MINISTRY OF EDUCATION

Te Tāhuhu o te Mātauranga

Do student loans drive people overseas – what is the evidence?

Report
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All views expressed in this report, and any remaining errors or omissions, remain the responsibility of the author.

Disclaimer
Access to the data used in this study was provided through Statistics New Zealand under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the author, not Statistics New Zealand.

Summary Statistics New Zealand Security Statement: Integrated Data Disclaimer
The Integrated Dataset on Student Loan Scheme Borrowers is based on the integration of data from the Ministry of Social Development, the Inland Revenue Department and the Ministry of Education. This project has been approved by Statistics New Zealand as a data integration project with data access provided through the Data Laboratory under relevant legislation and policy. Only approved researchers who have signed Statistics New Zealand's declaration of secrecy can access the integrated data in the Data Laboratory. For further information about confidentiality matters in regard to this study please contact Statistics New Zealand.

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Executive summary

This report examined the impact of the level of the student loan leaving balance on the likelihood that student loan scheme borrowers were living overseas. This is an important area of analysis, as much recent debate has centred on the burden of debt on tertiary students and the impact this has on the decision of New Zealanders to live overseas.

In this study, multi-variate regression was applied to data from the Integrated Dataset on Student Loan Scheme Borrowers (IDS) to analyse the impact of the characteristics of around 23,000 student loan scheme borrowers from the 1997 leaving cohort on the likelihood that they were declared overseas five years after leaving tertiary study.

The findings of this study should be viewed with caution for the following reasons. Firstly, the measure used to identify if a borrower was overseas has some major limitations and is likely to result in an undercount of the actual number of borrowers overseas. Secondly, the explanatory power of the regression models are relatively low – between 5 and 9 percent - indicating that there are important factors outside of the ones used in this study that impact on the residency status of borrowers. Thirdly, this analysis uses a cohort-based approach. As such, it is likely that events unique to this cohort would influence the behaviour of borrowers. Therefore, there are limitations on the extent to which it is possible to extrapolate these results to cohorts from other leaving years. Finally, this analysis is limited to student loan scheme borrowers. To gain a fuller understanding of the decision of people to leave for overseas after leaving tertiary study, it would be necessary to include those people who did not draw down a student loan in the analysis. At the current time, this data for this group is not available.

The results of this study showed that a higher student loan leaving balance is associated with a higher likelihood of borrowers being declared overseas, controlling for other factors (such as age, ethnic group, field of study). Specifically, borrowers with a student loan leaving balance above $8,000 were more likely to be declared overseas five years after leaving study than those with a leaving balance below $8,000, holding other factors (such as age and level of study) constant. However, the magnitude of the increase in the likelihood of being declared overseas is likely to be overstated as those borrowers with smaller student loan leaving balances may have repaid their loans before going overseas and would not be required to declare their residency status to Inland Revenue.

Further analysis showed that the likelihood of being declared overseas increased in each year, for all levels of student loan leaving balances, from 1998 to 2001. The likelihood of being declared overseas rose at a faster rate for those with higher student loan leaving balances. In 2002, the likelihood of being declared overseas dropped in 10 out of the 12 student loan leaving balance categories. The terror attacks in September 2001 are likely to be a contributing factor to this occurrence.

There is such a diversity of factors that may influence the decision of people to live overseas, and so many are individual responses and so few are captured by the administrative data used in this study, that it is impossible to say with any certainty why people go overseas. This report shows that the size of the student loan leaving

balance is a statistically significant factor. However, the scale of the linkage is not clear.

In other findings in the study, borrowers older than 35 years of age were less likely to be declared overseas five years after leaving study than borrowers of a younger age. In terms of ethnic group, Māori and Pasifika borrowers were less likely than their European counterparts to be declared overseas. Unsurprisingly, borrowers who were New Zealand citizens were less likely to be declared overseas than permanent residents and those borrowers with Australian citizenship. The gender of borrowers was not a statistically significant factor in the likelihood of a borrower being declared overseas.

An analysis of educational factors showed that borrowers who had studied at higher levels were more likely to be declared overseas than those from lower levels. Borrowers who studied at the doctoral level were the most likely to be declared overseas. Those borrowers who had successfully completed a qualification in their final year of study were found to be more likely to be declared overseas than those who did not. Borrowers, who studied in the fields of agriculture, environmental and related studies, and education, were less likely to be declared overseas than borrowers who studied in other subject areas. In terms of the type of provider at which the borrower studied, it was found that borrowers from wānanga were less likely to be overseas than borrowers from other sub-sectors.

1 Introduction

The role that student loans play in the decision of New Zealanders to live overseas has been the subject of much recent debate. Most of the debate has centred on concerns that large student loans may be 'causing' New Zealanders to live overseas, either to escape the burden of the debt, or to earn higher wages in order to pay off their loans.[1] It is the impact of student loans on the decision of people to live overseas that is the focus of this study.

The fact that New Zealanders go overseas at the end of their studies is not necessarily problematic. Many graduates choose to undertake their 'overseas experience' (OE) at the end of their studies, while others will be continuing with their studies at overseas institutions. Therefore, it is not the fact that people choose to live overseas that is a problem *per se*, it is the *duration* that they are overseas that is the key issue, particularly if they do not return. If they remain overseas for an extended period of time, then the costs to the economy from the loss of the money invested in their education will rise.[2]

A previous analysis of student loan scheme borrower behaviour by the Ministry of Education (Griffin, Scott and Smyth, 2005) concluded that being overseas is associated with a higher student loan leaving balance. However, the magnitude of this relationship, and the degree to which this is a result of other confounding factors, has been unclear.

This report uses multi-variate regression to analyse up to nine factors that impact on the likelihood of student loan scheme borrowers living overseas after they finish their tertiary studies. By using multi-variate regression, this analysis has the advantage of allowing for the impact of individual characteristics to be analysed, while controlling for other factors. In this way, a more definitive analysis of the impact of student loans on the likelihood of student loan scheme borrowers being overseas can be undertaken. Also, this study has the advantage of two more years of data being available in the Integrated Dataset on Student Loan Scheme Borrowers (IDS), allowing a longer window of analysis than in the previous study.[3]

However, it is important to note that this study excludes those tertiary students who did not draw down a student loan during the course of their studies. Therefore, any conclusions about the factors that impact on whether a borrower is living overseas should not be seen as being representative of *all* tertiary students.

This report has the following structure. Section 2 outlines the methodology and the dataset used in this study, and explains the limitations that apply. The results of the logistic regression analysis are presented in section 3. In this section, the impact of the level of student loan leaving balance on the likelihood of being declared overseas five years after leaving study is presented. Also, the impact that other factors have on the

[1] There have been numerous claims that debt levels are a major factor in persuading young New Zealanders to live overseas. Refer for instance to New Zealand Herald 29/04/05 "Debt leaves teachers staggering".

[2] Interestingly, there is some evidence that the proportion of New Zealanders who live overseas with a student loan is lower than for the general population. See Griffin, Scott and Smyth (2005) pp 131.

[3] Griffin, Scott and Smyth (2005) analysed the residency status in 2000 of those borrowers who last studied in 1997 - a time frame of three years.

likelihood of being declared overseas is briefly discussed. Then, an analysis is presented of how the student loan leaving balance impacts on the likelihood of being declared overseas in each year following the leaving of study. In section 4, conclusions are presented about the impact of the student loan leaving balance, along with other factors, on the likelihood of borrowers being overseas.

There are several appendices at the end of the report. These include a more detailed explanation of the regression methodology used in this analysis (in Appendix A) and a comparison of the characteristics of those borrowers who were declared overseas with those who had zero income (in Appendix B). In Appendix C, a repeat of the analysis in section 3 is presented for comparison purposes, this time using zero income as a proxy measure for a borrower being overseas. Appendix D contains the regression output and Appendix E contains additional graphs of the predicted probability of being declared overseas between 1998 and 2002 by student loan leaving balance.

2 Data, scope, method and limitations

The data for this study was sourced from the IDS.[4] That dataset contains the matched records of borrowers who have received a student loan since 1997, along with their tertiary education records and income, student loan leaving balance and residency status information from the Inland Revenue Department (IRD).

The cohort of borrowers who last studied at a tertiary education institution and had a student loan in 1997 are the focus of this study. This amounts to around 23,700 individuals.[5] The reason for selecting this cohort was that 1997 is the earliest year for which educational data is linked to IRD data in the IDS and therefore allows for a relatively long-term analysis to be undertaken.[6]

The use of cohort-based data means that factors unique to this particular group can impact on the results. For example, in 1998, when borrowers in this cohort would likely have been seeking employment, New Zealand was at the bottom of an economic cycle and was experiencing relatively high unemployment rates of 6.8 percent in 1998 and 7.4 percent in 1999. This compares with an unemployment rate of 4.5 percent in 2004. Therefore, it is likely that the propensity of borrowers in the 1997 leaving cohort to be overseas would be higher, given the lower employment opportunities in New Zealand at that time.

