

# **The Microeconomic Determinants of Emigration and Return Migration of the Best and Brightest: Evidence from the Pacific<sup>#</sup>**

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## **Abstract**

A unique survey which tracks worldwide the best and brightest academic performers from three Pacific countries is used to assess the extent of emigration and return migration among the very highly skilled, and to analyze, at the microeconomic level, the determinants of these migration choices. Although we estimate that the income gains from migration are very large, not everyone migrates and many return. Within this group of highly skilled individuals the emigration decision is found to be most strongly associated with preference variables such as risk aversion and patience, and choice of subjects in secondary school, and not strongly linked to either liquidity constraints or to the gain in income to be had from migrating. Likewise, the decision to return is strongly linked to family and lifestyle reasons, rather than to the income opportunities in different countries. Overall the data suggest a relatively limited role for income maximization in distinguishing migration propensities among the very highly skilled, and a need to pay more attention to other components of the utility maximization decision.

*Keywords:* Brain Drain; Brain Gain; Highly Skilled Migration; Return Migration; Selectivity.

*JEL codes:* O15, F22, J61.

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<sup>#</sup> We thank the World Bank's Research Support Budget and the Center for Global Development for research funding for this project; the New Zealand Ministry of Education, New Zealand Mathematical and Chemistry Olympiad Committees for help in assembling the New Zealand sample frames; 'Alisi Katoanga for excellent fieldwork for the Tongan sample frame; Geua Boe-Gibson and Tanorama for PNG; Cristina Tealdi and Chris Hector for research assistance; and Gordon Hanson, two anonymous referees, Moses Shayo, seminar participants at the Paris School of Economics and at the Globalization and the Brain Drain conference for useful comments. All views are of course those of the authors alone, and do not necessarily represent those of their employers, or the collaborating organizations.

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## 1. Introduction

Brain drain has long been one of the most common concerns developing countries have about migration. This concern has been amplified in recent years by the rapid increase in skilled emigration, driven in large part by developed countries shifting to more skill-intensive immigration systems. There is a long, mostly theoretical, literature on the *consequences* of brain drain for developing countries, with recent literature also pointing to the possibility of “brain gain” from highly skilled emigration through impacts such as an increase in the incentives to acquire human capital, remittances sent home, and return migration. There is much less research on the *determinants* of the brain drain. Portes (1976) asked the central research question which has so far not been addressed. He wrote (p. 490) “given the...attractions of emigration, the real question is often not why some professionals migrate but why so few in fact leave”.

Several recent papers look at the macroeconomic determinants of why the level of brain drain varies across countries (Docquier, Lohest and Marfouk, 2007; Belot and Hatton, 2008; Beine, Docquier and Schiff, 2008). They find country size to be an important determinant, with much higher emigration levels from small states. Such analysis provides a first step towards understanding why some countries have higher brain drain levels than others, but does not allow us to answer the key question posed by Portes, which is at the individual level, why do some highly skilled individuals within a country leave, while others stay. Moreover, amongst those who go, why do some return?

Answering this question requires data on highly skilled individuals who stay and on the emigrants. Existing surveys consist of one group but not others, preventing this comparison being made. This paper presents evidence from new surveys designed by the authors to study the individual level microeconomic determinants of the brain drain, and the determinants of return migration among the highly skilled. We focus our study on three small states with varying levels of development, population size, and brain drain. The three countries are: Tonga, population 112,000, for which Docquier and Marfouk (2005) estimate 75 percent of those with tertiary education live abroad; Papua New Guinea (PNG), population 6.3 million, with an estimated 29 percent brain drain rate; and New Zealand, population 4.1 million, which along with Ireland, has the highest rate of skilled emigration in the OECD, at 24.2% (OECD, 2005).

In each country we have collected the names of individuals who were the highest achieving students in their country at the end of high school, for students graduating high school between 1976 and 2004. Depending on the country, these are either the top students in nationwide competitive examinations, or the students placed top in their class at the most academically prestigious schools in the country. We then tracked down these former top students, wherever in the world they currently live, and surveyed them. The surveys ask detailed questions on incomes and occupations available at home and abroad, risk aversion, discount rates, parental background, and other socioeconomic factors that are likely to predict migration and return. The surveys also collect more qualitative evidence on a range of different social and cultural push and pull factors.

Using these data we measure the emigration rates and return migration rates of the most academically talented individuals in each country, and examine which characteristics predict emigration and return. We find the incidence of ever migrating is very high, with 83 percent of Tongan top students, 67 percent of New Zealand top students and 37 percent of PNG top students having ever worked or studied abroad. The incidence of return migration is also high, with between one-quarter and one-third of top students in each country being return migrants.

We find that most of the highly skilled say that salaries would be higher for them overseas. However, among these individuals, the decision to migrate is found to be most strongly associated with preference variables, such as risk aversion and patience, and with subjects studied in secondary school, and not strongly linked with economic variables such as liquidity constraints, the extent of the gain in income to be had from migration, or macroeconomic factors. Likewise we find the decision to return amongst ever migrants is most strongly associated with preferences, with family and lifestyle reasons being stronger predictors of return than the extent of the income gains from migrating. We also find educational bonding to be an important reason for return of Papua New Guineans, with little subsequent re-migration after the two-year required period is completed. Overall the data support a limited role for income maximization in determining the migration decisions of the highly skilled, and a need to consider the other elements of the utility maximization problem.

We acknowledge upfront several caveats in making broad conclusions from this analysis. The first is that our focus is on individuals who were at the very top of their high school classes in three small countries in the Pacific. Brain drain is particularly a concern in small island nations, and it appears likely our findings would generalize to other small countries, but different motivations may be driving high-skilled migration from larger countries with wider local career options. Academic high-achievers are not the only group of interest for brain drain discussions, but we believe they are certainly an important group which has the virtue of being well-defined, of interest to policymakers, and where membership in the group is itself not the result of migration. Third, despite our best efforts we are not able to track all top students. The evidence we have suggests little bias in terms of observable variables for who we can track, except for more difficulty tracking older individuals. Nevertheless, we believe any bias will be towards tracking individuals who have been more successful among the population under study, which for study of highly-skilled migration seems to be capturing the key individuals of interest. Finally, we note that just because we do not find certain variables such as the income gains to help in predicting migration among this elite group does not mean that income gains do not matter for migration – the fact that the best and brightest average US\$1000 a week gain from migrating may well help explain higher migration rates among this group than among less skilled individuals, even if differences in income gains to be had among top students do not help predict why one top student migrates and another does not.

The remainder of the paper is structured as follows. Section 2 describes the construction of the sample frame and the survey implementation. Section 3 analyzes the incidence of emigration and return migration among the top students. Section 4 models the determinants of ever migrating and return migration. Section 5 concludes.

## **2. Putting Together a Sample Frame and the Survey**

To examine the determinants of highly-skilled emigration, we need comprehensive data on both the highly skilled who migrate and those who return. Standard surveys do not provide this information. Many studies of migration use nationally representative surveys in the migrant origin country. Typically households are then asked to report on absent migrant members. Such surveys suffer two drawbacks for

studying the migration of the highly skilled. First, they miss individuals who migrate with their entire households, which may be more likely for the highly skilled than the less skilled.<sup>1</sup> Secondly, nationally representative surveys will contain few, if any, of the most highly skilled individuals from a country. Specialized surveys of immigrants in the destination country can help solve the first issue, but again will contain very few highly skilled migrants and lack comparable data on non-migrants. Census microdata from both source and destinations may contain sufficient numbers of the highly skilled, but do not have enough detailed information on these individuals to examine the determinants of migration. Given these problems, we developed a new specialized survey approach.

