                                |             | Foreign Languages and Linguistics                                                            | -1.049      |
| Gender ( <i>base = females</i> )                               | 0.136       | History, History of Art, Classics and Curatorial Studies                                     | -0.118      |
| FTE status                                                     | 0.847*      | Human Geography                                                                              | 1.950       |
|                                                                |             | Law                                                                                          | -1.462*     |
| <i>Provider (base = University of Auckland)</i>                |             | Management, Human Resources, Industrial Relations, International Business and Other Business | -1.548**    |
| University of Canterbury                                       | -0.232      | Māori Knowledge and Development                                                              | -0.872      |
| University of Otago                                            | -0.382      | Marketing and Tourism                                                                        | -1.818**    |
| Victoria University of Wellington                              | -0.428      | Molecular, Cellular and Whole Organism Biology                                               | -0.041      |
| Lincoln University                                             | -1.030*     | Music, Literary Arts and Other Arts                                                          | 0.143       |
| University of Waikato                                          | -0.878**    | Nursing                                                                                      | -3.610**    |
| Auckland University of Technology                              | -2.954**    | Other Health                                                                                 | -1.634**    |
| Massey University                                              | -1.061**    | Physics                                                                                      | -0.610      |
| Unitec                                                         | -2.750**    | Political Science, International Relations and Public Policy                                 | -1.245      |
| Wintec                                                         | -3.077**    | Psychology                                                                                   | -0.126      |
| Auckland College of Education                                  | -1.763**    | Public Health                                                                                | 0.637       |
| Wellington College of Education                                | -           | Pure and Applied Mathematics                                                                 | -0.402      |
| Christchurch College of Education                              | -           | Religious Studies and Theology                                                               | -0.627      |
| Dunedin College of Education                                   | -           | Sociology, Social Policy, Social Work, Criminology and Gender Studies                        | -0.484      |
| Bible College of New Zealand                                   | -1.901      | Sport and Exercise Science                                                                   | -1.411*     |
| Te Wānanga o Aotearoa                                          | a           | Statistics                                                                                   | -1.144      |
| Carey Baptist College                                          | -0.953      | Theatre and Dance, Film and Television, and Multimedia                                       | 0.307       |
| Whitecliffe College of Drama and Arts                          | -2.031*     | Veterinary Studies and Large Animal Science                                                  | -2.192**    |
| AIS St Helens                                                  | -2.581*     | Visual Arts and Crafts                                                                       | 0.949       |
| Te Whare Wānanga o Te Pihopatanga o Aotearoa                   | -           |                                                                                              |             |
| Anamata                                                        | -           | <i>Ethnicity (base = European)</i>                                                           |             |
| Bethlehem Institute of Education                               | -           | Māori                                                                                        | -0.374      |
|                                                                |             | Pasifika                                                                                     | -0.672      |
| <i>Subject (base = Philosophy)</i>                             |             | Asian                                                                                        | 0.184       |
| Accounting and Finance                                         | -2.498**    | Other                                                                                        | -0.137      |
| Agriculture and Other Applied Biological Sciences              | -0.501      | Not stated                                                                                   | -0.098      |
| Anthropology and Archaeology                                   | 0.404       |                                                                                              |             |
| Architecture, Design, Planning and Surveying                   | -0.198      |                                                                                              |             |
| Biomedical                                                     | -0.078      |                                                                                              |             |
| Chemistry                                                      | -0.519      |                                                                                              |             |
| Clinical Medicine                                              | -1.734*     |                                                                                              |             |
| Communications, Journalism and Media Studies                   | -0.722      |                                                                                              |             |
| Computer Science, Information Technology, Information Services | -1.171      |                                                                                              |             |
| Dentistry                                                      | -0.983      | Log likelihood                                                                               | -959.2      |
| Design                                                         | -1.931**    | Pseudo R <sup>2</sup>                                                                        | 0.272       |
| Earth Science                                                  | 0.351       | Number of observations                                                                       | 1,958       |

Notes:

1. \*\* Significant at the 1 percent level \*Significant at the 5 percent level.
  2. An 'a' indicates that the results have been withheld due to a small number of observations.
- Sources: Ministry of Education, Tertiary Education Commission.

## Appendix G OLS regression results

**Table 19: OLS regression results of the impact of staff characteristics on research performance by research quality score - all staff**

| Variables                                         | Research score  |                 |                  |                  |
|---------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                   | RO coefficients | PE coefficients | CRE coefficients | OQS coefficients |
| Constant                                          | -2.97*          | -4.85**         | -5.39**          | -359.8**         |
| Age                                               | 0.63**          | 0.71**          | 0.67**           | 64.5**           |
| Age <sup>2</sup>                                  | -0.01**         | -0.01**         | -0.01**          | -1.3**           |
| Age <sup>3</sup>                                  | 0.00**          | 0.00**          | 0.00**           | 0.0**            |
| Gender ( <i>base = females</i> )                  | 0.16**          | 0.03            | -0.04            | 10.7**           |
| FTE status                                        | 0.30**          | 0.43**          | 0.67**           | 37.7**           |
| <i>Provider (base = University of Auckland)</i>   |                 |                 |                  |                  |
| University of Canterbury                          | -0.16*          | -0.18**         | -0.26**          | -17.7**          |
| University of Otago                               | -0.00           | 0.14*           | 0.18**           | 4.6              |
| Victoria University of Wellington                 | -0.23**         | -0.06           | 0.02             | -17.2**          |
| Lincoln University                                | -0.77**         | -0.93**         | -0.70**          | -78.1**          |
| University of Waikato                             | -0.31**         | -0.22**         | -0.13            | -26.8**          |
| Auckland University of Technology                 | -1.12**         | -0.98**         | -1.08**          | -109.2**         |
| Massey University                                 | -0.65**         | -0.61**         | -0.64**          | -64.4**          |
| Unitec                                            | -0.83**         | -0.90**         | -1.20**          | -89.3**          |
| Wintec                                            | -1.73**         | -1.48**         | -1.44**          | -164.7**         |
| Auckland College of Education                     | -0.82**         | -0.39*          | -0.64**          | -72.5**          |
| Wellington College of Education                   | -1.96**         | -1.67**         | -1.91**          | -191.0**         |
| Christchurch College of Education                 | -1.77**         | -1.50**         | -1.58**          | -172.1**         |
| Dunedin College of Education                      | -1.95**         | -1.90**         | -1.84**          | -192.4**         |
| Bible College of New Zealand                      | -2.07**         | -1.93**         | -2.36**          | -208.9**         |
| Te Wānanga o Aotearoa                             | -1.19**         | -1.26**         | -0.93*           | -116.4**         |
| Carey Baptist College                             | a               | a               | a                | a**              |
| Whitecliffe College of Drama and Arts             | -2.38**         | -2.53**         | -2.40**          | -240.7**         |
| AIS St Helens                                     | a**             | a**             | a**              | a**              |
| Te Whare Wānanga o Te Pihopatanga o Aotearoa      | -1.83**         | -3.57**         | -2.76**          | -222.7**         |
| Anamata                                           | a               | a**             | a*               | a                |
| Bethlehem Institute of Education                  | a               | a               | a                | a                |
| <i>Position (base = Professor)</i>                |                 |                 |                  |                  |
| Academic                                          | -2.08**         | -2.65**         | -2.41**          | -220.9**         |
| Academic leadership role                          | -1.28**         | -1.33**         | -1.19**          | -127.0**         |
| Assistant research fellow                         | -3.09**         | -4.27**         | -3.86**          | -337.8**         |
| Associate professor                               | -0.75**         | -1.07**         | -0.96**          | -82.7**          |
| Lecturer                                          | -2.70**         | -3.26**         | -3.08**          | -283.6**         |
| Postdoctoral fellow                               | -3.06**         | -3.79**         | -3.91**          | -329.4**         |
| Research fellow                                   | -2.55**         | -3.57**         | -3.42**          | -283.6**         |
| Research officer                                  | -2.25**         | -2.85**         | -2.71**          | -240.6**         |
| Researcher                                        | -2.40**         | -3.44**         | -2.85**          | -262.4**         |
| Senior lecturer                                   | -1.88**         | -2.37**         | -2.14**          | -199.4**         |
| Senior research fellow                            | -1.34**         | -2.23**         | -1.91**          | -156.0**         |
| Senior teaching fellow                            | -2.90**         | -3.38**         | -3.15**          | -300.3**         |
| Senior tutor                                      | -3.19**         | -3.82**         | -3.60**          | -334.5**         |
| Teaching fellow                                   | -2.75**         | -3.80**         | -3.57**          | -303.2**         |
| Technician                                        | -2.63**         | -3.68**         | -3.26**          | -288.3**         |
| Tutor                                             | -2.92**         | -3.25**         | -3.37**          | -303.3**         |
| Visiting academic                                 | -2.53**         | -2.74**         | -2.52**          | -255.0**         |
| General                                           | -2.39**         | -3.83**         | -3.14**          | -272.3**         |
| <i>Subject (base = Philosophy)</i>                |                 |                 |                  |                  |
| Accounting and Finance                            | -1.28**         | -1.86**         | -1.56**          | -140.9**         |
| Agriculture and Other Applied Biological Sciences | -0.72**         | -0.38*          | 0.19             | -53.4**          |
| Anthropology and Archaeology                      | -0.50*          | -0.38           | 0.10             | -39.4*           |
| Architecture, Design, Planning and Surveying      | -1.03**         | -0.56**         | -0.46*           | -87.1**          |

