The Importance of Selectivity and Duration-Dependent Heterogeneity When Estimating the Impact of Emigration on Incomes and Poverty in Sending Areas: Evidence from the Samoan Quota Migration Lottery[1]

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Abstract

The impacts of international emigration and remittances on incomes and poverty in sending areas are increasingly studied with household survey data. But comparing households with and without emigrants is complicated by a triple-selectivity problem: first, households self-select into emigration; second, in some emigrant households everyone moves while others leave members behind; and third, some emigrants choose to return to the origin country. Allowing for duration-dependent heterogeneity introduces a fourth form of selectivity – we must now worry not just about whether households migrate, but also when they do so. In this paper, we clearly set out these selectivity issues and their implications for existing migration studies, and then address them by using survey data designed specifically to take advantage of a randomized lottery that determines which applicants to the over-subscribed Samoan Quota (SQ) may immigrate to New Zealand. We compare incomes and poverty rates amongst left behind members in households in Samoa that sent SQ emigrants with those for members of similar households that were unsuccessful in the lottery. Policy rules control who can accompany the principal migrant, providing an instrument to address the second selectivity problem. Our survey also covers return emigrants so that their households can be treated appropriately to deal with the third selectivity problem, while differences among migrants in which year their ballot was selected allow us to estimate duration effects. We find that migration, on average, increased household consumption and reduced poverty among former household members, but also find suggestive evidence that this effect may be short-lived as remittances and income from own production are negatively related to the duration that the migrant has been abroad.

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1. Introduction

The impacts of international emigration and remittances on incomes and poverty in sending areas are increasingly studied with household survey data. Empirical analysis is needed because the effect of emigration is *a priori* unclear. Households with emigrants typically benefit from remittance inflows, which now make up 30 percent of total financial flows to the developing world. There are also fewer mouths to feed amongst household members left behind. On the other hand, earnings and other household inputs that emigrants would have generated locally are lost. Since it is typically individuals of the most economically active ages who emigrate, foregone earnings and foregone own-production may outweigh the effect of fewer mouths and more remittances, potentially causing poverty to rise for those left behind, even if the migrants themselves become better off.

The biggest difficulty in estimating the impacts of emigration is posed by selectivity issues. A common research strategy in this literature is to use household survey data from the sending country to compare households where some members have emigrated to those where no one has emigrated. Such comparisons are complicated by a triple- or quadruple-selectivity problem: first, households self-select into emigration; second, in some emigrant households everyone moves (and thus are almost never included in survey data on the sending country) while other emigrant households leave some members behind; third, some emigrants choose to return home, so their household may (wrongly) be considered as not affected by emigration. And fourth, if researchers wish to examine how the impact varies with duration since migration, they also face selectivity into not just whether, but when households emigrate.

In this paper, we set out how these selectivity issues arise and their implications for existing migration studies. We then address these selectivity problems by using survey data designed specifically to take advantage of a randomized lottery that determines which applicants to the over-subscribed Samoan Quota (SQ) may immigrate to New Zealand. These data allow us to compare incomes and poverty amongst left behind members in households in Samoa that sent SQ emigrants with incomes and poverty rates of similar households that were unsuccessful in the lottery. This random lottery solves the problem of self-selection into migration. The SQ policy rules control who can accompany the principal migrant, thus we also have an instrument to address the second selectivity problem. Finally, our survey includes a module that captures the experiences of the small number of households that have members who once were SQ emigrants

but decided to return home to Samoa, allowing us to address the third selectivity problem. Differences among migrants in when they win the ballot lottery allow us to also explore duration effects and address this fourth selectivity issue.

The Samoan Quota was established by New Zealand in 1982 and currently allows an annual quota of 1,100 Samoans to immigrate as permanent residents without going through the usual channels available for groups such as skilled migrants and business investors. The quota is over-subscribed so a lottery is used to randomly select from amongst the applicants, with a probability of success of approximately six percent. The policy rules allow the principal applicant, their spouse, and their dependent children up to age 24 to migrate, but other household members are not eligible to accompany them. Hence, there are many households with left behind members, who may be parents, siblings, in-laws, married children, unmarried adult children with their own children, and nephews and nieces of the principal applicant. We examine the impact on this group, in terms of total household income and consumption, income from different sources, poverty rates and subjective welfare.

We find that emigration, on average, raises per adult equivalent consumption and reduces poverty among remaining members in the migrant-sending households. Although our sample is quite small for examining duration effects, we also find suggestive evidence that the impact varies with duration since migration, with the point estimates suggesting consumption and income fall relative to the first year effects as more time is spent abroad. This occurs because remittances, agricultural income and subsistence income decline with the duration since emigration, and increases in household labor earnings with duration are not enough to offset this.

In related work, we have looked at short-run (one year) effects of a similar (but newer and smaller) migration program in Tonga (McKenzie, Gibson and Stillman, 2007a; Gibson, McKenzie and Stillman, 2009). Here, there was no return migration in that first year, so only the first two selectivity issues were raised. This paper builds significantly on our earlier work both methodologically and substantively. From a methodological viewpoint, this paper clearly lays out the additional selectivity issues that the existing literature has not fully addressed, and provides guidance for both experimental and non-experimental attempts to look at the impacts of migration. From a substantive viewpoint, the paper provides the first medium-term experimental estimates of the impact of migration – the impacts here are measured within six years of the eligible household members moving to New Zealand, and the first estimates which allow for

duration dependent heterogeneity whilst addressing selectivity. There are a number of theoretical reasons why the impact of migration on sending households is likely to vary with the duration of migration, and there are indeed reasons to believe that not just the magnitude, but also the sign, of any effects may differ in the short- and medium-term. Our results for Tonga are not able to examine this issue since data from there only covers one cohort of migrants. Our findings here show that allowing for this type of heterogeneity may be important in practice.

The rest of this paper is structured as follows. Section 2 discusses four challenges that selectivity issues pose for attempts to empirically estimate the impact of migration on incomes and poverty in sending areas. Section 3 provides background to the immigration program we examine, describes the Samoa Labour Mobility Survey (SLMS) that we designed and explains the estimation methods. Our results are reported in Section 4 while Section 5 concludes.

2. Challenges to Understanding the Impact of Migration: Triple- or Quadruple-Selectivity and Duration-Dependent Heterogeneity of Impacts

There are now a sizeable number of studies which aim to answer the question "What is the impact of engaging in international migration on household incomes and poverty in sending countries?"[2] If emigration purely resulted in an exogenous increase in income for the remaining members via remittances, the sign of the expected impact would be trivial. However, emigration can have a large number of other impacts on sending households. Most obviously, an absent migrant earns no domestic wage and provides no time inputs into market and household production. These effects may counteract the effect of remittances received, so that the net effect of migration on sending households is *a priori* unclear and hence an empirical issue.[3] However there are several challenges to estimating this impact which the existing literature appears largely to have ignored. We outline these challenges here and describe how what has been done in the existing literature is unable to overcome them. Then, in the next section, we discuss our approach for producing unbiased estimates of the impact of emigration.

