The Long-Term Impact of International Migration on Economic Decision-Making: Evidence from a Migration Lottery and Lab-in-the-Field Experiments[*]

John Gibson, *University of Waikato*

David McKenzie, *World Bank*

Halahingano Rohorua, *University of Waikato*

Steven Stillman, *Free University of Bozen-Bolzano*

Abstract:

We study how migrating from a poor country to a rich country affects economic beliefs, preference parameters, and household decision-making efficiency. In a ten-year follow-up survey of applicants to a migration lottery program we elicit risk and time preferences and pro-market beliefs for the migrants and the unsuccessful applicants. The successful and the unsuccessful applicants are each linked to closest relative households, who would stay in the home country if the applicant moved, to play lab-in-the-field games that measure intra-family trust and the efficiency of intra-family decision-making. Despite the large permanent income shock from migrating, there are no significant impacts on risk and time preferences, pro-market beliefs, or decision-making efficiency of transnational households. This stability in the face of such a large and life-changing event lend credence to economic models of migration that treat these determinants of decision-making as time-invariant.

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1. Introduction

Moving from a developing to a developed country is one of the most powerful ways for poor people to raise their incomes and improve their overall living standards, with the gains experienced in household well-being greatly exceeding those from other popular development interventions like microfinance, conditional cash transfers, and ultra-poor programs (Clemens, 2011; Gibson and McKenzie, 2014; Clemens and Pritchett, 2016). The classic economic model of the migration decision (Sjaastad, 1962) has individuals compare the costs of migrating with the present discounted value of the income earned from migrating. Later models emphasized the role of risk, and that migration was often the decision of a household rather than just an individual (Stark and Bloom, 1985; Rosenzweig and Stark, 1989). The result is that households will take part in migration provided that the discounted expected utility of migrating exceeds the costs of doing so, provided liquidity constraints don't bind.

Inherent in these models are the assumptions that migration does not result in changes in the discount rate, in risk preferences, in the utility function, or in the efficiency of the intra-household decision-making process that solves this optimization problem. Such assumptions are standard in most economic models, which typically considers preferences as "deep" parameters (or "primitives") invariant to policy (e.g. Lucas, 1976; Wolpin, 2013). Failure of these assumptions could result in inconsistent decision-making, with migration potentially appearing utility-maximizing before migration, but not utility-maximizing afterwards (or vice-versa), even if the earnings gains from migration turn out exactly as expected.

However, recent literature has questioned the extent to which such preferences are stable (Schildberg-Hörisch, 2018). A notable set of studies have highlighted changes in risk preferences after negative shocks. These include Eckel et al. (2009) who find Hurricane Katrina evacuees exhibit more risk-loving behavior after the disaster, Malmendier and Nagel (2011) who find individuals who experience low stock market returns are less willing to take financial risks, Cameron and Shah (2015) who find individuals who recently suffered floods or earthquakes exhibit more risk-aversion, and Callen et al. (2014) who find individuals who experienced violence in Afghanistan exhibit a higher preference for certainty. Temporary poverty has also been found to increase discount rates (Carvalho et al, 2016), with individuals exhibiting higher discount rates before pay-day than afterwards. Nevertheless, a recent overview by Chuang and Schechter (2015) notes that even in the case of these negative events, the literature has not delivered a consistent set of results regarding preference stability and many papers have struggled to obtain appropriate control groups. They also show that in the case of less extreme shocks like changes in income, unemployment, health status, and family composition many studies have found no changes in risk and time preferences.

In this paper, we consider the stability of economic beliefs, preferences, and transnational household efficiency in the context of the major positive change in life circumstances that comes from moving from a poor country to a rich country. The context is Tongans migrating to New Zealand through a lottery program. This involves at least three major changes in their life circumstances. The first is a massive, and permanent increase in income. In earlier work (McKenzie et al, 2010), we show that migrating results in a 263 percent gain in income within the first year, while in recent work (Gibson et al, 2018), we show this income gain appears approximately stable over time, with migrants continuing to earn almost 300 percent more than non-migrant applicants to this lottery 10 years later, for an approximate life-time net present value income gain of US$250,000.[1] Second, this gain is accompanied by a major change in the institutions, values, and culture that individuals are exposed to, with migrants experiencing a more individualistic and market-oriented economy. Third, it involves a prolonged separation from extended family members, with migrants moving with their spouse and children, but leaving their parents and siblings behind in Tonga. Such large, comprehensive, and permanent changes in life circumstances provide a stringent test of the malleability of economic preferences and beliefs.

We use a long-term follow-up survey of individuals who applied to the migration lottery ten years earlier, with comparison of the winners and losers in this lottery enabling us to obtain causal estimates of the impact of migrating. We measure risk aversion using both survey questions and incentivized experimental games, and time preferences through survey questions. We examine the extent to which individuals have changed their economic beliefs using the pro-market beliefs questions of di Tella et al. (2007). Each applicant is then linked to a closest relative household in Tonga that contains either their parent or sibling, who are types of relatives that cannot accompany a successful lottery applicant when they migrate. The migrants are therefore in a different country from this relative, while the control group of unsuccessful applicants, who are non-migrants, are often living in the same village, and in a few cases, even in the same dwelling as the closest relative. Principal applicants and their relatives then play three variants of an incentivized trust game in order to measure the efficiency of extended-household decision-making.

Despite the large changes in life circumstances that winning the migration lottery entails, we find that migrating has no significant impact on any of our measures of preferences and beliefs. This includes a lack of significant effect on any of five different measures of risk preferences, any of three different measures of time preferences, any of four different measures of pro-market beliefs, and any of five different measures of household efficiency. A standard question about null results is whether they reflect a lack of

[1] This gain is similar when adjusting for differences in purchasing power in Tonga versus New Zealand.

impact, or simply a lack of statistical power. We address this issue in two ways. First, we show that when considering the results for specific outcomes, our confidence intervals do not contain the large impacts seen in other studies in the literature. Secondly, we follow Young (2016) in conducting a randomization-inference based omnibus test of overall significance of all these outcomes and fail to reject the null that there is no treatment effect whatsoever (p=0.738). We then show that we would reject such a test if there had been even relatively small (0.1 standard deviation) average impacts of migrating on preferences and beliefs. This stability in the face of such a large and life-changing event lends credence to economic models of migration that treat these determinants of decision-making as time-invariant.

The remainder of the paper is structured as follows: Section 2 describes the context in which this migration flow is occurring, and describes the survey and estimation strategy; Section 3 reports on impacts on risk and time preferences; Section 4 covers the impact on pro-market beliefs; Section 5 reports on the impact on interactions with closest relatives and on household efficiency; Section 6 discusses statistical power and external validity issues, and Section 7 concludes.

2. Context and Survey

2.1 Country Context

The Kingdom of Tonga is an archipelago of islands in the Pacific, with a resident population of just over 100,000. It has a gross national income (GNI) per capita of $5,069 (in 2011 PPP$), slightly less than that of India, and ranks 132nd out of 188 countries.[2] Average income in New Zealand is approximately six times as high, at $32,689. Both countries rank 32 places higher in the Human Development Index than they do in terms of per capita GNI.

Tonga has been and continues to be a less market-oriented economy than New Zealand. The Index of Economic Freedom ranks New Zealand third in the world, as a free, modern, and competitive economy, while Tonga is ranked as "mostly unfree" at 95th in the world, between Swaziland and the Kyrgyz Republic (Heritage Foundation, 2016). Tongan society has historically been highly stratified, with a monarch and aristocracy controlling resources and a largely subsistence-oriented economy. The extended family plays an important role, with the kinship system expected to provide for everyone's financial needs and a strong culture of sharing and reciprocity (makafetoli'aki) (Ketu'u, 2014). However, over-time the economy has become more market-oriented, with individuals combining remittance income from abroad with income

[2] All statistics in this section are from the *2015 Human Development Report* (UNDP, 2015).

from farming and wage labor to purchase market goods and the Mormon church influence emphasizing a role for individual achievement (Addo and Besnier, 2008).

Emigration out of Tonga has been high, with more than 30,000 Tongan-born living abroad, mainly in New Zealand, Australia and the United States. Remittances from these migrants were equivalent to 28 percent of GDP in 2014 (World Bank, 2016), the fourth-highest in the world. Since the 1990s the main channels of emigration have tended to be through family reunification categories as destination countries imposed points-based systems for work migration that favored highly skilled migrants. In 2002, New Zealand introduced a new migration pathway, the Pacific Access Category (PAC). This allows a quota of 250 Tongans to permanently migrate each year. Any Tongan citizen aged 18 to 45 who meets certain English, health, and character requirements can register for this program and a lottery (random ballot) is used to select amongst the applicants. The odds of success were approximately eight percent during the 2002-05 years that our sample is drawn from. If their ballot is drawn, applicants have six months to find a full-time job offer in New Zealand, and then may immigrate with their spouse and any unmarried children aged under 24.[3] In contrast, any other family members, such as their parents and siblings, are ineligible to accompany them under the PAC rules and are difficult to subsequently sponsor under family reunification categories which primarily provide for marriage migration or which require an income or wealth threshold to be exceeded that excludes most Tongans.

2.2 Survey

Our initial work using this lottery was based on a survey that interviewed a subsample of applicants to the 2002-2005 ballots approximately one year after they had moved to New Zealand, and this showed immediate large gains in income to the principal applicants who migrated (McKenzie et al, 2010). This sample includes just over one-third of the migrants who moved to New Zealand, mainly because we were not allowed to contact many of the others who were reserved for the sample frame of an official government survey of various immigrant streams taking place at the same time. In late 2012, the research team received permission from the immigration authorities to access the names of all PAC ballot winners from the 2002 to 2005 ballots. There were a total of 4,696 applicants, of whom 367 won the random lottery and were allowed to move to New Zealand. Official records based on passport scans showed that, by late 2012, 307 of these winners (84%) had approved residency applications and had ever migrated to

[3] See McKenzie et al. (2010) for more details on the PAC program.

