

# Impacts of International Migration and Remittances on Source Country Household Incomes in Small Island States: Fiji and Tonga

Richard P.C. Brown and Gareth Leeves\*. Discussion Paper No. 347, April 2007, School of Economics, The University of Queensland. Australia.

Full text available as:

[PDF](#) - Requires Adobe Acrobat Reader or other PDF viewer

## Abstract

We use original 2005 survey data from Fiji and Tonga on remittances and household income to estimate the combined impact of migration and remittances on the composition of household income. A two-stage methodology is followed. A variable for the predicted number of migrants in each household is generated to control for selectivity in migration. This variable is then used in a 3SLS remittances and income equation system. In neither country do we observe significant impacts on agricultural cash income, but, in relation to other income sources, including subsistence agriculture, wages and non-agricultural business activities, some significant and different effects are found, both positive and negative. These findings suggest that the duration and intensity of remittance-driven migration, and the structure of economic activity within a community are important in understanding the influences of migration and remittances on household resource allocation and production decisions and on the community's economic transformation.

**EPrint Type:** Departmental Technical Report

**Keywords:** migration, remittances, agricultural and non-agricultural income sources, Fiji, Tonga

**Subjects:** 340000 Economics;

**ID Code:** JEL Classification D13; F22; F24; O15

**Deposited By:**

**Richard P.C. Brown**  
School of Economics  
University of Queensland  
[r.brown@economics.uq.edu.au](mailto:r.brown@economics.uq.edu.au)

**G. Leeves**  
School of Economics  
University of Queensland

---

\* School of Economics, University of Queensland, Brisbane, Queensland 4072, Australia. We thank the World Bank for permission to use the data from a recent survey (see Brown *et al.*, 2006), and Eliana Jimenez and John Connell, our co-researchers on the World Bank study. We also thank participants of the FAO workshop on "Migration, Transfers, and Household Economic Decision Making", Rome, January 2007, and especially Paul Winters and Benjamin Davis for very useful comments on the first draft. The usual caveats apply.  
Corresponding author [r.brown@economics.uq.edu.au](mailto:r.brown@economics.uq.edu.au)

# **Impacts of International Migration and Remittances on Source Country Household Incomes in Small Island States: Fiji and Tonga**

**Richard P.C. Brown and Gareth Leeves\***

School of Economics  
The University of Queensland  
Brisbane  
Queensland 4072  
Australia

## **1. Introduction**

In many Pacific island countries remittances from international migrants are a prominent feature of the economy, yet there are very few detailed studies of remittances using survey-based, empirical analysis, and those that exist were undertaken more than a decade ago and may no longer be valid (See Brown, 1995; 1997; 1998a; 1998b). Furthermore, most previous empirical studies in this region suffer potential biases arising from possible self-selection among migrants and reverse causation in the relationships between remittances and income. Recent research has emphasized the importance of adequately controlling for these influences in econometric analysis given the possibility of estimation biases (see Ozden and Schiff, 2006; Bank, 2006a, Ch. 5). Thus, existing information is likely to be inadequate on remittances contribution to income and economic development, and on how they affect household resource allocation.

This paper addresses the interrelationships between migration, remittances and household income in two Pacific Island countries, Fiji and Tonga. The analysis aims to identify the effects on household income sources of the combined impacts of the migrant's absence and the inflow of remittances, taking into account how migration and remittances can have both positive and negative effects. More specifically, we analyze the combined effects of migration and remittances on household income from

---

\* School of Economics, University of Queensland, Brisbane, Queensland 4072, Australia. We thank the World Bank for permission to use the data from a recent survey (see Brown *et al.*, 2006), and Eliana Jimenez and John Connell, our co-researchers on the World Bank study. We also thank participants of the FAO workshop on "*Migration, Transfers, and Household Economic Decision Making*", Rome, January 2007, and especially Paul Winters and Benjamin Davis for very useful comments on the first draft. The usual caveats apply. Corresponding author r.brown@economics.uq.edu.au

waged-employment, commercial and subsistence agriculture, and other business activities, including self-employment.

