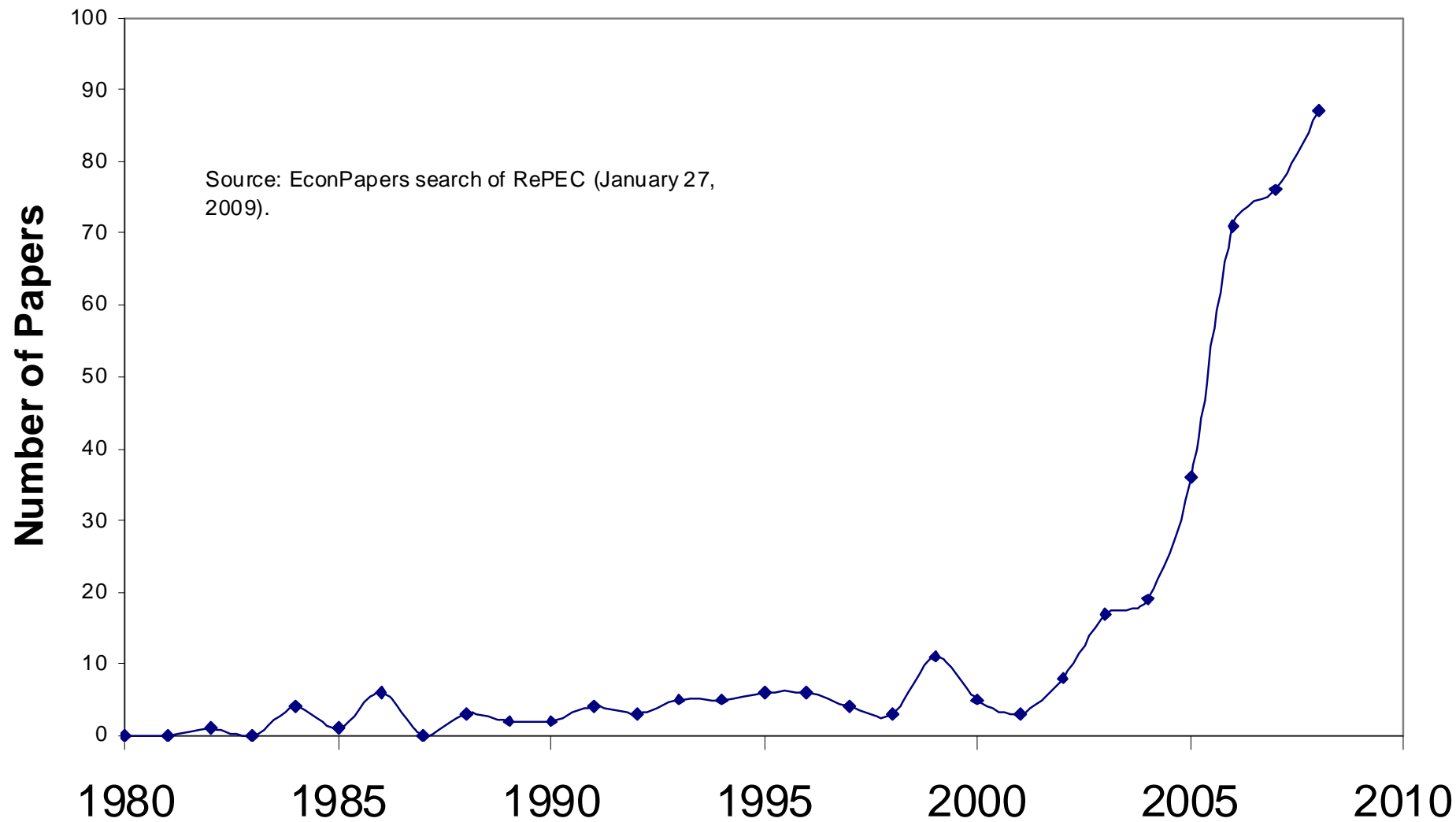


**The Impacts of International  
Migration on Remaining  
Household Members:  
Omnibus Results from a  
Migration Lottery Program**

David McKenzie, *World Bank*  
(with John Gibson and Steven  
Stillman)

## Working Papers and Journal Articles with "Remittances" in the title or as a keyword 1980-2008






# Overall Impact of Migration on Sending Household is Ambiguous

- n Increase in remittances
  - .. Income effect
  - .. May ease liquidity constraints
- n Loss in earnings and home production of member who left
- n Loss of mouth to feed
- n Possible transfer of knowledge and attitudes
- n Possible changes in bargaining power within household
- n Mental health impact of family separation
- n Change in incentives to migrate in the future.