Another factor to be considered is that tuition fees increased significantly for some students between 1997 and 2000, especially at the bachelors level or higher. Therefore, it is likely that borrowers in later leaving cohorts will have a higher student loan leaving balance. This may result in different borrower behaviour according to their level of student loan leaving balance, compared with the 1997 leaving cohort.[7] As a result, there is a need for caution in extrapolating these results for the 1997 leaving cohort to cohorts leaving in other years.

The borrower characteristics available for inclusion in this analysis include demographic, educational and student loan-related data. However, the decision of a borrower to be overseas involves a multitude of factors, many of which are outside the scope of this study. Therefore, there is a possibility of model misspecification from the omission of important explanatory variables, leading to biased regression results. In other words, the impact of an omitted factor might be captured by a variable that is included in the model.

Although this analysis uses data for 23,000 students who left tertiary study in 1997, it excludes those students who did not access a student loan.[8] Therefore, the results of

[4] For more information on this dataset see Griffin, Scott and Smyth (2005).
[5] There were around 29,000 borrowers who left tertiary study in 1997. Once borrowers with missing data had been excluded, around 23,700 records were available for the regression analysis.
[6] There is a gap of five years between the student's last year of study and being registered as resident overseas. The five year gap between study and residency status was selected in order to try and remove those borrowers who may have been overseas for a short period in earlier years as part of their OE.
[7] See Table 4 in the *Student Loan Scheme Annual Report 2004/05* for the median student loan leaving balance of students between 1992 and 2001.
[8] Approximately between 50 and 60 percent of students who are eligible for a student loan in each year access one. See the *Student Loan Scheme Annual Report 2004/05* for more information.

this analysis are representative of student loan scheme borrowers only and should not be seen as being representative of all tertiary students.

Another note of caution involves the variable used to measure if a borrower was overseas or not. If a person with a student loan leaves to go overseas for a period of three months or more they are required to inform IRD of their residency status. This declaration of residency status is used to measure whether the borrower was overseas or not. Around 10 percent of borrowers in the 1997 leaving cohort were declared overseas in 2002. However, it is likely that a substantial number of people may leave New Zealand without reporting this to IRD. In addition, those borrowers with lower student loan leaving balances may have completed repayment of their student loan by the time they leave for overseas and would not be required to declare their travel to IRD. Therefore, the non-residency data is likely to provide an undercount of the actual number of student loan borrowers who are overseas, especially for those with lower student loan leaving balances.

One way of attempting to overcome the problem of undercounting the true numbers of borrowers overseas is to use a proxy measure of the residency status of borrowers. One possible proxy measure of residency status is to treat those borrowers with zero declared income in 2002 as being overseas in that year.[9] In 2002, 28 percent of the 1997 leaving cohort had zero income. However, using this as a proxy measure of the residency status of borrowers is likely to result in an overcount of the actual number of borrowers overseas, as there are legitimate cases where people will not be overseas and have zero income. For instance, some borrowers who left the workforce to raise children may be picked up in that analysis. An analysis of the impact of the student loan leaving balance on the likelihood of a borrower being overseas, using zero income as the proxy measure for the residency status of borrowers, is presented in Appendix B for comparison purposes. In addition, a comparison of those borrowers who were declared overseas in 2002 and those who had zero income is presented in Appendix C.

Another limitation of this analysis is that although the student loan leaving balance is used as a measure of the financial burden on borrowers, it does not take into account other types of borrowing from regular commercial entities or from family. Therefore the true loan burden for borrowers is likely to be underestimated by the student loan leaving balance. Also, when a student receives a student allowance, their entitlements to student loans are reduced. Therefore, the amount that a student draws down in student loans will be influenced by their access to student allowances.

The main part of this report uses logistic regression[10] to analyse the impact of borrower characteristics on the probability of being overseas in 2002.[11] As borrowers are either overseas in 2002 (non-resident) or not, the dependent variable in this type of regression analysis is dichotomous or binary in nature and takes a value of 1 or 0.

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[9] For a more detailed comparison of the characteristics of those people who were declared overseas and those who declared zero income see Appendix C.

[10] More detail on the regression methodology used in this analysis is provided in Appendix A.

[11] For this analysis, those borrowers who were declared overseas for all of 2002 or had left to go overseas in 2002 are treated as being declared overseas. Borrowers who may have been declared overseas for part of 2002, but who had returned to New Zealand, were not considered declared overseas.

Then, the impact of the student loan leaving balance on the likelihood of a borrower being declared overseas is examined in each of the five years following the leaving of study in 1997. This approach can help to identify if the impact of the student loan leaving balance on the likelihood of being declared overseas varies over time.

To allow for possible interaction effects, the regression analysis is repeated for various subgroups of the main dataset. The subgroups analysed include borrowers from universities and institutes of technology and polytechnics (ITPs).

The borrower characteristics used as explanatory variables in the regression analysis are discussed below.

Student loan leaving balance
The balance of the student loan at 31 March in the year following leaving study was used to capture the effect of the size of the loan on the likelihood of being overseas. For the purposes of the analysis, a vector of dummy variables was created with the base category being a student loan leaving balance between $0 and $7,999.

Age
The age of the borrower in their last year of study is included in the model as an explanatory variable to control for age-related effects.[12] As was the case for the student loan variable, a vector of dummy variables was created with a base category of borrowers under 20 years of age.

Gender
A dummy variable is used to control for any gender effects. Women are the base category.

Ethnic group
To control for the impact of ethnic group, dummy variables were included in the analysis for Māori, Pasifika, Asian and borrowers of 'Other' ethnicity. The base category is European.

Residency status
New Zealand citizens, permanent residents, Australian citizens and refugees have access to the Student Loan Scheme. The links that permanent residents, Australians and refugees may have to their countries of origin may lead to a higher likelihood of their being overseas. To control for this effect, dummy variables for permanent residents and Others (Australians and refugees) are included in the regression model. The base category is a New Zealand citizen.

Level of study
The level of study of the borrower in their last year of study is likely to be a factor that impacts on the probability of their being overseas. Previous analysis shows people with higher level qualifications have higher rates of going overseas. Borrowers who were enrolled in higher levels of study would be more likely to find employment overseas. To control for this, a vector of dummy variables captured the level of study of the borrower in their last year of study. Dummies were included for level 4

[12] Younger people are more likely to travel overseas for their OE than older New Zealanders.

certificates, diplomas, bachelors, honours/postgraduate certificates, masters, and doctorate level. The base category is level 1-3 certificates.

Field of study
The field of study in which a borrower was enrolled is likely to influence the likelihood of being overseas. If the chosen field of study results in the borrower obtaining skills that are in high demand in world labour markets, then it is more likely that the borrower may decide to leave for overseas to seek employment. To control for the effect of field of study, a vector of dummy variables for the 12 broad classifications of field of study of the New Zealand Standard Classification of Education (NZSCED) were included in the regression models. The base category is natural and physical sciences.

Sub-sector
The type of provider may impact on the likelihood of a borrower being overseas. ITP programmes are more vocational in nature than university programmes, while colleges of education (CoEs) largely produce graduates in the field of education. Therefore, there could well be differences in the behaviour of borrowers from these different sub-sectors. A vector of dummy variables for the sub-sector in which the borrower was enrolled in were included in the regression model. Dummy variables were included for ITPs, CoEs and wānanga. Data on private training establishment borrowers in 1997 is not available in the IDS. The base category is universities.

Successful completion of a qualification in last year of study
Previous analysis has observed that, in actual terms, borrowers who successfully complete a qualification are more likely to be overseas than those who do not, as a result of greater opportunities of finding employment in world labour markets. A dummy variable that captured whether the borrower had successfully completed a qualification in their final year of study is included in the model. The base category is borrowers who did not complete a qualification in their last year of study.

3 Results

The impact that the student loan leaving balance and other factors have on the probability of a borrower being declared overseas is discussed in this results section.[13] Firstly, the impact of borrower characteristics on the likelihood of being declared overseas five years after study is examined. This is followed by an analysis of the impact of the student loan scheme leaving balance on the likelihood of a borrower being declared overseas in each year following the end of study.

Throughout the results section, the impact of individual borrower characteristics on the likelihood of being declared overseas is presented, while holding all the other factors constant.

At this point it should be noted that the explanatory power of the regression models is fairly low. The amount of variation explained by the independent variables in the models ranged between 5 and 9 percent. Therefore, there are many factors outside of the range of variables included in the IDS that play a part in determining if a person chooses to live overseas. These could include family reasons, peer pressure, business reasons, the motivation of the borrower, or the state of the overseas labour market. Therefore, caution needs to be exercised when considering the results that follow.

Factors influencing a borrower being overseas five years after study

In this section, the focus is on the student loan scheme leaving balance and the impact it has on the likelihood of borrowers being declared overseas, but the impact of other factors is also presented.