The approach conforms to recent developments in the New Economics of Labour Migration (NELM) literature, following closely the methodology developed by Taylor and others (see Taylor, Rozelle and de Brauw, 2003).<sup>2</sup> The empirical analysis is based on household survey data collected by the authors as part of a broader World Bank study in Fiji and Tonga during 2005 (Brown, *et al.*, 2006). There are three particular contributions that this paper makes to previous empirical research, through which we seek to shed additional insights on migration and remittances effects on resource allocation in developing economies. First, we include estimates of household subsistence income, which are then treated as a distinct source of household income. Our results indicate that migration can have significant effects on subsistence income, although neither migration nor remittances appear to any significant effects on market agricultural activities. Second, our estimate of remittance inflows includes both cash and in-kind transfers, sent through both formal and informal channels. Informal, in-kind transfers are known to be an important feature of migrants' remittance activities in Pacific island states (Brown, 1995) and so their inclusion provides a more complete picture of remittance effects. Third, the comparative analysis of two small, island economies, and two distinct ethnic communities within one of them, allows for investigation of the implications for the impacts of migration and remittances of different migration histories, patterns and motivations, and different economic structures and the associated differences in composition of household earnings.

The rest of this paper is organised as follows. Section 2 provides some background on the migration patterns and economies of Fiji and Tonga. Section 3 discusses the 2005 World Bank survey on remittances in Fiji and Tonga and presents some descriptive statistics on migration, remittances and the composition of household income. Section 4 discusses the modelling of the impacts of migration and remittances and in particular the treatment of endogeneity. Section 5 presents the results of the regression analysis of the combined effects of migration and remittances on household income from four main sources: cash and subsistence agriculture, wages and business activities. Section 6 draws conclusions.

---

<sup>2</sup> See also Stark and Levhari (1982); Stark and Bloom (1985); Taylor (2003); Taylor and Wyatt (1996).

## 2. Background

The choice of Fiji and Tonga as country studies for the World Bank project was motivated by their different migration histories and remittance behaviours. Tonga, with over 40 years of intensive remittances-motivated migration, has higher levels of migration and generates much larger per capita remittance flows (Brown, 1995; Brown *et al.*, 2006). In the case of Fiji, international migration is a relatively more recent phenomenon, and there are also important differences in migration histories between the two main ethnic groups, Indo- and Indigenous-Fijians. In Tonga there is no real evidence of any significant changes in the structure and impact of migration in the past decade. Fiji by contrast represents a country where migration and remittances have grown in significance (Brown *et al.*, 2006) as has the awareness of their importance on the part of the government and financial sector.

A distinctive feature of international migration in the Pacific is that migrants have typically tended to be settlers, rather than temporary migrants, even though they may express (and sometimes act on) intentions to return home. Permanent migration is particularly true of many migrants from Fiji (mainly Indo-Fijians) and especially Tonga. This limits direct comparisons with other migration-remittance states, such as the Philippines and Pakistan, where most migrants are on short-term contracts. However, in recent years there has been a growing demand for more temporary, contract migrants, from Gulf countries, which have been attracting increasing numbers of temporary migrants from Fiji, mainly Indigenous-Fijians. There are also mounting labour-market pressures for short-term contract labour migration from the Asia-Pacific region to Australia and New Zealand for both skilled and unskilled work (World Bank, 2006b).

Following a NELM approach this paper analyses migration and remittance flows as possible stimulants to households' economic activity with the potential to provide longer-term benefits in source communities (see for example, Stark and Levhari, 1982; Stark and Bloom, 1985; Taylor *et al.*, 2003). The paper seeks to disentangle these effects in the context of a pattern of permanent migration, which has not been the subject of previous research.

### 3. Survey Data on Migration, Remittances and Composition of Income

The survey on which this paper is based was prepared and conducted on behalf of the World Bank in the first half of 2005. (For details of the design of the survey instrument, selection of enumeration areas, sampling and survey administration, see Appendix 1 of Brown *et al.*, 2006.) The sample of 918 households was made up of 418 households in Fiji and 500 in Tonga. Information was collected for each individual within the household giving a total of 4,663 sampled individuals, 1,937 in Fiji and 2,726 in Tonga.