New Zealand, while the remaining 60 winners did not migrate and are thus non-compliers to the treatment of migration.

Our goal was to interview all of the ballot winners in New Zealand along with a random sample of ballot losers and non-compliers for our new survey.[4] For migrants, we were provided with only their names and address details from seven to ten years earlier. Using this information, and an extensive, long, and expensive tracking procedure (described in more detail in Gibson et al, 2018) in both New Zealand and Tonga, between late 2013 and early 2015, we attempted to locate all ballot winners in New Zealand and interview them. Even less information was available for ballot losers and non-compliers and so we used the home villages in Tonga of the migrants to create random samples of these groups.[5] Our main survey approach was face-to-face interviewing using an extensive survey that asked about employment outcomes, took physical health measurements, asked about preferences, and played incentivized lab-in-the-field games which we describe in detail later in the paper. Each principal applicant in this long survey was linked to a closest relative, defined as either a parent or sibling, who, according to the PAC rules, would not be eligible to move to New Zealand even if the principal applicant was a ballot winner. These relatives were used for the household efficiency game described in Section 5.

We supplemented this long, in-person, survey with a shorter telephone-based survey designed to reach those who had on-migrated from New Zealand or who were in less accessible parts of New Zealand. Given that surveying often uncovers details for other people (through snowball effects), we also gave this short survey to some recently identified migrants in areas where the longer survey had already been fielded, as well as to additional households in Tonga.

Figure 1 details the sampling procedure by group. Altogether we have a sample of 282 principal applicants who received the long survey and played all the lab-in-the-field games, comprised of 133 migrants (out of 307 in total), 6 non-compliers (out of 60 in total), and 143 ballot losers (out of 4,329 in total). We have an additional 103 principal applicants who were given the short survey (61 migrants, 3 non-compliers, and 39 ballot losers) for a total sample of 385 principal applicants. In the end, we were able to survey 64 percent of the principal applicants who had ever migrated to New Zealand (Figure 1). Non-compliers were sampled at a lower rate so we use the administrative data to reweight the migrant and non-complier

[4] For individuals in Tonga, we surveyed as many as our budget would allow. Our previous work showed many outcomes for non-compliers are, on average, identical to those for ballot losers. Hence, little is gained by trying to survey the non-complier group more extensively.

[5] Villages in Tonga average about 90 dwellings and so door-to-door methods are a feasible way to locate ballot losers and non-migrant winners.

samples to be representative of all ballot winners. We intentionally surveyed only enough ballot losers to optimize the power to detect impacts of migration. Across all of the samples the refusal rate amongst those we contacted for interview was less than two percent. Note that due to the new sampling frame, this was the first time being interviewed for approximately half of our sample, while it had been at least six years since the other half had been interviewed.

Table 1 then provides some basic summary statistics for the ballot winners and ballot losers. Given the time that has passed since individuals applied for the ballot, we unfortunately have few pre-determined characteristics on which to check balance: age, gender, and place of birth.[6] We see that the principal applicants are age 41 on average, two-thirds are male, and almost one-quarter were born in the outer islands. Although the ballot losers are slightly older, a joint test of orthogonality cannot reject the null hypothesis that age, gender, and birthplace are unrelated to treatment status (p=0.306). This suggests that our treatment (ballot winner) and control (ballot loser) samples are comparable and we can use the random assignment provided by the lottery to assess causal impacts. Nevertheless, we condition on age, gender, and island of birth to improve power and control for any effect of this slight difference in age.

The second half of Table 1 then shows characteristics that can change with migration. As shown in Gibson et al. (2018), winning the ballot results in substantially higher incomes for the principal applicants – an average of NZ$410 per week for the ballot winners compared to NZ$126 per week for the ballot losers.[7] Many of the migrants also undertake some tertiary schooling after arrival in New Zealand, resulting in an additional year of education on average for the ballot winners. However, note that the ballot losers still average 12 years of schooling. As a result, education levels are high enough that there should not be a problem for participants to understand the experimental games (and indeed similar games have been used in populations with average schooling of half this level (Chuang and Schechter, 2015)). Both the ballot winners and losers have an average household size of around five persons, where household here refers to individuals living in the same dwelling.[8] We see also from Table 1 that the average migrant has spent just over nine years in New Zealand.

[6] In Gibson et al. (2018), we show that the impact of migration on income is stable over time and that households in our new survey have similar characteristics to those in the original survey used to estimate the short-run impacts of migration. Taken together, this suggests that our new sample is well balanced.

[7] Over the survey period the Pa'anga exchange rate averaged 0.65 NZD, and had a range of just three NZ cents. To allow comparison with results from other countries, the NZD-USD exchange rate averaged 1.33 over this period. The income gain is similar in PPP terms (see Gibson et al, 2018).

[8] This reflects both the establishment and growth of independent households in New Zealand among the ballot winners and a trend towards living in a nuclear family in Tonga as households age.

2.3 Estimation Strategy

We estimate two parameters throughout. The first is the *intention-to-treat* (ITT) effect, of being offered the opportunity to migrate through the Pacific Access Category irrespective of whether the individual does migrate. We estimate the ITT through the following equation for a particular outcome for individual or household *i:*

$$Outcome_i = \alpha + \beta BallotWin_i + \gamma X_i + \varepsilon_i \quad (1)$$

Where *BallotWin* takes value one if the principal applicant was chosen in the 2002 to 2005 Pacific Access Category ballots and zero otherwise, and *X* is a vector of controls for the pre-determined characteristics (age, gender, and island of birth), for survey type (long or short), and for each of the different PAC ballot years that the individual entered. The median and modal applicant in our sample entered only one of the ballot years between 2002 and 2005. However, given that those who entered multiple times had a higher probability of getting chosen, we correct for this by conditioning on the lotteries entered (Abdulkadiroglu et al, 2011).

Second, we use assignment to the treatment (winning the PAC lottery) as an instrumental variable (IV) for the actual treatment of migrating, in regressions like:

$$Outcome_i = \mu + \lambda * Migrate_i + \delta X_i + \omega_i \quad (2)$$

where $Migrate_i$ is a dummy variable that equals one if person *i* ever migrated to New Zealand and is zero otherwise. The IV estimator of $\hat{\lambda}$ is a Local Average Treatment Effect (IV-LATE), interpreted in this case as the impact of migrating on people who would migrate only if they won the PAC lottery and not otherwise.[9] Winning the PAC ballot is a strong instrument for migration, with Appendix 2 showing the first stage, which has a F-statistic of 86.7 (full sample) and 61.8 (long survey sample).

2.4 Migration theory and preferences

A general economic model of migration, building on Sjaastad (1962), Stark and Bloom (1985), and

[9] Validity of the instrument also requires that the ballot result only affects outcomes through migration. This assumption would be violated if losing the lottery had an independent effect on the risk attitudes, pro-market beliefs, or household efficiency of losing applicants. We find it plausible that there might be a short-term impact on happiness right after receiving the lottery result, but even then, in Stillman et al. (2009), we find that the mental health of ballot losers is similar to those who won the lottery but had not yet moved, and argue that there is no impact a year after the ballot draw. We do not believe that losing the lottery is likely to affect these more fundamental preference parameters, especially 10 years later.

Rosenzweig and Stark (1989), has households compare the difference between the present discounted value of the utility received from the income W^M and amenities A^M experienced with migration, and the utility received from the income W^H and the amenities A^H received at home, to the cost C of migrating. Then migration occurs if:

$$\sum_{t=1}^{T} \beta\delta^t \, E[U(W_t^M, A_t^M) - U(W_t^H, A_t^H)] > C \qquad (3)$$

This model is quite general, and so enables many of the critiques of more narrow "income gains" economic models of migration to be easily incorporated: it can include hyperbolic discounting (beta-delta preferences), it allows for non-economic factors such as culture, language, and family ties to directly enter into utility considerations, and it also allows for a variety of different financial and non-financial costs to be incorporated into *C.*

However, implicit in writing down an equation like (3) is the assumption that the preference parameters and utility function do not themselves change with migration. That is, it is assumed that time preferences (β and δ), and risk preferences (which come from the curvature of the utility function *U()* when subject to the risks involved in forming expected utility EU[] do not change. Households are also assumed to not change how they view the role of markets in translating income into utility. Writing down the household optimization problem as a single utility optimization problem also assumes the efficiency of household decision-making among members also does not change with migration. Failure of these assumptions about preferences and decision-making could then mean that a migration decision that appears optimal before migrating (or not) has taken place, may no longer be optimal after this action is realized. The failure of these assumptions would therefore prevent calculations of the welfare gains from migration. The next sections report on our tests of these assumptions.

3. Impact on Risk and Time Preferences

There are several channels through which migrating might be hypothesized to affect risk and time preferences. The very act of moving to another country to set up a new life is a risky decision, and successfully doing this may lead to more confidence in taking subsequent risks. To the extent that cultures differ in risk attitudes or time preferences (Falk et al., 2015), moving to a new country entails exposure to

this new culture. Migration also can affect education and wealth levels, and lifespans, which in turn may affect time preferences and risk attitudes.

3.1 Existing Evidence on the Association between Migration and Risk Preferences

Risk is a key determinant of migration decisions and several studies have attempted to examine the association between migrating and risk preferences, with an implied causal direction from time-invariant risk preferences to migration. Jaeger et al. (2010) use data from the German Socio-economic survey on an individual's self-reported propensity to take risks and find that individuals with higher risk propensities are more likely to migrate within Germany.[10] Gibson and McKenzie (2011) use the same risk measure and find that amongst high-skilled people from three Pacific countries the more risk-seeking individuals are more likely to have emigrated. They also find that individuals who are more patient in a discounting question are more likely to have emigrated. Three recent papers have also examined the association between risk-seeking and internal migration within China. Akgüç et al, (2016) and Dustmann et al, (2017) use the same self-reported survey measure on propensity to take risks and find migrants are more risk-seeking, while Hao et al. (2016) use incentivized lotteries and find no difference in risk attitudes between migrants and stayers.