[2] Examples include Stark et al. (1986), Adams (1989), Barham and Boucher (1998), Esquivel and Huerta-Pineda (2006), Acosta et al. (2007), and Brown and Jimenez (2008).

[3] One might still argue that revealed preference ought to mean that the household is better off (at least in expectation) as a result of migration. However, expectations of opportunities abroad may be systematically incorrect (see McKenzie et al, 2007b). Moreover, once we move away from a unitary household model, revealed preference need only suggest that the migrant is made better off, not that those who remain behind benefit.

2.1 Triple-Selectivity

Assume for the moment that sending members abroad has a homogenous impact β on the per-capita household income of remaining household members. The goal of many papers in the literature is to estimate this causal effect. The standard approach is to begin by specifying a linear regression model for household *i*, relating per-capita household income (or any other related outcome of interest), Y_i, to whether or not that household engages in international migration, M_i, and a set of observed (exogenous) characteristics of the household X_i:

$$Y_i = \beta M_i + \gamma' X_i + \varepsilon_i . \quad (1)$$

The standard concern is then that households self-select into migration. In particular, we are concerned that there are unobserved attributes of the household, such as personality type, entrepreneurial ability, drive, and ambition which are correlated with both the decision of the household to send migrants, and the income that the household earns. That is, we are concerned that:

$$E(M_i \varepsilon_i) \neq 0 . \quad (2)$$

The existing literature has focused on trying to overcome this first form of selectivity using a variety of non-experimental methods. This includes assuming selection on observables (e.g. Adams, 1998), parametric selection correction models (e.g. Barham and Boucher, 1998; Acosta et al, 2007), propensity-score matching (e.g. Esquivel and Huerta-Pineda, 2006), and instrumental variables methods (e.g. Brown and Leeves, 2007; McKenzie and Rapoport, 2007). However it is easy to question the identification assumptions underlying these non-experimental approaches. A number of recent papers show that migrants self-select in terms of both observables and unobservables (McKenzie et al, 2009, Akee 2009), thus methods like OLS and matching that assume selection on only observables are likely to be biased. Similarly, selection correction methods in the Heckman tradition rely on stringent functional form and distributional assumptions, and dubious excludability restrictions. For example, Acosta et al. (2007) and Barham and Boucher (1998) assume that household assets predict selection into migration but do not directly affect earnings or labor force participation. Yet, these assets could be used to help finance business activities or themselves could be the result of labor earnings, so they are unlikely to be a valid instrument.

Similarly, most papers using instrumental variables methods rely on current migration networks as an instrument which is subject to concerns about whether there are other excluded variables at the community level which also affect migration and outcomes of interest. For example, a recent community weather shock such as a drought may lead to both increased migration and a reduction in agricultural income in the community so an empirical correlation between emigration and poverty would be a misleading estimate of emigration's impact. Historic networks are less subject to concerns about recent shocks, but still need to rely on a plausible story of why networks exogenously formed in one location and not in another, such as the pattern of development of the railroad system in Mexico, as used by Woodruff and Zenteno (2007).

Moreover, the selection issue raised by equation (2) is only one of the three sources of selectivity that make it difficult to estimate β. The second source is selectivity among the households which engage in international migration as to whether or not the whole household moves. To see how this matters, note that we only observe the per-capita income in equation (1) for households in which some members remain after other household members emigrate. Define a selection indicator s_i for each household *i* so that $s_i = 1$ if we observe Y_i and $s_i = 0$ if we do not due to the whole household moving. Then, rather than being able to estimate equation (1), all we can estimate is the following equation:

$$s_i Y_i = \beta s_i M_i + \gamma' s_i X_i + s_i \varepsilon_i . \tag{3}$$

Consistency of OLS estimation then requires assuming[4]:

$$E\left(s_i M_i \varepsilon_i\right) = 0 \text{ and} \tag{4}$$

$$E\left(s_i \varepsilon_i\right) = 0 . \tag{5}$$

Equation (4) is again the first form of self-selection considered, this time restricted to the group of households that are observed in the home country. The new insight here is the need for equation (5) to hold. This requires the assumption that unobserved determinants of income are uncorrelated with whether a whole household leaves or not. It is important to note that this might not be true even if equation (4) holds. In particular, even if there is no self-selection of households into migration (which is unlikely), if households self-select in terms of whether or

[4] Of course it also requires that the X variables are exogenous, which we have already assumed.

not the whole household moves, this will still generate inconsistent estimates. In particular, our previous work on Tongan emigrants (Gibson et al, 2009) has found that whole households which emigrate are, on average, smaller than households in which some individuals stay behind. Since household size is an immediate channel through which migration affects households (members leave), it is not an exogenous variable which can be included as a control in *X*. Since poverty varies sharply with household size (Lanjouw and Ravallion, 1995), self-selection into whether the whole household moves on the basis of household size will be automatically correlated with measures of incomes and poverty.

This formulation shows that if efforts are made to deal with the first selectivity, as is common in the existing studies, the results produced are still inconsistent if there is self-selection among which households migrate en masse and which separate. The standard solution to account for this second form of selectivity is to explicitly model the process of selection into the sample, and correct for this – either parametrically through the standard Heckman procedure or semi-parametrically. But, this requires researchers to come up with not just an instrumental variable or convincing exclusion restriction that can be used to explain why some households migrate and others do not, but also to find a second instrumental variable or exclusion restriction to explain which households migrate in full and which leave members behind.

This is not just a tall order, but is, in fact, impossible in most existing studies which only use data from the sending country. These studies by definition miss all households in which all members migrate (e.g. none are left in the sample population of the survey). Without data on the characteristics of these households, it is impossible to examine how their characteristics compare to those of households with remaining members or to model this selection process. Either policy rules which constrain migrant eligibility or data from the destination country on whole households that move are needed to model this selectivity.

Finally, the third form of selectivity that raises a challenge for estimating the impact of migration on sending households arises from return migration. There is both theory and evidence to suggest that return migrants are also self-selected (Dustmann, 2003; Dustmann and Kirchkamp, 2002). In particular, Borjas and Bratsberg (1996) find evidence that return migration accentuates the type of initial self-selection, so that if migrants are positively selected from the origin population, return migrants are negatively selected from among the migrant group.