**Table 19: OLS regression results of the impact of staff characteristics on research performance by research quality score - all staff - continued**

| Variables                                                                                    | Research score  |                 |                  |                  |
|----------------------------------------------------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                                                              | RO coefficients | PE coefficients | CRE coefficients | OQS coefficients |
| Biomedical                                                                                   | -0.70**         | -0.79**         | -0.17            | -63.4**          |
| Chemistry                                                                                    | -0.52**         | -0.34           | 0.25             | -37.6*           |
| Clinical Medicine                                                                            | -1.44**         | -1.33**         | -0.91**          | -134.4**         |
| Communications, Journalism and Media Studies                                                 | -0.80**         | -1.01**         | -0.68**          | -81.4**          |
| Computer Science, Information Technology, Information Services                               | -0.79**         | -0.88**         | -0.45            | -75.6**          |
| Dentistry                                                                                    | -1.37**         | -1.34**         | -1.10**          | -132.1**         |
| Design                                                                                       | -1.48**         | -1.82**         | -1.25**          | -149.8**         |
| Earth Science                                                                                | -0.57**         | -0.23           | 0.45*            | -36.5*           |
| Ecology, Evolution and Behaviour                                                             | -0.47**         | 0.13            | 0.37             | -29.1            |
| Economics                                                                                    | -0.93**         | -0.75**         | -0.32            | -81.0**          |
| Education                                                                                    | -1.20**         | -1.45**         | -1.00**          | -120.8**         |
| Engineering and Technology                                                                   | -0.42**         | -0.34*          | 0.03             | -34.3*           |
| English Language and Literature                                                              | -0.81**         | -0.98**         | -0.87**          | -84.2**          |
| Foreign Languages and Linguistics                                                            | -0.73**         | -0.85**         | -0.63**          | -73.1**          |
| History, History of Art, Classics and Curatorial Studies                                     | -0.55**         | -0.46*          | -0.40*           | -51.5**          |
| Human Geography                                                                              | -0.53*          | -0.38           | 0.07             | -41.9*           |
| Law                                                                                          | -1.25**         | -0.88**         | -0.98**          | -115.4**         |
| Management, Human Resources, Industrial Relations, International Business and Other Business | -1.25**         | -1.20**         | -0.73**          | -117.4**         |
| Māori Knowledge and Development                                                              | 0.01            | -0.01           | 0.08             | 1.4              |
| Marketing and Tourism                                                                        | -1.28**         | -1.27**         | -0.95**          | -122.6**         |
| Molecular, Cellular and Whole Organism Biology                                               | -0.56**         | -0.59**         | 0.04             | -48.9**          |
| Music, Literary Arts and Other Arts                                                          | -0.24           | -0.45*          | -0.79**          | -35.3*           |
| Nursing                                                                                      | -2.46**         | -1.95**         | -1.32**          | -221.4**         |
| Other Health                                                                                 | -1.32**         | -1.06**         | -0.62**          | -117.8**         |
| Physics                                                                                      | -0.55**         | -0.40           | 0.17             | -41.7*           |
| Political Science, International Relations and Public Policy                                 | -0.48*          | -0.79**         | -0.59**          | -54.1**          |
| Psychology                                                                                   | -0.44**         | -0.22           | 0.23             | -30.5            |
| Public Health                                                                                | -1.02**         | -0.94**         | -0.25            | -89.2**          |
| Pure and Applied Mathematics                                                                 | -0.22           | -0.41*          | 0.06             | -22.7            |
| Religious Studies and Theology                                                               | -0.28           | -0.41           | 0.17             | -28.0            |
| Sociology, Social Policy, Social Work, Criminology and Gender Studies                        | -0.89**         | -0.61**         | -0.14            | -73.2**          |
| Sport and Exercise Science                                                                   | -1.71**         | -1.49**         | -1.20**          | -159.6**         |
| Statistics                                                                                   | -0.62**         | -0.88**         | -0.75**          | -67.4**          |
| Theatre and Dance, Film and Television, and Multimedia                                       | -0.52*          | -0.97**         | -1.03**          | -66.6**          |
| Veterinary Studies and Large Animal Science                                                  | -1.19**         | -1.85**         | -1.66**          | -135.8**         |
| Visual Arts and Crafts                                                                       | 0.07            | -0.61**         | -0.90**          | -18.1            |
| <i>Ethnicity (base = European)</i>                                                           |                 |                 |                  |                  |
| Māori                                                                                        | -0.16           | 0.29**          | 0.16             | -4.4             |
| Pasifika                                                                                     | -0.30           | -0.08           | -0.17            | -24.6            |
| Asian                                                                                        | 0.03            | -0.24**         | -0.30**          | -6.1             |
| Other                                                                                        | -0.03           | -0.05           | -0.08            | -3.8             |
| Not stated                                                                                   | -0.02           | -0.04           | -0.12*           | -4.1             |
| F statistic                                                                                  | 56.2            | 67.8            | 66.6             | 71.9             |
| R <sup>2</sup>                                                                               | 0.47            | 0.52            | 0.52             | 0.53             |
| Number of observations                                                                       | 5,640           | 5,641           | 5,641            | 5,641            |

Notes:

1. \*\* Significant at the 1 percent level \*Significant at the 5 percent level.
2. The OLS regressions used data for staff who were panel assessed. Therefore, the results of these regressions should not be compared with analysis that includes data for all PBRF-eligible staff.
3. An 'a' indicates that the results have been withheld due to a small number of observations.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 20: OLS regression results of the impact of staff characteristics on research performance by research quality score - males**