Fiji, with a population of 836,000, comprises 322 islands, though the largest two islands, Viti-Levu and Vanua Levu, are home to over 94% of the people. The main population centres, including the capital, Suva, are located on Viti-Levu on which over 70% of the country's population lives. Due to budget constraints, the survey sample was limited to Viti-Levu. The sample consisted of 13 urban and 21 rural enumeration areas, scattered across Viti-Levu, including Suva and the five major towns of Nausori, Lautoka, Nadi, Ba and Sigatoka, nine villages, and twelve settlements. As can be seen from Table 1, the sample reflects the fairly even urban-rural split of the population, as well as its ethnic composition, with 50.5% of the sample being Indo-Fijian, 47.1% Indigenous-Fijian and the remaining 2.4% comprising other ethnic groups.<sup>3</sup>

The Kingdom of Tonga embraces 171 islands, and has a population of approximately 100,000. Only 25% live in the outer-islands, with the large majority of the population living in the main island of Tongatapu and mostly concentrated in the capital, Nuku'alofa, which is home to around 50% of the people. This population split is reflected in the survey sample, which was provided by the Department of Statistics in Nuku'alofa. The primary sampling units consisted of 20 enumeration areas covering both the urban and rural population. The sample was drawn from the capital city Nuku'alofa, 4 districts of rural Tongatapu and two groups of outer-islands, Vava'u and Hapa'i. Again, the sample was split quite evenly between urban and rural households.

---

<sup>3</sup> In this table and in the remainder of this study the data for the two main ethnic groups are presented, with the 'other Fiji' category, comprising 10 households, is omitted altogether.

Table 1 Composition of 2005 Household Sample, Fiji and Tonga

<b>Country</b>		<b>Urban</b>	<b>Rural</b>	<b>Total</b>
Indo-Fijian	n=	107	90	197
(%)		(54.31)	(45.69)	(100.00)
Indigenous-Fijian	n=	94	117	211
(%)		(44.55)	(55.45)	(100.00)
Tongan	n =	250	250	500
(%)		(50.00)	(50.00)	(100 .00)

Source: Brown *et al.* (2006)

Table 2 shows the proportions of households with and without migrants, and, the number of migrant members in those with at least one migrant. As expected, the percentage of Tongan households with one or more migrants is significantly greater than in Fiji, and, within Fiji, the incidence is higher among Indo-Fijians. However, it should also be noted that in Tonga, 24% of households have more than two migrant members, and among Indo-Fijians a similar percentage has more than one migrant. Some households had as many as six migrants currently living abroad. It is therefore possible that the level of migration and remittances could influence income in the household. This hypothesis is examined more closely in the econometric analysis in Section 5.

Table 2 Numbers of Migrants in Household

	<b>Number of Migrants/Household</b>				
	<b>0</b>	<b>1</b>	<b>2</b>	<b>&gt;2</b>	<b>Total</b>
	<b>Indo-Fijian</b>				
n =	112	36	22	27	197
(%)	(56.9)	(18.3)	(11.2)	(13.7)	(100.00)
	<b>Indigenous-Fijian</b>				
n=	155	37	13	5	210
(%)	(73.8)	(17.6)	(6.2)	(2.4)	(100.0)
	<b>Tongan</b>				
n =	209	95	76	120	500
(%)	(41.8)	(19.0)	(15.2)	(24.0)	(100.0)

Table 3 shows which households had received remittances in one form or another over the preceding year. The sample is split between those households with at least one migrant and those without any migrants. In Fiji, 34.4% of the sample had at least one migrant, and of these 86.8% received remittances.<sup>4</sup> In Tonga, 58.2% of the

<sup>4</sup> The mean number of migrants per migrant household is also higher in Tonga (2.4) in comparison with Fiji (1.8).

sample had at least one migrant, of which 97.6% received remittances. Although the high incidence of remitting migrants was to be expected from previous knowledge about remittances and migration networks in the region, what was not expected was the high proportion of households without any migrants who were also in receipt of remittances. It should be noted that in the survey instrument, household member was defined broadly in terms of ‘those eating from the same pot’ and migrant members are those who lived within the household before leaving and/or who would live within it if they were to return in the near future.