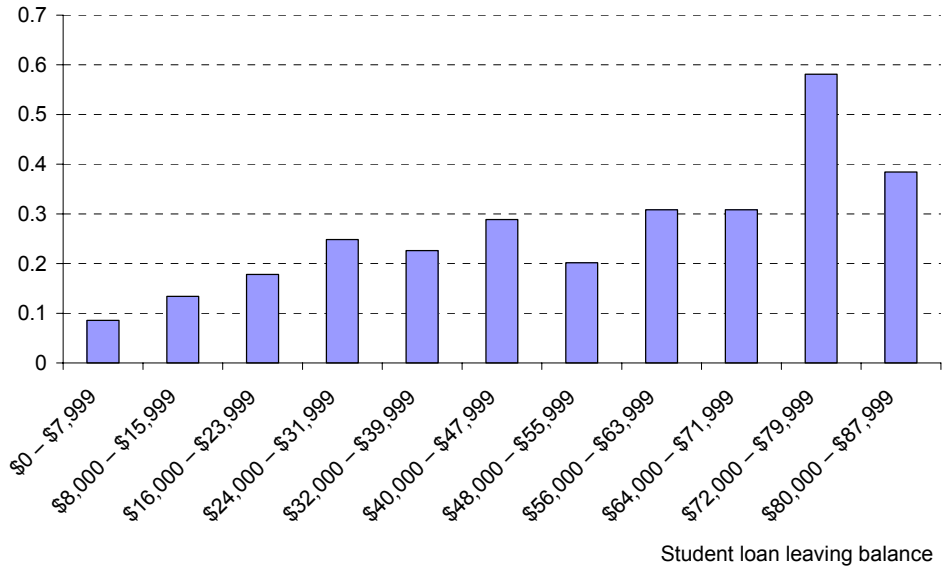
Student loan leaving balance

The analysis showed that the size of the student loan leaving balance is a statistically significant factor in determining if a borrower was declared overseas five years after ending study. Generally, borrowers with leaving balances greater than $8,000 had a greater likelihood of being declared overseas than borrowers with balances less than $8,000, holding other factors constant.

One way of illustrating the impact of the student loan balance on the likelihood of being declared overseas is to estimate the predicted probabilities of being overseas at different levels of student loan leaving balance.[14] The predicted probabilities of being declared overseas for a selected reference group are presented in Figure 1.[15] It shows that the predicted probability of being declared overseas generally rises as the level of leaving balance increases. For example, the probability of being declared overseas increases from 0.09 for a leaving balance between $0 and $7,999 to a probability of 0.25 for a leaving balance between $24,000 and $31,999.[16]

[13] The regression output from this analysis can be found in Table 3 in Appendix D.
[14] See Appendix A for a detailed explanation of how the predicted probabilities were calculated.
[15] The reference group had the following characteristics: age = 20 to 24, gender = male, ethnic group = European, residency = New Zealand citizen, field of study = society and culture, they successfully completed a qualification in final year of study and they studied at the bachelors level at university.
[16] The odds of a borrower with a leaving balance of between $24,000 and $31,999 being declared overseas are 2.3 times the odds of a borrower with a leaving balance of between $0 and $7,999. For a fuller explanation of odds and odds ratios, see Appendix A.

Figure 1: Predicted probabilities of student loan scheme borrowers who left tertiary study in 1997 being declared overseas in 2002 by student loan leaving balance



Note: The predicted probabilities were calculated using the modal categories for the dummy variables. The characteristics of the reference group are: age = 20 to 24, gender = male, ethnic group = European, residency = New Zealand citizen, field of study = society and culture, they successfully completed a qualification in final year of study and they studied at the bachelors level at university.

For student loan leaving balances over $32,000, there were some cases where borrowers had a significantly higher predicted probability of being overseas than those with lower leaving balances. For example, borrowers with student loan leaving balances in the range $72,000 to $79,999 had a predicted probability of being declared overseas of 0.58. This is significantly higher than the predicted probability of 0.09 for borrowers with a leaving balance of $0 to $7,999.[17]

However, there are relatively few borrowers in the 1997 leaving cohort with a student loan leaving balance above $32,000. Only 7 percent of borrowers had a leaving balance above $32,000. Therefore, although one can say that the probability of being overseas rises as the student loan leaving balance rises, the magnitude of this rise once the leaving balance is over $32,000 should be treated with caution.

The magnitude of the increase in the predicted probability of being declared overseas may also simply reflect that borrowers with lower student loan leaving balances may have completed the repayment of their student loan prior to going overseas and would not be required to declare their travel overseas to IRD. As a result, the magnitude of the increase in predicted probability of being overseas as the leaving balance increases is possibly lower than indicated in the above analysis.[18]

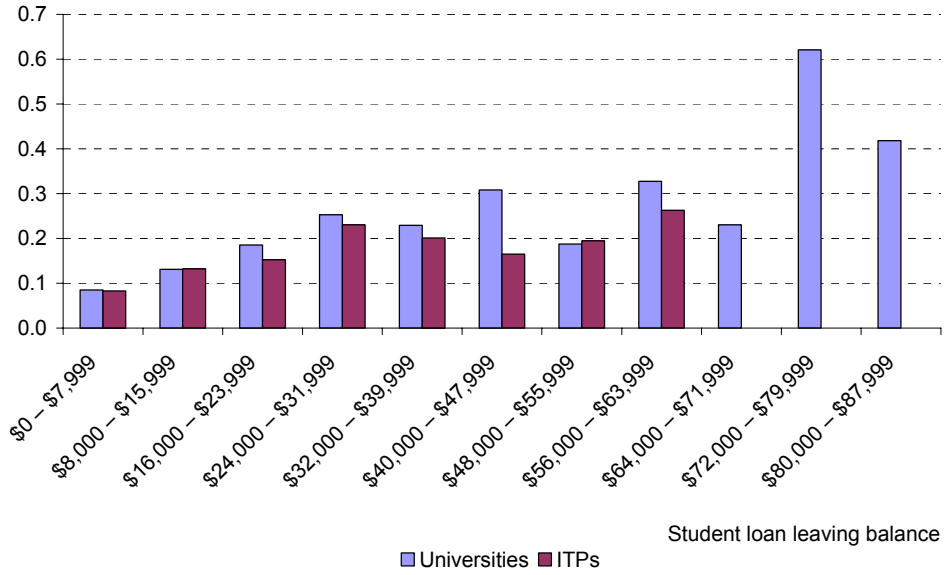
Separate analyses of borrowers from universities and ITPs show that from a starting point of a $0 to $7,999 student loan balance, the likelihood of being declared overseas rises for borrowers from universities and ITPs, up to a balance of $31,999. For

[17] The odds of a borrower with a leaving balance of between $72,000 and $79,999 being declared overseas are 14.8 times the odds of a borrower with a leaving balance of between $0 and $7,999.
[18] This is supported to an extent by the findings of the analysis that used zero income as a proxy for being overseas. This analysis is presented in Appendix B.

example, the predicted probability of being declared overseas for university borrowers increases from 0.09 for those with a student loan leaving balance of $0 to $7,999 to a probability of 0.19 for those with a student loan leaving balance of $16,000 to $23,999.[19]

As mentioned previously, the low number of borrowers with a balance above $32,000 means that the predicted probabilities above this level of leaving balance should be treated with caution.

Figure 2: Predicted probabilities of student loan scheme borrowers who left tertiary study in 1997 being declared overseas in 2002 by sub-sector and student loan leaving balance



Note: The predicted probabilities were calculated using the modal categories for the dummy variables. The characteristics of the reference group are: age = 20 to 24, gender = male, ethnic group = European, residency = New Zealand citizen, field of study = society and culture, they successfully completed a qualification in final year of study and they studied at the bachelors level.

Age

The results showed that older borrowers were less likely to be declared overseas than younger borrowers. In particular, borrowers aged over 35 were less likely to be declared overseas than borrowers from younger age groups.

There was evidence that this relationship varies by gender. Men exhibited an increase in the likelihood of being overseas with age, with a peak at the ages between 20 and 29 and then a decline with age. However, women generally experienced an ongoing decline in the likelihood of being declared overseas with age.[20]

[19] The odds of a borrower from university with a leaving balance of between $16,000 and $23,999 being declared overseas are 2.4 times the odds of a borrower with a leaving balance of between $0 and $7,999.

[20] The regression output of the separate analysis of male and female borrowers is not presented in this report. However, this output is available on request from the author.

Gender

Overall, the analysis showed that the gender of borrowers was not a statistically significant factor in determining the likelihood of being declared overseas. However, there is evidence that gender does appear to play a role in some areas of borrower behaviour. As previously discussed, male and female borrowers have differing relationships between age and the probability of being overseas. There is also some evidence that there are slightly differing results by gender for the impact of level of study and the likelihood of being overseas. This is discussed in more detail later in this section.

Ethnic group

Generally, the results showed that Māori and Pasifika borrowers were less likely to be declared overseas than European borrowers, while borrowers from the 'Other' ethnic group had the greatest likelihood of being declared overseas. There was no statistically significant difference in the likelihood of Asian and European borrowers being declared overseas.