| Variables                                         | Research score  |                 |                  |                  |
|---------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                   | RO coefficients | PE coefficients | CRE coefficients | OQS coefficients |
| Constant                                          | -3.70*          | -5.52**         | -6.08**          | -433.2**         |
| Age                                               | 0.69**          | 0.77**          | 0.75**           | 70.7**           |
| Age <sup>2</sup>                                  | -0.01**         | -0.01**         | -0.01**          | -1.4**           |
| Age <sup>3</sup>                                  | 0.00**          | 0.00**          | 0.00**           | 0.0**            |
| FTE status                                        | 0.36*           | 0.38*           | 0.65**           | 40.1**           |
| <i>Provider (base = University of Auckland)</i>   |                 |                 |                  |                  |
| University of Canterbury                          | -0.19**         | -0.18*          | -0.25**          | -20.2**          |
| University of Otago                               | 0.08            | 0.22**          | 0.26**           | 12.9*            |
| Victoria University of Wellington                 | -0.11           | -0.03           | -0.01            | -8.6             |
| Lincoln University                                | -0.78**         | -0.92**         | -0.65**          | -78.1**          |
| University of Waikato                             | -0.22**         | -0.08           | -0.06            | -17.3*           |
| Auckland University of Technology                 | -1.11**         | -0.90**         | -0.92**          | -105.5**         |
| Massey University                                 | -0.63**         | -0.52**         | -0.56**          | -60.7**          |
| Unitec                                            | -0.95**         | -0.91**         | -1.17**          | -98.0**          |
| Wintec                                            | -1.99**         | -1.76**         | -1.69**          | -191.1**         |
| Auckland College of Education                     | -0.81*          | -0.72*          | -0.01**          | -82.4**          |
| Wellington College of Education                   | a               | a               | a                | a                |
| Christchurch College of Education                 | -1.55**         | -1.41**         | -1.40**          | -150.7**         |
| Dunedin College of Education                      | -1.91**         | -2.28**         | -2.39**          | -203.3**         |
| Bible College of New Zealand                      | -1.79**         | -2.45**         | -2.60**          | -201.2**         |
| Te Wānanga o Aotearoa                             | -0.94           | -1.95**         | -1.30*           | -114.7*          |
| Carey Baptist College                             | a               | -0.59           | -0.93            | -3.5             |
| Whitecliffe College of Drama and Arts             | -2.70**         | -2.75**         | -2.31**          | -265.2**         |
| AIS St Helens                                     | a**             | a**             | a**              | a**              |
| Te Whare Wānanga o Te Pihopatanga o Aotearoa      | -1.53*          | -4.19**         | -3.16**          | -218.2**         |
| Anamata                                           | a               | a**             | a*               | a                |
| <i>Position (base = Professor)</i>                |                 |                 |                  |                  |
| Academic                                          | -2.08**         | -2.69**         | -2.33**          | -221.3**         |
| Academic leadership role                          | -1.14**         | -1.06**         | -1.06**          | -111.8**         |
| Assistant research fellow                         | -3.21**         | -4.22**         | -4.19**          | -351.3**         |
| Associate professor                               | -0.82**         | -1.15**         | -1.04**          | -90.4**          |
| Lecturer                                          | -2.77**         | -3.28**         | -3.09**          | -290.0**         |
| Postdoctoral fellow                               | -3.20**         | -3.93**         | -4.02**          | -343.5**         |
| Research fellow                                   | -2.62**         | -3.60**         | -3.46**          | -289.7**         |
| Research officer                                  | -2.26**         | -2.97**         | -2.80**          | -245.2**         |
| Researcher                                        | -2.27**         | -3.35**         | -2.91**          | -253.3**         |
| Senior lecturer                                   | -1.96**         | -2.41**         | -2.19**          | -206.6**         |
| Senior research fellow                            | -1.44**         | -2.32**         | -1.94**          | -164.9**         |
| Senior teaching fellow                            | -2.81**         | -3.10**         | -2.65**          | -283.7**         |
| Senior tutor                                      | -3.11**         | -3.77**         | -3.79**          | -331.4**         |
| Teaching fellow                                   | -1.76**         | -2.59**         | -2.63**          | -201.7**         |
| Technician                                        | -2.75**         | -3.72**         | -3.44**          | -300.2**         |
| Tutor                                             | -3.19**         | -2.47**         | -2.82**          | -302.8**         |
| Visiting academic                                 | -3.34**         | -2.37**         | -2.39**          | -305.7**         |
| General                                           | -3.19**         | -4.99**         | -4.00**          | -358.4**         |
| <i>Subject (base = Philosophy)</i>                |                 |                 |                  |                  |
| Accounting and Finance                            | -1.27**         | -1.99**         | -1.67**          | -144.2**         |
| Agriculture and Other Applied Biological Sciences | -0.67**         | -0.50*          | 0.18             | -52.2**          |
| Anthropology and Archaeology                      | -0.57*          | -0.65*          | -0.00            | -49.9*           |
| Architecture, Design, Planning and Surveying      | -1.00**         | -0.55*          | -0.42            | -84.8**          |
| Biomedical                                        | -0.69**         | -0.93**         | -0.09            | -64.3**          |
| Chemistry                                         | -0.49*          | -0.45*          | 0.29             | -37.2*           |
| Clinical Medicine                                 | -1.44**         | -1.54**         | -1.03**          | -139.6**         |
| Communications, Journalism and Media Studies      | -0.80**         | -1.20**         | -0.61*           | -83.7**          |

**Table 20: OLS regression results of the impact of staff characteristics on research performance by research quality score - males - continued**

| Variables                                                                                    | Research score     |                    |                     |                     |
|----------------------------------------------------------------------------------------------|--------------------|--------------------|---------------------|---------------------|
|                                                                                              | RO<br>Coefficients | PE<br>Coefficients | CRE<br>coefficients | OQS<br>coefficients |
| Computer Science, Information Technology, Information Services                               | -0.75**            | -0.97**            | -0.35               | -72.6**             |
| Dentistry                                                                                    | -1.22**            | -1.37**            | -1.08**             | -122.4**            |
| Design                                                                                       | -1.53**            | -1.93**            | -1.51**             | -159.3**            |
| Earth Science                                                                                | -0.42*             | -0.31              | 0.49*               | -27.0               |
| Ecology, Evolution and Behaviour                                                             | -0.32              | -0.13              | 0.53*               | -16.9               |
| Economics                                                                                    | -0.82**            | -0.79**            | -0.28               | -74.1**             |
| Education                                                                                    | -1.28**            | -1.51**            | -1.03**             | -128.2**            |
| Engineering and Technology                                                                   | -0.37*             | -0.43*             | 0.06                | -31.5               |
| English Language and Literature                                                              | -0.75**            | -1.08**            | -0.76**             | -80.9**             |
| Foreign Languages and Linguistics                                                            | -0.65**            | -0.83**            | -0.61*              | -67.8**             |
| History, History of Art, Classics and Curatorial Studies                                     | -0.44*             | -0.54*             | -0.36               | -45.0*              |
| Human Geography                                                                              | -0.68**            | -0.52              | 0.03                | -55.4*              |
| Law                                                                                          | -1.06**            | -0.90**            | -0.86**             | -100.9**            |
| Management, Human Resources, Industrial Relations, International Business and Other Business | -1.29**            | -1.47**            | -0.81**             | -125.0**            |
| Māori Knowledge and Development                                                              | -0.29              | -0.33              | -0.05               | -26.6               |
| Marketing and Tourism                                                                        | -1.31**            | -1.44**            | -1.10**             | -130.1**            |
| Molecular, Cellular and Whole Organism Biology                                               | -0.58**            | -0.66**            | 0.00                | -51.0**             |
| Music, Literary Arts and Other Arts                                                          | -0.17              | -0.59**            | -0.90**             | -34.5               |
| Nursing                                                                                      | -2.00**            | -2.07**            | -1.65**             | -196.2**            |
| Other Health                                                                                 | -1.00**            | -0.95**            | -0.46               | -91.8**             |
| Physics                                                                                      | -0.48*             | -0.48*             | 0.18                | -38.1*              |
| Political Science, International Relations and Public Policy                                 | -0.47*             | -1.05**            | -0.65*              | -59.1**             |
| Psychology                                                                                   | -0.30              | -0.35              | 0.21                | -23.5               |
| Public Health                                                                                | -0.91**            | -1.04**            | -0.22               | -83.2**             |
| Pure and Applied Mathematics                                                                 | -0.14              | -0.51*             | -0.07               | -19.0               |
| Religious Studies and Theology                                                               | -0.36              | -0.62              | -0.21               | -37.8               |
| Sociology, Social Policy, Social Work, Criminology and Gender Studies                        | -0.78**            | -0.74**            | -0.27               | -70.5**             |
| Sport and Exercise Science                                                                   | -1.54**            | -1.60**            | -1.20**             | -150.4**            |
| Statistics                                                                                   | -0.70**            | -1.08**            | -0.78**             | -77.4**             |
| Theatre and Dance, Film and Television, and Multimedia                                       | -0.40              | -0.94**            | -1.47**             | -64.9*              |
| Veterinary Studies and Large Animal Science                                                  | -1.04**            | -1.84**            | -1.60**             | -125.2**            |
| Visual Arts and Crafts                                                                       | 0.22               | -0.71**            | -0.86**             | -8.0                |
| <i>Ethnicity (base = European)</i>                                                           |                    |                    |                     |                     |
| Māori                                                                                        | 0.02               | 0.42**             | 0.18                | 11.2                |
| Pasifika                                                                                     | -0.25              | -0.10              | -0.37               | -24.9               |
| Asian                                                                                        | 0.04               | -0.28**            | -0.37**             | -6.5                |
| Other                                                                                        | 0.03               | -0.05              | -0.12               | -0.4                |
| Not stated                                                                                   | -0.04              | -0.06              | -0.15**             | 6.6                 |
| R <sup>2</sup>                                                                               | 0.45               | 0.52               | 0.52                | 0.52                |
| Number of observations                                                                       | 3,615              | 3,615              | 3,615               | 3,615               |

Notes:

1. \*\*Significant at the 1 percent level \*Significant at the 5 percent level.
  2. The OLS regressions used data for staff who were panel assessed. Therefore, the results of these regressions should not be compared with analysis that includes data for all PBRF eligible staff.
  3. An 'a' indicates that the results have been withheld due to a small number of observations.
- Sources: Ministry of Education, Tertiary Education Commission.