In Tonga, where migration- and remittances-dependency have been long established and have become almost ubiquitous, 78.5% of non-migrant households received remittances, and in Fiji, the ‘less mature’ migration-and-remittances economy, almost 20% of households without migrants received remittances. Of the total sample, 89.6% of Tongan and 42.8% of Fiji households received remittances.<sup>5</sup> However, this table also points to some important differences between the two main ethnic groups in Fiji. First, a much larger proportion of Indo-Fijian households have at least one migrant (43.2%) in comparison with Indigenous-Fijians (26.1%).<sup>6</sup> Second, although a similarly high proportion of migrant households in both groups receive remittances - 84.7% of Indo-Fijians and 89.1% of Indigenous-Fijians – a much larger proportion of Indo-Fijian non-migrant households receive remittances (26.8%), in comparison with Indigenous-Fijians (14.7%).

Table 3 Households Receiving Remittances: Fiji and Tonga, 2004

<b>Migrants in HH?</b>	<b>Fiji</b>			<b>Tonga</b>		
	<b>Received</b>	<b>Received</b>	<b>Received</b>	<b>Received</b>	<b>Received</b>	<b>Received</b>
	<b>No</b>	<b>Yes</b>	<b>Total</b>	<b>No</b>	<b>Yes</b>	<b>Total</b>
No	220	54	274	45	164	209
(%)	(80.3)	(19.7)	(65.6)	(21.5)	(78.5)	(41.8)
Yes	19	125	144	7	284	291
(%)	(13.2)	(86.8)	(34.4)	(2.4)	(97.6)	(58.2)
Total	239	179	418	52	448	500
(%)	(57.2)	(42.8)	(100.0)	(10.4)	(89.6)	(100.0)

<sup>5</sup> The percentage for Tonga is considerably higher than the 75% found in the 2001 *Household Income and Expenditure Survey*. The most likely explanation for the difference is that the HIES used a rather general question about cash remittances only, while this questionnaire asks numerous questions with cross-checks to assist the respondent in recalling transfers that might not have been considered remittances, such as in-kind transfers, and bills paid on behalf of the household. The 91% figure is also very similar to what was observed in a similar survey over a decade earlier (Brown, 1995).

<sup>6</sup> Indo-Fijian migrant households also have more migrants on average (2.0) than do Indigenous-Fijians (1.5).

<b>Migrants in HH?</b>	<b>Indo-Fijian Received Remittances?</b>			<b>Indigenous-Fijian Received Remittances?</b>		
	<b>No</b>	<b>Yes</b>	<b>Total</b>	<b>No</b>	<b>Yes</b>	<b>Total</b>
No	82	30	112	133	23	156
(%)	(73.2)	(26.8)	(56.9)	(85.3)	(14.7)	(73.9)
Yes	13	72	85	6	49	55
(%)	(15.3)	(84.7)	(43.2)	(10.9)	(89.1)	(26.1)
Total	95	102	197	139	72	211
(%)	(48.2)	(51.8)	(100.0)	(65.9)	(34.1)	(100.0)

Source: Brown *et al.* (2006)

These observations are important for they suggest that as migration and remittances become more commonplace in an economy, non-migrant households can benefit more from direct access to remittances. This points to a more nuanced view on the relationship between migration, remittances and household income in these societies than what is generally concluded from most other studies of migration and remittances, where it is normally assumed that it is only migrant households who stand to benefit, at least directly, from the flows of remittances.

In relation to composition of household income, the survey obtained information from each household on income from the following sources: agricultural cash income, subsistence income, wage income and non-agricultural business income. Other sources of income including interest, government transfers and pensions were grouped together in a residual “other” category. Remittances (in all forms) and other private unrequited transfers are not treated as part of household income but as separate supplements to income.