3.2 Measurement

We use two survey approaches and one incentivized lottery task to measure risk aversion. The first survey measure is the self-reported propensity to take risks used by Jaeger et al. (2010), Falk et al. (2015), and a number of other studies referenced above. This question asks individuals for their attitude toward risk in general, allowing respondents to indicate their willingness to take risks on an eleven-point scale, with 0 indicating complete unwillingness to take risks and 10 indicating complete willingness to take risks. The second survey measure is based on Barsky et al. (1997) and asks "Suppose you are the only income earner in your family, and you have a good job guaranteed to give you your current (family) income for life. You are given the opportunity to take a new job, with a 50:50 chance it will double your current income, and a 50:50 chance that it will cut your income by 20 percent. Would you take the new job?" Appendix 1 sets out the exact variable definitions used as outcomes.

[10] In addition to their main analysis which focuses on how risk preferences predict migration, they use panel data over two years to show that changes in migration status are not correlated with changes in self-reported risk attitudes over this short period.

Our incentivized lottery measure is based on Eckel and Grossman (2002) and is designed to be a simple way to elicit risk preferences through asking individuals to make only a single choice from a menu of options. Aside from only requiring one choice, another key advantage of this method is that the measure is relatively easy for individuals to understand compared to more complicated lottery designs, and as a result can produce less noisy estimates of risk preferences when individuals have lower math abilities (Charness et al, 2013). Individuals choose between competing lotteries with payoffs that ranged from 0 to 40 pa'anga (NZ$26 or US$20). Each participant was paid according to his or her choices, with the expected value equivalent to approximately 2 to 4 hours of average earnings in Tonga and about one hour of average earnings for Tongans in New Zealand.[11] Based on these choices, we construct three variables to indicate whether they made an inefficient choice (that was dominated by other lotteries they could have chosen), a choice consistent with severe risk aversion, or a choice consistent with risk-seeking.

To account for multiple hypothesis testing in the risk domain and to examine an overall measure of risk attitudes, we construct an aggregate index which signs each risk measure so that a higher score indicates more risk-seeking and then takes the average of the standardized z-scores.

Time preferences were assessed using standard hypothetical questions which asked whether individuals would prefer an amount of money today compared to an amount one year from today, and also whether they would prefer an amount in one year versus two years. Individuals were coded as having a high discount rate if they would prefer NZ$1000 today to NZ$1500 one year from today, and as being a hyperbolic discounter if they had a higher discount rate when comparing today to one year than when comparing one year to two years. These are standard questions in the literature, and have been used in a wide variety of contexts to infer patience. We also ask individuals the time period over which they make financial decisions, with individuals who think most about the next week coded as short-term planners. We then construct an aggregate index of the three measures in the time preference domain that we call the Aggregate Short-termism index, with higher scores indicating more short-term planning.

[11] We use the same payoffs in both countries, so that the task does not endogenously change with migration. One potential channel for risk preferences to change with migration would be if decreasing absolute risk aversion causes individuals who become wealthier through migration to take more risks when presented with the same gambles. Changing the payoffs so that they were higher in the richer country would mean they were no longer considering the same gamble.

3.3 Results

Table 2 then reports the impact of winning the ballot (ITT) and impact of migrating to New Zealand (LATE) on these risk and time preferences. We see individuals appear more risk-seeking in the survey questions than in the incentivized game, with an average self-assessed propensity to take risks of 6.2 out of 10 and 52 percent saying they would take a riskier job with a chance of higher income, compared to just 6.3 percent choosing one of the two lottery options consistent with risk-seeking behavior. There is no significant impact of migration on any of these measures, nor on the aggregate index. One quarter of individuals say they would prefer $1500 in one year to $1000 today, 13 percent have a higher discount rate when comparing today with one year than one year with two years (consistent with hyperbolic discounting), and 75 percent say they have a short-term planning horizon of a year or less for financial decisions. We find no significant impact of migration on any of these measures, nor on the aggregate short-termism index.

In addition to not being statistically significant, the associated confidence intervals do not contain the large effect sizes of many of the studies in the literature (although we cannot rule out moderate effects). For example, , a 95% confidence interval for the impact on the 11-point risk-seeking scale is (-0.27, +0.30), and for the likelihood of choosing a risky job is (-0.14, +0.14). Any impact on risk attitudes is therefore relatively modest, and less than the 20 percentage point change seen in Cameron et al (2013), or the 20 percentage point increase in the likelihood of choosing a risky activity for Hurricane Katrina evacuees (Eckel et al, 2009).

Taken together, these results show that we cannot reject the hypothesis that risk and time preferences are stable in the presence of the major changes induced by international migration.

4. Impact on Pro-Market Beliefs

4.1 Existing Evidence and Measurement

There is limited existing evidence on how attitudes towards markets determine the migration decision or are in turn affected by migration. Williams et al. (2014) compare Nepali migrants living in the Gulf to non-migrants in Nepal and find that migrants are more materialistic, although they are unable to determine causality. Osili and Paulson (2008a, b) document that immigrants to the United States from countries with more developed financial systems are more likely to own stock and use bank accounts, suggesting that home country institutional environment shapes trust and beliefs in the financial system. The question is

then whether exposure to the more formal and market-oriented institutions of a developed country makes individuals more market-oriented in their beliefs?

Di Tella et al (2007) provide evidence from a different setting to suggest that greater inclusion in a market economy can change beliefs. They argue that individualism, materialism, meritocratic inclinations and trust in others are necessary for the functioning of markets, and ask questions to measure these attitudes amongst squatters in Argentina, some of whom had been granted property rights. They find that those who were brought into the formal system through these property rights subsequently exhibited stronger pro-market beliefs. We use their same four questions to measure these different aspects of pro-market beliefs, and like them, to aggregate into an overall measure of pro-market beliefs (see appendix 1). As a small island nation, Tongans are much less reliant on impersonal markets for buying goods and making other transactions than are the majority of New Zealanders, hence one might expect that moving to New Zealand and using impersonal markets on a regular basis would lead to greater pro-market beliefs.

4.2 Results

Table 3 shows the impact of migrating on pro-market beliefs. Despite Tonga being classified as a mostly unfree economy (Heritage Foundation, 2016), we find attitudes among the ballot losers to be substantially more pro-market than was the case of the land-squatters in di Tella et al (2007).[12] For example, 80 percent of the ballot losers believe you can succeed on your own, compared to only 33 percent of the squatter control group, and 70 percent of ballot losers say you can trust others versus only 34 percent of the squatter control group.[13] Our sample still has room to be more pro-market, but is starting from a more market-oriented base than is the case of the sample of di Tella et al (2007). We see from Table 3 that there is no statistically significant impact of migrating on any of these four measures, nor on the aggregate measure of pro-market beliefs. After almost a decade in New Zealand, we cannot reject the hypothesis that Tongan migrants are no more pro-market than are similar individuals who never migrated. For the overall impact on pro-market beliefs, the 0.53 estimate of di Tella et al (2007) lies right at the boundary of a 90 percent confidence interval for our LATE impact (-0.18, 0.53).

[12] Since we do not have these measures for people who did not apply to the lottery, we cannot tell whether this shows that individuals with pro-market attitudes are more likely to want to migrate, or whether Tongans in general have higher levels of pro-market beliefs than in the Argentine squatter sample of di Tella et al (2007).

[13] We also have higher baseline means on the other two measures, which we code differently from di Tella et al (2007) as a result (see appendix 1). Using their coding, 100% of our sample would give the materialistic answer and 97% would say that effort matters, compared to just 50% and 74% of their control group giving these answers.

5. Impact on Interactions with Closest Relatives and on Household Efficiency

Migration is often modeled as a household decision (Stark and Bloom, 1985). The standard efficient-household decision-making problem assumes households are efficient in maximizing some household utility function, with bargaining power then determining how the gains are allocated amongst members. But if migration changes the ability of families to efficiently make decisions over resource use, then decisions over migration can be time-inconsistent in the same way as would be the case if other parameters of the decision problem, such as risk or time preferences, change with migration. Hence, we investigate whether migration affects the efficiency of transnational household decision-making.

5.1 Defining closest relatives

At the time of migrating the principal applicants are typically adults in their late twenties or early thirties, who move with their spouse and children. When applying, some would still have lived with their parents or siblings, or otherwise would typically have recently set up their own dwellings in the same small villages as their extended family members. A decade later, by the time of our follow-up survey at about age 40, most would have formed their own households in Tonga if they had not been selected to migrate. We therefore defined for each principal applicant in the long survey a closest relative household in Tonga containing either a parent or elder sibling (with priority on parents over siblings, and females over males). A strict rule was used for matching so that the choice of closest relative household is orthogonal to winning the lottery. In about 15 percent of cases the relative was living in the same dwelling in Tonga as the ballot loser.

Each designated closest relative was then interviewed separately from the principal applicant. Table 4 provides some descriptive statistics on these relatives by treatment group. The closest relative is the parent of the principal applicant in 44 percent of the cases, and their sibling in the remainder. This is reasonably balanced by treatment status, although the ballot losers are slightly more likely to have a parent rather than sibling interviewed as the closest relative, but not significantly so. The relative's age averages 66 for parents of the principal applicant and 52 for their siblings, for an average age of 54. This is slightly higher for the ballot loser sample reflecting the higher incidence of parents. We see no significant difference by treatment status on other relative characteristics such as gender, education, or earnings. The latter result is consistent with Gibson et al (2018) who find that the massive gains in income to the migrants are not accompanied by changes in the income of these households with closest relatives.

We control for closest relative type (parent or not), closest relative gender, and closest relative age in our trust game regressions.

5.2 Interactions with Closest Relatives

Table 5 then examines how migrating has affected the different types of interactions principal applicants have with these closest relatives. Column 1 shows that there is a large and significant reduction in regular communication. Over three-quarters (77%) of ballot losers communicate at least weekly with their relative, while migrating lowers this by 35 percentage points. Column 2 shows there is a small positive, but insignificant, effect of migration on the likelihood the principal applicant sends money to the relative. This might seem surprising as we might expect migrants to be remitting, and non-migrants not to be. But this question does not capture the size of the transfer – migrants are likely to be making much larger transfers. Moreover, inter-household transfers are common within Tonga, as seen by the control group mean proportion of 0.72. In contrast to the lack of effect on transfers to the closest relative, in Column 3 we see a large reduction in receipt of money from this relative; 45 percent of ballot losers had received money at least several times a year from the closest relative, with these reverse flows of money not occurring for migrants.