**Table 21: OLS regression results of the impact of staff characteristics on research performance by research quality score - females**

| Variables                                         | Research score  |                 |                  |                  |
|---------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                   | RO coefficients | PE coefficients | CRE coefficients | OQS coefficients |
| Constant                                          | -1.25           | -2.69**         | -4.80**          | -218.5           |
| Age                                               | 0.52**          | 0.66**          | 0.63**           | 56.1**           |
| Age <sup>2</sup>                                  | -0.01**         | -0.01**         | -0.01**          | -1.1**           |
| Age <sup>3</sup>                                  | 0.00**          | 0.00**          | 0.00**           | 0.0**            |
| FTE status                                        | 0.19            | 0.52**          | 0.71**           | 32.0*            |
| <i>Provider (base = University of Auckland)</i>   |                 |                 |                  |                  |
| University of Canterbury                          | -0.03           | -0.11           | -0.22            | -7.3             |
| University of Otago                               | -0.13           | -0.00           | 0.03             | -8.7             |
| Victoria University of Wellington                 | -0.42**         | -0.11           | -0.03            | -31.7**          |
| Lincoln University                                | -0.67**         | -0.83**         | -0.67**          | -69.6**          |
| University of Waikato                             | -0.46**         | -0.47**         | -0.26*           | -43.7**          |
| Auckland University of Technology                 | -1.20**         | -1.12**         | -1.32**          | -121.1**         |
| Massey University                                 | -0.71**         | -0.76**         | -0.79**          | -72.8**          |
| Unitec                                            | -0.65**         | -0.85**         | -1.25**          | -77.6**          |
| Wintec                                            | -1.46**         | -1.19**         | -1.16**          | -138.3**         |
| Auckland College of Education                     | -0.85**         | -0.19           | -0.53**          | -70.7**          |
| Wellington College of Education                   | -2.06**         | -1.53**         | -1.99**          | -197.3**         |
| Christchurch College of Education                 | -1.97**         | -1.54**         | -1.66**          | -188.3**         |
| Dunedin College of Education                      | -1.99**         | -1.66**         | -1.59**          | -188.3**         |
| Bible College of New Zealand                      | -2.75**         | -0.00           | -1.26            | -211.8**         |
| Te Wānanga o Aotearoa                             | -1.64*          | -0.59           | -0.76            | -135.2*          |
| Whitecliffe College of Drama and Arts             | a*              | a**             | a**              | a*               |
| Bethlehem Institute of Education                  | a               | a               | a                | a                |
| <i>Position (base = Professor)</i>                |                 |                 |                  |                  |
| Academic                                          | -2.02**         | -2.64**         | -2.52**          | -218.5**         |
| Academic leadership role                          | -1.41**         | -1.74**         | -1.31**          | -144.9**         |
| Assistant research fellow                         | -2.87**         | -4.19**         | -3.41**          | -315.6**         |
| Associate professor                               | -0.31*          | -0.64**         | -0.52**          | -39.4**          |
| Lecturer                                          | -2.47**         | -3.14**         | -2.95**          | -264.4**         |
| Postdoctoral fellow                               | -2.72**         | -3.47**         | -3.57**          | -296.5**         |
| Research fellow                                   | -2.32**         | -3.42**         | -3.21**          | -262.2**         |
| Research officer                                  | -2.15**         | -2.58**         | -2.43**          | -225.7**         |
| Researcher                                        | -2.38**         | -3.42**         | -2.60**          | -257.0**         |
| Senior lecturer                                   | -1.64**         | -2.20**         | -1.96**          | -177.4**         |
| Senior research fellow                            | -1.08**         | -1.99**         | -1.65**          | -130.4**         |
| Senior teaching fellow                            | -2.90**         | -3.72**         | -3.70**          | -314.5**         |
| Senior tutor                                      | -3.15**         | -3.82**         | -3.29**          | -327.9**         |
| Teaching fellow                                   | -3.22**         | -4.39**         | -4.10**          | -353.3**         |
| Technician                                        | -2.25**         | -3.46**         | -2.55**          | -247.6**         |
| Tutor                                             | -2.43**         | -3.88**         | -3.70**          | -284.1**         |
| Visiting academic                                 | -1.95**         | -2.91**         | -2.60**          | -217.4**         |
| General                                           | -1.51*          | -3.04**         | -2.39**          | -187.2**         |
| <i>Subject (base = Philosophy)</i>                |                 |                 |                  |                  |
| Accounting and Finance                            | -1.42**         | -1.64**         | -1.41**          | -145.3**         |
| Agriculture and Other Applied Biological Sciences | -0.78*          | -0.11           | 0.02             | -56.5            |
| Anthropology and Archaeology                      | -0.55           | 0.03            | 0.11             | -36.3            |
| Architecture, Design, Planning and Surveying      | -1.14**         | -0.61           | -0.60            | -98.5**          |
| Biomedical                                        | -0.89**         | -0.63           | -0.49            | -79.5**          |
| Chemistry                                         | -0.68*          | -0.12           | -0.10            | -51.8            |
| Clinical Medicine                                 | -1.60**         | -0.92**         | -0.81*           | -138.3**         |
| Communications, Journalism and Media Studies      | -0.98**         | -0.75*          | -0.90*           | -94.2**          |



**Table 21: OLS regression results of the impact of staff characteristics on research performance by research quality score - females - continued**

| Variables                                                                                    | Research score     |                    |                     |                     |
|----------------------------------------------------------------------------------------------|--------------------|--------------------|---------------------|---------------------|
|                                                                                              | RO<br>Coefficients | PE<br>Coefficients | CRE<br>coefficients | OQS<br>coefficients |
| Computer Science, Information Technology, Information Services                               | -1.14**            | -0.87*             | -1.13**             | -110.4**            |
| Dentistry                                                                                    | -1.79**            | -1.35**            | -1.26**             | -165.2**            |
| Design                                                                                       | -1.54**            | -1.63**            | -0.97*              | -147.4**            |
| Earth Science                                                                                | -1.15**            | -0.16              | 0.18                | -80.2**             |
| Ecology, Evolution and Behaviour                                                             | -1.00**            | -0.30              | -0.30               | -79.6**             |
| Economics                                                                                    | -1.30**            | -0.80*             | -0.61               | -112.9**            |
| Education                                                                                    | -1.37**            | -1.31**            | -1.15**             | -133.7**            |
| Engineering and Technology                                                                   | -0.58              | -0.15              | -0.29               | -48.0               |
| English Language and Literature                                                              | -1.02**            | -0.79*             | -1.14**             | -100.8**            |
| Foreign Languages and Linguistics                                                            | -0.99**            | -0.84*             | -0.85**             | -95.4**             |
| History, History of Art, Classics and Curatorial Studies                                     | -0.89**            | -0.34              | -0.64               | -77.3**             |
| Human Geography                                                                              | -0.42              | -0.15              | -0.06               | -32.9               |
| Law                                                                                          | -1.69**            | -0.83*             | -1.28**             | -150.2**            |
| Management, Human Resources, Industrial Relations, International Business and Other Business | -1.37**            | -0.80*             | -0.75*              | -119.5**            |
| Māori Knowledge and Development                                                              | 0.23               | 0.47               | 0.13                | 25.6                |
| Marketing and Tourism                                                                        | -1.34**            | -0.93**            | -0.75*              | -119.2**            |
| Molecular, Cellular and Whole Organism Biology                                               | -0.64*             | -0.49              | -0.29               | -56.6*              |
| Music, Literary Arts and Other Arts                                                          | -0.68              | -0.23              | -0.56               | -60.2*              |
| Nursing                                                                                      | -2.79**            | -1.81**            | -1.45**             | -244.5**            |
| Other Health                                                                                 | -1.73**            | -0.99**            | -0.83*              | -149.0**            |
| Physics                                                                                      | -0.88              | -0.14              | 0.15                | -61.4               |
| Political Science, International Relations and Public Policy                                 | -0.58              | -0.24              | -0.52               | -52.1               |
| Psychology                                                                                   | -0.79*             | -0.05              | 0.08                | -55.4               |
| Public Health                                                                                | -1.27**            | -0.77*             | -0.45               | -107.5**            |
| Pure and Applied Mathematics                                                                 | -0.84              | -0.26              | 0.14                | -61.2               |
| Religious Studies and Theology                                                               | -0.45              | -0.27              | -0.51               | -43.5               |
| Sociology, Social Policy, Social Work, Criminology and Gender Studies                        | -1.16**            | -0.42              | -0.20               | -91.3**             |
| Sport and Exercise Science                                                                   | -2.33**            | -1.42**            | -1.48**             | -206.8**            |
| Statistics                                                                                   | -0.41              | -0.45              | -0.85*              | -48.6               |
| Theatre and Dance, Film and Television, and Multimedia                                       | -0.76*             | -0.90*             | -0.68               | -77.1*              |
| Veterinary Studies and Large Animal Science                                                  | -1.62**            | -2.10**            | -1.94**             | -173.0**            |
| Visual Arts and Crafts                                                                       | -0.29              | -0.44              | -1.05**             | -42.7               |
| <i>Ethnicity (base = European)</i>                                                           |                    |                    |                     |                     |
| Māori                                                                                        | -0.34**            | 0.19               | 0.16                | -18.6               |
| Pasifika                                                                                     | -0.41              | -0.06              | 0.16                | -27.9               |
| Asian                                                                                        | -0.03              | -0.14              | -0.13               | -6.5                |
| Other                                                                                        | -0.10              | -0.00              | 0.06                | -6.6                |
| Not stated                                                                                   | 0.00               | -0.00              | -0.02               | -0.2                |
| R <sup>2</sup>                                                                               | 0.46               | 0.49               | 0.49                | 0.51                |
| Number of observations                                                                       | 2,025              | 2,026              | 2,026               | 2,026               |