To estimate subsistence income the survey collected information about household agricultural activities, including farming, raising livestock, average stocks of animals held by the household during 2004 and the number sold at the markets. National average production data were provided by the Department of Statistics in Tonga and the Ministry of Agriculture in Fiji, as well as agricultural reports and census in Fiji and Tonga and the FAO Statistical Database.<sup>7</sup> Off-take rates from secondary sources were used to estimate the household’s own consumption and that which was given away to others, deducting market sales. The survey also asked the household if they grew crops during 2004, what type of crops, the number of acres

<sup>7</sup> Average household production might then be overestimated for subsistence farmers since data are calculated using commercial crop producers.



cultivated and the proportion of output sold at the markets.<sup>8</sup> In estimating subsistence farming production value, farm-gate prices<sup>9</sup> were used, with the exception milk and eggs, for which retail prices were used. Subsistence farming value is thus assumed to be the net value households would have obtained for their own consumption of produce at the markets, after deducting transport and transaction costs.

Estimates of the other primary sources of household income – wages and business income – are derived from respondents’ responses to direct questions about these amounts.

It is well recognized in the literature that migration and remittances can affect household income both directly and indirectly. First, remittances can, in the shorter term, be a substitute for what the migrant would have earned had he/she decided to stay, in which case migration might have a negative impact on household income. However, if migration is of a more permanent nature then remittances may become more akin to an exogenous income supplement, where the household accommodates for the absence of the migrants by re-organising its remaining members’ activities. Second, having access to remittances might also have a positive impact on household income by providing insurance and removing liquidity constraints. Therefore, to estimate the net effect of migration and remittances on incomes, it is necessary to control for endogeneity between remittances and income sources.

Table 4 shows the composition of household cash income, for the whole sample disaggregated by per capita income quintile. Income is divided between: farm income (cash); subsistence income; wage income; business income; and ‘other’ income.

Table 4 Composition of Income by Per Capita Income Quintiles

Per Capita Quintile	Mean (US\$2004)	% Composition of Income by Source					Total
		Farm	Subsistence	Wages	Business	Other	
<b>Indo-Fijian</b>							
1 <sup>st</sup>	422.1	6.5	2.0	60.6	19.8	11.1	100.0
2 <sup>nd</sup>	919.6	10.5	4.1	79.4	6.0	0.0	100.0
3 <sup>rd</sup>	1522.4	3.6	2.7	85.0	2.7	6.0	100.0
4 <sup>th</sup>	2384.1	2.2	2.1	77.8	12.0	6.0	100.0

<sup>8</sup> This work forms part of Eliana Jimenez’s ongoing PhD thesis at University of Queensland. Details of estimates available on request.

<sup>9</sup> These prices, which are net of transport and other transaction costs were directly provided by the Department of Statistics in Tonga and the Ministry of Agriculture in Fiji in February 2006.

<b>5<sup>th</sup></b>	<b>5793.2</b>	1.9	0.7	74.6	17.6	5.2	100.0
<b>TOTAL</b>	<b>2199.6</b>	3.1	1.6	76.6	13.4	5.2	100.0
<b>Indigenous-Fijian</b>							
<b>1<sup>st</sup></b>	<b>156.1</b>	27.4	15.8	37.9	6.6	12.3	100.0
<b>2<sup>nd</sup></b>	<b>447.2</b>	27.3	15.8	42.2	11.3	3.4	100.0
<b>3<sup>rd</sup></b>	<b>734.4</b>	11.5	17.1	67.1	0.0	4.3	100.0
<b>4<sup>th</sup></b>	<b>1279.2</b>	12.5	11.2	75.8	0.2	0.3	100.0
<b>5<sup>th</sup></b>	<b>3398.5</b>	20.5	5.0	54.6	8.5	11.4	100.0
<b>TOTAL</b>	<b>1203.1</b>	18.4	8.9	59.3	5.9	7.6	100.0
<b>Tongan</b>							
<b>1<sup>st</sup></b>	<b>127.5</b>	18.8	39.1	26.8	3.6	11.8	100.0
<b>2<sup>nd</sup></b>	<b>394.8</b>	16.4	26.4	43.1	4.2	9.9	100.0
<b>3<sup>rd</sup></b>	<b>726.0</b>	14.9	21.5	48.8	6.5	8.4	100.0
<b>4<sup>th</sup></b>	<b>1166.3</b>	10.1	20.0	50.6	7.1	12.1	100.0
<b>5<sup>th</sup></b>	<b>4716.2</b>	4.7	14.9	37.5	6.8	36.1	100.0
<b>TOTAL</b>	<b>1426.2</b>	7.5	17.5	40.9	6.6	27.5	100.0