Column 4 shows that migrants are more likely to say they would trust the closest relative to give something back to them if they loaned it, without having to repeatedly ask for it to be returned. This might reflect that such loans are less common and occur for larger items when made across distance, so the expectations about return might be different; or that the leverage provided through remittance transactions may make the relative more likely to respond quickly to requests. Column 5 and 6 look at knowledge about earnings of the other party. There is no significant impact on whether the principal applicant knows the relative's earnings, but migration reduces the likelihood that the relative knows how much the principal applicant earns. Just over one-half (54%) of ballot losers say they consult with the relative on financial decisions, while migration lowers this by 34 percentage points (Column 7). Closest relatives also consult with the ballot losers on financial decisions just over half the time, with no significant impact of migration on this outcome. Migration lowers the likelihood of having a joint business with the relative (but not significantly), and increases the likelihood of owning livestock together. This latter effect could occur through relatives looking after livestock for the migrant, which might be needed, for example, to donate to ceremonial feasts in the migrant's name.

Taken together these results suggest reductions in communication and knowledge flows, but also increases in some other types of interactions. We sign each variable so that a higher value indicates more interaction and construct an overall index of standardized z-scores. The last column shows that migration has an overall effect of reducing interactions, with the effect size equivalent to approximately one-third of a standard deviation.

5.3 Measuring Household Efficiency Through a Trust Game

The existing literature has noted that the separation of household members brought about by migration is likely to increase information frictions, and as a consequence, increase the likelihood of strategic behavior. As a result, the standard unitary model of the household seems unlikely to hold (Chen 2013, de Laat, 2014). In a lab-in-the-field experiment, Ambler (2015) finds that migrants strategically send less of a windfall as remittances when their choice is not revealed to recipients. Ashraf et al (2015) find that migrants demand financial products that give more control over how the money they send home is saved. In contrast, de Arcangelis et al (2015) find that information asymmetry does not determine how much migrants will remit for education purposes in their lab-in-the-field experiment.

While these studies provide evidence against the unitary model of the household, none of them test whether migrant households are inefficient, nor whether migration has a causal effect on the efficiency of transnational household decisions. To investigate this question, we had principal applicants and their closest relatives play three games (in random order) that are related to the widely used trust game of Berg et al. (1995). Appendix 1 provides the exact wording of these games. In the first two variants, the PAC principal applicant (who is either a migrant in New Zealand or an unsuccessful ballot holder or non-complier in Tonga) chooses how much to keep of a windfall of 300 pa'anga (US$160) and how much to transfer to the other player, who is their parent or elder sibling in the closest relative household in Tonga. The player in the closest relative household then decides how much of the amount s/he has been sent to keep, and how much to put into a bonus pot.

The money in the bonus pot is multiplied by the value that comes up on a 4-sided dice and in the first variant goes to the PAC applicant (plus what they kept in the first stage), while in the second variant it goes to the player in the closest relative household (plus the amount they kept back from the bonus pot). In both these variants, the player in the closest relative household knows that the windfall was 300 pa'anga. In the third variant of the game, the windfall is either 100, 300 or 500 pa'anga and the player in the closest relative household does not know the value of the windfall, just that it was somewhere

between 100-500 pa'anga. The rest of this game proceeds as in the first variant, with the money in the bonus pot going to the first mover (either the migrant or unsuccessful PAC applicant). All three games were played by each principal applicant-relative pair, with the order of the games randomized. At the end of the three games, each player chose a number between 0 and 99, and if either number came up from the roll of two 10-sided dice, the payout from one of the games was made for real.[14]

Because the players can then ex-post divide this money amongst themselves as they wish, in these games the efficient outcome for the extended household is for the first player to send the entire amount to the closest relative and for the relative to put the entire amount in the bonus pot where it will be multiplied by a number between 1 and 4 depending on the dice roll. However, if there is distrust over the likelihood that the other player in the game will put the money in the bonus pot, or will share any windfall at the end, players may keep some of the money. We then measure the efficiency of the transnational household by the share of the initial windfall that makes its way to the bonus pot.

Two approaches to implementing these games have been used in the literature. The game, or direct response, method has the first player play first and then the outcome of their actions is relayed to the second player who then makes their decision. In contrast, the strategy method asks respondents to reveal conditional decisions for every possible action – which in our case would require the closest relatives to state how much they would put into the pot for all possible amounts they could receive. We use the direct response method given evidence in the literature that it can be easier for subjects to understand, and that behavior can differ under the strategy method (e.g. Casari and Cason, 2009; Brandts and Charness, 2011).

We believe these variants of the trust game have close parallels to the remittance decisions faced by migrants. Consider a migrant sending money home to an extended family member hoping that they will invest part of the money in an activity that will yield some return to the migrant in the long-run. The first version of the game mirrors this decision, with the migrant deciding how much to remit, the relative deciding how much of the remittance to keep for themselves versus devoting it to the investment activity, and then the migrant gaining the return from what is invested. The third version of the game would then correspond to this same decision when the relative does not know how much income or surplus income the migrant has to possibly invest in the first place. The second version of the game could correspond to

[14] We rolled the dice sequentially with the tens unit determined by the first die and then the ones unit by the second and the player could see this. The choice of game to pay out was determined by the sum of the two 0-99 numbers chosen by the player and the closest relative, with three equal ranges (<67, 68-133, >133) matching to a particular game.

the migrant deciding on remitting to the relative to have them make some longer-term investment, such as spending on education of nieces and nephews, with again the possibility that the money is instead kept by the relative and not invested.

5.4 Results on Household Efficiency

Figure 2 plots the extended household efficiency in version A of the game (when the principal applicant is the residual claimant of the bonus pot) against that in version B (where the closest relative is the residual claimant). Hence, each point on the graph reflects the results from two of the three games played by each household. The first point to note is that most households are not acting efficiently. On average only about half of the windfall makes its way into the bonus pot. As a result, there is plenty of scope to potentially see differences in efficiency emerge with migration. However, the second point to note is that inefficiency seems prevalent for both ballot losers and ballot winners, with no strong difference apparent between the two. Third, we see behavior strongly correlated across the two games, with households that are more efficient under version A also tending to be more efficient under version B. More of the points lies below the 45-degree line than above, which suggests efficiency is higher on average when the closest relative rather than the principal applicant is the residual claimant.

Figure 3 shows a similar pattern when comparing version C of the game (with partial information) to version A. Again there is a high correlation in behavior in the two games, ballot status does not seem strongly associated with game behavior, and there is more mass below the 45-degree line suggesting higher efficiency on average when only partial information is available.

Table 6 has estimates of the impact of international migration on extended household efficiency in these games. Column 1 shows that in game A, the ballot losers transfer on average only 47 percent of the windfall amount to the bonus pot, representing substantial inefficiency. Migration has no significant impact on the amount transferred, with the point estimate for the amount transferred to the bonus pot only 4 percentage points higher. A 95 percent confidence interval for the impact on household efficiency in game A is (-0.03, +0.09); less than the 16 percentage point change in the amount sent by player 1 in the trust game of Cameron et al (2013). Column 2 shows that household efficiency is approximately 4 percentage points higher in game B than in game A, but that again there is no significant effect of migration on this efficiency. Column 3 shows that household efficiency is 2 percentage points higher in game C than game A, but that again there is no significant effect of migration on this efficiency. The last two columns consider the difference between games A and B, and between games B and C, and show that

migration has no significant impact on either of these differences. Therefore, despite the reduction in interactions with the closest relative seen in Table 5, migrant households are no less efficient at decision-making.

Appendix 3 examines the impact of international migration on individual actions and beliefs within these trust games. We examine the share of the windfall kept by the principal applicant, the share of what the closest relative receives that the relative keeps, the principal applicant's beliefs about what the relative will do, and the degree of inaccuracy in these beliefs. For games A and B we see no significant impacts on any of these actions or beliefs. In game C, with partial information, migrants keep a lower share of the initial windfall than non-migrants (significant at the 5 percent level), but there is no significant effect on any of the other actions or beliefs.

Although we do not find any significant impact of migration on household efficiency, it is still of interest to ask which characteristics of principal applicants and their closest relatives are associated with more efficient outcomes. We pool together the migrant and non-migrant samples and examine this in Table 7. We focus on household efficiency in game A, because behavior in the other games is strongly correlated with behavior in this game. We see in column 1 that household efficiency is higher the more years of education the principal applicant and their closest relative both have, suggesting that those with more skills are better able to achieve an efficient outcome in this game. We also find household efficiency is higher when the closest relative is a parent compared to a sibling. The remaining columns of the table then examine how household efficiency is correlated with the different types of interactions between principal applicants and closest relatives. We see household efficiency is significantly higher when the principal applicants trust the closest relative more, when they already send money frequently to the relative, when the relative consults with them on financial decisions, and when they jointly own a business together. As a result, household efficiency is higher when our overall interactions index is higher.

We therefore have the result that migration reduces interactions between principal applicants and their closest relatives, and that fewer interactions are associated with lower household efficiency. Why, therefore, do we not find a significant impact of migration on household efficiency. If we take the point estimates from Table 5, the ITT of ballot winning is to lower the interactions index by 0.138. From Table 7, a 0.14 reduction in the interactions is associated with a 0.018 reduction in household efficiency. This small effect lies within the confidence interval seen in Table 6. Hence, although there are reasons to think migration would lower household efficiency, it seems the size of the effect is small in practice.