Residency status

Overall, a permanent resident had a higher likelihood of being declared overseas five years after leaving study than a New Zealand citizen.[21] The predicted probability of a New Zealand citizen being declared overseas five years after study for the selected reference group[22] is 0.09, while the predicted probability of a permanent resident being declared overseas is 0.10.[23] Those in the 'Other' category were also more likely than New Zealand citizens to be declared overseas. The predicted probability of being declared overseas for this group was 0.13.[24]

Level of study

A consistent finding was that the higher the level of study in the borrower's final year, the greater was the likelihood that they would be overseas. This would reflect the greater employment opportunities that higher-qualified borrowers would have in the world labour market. In the case of holders of postgraduate qualifications, it may also indicate a tendency to seek further postgraduate qualifications or postdoctoral fellowships overseas.

Generally, borrowers who had studied at the doctoral level had the highest likelihood of being declared overseas. However, for men, those borrowers who studied at the doctorate level in their last year of study were the most likely to be overseas, while for women it was those borrowers who had studied at the masters level.

[21] This effect was largest for borrowers from ITPs.

[22] The characteristics of the reference group are: age = 20 to 24, gender = male, ethnic group = European, field of study = society and culture, they successfully completed a qualification in final year of study at university, studied at the bachelors level and they had a student loan leaving balance between $0 and $7,999.

[23] The odds of a permanent resident being declared overseas were 1.3 times the odds of a New Zealand citizen.

[24] The odds of a borrower in the 'Other' category being declared overseas were 2.3 times the odds of a New Zealand citizen.

Successful completion in last year of study
Overall, the results showed that borrowers who had successfully completed a qualification in their final year of study had a higher likelihood of being overseas than those who did not.

Field of study
The analysis of the impact of the subject area studied by borrowers was limited to analysing the fields of study using relatively broad definitions of NZSCED broad fields. Therefore, the following results should be treated with a degree of caution.[25]

The results showed that borrowers who studied in the field of education were generally the least likely to be declared overseas. Similarly, borrowers who studied in the area of agriculture, environmental and related studies were less likely to be declared overseas than borrowers from the base category of natural and physical sciences.

Sub-sector
Overall, there was no statistically significant difference in the likelihood of university and ITP borrowers being declared overseas. Wānanga borrowers were the least likely to be declared overseas.

[25] For example, health is a very broad field of study and includes areas such as nursing, medical studies, and physiotherapy. Therefore, the likelihood of, say, doctors being overseas may be masked by the behaviour of borrowers from other areas within the health field.

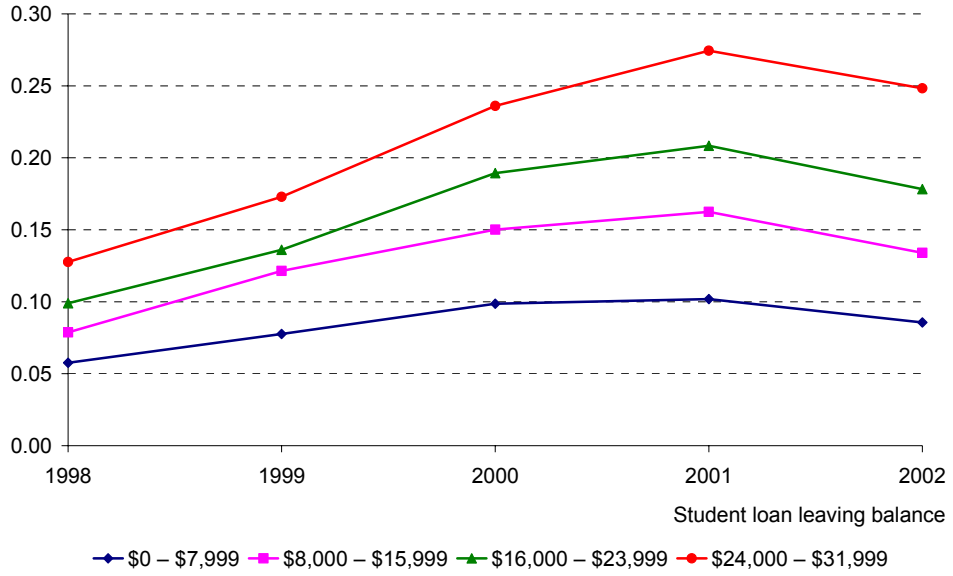
The impact of the student loan leaving balance on the likelihood of being overseas in each year following study

The analysis in the previous section showed that the size of the student loan leaving balance impacted on the likelihood of being declared overseas five years after leaving study. By examining the impact of the student loan leaving balance on the likelihood of a borrower being overseas in each of the five years following leaving study, a more dynamic picture can be obtained.

Figure 3 shows the predicted probability of a student loan scheme borrower with a leaving balance between $0 and $31,999 being declared overseas in each of the five years following the end of study for the selected reference group.[26] The predicted probability of being overseas increases for each of the levels of leaving balances between 1998 and 2001. However, the increase in predicted probability of being declared overseas for those borrowers with a leaving balance between $0 and $7,999 was relatively moderate.

In 2002, the probability of being overseas fell in 10 of the 12 leaving balance categories. This is likely to partly reflect the impact of the terror attacks in 2001 in persuading a number of New Zealanders to return home and dissuading some New Zealanders from travelling overseas.

Figure 3: Predicted probabilities of student loan scheme borrowers who left tertiary study in 1997 being declared overseas by year and student loan leaving balance between $0 and $31,999



Note: The predicted probabilities were calculated using the modal categories for the dummy variables. The characteristics of the reference group are: age = 20 to 24, gender = male, ethnic group = European, residency = New Zealand citizen, field of study = society and culture, they successfully completed a qualification in their final year of study and they studied at the bachelors level at university.

[26] Graphs with the predicted probabilities of borrowers with student loan leaving balances of $32,000 and higher being declared overseas in each year are presented in Appendix E.

4 Conclusion

The results of this analysis show that the size of the student loan leaving balance was a statistically significant factor in the likelihood that a borrower was declared overseas five years after finishing study. Borrowers with a higher level of student loan leaving balance were generally found to have a higher likelihood of being declared overseas, holding other factors constant. Specifically, borrowers with a student loan leaving balance above $8,000 were more likely to be declared overseas five years after leaving study than those with a leaving balance below $8,000.

It may be that part of the rate of increase in likelihood of being declared overseas as the student loan leaving balance rises is a result of borrowers with smaller leaving balances having repaid their student loan and therefore not being required to declare their travels to IRD. Additional analysis (in Appendix B), using zero income as a proxy measure of residency status, reinforces this point, indicating that the magnitude of the increase may be overstated when using declared overseas as the measure of residency status.

A significant rise in the predicted probability of being declared overseas at higher leaving balance levels needs to be treated with caution, as there are relatively few borrowers with these high levels of debt in this cohort.

Further analysis showed that between 1998 and 2001 the probability of being declared overseas increased for student loan scheme borrowers at all levels of leaving balance. In 2002, the likelihood of being declared overseas fell in a majority of the student loan leaving balances. A probable cause of this is likely to be the terror attacks that took place in the United States in 2001.

In other findings, younger student loan scheme borrowers were more likely to be declared overseas five years after leaving study than older borrowers, while the gender of the borrower did not have a statistically significant impact on the likelihood of being overseas.

Māori borrowers were less likely to be declared overseas than European borrowers and borrowers who studied to higher levels were more likely to be overseas. Permanent residents were found to be more likely to be declared overseas than New Zealand citizens.

A consistent finding was that borrowers who studied in the education field were less likely to be declared overseas than borrowers who studied in other areas. Generally, borrowers who had successfully completed a qualification in their final year of study were more likely to be declared overseas than those borrowers who had not completed. In terms of the sub-sector in which borrowers studied, wānanga borrowers were less likely to be declared overseas than university borrowers.

In conclusion, although the analysis showed that borrowers with higher student loan leaving balances were more likely to be declared overseas, holding other factors constant, the magnitude of the relationship is unclear. This is mainly due to the lack of a reliable measure of the residency status of borrowers. A further note of caution is that the explanatory power of the regression models was relatively low, indicating that factors outside the scope of this analysis impact on the decision making of borrowers.

There is such a diversity of factors that may influence the decision of people to live overseas, and so many are individual responses and so few are captured by the administrative data used in this study, that it is impossible to say with any certainty why people go overseas. This report shows that the size of the student loan leaving balance is a statistically significant factor. However, the scale of the linkage is not clear.

Therefore, further research is required into the nature of the relationship between the student loan leaving balance and the likelihood of being overseas. A key factor in this research will be the ability to measure accurately the residency status of borrowers and to include a longer window of analysis to capture the long-term trends with more certainty. In addition, an analysis of the behaviour of people who have studied at tertiary level without drawing down a student loan would provide some important context to the impact of the student loan leaving balance on residency status.

Appendix A: Regression methodology

Regression model

As people were declared overseas in a year or they were 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 student loan scheme borrower was declared overseas five years after finishing study.[27]

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 borrower being declared overseas, or not.