Notes:

1. \*\*Significant at the 1 percent level \*Significant at the 5 percent level.
2. The OLS regressions used data for staff that were panel assessed. Therefore, the results of these regressions should not be compared to analysis that includes data for all PBRF-eligible staff.
3. An 'a' indicates that the results have been withheld due to a small number of observations.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 22: OLS regression results of the impact of staff characteristics on research performance by research quality score - professors**

| Variables                                                                                    | Research score  |                 |                  |                  |
|----------------------------------------------------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                                                              | RO coefficients | PE coefficients | CRE coefficients | OQS coefficients |
| Constant                                                                                     | 6.96**          | 6.77**          | 7.67**           | 699.2**          |
| Age                                                                                          | -0.03**         | -0.01           | -0.02            | -2.3**           |
| Gender ( <i>base = females</i> )                                                             | 0.13            | -0.14           | -0.13            | 5.3              |
| FTE status                                                                                   | 0.68*           | 0.43            | 0.45             | 61.1*            |
| <i>Provider (base = University of Auckland)</i>                                              |                 |                 |                  |                  |
| University of Canterbury                                                                     | -0.27           | -0.14           | -0.18            | -24.0            |
| University of Otago                                                                          | -0.08           | 0.03            | 0.10             | -3.7             |
| Victoria University of Wellington                                                            | -0.48*          | -0.31           | -0.18            | -41.6*           |
| Lincoln University                                                                           | -0.87**         | -0.94**         | -0.46            | -82.2**          |
| University of Waikato                                                                        | -0.14           | -0.38*          | -0.12            | -17.6            |
| Auckland University of Technology                                                            | -0.75*          | -0.89**         | -0.39            | -70.8*           |
| Massey University                                                                            | -0.68**         | -0.55**         | -0.43            | -62.8**          |
| Unitec                                                                                       | -0.99           | -0.82           | -1.25*           | -100.9*          |
| Wellington College of Education                                                              | -a**            | -a**            | -a**             | -a**             |
| <i>Subject (base = Philosophy)</i>                                                           |                 |                 |                  |                  |
| Accounting and Finance                                                                       | -1.12*          | -2.03**         | -2.44**          | -145.9**         |
| Agriculture and Other Applied Biological Sciences                                            | -0.46           | -0.44           | -0.96            | -53.3            |
| Anthropology and Archaeology                                                                 | -0.62           | -1.34*          | -1.18            | -81.8            |
| Architecture, Design, Planning and Surveying                                                 | -0.77           | -1.05           | -1.06            | -86.0            |
| Biomedical                                                                                   | -0.31           | -0.95           | -0.98            | -51.4            |
| Chemistry                                                                                    | -0.00           | -0.50           | -0.42            | -14.0            |
| Clinical Medicine                                                                            | -1.22*          | -1.99**         | -2.10**          | -147.2**         |
| Communications, Journalism and Media Studies                                                 | -a              | -a              | -a               | -a               |
| Computer Science, Information Technology, Information Services                               | -0.33           | -1.01*          | -1.02            | -54.0            |
| Dentistry                                                                                    | -1.10           | -2.04**         | -2.90**          | -151.4*          |
| Earth Science                                                                                | -0.18           | -0.61           | -0.42            | -28.2            |
| Ecology, Evolution and Behaviour                                                             | -0.46           | -0.52           | -0.47            | -47.5            |
| Economics                                                                                    | -0.93           | -0.44           | -0.21            | -75.3            |
| Education                                                                                    | -0.28           | -1.09*          | -1.21*           | -54.3            |
| Engineering and Technology                                                                   | 0.04            | -0.43           | -0.38            | -9.8             |
| English Language and Literature                                                              | -0.96           | -1.56**         | -1.98**          | -120.7*          |
| Foreign Languages and Linguistics                                                            | -0.08           | -1.07           | -1.10            | -38.8            |
| History, History of Art, Classics and Curatorial Studies                                     | -0.56           | -1.39**         | -1.58**          | -84.1            |
| Human Geography                                                                              | -0.39           | -0.83           | -0.50            | -48.0            |
| Law                                                                                          | -0.83           | -1.29*          | -2.18**          | -110.9*          |
| Management, Human Resources, Industrial Relations, International Business and Other Business | -1.05*          | -1.37**         | -1.66**          | -119.5*          |
| Māori Knowledge and Development                                                              | -0.86           | -1.76*          | -2.20**          | -120.3           |
| Marketing and Tourism                                                                        | -1.10*          | -1.11*          | -1.53            | -117.2*          |
| Molecular, Cellular and Whole Organism Biology                                               | -0.24           | -0.64           | -0.59            | -35.9            |
| Music, Literary Arts and Other Arts                                                          | 0.32            | -1.06           | -1.48            | -15.5            |
| Nursing                                                                                      | -a**            | -a**            | -a**             | -a**             |
| Other Health                                                                                 | -0.62           | -1.10           | -1.18            | -78.4            |
| Physics                                                                                      | -0.12           | -0.47           | -0.12            | -17.5            |
| Political Science, International Relations and Public Policy                                 | -0.41           | -1.04           | -0.54            | -53.1            |
| Psychology                                                                                   | -0.35           | -0.75           | -1.16            | -53.8            |
| Public Health                                                                                | -0.52           | -0.85           | -0.76            | -60.9            |
| Pure and Applied Mathematics                                                                 | 0.37            | -0.16           | -0.09            | 22.4             |

**Table 22: OLS regression results of the impact of staff characteristics on research performance by research quality score - professors - continued**

| Variables                                                             | Research score  |                 |                  |                  |
|-----------------------------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                                       | RO coefficients | PE Coefficients | CRE Coefficients | OQS coefficients |
| Religious Studies and Theology                                        | -0.43           | -0.82           | -1.99**          | -72.7            |
| Sociology, Social Policy, Social Work, Criminology and Gender Studies | -0.87           | -1.46*          | -1.46*           | -105.4           |
| Sport and Exercise Science                                            | -a              | -a              | -a               | -a               |
| Statistics                                                            | -0.22           | -0.44           | -0.82            | -34.6            |
| Veterinary Studies and Large Animal Science                           | a               | -0.48           | -1.76*           | 6.4              |
| Visual Arts and Crafts                                                | -a              | -a**            | -a**             | -a*              |
| <i>Ethnicity (base = European)</i>                                    |                 |                 |                  |                  |
| Māori                                                                 | -0.19           | 0.50            | 0.84*            | 6.6              |
| Pasifika                                                              | -a              | -a              | -a               | -a               |
| Asian                                                                 | -0.38           | -0.64           | -1.13*           | -53.8            |
| Other                                                                 | 0.22            | -0.00           | -0.19            | 12.4             |
| Not stated                                                            | 0.01            | -0.04           | -0.27            | -3.5             |
| R <sup>2</sup>                                                        | 0.26            | 0.27            | 0.31             | 0.30             |
| Number of observations                                                | 565             | 565             | 565              | 565              |

Notes:

1. \*\*Significant at the 1 percent level \*Significant at the 5 percent level.
  2. The OLS regressions used data for staff who were panel assessed. Therefore, the results of these regressions should not be compared with analysis that includes data for all PBRF eligible staff.
  3. An 'a' indicates that the results have been withheld due to a small number of observations.
- Sources: Ministry of Education, Tertiary Education Commission.