The lack of impact is also consistent with research on the strong persistence of some aspects of culture. Guiso, Sapienza, and Zingales (2006) show a strong correlation between the trust in others displayed by immigrants in the United States and the level of trust in their countries of origin, and this pattern persists in subsequent generations. These findings also can be reconciled with those of Ambler (2015), who focuses on remittances from overseas male migrants to their spouses, if it is the case that Tongan husbands and wives already were not acting in a unitary fashion in the home country, or if the relationship between migrants and extended family is less efficient and less susceptible to change than that between husbands and wives.

6. Power and External Validity

We find no significant impact of international migration on risk and time preferences, on attitudes towards markets, or on the efficiency of transnational household decision-making. Three key concerns are (i) whether this lack of impact is due to a lack of statistical power, (ii) whether Tongan migrants already had preferences and beliefs that are similar to the New Zealand-born, and (iii) to what extent these results might generalize to other settings. We discuss each concern in turn.

6.1 Statistical Power

Our sample size consists of 385 individuals for the preference and belief questions and of 282 for the incentivized lotteries and trust games. Are these sample sizes too small to detect meaningful effect sizes? We have three responses to this question. First, this is as large a sample as is likely to be possible for such an exercise, since running incentivized lab in the field experiments (across two countries, in our case) is costly in terms of money and time. For this reason, most related papers in the literature have similar sample sizes. For example, Cameron et al (2013) have 421 individuals for their study of China's one child policy's effects; Chuang and Schechter have between 49 and 140 households for their analyses of how shocks affect time and risk preferences, and their survey of 19 studies of risk preference stability in the literature shows a median sample size of 84; Hao et al (2016) have 144 individuals for their study on migration and risk preferences in China; and di Tella et al (2007) have 312 households for their study of how property rights affect pro-market beliefs.

Second, we can ask whether large impacts are consistent with the results we obtain. Considering first the estimates one by one, the standard errors provided in each table allow one to determine the confidence intervals for the different impacts

Finally, we follow Young (2016) in conducting a randomization-inference based omnibus test of overall statistical significance of the 20 outcomes tested in Tables 2, 3 and 6.[15] His preferred randomization-t method yields a p-value of 0.738. As a result, we cannot reject that there is no treatment effect whatsoever. In contrast, if the estimated impact of migration was either 0.1 of a standard deviation larger or smaller for each outcome (typically considered a small effect), the same test would have a p-value of 0 and hence would reject the null hypothesis that migration has no impact of preferences and household efficiency. In other words, our somewhat small sample is capable of picking up relatively small treatment effects if they were truly present.

6.2 Are Tongan Migrants Similar to New Zealanders

Another potential explanation for why migrating appears to have no impact on preferences and beliefs of the Tongan migrants could be that these do not vary between the two countries to begin with. Until recently, globally representative surveys on preferences have not been available. Falk et al. (2015) embedded risk and time preference questions into the Gallup World Poll in 76 countries. They find significant differences in patience and risk preferences across countries, with people in higher income countries more patient, and risk aversion higher in more equal societies with stronger social safety nets. These differences would predict that significant differences in preferences should exist between Tonga and New Zealand, although unfortunately neither country is included in their surveys to directly test this.

Rieger et al. (2014) provide some corroborating evidence from a survey in 53 countries (including New Zealand) with risk preference lottery questions similar to the ones we present in Table 2. In their most similar lottery (lottery #2 in their paper), 24 percent of New Zealanders are risk seekers and 5 percent have severe risk aversion. In contrast, in our results only 6 percent of Tongan migrants are risk seekers and 13 percent have severe risk aversion. Together with the global evidence in Falk et al (2015), this suggests the lack of effect is unlikely to simply reflect preferences not differing between Tonga and New Zealand in the first place.

6.3 External Validity

How much can we expect the results here to generalize to other migration settings? Our setting here considers a common form of international migration – a nuclear household moving permanently from a

[15] We thank Alwyn Young for sharing code to conduct this test. This procedure also provides randomization-inference p-values for each coefficient. None of these are statistically significant, with the smallest p-value being 0.201 using his randomization-t (or randomization-p) values.

poor country to a rich country, leaving extended family behind and integrating into the host society.[16] To the extent that it differs from other common migration types, it differs in ways which we might think would make it more likely that we would find changes in preferences or beliefs. That is, we would expect any effects to be smaller if migration was more temporary or if it was between countries with more similar income levels, institutions, and levels of economic freedom (as would be the case for migrating from one developed economy to another). We would therefore also expect to see no impact of migrating on preferences and beliefs in these other migration settings.

7 Conclusions

Tongans migrating to New Zealand experience major changes in life circumstances, earning much higher incomes, living in a country with a different culture and with more individualistic and market-oriented institutions, and having less interaction with their parents and siblings who remain behind in Tonga. Despite these changes, we find no significant impacts of international migration on the risk and time preferences and on the pro-market beliefs of these migrants, nor on the efficiency of decision-making with their extended family members. These results suggest that, in the case of migration, we can continue to think of decision-making as being based on "deep" parameters of a utility optimization decision that do not change with migration. Thus, our evidence is supportive of the assumptions underlying economic theories of migration.

These results do contrast with some evidence on large negative shocks and disasters. The literature has speculated that such negative shocks can cause individuals to reappraise their views of the world in which they live. In contrast, international migration provides much more of a positive change in life trajectory, and is a choice made by individuals rather than something forced upon them. This suggests that other large changes in circumstances that are voluntary in nature might also be unlikely to lead to changes in fundamental decision-making parameters.[17]

[16] For example, by linking with the 2013 Census we see that only 21 percent of migrant households in our sample live in majority Pacific Island neighborhoods in New Zealand and a quarter live in neighborhoods where less than six percent of individuals are Pacific Islanders.

[17] There appears to be very little literature on the impact of positive shocks on preference parameters, nor of voluntary positive changes in life circumstances. In a recent overview, Schildberg-Hörisch (2018) summarizes the evidence on the stability of risk preferences, noting many studies on negative shocks and disasters. The only mention of positive shocks comes from a couple of studies linking periods of economic growth to greater risk-seeking, but the author notes that this could also reflect a change in beliefs about returns to investments, rather than a change in preferences.

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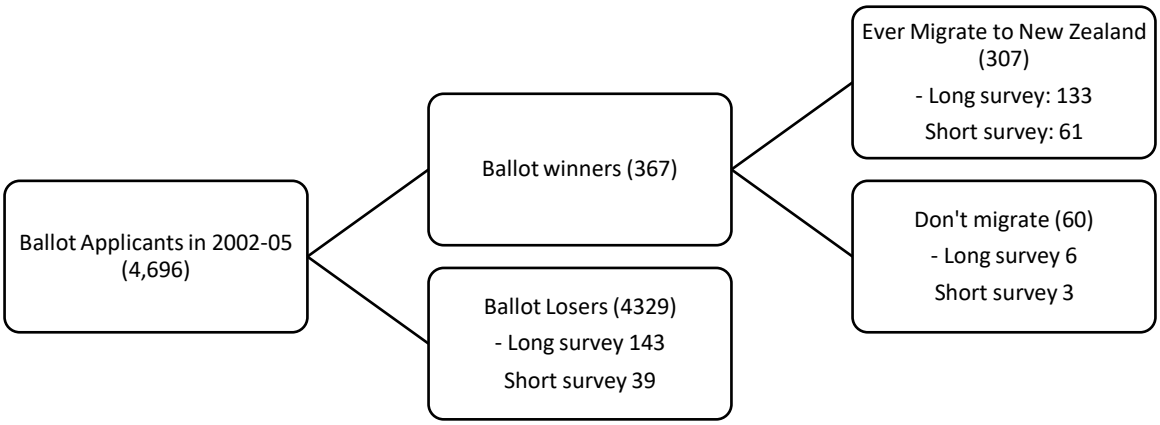
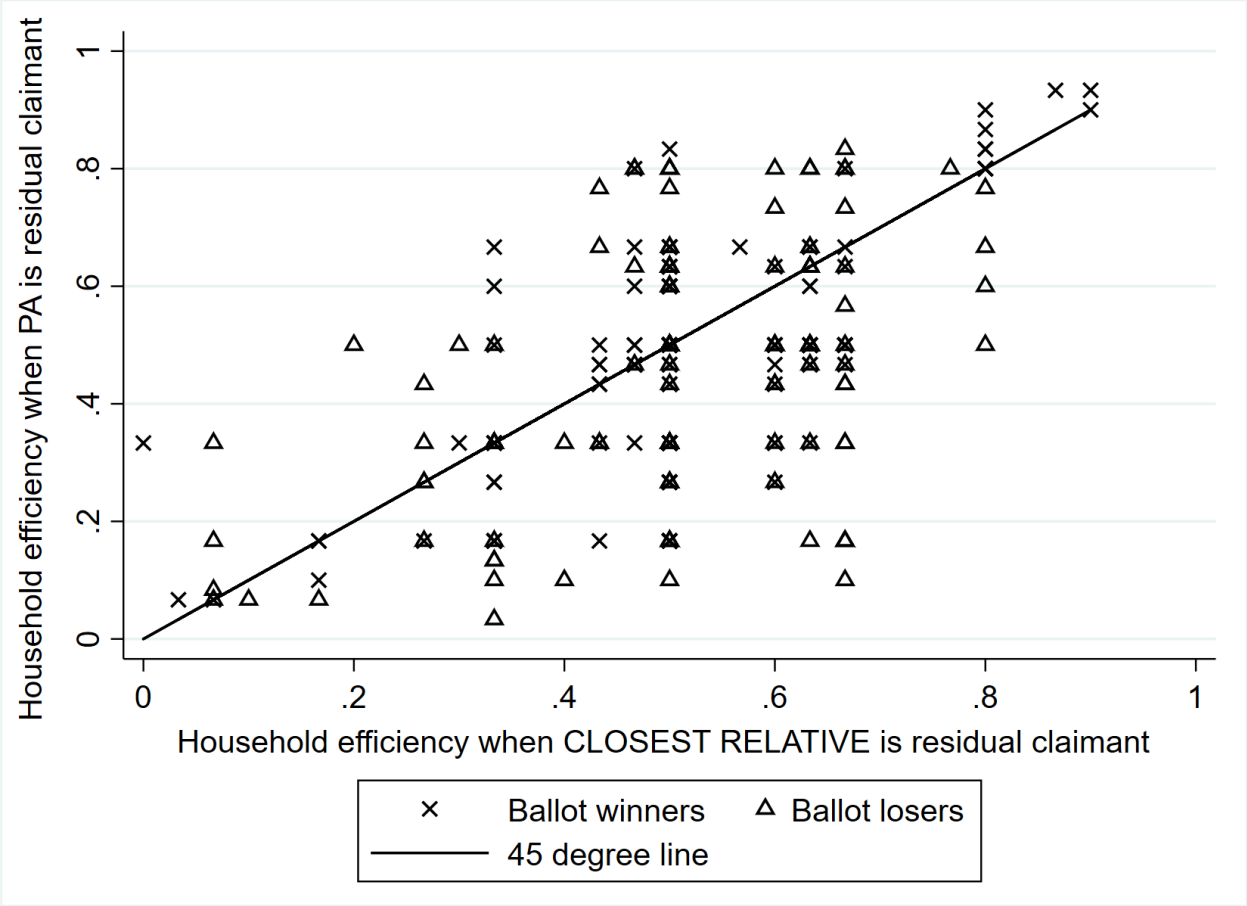
Figure 1: Sampling Frame