# Double (or Triple) Selectivity problem

- n Typical approach to studying household impacts is to compare households with migrants to those without
- n Selection 1: Households decision of whether or not to have member migrate
- n Selection 2: Among households engaging in migration, decision of whether or not to have whole household move
- n (Selection 3): Decision of which households return



# PAC lottery program allows us to overcome these selectivity issues

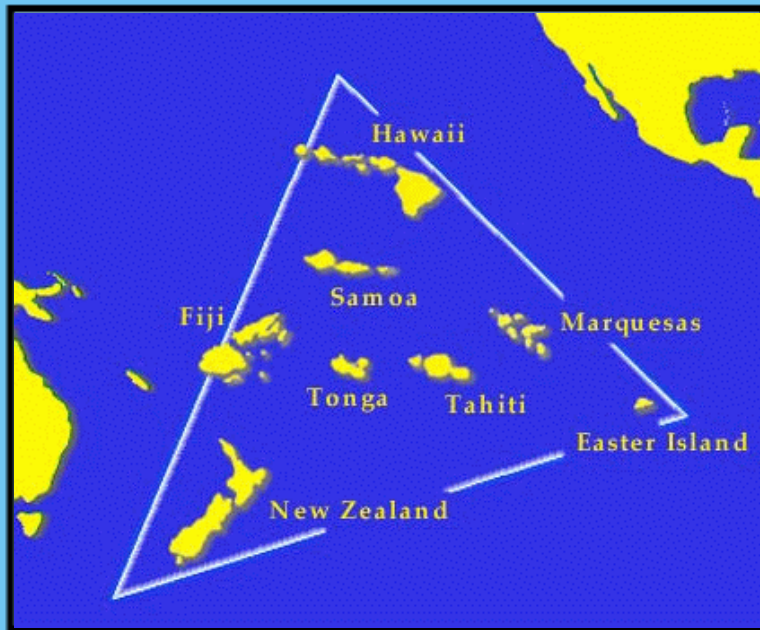
## n Pacific Access Category

- 18-45 year old Tongans allowed to register to migrate to New Zealand
- Random ballot used to select among entrants
- Ballot provides reason why some households have migrant and others do not.

## n Winning applicants can take spouse and dependent children 24 and under with them. Can not take other household members.

⇒ This rule provides a way of knowing which household members would stay and which would leave.

(No return migration in first 2 years – we have passport records of movement – so no third selectivity).



**TONGATAPU**  
 ■  
 LOW - FLAT LAND

**Tonga**  
 worldatlas.com

Pacific Ocean

Tafahi  
 Niuatoputapu  
 100 mi  
 100 km

Fonualei  
 Toku  
**Vava'u Group**  
 Late  
 Vava'u  
 Ha'ano  
 Lifuka  
 Uiha  
 Nomuka  
**Ha'apai Group**  
 Kao  
 Tofua  
 Nuku'alofa  
 Tongatapu  
 'Enu  
**Tongatapu Group**  
 'Ata



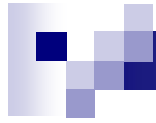
# Outline

- n PINZMS survey
- n Evidence on Selection
- n Migration Impacts
- n Robustness to Multiple Hypothesis Testing
- n Conclusions



# PINZMS survey

- n Four groups used for this paper
    - 61 households (283 individuals) with previous member who has moved to NZ through PAC (treatment group)
    - 26 households (115 individuals) with member successful in ballot, but who hasn't moved (non-complier group)
    - 124 households (654 individuals) with member who applied for ballot but not successful (experimental control group)
    - 124 households (727 individuals) where no one applied (non-experimental control group)
  - ⇒ Then use age and relationship rules to drop households and individuals who would have moved had the household won.
- Success in lottery used as instrument for migration.



# Timing

Survey occurs when migrants gone for median of 10 months, 77% interviewed when migrant abroad for less than one year.

=> Avoids averaging short and long run effects which may differ in sign.