How return migrants should be treated in an analysis of the impact of emigration depends on what the parameter of interest is to the researcher. If the object of interest is to estimate the impact of a household *currently* having a migrant abroad, then return migrants should be classified as having $M_i = 0$ in estimating equation (3). However, this has consequences for ensuring that condition (4) is satisfied. In particular, it means researchers must come up with an exogenous reason why some households have a migrant abroad *who has not returned* while others do not. Simply modelling the decision to engage in migration or using instruments such as migration networks which predict the initial migration decision will then no longer be enough – either return migration will need to be separately modelled, or instruments that explain both the decision to migrate and the decision to stay abroad will be needed. This is of course on top of still needing to solve the second selectivity issue and explaining which households migrate en masse and which do not.

An alternative approach is to treat the parameter of interest as the impact of *ever* having engaged in international migration. Then, households with return migrants should be treated as having $M_i = 1$ in estimating equation (3). Studies that focus on the direct impacts of remittances typically do not treat return migrant households in this way. However, research which recognizes the whole host of channels through which migration affects sending households (e.g. McKenzie and Rapoport, 2007) often acknowledges that migration can continue to have impacts on households (e.g. through repatriated savings and through knowledge and skills gained abroad), and so treat return migrant households as participating in migration. In this case, this third form of selection does not present additional challenges for estimation from the first two forms, it just requires that households with return migrants be correctly classified as migrant households.

As is discussed in more detail in section 3, in this study we take advantage of a migrant lottery program whose rules allow us to control for both the first and second sources of selection bias. In particular, a random lottery is used to select households that are then able to send migrants and the rules of the lottery determine which household members are eligible to be sent. We then account for the third source of selectivity by treating our small sample of return migrants as still affected by migration.

2.2 Duration-Dependent Heterogeneity of Impacts

The discussion above assumes, in common with most of the literature, that participating in international migration has a constant effect on all households. If this assumption is violated and the impact of migration varies across households, then what is actually estimated is an average effect of some form – either the average effect from OLS in the absence of selectivity, or the marginal average treatment effect (MTE) or local average treatment effect (LATE) when methods to deal with selectivity are used. There is considerable discussion in the treatment effects literature as to when and whether these MTE and LATE estimates are parameters of interest for research or policy. We discuss these issues in the context of our estimation later in this paper.

However, we wish to point out a more fundamental issue when it comes to estimating the impact of migration on incomes and poverty in sending households. This is that the impact of migration on sending households is likely to vary with the duration of migration, and there are indeed reasons to believe that not just the magnitude, but also the sign, of any effects may differ in the short- and medium-term. For example, the short-term impact of migration may be negative as households lose the domestic income that the migrating members normally generated and perhaps have less assets to work with due to the costs of financing migration. It may take migrants some time to start paying off their moving costs and to earn enough to start sending remittances. However, in the medium-term, this impact may be positive as the left behind household members adapt to their new circumstances and receive greater remittances from migrants. On the other hand, there is a debate in the literature as to whether remittances decay – that is as to whether the amount of remittances received falls with duration abroad. If this is the case (perhaps because links with remaining household members weaken with time abroad), then the short-run impact may be more positive than the longer-run impact. In each case, estimating the average effect of migration over all household therefore gives an effect which might be accurate for at most some point between the short- and medium-terms, and could miss most of the impacts of migration.

As a consequence, researchers should ideally move from the simple specification in equation (1) and (3) towards allowing the impact of migration to vary with the duration abroad. For example, if we let t_i be the number of years since emigration, we might be interested in estimating:

$$s_i Y_i = \beta s_i M_i + \lambda s_i M_i * t_i + \gamma' s_i X_i + s_i \varepsilon_i \quad (6)$$

Then, the impact of having a household member abroad for t_i years is $\beta + \lambda t_i$. However, consistently estimating equation (6) requires an additional assumption on top of the selectivity assumptions raised previously. On top of the other sources of selectivity mentioned, this requires that there can be no selectivity in terms of how long members have been abroad, eg. it requires that:

$$E\left(s_i M_i t_i \varepsilon_i\right) = 0 . \quad (7)$$

Return migration is one reason why such selectivity could arise. However, even in the absence of selectivity into return migration, this assumption will be violated if the characteristics of households which sent migrants say two years ago differ from the characteristics of those households which sent migrants five years ago. That is, if there is selectivity in not just *whether* a household engages in migration, but in *when* it does. Business cycle effects are one reason this assumption could be violated – the types of households which send migrants during a recession may differ from the types of households which send migrants during a boom. Researchers attempting to estimate (6) therefore face a quadruple-selectivity – selection into migration, selection among migrants as to whether the whole household migrates, selection into return migration, and selection into current duration abroad. Attempting to model these four forms of selectivity and control for them in a non-experimental way poses an extreme challenge that most research designs are unlikely to be able to meet. We discuss next how the migration lottery we study allows us to overcome each of these factors.

3. Using an Emigration Lottery among Samoans to Overcome these Selection Issues

3.1 Background on Samoan Emigration

The country of Samoa consists of four inhabited islands in the South Pacific, with total population of approximately 180,000. The population is predominantly rural, with two-thirds of the labour force employed in agriculture.[5] GDP per capita at market exchange rates is approximately US$2,000 (Vaai, 2007), similar to Guatemala, Indonesia and Morocco. In common with many small island nations, emigration and remittances are very important for

[5] Source: CIA World Factbook https://www.cia.gov/library/publications/the-world-factbook/geos/WS.html [accessed June 8, 2009].

Samoa. There are approximately 100,000 Samoa-born living overseas. Slightly over 50,000 of these emigrants live in New Zealand, with Australia, American Samoa and the continental United States being the next most important destinations, each with approximately equal numbers. Samoa is also highly dependent on remittances, which are equivalent to almost one-quarter of GDP.

Sizeable migration from Samoa to New Zealand began during the 1960s and 1970s, with Samoans arriving on three month visas to take up work opportunities. After their permits expired, many stayed in New Zealand since the return provisions of the visas were not actively policed due to the excess labour demand at the time. But in the recession which followed the first oil crisis, labour demand fell sharply and starting in 1974 "dawn raids" were launched to deport alleged over-stayers. Since New Zealand had administered Samoa (then known as Western Samoa) under League of Nations and United Nations mandates from 1920 until 1962, the citizenship status of Samoans was uncertain and a case was taken to the British Privy Council. In 1982, it ruled that all Samoans born between 1924 and 1948 were British subjects and that when New Zealand citizenship was created in 1949 (New Zealanders previously being British), these Samoans and their descendants had also become New Zealand citizens. In response, the New Zealand Government passed the Citizenship (Western Samoa) Act 1982 to over-turn that ruling, restricting citizenship only to those already lawfully in New Zealand.