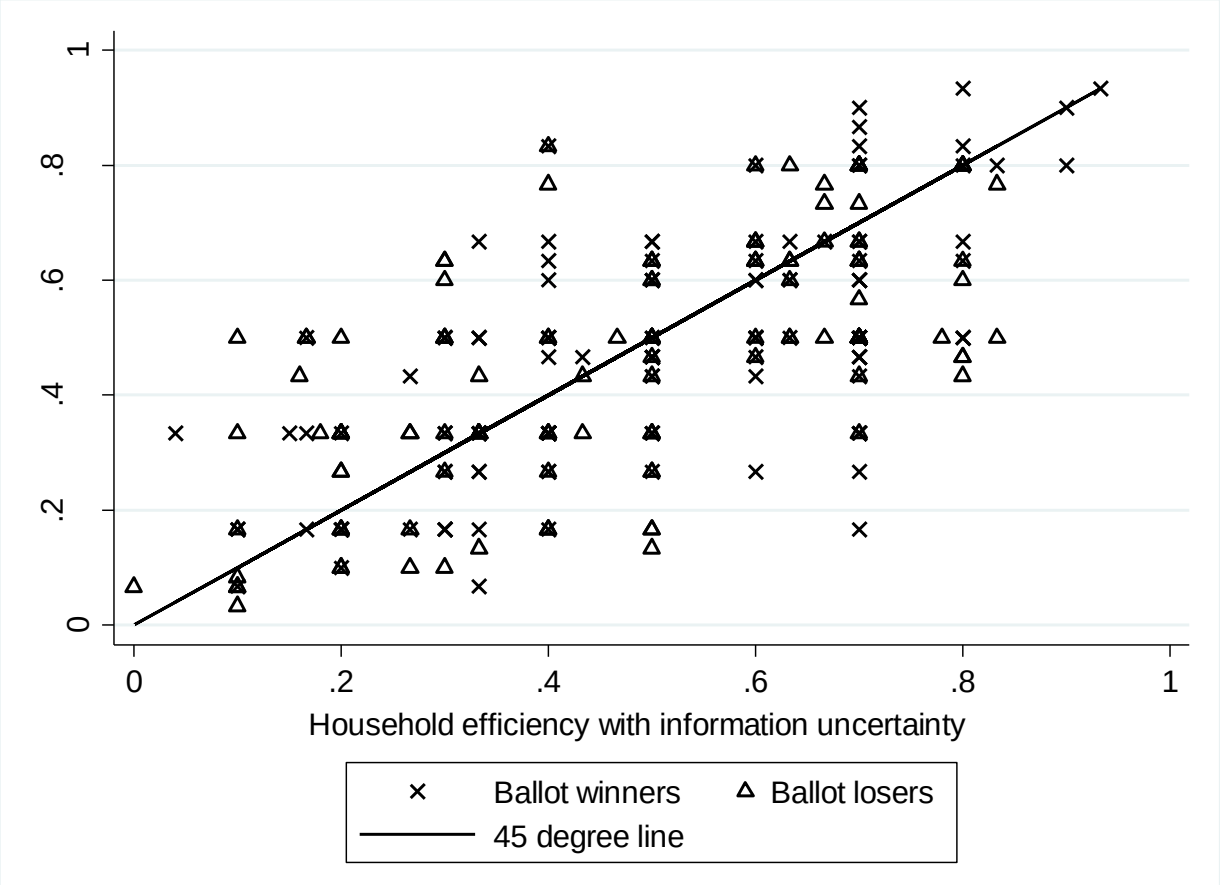
Notes: numbers in parentheses show population numbers. The survey attempted to interview all individuals who migrated to New Zealand by late 2012 when the sample frame was provided; therefore, the interview success rate is 64% (194/307). A random sample of ballot losers and non-compliers (winners who do not migrate) was obtained through village-based sampling. See text for details.

Figure 2: Household efficiency by treatment status and residual claimant in game



Notes: household efficiency is defined as the proportion of the initial windfall that is transferred to the bonus pot in the trust game. Y-axis shows efficiency in game A, where the principal applicant (PA) receives all the money in the bonus pot; X-axis shows efficiency in game B, where the closest relative receives all the money in the bonus pot. Ballot winners and ballot losers denote households which won and lost the Pacific Access Category migrant lottery respectively.

Figure 3: Household efficiency by treatment status and information availability to closest relative



Notes: household efficiency is defined as the proportion of the initial windfall that is transferred to the bonus pot in the trust game. Y-axis shows efficiency in game A, where the principal applicant (PA) receives all the money in the bonus pot and the closest relative household has full information on PA's actions; X-axis shows efficiency in game C, where the principal applicant receives all the money in the bonus pot, but where the closest relative only observes how much the PA transfers, but does not know their initial windfall. Ballot winners and ballot losers denote households which won and lost the Pacific Access Category migrant lottery respectively.

Table 1: Summary Statistics of Principal Applicants by Treatment Group

	Ballot Winners			Ballot Losers			
	N	Mean	S.D.	N	Mean	S.D.	P-value
Pre-determined Characteristics							
Age	203	40.1	7.0	182	41.8	7.0	0.045
Male	203	0.66	0.49	182	0.67	0.47	0.814
Born in Outer Islands	203	0.23	0.43	182	0.24	0.43	0.973
Height (cm)	139	171.6	5.2	143	171.7	5.2	0.875
Characteristics that can change with migration							
Years of Schooling	203	13.1	1.4	182	12.2	1.8	0.000
Tertiary Education	203	0.37	0.49	182	0.18	0.39	0.000
Weekly Earnings (NZD)	203	410	367	182	126	140	0.000
Household Size	203	5.05	2.25	182	5.26	1.99	0.330
Years in New Zealand	133	9.20	1.25				

Notes:
Weighted mean for ballot winners shown, which accounts for different sampling rate of migrants and non-compliers. P-value is for test of equality of means. Height and Years in New Zealand only asked in long-form survey. Years in New Zealand is conditional on ever migrating.

Table 2: Impact on Risk and Time Preferences

	Risk-seeking scale	Take Risky Job	Inefficient Decision	Severe Risk Aversion	Risk Seeker	**Aggregate Risk-Seeking Index**	High Discount Rate	Hyperbolic Discounter	Short-term Planner	**Aggregate Short-termism Index**
Panel A: ITT Impact										
Ballot Winner	0.014	0.001	-0.084	0.095	0.000	-0.109	-0.035	0.031	0.023	-0.024
	(0.106)	(0.070)	(0.077)	(0.072)	(0.036)	(0.084)	(0.061)	(0.060)	(0.082)	(0.130)
Panel B: LATE Impact										
Migrate	0.020	0.001	-0.112	0.128	0.000	-0.147	-0.049	0.042	0.031	-0.032
	(0.146)	(0.097)	(0.104)	(0.102)	(0.049)	(0.123)	(0.083)	(0.081)	(0.109)	(0.176)
Sample Size	384	385	282	282	282	282	385	282	282	282
Control Mean	6.210	0.522	0.392	0.133	0.063	0.007	0.253	0.133	0.748	-0.008
Control S.D.	0.907	0.501	0.490	0.341	0.244	0.499	0.436	0.341	0.436	0.659

Notes:

Robust standard errors in parentheses: *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively.

Regressions weighted for population proportions of compliers and non-compliers, and include controls for age, gender, island of birth, ballot years, and survey form (long or short).

Risk-seeking scale is self-assessed on a scale from 0 to 10, with higher scores reflecting more willingness to take risks; take risky job indicates they would give up a safe job for a riskier one with a chance of higher income; inefficient decision indicates they make an inefficient decision in an incentivized risk preferences game; severe risk aversion and risk-seeker indicate making a choice in the incentivized risk preference game that corresponds to a coefficient of relative risk aversion above one or below zero respectively; aggregate risk-seeking index is an standardized index of the different risk preference measures, with higher scores indicating more risk-seeking; high discount rate indicates they prefer NZ$1000 today to NZ$1500 in one year in a hypothetical choice; hyperbolic discounter indicates they have a higher discount rate when comparing today to one year than one year to two years in a hypothetical choice; short-term planner indicates they make choices over the next week; and aggregate short-termism index is a standardized index of the different time preference measures. See appendix 1 for more details on each variable.

Table 3: Impact on Pro-market Beliefs

	Success Alone	Money Important	Effort Better	Trust Others	**Market Beliefs**
Panel A: ITT Impact					
Ballot Winner	-0.010	0.054	0.005	0.078	0.127
	(0.051)	(0.068)	(0.075)	(0.059)	(0.152)
Panel B: LATE Impact					
Migrate	-0.014	0.076	0.006	0.109	0.177
	(0.070)	(0.096)	(0.104)	(0.085)	(0.217)
Sample Size	385	385	385	385	385
Control Mean	0.808	0.280	0.418	0.703	2.209
Control Std. Dev.	0.395	0.450	0.495	0.458	1.072

Notes:

Robust standard errors in parentheses: *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively.