Source: Authors' calculations from 2005 World Bank survey (Brown, *et al.*, 2006)

Indo-Fijians enjoy a relatively higher mean income than Tongans and Indigenous-Fijians. With Fiji being more industrially-developed, wage income for both Fijian communities is a much higher proportion compared with Tonga, and, given Indo-Fijians' heavier involvement in business activities, their business income is considerably more important than in either of the other two communities, across all quintiles. In Tonga, a much less industrially developed country, subsistence income still constitutes an important source of household income at all income levels. For Indigenous-Fijians, cash income from agriculture is substantially more important than for the other two groups, again, across all income levels, including the highest income households. In Tonga, other income sources account for over 25% of total income, and at the top end of the income scale this is over 36%, indicative of the socio-economic structure of the Kingdom with its nobility still yielding considerable economic power. With such clear differences in the structure of earnings among the three communities it should not be expected that migration and remittances will have the same impacts on household resource allocation. We test for possible differential impacts by estimating separate models for each community in the econometric analysis discussed in the next two sections.

#### 4. Methodology

To address problems of endogeneity researchers attempt to construct instruments that are correlated to the endogenous regressor, but uncorrelated to the outcome variable. For instance, Ravallion and Dearden (1988) used predicted consumption as an instrument for actual consumption. A similar approach was followed by Taylor *et al.* (2003) in their analysis of the impact of migration on income in China, where they used the predicted rather than the actual number of migrants for each household, where the variable for the predicted number of migrants satisfied the condition of being exogenous to the income equations. Moreover, predicted migration addresses the problem of selectivity bias as not all households have migrants.

Further, in modelling the relationships between remittances and household income an endogeneity problem arises from the likelihood of remittances being jointly determined with income from the various other, non-remittance sources. Furthermore, remittances and household income may be subject to the same exogenous shocks which could result in contemporaneous correlation across the estimated income and remittances equations. To resolve these issues this analysis follows closely the approach of Taylor *et al.* (2003). Their model, drawing on NELM, is based on the hypothesis that both migration and remittances can affect (non-remittance) household income from all sources, and that remittances and migration are endogenously determined with income sources. A two-stage methodology is followed, where, in the first stage, a variable for the predicted number of migrants in each household is generated to control for selectivity. This variable is then used in a second-stage system of remittances and income equations.

The functional form of the first-stage migration equation must take into account that some households could have no migrants and while others could have more than one migrant. A count data model is therefore estimated, using a negative binomial functional form as a predictor of migration.<sup>10</sup> This model also ensures non-negative predictions, which a linear model could not. To identify the predicted migration equation a community-level ‘migration network’ variable is used. This is chosen because of the important role of migration networks at the local community level in the migrant-sending country that serve to enhance migration opportunities and propensities for potential migrants by, for example, reducing migration costs and

---

<sup>10</sup> Taylor *et al.* (2003) use a Poisson model which was also estimated in this study. However, likelihood ratio tests (see Table X) suggest that a negative binomial model is preferred to a Poisson model due to over-dispersion in the data.

providing information to the potential migrant. As the dataset used in this analysis did not include separate community-level observations as in the study of Taylor *et al.* (2003) it was necessary to construct this network variable from the household data. The mean maximum length of absence of households' migrant members was calculated for the local community, omitting the household observation in each instance.

In the second stage, in estimating remittances and income, it is hypothesized that migration and remittances could have different effects on income from each main source. The predicted number of migrants derived from the migration equation described above is used as the instrument for the observed number of migrants. Then, to control for potential endogeneity, a three-stage least squares (3SLS) procedure is used to estimate, simultaneously, the remittances and income equations to allow for the possibility of contemporaneous correlation in the error terms across remittances and income and the possibility of effects from unobserved common shocks.