3.2 The Samoan Quota

However, as a compensation for this limitation on labour mobility, which restricted Samoa to the same immigration status as countries like Fiji and Tonga that were not former protectorates, a "Samoan Quota" was agreed to as part of a Treaty of Friendship. This quota allows a specified number of Samoans to be granted New Zealand permanent residence annually, in addition to those entering New Zealand under normal immigration arrangements. The quota has been set at 1,100 places per year since 2002, and any Samoan citizen aged between 18 and 45 is eligible to register. The registration is free and many more applications are received than the quota allows, so a random ballot is used to deal with this over-subscription.[6] The number of registrations varies between 5,000 and 7,000 per year (there are 23,000 households in Samoa).

[6] The random ballot was introduced in 1999. Prior to this, decisions were made on a first come, first served basis. The ballot was drawn manually up until 2003, from which point a computer was used to select randomly amongst registrations.

Since the quota of 1,100 applies to the total of Primary applicants and the secondary migrants who are eligible to emigrate with them, it represents about 400 family groups. Over the last three years, 1,201 out of 19,326 registrations were drawn in the ballot, representing odds of about six percent.

Permanent and long-term arrivals from Samoa to New Zealand average only 2,000 per year, while settlement migrants from Samoa average 500 per year into Australia and 200 per year into the United States over the 2002-2008 period, mostly through family reunification policies.[7] It is thus clear that the Samoan Quota is a major channel for settlement emigration out of Samoa, accounting for approximately 40 percent of all emigration and the vast majority of emigration through a channel other than family reunification.

Once an applicant is selected in the random ballot, they must provide a valid job offer in New Zealand (unskilled jobs suffice) within six months in order to have their application to immigrate approved. These job offers are increasingly arranged by large employers visiting Samoa after the annual ballot results are announced. Once a job offer is filed along with a residence application, it typically takes three to nine months for an applicant to receive a decision and they are then given up to one year to move. If they are successful, their immediate family (spouse and dependent children up to age 24) can also move to New Zealand with them. This rule specifying which family members can and cannot accompany the successful migrant, coupled with the random selection amongst Samoan Quota applicants, is key to being able to overcome the selectivity issues raised in the previous section. Conceptually, we can estimate the impact of migration on family members left behind by comparing outcomes for the group of households in Samoa that sent SQ emigrants to those for the group with unsuccessful ballots who would not be eligible to move their entire household to New Zealand had their principal applicant been chosen in the ballot. We next discuss the data that has been collected to allow us to implement this estimation approach.

3.3 The Samoa Labour Mobility Survey

The data used in this paper are from the Samoa Labour Mobility Survey (SLMS) which was designed by the authors and implemented by the Samoa Bureau of Statistics in late 2008.

[7] A new seasonal labour migration channel opened in 2007 which allows 5,000 workers from throughout the Pacific to work in New Zealand's orchards, vineyards and pack houses for up to seven months per year. In the first full year of the scheme approximately 700 workers from Samoa participated.

The survey is based on a self-weighting sample of 622 households in 90 villages, drawn from all regions of Samoa.[8] Out of these surveyed households, 86 had current or former members that were successful applicants to the Samoan Quota in the previous five years. A further 121 households contained individuals that had applied at least once to the Samoan Quota in the previous five years and had never been successful.[9] The remaining 415 households in the sample did not report having either former members who were now SQ emigrants or having current members who had applied to the SQ in the previous five years.

The SLMS measures both incomes and expenditures of the responding households. Five income components are considered: earnings (based on individual reports for the previous week); net (i.e., also taking account of outbound) remittances of both money and goods over the previous six months; net returns from sales of fish, crops, livestock, and handicrafts (based on household reports on an average month); the value of own-produced or own-captured food consumed by the household (based on household reports for the previous week); and other income from investments, pensions, rentals, etc. (based on household reports for the previous month). Household expenditures are recalled over the previous week, month or six months, depending on the particular item and an estimate of household consumption is formed from the sum of cash expenditures and the value of own-produced or own-captured food consumed by the household. All of the income and expenditure components are adjusted to an annual basis.

We use poverty standards that are based on existing poverty lines set for Samoa from the 2002 Household Income and Expenditure Survey. The higher "basic needs" poverty line had a value of ST$37.49 per adult equivalent per week and 20.3 percent of households had consumption expenditures below this level in 2002. The food poverty line, which was the required expenditure just for a minimum diet providing 2,200 kilocalories per adult per day, was calculated as ST$24.68 per week in 2002 (with 7.6 percent of households below this line). We use the Samoa CPI to update these poverty lines to October 2008 annual values of ST$2,962 and ST$1,850 which is equivalent to US$ $1,007 and $663 per adult equivalent per year.[10]

[8] The survey also covered a further 83 households drawn from an administrative frame with data on participants and applicants to the new RSE seasonal work migration scheme. These RSE households are not used in the current paper but future research will compare the impact of seasonal and settlement migration on the sending households.

[9] The group of unsuccessful applicants is smaller than might be expected from the current odds of winning the migration lottery because many applicants with a losing ballot re-enter the lottery in subsequent years (29% of registrations is 2006 were repeat registrations) and many households contain multiple applicants.

[10] The average exchange rate during the period of the survey was 2.94 Samoan Tala per US Dollar. In the absence of any nutritional-based adult-equivalence scales we assume that children count as 0.5 of an adult.

In addition to these two objective poverty standards, the SLMS also asked one adult respondent in each household about subjective poverty, using a 10-rung Cantril ladder question:

> "Please imagine a 10-step ladder where on the bottom, the first step, stand the poorest people and on the highest step, the tenth, stand the richest. On which step are you today?

The respondent for this question was either the adult in the household who held an unsuccessful ballot in the Samoan Quota lottery, or else a successful ballot but had not emigrated. In households with SQ emigrants and non-applicant households, the person in the age range from 18-45 whose birthday was coming next was the respondent.

3.4 Estimating the Impact of Migration Through the Samoan Quota

The Samoan Quota enables us to overcome the triple- and quadruple-selectivity issues more credibly than existing studies. Consider first the problem of estimating the overall average impact of migration on household income per capita in Samoa, as in equation (3) above. The random selection among SQ applicants provides a means of overcoming the first selectivity issue – that households self-select into migration. Households self-select into whether or not a member applies for the SQ, but among these applicants, whether or not they can migrate is random. Thus we restrict the sample for analysis to households with a member who applied to the SQ. The SQ policy rules provide a means for overcoming the second source of selectivity. The rules specify which individuals can migrate with a principal applicant – the spouse and dependent children. Thus, we restrict the sample further to drop households where all members would be eligible to move to New Zealand if they had a successful ballot. This involves dropping approximately 22 percent of the 121 unsuccessful ballot households in our sample, who would move their whole household to New Zealand if they had won the SQ lottery. Then, equation (5) is satisfied for this sub-sample of ballot applicant households where someone would remain even if a household member was successful in the SQ lottery.