Regressions weighted for population proportions of compliers and non-compliers, and include controls for age, gender, island of birth, ballot years, and survey form (long or short).

Success Alone denotes the individual believes you can be successful on your own; money important denotes they believe money is very important for happiness; effort better denotes they believe those who put in effort working are much better off; trust others denotes they believe others can be trusted; and market beliefs is the sum of these four variables. See appendix 1 for more on these variables.

Table 4: Descriptive Statistics on Closest Relatives by Treatment Group

	Ballot Winners			Ballot Losers			
	N	Mean	S.D.	N	Mean	S.D.	P-value
Relative is Their Parent	139	0.40	0.49	143	0.46	0.50	0.338
Relative is Their Sibling	139	0.60	0.49	143	0.54	0.50	0.338
Relative's Age	139	52.1	12.9	143	56.2	12.3	0.008
Relative Female	139	0.57	0.50	143	0.64	0.48	0.269
Relative's Years of Schooling	139	11.4	1.9	143	11.2	2.3	0.426
Relative has Tertiary Education	139	0.13	0.34	143	0.18	0.39	0.314
Relative is Employed	139	0.42	0.49	143	0.35	0.48	0.299
Relative's Weekly Earnings (NZD)	139	63	85	143	60	92	0.787
Relative's Household Income (NZD)	139	129	140	143	150	143	0.238

Notes:

Weighted mean for ballot winners shown, which accounts for different sampling rate of migrants and non-compliers. P-value is for test of equality of means. Closest relative refers to person chosen for trust game.

Table 5: Impact on Interaction with Closest Relative

	Communicate Weekly	Send money several times	Receive money several times	Would trust relative with loan	Knows relative's earnings	Relative knows PA's earnings	Consults with relative on finances	Relative consults them on finances	Joint Business	Joint Livestock	**Aggregate Interactions Index**
Panel A: ITT Impact											
Ballot Winner	-0.257***	0.034	-0.448***	0.158***	0.014	-0.075**	-0.254***	0.074	-0.072	0.165***	-0.138*
	(0.075)	(0.096)	(0.045)	(0.037)	(0.025)	(0.033)	(0.083)	(0.092)	(0.078)	(0.050)	(0.070)
Panel B: LATE Impact											
Migrate	-0.345***	0.046	-0.603***	0.212***	0.019	-0.101**	-0.341***	0.099	-0.096	0.222***	-0.186*
	(0.094)	(0.125)	(0.099)	(0.058)	(0.033)	(0.049)	(0.115)	(0.120)	(0.102)	(0.076)	(0.103)
Sample Size	282	282	282	282	282	282	282	282	282	282	282
Control Mean	0.769	0.720	0.448	0.804	0.021	0.105	0.538	0.545	0.413	0.741	0.077
Control Std Dev	0.423	0.450	0.499	0.398	0.144	0.307	0.500	0.500	0.494	0.439	0.651

Notes: Robust standard errors in parentheses. *, **, and *** indicate significance at the 10, 5, and 1 percent levels respectively.
Regressions weighted for population proportions of compliers and non-compliers, and include controls for age, gender, island of birth, and ballot years.
Outcomes are all binary variables indicating that principal applicant (PA) and relative communicate weekly, that PA sends money to relative at least several times per year, that PA receives money from relative at least several times per year, that PA would trust relative to return a possession loaded, that PA says they know the relative's earnings, that the PA thinks the relative knows the PA's earnings, that the PA consults with the relative on finances, that the relative consults with them on finances, and that the PA and relative jointly own a business or livestock together. Closest relative is the parent or sibling of the principal applicant chosen for household decision-making game.
Aggregate interactions index is an index of standardized z-scores of these variables, with a higher value indicating more communication.

Table 6: Impact on Household Efficiency in Trust Game

	Household Efficiency in:			Efficiency Gap:	
	Game A	Game B	Game C	A-B	A-C
Panel A: ITT Impact					
Ballot Winner	0.034	0.026	0.037	0.009	-0.003
	(0.031)	(0.022)	(0.027)	(0.029)	(0.026)
Panel B: LATE Impact					
Migrate	0.044	0.033	0.048	0.011	-0.003
	(0.041)	(0.030)	(0.036)	(0.038)	(0.033)
Sample Size	282	282	282	282	282
Control Mean	0.465	0.508	0.482	-0.043	-0.018
Control Std Dev	0.205	0.150	0.216	0.188	0.168

Notes:

Robust standard errors in parentheses: *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively.

Regressions weighted for population proportions of compliers and non-compliers, and include controls for age, gender, island of birth, ballot years, game order, relative age, relative gender, and whether the closest relative is the parent of the principal applicant.

Game A has full information and the principal applicant (PA) as the claimant on the bonus pot; Game B has full information and the closest relative as the claimant on the bonus pot; Game C has the principal applicant as the claimant on the bonus pot, but partial information, with the closest relative only observing how much the PA transfers, not how much they start with. Household efficiency is the share of the windfall transferred to the bonus pot.

Table 7: What factors are associated with greater transnational household efficiency?

Dependent Variable: Household Efficiency in Game A

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Principal Applicant Age	0.002	0.003**	0.002	0.003*	0.003**	0.003*	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Principal Applicant is Male	-0.010	-0.001	-0.009	-0.009	-0.011	-0.018	-0.015
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.023)	(0.024)
Principal Applicant from Outer Islands	0.052*	0.044	0.052*	0.052*	0.051*	0.027	0.044
	(0.030)	(0.028)	(0.031)	(0.030)	(0.030)	(0.030)	(0.029)
Principal Applicant's Years of Schooling	0.025***	0.017**	0.024***	0.022***	0.019**	0.015**	0.012
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.009)
Principal Applicant's Earnings	-0.000	-0.000	-0.000	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Closest relative is Parent of PA	0.082***	0.032	0.074**	0.067**	0.036	0.061**	0.011
	(0.028)	(0.029)	(0.030)	(0.029)	(0.028)	(0.027)	(0.030)
Closest relative is Female	0.022	0.004	0.022	0.020	0.024	0.017	0.015
	(0.023)	(0.022)	(0.023)	(0.024)	(0.023)	(0.022)	(0.022)
Closest Relative's Years of Schooling	0.016**	0.012*	0.016**	0.019***	0.017**	0.012*	0.013*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)
Would trust other player if lent possessions		0.195***					
		(0.031)					
Communicates weekly with other player			0.015				
			(0.030)				
Sends money to other player several times a year				0.068*			
				(0.038)			
Typically consults with relative on financial decisions					0.004		
					(0.030)		
Relative typically consults with PA on financial decisions					0.108***		
					(0.029)		

Jointly own a business together						0.144***	
						(0.025)	
Aggregate Index of Interaction with Closest relative							0.131***
							(0.025)
Sample Size	282	282	282	282	282	282	282

Notes: Robust standard errors in parentheses. *, **, and *** indicate significance at the 10, 5, and 1 percent levels respectively.

Household Efficiency in Game A is the share of the initial windfall that ends up getting transferred by the player and their relative into the bonus pot, with a higher share indicating greater efficiency. Coefficients shown are regression estimates, pooling together the ballot winner and ballot loser samples.

Appendix 1: Variable Definitions

Risk preference measures

Risk-seeking score: is a score based on the respondent's rating of themselves on an 11-point scale from 0 to 10, where 0 is unwilling to take risks, and 10 is fully prepared to take risks. This is based on the self-assessed risk preference question from the German Socio-economic Panel (Jaeger et al, 2010).

Take Risky Job: is a binary variable indicating that the individual would choose to take a new job that, with a 50-50 chance would double their current income, and a 50:50 chance would cut their income by 20 percent. This is based on the question used in the Health and Retirement Study and analyzed by Barsky et al. (1997).

Inefficient Decision, Severe Risk Aversion, and *Risk-Seeker* are based on the individual's choices in an incentivized game. Individuals were asked to choose one of the businesses from the list of A through H below. Each business differs in terms of how many Pa'anga it pays out in a good month and how many in a less good month, but in all other regards the businesses are the same. They were told a coin would be tossed and they will receive the amount of money in the Heads column if it comes up heads (a less good month), and the amount in the Tails column if it comes up tails (the good month). They were not shown the expected return, standard deviation, or implied coefficient of relative risk aversion for each game. This game is based on the approach of Eckel and Grossman (2002), but modified to be framed in terms of businesses in case individuals had religious objections to gambling.

Business	Heads	Tails	Expected Return	Std. Dev.	Implied CRRA range
A	10	10	10	0	7.5<r
B	9	19	14	5	1<r<7.5
C	8	24	16	8	0.85<r<1
D	7	25	16	9	inefficient
E	6	30	18	12	0.315< r<0.85
F	4	32	18	14	inefficient
G	2	38	20	18	0<r<0.315
H	0	40	20	20	r<0

We created three dummy variables based on response choices to this game. Individuals made an *Inefficient Decision* if they chose business D or F. To see this, note that businesses D and F have the same expected return as other businesses in the game (C and E respectively) but higher standard deviations. An

individual should therefore only prefer D to C or F to E if they are risk-seeking. But if they are risk-seeking, they should prefer business H which has a higher expected return to business D or F. *Severe Risk Aversion* was coded as an individual choosing businesses A or B, which have implied coefficients of relative risk aversion above 1. *Risk-Seeker* denotes that the individual choose business H.

Aggregate Risk-Seeking Index is the average of the standardized z-scores for the following four risk measures which were signed so that for each a higher number indicates more risk-seeking (risk-seeking score, take risky job, severe risk aversion (reverse-signed), and risk-seeker).

Time preference measures

High discount rate indicates that an individual would prefer to receive NZ$1000 today than NZ$1500 one year from today when asked a hypothetical choice.

Hyperbolic discounter indicates the individual has a higher discount rate when comparing today to one year than comparing one year to two years when asked hypothetical choices about amounts to be received at different dates.