The base logistic regression equation took the form:

$$(A) \quad \ln[DO(1\text{-}DO)] = \beta_1 + \beta_2\, age^* + \beta_3\, gender + \beta_4\, ethnicity^* + \beta_5\, Residency^* + \beta_6\, level^* + \beta_7\, provider^* + \beta_8\, subject^* + \beta_9\, completed + \beta_{10}\, student\ loan\ balance^* + \mu$$

Where DO is the probability of a student loan borrower being declared overseas, age* is a vector of dummy variables for the age of the borrower in 1997, gender is a dummy variable (if male = 1 otherwise 0), ethnicity* is a vector of dummy variables for the ethnicity of the student loan borrower, residency* is a vector of dummy variables for the residency status of the borrower, level* is a vector of dummy variables for the level of study in the borrower's last year of study, provider* is a vector of dummy variables for the type of sub-sector in the logistic regression analysis, subject* is a vector of dummy variables for the field of study, completed is a dummy variable indicating if the borrower successfully completed a qualification in their last year of study (if successfully completed = 1, otherwise 0), student loan balance* is a vector of dummy variables for the balance of the borrower's student loan as at 31 March in the year following study, μ is an error term and ln is the natural logarithm.

As mentioned previously, it is likely that the use of declared overseas as the measure of the overseas status of a borrower is likely to result in an undercount of the true value. Therefore, as a test of the robustness of the results a proxy measure of whether a borrower is overseas or not is used. If a person had zero income they were treated as being overseas in that year. The results of this additional regression analysis are presented in Appendix D.

Predicted probabilities

To aid with the interpretation of the results, predicted probabilities are provided for the variable in question. The predicted probability is calculated by substituting the modal values of the borrower characteristics 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

[27] Stata release 9.0 was used to produce the regression output.

equation. By doing so, the impact of the selected student borrower characteristic on the predicted probability can be calculated for this reference group. The characteristics of the reference group in this analysis were: age = 20 to 24, ethnic group = European, residency = New Zealand citizen, gender = male, level of study = bachelors, field of study = society and culture, and successfully completed qualification.

It is important to note that these predicted probabilities of being overseas are for the selected reference group only. As this reference group includes borrowers who successfully completed a bachelors degree in their final year of study, they are more likely than other groups to be declared overseas. If a different reference group was chosen, then the values of the predicted probabilities would change and in many cases would be lower. However, the nature of the relationship between student loan balance and the probability of being declared overseas would not change if a different reference group was selected.

Odds ratios

The results of the logistic regression are also presented in odds ratio form. Odds ratios are not the same as probabilities and to aid in their interpretation a fictional example is set out below.

Suppose that 400 borrowers who are male were living overseas and 200 were not. The odds of a male borrower living overseas are 400/200 = 2, or 2 to 1. In other words, the chances of a male borrower living overseas are reasonably good.

Suppose that 500 female borrowers were living overseas and 1,000 were not. The odds of a female borrower living overseas would be 500/1,000 = 0.5, or 1 to 2. The chances of their living overseas are therefore significantly lower than for males.

To calculate the odds ratio of a female borrower living overseas compared with a male borrower, the odds of a female living overseas (0.5) are divided by the odds of a male living overseas (2), which equals 0.25.

This result can be interpreted as the odds of a female borrower living overseas are 25 percent of those of a male borrower. Alternatively, taking the inverse of the odds ratio (2/0.5), the odds of a male borrower living overseas are four times higher than for a female borrower. Therefore, it is more likely that a male borrower will be living overseas than a female borrower.

This is not the same as saying that the probability of a male borrower living overseas is four times higher than that of a female borrower. Using the data in the above example, the probability of a male borrower living overseas is equal to the number of male borrowers living overseas divided by the total number of male borrowers, living in New Zealand or not. The probability is found using the following calculation 400/(400+200) = 0.67. In other words, the probability that a male borrower will be living overseas is 67 percent.

For a female borrower, the probability that they are living overseas would equal 500/(500+1,000) = 0.33. In other words, the probability that a female borrower is overseas is 33 percent.

Comparing the two results, the probability that a male borrower will be living overseas is twice as great as the probability that a female borrower will be living overseas (67/33). This compares with the odds ratio that indicated that the odds of a male borrower living overseas were four times greater than for a female borrower.

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.

Appendix B: Analysis using zero income as a proxy measure for a borrower being overseas[28]

As mentioned in section 2, the use of declared overseas as a measure of residency status is likely to result in an undercount of the true number of borrowers overseas. Therefore, in this section a proxy measure is used to test the robustness of the analysis that used declared overseas as the measure of residency status. If a borrower had zero income over a year, he/she was assumed to be overseas. This measure is likely to result in an overcount of the true number of borrowers overseas and the results should be viewed with caution. Nevertheless, it is a useful way of testing the robustness of the findings of the earlier analysis.

Of the borrowers who left study in 1997, 2,419 or 10.2 percent were declared overseas. The number of borrowers with zero income is significantly higher at 6,731, or 28.4 percent of borrowers. Some of the borrowers with zero income will be child rearing or out of the workforce. But preliminary checks by IRD found that many of those with zero income were overseas without having declared it. A more detailed comparison of the characteristics of borrowers who were declared overseas and those who had zero income is presented in Appendix C.

Factors influencing a borrower being overseas five years after study

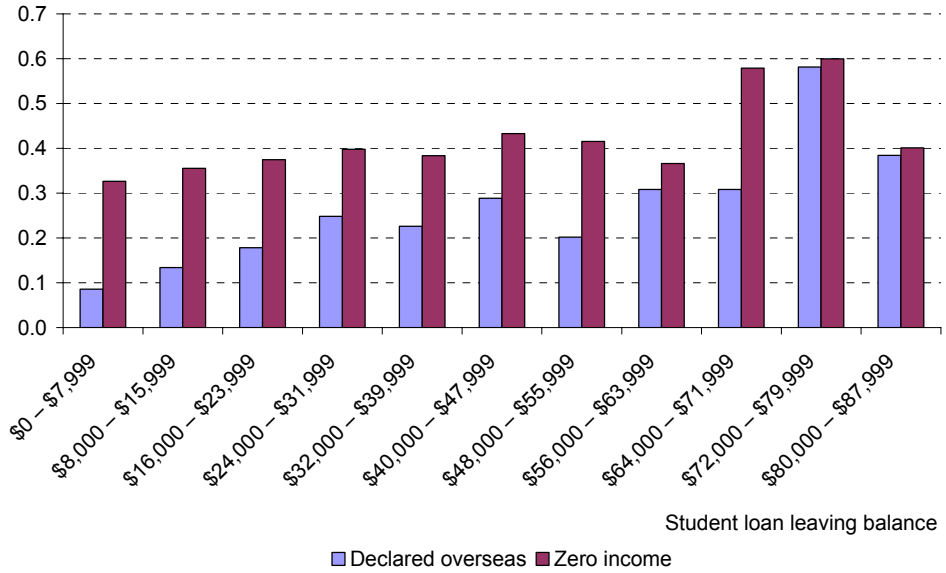
The zero income proxy variable for residency status was used to analyse the impact of borrowers' characteristics on the probability of being overseas five years after finishing study. Figure 4 shows the predicted probabilities for borrowers being declared overseas five years after study, compared with having zero income five years after study, for the selected reference group.[29]

The rate of increase in predicted probability for those with zero income is lower compared with using declared overseas as the measure of residency status. For example, the predicted probability of a borrower having zero income five years after leaving study increases from 0.33 for a leaving balance between $0 and $7,999 to 0.40 for a balance between $24,000 and $31,999.[30] This compares with an increase in the predicted probability of being declared overseas of 0.09 and 0.25, respectively.

This indicates a lower degree of sensitivity to higher leaving balances than was indicated in the earlier analysis and may be a more accurate reflection of the impact of higher leaving balances.

[28] The regression analysis output can be found in Table 5 in Appendix D.
[29] This analysis uses the same reference group that was used for the earlier analysis using declared overseas as the indicator of residency status.
[30] The odds of a borrower with a leaving balance of between $24,000 and $31,999 having zero income are 1.4 times the odds of a borrower with a leaving balance of between $0 and $7,999.

Figure 4: Predicted probabilities of student loan scheme borrowers who left study in 1997 being declared overseas and having zero income in 2002 by student loan leaving balance



Note: The predicted probabilities were calculated using the modal categories for the dummy variables. The characteristics of the reference group are: age = 20 to 24, gender = male, ethnic group = European, residency = New Zealand citizen, field of study = society and culture, they successfully completed a qualification in their final year and they studied at the bachelors level.

Age
Overall, the likelihood of having zero income rises with age, before falling for leaving ages over 30.

Gender
Gender appeared to have no statistically significant effect on the likelihood of having zero income.

Ethnic group
Overall, Māori borrowers were less likely to have zero income than European borrowers, while borrowers from the Asian and 'Other' ethnic groups were more likely to have zero income than their European counterparts.