More formally, for the first stage migration equation the Poisson model for the probability of observing  $m_i$  migrants would be expressed as:

$$P(M_i = m_i) = \frac{e^{-\lambda_i} \lambda_i^{m_i}}{m_i!}, m_i = 0,1,2,\dots \quad (1)$$

with  $\ln \lambda_i = \beta' x_i$  where the conditional mean equals the conditional variance ( $\lambda_i$ ). The negative binomial functional form generalizes the Poisson model where  $\ln \lambda_i = \beta' x_i + \varepsilon$  where  $\exp(\varepsilon)$  has mean 1 and variance  $\alpha$ ,  $\alpha$  is the dispersion parameter. The resulting probability distribution is given by:

$$P(M_i = m_i | \varepsilon) = \frac{e^{-\lambda_i \exp(\varepsilon)} \lambda_i^{m_i}}{m_i!}, m_i = 0,1,2,\dots \quad (2)$$

and  $E(m_i/x_i) = \lambda_i$  and  $\text{Var}(m_i/x_i) = E(m_i/x_i)(1 + \alpha E(m_i/x_i))$ . If  $\alpha = 0$  then the model is equivalent to the Poisson distribution.

In the three-stage least squares we estimate an equation describing the motivation to remit:

$$R_i = \phi_o + \phi_1 \hat{M}_i + \phi_2 X'_i + \varepsilon_i \quad (3)$$

where  $R$  denotes the amount of remittances, is  $\hat{M}$  the predicted level of migration from the first stage equation,  $X'$  is a vector of household characteristics and  $\varepsilon$  is an error term. For each income source we specify an equation of the form

$$Y_{ki} = \gamma_o + \gamma_1 \hat{M}_i + \gamma_2 R_i + \gamma_3 Z'_{ki} + \varepsilon_{ki}, k = f, s, w, b \quad (4)$$

where the four income sources are:  $f$  = farming;  $s$  = subsistence income;  $w$  = wage income;  $b$  = business income and  $\varepsilon$  are error terms;.  $Z'$  is a vector of household characteristics and the other terms are as before.

## 5. Results

A detailed description of the variables used in the empirical estimation is contained in the Appendix (Table A.1). Summary statistics of the variables are presented in Table 5. Remittances and the various income sources have been discussed in some detail in Tables 2 to 4. Of the other variables we note that predicted migration (first stage regression) is, as expected, higher for Tonga.

Table 5 Migration and Remittances Effects on Income Sources: Descriptive Statistics

Variable	Sample Means (Standard Deviations)		
	Indo-Fijian (n=197)	Indigenous- Fijian (n=210)	Tongan (n=500)
Remittances	413.90 (1035.53)	606.72 (2020.31)	2178.35 (3608.46)
Farm Income	286.26 (1037.86)	911.83 (5371.59)	469.06 (1787.72)
Subsistence Income	167.20 (586.38)	434.89 (889.30)	922.59 (3134.68)
Wage Income	6221.32 (6931.39)	3449.94 (5045.92)	2735.68 (4058.87)
Business Income	1198.21 (5975.42)	254.66 (1319.98)	330.75 (2389.45)
No of Migrants (predicted)	0.91 (0.56)	0.40 (0.37)	1.40 (0.57)
<i>Household Characteristics:</i>			
Young dependents	0.97 (1.27)	1.34(1.40)	1.74 (1.73)
Household Size	4.32 (2.09)	5.12 (2.41)	5.45 (2.92)
Household Head Experience	31.15 (15.93)	30.86 (13.58)	33.00 (15.32)
<i>Household Head Education:</i>			
Primary	0.17 (0.37)	0.15 (0.35)	0.05 (0.22)
Tertiary	0.16 (0.37)	0.11 (0.32)	0.09 (0.29)
Wealth Index	1.50 (1.99)	-1.49 (2.93)	0.00 (2.45)
Location – Capital	0.25 (0.43)	0.15 (0.36)	0.51 (0.50)
Av. Educ. migrants	5.22 (6.55)	3.05 (5.27)	7.70 (6.60)
US migrants	0.19 (0.51)	0.04 (0.19)	0.26 (0.44)
Other Country migrants	0.08 (0.27)	0.08 (0.26)	0.05 (0.22)
Aus/NZ migrants	0.55 (0.98)	0.25 (0.70)	0.52 (0.63)
Wedding	0.07 (0.25)	0.05 (0.21)	0.04 (0.19)
Loans 2003	0.13 (0.34)	0.28 (0.45)	0.27 (0.45)
Agric.land per capita	0.39 (1.25)	0.53 (1.05)	0.46 (0.80)
Business duration	3.93 (9.05)	4.67 (10.63)	1.86 (4.72)