# Who are the household members left behind?

- n Working age adults who are the siblings or parents of the winners
- n Children who are the nephews and nieces of winners

Reasonably common type of migration – migrant moving with spouse and leaving other family members behind. E.g. majority of married new migrants to the U.S. have spouse present

# Evidence of Selection?

	Sample Means			
	Stayer Ballot Losers	All Move Ballot Losers	Non-applicant Stayer HHs	All Non-applicant Households
<i>Household Characteristics</i>				
Total household Size	6.65	4.37***	6.04	5.90
Adults Aged 18 to 45	3.08	1.84***	2.62*	2.55**
Children Aged Under 18	2.57	2.53	2.88	2.89
Adults Aged over 45	1.00	0.00***	0.50***	0.43***
Log Total Income per capita	8.36	8.41	7.93***	8.00***
Total Income per capita	5400	6508	3626***	3896***
Household Labor earnings per capita	2683	3359	1712***	1851**
Agricultural Income per capita	282	141	124	113*
Subsistence Income per capita	2192	2621	1659	1789
Remittances per capita	243	373	130	130
Home ownership	0.53	0.35	0.29***	0.32**
Improve Home	0.06	0.01	0.06	0.05
Value of Durables	7672	7456	6042***	6250***
Number of Cars	1.24	1.01	0.83***	0.82***
Number of Pigs	5.96	4.12	5.36	5.22
Number of Chickens	8.49	3.84***	6.28	6.07*
Has Bank Account	0.89	0.88	0.64***	0.64***



# What outcomes should we look at?

- n Literature generally considers one or a handful
  - Income, asset levels, poverty
  - Labor supply
  - Child health
  - Education
  - Entrepreneurship
  
- ⇒ We look at all these, as well as
  - diet, anthropometric health measures, mental health, access to bank accounts.
  
  - IV-LATE estimation for 62 different outcomes, with and without controls



# Impacts on Household Size and Composition

	Total Household Size	Adults Aged 18 to 45	Children Aged under 18	Adults Aged over 45
<i>Panel A: Without Controls</i>				
Migration	-2.23*** (0.62)	-1.54*** (0.33)	-0.80* (0.44)	0.06 (0.18)
<i>Panel B: With Controls</i>				
Migration	-2.19*** (0.70)	-1.47*** (0.34)	-0.68 (0.52)	-0.09 (0.20)
Mean for Unsuccessful Stayer Households	6.65	3.08	2.57	1.00
<i>Estimates using Non-experimental Control Groups</i>				
Ignoring Whole households which would move:	-0.85 (0.53)	-0.76*** (0.23)	-0.78** (0.39)	0.64*** (0.15)
Using Non-applicant Stayer sample	-0.72* (0.41)	-0.60*** (0.18)	-0.74** (0.32)	0.61*** (0.15)
Using all Non-applicants	-0.64 (0.40)	-0.54*** (0.18)	-0.78** (0.31)	0.68*** (0.15)



# Impacts

- n Household Size and Composition:
  - .. Reduction in Adults aged 18 to 45, and in children 18 and under
  - .. No change in adults aged 46+
  - .. Total household size falls 2.2-3.3 from mean of 6.7

# Impact on Household Income

	Log Total Income	Household Labor Earnings	Agricultural Income	Subsistence Income	Net Remittances
<i>Panel A: Per Capita Without Controls</i>					
Migration	-0.259* (0.149)	-1,281*** (421)	-197 (165)	5 (461)	466*** (156)
<i>Panel B: Per Capita With Controls</i>					
Migration	-0.217 (0.150)	-1,031** (436)	45 (136)	-150 (531)	501*** (163)
Mean for Unsuccessful Stayer Households		2,683	282	2,192	243
<i>Estimates using Non-experimental Control Groups (for per capita):</i>					
Ignoring Whole households w	-0.243* (0.145)	-1,478*** (553)	-90 (118)	-195 (418)	366** (150)
Using Non-applicant Stayer sa	0.178 (0.134)	-206 (231)	-45 (71)	259 (319)	576*** (159)
Using all Non-applicants	0.149 (0.129)	-220 (225)	-32 (69)	167 (313)	581*** (156)



# Impact on Household Incomes

- n Total household income falls, but so does family size – look at per capita and per adult equivalent
- n 20-23% FALL in log income per capita (significant at 10% level)
- n Due to big drop in labor earnings per capita, which more than offset increase in remittances per capita.
- n No significant changes in per capita agricultural income and subsistence income (so total falls).
- n i.e. Migration INCREASING poverty.
  - Whereas using non-experimental control group might conclude migration is REDUCING poverty.