We apply this new approach in the Pacific, which is the region with the highest brain drain rate in the world (Docquier and Marfouk, 2005). By focusing on one region, with similar migrant destinations, we can take advantage of economies of scale in surveying emigrants, and compare neighboring countries with differing emigration options. Within the Pacific we selected countries which provide a broad range of development levels and migration experiences, and where we had the necessary contacts to make the surveying feasible. The countries chosen, along with their population, and 2000 brain drain rates for those who entered their destination country after age 18 are<sup>2</sup>:

- **Tonga:** 112,000 population, 65.1% brain drain
- **Papua New Guinea:** 6.3 million population, 36.9% brain drain
- **New Zealand:** 4.1 million population, 15.8% brain drain

A concern with existing efforts to quantify the brain drain at a more micro-level through studies of doctors or professors is the extent to which individuals self-select into occupations based on the ease of emigration in that occupation. Rather than focus on specific occupations, we therefore choose to focus on individuals with high ability. Specifically, our sample frame is individuals who were the very top academic performers in their country at the end of secondary school, which allows us to identify individuals before they have self-selected into particular careers or migrated overseas for tertiary education. We decided to focus on students graduating high school between 1976 and

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<sup>1</sup> See for example McKenzie and Rapoport (2009), who find that more-educated Mexican immigrants in the U.S. are more likely to have their spouse accompany them than less-educated Mexican immigrants.

<sup>2</sup> Brain drain rates are from the new estimates controlling for age of entry, from Beine, Docquier and Rapoport (2007).

2004. Records are likely to be better for more recent students, but they are younger and have had less time to study or work abroad. A detailed online appendix discusses the sample frame construction, tracking approach, response rates and possible impacts of non-response in each country, with a brief overview below.

Our New Zealand (NZ) sample frame comprised one older group and three (partially overlapping) younger groups; members of New Zealand's Mathematical Olympiad team since 1988 ( $n=73$ ); members of New Zealand's Chemistry Olympiad team since 1992 ( $n=48$ ); and students who were either top overall, top in each subject or top of their sub-population (by gender and ethnicity) in University Bursary examinations from 1991-2004 ( $n=484$ ). For the older group, graduating 1976-91, we sought the top student (the Dux, which is similar to the Valedictorian in the United States) each year back to 1976 from a set of 16 top high schools that had had supplied many of the individuals in the first three groups ( $n=271$ ). In total the NZ sample frame had 851 highly skilled individuals who graduated secondary school in New Zealand from 1976-2004.

For Tonga our sample frame is the Dux and Proxime Accessit (runner up) from the top three high schools on the main island of Tongatapu (with two-thirds of the population) and two top schools from other islands. Two are mission schools belonging to the Free Wesleyan Church, while the other three schools are Government-run. For all but one school, which only opened in 1985, we cover 1976-2004. This gave a target sample of 266 individuals and school records provided the names of 245 of them.

For PNG we obtained the names of the 264 students (0.7 percent of all candidates) who had achieved a 4.0 GPA in their Grade 12 national examinations during 1995-98 and 2000-2004. We also included any Duxes or Proxime Accesits from the top two-thirds of schools supplying the 4.0 GPA group, giving a potential sampling frame of 624 if the two groups were mutually exclusive and 376 if all of the 4.0 GPA students were also a Dux or Proxime Accesit. For 1976-1994 our sample frame consists of the Duxes and Proxime Accesits from the four National High Schools that were the only Grade 11 and Grade 12 schools during that period. This gives a potential sample frame of 152 individuals over this period. However, due to a lack of school records, we were only able to identify the names of 93 of these individuals.

The tracking rates and survey response rates varied across the various groups (Table 1). Tracking and response rates were remarkably high for the New Zealand Mathematics and Chemistry Olympians and the Tongan top students; current location was tracked for 100% of the Tongans and 97% of the Olympians. Overall survey rates for these three groups ranged from 79% to 90%. Tracking rates were above 50% for the top Bursary scholars from NZ and the 1976-94 National High School Duxes from PNG but were only about 40% for the earlier NZ Duxes and the more recent top students from PNG. Hence overall survey rates were lower for these groups despite high response rates from those whose current location was tracked. Analyses of possible biases due to survey non-response suggest that the migration rates reported below for the sample are likely to be unbiased estimates for the population of top students.<sup>3</sup>

### **3. The Incidence of Emigration and Return Migration.**

We define migration as ever having worked or studied abroad after finishing secondary school. We do not place a restriction on the minimum amount of time this must have occurred for, but it is very rare for the time abroad to be less than one year for these populations. Some readers may question whether individuals who go abroad to study should be counted as migrants. We believe that they should for two reasons. First, migration for study and for work are strongly interrelated. Some individuals work while they study, while it has been found in other contexts that studying abroad has a large causal positive effect on the chances of later working abroad (Parey and Waldinger, 2008). Second, this classification fits with both the definitions of migrant being used in the macro literature on brain drain, and with the standard statistical definition of a migrant as someone who was born in one country and lives in another used by almost all international data agencies, such as the U.N. Population Division. Nonetheless, we will also look separately at work and study abroad, and show that the determinants of ever working abroad are similar to the determinants of ever migrating.

A second issue to note here is that some individuals going abroad do so through bonds which require them to return home at the completion of a set period. The most

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<sup>3</sup> Details are available in the on-line appendix.

common example is AusAid scholarships which typically fund Masters study in Australia, after which the individual is required to return to their home country for two years. These are used more by PNG top students than Tongans, in part because Tongans have more alternatives available such as study in New Zealand or in Fiji. The Government of PNG also operates several work abroad schemes where Government employees work abroad for a fixed period to gain experience, but then are again required to return home. The presence of this bonded migration leads to more return than would otherwise be the case. However, this is mostly an issue for PNG, and we note later in the paper that our return migration regressions are robust to omitting bonded individuals.

Table 2 provides the incidence of ever migrating, currently being an emigrant, and being a return migrant among our different populations and samples. In a handful of cases individuals answering the survey answered that they were currently living in the source country, but did not answer the question on whether they had ever studied or worked abroad. We therefore give bounds for the incidences of current migration and return migration in the sample in these cases, and also estimate bounds to account for individuals not surveyed (see the online appendix for details).

The incidence of ever migrating is very high. In the sample, 83 percent of Tongan top students, 67 percent of NZ top students, and 37 percent of PNG top students had ever worked or studied abroad. The incidence of current migration is also high for the Tongan and NZ samples, but much lower in PNG. 51 percent of Tongans, 41 percent of New Zealanders, and 9 percent of Papua New Guineans are current migrants. Between one-quarter and one-third of the sample in each country are return migrants: 33 percent in Tonga, 27 percent in PNG, and 26 percent in New Zealand.

Where are these migrants going to? The main three destinations for current NZ migrants are the United Kingdom (30%), the United States (28%) and Australia (20%). The main four destinations for Tongan top students are New Zealand (31%), the United States (23%), Fiji (18%) and Australia (17%).<sup>4</sup> There are fewer current migrants from PNG, with 50% of them in Australia, 18% in New Zealand, and the rest scattered widely.

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<sup>4</sup> While 75% of the migrants in Fiji are studying, 33% are working in jobs such as university lecturer, medical professional, IT professional, and in international organizations. The current students in Fiji should therefore not be automatically assumed to return to Tonga. They may also migrate from Fiji to Australia or New Zealand after their tertiary training.



The main occupations of the migrants from New Zealand are academics and researchers (35%), business (21%), information technology (12%) and medicine (6%). For those migrating from Tonga the main occupations are medical doctors and nurses (19%), school teachers (10%), and bankers and accountants (10%), and the handful of top students from PNG that are working overseas are in similar occupations: IT, accounting, law, academia, engineering, and nursing. Thus it appears that the top students are not just academics, and that they engage in a wide range of occupations which incorporate many of the skilled occupations that one might think have positive externalities for development. Thus the migration and return migration of these individuals should be of importance for considerations of skilled emigration and return migration.

### **3.1 Migration and Return Migration by Age**

Our survey asked individuals for retrospective life histories of migration movements, and also the time and place of tertiary education. We use this to calculate for each individual their migration status at each age from age 18 up to their current age. We pool these data, assuming there are no substantial cohort or time effects. Figures 1-3 then plot, for each country, the proportion of all individuals in the sample who had ever migrated, who were a current migrant, and who were a return migrant at a given age. We plot confidence bands around the ever migration and return migration lines, calculated as plus and minus 1.96 standard deviations of the mean. These confidence intervals get wider with age, reflecting that we have far fewer observations on individuals who have ever been 40 years old than we do for individuals who have ever been 20 years old.

Figure 1 shows the rate of migration is fairly low over the ages 18-21 for New Zealanders, when the majority of top students undertake undergraduate education in New Zealand. The rate of migration then rises rapidly over the age range 21-28, with less than 10 percent having migrated before age 21, and 61 percent having migrated by age 28. There is then a very slow rate of new migration beyond age 28. Age 28 is also the peak age for individuals to be current migrants, with 50 percent of the sample overseas at this age. There is a slow, almost linear, pattern of return migration with age, and by age 40, the sample is almost divided equally into three groups of current migrants, return migrants, and never migrated.