Residency status
Permanent residents and borrowers in the 'Other' category had a higher likelihood of having zero income than New Zealand citizens.

Level of study
The higher the level of study in the borrower's final year, the greater was the likelihood that the borrower would have zero income five years after leaving study.

Field of study
Borrowers in subject areas such as education, creative arts and agriculture were less likely to have zero income than borrowers in other fields of study.

Completion status
The successful completion of a qualification in the final year of study did not appear to influence the likelihood of the borrower having zero income.

Appendix C: Comparison of borrowers who were declared overseas in 2002 with borrowers with zero income in 2002

This appendix compares the two variables used to measure the residency status of student loan scheme borrowers in this report. These were: borrowers who were declared overseas, versus the proxy for whether a borrower was overseas, those with zero income.

There is a much higher proportion of borrowers with zero income than of borrowers who are declared overseas. In 2002, 10.2 percent of borrowers from the 1997 leaving cohort were declared overseas, compared with the 28.4 percent of borrowers who had zero income (see Table 1). Eighty-seven percent of people who were declared overseas had zero income, while just 31 percent of people with zero income were declared overseas.

Table 1: Student loan scheme borrowers who left study in 1997 by declared overseas status and zero income status in 2002

	Non-declared overseas	Declared overseas	Total
Non-zero income	16,676	315	16,991
Zero income	4,627	2,104	6,731
Total	21,303	2,419	23,722

Generally borrowers with zero income and borrowers who were declared overseas had a similar distribution of characteristics. However, there were some areas where the two groups differed in make-up. For example, there was a lower representation of the European ethnic group and a higher representation of the Asian ethnic group in the zero income dataset. There was also a higher representation of borrowers from lower levels of study in the dataset of those who had zero income.

Significantly, there is a higher proportion of borrowers with lower levels of student loan leaving balance among borrowers who had zero income. This might indicate that borrowers with lower balances may be less likely to declare their residency status accurately to IRD.

The characteristics of borrowers who were declared overseas and those who had zero income are presented in Table 2.

Table 2: Comparison of characteristics of borrowers who were declared overseas in 2002 with those who had zero income in 2002

	Declared overseas	Zero income		Declared overseas	Zero income
Completion status			*Gender*		
Completed	54.3%	48.1%	Male	48.6%	51.6%
Not completed	45.7%	51.9%	Female	51.4%	48.4%
Ethnic group			*Sub-sector*		
European	72.1%	62.7%	Universities	65.2%	60.5%
Māori	11.3%	11.8%	ITPs	29.5%	34.8%
Pasifika	3.6%	4.8%	CoEs	5.2%	4.2%
Asian	7.4%	14.2%	Wānanga	0.1%	0.4%
Other	4.7%	5.5%			
Unknown	1.0%	1.1%			
Level of study			*Student loan leaving balance*		
Certificate – levels 1-3	16.7%	24.0%	$0 – $7,999	22.1%	37.6%
Certificate – level 4	1.5%	1.9%	$8,000 – $15,999	25.0%	26.3%
Diplomas	15.8%	15.0%	$16,000 – $23,999	20.2%	16.2%
Bachelors	49.5%	44.5%	$24,000 – $31,999	17.1%	10.4%
Honours/postgrad cert/dip	9.5%	8.3%	$32,000 – $39,999	8.5%	5.4%
Masters	6.4%	5.8%	$40,000 – $47,999	4.7%	2.6%
Doctorate	0.6%	0.5%	$48,000 – $55,999	1.1%	0.8%
			$56,000 – $63,999	0.8%	0.4%
Field of study			$64,000 – $71,999	0.2%	0.2%
Natural and physical sciences	8.9%	8.7%	$72,000 – $79,999	0.2%	0.1%
Information technology	2.6%	2.9%	$80,000 – $87,999	0.2%	0.1%
Engineering and related technologies	4.1%	5.1%			
Architecture and building	2.6%	2.1%	*Age*		
Agriculture, environmental and related studies	2.4%	2.8%	<20	9.1%	10.7%
Health	9.0%	7.2%	20 – 24	58.9%	49.9%
Education	8.2%	7.1%	25 – 29	17.9%	17.5%
Management and commerce	20.3%	20.9%	30 – 34	7.0%	9.5%
Society and culture	23.1%	21.9%	35 – 39	4.0%	6.0%
Creative arts	9.3%	10.0%	40 – 44	1.6%	3.1%
Food and hospitality	5.9%	6.7%	45 – 49	1.0%	1.8%
Mixed field	3.5%	4.5%	50 – 54	0.6%	1.1%
			55 – 59	0.0%	0.3%
Residency status			60 +		0.2%
New Zealand citizen	88.6%	82.0%			
Permanent resident	10.4%	16.9%			
Other	1.0%	1.1%			

Appendix D: Regression results

Table 3: Logistic regression results of the impact of student loan scheme borrower characteristics on the likelihood of their being declared overseas five years after leaving tertiary study in 1997 by sub-sector (Dependent variable = ln(DO/(1- DO)))

	Logit coefficients		
Independent variable	All	Universities	ITPs
Constant	-3.051***	-2.910***	-2.761***
Student loan leaving balance (base = $0 – $7,999)			
$8,000 – $15,999	0.502***	0.485***	0.523***
$16,000 – $23,999	0.840***	0.893***	0.689***
$24,000 – $31,999	1.261***	1.291***	1.198***
$32,000 – $39,999	1.138***	1.163***	1.023***
$40,000 – $47,999	1.467***	1.566***	0.782*
$48,000 – $55,999	0.993***	0.908***	0.983
$56,000 – $63,999	1.561***	1.656***	1.373
$64,000 – $71,999	0.991*	1.169**	-
$72,000 – $79,999	2.697***	2.867***	-
$80,000 – $87,999	1.897***	2.045***	-
$88,000 +	-	-	-
Age (base <20)			
20 – 24	0.121	-0.023	0.109
25 – 29	-0.006	-0.166	0.083
30 – 34	-0.190	-0.322	-0.101
35 – 39	-0.403***	-0.663***	-0.178
40 – 44	-0.868***	-1.086***	-0.648**
45 – 49	-0.993***	-0.943***	-1.312***
50 – 54	-0.654**	-0.880**	-0.772
55 – 59	-2.241**	-	-1.133
Gender (base = female)	-0.061	-0.038	-0.124
Ethnic group (base = European)			
Māori	-0.180**	-0.287***	0.002
Pasifika	-0.352***	-0.291*	-0.372*
Asian	-0.006	-0.098	0.265
Other	0.361***	0.235*	0.609***
Residency status (base = New Zealand citizen)			
Permanent resident	0.287***	0.210*	0.397**
Other	0.847***	0.511	1.235***
Level of study (base = Certificate – levels 1-3)			
Certificate – level 4	0.298	0.075	0.447**
Diplomas	0.369***	0.357*	0.392***
Bachelors	0.459***	0.439***	0.558***
Honours/postgrad cert/dip	0.681***	0.674***	-
Masters	0.794***	0.795***	-
Doctorate	1.304***	1.312***	-

Table 3: Logistic regression results of the impact of student loan scheme borrower characteristics on the likelihood of their being declared overseas five years after leaving tertiary study in 1997 by sub-sector (Dependent variable = ln(DO/(1- DO))) continued

	Logit coefficients		
	All	Universities	ITPs
Sub-sector (base = university)			
ITPs	-0.034	-	-
CoEs	0.239	-	-
Wānanga	-1.748**	-	-
Completion status (base = not completed)	0.150***	0.099*	0.272***
Field of study (base = Natural and physical sciences)			
Information technology	0.233	0.453**	-0.352
Engineering and related technologies	-0.224*	0.009	-1.109***
Architecture and building	0.043	0.115	-0.461
Agriculture, environmental and related studies	-0.494***	-0.406*	-1.027***
Health	-0.036	-0.122	-0.430
Education	-0.439***	-0.416***	-1.270**
Management and commerce	0.056	0.100	-0.384
Society and culture	0.012	0.058	-0.458*
Creative arts	-0.163	-0.005	-0.623**
Food and hospitality	0.010	0.009	-0.426*
Mixed field	0.276*	0.294*	-0.320
Pseudo R^2	0.08	0.06	0.06
Log likelihood	-7,111	-4,253	-2,438
n	23,390	11,310	10,540

Notes:
1. *** significant at 1 percent level, ** significant at 5 percent level, * significant at 10 percent level.
2. Robust standard errors were used to calculate the level of significance of the independent variables.