# Impact on Durable Assets and Financial Access

	Home Ownership	Value of Durables	Number of Cars	Number of Chickens	Number of Cattle	Has Bank Account	Has ATM Card
<i>Panel A: Without Controls</i>							
Migration	-0.022 (0.103)	-615 (508)	-0.288* (0.153)	-4.639*** (1.711)	-0.860* (0.493)	-0.172** (0.078)	-0.340*** (0.095)
<i>Panel B: With Controls</i>							
Migration	-0.058 (0.123)	-306 (637)	-0.236 (0.163)	-3.860** (1.900)	-0.81 (0.515)	-0.167* (0.090)	-0.306*** (0.108)
Mean for Unsuccessful Stayer Households	0.531	7,672	1.24	8.49	1.71	0.891	0.761
<i>Estimates using Non-experimental Control Groups:</i>							
Ignoring Whole households w	0.117 (0.093)	-328 (403)	-0.181 (0.125)	-2.015 (1.230)	-0.438 (0.376)	-0.147** (0.072)	-0.219** (0.090)
Using Non-applicant Stayer s	0.170** (0.080)	1,150*** (388)	0.295** (0.115)	-1.231 (1.170)	0.260 (0.277)	0.137* (0.074)	0.039 (0.080)
Using all Non-applicants	0.149* (0.079)	1,066*** (380)	0.318*** (0.112)	-1.063 (1.109)	0.263 (0.270)	0.146** (0.072)	0.002 (0.078)

# Impact on Diet


	# of Meals Rice	# of Meals Roots	# of Meals Fruits / Veggies	# of Meals Fish	# of Meals Fats
<i>Panel A: Without Controls</i>					
Migration	0.189** (0.072)	0.392*** (0.142)	-1.291*** (0.434)	0.177 (0.111)	-0.213 (0.149)
<i>Panel B: With Controls</i>					
Migration	0.130 (0.087)	0.314* (0.171)	-1.277** (0.498)	0.201 (0.143)	-0.337* (0.180)
Mean for Unsuccessful Stayer Households	0.082	1.571	3.265	0.551	0.837

*Estimates using Non-experimental Control Groups:*

Ignoring Whole households w	0.052 (0.078)	0.356** (0.144)	-0.511 (0.344)	0.142 (0.092)	-0.069 (0.128)
Using Non-applicant Stayer s&	0.026 (0.077)	0.135 (0.142)	-0.221 (0.290)	0.145* (0.085)	-0.100 (0.117)
Using all Non-applicants	0.010 (0.076)	0.120 (0.138)	-0.136 (0.282)	0.150* (0.083)	-0.080 (0.114)

**Table 6: Impact of Migration on Outcomes for 18-45 year old Adults Remaining in Tonga**

	Currently Employed (Males)	Currently Employed (Females)	Business Owner	Main Activity is Agriculture	Alcoholic Drinks Per Month	Body Mass Index	Waist to Hip Ratio	Mental Health
<i>Panel A: Without Controls</i>								
Migration	0.084 (0.123)	-0.103 (0.100)	-0.001 (0.059)	-0.178* (0.092)	7.476** (3.426)	-0.565 (1.776)	-0.028** (0.011)	-0.624 (0.417)
<i>Panel B: With Controls</i>								
Migration	0.057 (0.165)	-0.052 (0.093)	0.072 (0.047)	-0.178* (0.098)	6.550 (4.268)	-2.151* (1.092)	-0.029** (0.012)	-0.457 (0.556)
Mean for Unsuccessful Stayer Households	0.459	0.333	0.097	0.300	3.31	32.4	0.925	20.4
Sample Size	85	91	175	170	134	157	159	172
<i>Estimates using Non-experimental Control Groups:</i>								
Ignoring Movers	-0.038 (0.092)	-0.155** (0.075)	-0.044 (0.043)	-0.164** (0.065)	-1.150 (5.336)	-1.803 (1.095)	-0.021** (0.011)	-0.003 (0.414)
Using Non-applicant Stayers	-0.077 (0.065)	-0.075 (0.066)	-0.019 (0.034)	-0.090 (0.057)	2.259 (3.696)	-1.537* (0.927)	-0.027*** (0.009)	0.169 (0.362)
Using all Non-applicants	-0.037 (0.064)	-0.077 (0.063)	-0.003 (0.032)	-0.094* (0.051)	3.863 (3.470)	-1.398 (0.852)	-0.026*** (0.009)	0.315 (0.332)



# Impacts on kids and older adults

- n No impact on schooling or health for children
- n No impact on labor force participation, business activities, or health for over 45s.