If all households which won the SQ lottery sent a migrant to New Zealand then equation (4) would also be satisfied in this sub-sample. However, not all lottery winners moved to New Zealand – some may have changed their minds, others may still have been in the process of moving, while others may have been unable to find a job or failed another of the immigration requirements. In our sample of 86 households with ballot winners, 29 households (34%) did not have a member who had yet moved to New Zealand via the SQ, although 11 of these from the

most recent SQ ballots were in the process of moving to New Zealand. To overcome this drop-out bias, we employ the standard strategy in the experimental literature of using assignment to the treatment as an instrumental variable for the treatment itself. In other words, our instrumental variable is a dummy for whether a current or former household member had a successful ballot, whereas the treatment variable is whether someone from the household ever moved to New Zealand via the SQ.[11] Randomization ensures that success in the ballot is uncorrelated with unobserved individual attributes that might also affect outcomes amongst the stayer household members and success in the ballot also strongly predicts migration.[12]

What about the third source of selectivity, arising from return migration? In our sample, 4 out of the 86 households (4.7%) with ballot winners contained a member who had migrated to New Zealand through the SQ but who had subsequently returned to live in Samoa. Given the small number who have returned and our lack of credible instruments for identifying why some migrants return and others do not, we do not try and model the return process. Instead, we follow the strategy outlined in Section 2 of defining the object of interest as the impact of ever having had a household member emigrate through the SQ, regardless of whether or not they have returned. This allows for migration to still be influencing household income upon return, either through remittances and repatriated savings that are used for agricultural and business investments, or through skills and qualifications gained abroad.

Classifying return migrants in this way, restricting the sample to SQ ballot entrant households who would not all move if a member won the lottery, and using success in the lottery as an instrument for migration therefore enables us to consistently estimate the impact of migration. If the impact varies across households, the impact we identify is a local average treatment effect, which in our case is also the average treatment effect on the treated, since none of the households losing the lottery can migrate through the SQ and likely do not have access to other migration channels (Angrist, 2004). We believe that this parameter is a parameter of policy interest, since it is an unbiased estimate of the impact of migrating for a Samoan household that applies to migrate through the migration policy being offered, and does migrate if it is chosen.

[11] The non-compliers are then the households with someone holding a successful ballot who has not (yet) moved to New Zealand. This includes 'slow' compliers in the process of moving, since if we were to drop these households from the analysis we would also need to drop ballot loser households who only entered in the most recent SQ lotteries, reducing our sample size considerably.

[12] Validity of the instrument also requires that the ballot outcome does not directly affect our outcomes of interest conditional on migration status. We believe this is a quite innocuous assumption when examining outcomes such as household size, income and consumption.

The impact of migration is then measured for the remaining household members of SQ winner households. These remaining members are typically working-age and older adults who are either the parents and/or the siblings of the Principal Applicant, along with children who are often their nephews and nieces. Specifically, 41% of household members left behind are under 18 and are mostly nephews and nieces of the Principal Applicant and spouse, 39% are working-age adults and are mostly the siblings of the Principal Applicant and spouse, and the remaining 20% are older adults who are mostly the parents, aunts and uncles of the Principal Applicant and spouse.[13] Many migration policies worldwide allow migrants to bring their spouse and children, while making it difficult for them to bring other family members, so these remaining members are likely to be similar to the remaining family members seen in many other countries where permanent emigration is common (Gibson et al., 2009).

The initial impact of migration which we estimate is an average over households whose members have been abroad for varying amounts of time. At the time of our survey, the sampled Samoan households with SQ emigrants in New Zealand had a mean (median) time abroad for their former household members of 3.8 years (3.5 years). While nearly 37 percent of households were interviewed five or more years after eligible household members had emigrated to New Zealand, only 6 percent had been gone for more than six years. Thus, our sample covers both the short- and medium-run impacts of migration.

As discussed above, there are theoretical reasons to suspect that the effect of migration may vary with duration, thus we also estimate equation (6) for the sub-sample of households applying for the SQ lottery who would not all move in event of ballot success and using ballot success as an instrument for migration. Identification of the duration effect requires overcoming the fourth selectivity discussed in section 2, e.g. that there is not selection among the timing of migration. The Samoan Quota provides us with a plausible reason why households sent migrants at different points in time – they just happened to have their ballot drawn in different rounds. We would still be concerned about selectivity if the characteristics of households applying (and thus of those winning) in different years differ significantly. Our sample sizes are too small to examine year-to-year variation in household characteristics, but, as a simple check, we compare the characteristics of ballot winner households with members abroad for less than the median

[13] While the survey asked for the age, gender and year of emigration of all previous household members, it did not collect data on the exact relationship between the emigrant Principal Applicant and the household members left behind.

duration to those abroad for more than the median duration. The results suggest that there is little selection into when individuals entered the SQ ballot over the years considered here.

In estimating equation (6), we classify return migrants as migrant households. Since data is not available on when the return migrants first left for New Zealand, we assume they departed at the mean time abroad, 3.8 years.[14] We then instrument the interaction between duration abroad and migrant status with the interaction between duration abroad and ballot success. This enables us to arrive at estimates of how the impact of migration varies with duration that overcome the quadruple-selectivity issues that have prevented previous research from being able to do this.

3.5. Verifying Randomization

We first test whether the lottery correctly randomises households into a treatment and a control group by examining whether the households containing ballot losers are statistically different from the households containing ballot winners (both the emigrant-sending households and the non-compliers). As discussed above, attention is restricted to households where some members would have stayed according to the age and relationship rules on which Secondary Applicants may accompany the Principal Applicant if they had a successful ballot and moved to New Zealand. Table 1 compares the ex-ante pre-migration characteristics available from the survey for ballot winners to those who were unsuccessful. While the means are mostly the same, we find significant differences in the size of the households, the number of children in the household (which explains the entire difference in overall size), the proportion of working age adults who are female and the mean age of working-age adults.

Unfortunately, we did not collect information on whether each household member at the time of the survey resided in the household when the SQ winners emigrated in the past. Thus, these differences between ballot winners and losers may just reflect changes in household composition that occurred after the SQ migrants emigrated and were potentially caused by this subsequent change in household composition. We feel this is quite plausible given the length of time that has passed since migration. Thus, in all our experimental estimates, we present regression results with and without controls for these characteristics to examine the robustness of

[14] We also make this same assumption for one household with a SQ migrant in New Zealand that does not report how long ago they emigrated. Given the small number of return migrants, our results are robust to alternative assumptions about their duration of migration.

our findings to small sample differences in the treatment and control group and changes in household composition that are potentially causally linked with winning the lottery.