Table 4: Logistic regression results of the impact of student loan scheme borrower characteristics on the likelihood of their being declared overseas in the years after leaving tertiary study in 1997 (Dependent variable = ln(DO/(1- DO)))

	Logit coefficients				
Independent variable	1998	1999	2000	2001	2002
Constant	-3.874***	-3.466***	-3.121***	-3.246***	-3.051***
Student loan leaving balance (base = $0 – $7,999)					
$8,000 – $15,999	0.335***	0.496***	0.479***	0.536***	0.502***
$16,000 – $23,999	0.587***	0.627***	0.758***	0.842***	0.840***
$24,000 – $31,999	0.873***	0.910***	1.038***	1.204***	1.261***
$32,000 – $39,999	0.481***	0.793***	0.849***	1.008***	1.138***
$40,000 – $47,999	0.707***	0.874***	1.186***	1.449***	1.467***
$48,000 – $55,999	0.462	0.819***	1.070***	1.151***	0.993***
$56,000 – $63,999	0.767*	1.177***	1.159***	1.275***	1.561***
$64,000 – $71,999	0.738	0.983*	1.303***	1.118**	0.991*
$72,000 – $79,999	2.058***	1.958***	2.480***	2.932***	2.697***
$80,000 – $87,999	0.686	0.937	0.710	1.317*	1.897***
$88,000 +	-	-	-	-	-
Age (base <20)					
20 – 24	0.394***	0.475***	0.378***	0.318***	0.121
25 – 29	0.528***	0.420***	0.225**	0.137	-0.006
30 – 34	0.133	0.156	-0.028	-0.085	-0.190
35 – 39	0.124	-0.192	-0.273*	-0.314**	-0.403***
40 – 44	-0.760***	-0.637***	-0.776***	-0.722***	-0.868***
45 – 49	-0.661**	-0.638**	-1.018***	-0.979***	-0.993***
50 – 54	-0.220	-0.346	-0.627**	-0.751**	-0.654**
55 – 59			-2.076**	-2.205**	-2.241**
Gender (base = female)	0.052	-0.030	-0.103**	-0.054	-0.061
Ethnic group (base = European)					
Māori	-0.363***	-0.217***	-0.231***	-0.219***	-0.180**
Pasifika	-0.509***	-0.654***	-0.571***	-0.395***	-0.352***
Asian	0.008	0.096	0.050	0.018	-0.006
Other	0.149	0.289**	0.312***	0.317***	0.361***
Residency status (base = New Zealand citizen)					
Permanent resident	0.312**	0.305***	0.275***	0.287***	0.287***
Other	0.627*	0.564**	0.552**	0.754***	0.847***
Level of study (base = Certificate – levels 1-3)					
Certificate – level 4	0.749***	0.487**	0.221	0.264	0.298
Diplomas	0.492***	0.342***	0.259***	0.359***	0.369***
Bachelors	0.723***	0.507***	0.417***	0.453***	0.459***
Honours/postgrad cert/dip	0.870***	0.719***	0.622***	0.707***	0.681***
Masters	1.101***	0.921***	0.795***	0.802***	0.794***
Doctorate	2.093***	1.740***	1.358***	1.326***	1.304***

Table 4: Logistic regression results of the impact of student loan scheme borrower characteristics on the likelihood of their being declared overseas in the years after leaving tertiary study in 1997 by sub-sector (Dependent variable = ln(DO/(1- DO))) continued

	Logit coefficients				
Independent variable	1998	1999	2000	2001	2002
Sub-sector (base = university)					
ITPs	-0.131	-0.123	-0.127*	-0.027	-0.034
CoEs	0.096	0.173	0.216	0.287*	0.238
Wānanga	-0.857	-2.104**	-1.275**	-1.360**	-1.743**
Completion status (base = not completed)	0.003	0.006	0.106**	0.170***	0.151***
Field of study (base = Natural and physical sciences)					
Information technology	-0.283	-0.053	0.055	0.229	0.233
Engineering and related technologies	-0.536***	-0.400***	-0.327**	-0.239*	-0.224*
Architecture and building	0.106	0.121	0.079	0.098	0.042
Agriculture, environmental and related studies	-0.375*	-0.212	-0.231	-0.219	-0.495***
Health	-0.309*	0.071	0.124	0.126	-0.036
Education	-0.785***	-0.516***	-0.335**	-0.323**	-0.438***
Management and commerce	-0.055	0.041	0.090	0.130	0.057
Society and culture	-0.094	0.032	0.109	0.184**	0.012
Creative arts	-0.473***	-0.353***	-0.242**	-0.121	-0.164
Food and hospitality	-0.213	0.120	0.131	0.051	0.010
Mixed field	0.118	0.109	0.328**	0.517***	0.278*
Pseudo R^2	0.07	0.07	0.08	0.09	0.08
Log likelihood	-4,332	-5,923	-6,988	-7,304	-7,111
n	23,280	23,280	23,390	23,390	23,390

Notes:
1. *** significant at 1 percent level, ** significant at 5 percent level, * significant at 10 percent level.
2. Robust standard errors were used to calculate the level of significance of the independent variables.

Table 5: Logistic regression results of the impact of student loan scheme borrower characteristics on the likelihood of their having zero income five years after leaving tertiary study in 1997 by sub-sector (Dependent variable = ln(ZI/(1- ZI)))

	Logit coefficients		
Independent variable	All	Universities	ITPs
Constant	-1.521***	-1.420***	-1.453***
Student loan leaving balance (base = $0 – $7,999)			
$8,000 – $15,999	0.129***	0.132**	0.147**
$16,000 – $23,999	0.212***	0.237***	0.137
$24,000 – $31,999	0.310***	0.311***	0.318**
$32,000 – $39,999	0.250***	0.249***	0.316
$40,000 – $47,999	0.454***	0.411***	0.825***
$48,000 – $55,999	0.382**	0.349*	-0.555
$56,000 – $63,999	0.174	0.141	0.221
$64,000 – $71,999	1.043**	1.027**	-
$72,000 – $79,999	1.128*	1.110*	-
$80,000 – $87,999	0.323	0.285	-
$88,000 +	-	-	-
Age (base <20)			
20 – 24	0.306***	0.123	0.328***
25 – 29	0.158***	-0.018	0.209**
30 – 34	-0.063	-0.258	-0.028
35 – 39	-0.249***	-0.573***	-0.065
40 – 44	-0.361***	-0.516***	-0.231*
45 – 49	-0.509***	-0.719***	-0.390**
50 – 54	-0.134	-0.203	-0.424
55 – 59	-0.321	-1.212**	0.190
60 – 64	0.358	0.288	0.372
65 – 69	-0.411	-0.629	-0.179
Gender (base = female)	0.045	0.071*	0.006
Ethnic group (base = European)			
Māori	-0.191***	-0.303***	-0.054
Pasifika	0.013	-0.089	0.118
Asian	0.968***	0.863***	1.255***
Other	0.664***	0.523***	0.949***
Residency status (base = New Zealand citizen)			
Permanent resident	0.479***	0.483***	0.383***
Other	1.097***	1.028***	1.192***
Level of study (base = Certificate – levels 1-3)			
Certificate – level 4	0.255**	0.124	0.358***
Diplomas	0.193***	0.272**	0.171**
Bachelors	0.474***	0.537***	0.497***
Honours/postgrad cert/dip	0.612***	0.679***	-
Masters	0.769***	0.848***	-
Doctorate	1.328***	1.409***	-

Table 5: Logistic regression results of the impact of student loan scheme borrower characteristics on the likelihood of their having zero income five years after leaving tertiary study in 1997 by sub-sector (Dependent variable = ln(ZI/(1- ZI))) continued

	Logit coefficients		
Independent variable	All	Universities	ITPs
Sub-sector (base = university)			
ITPs	-0.047	-	-
CoEs	0.141	-	-
Wānanga	-0.295	-	-
Completion status (base = not completed)	0.031	0.037	0.043
Field of study (base = Natural and physical sciences)			
Information technology	-0.048	0.205	-0.381*
Engineering and related technologies	-0.116	-0.048	-0.354*
Architecture and building	-0.069	-0.042	-0.256
Agriculture, environmental and related studies	-0.415***	-0.390***	-0.617***
Health	-0.134	-0.097	-0.355*
Education	-0.469***	-0.498***	-0.647**
Management and commerce	0.033	0.066	-0.181
Society and culture	-0.058	-0.019	-0.268
Creative arts	-0.254***	-0.208*	-0.427**
Food and hospitality	-0.048	-0.047	-0.230
Mixed field	0.170*	0.219*	-0.076
Pseudo R^2	0.06	0.05	0.05
Log likelihood	-13,087	-7,035	-5,281
n	23,440	11,410	10,580

Notes:
1. *** significant at 1 percent level, ** significant at 5 percent level, * significant at 10 percent level.
2. Robust standard errors were used to calculate the level of significance of the independent variables.