The age pattern is quite different for Tongans in Figure 2. Many of the top students migrate immediately after graduating secondary school, and by age 21, 54 percent have ever migrated. This reflects the relative lack of tertiary education opportunities in Tonga, with many migrating to receive undergraduate education abroad. As with the New Zealand sample, there is very little new migration after age 30. However, the proportion who are current migrants and who are return migrants also levels off around age 30, and the proportion who are current migrants dominates those who are return migrants.

We only show the age patterns for PNG up to age 31, reflecting the larger sample graduating secondary school over 1995-2004. The incidence of migration is much lower than in the other two cases. There is very little migration before age 21, consistent with most Papua New Guinean top students carrying out their undergraduate education at one of PNG's universities. There is then gradual emigration from age 22 to 30, with return migration at approximately the same rate. Much of this is from students going to Australia for Masters degrees on scholarships which bond them to return home, and workers such as pilots getting sent abroad by their employer for work experience, with again a bond to return home. Nevertheless, not all migration is of this type, and by age 31 there are 21 percent of the top students currently abroad.

We also tested whether the age pattern of migration varies by cohort, for five cohorts defined by current age: 18-24, 25-29, 30-34, 35-39, and aged 40 and above. Once we include controls for the reason the individual entered the sample (maths Olympian, chemistry Olympian, pre-1992 Dux) there are no significant differences amongst the NZ cohorts. Among Tongans, the cohort currently aged 35 to 39 has a higher migration rate than both the earlier and the later cohort. For the sample from PNG the older group has higher migration rates but the sample size for the younger cohort is quite small. So overall there is no clear evidence of a shift in migration propensities across cohorts.

#### **4. Modeling the Determinants of Migration and Return Migration.**

Migration in our context includes both migration for work abroad, and migrating to undertake tertiary education abroad. The two are often interrelated – migrants may obtain overseas qualifications as a pathway to working abroad, may work abroad for

several years after completing their undergraduate education before returning to undertake graduate study, or may work and study at the same time. Table 3 considers the extent to which current and return migrants have worked and studied abroad. Individuals are classified as having worked abroad if they are current migrants and are working, if they are return migrants and say they worked while abroad, or if they list work as the reason for migration. However, there is significant item non-response on some of these questions. We therefore show bounds for the percentage working abroad, and who have both worked and studied abroad.

Table 3 shows that approximately half of the migrants from each country have both worked and studied abroad. Working abroad is near universal for the New Zealand sample, with 50 percent having studied abroad. Studying abroad is universal for the Tongan sample of migrants, with between 36 and 76 percent having worked abroad. The PNG sample has relatively high levels of both studying abroad (88 percent), and working abroad (46 to 66 percent).

#### 4.1 Modeling the Decision to Migrate

Standard models of migration (Sjaastad, 1962; Borjas, 1987) view migration as an investment decision, in which potential migrants weigh up the gain in wages from migrating with the costs of doing so. The emphasis in these models is on income maximization as the reason for migration, despite the underlying theory being based on utility maximization. One reason for this is that they are interested in differences in migration propensities *across* skill levels. In contrast, our focus is on the difference in migration propensities *within* a quite narrow skill level. In our context then, the other components of utility maximization may matter more. For example, following Grogger and Hanson (2008), consider a linear utility model<sup>5</sup> where the utility associated with working in location  $h$  for person  $i$  of skill level  $j$  is:

$$U_{i,h}^j = \alpha(w_{i,h}^j - C_{i,h}^j) + \varepsilon_{i,h}^j \quad (2)$$

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<sup>5</sup> There is some debate in the literature as to whether maximization of levels or logs of incomes better describes the data. See e.g. Belot and Hatton (2008), Grogger and Hanson (2008), among others. We will consider both linear and log wages.

Where  $w_{i,h}^j$  is the wage earned from working in location  $h$ , and  $C_{i,h}^j$  is the cost associated with migrating to location  $h$ , which is zero for the home country. Assuming that the error term  $\varepsilon$  follows an extreme value distribution, the log odds of migrating from the home country  $h$  to the destination country  $d$  are:

$$\alpha(w_{i,d}^j - w_{i,h}^j) - \alpha C_{i,d}^j \quad (3)$$

We view the cost term as also implicitly including the psychic as well as financial costs of migrating, and the cost to utility of the risk and uncertainty associated with how much can be earned abroad. Since we do not directly measure the cost, we follow previous literature in assuming that the financial aspect of it is constant within a narrow skill class (Grogger and Hanson, 2008). We will attempt to measure proxies for some of the non-financial determinants of this cost term, as well as considering the income gain.

Typical studies of migration selectivity assign  $j$  to different skill groups in terms of education outcomes. However, in our case the education decision is intertwined with the migration decision, and ultimate education levels are themselves a function of migration. Some form of tertiary education is almost universal for these top scholars in all three countries. Table 4 shows the educational attainments of our sample. Classifying medical and law degrees as graduate degrees<sup>6</sup>, we see that two-thirds of the New Zealanders, half of the Tongans, and one-third of the Papua New Guineans have undertaken graduate education.

Table 5 then carries out what would be the typical test of educational selectivity, comparing the migration rates of top students with different levels of education. We see that students with PhDs, and the group of those with any graduate degree have higher migration rates than those without these qualifications in each country. This would suggest positive educational self-selection, and in a framework like (2), would be typically explained by higher returns to education abroad than at home. However, the last column of Table 5 shows that 52 percent of New Zealanders with graduate degrees studied abroad, as did 66 percent of Papua New Guineans and 100 percent of Tongans with graduate degrees. Those with PhDs are even more likely to have obtained them

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<sup>6</sup> Medical and law degrees are undergraduate degrees in New Zealand, but last for longer than standard undergraduate degrees. Students in these fields often also undertake further specialization studies. Since these are taught as graduate programs in some countries, we classify anyone with a medical degree or law degree as having graduate education.

abroad. As such, the standard analysis of returns to skill and educational selectivity is misleading, since education is itself a result of migration, rather than a determinant.

#### **4.2. What are the income gains from migrating?**

We begin our analysis of the determinants of migration by estimating the gain in income from migrating, effectively capturing the first term in equation (3). We consider two approaches to measuring this gain. First, we regress the income earned by worker  $i$  on indicators for his or her migration status, and a vector of individual characteristics:

$$INCOME_i = \pi + \beta CURRENTMIGRANT_i + \delta RETURNMIGRANT_i + \lambda' X_i + v_i \quad (4)$$

We first condition on age and sex, and then on education, which it is debatable whether it should be controlled for since education attained through migration is one channel through which migration can increase incomes. A concern with a regression of this form is that if individuals who stand to gain more income from migrating self-select into migration, the estimate of  $\beta$  will be biased upwards. This may be less concerning in our application given that the entire sample consists of very high ability individuals.

Our second approach to measure the income gain from migrating is by asking migrants what job they would do if working in their home country and the expected earnings, and return migrants the job and expected earnings if working abroad. Both groups were assumed to have reasonable knowledge of employment prospects in the other country, and almost all answered this question. We did not ask similar questions of non-migrants. The income gain from migration is then the self-assessed difference in incomes. For comparison purposes, we also re-estimate equation (4) just for the current and return migrants. These self-assessments will not suffer from the same bias as the regression. However, they may be biased upwards if people self-validate by asserting they would earn less in the other location than they would in the current location, or be biased downwards if both current migrants and return migrants believe the “grass is greener” in the other location. In practice the magnitudes of the counterfactual incomes people report seem to a first order accurate for both groups, so such self-reporting biases do not appear large.

Both approaches requiring converting incomes earned in different currencies into a common unit of analysis. Our preferred method is to convert all income figures into

March 2008 United States Dollars at the Interbank Exchange Rate. We also convert into PPP U.S. Dollars using Purchasing Power Parity rates from the Penn World Tables but we believe these understate costs of living in the Pacific.<sup>7</sup> As well as measurement issues, PPP may not be the right benchmark if migrants plan on returning with earnings saved from abroad, or if they are remitting: then the actual exchange rate is what matters for determining the purchasing power of income earned abroad in the home country (Ku, 2008). As such, we believe use of PPP makes incomes in PNG and Tonga appear more attractive than they are in reality.