Short-term planner indicates that when the individual was asked the time period that best describes the period most important to them in making financial decisions about saving and spending, they answered "the next week" as compared to longer term horizons.

Aggregate Short-termism index is the average of standardized z-scores for each of the three time preference measures (high discount rate, hyperbolic discounter, and short-term planner), with higher scores indicating the individual is more short-term in their decision-making orientation.

Pro-market belief measures

Our measures of pro-market beliefs come from questions that follow di Tella et al. (2007).

Success alone is a binary variable coded as one if the individual believes it is possible to be successful on your own versus that a large group is necessary to be successful.

Money important is a binary variable coded as one if the individual believes money is indispensable to being happy. Note this differs from the coding of di Tella et al. (2007) who also include the responses "it is very important" and "it is important" as one, versus "it is not important to being happy". We had no responses of "it is not important to being happy" so this variable would be degenerate if coded as they did.

Effort better is a binary variable coded as one if the individual believes that people who put effort into working end up much better off than those who do not put in an effort. This differs from the coding of di Tella et al. (2007) who also include "better off" as one, versus "worse off" and "much worse off". No one responds "much worse off" in our survey, and only 3 percent respond "worse off", so the dichotomy here is between "much better" versus "better".

Trust others is a binary variable coded as one if the individual believes you can trust others versus that you cannot trust others.

Market beliefs is the sum of the four binary variables of pro-market beliefs.

Interaction with Closest relative Household

Communicate Weekly is a binary variable coded as one if the principal applicant says that they communicate at least weekly with the player in the closest relative household.

Send money several times is a binary variable coded as one if the principal applicant says that they send money to the closest relative household at least several times a year (the question gave options of at least monthly, several times a year, once a year, less than once a year or never, and only 2% of ballot winners and 4% of ballot losers send money monthly).

Receive money several times is a binary variable coded as one if the principal applicant says that they receive money from the closest relative household at least several times a year.

Would trust relative loan is a binary variable indicating that the principal applicant says that they would trust the closest relative to return a possession that they lent to them without having to ask repeatedly for it to be returned.

Know relative earnings is a binary variable indicating that the principal applicant says that they know how much the closest relative earns from work each month.

Relative knows PA's earnings is a binary variable indicating that the principal applicant says that the closest relative knows how much the principal applicant (PA) earns from work each month.

Consults with relative on finances is a binary variable indicating that the principal applicant says that they typically consult with the closest relative before making financial decisions.

Relative consults them on finances is a binary variable indicating that the principal applicant says that the closest relative typically consults the principal applicant before making financial decisions.

Joint business is a binary variable indicating that the principal applicant and closest relative jointly own a business together

Joint livestock is a binary variable indicating that the principal applicant and closest relative jointly own livestock together.

Aggregate interactions index is the average of the standardized z-scores of these 10 measures of interaction between the principal applicant and the closest relative household.

Household Efficiency in the Trust Game

Three versions of the trust game were given to each applicant- closest relative dyad, with the order randomized. The versions differ in how money is divided between players and in the information available to each player. Version A of the trust game has full information and the principal applicant as the residual claimant, with the following instructions:

A Assume you receive a windfall of 300 pa'anga. There are then three stages to this game.
Stage 1: You decide how much of the 300 pa'anga to keep for yourself, and how much you would like to transfer to the other player.
Stage 2: The other player then decides how much of the money you sent them to keep for themselves, and how much money to put into the **BONUS POT**. **The other player knows your windfall was 300 Pa'anga, and how much of that you have chosen to send to them.**
Stage 3: We then roll a 4-sided dice and multiply the money put into the bonus pot by the number that comes up on the dice. All the money in the bonus pot goes **to you,** along with what you kept in Stage 1.
Interviewer : Show the GREEN example card for game A and check that they understand it.

This Player (eldest PAC Principal Applicant)	*Other Player (phone now or soon after)*
a. how much of the 300 will you keep? _____	d. how much of what is received is kept? _____
b. how much will you give to Other Player? _____	e. how much is transferred to bonus pot? _____
c. how much do you think the other player will put into the bonus pot? ____	

Interviewer : Roll the 4-sided dice, and multiply the one number that shows on all faces by the amount in (e). Write down this number here: _____ . This amount plus that in (a) goes to the PAC Applicant player.

Household efficiency in game A is then defined as the share of the available windfall in this game (300 pa'anga) transferred to the bonus pot (sub-question e).

Version B of the game has full information and the closest relative as the residual claimant:

B Assume you receive a windfall of 300 pa'anga. There are then three stages to this game.
Stage 1: You decide how much of the 300 pa'anga to keep for yourself, and how much you would like to transfer to the other player.
Stage 2: The other player then decides how much of the money you sent them to keep for themselves, and how much money to put into the **BONUS POT**. **The other player knows your windfall was 300 Pa'anga, and how much of that you have chosen to send to them.**
Stage 3: We then roll a 4-sided dice and multiply the money put into the bonus pot by the number that comes up on the dice. All the money in the bonus pot goes **to the OTHER PLAYER,** along with what they kept in Stage 2.

Interviewer : Show the RED example card for game B and check that they understand it.

This Player (eldest PAC Principal Applicant)	*Other Player (phone now or soon after)*
a. how much of the 300 will you keep? _____	d. how much of what is received is kept? _____
b. how much will you give to Other Player? _____	e. how much is transferred to bonus pot? _____
c. how much do you think the other player will put into the bonus pot? ____	

Interviewer : Roll the 4-sided dice, and multiply the one number that shows on all faces by the amount in (e). Write down this number here: _____ . This amount plus that in (d) goes to the Other Player.

Household efficiency in game B is then again defined as the share of the windfall in this game transferred to the bonus pot.

Version C of the game again has the principal applicant as the residual claimant, but has partial information, with the closest relative not knowing exactly what the windfall received by the principal applicant was:

*Interviewer : In version C of the game, the PAC Applicant player draws a number from a hat, which is either 100, 300 or 500. This is the amount of windfall (**W**) for this game. The other player is not told how much **W** is.*

C Assume you receive a windfall of **W** pa'anga. There are then three stages to this game.
Stage 1: You decide how much of the **W** pa'anga to keep for yourself, and how much you would like to transfer to the other player.
Stage 2: The other player then decides how much of the money you sent them to keep for themselves, and how much money to put into the **BONUS POT**. **The other player only knows your windfall was somewhere between 100 and 500 Pa'anga but not the exact amount.**
Stage 3: We then roll a 4-sided dice and multiply the money put into the bonus pot by the number that comes up on the dice. All the money in the bonus pot goes **to YOU,** along with what you kept in Stage 1.

Interviewer : Show the BLUE example card for game C and check that they understand it.

This Player (eldest PAC Principal Applicant)	*Other Player (phone now or soon after)*
a. how much of the **W** will you keep? _____	d. how much of what is received is kept? _____
b. how much will you give to Other Player? _____	e. how much is transferred to bonus pot? _____
c. how much do you think the other player will put into the bonus pot? ____	

Interviewer : Roll the 4-sided dice, and multiply the one number that shows on all faces by the amount in (e). Write down this number here: _____ . This amount plus that in (a) goes to the PAC Applicant Player.

Household efficiency in game C is defined as the share of the windfall W that is transferred to the bonus pot.

Efficiency gap A-B is household efficiency in game A minus household efficiency in game B.

Efficiency gap A-C is household efficiency in game A minus household efficiency in game C.

Appendix 2: First-stage Regressions

	Full Sample	Long Survey Sample
	Migrate	Migrate
Ballot Win	0.726***	0.743***
	(0.078)	(0.095)
Sample Size	385	282
F-test	86.7	61.8

Note: Robust standard errors in parentheses. *** indicates significance at the 1 percent level.

Appendix 3: Individual Player Behavior in Trust Game

	Sample Size	Control Mean	Control S.D.	ITT Impact	LATE Impact
Share kept by PA in game A	282	0.405	0.182	-0.038	-0.050
				(0.027)	(0.035)
Share kept by PA in game B	282	0.359	0.144	-0.014	-0.018
				(0.021)	(0.027)
Share kept by PA in game C	282	0.373	0.203	-0.052**	-0.068**
				(0.026)	(0.034)
PA share in A - PA share in B	282	0.046	0.205	-0.024	-0.032
				(0.029)	(0.038)
PA share in A - PA share in C	282	-0.032	0.187	-0.014	-0.018
				(0.029)	(0.038)
Share kept by relative in game A	282	0.245	0.192	-0.016	-0.020
				(0.030)	(0.038)
Share kept by relative in game B	282	0.218	0.144	-0.026	-0.033
				(0.024)	(0.033)
Share kept by relative in game C	282	0.255	0.184	-0.004	-0.005
				(0.023)	(0.029)
Share PA expected relative to keep in game A	282	0.425	0.177	0.009	0.012
				(0.022)	(0.029)
Share PA expected relative to keep in game B	281	0.422	0.188	-0.019	-0.024
				(0.024)	(0.031)
Share PA expected relative to keep in game C	282	0.418	0.173	-0.031	-0.041
				(0.030)	(0.040)
Overestimate of PA of share relative keeps in A	282	0.181	0.240	0.025	0.032
				(0.036)	(0.047)
Overestimate of PA of share relative keeps in B	281	0.205	0.224	0.006	0.007
				(0.032)	(0.041)
Overestimate of PA of share relative keeps in C	282	0.201	0.204	-0.006	-0.008
				(0.041)	(0.053)

Notes:

Robust standard errors in parentheses: *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively. Each row represents migration impact for a single regression or IV regression.

Regressions weighted for population proportions of compliers and non-compliers, and include controls for age, gender, island of birth, ballot years, game order, and closest relative characteristics.

Game A has full information and the principal applicant (PA) as the claimant on the bonus pot; Game B has full information and the closest relative as the claimant on the bonus pot; Game C has the principal applicant as the claimant on the bonus pot, but partial information, with the closest relative only observing how much the PA transfers, not how much they start with.