Table 6: Logistic regression results of the impact of student loan scheme borrower characteristics on the likelihood of their having zero income in the years after leaving tertiary study in 1997 (Dependent variable = ln(ZI/(1- ZI)))

	Logit coefficients				
Independent variable	1998	1999	2000	2001	2002
Constant	-0.779***	-2.361***	-1.907***	-1.634***	-1.521***
Student loan leaving balance (base = $0 – $7,999)					
$8,000 - $15,999	-0.088**	0.225***	0.146***	0.115***	0.129***
$16,000 – $23,999	-0.118**	0.243***	0.175***	0.196***	0.212***
$24,000 – $31,999	-0.047	0.352***	0.290***	0.280***	0.310***
$32,000 – $39,999	0.002	0.174*	0.192**	0.191**	0.250***
$40,000 – $47,999	-0.058	0.102	0.160	0.410***	0.454***
$48,000 – $55,999	0.119	0.443**	0.291	0.376*	0.382**
$56,000 – $63,999	-0.049	0.436	0.582**	0.110	0.174
$64,000 – $71,999	-0.227	0.428	0.805*	0.666	1.043**
$72,000 – $79,999	1.074*	0.645	1.125**	0.805	1.128*
$80,000 – $87,999	-0.683	0.589	-1.059	-0.058	0.323
$88,000 +	-	-	-	-	-
Age (base <20)					
20 – 24	0.070	0.426***	0.371***	0.386***	0.306***
25 – 29	0.126**	0.416***	0.283***	0.254***	0.158***
30 – 34	-0.157**	0.162*	0.041	-0.006	-0.063
35 – 39	-0.231***	0.118	-0.109	-0.188**	-0.249***
40 – 44	-0.362***	0.058	-0.232**	-0.295***	-0.361***
45 – 49	-0.192*	0.245*	-0.102	-0.349***	-0.509***
50 – 54	-0.115	0.650***	0.253	0.075	-0.134
55 – 59	-0.344	-0.118	-0.247	-0.400	-0.321
60 – 64	-0.224	0.653	0.161	0.302	0.358
65 +	-0.244	0.514	0.066	-0.222	-0.411
Gender (base = female)	0.290***	0.055	0.048	0.029	0.045
Ethnic group (base = European)					
Māori	0.707***	-0.187***	-0.174***	-0.174***	-0.191***
Pasifika	0.774***	0.126	-0.043	-0.014	0.013
Asian	0.354***	0.858***	0.887***	0.942***	0.968***
Other	0.344***	0.464***	0.599***	0.710***	0.664***
Residency status (base = New Zealand citizen)					
Permanent resident	0.045	0.327***	0.373	0.447***	0.479***
Other	0.899***	1.309***	1.046	1.084***	1.097***
Level of study (base = Certificate – levels 1-3)					
Certificate – level 4	0.046	0.319**	0.403***	0.305**	0.255**
Diplomas	-0.172***	0.261***	0.273***	0.258***	0.193***
Bachelors	-0.023	0.519***	0.496***	0.458***	0.474***
Honours/postgrad cert/dip	-0.483***	0.439***	0.510***	0.521***	0.612***
Masters	-0.224**	0.631***	0.721***	0.763***	0.769***
Doctorate	0.118	1.356***	1.206***	1.257***	1.328***

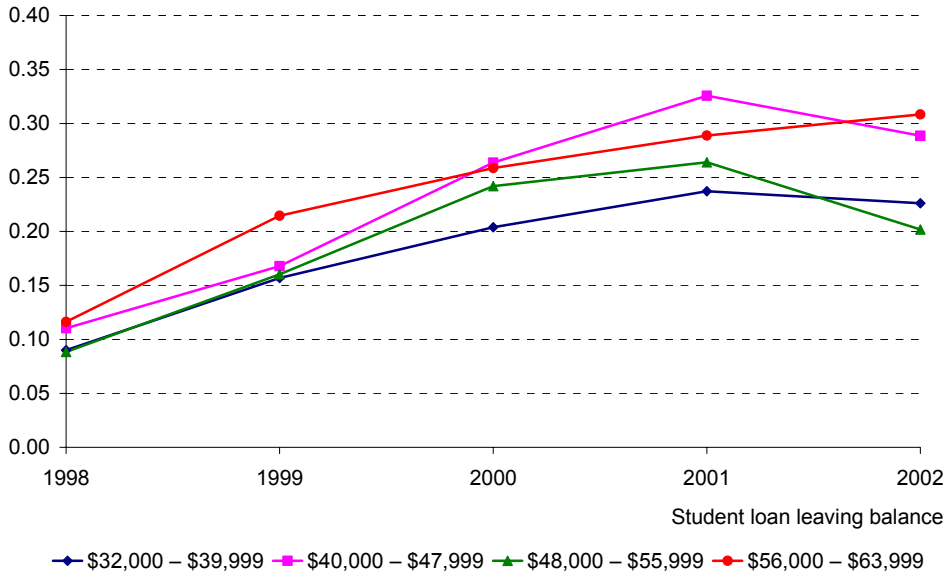
Table 6: Logistic regression results of the impact of student loan scheme borrower characteristics on the likelihood of their having zero income in the years after leaving tertiary study in 1997 (Dependent variable = ln(ZI/(1- ZI))) continued

	Logit coefficients				
	1998	1999	2000	2001	2002
Sub-sector (base = university)					
ITPs	0.056	-0.051	-0.103*	-0.104**	-0.047
CoEs	0.067	0.001	0.129	-0.015	0.141
Wānanga	0.638***	-0.419	-0.179	-0.143	-0.295
Completion status (base = not completed)	-0.637***	-0.207***	-0.092***	0.003	0.031
Field of study (base = Natural and physical sciences)					
Information technology	-0.224**	-0.256*	-0.175	-0.225**	-0.048
Engineering and related technologies	-0.490***	-0.346***	-0.359***	-0.269***	-0.116
Architecture and building	-0.267**	-0.011	-0.088	-0.088	-0.069
Agriculture, environmental and related studies	-0.099	-0.218*	-0.215**	-0.320***	-0.415***
Health	-0.556***	-0.532***	-0.120	-0.101	-0.134
Education	-0.394***	-0.879***	-0.685***	-0.522***	-0.469***
Management and commerce	-0.201***	-0.122	-0.044	-0.024	0.033
Society and culture	0.106	-0.058	-0.056	-0.069	-0.058
Creative arts	-0.165**	-0.340	-0.341***	-0.252***	-0.254***
Food and hospitality	-0.116	-0.132***	-0.033	-0.147	-0.048
Mixed field	-0.001	-0.077	0.064	0.094	0.170*
Pseudo R^2	0.06	0.06	0.06	0.06	0.06
Log likelihood	-13,304	-9,275	-11,271	-12,521	-13,087
n	23,440	23,440	23,440	23,440	23,440

Notes:
1. *** significant at 1 percent level, ** significant at 5 percent level, * significant at 10 percent level.
2. Robust standard errors were used to calculate the level of significance of the independent variables.

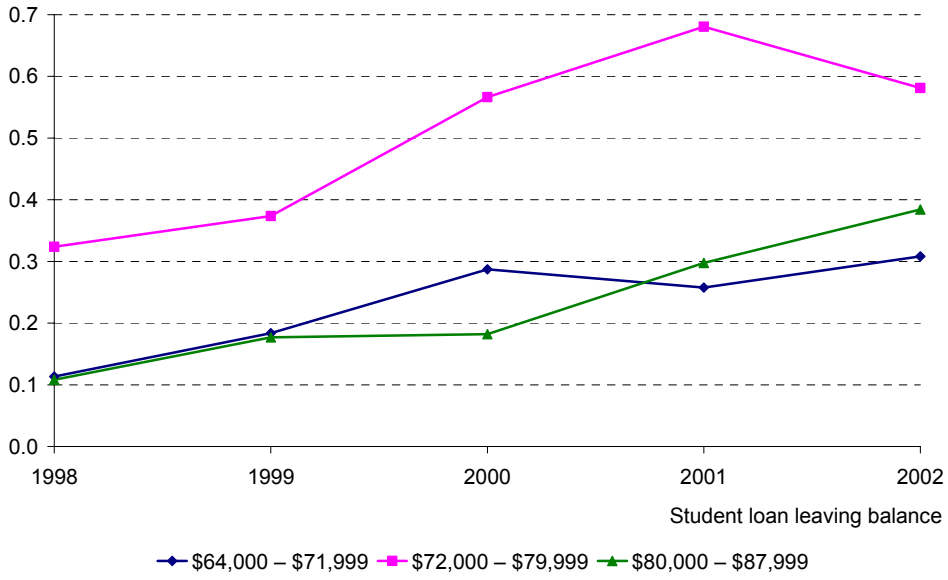
Appendix E

Figure 5: Predicted probabilities of student loan scheme borrowers who left tertiary study in 1997 being declared overseas by year and student loan leaving balance between $32,000 and $63,999



Note: The predicted probabilities were calculated using the modal categories for the dummy variables. The characteristics of the reference group are: age = 20 to 24, gender = male, ethnic group = European, residency = New Zealand citizen, field of study = society and culture, they successfully completed a qualification in their final year of study and they studied at the bachelors level at university.

Figure 6: Predicted probabilities of student loan scheme borrowers who left tertiary study in 1997 being declared overseas by year and student loan leaving balances over $64,000



Note: The predicted probabilities were calculated using the modal categories for the dummy variables. The characteristics of the reference group are: age = 20 to 24, gender = male, ethnic group = European, residency = New Zealand citizen, field of study = society and culture, they successfully completed a qualification in their final year of study and they studied at the bachelors level at university.

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