Table 6 presents these estimates for the gain in weekly income from migration, for the sample that are currently working and who are currently not students. The top two rows compare current migrants to both never-migrants and return migrants, suppressing the coefficients on return migrants for presentational clarity.<sup>8</sup> These coefficients are thus the gain in income from emigrating. The second two rows compare current migrants to return migrants, thereby giving the gain from not-returning. In practice we see the gain from migrating and the gain from not-returning are similar in magnitude.

For the New Zealand top students, the mean gain in income from migration according to the regression is between 800 and 1000 U.S. dollars per week. The mean self-assessed change is of similar magnitude (815-899 per week). The mean income of those working in New Zealand is \$US1250 per week, so this represents a 64 to 80 percent increase in mean income from migrating. The mean change in log income is also similar for the regression and self-assessed methods, at 0.44 and 0.56. There is thus a large gain in average income to be had in both PPP and exchange rate terms from migration.

For the Tongan sample the PPP estimates of the gains are a little lower than those using the actual exchange rate, but as noted, we believe the PPP estimates understate the

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<sup>7</sup> PNG and Tonga were not part of the International Comparison Program (ICP), and so their PPP rates come solely from a regression on GNI per capita and the secondary school enrolment rate. The only Pacific country covered by the ICP is Fiji, which is a large outlier when such a regression is used with more expensive prices than predicted (ICP, 2008); probably because no account is taken of small country size, rugged terrain, and remoteness increasing prices. Indeed, our own comparison of prices in Tonga to those in New Zealand suggests that the correct PPP exchange rate is approximately the prevailing exchange rate between these two countries, not the imputed rate. Likewise personal experience suggests the cost of living in PNG is much higher than implied by the PPP rate, especially for the basket of goods consumed by high-skilled individuals

<sup>8</sup> After controlling for education these coefficients in USD terms are -102 for New Zealand, +176 for PNG, and -498 for Tonga, all insignificantly different from zero.

effective gain. Using the exchange rate, the gain in income according to the regression estimates is between 700 and 1200 U.S. dollars per week, compared to a mean income in Tonga of only US\$246 per week. The self-assessed change is US\$728 per week, which is not significantly different from the regression estimates. In logs, the gain in income is 1.2 to 2.0 log points. Thus by any measure the average gain in income is huge.

In the PNG sample, using PPP we see no significant change in income from migrating, whereas using the actual exchange rate the gain in income is again in the order of US\$740-1100 per week, comparable to the gain for both New Zealand and Tongan top students. As discussed above, we believe the estimates using the exchange rate are more accurate. Note however that the PNG estimates are based on 149 individuals working in PNG and only 11 current migrants working abroad, so that this small sample size of migrants should make one very cautious in these estimates. Nonetheless, again they suggest that there is a large average gain in income from migrating.

Moreover, the fact that we get similar (and large) estimates of the income gain from migration both with and without controlling for education, and from both the regression and self-assessed methods suggests that selectivity biases are unlikely to be having a first-order effect on the estimates.

Of course in addition to estimating the average gain in income from migrating, it would be of interest to examine the returns to different qualifications at home and abroad. However, small sample sizes limit the extent to which we can do this – not to mention the fact that migration is linked to the attainment of many qualifications. For the New Zealand sample, which has the largest sample size, the difference in incomes is greatest for those without graduate education, and least for those with PhDs, suggesting the incentive to migrate (or at least remain abroad after getting education) for income gains should be largest for those with the least education among these top students. The current migrants with only undergraduate education are typically in management consulting, IT, and hedge funds, which are all very lucrative occupations abroad.

The top of Table 7 presents the results of quantile regressions of equation (4) to examine the heterogeneity in income gains from migrating. The bottom of the table presents quantiles of the self-assessed change in income, which we only have for current and return migrants. The quantile regression estimates show the income gains are still

sizeable at the 25<sup>th</sup> percentile, and are very large for the 75<sup>th</sup> percentile and above.<sup>9</sup> Both methods suggest income gains for the top 10 percent in the order of 1500 to 2000 USD per week, or 75,000-100,000 USD per year!

A second important point to note from Table 7 is that most individuals stand to gain income from migrating, but there is substantial heterogeneity in the amount to be gained. This is important, since it provides variation in income gains that we can use in analyzing the determinants of migration and return in the next section. For New Zealand top students, 82 percent of current migrants and 87 percent of return migrants believe their income would be higher abroad ( $p=0.47$ ); for Tongan top students, 74 percent of current migrants and 90 percent of return migrants believe their income would be higher abroad ( $p=0.23$ ); and for PNG top students, 79 percent of return migrants and 82 percent of current migrants believe their income would be higher abroad ( $p=0.81$ ). Thus it appears that there is not only a large average gain in income from migrating, but that gains occur for the vast majority of migrants.

#### **4.3. What explains who migrates and who doesn't?**

In light of these large gains in income to be had by migration, what explains who migrates and who chooses not to take advantage of these large gains? In particular, we would like to identify characteristics which were plausibly predetermined at the time of finishing secondary school and which are predictive of whether an individual will later emigrate. We control for age and sex, since older individuals have had more time over which to emigrate, and we are interested to see whether the rate of emigration varies by sex. Taking the utility maximization framework in equation (2), we then seek variables which are associated with either the income gains of emigrating, or the costs of emigrating.

We first consider subjects studied in secondary school. These are predetermined at the end of secondary school, but not necessarily exogenous since students who want to move overseas may choose the secondary school subjects which maximize their chance of going abroad. Nevertheless, selection of secondary school subjects is at least at an

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<sup>9</sup> The small number of current migrants working in the PNG sample makes the quantile regression estimates jump around a lot for PNG.



earlier stage than choosing a major at the tertiary level where we might expect the likelihood of migration to induce a greater influence. We asked students which subjects they studied in their ultimate year of school, and create two dummy variables. The first is for having studied a foreign language other than English. Studying French, German, Chinese, Japanese or other languages will reduce the costs of working in another country, and also add a non-monetary utility gain from migrating – the opportunity to practice and extend these language skills should be a strong incentive for migration. The second dummy variable is for having taken all three of the science subjects: biology, chemistry and physics. Top students with a predilection for sciences may be more inclined to study overseas where scientific laboratories are better equipped, or to pursue careers in engineering or computer science which are internationally mobile.<sup>10</sup>

The second set of variables we consider are family wealth. We expect family wealth to affect the migration decision in several ways. Wealthier families can better afford the costs of paying for emigration, arranging work permits, and/or paying for education abroad. This should lead to a positive association between wealth and migration. However, family wealth may also increase the income opportunities available domestically, either directly through employment in a family enterprise, or through family social networks helping to arrange better paying jobs. We would expect both channels to be stronger for Tonga and PNG than for New Zealanders.

We proxy for family wealth in two ways. The first is to ask students if their family had above average wealth, average wealth, or below average wealth while they were in secondary school. Approximately one-third of top students from PNG and Tonga rate their families as below average wealth. These self-reports of relative wealth status line up well with father's occupation – those reporting above average wealth have a father who was a politician, doctor, lecturer or manager, while many of those reporting below average wealth have a father who was a subsistence farmer or fisherman. It is thus not the case that only the children of the rich are top students. The second measure of wealth is to ask students how many overseas trips they made while in secondary school. The latter measure is less subject to concerns about reporting of wealth levels, but may

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<sup>10</sup> Many students take mathematics in their senior secondary school year, so this distinguishes science and computer-science oriented students less from other students than does taking three science subjects.

also influence the likelihood of migration through exposure to overseas lifestyles or through presence of family members abroad, rather than just reflecting a wealth effect.

We also consider parental education as a driver of migration. Parental education is traditionally strongly associated with educational outcomes, and for this reason may be linked to migration for education. However, it is less clear that, conditional on being a top student in secondary school, parental education should have as strong an influence on tertiary education choices as it would in a random sample of the population. Parental education is also likely to be correlated with wealth, and influence the costs and benefits of migration through this channel.

The costs of migration are also likely to be lower for individuals who were immigrants to the country they attended secondary school in. These individuals may have an easier time gaining admission to an overseas country, and will likely experience lower assimilation costs. This is particularly relevant for the New Zealand sample, where 31 percent of top students were born outside New Zealand. It is less relevant for Tonga, where 7.8 percent of top students were born outside Tonga, and PNG, where only 2 percent were born outside PNG.