**Table 23: OLS regression results of the impact of staff characteristics on research performance by research quality score - associate professors**

| Variables                                                                                    | Research score  |                 |                  |                  |
|----------------------------------------------------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                                                              | RO coefficients | PE coefficients | CRE coefficients | OQS coefficients |
| Constant                                                                                     | 6.93**          | 6.46**          | 5.69**           | 667.7**          |
| Age                                                                                          | -0.04**         | -0.04**         | -0.04**          | -4.37**          |
| Age <sup>2</sup>                                                                             | -               | -               | -                | -                |
| Age <sup>3</sup>                                                                             | -               | -               | -                | -                |
| Gender ( <i>base = females</i> )                                                             | 0.03            | -0.23           | -0.32*           | -5.7             |
| FTE status                                                                                   | 0.91**          | 1.61**          | 1.72**           | 114.2**          |
| <i>Provider (base = University of Auckland)</i>                                              |                 |                 |                  |                  |
| University of Canterbury                                                                     | -0.42**         | -0.35*          | -0.44*           | -42.0**          |
| University of Otago                                                                          | -0.08           | -0.07           | 0.04             | -6.4             |
| Victoria University of Wellington                                                            | -0.37*          | -0.41*          | -0.12            | -34.0*           |
| Lincoln University                                                                           | -1.37**         | -0.79*          | -0.94**          | -122.7**         |
| University of Waikato                                                                        | -0.47**         | -0.62**         | -0.28            | -46.7**          |
| Auckland University of Technology                                                            | -1.38**         | -1.47**         | -1.36**          | -139.5**         |
| Massey University                                                                            | -0.75**         | -0.66**         | -0.51**          | -70.5**          |
| Unitec                                                                                       | -1.02**         | -1.22**         | -1.46**          | -112.1**         |
| Bible College of New Zealand                                                                 | a               | a               | a                | a                |
| <i>Subject (base = Philosophy)</i>                                                           |                 |                 |                  |                  |
| Accounting and Finance                                                                       | -0.44           | -2.34**         | -1.77**          | -93.1*           |
| Agriculture and Other Applied Biological Sciences                                            | -0.26           | -0.74           | 0.02             | -29.2            |
| Anthropology and Archaeology                                                                 | -0.96           | -1.33*          | -1.37*           | -108.3*          |
| Architecture, Design, Planning and Surveying                                                 | -1.22**         | -0.74           | -0.91            | -110.7**         |
| Biomedical                                                                                   | -0.63           | -1.58**         | -0.50            | -75.6*           |
| Chemistry                                                                                    | 0.08            | -0.58           | 0.33             | 2.2              |
| Clinical Medicine                                                                            | -1.03**         | -1.24**         | -0.91*           | -104.2**         |
| Communications, Journalism and Media Studies                                                 | a               | a               | a                | a                |
| Computer Science, Information Technology, Information Services                               | -0.53           | -1.06*          | -0.17            | -55.9            |
| Dentistry                                                                                    | a               | a               | a                | a                |
| Design                                                                                       | a               | a               | a                | a                |
| Earth Science                                                                                | -0.46           | -0.70           | 0.40             | -36.8            |
| Ecology, Evolution and Behaviour                                                             | -0.40           | -0.53           | 0.50             | -28.7            |
| Economics                                                                                    | -0.95*          | -1.21**         | -0.49            | -92.5*           |
| Education                                                                                    | -0.27           | -0.97*          | -0.25            | -37.5            |
| Engineering and Technology                                                                   | 0.24            | -0.18           | 0.28             | 18.8             |
| English Language and Literature                                                              | -0.20           | -0.94           | -1.02*           | -43.5            |
| Foreign Languages and Linguistics                                                            | -0.34           | -0.09           | -0.02            | -25.5            |
| History, History of Art, Classics and Curatorial Studies                                     | -0.24           | -0.53           | -0.53            | -33.1            |
| Human Geography                                                                              | -0.45           | -0.90           | -0.14            | -47.3            |
| Law                                                                                          | -0.49           | -0.81           | -0.59            | -55.5            |
| Management, Human Resources, Industrial Relations, International Business and Other Business | -0.52           | -1.31**         | -0.54            | -64.6            |
| Māori Knowledge and Development                                                              | a               | a               | a                | a                |
| Marketing and Tourism                                                                        | -0.80           | -1.62**         | -0.95            | -95.1*           |
| Molecular, Cellular and Whole Organism Biology                                               | -0.56           | -0.89*          | 0.12             | -51.2            |
| Music, Literary Arts and Other Arts                                                          | 0.37            | -0.61           | -0.83            | 4.3              |
| Nursing                                                                                      | -2.32**         | -2.27**         | -1.52**          | -219.3**         |
| Other Health                                                                                 | -0.82           | -1.27*          | -0.51            | -84.9*           |
| Physics                                                                                      | -0.84*          | -1.16*          | -0.16            | -79.1*           |
| Political Science, International Relations and Public Policy                                 | -0.11           | -0.62           | -0.09            | -18.8            |
| Psychology                                                                                   | 0.24            | -0.23           | 0.40             | 19.5             |
| Public Health                                                                                | -0.55           | -1.29*          | -0.32            | -63.0            |
| Pure and Applied Mathematics                                                                 | 0.01            | -0.78           | -0.40            | -16.6            |

**Table 23: OLS regression results of the impact of staff characteristics on research performance by research quality score - associate professors - continued**

| Variables                                                             | Research score  |                 |                  |                  |
|-----------------------------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                                       | RO coefficients | PE Coefficients | CRE Coefficients | OQS coefficients |
| Religious Studies and Theology                                        | a               | a               | a                | a                |
| Sociology, Social Policy, Social Work, Criminology and Gender Studies | -0.52           | -1.18*          | -0.44            | -61.0            |
| Sport and Exercise Science                                            | -0.84           | -1.44*          | -1.46*           | -102.6*          |
| Statistics                                                            | -0.45           | -1.66**         | -1.05            | -72.6**          |
| Theatre and Dance, Film and Television. and Multimedia                | a               | a               | a                | a                |
| Veterinary Studies and Large Animal Science                           | -0.79           | -2.07**         | -1.73**          | -112.6           |
| <i>Ethnicity (base = European)</i>                                    |                 |                 |                  |                  |
| Māori                                                                 | 0.08            | 0.51            | -0.53            | 5.5              |
| Asian                                                                 | 0.16            | -0.26           | -0.24            | 3.3              |
| Other                                                                 | 0.01            | -0.22           | -0.07            | -3.2             |
| Not stated                                                            | 0.09            | 0.07            | -0.05            | 6.6              |
| R <sup>2</sup>                                                        | 0.33            | 0.32            | 0.32             | 0.36             |
| Number of observations                                                | 660             | 660             | 660              | 660              |

Notes:

1. \*\*Significant at the 1 percent level \*Significant at the 5 percent level.
  2. The OLS regressions used data for staff who were panel assessed. Therefore, the results of these regressions should not be compared with analysis that includes data for all PBRF eligible staff.
  3. An 'a' indicates that the results have been withheld due to a small number of observations.
- Sources: Ministry of Education, Tertiary Education Commission.