# Key Econometric Issue

## MULTIPLE HYPOTHESIS TESTING

- n We are testing impacts on 62 different outcomes – of course expect to find some significant at the 10% and 5% levels.
- n Three approaches used to account for multiple testing and keep family-wise error rate at  $\alpha$
- 1) Bonferroni adjustment for k outcomes:

$$\text{Adjusted p-value} = \min(k\alpha, 1)$$

So with 62 outcomes,  $p=0.0016$  translates to adjusted p-value of 0.10.

- n Interpretation: looking across 62 outcomes, when there is no effect of migration on any outcome, the likelihood we find at least one variable with (unadjusted)  $p \leq 0.0016$  is 10%.
- n Issues:
  - Very conservative: assumes independence across outcomes
  - Low power as the number of outcomes increases.



# Multiple testing II

- n **Holm sequential adjusted p-values**
- n Sort outcomes so  $p_1 < p_2 < \dots < p_k$
- n Then adjusted p-values are:
  - ..  $p_{(1)} = \min(kp_1, 1)$
  - ..  $p_{(2)} = \max(p_{(1)}, (k-1)p_2)$
  - .. .....
  - ..  $p_{(k)} = \max(p_{(k-1)}, p_k)$
- n Offers more power than Bonferroni
- n Still assumes independence



# Multiple testing III

- n **Westfall-Young (1993) free step-down resampling**
- n Modified by Katz, Kling and Liebman (2007, Ecta) to use bootstrap
- n Used heavily in biology with thousands of genes to look for effects of
- n Algorithm:
  - Draw bootstrap sample of households
  - For each parameter  $j$ , calculate the p-value for the test that the bootstrap estimate  $B_j = b_j$ , the estimate from the actual data (this provides the distribution of p-values under the complete null)
  - Then compute successive minima of p-values
    - n  $q_{k,b} = p_{q,b}$
    - n  $q_{i,b} = \min(q_{i+1,b}, p_{i,b})$
  - Then adjusted p-value  $padj_j = \text{proportion of times } q_{i,b} < \text{original } p_i$
- n Allows for correlation across outcomes

**Table 9: P-Values and FamilyWise Adjusted P-Values for Models with Controls**

	Single variable P-value	Adjusted p-value for family-wise comparison		
		Bonferroni	Holm	Westfall-Young step-down minP
Adults aged 18 to 45	0.000	0.000	0.000	0.000
Household Size	0.000	0.000	0.000	0.000
Net remittances per capita	0.003	0.032	0.032	0.045
Net remittances per adult	0.005	0.062	0.057	0.069
Household has ATM card	0.006	0.050	0.050	0.129
# Meals of Fruits and Vegetables	0.012	0.083	0.083	0.114
Household labor earnings per adult	0.014	0.163	0.135	0.107
Adult Waist-to-hip ratio	0.016	0.197	0.197	0.111
Household labor earnings per capita	0.020	0.237	0.178	0.138
Number of chickens	0.045	0.402	0.358	0.369
Adult BMI	0.052	0.629	0.629	0.268
# Meals of Fats	0.064	0.446	0.382	0.307
Household has Bank account	0.068	0.614	0.477	0.434
# Meals of Roots	0.069	0.480	0.343	0.307
Adult main activity is agriculture	0.072	0.867	0.578	0.316
Older Adult in Very Good Health	0.073	0.801	0.801	0.358
English literacy for children	0.091	0.637	0.637	0.690
Log Total income per adult	0.096	1.000	0.674	0.348



# Conclusions

- n Addressed double-selectivity issue
- n Find evidence that sending families may be initially worse off when migrant leaves
  - .. And that failure to account for this double-selectivity would miss most of this impact.
  - .. Would think that migration has raised income and wealth, but experimental results suggest income may have fallen!



# Caveats

- n These are only short-run impacts, long-run impacts may differ.
- n Migrants themselves are benefiting a lot
  - .. Find a 283% in their income'
  - .. Their mental health improves
- n These impacts might extend to remaining family if they were allowed to move with the migrant.