Adding uncertainty and multiple periods to the utility maximization problem will make the decision to emigrate also depend on risk preferences and the rate of time preference. We measure risk preferences with a question taken from the German Socio-Economic Panel, which asks individuals to state on a 11-point scale whether they are generally a person who is fully prepared to take risks or someone who tries to avoid taking risks. This has been used in the study of migration by Jaeger et al. (2009), and like them we are forced to assume that attitudes towards risks are intrinsic characteristics of individuals which are not affected by their migration decision.

We measure patience by a dummy variable which takes the value one if an individual would accept \$1100 in one year's time compared to \$1000 today. Since migration for both work and education can be construed as an investment with short-term costs required to be paid to achieve longer term gains, we might expect more patient individuals to be more likely to migrate. Again this is measured ex post, but we do not see either the proportion who are patient, or the mean risk score, changing with age over the 20s, when migration rates are increasing dramatically.

Finally, we consider macroeconomic variables which might explain why an individual graduating at one point in time migrates, whereas another graduating later does not. We first consider the real effective exchange rate over the age range where the incidence of new migration is highest.<sup>11</sup> We take age range 22 to 25 for Tonga and New Zealand, and age range 25 to 28 for PNG. A high real effective exchange rate means that foreign earnings have less purchasing power in the home country, which we would expect to lead to less migration. For example, migration for work should be more attractive to New Zealanders who were at the key age for deciding on an initial migration in 2001 when the real exchange rate index was 98 (and when \$1US = \$2.46NZ) than in 2007 when it was 137 (and \$1US = \$1.30NZ). The second macro variable we include is the difference in GDP growth per capita in the home country relative to the average GDP per capita growth in the main destination countries during this same age range. We should expect a negative relationship of this variable with migration – the better is growth at home relative to abroad the less likely migration should be.

#### **4.4 Results on the Determinants of Ever Migrating**

Table 8 presents the results of estimating a probit model for the determinants of ever migrating as a function of these variables. We first estimate the determinants separately by country, and then pool the three countries together since the signs generally go in the same directions and the sample sizes are relatively small in the single country analysis.<sup>12</sup> First of all, unsurprisingly, the likelihood of ever having migrated increases with age. However, there is no difference in migration rates of male and female top students. Also somewhat surprisingly, there is no difference in the migration rates of top students who were born abroad from those who are born in the home country. Since this group is largely immigrants to New Zealand, this might reflect that parents have moved to New Zealand so that their children can undertake education there, with this effect offsetting the lower costs of migration for immigrants.

The strongest predictors of ever migrating are from variables that might be broadly interpreted as measuring preferences. Risk preferences and patience are

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<sup>11</sup> Source World Bank Central Database.

<sup>12</sup> Note that in particular the sample size becomes small for Tongan top students, due to significant item non-response on the online survey and to some variables not being included in the abridged phone surveys.

associated with migration in the way theory would predict. Risk seeking individuals are more likely to have ever migrated, with a one standard deviation difference in risk seeking score associated with a 6 to 8 percentage point higher likelihood of having ever migrated. More patient individuals are 12 to 13 percentage points more likely to have ever migrated.

We also find a strong positive association between studying foreign languages or three sciences in secondary school and subsequent migration. Between 24 percent and 39 percent of top students in each country took three science subjects, and this is associated with a 21 percentage point higher likelihood of migrating. Foreign languages other than English are rare in PNG and Tonga, with less than 2 percent studying them – all of whom migrated. However, 33 percent of New Zealand top students took a foreign language, and this is associated with a 19 percentage point higher likelihood of migrating. One interpretation of these subjects is that they measure preferences of individuals to work and study in different locations. An alternative explanation is that they proxy for pre-migration investments or unobserved parental attributes. In practice we believe it is probably a mixture of the two – children choose to study subjects which interest them, but may also take subjects they otherwise wouldn't in order to increase their chances of being able to work or study abroad.

In contrast to the strong role for preferences and school subjects, we find only a weak role for wealth and an even weaker role for macroeconomic factors. The 26 percent of the pooled sample who had taken two or more trips abroad during secondary school have a higher incidence of migration, but not significantly so. Moreover, this could represent family networks abroad in addition to wealth. The 28 percent who classify their families as having above average wealth at the time of secondary school are marginally more likely to have migrated, but this is not significant when we control for country fixed effects. This suggests liquidity constraints which prevent migration costs being met might not be that important for this group of top students. Children whose mother's did not have tertiary education have slightly lower, but not significantly so, levels of migration.

The macroeconomic variables have a small and statistically insignificant relationship with the likelihood of migration in the pooled sample. The only country for which there is an association is Papua New Guinea, where the real exchange rate is

negatively associated with migration. However, in PNG the real exchange rate experienced a secular decline over the sample period, giving it a 0.92 correlation with age. Therefore it is hard to separate the effect of the exchange rate from a non-linear age effect in this case. If we add to this the uncertainty surrounding the small size of the PNG sample for older age groups, there seems reason to question this macro effect even in the case where it is significant.

Finally, in columns 8 and 9 we show that the results are similar if we consider the determinants of ever working abroad. We present this for robustness only, since in many cases migration for study naturally leads onto work, migrants may upskill abroad before working, and we only observe whether or not individuals worked while abroad, not whether or not they migrated with the intention to work.<sup>13</sup> The main point here is that the results are not being driven by migration purely for study.

#### **4.5. Modeling Return Migration**

The return migrants in our sample had been abroad for an average of 5.5 years for the Tongans, and for 3 years for the New Zealanders and Papua New Guineans. Given the large income gains to be had from migrating, what explains why some migrants return? Table 9 presents the marginal effects from probit estimation of the correlates of being a return migrant among the sample of individuals who have migrated. We pool current and return migrants across the three countries, with country fixed effects included, since the sample sizes are small for each country, and the results from country-by-country estimation are qualitatively similar across countries. The results are also similar if we drop individuals who are bonded to return after work or study from the analysis.<sup>14</sup> Approximately 40 percent of the combined sample are return migrants. The one variable that differs most across countries is the role of short-term career considerations, which are a stronger predictor of return migration for New Zealanders than the other countries. We therefore interact this variable with a dummy variable for New Zealand top students.

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<sup>13</sup> Moreover, we lose a handful of observations for which we know that they have migrated abroad at some stage, but not whether or not they worked while abroad.

<sup>14</sup> There are only 26 such individuals in the sample, 20 from PNG and 6 from Tonga. Only 16 have non-missing data on all the variables used for the return regression in column 9 of Table 9, so robustness checking here does not involve dropping many observations.

Item non-response on the online surveys and the abridged nature of the telephone surveys means that not all variables are available for every returned and current migrant. For this reason we first investigate the role of various sets of variables, before combining together. We always include age and gender, with older migrants more likely to have returned than younger migrants. As with the initial decision to migrate, there is no significant gender difference in whether migrants return. In contrast to the small and insignificant role of being born outside the home country on the initial decision to emigrate, those who do migrate and were born overseas are much less likely to return. This is consistent with these individuals having weaker ties to the home country, and an easier time assimilating and obtaining residence abroad.

Columns 1 and 2 then examine the role of wealth in the return migration decision. Recall that the liquidity constraints theory would predict that poorer individuals should be more likely to return, since they would be more likely to have migrated to alleviate liquidity constraints at home. In contrast, we find wealth to be positively correlated with return migration. This is consistent with the idea that family wealth may increase the income opportunities available domestically, either directly through employment in a family enterprise, or through family social networks helping to arrange better paying jobs.

Columns 3 and 4 then investigate the role of some of the preference variables that were found to be strongly correlated with the initial decision to emigrate. In contrast to this strong association with ever migrating, we find that risk seeking, patience, and the subject choice in secondary school are not significantly associated with whether or not a migrant returns.

Column 5 then examines whether the likelihood of returning varies according to educational achievement. We find that individuals with PhDs are significantly less likely to have returned. In the combined sample, only 18 percent of ever migrants with a PhD have returned, compared to 50 percent of ever migrants without a PhD. Controlling for age, gender, and country of origin, this gap remains a 32 percentage point difference in the likelihood of having returned. In contrast, there is no significant effect of having a medical degree, law degree, or other masters degree on the likelihood of return.