**Table 24: OLS regression results of the impact of staff characteristics on research performance by research quality score - senior lecturers**

| Variables                                                                                    | Research score  |                 |                  |                  |
|----------------------------------------------------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                                                              | RO coefficients | PE coefficients | CRE coefficients | OQS coefficients |
| Constant                                                                                     | -1.32           | -9.14*          | -10.5**          | -384.8           |
| Age                                                                                          | 0.42*           | 0.85**          | 0.86**           | 54.9**           |
| Age <sup>2</sup>                                                                             | -0.00*          | -0.01**         | -0.01**          | -1.1**           |
| Age <sup>3</sup>                                                                             | 0.00*           | 0.00**          | 0.00**           | 0.0**            |
| Gender ( <i>base = females</i> )                                                             | 0.06            | -0.06           | -0.15**          | 1.2              |
| FTE status                                                                                   | 0.64**          | 0.80**          | 1.05**           | 73.0**           |
| <i>Provider (base = University of Auckland)</i>                                              |                 |                 |                  |                  |
| University of Canterbury                                                                     | -0.18           | -0.27*          | -0.35**          | -22.1*           |
| University of Otago                                                                          | 0.02            | 0.22*           | 0.17             | 7.3              |
| Victoria University of Wellington                                                            | -0.16           | -0.00           | 0.01             | -11.5            |
| Lincoln University                                                                           | -0.86**         | -1.10**         | -0.78**          | -89.0**          |
| University of Waikato                                                                        | -0.39**         | -0.07           | -0.18            | -31.2**          |
| Auckland University of Technology                                                            | -1.45**         | -1.30**         | -1.43**          | -143.0**         |
| Massey University                                                                            | -0.77**         | -0.73**         | -0.79**          | -77.4**          |
| Unitec                                                                                       | -1.22**         | -1.44**         | -1.47**          | -129.8**         |
| Wintec                                                                                       | -2.22**         | -2.21**         | -2.57**          | -227.8**         |
| Wellington College of Education                                                              | -2.29**         | -1.59**         | -2.13**          | -216.3**         |
| Christchurch College of Education                                                            | -2.17**         | -1.87**         | -1.86**          | -211.0**         |
| Dunedin College of Education                                                                 | -1.67**         | -1.72**         | -1.74**          | -169.2**         |
| Whitecliffe College of Drama and Arts                                                        | a               | a**             | a                | a**              |
| <i>Subject (base = Philosophy)</i>                                                           |                 |                 |                  |                  |
| Accounting and Finance                                                                       | -1.45**         | -1.96**         | -1.40**          | -152.1**         |
| Agriculture and Other Applied Biological Sciences                                            | -0.93**         | -0.32           | 0.63*            | -61.1*           |
| Anthropology and Archaeology                                                                 | -0.51           | -0.11           | 0.69*            | -27.6            |
| Architecture, Design, Planning and Surveying                                                 | -1.01**         | -0.44           | -0.22            | -81.3**          |
| Biomedical                                                                                   | -0.99**         | -0.98**         | 0.09             | -83.1**          |
| Chemistry                                                                                    | -0.42           | 0.10            | 0.90**           | -14.5            |
| Clinical Medicine                                                                            | -1.65**         | -1.23**         | -0.57*           | -142.7**         |
| Communications, Journalism and Media Studies                                                 | -0.61*          | -0.66*          | -0.23            | -56.6*           |
| Computer Science, Information Technology, Information Services                               | -0.95**         | -0.90**         | -0.33            | -85.4**          |
| Dentistry                                                                                    | -2.18**         | -1.87**         | -1.33**          | -198.0**         |
| Design                                                                                       | -1.37**         | -1.77**         | -0.48            | -130.1**         |
| Earth Science                                                                                | -0.69**         | -0.20           | 0.70*            | -41.4            |
| Ecology, Evolution and Behaviour                                                             | -0.54*          | -0.17           | 0.73*            | -29.3            |
| Economics                                                                                    | -0.69**         | -0.55           | 0.00             | -56.7*           |
| Education                                                                                    | -1.43**         | -1.60**         | -0.90**          | -138.3**         |
| Engineering and Technology                                                                   | -0.75**         | -0.46           | 0.29             | -55.4**          |
| English Language and Literature                                                              | -0.97**         | -0.91**         | -0.51            | -89.2**          |
| Foreign Languages and Linguistics                                                            | -0.89**         | -1.02**         | -0.59*           | -87.0**          |
| History, History of Art, Classics and Curatorial Studies                                     | -0.60*          | -0.44           | -0.10            | -50.3*           |
| Human Geography                                                                              | -0.58           | -0.46           | 0.13             | -45.8            |
| Law                                                                                          | -1.47**         | -0.83**         | -0.65*           | -125.4**         |
| Management, Human Resources, Industrial Relations, International Business and Other Business | -1.45**         | -1.18**         | -0.42            | -125.6**         |
| Māori Knowledge and Development                                                              | 0.42            | 0.90*           | 1.38*            | 64.0             |
| Marketing and Tourism                                                                        | -1.34**         | -1.24**         | -0.68*           | -123.1**         |
| Molecular, Cellular and Whole Organism Biology                                               | -0.60*          | -0.45           | 0.48             | -42.0            |
| Music, Literary Arts and Other Arts                                                          | -0.32           | -0.30           | -0.32            | -31.8            |
| Nursing                                                                                      | -2.75**         | -2.04**         | -1.33**          | -243.2**         |
| Other Health                                                                                 | -1.44**         | -0.74*          | -0.17            | -114.9**         |
| Physics                                                                                      | -0.78**         | -0.33           | 0.80*            | -47.9            |

**Table 24: OLS regression results of the impact of staff characteristics on research performance by research quality score - senior lecturers - continued**

| Variables                                                             | Research score  |                 |                  |                  |
|-----------------------------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                                       | RO coefficients | PE coefficients | CRE coefficients | OQS coefficients |
| Political Science, International Relations and Public Policy          | -0.47           | -0.93**         | -0.70*           | -57.9*           |
| Psychology                                                            | -0.44           | -0.07           | 0.60*            | -23.1            |
| Public Health                                                         | -1.43**         | -1.01**         | -0.39            | -121.8**         |
| Pure and Applied Mathematics                                          | -0.50           | -0.77*          | -0.19            | -45.6            |
| Religious Studies and Theology                                        | 0.03            | 0.20            | 0.90             | 19.4             |
| Sociology, Social Policy, Social Work, Criminology and Gender Studies | -0.96**         | -0.44           | 0.14             | -72.8**          |
| Sport and Exercise Science                                            | -2.13**         | -1.28**         | -0.73*           | -179.1**         |
| Statistics                                                            | -0.58*          | -0.87**         | -0.43            | -60.2*           |
| Theatre and Dance, Film and Television, and Multimedia                | -0.78*          | -1.32**         | -0.96*           | -89.1**          |
| Veterinary Studies and Large Animal Science                           | -1.32**         | -1.91**         | -1.46**          | -143.4**         |
| Visual Arts and Crafts                                                | -0.18           | -0.74**         | -0.56            | -32.9            |
| <i>Ethnicity (base = European)</i>                                    |                 |                 |                  |                  |
| Māori                                                                 | -0.27           | -0.11           | -0.33            | -26.0            |
| Pasifika                                                              | -0.60           | -0.73*          | -0.51            | -61.3*           |
| Asian                                                                 | 0.00            | -0.02           | -0.16            | -2.4             |
| Other                                                                 | -0.06           | 0.04            | 0.01             | -3.7             |
| Not stated                                                            | -0.08           | -0.06           | -0.06            | -7.9             |
| R <sup>2</sup>                                                        | 0.38            | 0.35            | 0.36             | 0.41             |
| Number of observations                                                | 2,053           | 2,054           | 2,054            | 2,054            |

Notes:

1. \*\*Significant at the 1 percent level \*Significant at the 5 percent level.

2. The OLS regressions used data for staff who were panel assessed. Therefore, the results of these regressions should not be compared with analysis that includes data for all PBRF eligible staff.

3. An 'a' indicates that the results have been withheld due to a small number of observations.

Sources: Ministry of Education, Tertiary Education Commission.