4. Experimental Estimates of the Impacts on Income and Poverty

In this section, we present experimental estimates of the impact on income and poverty of sending household members to New Zealand under the Samoan Quota. As discussed above, here the age and relationship rules governing which Secondary Applicants can move with the Principal Applicant are used to identify and drop control group households where all members would have moved to New Zealand if they had a successful ballot. To illustrate the selectivity problem that results from these all-move households, we also report estimates from when these households are added back into the control group.

4.1. The Impact on Household Size and Composition

We begin by examining the impact of emigration on household size and composition, since one immediate effect is that there are "fewer mouths to feed". The impact of having some household members migrate to New Zealand on household size and composition is shown in Table 2. These results are unweighted and thus indicate the change in household size for the average household. Emigration leads to a significant reduction in household size. The mean household among unsuccessful applicants households that are not entirely composed of individuals who would have migrated had the ballot been won has 8.2 people, and emigration is estimated to reduce this by 1.2-1.9 people. Emigration leads to households having, on average, 0.8 fewer prime-age adults and 0.1-0.9 fewer children. There is no change in the number of older adults (>45 years), which is reassuring since they are not eligible to move as Secondary Applicants.

The third panel in Table 2 interacts the indicator for whether a household has had members emigrate to New Zealand with a continuous variable measuring how long ago these members first emigrated. Thus, the main effect in this table shows the immediate impact of emigration on household size, while the interaction term shows how this impact changes over time. The results here indicate that the immediate impact on household size is larger than the average impact with emigration reducing household size by 2.2 people (by 1.0 prime-age adults and 1.1 children) at the time of emigration, but that this impact is counteracted by inflows into

the household of 0.1 new members for each year that the migrants are gone. This panel also shows the total estimated impact for households that emigrated 1, 3, and 5 years ago. This shows that while household size is reduced by 2.1 individuals in the short-term (e.g. one year after migration), the impact is reduced to 1.8 individuals in the medium-term (e.g five years after migration). This is consistent with our findings in the previous section that households with successful ballots have more 'stayer' members than those with unsuccessful ballots.

Because of the structure of the SQ policy rules, whole households which move are smaller than stayer households. As can be seen in the fourth panel of Table 2, failure to remove "all move" ballot losers therefore causes us to understate the fall in household size from migration. This potentially leads to an overstated positive impact of migration on per capita household resources because the incorrect inference suggests the 'treated' households are bigger than they are, in fact, and uses similarly larger households as counterfactuals.

4.2. The Impact on Total Household Resources

We next examine the impact of emigration on household total resources and the composition of household income (Table 3). Since emigration changes household size and demographic composition these measures are not necessarily good proxies for individual welfare. However, they do show the ways in which households adjust their economic activities in response to emigration. Again, these results are unweighted and thus indicate the change in total resources for the average household.

The point estimates suggest that households which sent emigrants have larger total household income and consumption than households who were unsuccessful in the lottery, but large standard errors on these estimates make the estimates statistically insignificant. The results in Table 3 show a change in the composition of household income. Income from agricultural production and remittances are significantly higher, while household labour earnings are lower (but not significantly so). Subsistence income, which is agricultural production for own consumption rather than sale, also appears larger, but not significantly so.

The third panel of table 3 then examines duration effects. We see a significant negative duration effect on agricultural income, and a similar, but insignificant effect on remittances and subsistence income. One explanation for this might be that emigrants work extra hard on the gardens of their sending families before they leave, in order to plant extra crops which can

provide their families with income and food in the first year while the migrant is away. We have received reports of this occurring for workers participating in the new seasonal worker program. The effect of this would then dissipate after the first year's crops are harvested. An alternative explanation might be that the increase in remittances received in the first year are being used to purchase fertilizer and other agricultural inputs to increase production, and then as remittances appear to fall with duration, less of this occurs. Our survey does not allow us to test these hypotheses.

Conversely, the results suggest that household labor earnings may increase with time spent abroad, possibly as remaining household members adjust to the absence of the migrants, and/or as they adjust their labour supply in response to the declining remittance and agricultural income. However, the point estimates suggest that this is not enough to offset a decline in total household income relative to the initial impact as emigrants spend more time abroad. However, our small sample size among the treatment group means that we can not reject that income and its components other than agricultural income instead are level over time, despite the sizeable economic significance of the point estimates.

If all-move households were not removed from the control group, the estimated impact of sending emigrants would have been similar, as seen from the last panel of Table 3. The reason is that even though the all-move households have fewer members than the other households with lottery losers, they have higher income and consumption per capita. Hence, when examining total income and consumption wrongly including the all-move households in the control group does not have a qualitative impact on the results.

4.3. The Impact on Per Person Resources

We next examine the impact of emigration on per person resources (Table 4). We now variance weight the estimates by household size and hence the results indicate the change in per person resources for the average individual. These results show that left behind household members are better off in comparison to members of households with lottery losers. Average consumption is approximately 23-31 percent higher in per adult-equivalent terms and income is approximately 21-25 percent higher (although not statistically significant). Since the change in income and consumption are largely the same, it suggests that these changes associated with emigration and remittances are being viewed as shocks to permanent income by the left behind

households. There is some weak evidence that these gains become smaller over time, both because household size is rising and because the income gains are declining. However, these results are also consistent with the impacts being independent of how long the emigrants have been gone. The impact of emigration on consumption is smaller when all-move households are included in the control group because, as discussed in the previous section, these households have higher per capita consumption than other households with lottery losers.

4.4 The Impact on Poverty

Our final table examines the impact of emigration on poverty (Table 5). Again, we variance weight the estimates by household size and hence the results indicate the change in poverty for the average individual. The poverty rate amongst individuals living in households that sent Samoan Quota emigrants is 20-24 percentage points lower using the basic needs poverty line. Since the poverty rate amongst individuals in households with lottery losers is 37 percent, this represents a 55-65 percent reduction in headcount poverty. However, there is no measured effect of emigration on the food poverty rate which captures deeper poverty (with only 12 percent of the lottery loser households below this line), nor is there any effect on the poverty gap ratio at either poverty line. Moreover, the impact on the subjective poverty reported by an individual adult respondent in each household is not only statistically insignificant but also suggests that individuals in emigrant-sending households see themselves as worse off (by around one-half of a rung on the 10-rung ladder). Again, there is some weak evidence that any possible poverty reduction declines over time, but the years since migration term is neither significant nor the same sign across different poverty measures.