Column 6 directly tests the role of income gains from migration in explaining who returns. If it were only those migrants who discover that income abroad is less than they expected who return, as Borjas and Bratsberg (1996) speculate, then we would expect a strong negative effect of this change in income from migrating abroad on the likelihood of return. Instead we find a point estimate which is close to zero and insignificant.<sup>15</sup>

Column 7 next looks at the role of family in the decision to return. Top students who have ever migrated are more likely to have returned to their home countries if they have a parent alive in the home country, and less likely if they have a spouse who is a citizen of another country. The majority (87%) of the pooled sample have a parent alive in their home country, while 14% are married to a foreign citizen. This strong role for family is consistent with the “life-cycle” theory of return, with family shaping the preference for consumption in the home country or abroad country.

Column 8 examines the role of salaries, lifestyle, and careers in return decisions, based on three qualitative indicators of the draw of these factors.<sup>16</sup> We see a small and insignificant role for salaries, which is consistent with column 6 in showing that income gains are not the prime determinant of return. In contrast, the extent to which lifestyle draws individuals abroad is a negatively associated with return migration, significant at the 1% level. The draw of career possibilities is not a significant determinant for Tongan or PNG top students, but is for New Zealand top students.

Column 9 combines all of these variables together for the sample which answered all these questions. The point estimates are broadly similar to those in the earlier columns. Return migration is found to be more likely for individuals with a parent alive in their home country, who are attracted by the lifestyle in their home country, and who don’t have a PhD. For New Zealand top students, return is less likely for those who find their career prospects to be stronger draws abroad.

These econometric results also broadly match the responses given by return migrants when they were asked why they returned in an open-ended question. The most

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<sup>15</sup> This is not the result of insufficient variation in this income gains variable – Appendix Table 1 and Table 7 show considerable variation across individuals in the income gains to be had from migrating.

<sup>16</sup> Individuals answered on a five-point Likert scale which ranged from “draws me strongly towards my home country” to “draws me strongly towards overseas”.

common responses had to do with lifestyle, family, and a strong sense of personal connection to their home country. Among New Zealand top students, only a couple mentioned a job opportunity in the home country as the reason for return, and none directly mentioned better pay in the home country. Some of the return of the PNG and Tongan top students was non-voluntary - 31 percent of Papua New Guinean returnees and 10 percent of Tongan returnees said they returned because either the scholarship or work agreement they were on required them to return to their home country. There appears to have been little subsequent emigration of individuals who returned because of such restrictions. Another common answer among Papua New Guineans and also expressed by some Tongans was a desire to contribute to the development and progress of their home country.

## **6. Conclusions and Policy Implications**

We have successfully tracked down a high proportion of the very top performers in secondary school over the period 1976 to 2004 from three Pacific countries. Despite not being able to track all individuals in the population of interest, the analysis suggests that the sample obtained is broadly representative of this group of top students, a group which is likely to be of interest to both policymakers and academics.

The results reveal very high rates of emigration among top students during their twenties, together with significant levels of return migration. For both the initial decision to emigrate and the decision to return, we find that narrow measures of the income gains or economic incentives for migrating play a very minor role in determining which of the highly skilled migrate and return and which do not, whereas preference variables are strong predictors. Broader career concerns also matter, but this involves factors other than income, such as the quality of opportunities to conduct research, work with other leaders in the profession, and learn from the best. This leads us to conclude that an income maximization framework does not seem to be the most appropriate model for analyzing the first-order determinants of migration of the best and brightest, and that more emphasis needs to be put on the non-income components of the utility maximization decision.

These results also may have implications for the types of policies which are most likely to succeed in allowing countries to better attract back their highly talented



individuals. First we see in PNG in particular that almost one-third of return migrants returned because of bonding. This bonding typically required them to return for only 2 years, yet almost no one migrated again after this return period. Understanding more about the role of bonding policy in determining migration decisions strikes us as a fruitful area for further research.

Second, whilst much of the policy debate has centered on the need for higher salaries and lower taxes<sup>17</sup>, our work shows return migrants are giving up approximately US\$1000 per week to return to their home countries. While the huge gains in income to be had may in part explain why the high-skilled migrate more than the less skilled (Grogger and Hanson, 2008), the variation in income gains among top students does not help explain why some stay and others go. There are several issues with comparing salaries across countries and individuals which mean caution is required in drawing conclusions from this analysis. Nevertheless, we have endeavored to address these issues as best as possible with our data and the fact that multiple approaches give similar estimates of the income gains give us reason to feel somewhat confident that this lack of significance is not driven by measurement issues. Our results therefore suggest that marginal changes in tax rates or salary levels are unlikely to change the migration decision amongst this top group, whereas policies which change the non-income benefits of being in the home country may have more effect.

Indeed, when asked an open-ended question about which policies they would personally recommend to Government officials and Universities trying to attract back top students, the current migrants in our survey offer suggestions more closely linked to improving the career opportunities rather than to simply raising salaries. The New Zealand top students comment on the relatively poor environment for academic research in New Zealand compared to abroad, requesting better funding for scientific laboratories, increased research grant opportunities, and more specific requests such as the removal of regulations that make it difficult to work in genetic engineering and related biological fields. The majority of Tongan emigrants answering this question answered with respect to issues of political and institutional reforms. These included calls for more transparency

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<sup>17</sup> See e.g. “Higher Salaries best way to reverse brain drain”, New Zealand National Party Press Release December 9, 2004. <http://www.scoop.co.nz/stories/PA0412/S00222.htm> [accessed December 2, 2008].

in government, more democracy, allowing dual citizenship, land reform, and improving the civil service so that pay is more closely linked to performance and merit rather than to tenure. As noted, our sample contains few current emigrants from PNG. Their two main areas of recommendations are removing a dual salary system which pays foreigners differently from locals in certain occupations, and allowing dual citizenship. And in all three countries, current migrants gave improving the overall economy as a more important priority than lowering income taxes, or increasing salaries.

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**Table 1: Tracking and Response Rates**

	Target Population	Number with Location tracked	Number Surveyed	Survey Rate
<i>New Zealand Top Students</i>				
Maths olympians	73	70	65	89%
Chemistry olympians	48	47	43	90%
Top bursary scholars	484	263	228	47%
pre-1992 Duxes	271	96	67	25%
Total New Zealand Sample	851	476	371	44%
<i>Tongan Top Students</i>				
All Duxes and Proxime Accesits	266	245	193	73%
All with name known	245	245	193	79%
<i>PNG Top Students</i>				
1995-98, 2000-04 with 4.0 GPA & Booster sample of 1995-2004 Duxes	509	196	149	29%
1976-1994 and 1999 Duxes	182	102	87	48%
Total PNG Sample	691	298	236	34%

**Table 2: The Incidence of Emigration and Return Migration**

	Number of Observations	Ever Migrated	PERCENT	
			Current Migrant	Return Migrant
<b><i>New Zealand Top Students</i></b>				
Maths and chemistry olympians				
Population	121	[66.1, 72.7]	[54.5, 57.9]	[11.6, 18.2]
Sample	108	70.1	57.0	13.1
Estimate of Population	121	69.6	56.4	12.8
Top Bursary Scholars				
Population	484	[27.9, 80.2]	[18.4, 65.1]	[9.5, 63.4]
Sample	228	[57.0, 57.9]	36.8	[20.2, 21.0]
Estimate of Population	484	58.4	37.4	20.6
Pre-1992 Duxes				
Population	271	[22.5, 94.8]	[13.3, 78.2]	[9.2, 81.5]
Sample	67	[77.6, 79.1]	40.9	[37.3, 38.8]
Estimate of Population	271	75.6	37.0	38.5
All New Zealand Top Students				
Population	851	[30.3, 84.6]	[20.8, 69.1]	[9.5, 63.8]
Sample	371	[63.6, 64.7]	41.8	[21.8, 22.9]
Estimate of Population	851	67.2	41.1	25.8
<b><i>Tonga Top Students</i></b>				
All Top Students				
Population	266	[75.9-88.0]	[52.2-65.3]	[23.7-47.8]
Sample	193	83.4	50.8	32.6
<b><i>PNG Top Students</i></b>				
Sample	233	36.5	9.4	27.0

Note: Parentheses indicate bounds in cases of missing data.