**Table 25: OLS regression results of the impact of staff characteristics on research performance by research quality score - lecturers**

| Variables                                                                                    | Research score  |                 |                  |                  |
|----------------------------------------------------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                                                              | RO coefficients | PE coefficients | CRE coefficients | OQS coefficients |
| Constant                                                                                     | 4.62**          | -6.93*          | -4.91*           | -181.4           |
| Age                                                                                          | -0.01**         | 0.67**          | -0.51**          | 40.8**           |
| Age <sup>2</sup>                                                                             | -               | -0.01**         | -0.01**          | -0.9**           |
| Age <sup>3</sup>                                                                             | -               | 0.00**          | 0.00**           | 0.0**            |
| Gender ( <i>base = females</i> )                                                             | 0.24**          | 0.07            | 0.07             | 17.1**           |
| FTE status                                                                                   | -0.35           | 0.07            | 0.40             | -6.7             |
| <i>Provider (base = University of Auckland)</i>                                              |                 |                 |                  |                  |
| University of Canterbury                                                                     | 0.01            | -0.06           | -0.08            | -1.4             |
| University of Otago                                                                          | 0.09            | 0.17            | 0.23*            | 12.7             |
| Victoria University of Wellington                                                            | -0.08           | 0.06            | -0.06            | -6.2             |
| Lincoln University                                                                           | -0.41           | -0.87**         | -0.72**          | -52.4*           |
| University of Waikato                                                                        | -0.23           | -0.24           | 0.02             | -17.8            |
| Auckland University of Technology                                                            | -0.40           | 0.05            | -0.58**          | -34.1            |
| Massey University                                                                            | -0.42**         | -0.44**         | -0.57**          | -43.5**          |
| Unitec                                                                                       | -0.45*          | -0.64**         | -0.78**          | -49.3*           |
| Wintec                                                                                       | -1.02**         | -0.73**         | -0.86**          | -92.6**          |
| Auckland College of Education                                                                | -0.55*          | -0.02           | -0.15            | -38.4            |
| Wellington College of Education                                                              | -1.22**         | -0.90           | -1.28**          | -118.7**         |
| Christchurch College of Education                                                            | -1.59**         | -1.38**         | -1.43**          | -153.3**         |
| Dunedin College of Education                                                                 | -1.35**         | -1.23*          | -0.39            | -115.5**         |
| Bible College of New Zealand                                                                 | a               | a               | a                | a                |
| Te Wānanga o Aotearoa                                                                        | a               | a               | a                | a                |
| Carey Baptist College                                                                        | a               | a               | a                | a                |
| Whitecliffe College of Drama and Arts                                                        | a*              | a**             | a*               | a*               |
| AIS St Helens                                                                                | a               | a               | a                | a                |
| Bethlehem Institute of Education                                                             | a               | a               | a                | a                |
| <i>Subject (base = Philosophy)</i>                                                           |                 |                 |                  |                  |
| Accounting and Finance                                                                       | -1.33**         | -1.41**         | -1.38**          | -132.3**         |
| Agriculture and Other Applied Biological Sciences                                            | -0.73*          | -0.41           | -0.26            | -59.7            |
| Anthropology and Archaeology                                                                 | -0.48           | -0.23           | -0.27            | -38.2            |
| Architecture, Design, Planning and Surveying                                                 | -1.06**         | -0.36           | -0.32            | -81.4*           |
| Biomedical                                                                                   | -0.30           | -0.47           | -0.30            | -29.9            |
| Chemistry                                                                                    | a               | a               | a                | a                |
| Clinical Medicine                                                                            | -1.45**         | -0.74           | -0.47            | -117.6*          |
| Communications, Journalism and Media Studies                                                 | -1.01**         | -1.18**         | -1.14**          | -104.6**         |
| Computer Science, Information Technology, Information Services                               | -0.98**         | -0.79*          | -0.98**          | -94.4**          |
| Dentistry                                                                                    | -1.00           | -0.90           | -1.58            | -101.0           |
| Design                                                                                       | -1.65**         | -1.57**         | -1.64**          | -161.6**         |
| Earth Science                                                                                | -0.97**         | 0.03            | 0.42             | -59.7            |
| Ecology, Evolution and Behaviour                                                             | -0.41           | 0.27            | -0.07            | -24.3            |
| Economics                                                                                    | -1.42**         | -1.14**         | -1.27**          | -134.8**         |
| Education                                                                                    | -1.34**         | -1.32**         | -1.34**          | -130.9**         |
| Engineering and Technology                                                                   | -0.61           | -0.40           | -0.60            | -58.4*           |
| English Language and Literature                                                              | -0.62           | -0.66           | -1.15**          | -71.5*           |
| Foreign Languages and Linguistics                                                            | -1.04**         | -0.87*          | -0.98**          | -99.1**          |
| History, History of Art, Classics and Curatorial Studies                                     | -0.38           | 0.03            | -0.43            | -32.3            |
| Human Geography                                                                              | -0.65           | -0.30           | -0.50            | -56.1            |
| Law                                                                                          | -1.58**         | -0.86*          | -1.32**          | -143.1**         |
| Management, Human Resources, Industrial Relations, International Business and Other Business | -1.36**         | -1.06**         | -1.20**          | -128.4**         |
| Māori Knowledge and Development                                                              | 0.08            | 0.53            | -0.24            | 7.4              |
| Marketing and Tourism                                                                        | -1.49**         | -1.30**         | -1.30**          | -142.4**         |
| Molecular, Cellular and Whole Organism Biology                                               | -1.16           | -0.20           | -0.56            | -22.9            |



**Table 25: OLS regression results of the impact of staff characteristics on research performance by research quality score - lecturers - continued**

| Variables                                                             | Research score  |                 |                  |                  |
|-----------------------------------------------------------------------|-----------------|-----------------|------------------|------------------|
|                                                                       | RO coefficients | PE coefficients | CRE Coefficients | OQS coefficients |
| Music, Literary Arts and Other Arts                                   | -0.29           | 0.00            | -1.00**          | -33.8            |
| Nursing                                                               | -1.96**         | -1.20**         | -0.87*           | -161.5**         |
| Other Health                                                          | -1.64**         | -1.15**         | -1.10**          | -146.4**         |
| Physics                                                               | -0.13           | -0.07           | -0.39            | -17.3            |
| Political Science, International Relations and Public Policy          | -0.37           | -0.35           | -0.92*           | -45.3            |
| Psychology                                                            | -0.52           | -0.10           | -0.16            | -40.5            |
| Public Health                                                         | -0.91*          | -0.61           | -0.36            | -72.5            |
| Pure and Applied Mathematics                                          | -0.10           | -0.12           | -0.29            | -15.1            |
| Religious Studies and Theology                                        | -0.61           | -0.86           | -1.02            | -69.1            |
| Sociology, Social Policy, Social Work, Criminology and Gender Studies | -1.03**         | -0.64           | -0.55            | -89.4**          |
| Sport and Exercise Science                                            | -1.77**         | -1.52**         | -1.69**          | -171.9**         |
| Statistics                                                            | -1.27**         | -1.08**         | -1.50**          | -128.2**         |
| Theatre and Dance, Film and Television, and Multimedia                | -0.31           | -0.67           | -1.27**          | -60.4            |
| Veterinary Studies and Large Animal Science                           | -1.39**         | -1.87**         | -2.04**          | -156.6**         |
| Visual Arts and Crafts                                                | 0.04            | -0.28           | -1.31**          | -20.1**          |
| <i>Ethnicity (base = European)</i>                                    |                 |                 |                  |                  |
| Māori                                                                 | -0.11           | 0.31*           | 0.29             | -1.4             |
| Pasifika                                                              | 0.05            | 0.59            | 0.31             | 17.7             |
| Asian                                                                 | 0.15            | -0.02           | -0.01            | 10.0             |
| Other                                                                 | 0.05            | -0.10           | -0.13            | -0.5             |
| Not stated                                                            | -0.06           | -0.09           | -0.12            | -7.6             |
| R <sup>2</sup>                                                        | 0.30            | 0.31            | 0.30             | 0.33             |
| Number of observations                                                | 1,173           | 1,173           | 1,173            | 1,173            |

Notes:

1. \*\*Significant at the 1 percent level \*Significant at the 5 percent level.
  2. The OLS regressions used data for staff who were panel assessed. Therefore, the results of these regressions should not be compared with analysis that includes data for all PBRF eligible staff.
  3. An 'a' indicates that the results have been withheld due to a small number of observations.
- Sources: Ministry of Education, Tertiary Education Commission.

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