If the households where everyone would emigrate are wrongly included in the control group, the estimated poverty-reducing impact of emigration is slightly attenuated and becomes less significant (bottom panel of Table 5). The reason as before is that the all-move households have higher individual welfare levels than the other households with lottery losers, so including them in the control group closes the gap with the emigrant-sending households.

5. Conclusions

The main difficulty in estimating the impacts of emigration on household members left behind is posed by selectivity issues. A common research strategy in this literature is to use

household survey data to compare outcomes for households where some members have emigrated to outcomes for those where all members are currently in the particular sending country being examined. Such comparisons are complicated by a triple-selectivity problem: first, households self-select into emigration; second, in some emigrant households everyone moves (and thus are almost never included in survey data on the sending country); third, some emigrants choose to return home, so their household may (wrongly) be considered as not being affected by emigration.

In this paper, we have shown how these selection problems invalidate the approaches used in most of the existing literature and we have addressed these selectivity problems by using survey data designed specifically to take advantage of a randomized lottery that determines which applicants to the over-subscribed Samoan Quota (SQ) may immigrate to New Zealand. These data allow us to compare incomes and poverty amongst left behind members in households in Samoa that sent SQ emigrants with incomes and poverty of similar households that were unsuccessful in the lottery. This random lottery solves the problem of self-selection into migration. The SQ policy rules control who can accompany the principal migrant, thus we also have an instrument to address the second selectivity problem. Finally, our survey includes a module that captures the experiences of the small number of households that have members who once were SQ emigrants but decided to return home to Samoa, allowing us to address the third selectivity problem. We find that the average effect of migration has been to increase per adult-equivalent consumption and to reduce poverty among household members remaining in Samoa, with income rising by about the same amount as consumption, although the estimated effect for income is not significant.

In addition to forming experimental estimates of the average impact of migration on left behind household members, we estimate models which allow for duration dependent heterogeneity in these impacts. There are a number of theoretical reasons why the impact of migration on sending households is likely to vary with the duration of migration, and there are indeed reasons to believe that not just the magnitude, but also the sign, of any effects may differ in the short- and medium-term. While our sample size is small for precise estimation of such effects, we do find suggestive evidence that allowing for this type of heterogeneity may be important in practice. Our point estimates suggest that income among sending households decays as SQ migrants spend increasing time in New Zealand, with agricultural income, remittances and

subsistence income declining with duration. While these results are only suggestive, they do point to a need for other studies with larger samples to model seriously the multiple sources of selection and to not assume a homogenous impact of migration with time spent abroad.

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Table 1: Tests of Randomization

	Successful Ballot	Unsuccessful Ballot	T-Test P-Value
Stayer Household Characteristics (n=174)			
Size of the Stayer Household	6.7	5.1	0.002
Number of Adults 18-45 Among Stayers	2.8	2.6	0.623
Number of Children <18 Among Stayers	3.1	2.3	0.035
Number of Adults >45 Among Stayers	1.2	1.4	0.152
Proportion of Adults 18-45 Who Are Female	0.48	0.38	0.019
Mean Age of Stayer Adults	31.4	28.5	0.001
Mean Years of Education of Stayer Adults	13.5	13.5	0.982
Located in Apia	0.21	0.24	0.618
Located in Northwest Upolu	0.35	0.30	0.466
Located in Savai'i	0.25	0.18	0.269

Note: Characteristics are typically measured 0-6 years after randomisation.

Table 2: Impact of Migration on Household Size and Composition

	Total Household Size	Adults Aged 18 to 45	Children Aged under 18	Adults Aged over 45
Panel A: Experimental Estimates without Controls				
Impact of Migration	-1.17*	-0.83***	-0.08	-0.25
	(0.66)	(0.31)	(0.48)	(0.18)
Panel B: Experimental Estimates with Controls				
Impact of Migration	-1.86***	-0.81***	-0.87***	-0.19
	(0.32)	(0.17)	(0.21)	(0.19)
Panel C: Experimental Estimates by Years in New Zealand with Controls				
Impact of Migration	-2.17***	-0.95**	-1.07**	-0.15
	(0.74)	(0.39)	(0.46)	(0.43)
Added Impact of Each Year in New Zealand	0.08	0.04	0.05	-0.01
	(0.13)	(0.06)	(0.08)	(0.08)
Impact of One Year in New Zealand	-2.09***	-0.91***	-1.02**	-0.16
	(0.63)	(0.33)	(0.39)	(0.36)
Impact of Three Years in New Zealand	-1.93***	-0.84***	-0.91***	-0.18
	(0.40)	(0.22)	(0.26)	(0.24)
Impact of Five Years in New Zealand	-1.78***	-0.77***	-0.81***	-0.20
	(0.26)	(0.13)	(0.17)	(0.16)
Mean for Unsuccessful Stayer Households	8.23	3.53	3.31	1.39
Sample Size	174	174	174	174
Panel D: Experimental Estimates without Controls, including Unsuccessful All Mover Households				
Impact of Migration	-0.63	-0.51	-0.11	-0.01
	(0.66)	(0.31)	(0.47)	(0.19)
Sample Size	207	207	207	207

Note: Experimental Estimates are IV estimates where migration is instrumented with the SQ ballot outcome. Controls are the number of adult and child stayers in the household, whether there are any adult stayers in the household, the proportion of adult stayers who are female, the average age for adult stayers, the highest education level of stayer adults, and the location of household in Samoa. All standard errors and significant tests are robust to arbitrary heteroskedasticity.

*, **, and *** indicate significance at the 10%, 5% and 1% levels.

Table 3: Impact of Migration on Total Resources and Components of Household Income

	Total Income	Household Labor Earnings	Agricultural Income	Subsistence Income	Net Remittances	Total Consumption
Panel A: Experimental Estimates without Controls						
Impact of Migration	2,358	-1,172	976**	669	1,954***	2,393
	(3325)	(3168)	(393)	(695)	(694)	(2587)
Panel B: Experimental Estimates with Controls						
Impact of Migration	472	-2,373	1,090**	944	1,379*	2,818
	(3571)	(3165)	(430)	(735)	(777)	(2975)
Panel C: Experimental Estimates by Years in New Zealand with Controls						
Impact of Migration	4,677	-3,831	2,770***	1,994	2,989*	4,340
	(8235)	(7351)	(1026)	(1705)	(1769)	(6729)
Added Impact of Each Year in New Zealand	-1,073	371	-428**	-267	-415	-392
	(1462)	(1305)	(183)	(301)	(314)	(1198)
Impact of One Year in New Zealand	3,604	-3,459	2,342**	1,727	2,574*	3,948
	(6957)	(6092)	(938)	(1444)	(1452)	(5891)
Impact of Three Years in New Zealand	1,458	-2,717	1,486***	1,192	1,743*	3,165
	(4611)	(4034)	(563)	(947)	(936)	(3785)
Impact of Five Years in New Zealand	-687	-1,975	630	657	913	2,382
	(3121)	(2847)	(397)	(653)	(651)	(2362)
Mean for Unsuccessful Stayer Households	22,860	14,377	443	3,785	2,227	25,143
Sample Size	171	171	171	169	170	170
Panel D: Experimental Estimates without Controls, including Unsuccessful All Mover Households						
Impact of Migration	4,474	365	1,660***	807	2,304***	2,372
	(3465)	(3185)	(554)	(689)	(729)	(2760)
Sample Size	202	202	202	202	202	202