Estimate of population is obtained by using predicted probabilities from a probit model of migration status as a function of age and sex to impute probabilities for missing observations.

**Table 3: Migrating to Work, Study, or Both?**

	Percentage of Current and Return Migrants who have:			Number of Observations
	Studied Abroad	Worked Abroad	Worked & Studied Abroad	
New Zealand Top Students				
Aged 25+	50	[92, 98]	[46, 52]	194
Aged 30+	50	[97, 99]	[48, 50]	124
Tonga Top Students				
Aged 25+	100	[36, 76]	[34, 76]	129
Aged 30+	100	[34, 76]	[32, 76]	101
PNG Top Students				
Aged 25+	88	[46, 66]	[39, 59]	82
Aged 30+	88	[48, 68]	[39, 59]	69

Note: Parentheses show bounds on percentage who have worked abroad, and who have worked or studied abroad.

**Table 4: Educational Attainment**

	Percentage With				
	PhD	Law Degree	Medical Degree	Other Masters	Any Graduate
New Zealand Top Students					
All 25+	30	7	12	19	64
All 30+	31	7	13	21	67
PNG Top Students					
All 25+	4	5	7	14	29
All 30+	6	3	8	20	36
Tonga Top Students					
All 25+	8	3	15	18	45
All 30+	8	3	15	23	49

**Table 5: Migrant Status by Educational Attainment**

	Percentage		
	Ever Migrated	Current Migrant	With overseas degree
New Zealand Top Students			
All 25+	72.5	47.2	36.3
25+ with PhD	88.6***	74.7***	73.4***
25+ with Medical or Law degree	69.2	36.5*	25.0*
25+ with any graduate degree	79.9***	55.0***	51.8***
PNG Top Students			
All 25+	42.3	11.4	36.7
25+ with PhD	100***	42.9***	100***
25+ with Medical or Law degree	30.4	4.3	26.1
25+ with any graduate degree	67.8***	21.4***	66.1***
Tonga Top Students			
All 25+	87.2	47.3	85.8
25+ with PhD	100	72.7*	100
25+ with Medical or Law degree	100**	41.7	100**
25+ with any graduate degree	100***	52.5	100***

Notes:

\*, \*\*, and \*\*\* indicate that a t-test of difference in means shows significance relative to group without this educational level at the 10%, 5% and 1% levels respectively.

**Table 6: Gain in Weekly Income from Migrating**

	New Zealand		Papua New Guinea		Tonga	
	PPP-USD	USD	PPP-USD	USD	PPP-USD	USD
<i>Regression-based estimate:</i>						
<u>Change in the level of weekly income</u>						
All Individuals						
controlling for age, sex	769*** (190)	787*** (218)	193 (279)	1103*** (186)	822*** (291)	1011** (385)
controlling for age, sex, education	816*** (205)	874*** (235)	156 (281)	1052*** (189)	604** (289)	725* (324)
Current and Return Migrants only						
controlling for age, sex	865*** (219)	909*** (248)	-100 (377)	875*** (274)	993*** (249)	1279*** (332)
controlling for age, sex, education	917*** (232)	1000*** (262)	-153 (391)	831*** (285)	979*** (241)	1231** (314)
<u>Change in log weekly income</u>						
Current and Return Migrants only						
controlling for age, sex	0.440*** (0.097)	0.385*** (0.092)	0.082 (0.265)	0.926*** (0.284)	1.455*** (0.321)	1.866*** (0.344)
controlling for age, sex, education	0.483*** (0.102)	0.436*** (0.096)	0.092 (0.274)	0.923*** (0.295)	1.601*** (0.300)	2.021 (0.318)
<i>Self-assessed change for current and return migrants</i>						
Mean change in levels	815	899	1147	739	738	728
Mean change in log income	0.557	0.521	0.635	0.804	1.038	1.207
<i>Actual level of income for those in home country</i>						
Mean for all in home country	1004	1256	867	466	349	246
Median for all in home country	842	1053	498	254	249	177
Mean for return migrants	1084	1356	1320	749	391	284
Median for return migrants	939	1175	1023	514	303	193

**Notes:**

Regression model with all individuals also contains an indicator for being a return migrant.

Education controls are dummies for having a PhD, Medical degree, Law degree, or other masters degree.

Standard errors in parentheses. \*, \*\*, and \*\*\* indicate significance at the 10%, 5% and 1% levels respectively.

**Table 7: Quantiles of Income Gain from Migrating in USD per week**

	New Zealand	Tonga	PNG
Quantile Regression Estimates			
10th	222* (128)	142 (181)	698*** (49)
25th	354*** (98)	532*** (97)	736*** (62)
50th	508*** (163)	849*** (105)	780*** (90)
75th	1086*** (259)	1670*** (134)	1361*** (133)
90th	1511** (703)	2169* (1247)	850 (530)
Self-assessed change for current and return migrants			
10th	-87	-56	-465
25th	193	80	147
50th	604	414	545
75th	1269	839	1060
90th	2156	1829	1611

Standard errors in parentheses. \*, \*\*, and \*\*\* indicate significance at the 10%, 5% and 1% levels respectively.

**Table 8: What are the Determinants of Ever Migrating?**

Marginal effects from probit estimation

	New Zealand	Tonga	PNG	Pooled Across Countries				Ever migrating for work	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Age	0.00987 (0.0068)	0.0255* (0.015)	0.0986*** (0.028)	0.0174*** (0.0035)	0.0186*** (0.0036)	0.0176*** (0.0035)	0.0184*** (0.0036)	0.0222*** (0.00410)	0.0214*** (0.00406)
Female	-0.0144 (0.059)	0.00704 (0.18)	-0.0193 (0.11)	0.00774 (0.046)	-0.0470 (0.049)	0.00401 (0.046)	-0.0478 (0.049)	0.0189 (0.0537)	0.0216 (0.0539)
Mother has secondary school or less	-0.0240 (0.065)	p.p. (-)	-0.231** (0.11)	-0.0204 (0.047)	-0.0637 (0.052)	0.0114 (0.050)	-0.0417 (0.054)	-0.0175 (0.0575)	-0.00179 (0.0598)
Born abroad	-0.00103 (0.061)	p.p. (+)	p.p. (-)	0.0477 (0.055)	-0.0158 (0.060)	0.0457 (0.056)	-0.0130 (0.060)	0.0558 (0.0656)	0.0584 (0.0654)
Risk seeking score	0.0449*** (0.013)	-0.0109 (0.035)	0.0170 (0.023)	0.0262*** (0.0100)	0.0287*** (0.010)	0.0277*** (0.0099)	0.0295*** (0.010)	0.0352*** (0.0118)	0.0367*** (0.0118)
Dummy for being patient	0.123** (0.055)	0.0752 (0.16)	0.199 (0.12)	0.133*** (0.045)	0.111** (0.046)	0.125*** (0.045)	0.104** (0.047)	0.0724 (0.0546)	0.0756 (0.0547)
Studied a foreign language	0.189*** (0.054)	p.p. (+)	p.p. (+)	0.222*** (0.046)	0.197*** (0.048)	0.214*** (0.048)	0.196*** (0.048)	0.196*** (0.0649)	0.205*** (0.0646)
Studied all three science subjects	0.184*** (0.057)	p.p. (+)	0.0502 (0.12)	0.190*** (0.045)	0.213*** (0.044)	0.189*** (0.045)	0.213*** (0.045)	0.205*** (0.0554)	0.209*** (0.0556)
Real exchange rate when of prime migration age	-0.00292 (0.0038)	0.0421 (0.030)	-0.0283** (0.013)	0.000813 (0.0016)	0.00227 (0.0019)	0.000477 (0.0016)	0.00232 (0.0019)	-0.000897 (0.00223)	-0.000790 (0.00224)
GDP growth relative to destinations when of prime migration age	-0.00640 (0.036)	-0.0257 (0.066)	0.00417 (0.018)	-0.0139 (0.011)	-0.0141 (0.011)	-0.0138 (0.011)	-0.0149 (0.011)	-0.0131 (0.0126)	-0.0154 (0.0128)
Two or more trips abroad while in school	0.0377 (0.061)	0.0774 (0.17)	0.116 (0.13)	0.0422 (0.050)	0.0465 (0.051)			0.0502 (0.0588)	
Above average wealth in high school						0.0955* (0.051)	0.0768 (0.052)		-0.0185 (0.0604)
Below average wealth in high school						-0.0579 (0.061)	-0.0473 (0.065)		-0.100 (0.0708)
PNG fixed effect					-0.259*** (0.069)		-0.233*** (0.071)	-0.478*** (0.0537)	-0.467*** (0.0560)
Tonga fixed effect					0.252*** (0.059)		0.266*** (0.058)	-0.254*** (0.0877)	-0.229** (0.0918)
Observations	302	82	126	510	510	511	511	485	486

Notes:

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

p.p. (-) and p.p.(+) indicate that the variable is a perfect predictor of not migrating or of migrating respectively.



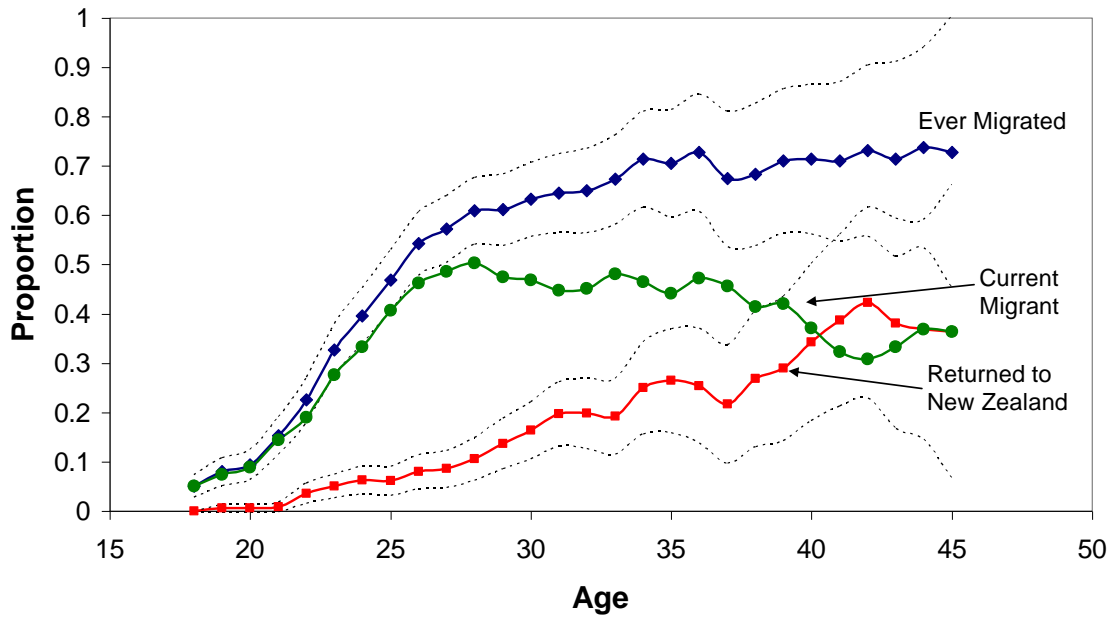
**Table 9: What are the Determinants of Return Migration Among Ever Migrants?**  
Marginal effects from Probit Estimation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Age	0.0124*** (0.0035)	0.0119*** (0.0035)	0.0114*** (0.0039)	0.0130*** (0.0035)	0.0142*** (0.0035)	0.00736 (0.0047)	0.0154*** (0.0037)	0.00696* (0.0038)	0.00861 (0.0063)
Female	0.0206 (0.051)	0.0129 (0.052)	0.0274 (0.057)	-0.00751 (0.052)	0.0224 (0.050)	0.0250 (0.068)	0.0106 (0.052)	-0.0190 (0.057)	-0.0958 (0.084)
Born outside country	-0.205*** (0.060)	-0.184*** (0.061)							-0.0803 (0.10)
Two or more trips abroad in high school	0.177*** (0.058)								0.121 (0.091)
Above average wealth in high school		0.117* (0.063)							
Below average wealth in high school		-0.0588 (0.068)							
Risk seeking Score			0.00543 (0.013)						-0.00771 (0.019)
Dummy for being patient			-0.0734 (0.057)						0.0169 (0.083)
Studied a foreign language				0.0967 (0.071)					0.0918 (0.12)
Studied all three science subjects				-0.0510 (0.054)					-0.0990 (0.082)
Has a PhD					-0.320*** (0.055)				-0.257*** (0.087)
Has a Medical or Law Degree					0.0923 (0.067)				0.0808 (0.11)
Has another form of Masters Degree					-0.0607 (0.062)				-0.0613 (0.091)
Change in log income expected from migration						-0.0194 (0.031)			-0.0407 (0.039)
Has a parent alive in their home country							0.231*** (0.065)		0.203** (0.096)
Has a spouse who is a citizen of another country							-0.267*** (0.056)		-0.150 (0.098)
Extent to which salaries draw them abroad								-0.0327 (0.033)	-0.0451 (0.045)
Extent to which lifestyle draw them abroad								-0.0630*** (0.022)	-0.0597* (0.031)
Extent to which career draws them abroad								-0.0411 (0.036)	-0.0446 (0.051)
NZ dummy*Extent to which career draws abroad								-0.187*** (0.048)	-0.174*** (0.065)
Mother has less than secondary education									0.0667 (0.088)
PNG country effect	0.266*** (0.071)	0.319*** (0.072)	0.338*** (0.072)	0.359*** (0.066)	0.277*** (0.069)	0.350*** (0.078)	0.306*** (0.070)	0.242*** (0.090)	0.257* (0.15)
Tonga country effect	-0.0336 (0.059)	0.0115 (0.065)	0.0154 (0.068)	0.0513 (0.065)	-0.0461 (0.057)	0.214** (0.092)	-0.0103 (0.061)	-0.105 (0.075)	0.00584 (0.14)
Observations	427	425	358	425	461	253	419	391	218

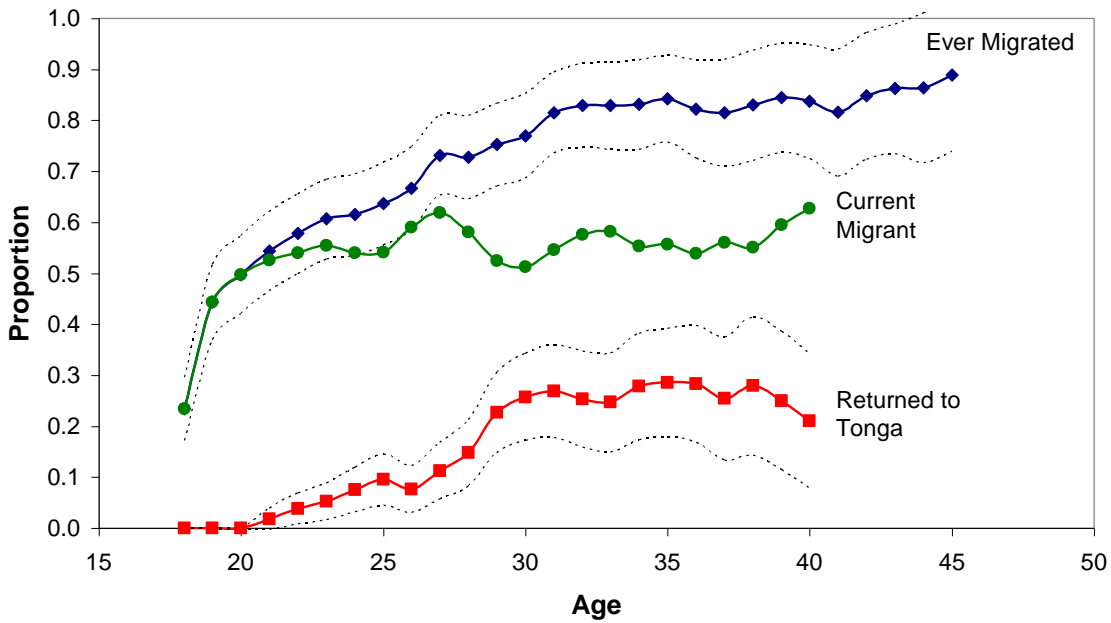
Notes:

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Figure 1**  
**New Zealand Top Students: Migrant Status by Age**



**Figure 2**  
**Tongan Top Students: Migrant Status by Age**



**Figure 3:  
PNG Top Students: Migrant Status by Age**