Note: Experimental Estimates are IV estimates where migration is instrumented with the SQ ballot outcome. The observations with the five highest values on each outcome are excluded from the regression. Controls are the number of adult and child stayers in the household, whether there are any adult stayers in the household, the proportion of adult stayers who are female, the average age for adult stayers, the highest education level of stayer adults, and the location of household in Samoa. All standard errors and significant tests are robust to arbitrary heteroskedasticity.

*, **, and *** indicate significance at the 10%, 5% and 1% levels.

Table 4: Impact of Migration on Per Adult Equivalent Resources

	Income Per Adult Equivalent	Log Income Per Adult Equivalent	Consumption Per Adult Equivalent	Log Consumption Per Adult Equivalent
Panel A: Experimental Estimates without Controls				
Impact of Migration	961	0.21	980*	0.23*
	(612)	(0.17)	(548)	(0.12)
Panel B: Experimental Estimates with Controls				
Impact of Migration	930	0.25	1,362**	0.31**
	(632)	(0.19)	(575)	(0.13)
Panel C: Experimental Estimates by Years in New Zealand with Controls				
Impact of Migration	2,152	0.68	1,956	0.38
	(1537)	(0.45)	(1404)	(0.32)
Added Impact of Each Year in New Zealand	-323	-0.11	-157	-0.02
	(286)	(0.08)	(261)	(0.06)
Impact of One Year in New Zealand	1,829	0.57	1,799	0.36
	(1294)	(0.39)	(1268)	(0.30)
Impact of Three Years in New Zealand	1,182	0.34	1,485*	0.32*
	(836)	(0.26)	(778)	(0.19)
Impact of Five Years in New Zealand	536	0.12	1,170**	0.28**
	(519)	(0.18)	(481)	(0.11)
Mean for Unsuccessful Stayer Households	3,533	7.93	3,983	8.15
Sample Size	172	172	172	172
Panel D: Experimental Estimates without Controls, including Unsuccessful All Mover Households				
Impact of Migration	1,081*	0.23	549	0.14
	(606)	(0.17)	(553)	(0.12)
Sample Size	202	202	202	202

Note: Experimental Estimates are IV estimates where migration is instrumented with the SQ ballot outcome. The observations with the five highest values on each outcome are excluded from the regression. Controls are the number of adult and child stayers in the household, whether there are any adult stayers in the household, the proportion of adult stayers who are female, the average age for adult stayers, the highest education level of stayer adults, and the location of household in Samoa. All standard errors and significant tests are robust to arbritary heteroskedasticity. Estimates are variance weighted by household size.
*, **, and *** indicate significance at the 10%, 5% and 1% levels.

Table 5: Impact of Migration on Poverty Among Remaining Household Members

	Poverty Headcount Basic Needs Line	Poverty Headcount Food Poverty Line	Poverty Gap Basic Needs Line	Poverty Gap Food Poverty Line	Subjective Poverty Ladder
Panel A: Experimental Estimates without Controls					
Impact of Migration	-0.20*	-0.01	-0.03	-0.01	-0.49
	(0.10)	(0.07)	(0.04)	(0.02)	(0.48)
Panel B: Experimental Estimates with Controls					
Impact of Migration	-0.24**	0.00	-0.04	-0.02	-0.55
	(0.11)	(0.08)	(0.04)	(0.02)	(0.52)
Panel C: Experimental Estimates by Years in New Zealand with Controls					
Impact of Migration	-0.35	0.11	-0.03	0.01	-0.97
	(0.28)	(0.20)	(0.11)	(0.06)	(1.26)
Added Impact of Each Year in New Zealand	0.03	-0.03	0.00	-0.01	0.11
	(0.05)	(0.04)	(0.02)	(0.01)	(0.23)
Impact of One Year in New Zealand	-0.32	0.08	-0.03	0.00	-0.86
	(0.26)	(0.21)	(0.11)	(0.06)	(1.03)
Impact of Three Years in New Zealand	-0.26	0.02	-0.04	-0.01	-0.64
	(0.16)	(0.13)	(0.07)	(0.04)	(0.66)
Impact of Five Years in New Zealand	-0.20**	-0.04	-0.05	-0.03	-0.41
	(0.10)	(0.07)	(0.04)	(0.02)	(0.42)
Mean for Unsuccessful Stayer Households	0.366	0.120	0.095	0.033	5.44
Sample Size	174	174	174	174	167
Panel D: Experimental Estimates without Controls, including Unsuccessful All Mover Households					
Impact of Migration	-0.17*	0.00	-0.02	-0.01	-0.62
	(0.10)	(0.07)	(0.04)	(0.02)	(0.47)
Sample Size	202	202	202	202	194

Note: Experimental Estimates are IV estimates where migration is instrumented with the SQ ballot outcome. Controls are the number of adult and child stayers in the household, whether there are any adult stayers in the household, the proportion of adult stayers who are female, the average age for adult stayers, the highest education level of stayer adults, and the location of household in Samoa. All standard errors and significant tests are robust to arbritary heteroskedasticity. Estimates are variance weighted by household size.

*, **, and *** indicate significance at the 10%, 5% and 1% levels.

Appendix Table 1: Sample Size

	Full Sample	Dropping All Movers	Percent All Movers
	Individuals		
Successful Ballots - Migrants	364		
Successful Ballots - Non-Compliers	227	140	38%
Successful Ballots - Return Migrants	34	12	65%
Unsuccessful Ballots	930	481	48%
Non-Applicants	2840	1241	56%
	Households		
Successful Ballots - Migrants	53	53	
Successful Ballots - Non-Compliers	29	23	21%
Successful Ballots - Return Migrants	4	4	
Unsuccessful Ballots	121	94	22%
Non-Applicants	415	285	31%

Note: Successful Ballots - Migrants only includes ballot winners with former household members remaining in Samoa

Relationship to Head in Migrant Households	Percent
Adults 18-45	38.8%
Children	40.8%
Older Adults	20.3%

Note: The non-dropped principal applicants, spouses and own/adopted children are outside the age range eligible for the Samoa Quota.