To derive a measure of wealth that was broadly based and less subject to endogeneity concerns that might exist with a contemporaneous measure of financial assets, a wealth index was constructed and a value assigned to each household. The index was based on principal components analysis derived from components representing household assets (physical and financial) and housing quality. The components are assigned weights and used to derive a score for wealth following the methodology of Filmer and Pritchett (1999) (see Brown *et al.* (2006) for a more detailed discussion of the derivation of the wealth index in this paper). By construction the mean of this index for each country will be zero. In Fiji it is clear that Indo-Fijian households are almost exclusively in the upper half of the wealth distribution and Indigenous-Fijian households in the lower half. Tongan households are larger and the household head is on average older, with more young dependents. The Tongan capital is the only major urban centre, containing approximately half the population, which is reflected in the statistics. Tongan migrants have higher levels of human capital. In all cases, more households have migrants in the traditional destinations of Australia and New Zealand.

The migration equation estimates are reported in Table 6. The network variable is the average maximum length of absence overseas of migrants from households in the village/district.

Table 6 First Stage Negative Binomial Migration Equation Test Statistics  
(p-values in brackets) <sup>+</sup>

	<b>Indo-Fijian</b>	<b>Indigenous-Fijian</b>	<b>Tongan</b>
Mean of the maximum length of absence of households' migrants, for village/district	0.13 (0.00)* Mean (4.37) sd (2.85)	0.13 (0.01)* Mean (2.88) sd (2.66)	0.11 (0.00)* Mean (6.96) sd (3.48)
$\alpha = 0 : \chi^2(1)$	21.67 (0.00)*	11.44 (0.00)*	49.53 (0.00)*
No. of Observations	194	209	500
Correlation predicted and actual	0.34	0.28	0.36

<sup>+</sup> Other variables included – Household size, Total number of children, Household head experience, Household head education, wealth index, p-values based on robust standard errors. \* sig at 5%

This variable was constructed in order to capture the degree of migration culture in the local area. This is based on evidence of strong chain migration effects observed in recent studies (Bauer, Epstein and Gang, 2002; Epstein and Gang, 2006). Migrants are important in shaping migration plans of others in the same network. It is

expected that a longer duration overseas will have enabled migrants to build better networks in the host countries and the content of information that they supply will be of better quality and more reliable, both of which will encourage migration. In a recent study of a number of African countries van Dalen *et al* (2005) noted a migration culture in a region is far more likely to generate network effects.

The coefficients on the network variable have the expected positive sign and are highly significant in all cases. The correlation between the actual and predicted number of migrants is less than that reported by Taylor *et al* (2003) but this is to be expected given the much more homogeneous group of respondents in their survey who were all rural farmers in one district of China. Nevertheless, there is still a reasonably strong correlation. It is interesting that the network variable has a similar quantitative effect on current migrants in Fiji even though migration is less established than in Tonga, as can be seen from the mean values. The test for  $\alpha = 0$  is a test for over-dispersion and strongly supports the use of the negative binomial rather than a Poisson distribution.

For brevity, the results reported from the regression analysis in Table 7 are restricted to the effects of the predicted number of migrants and remittances on household income from the four main sources: farm cash income; subsistence income; wage income; and, business income.

Table 7 Estimated Effects of Migration and Remittances on Income Sources+  
(Coefficients in US\$ values; p-values in brackets)

	Remittances	Farm Income	Subsistence Income	Wage Income	Business Income
<b>Indo-Fijians</b>					
No. of Migrants (predicted)	-63.92 (0.66)	112.38 (0.42)	-101.23 (0.30)	-458.14 (0.68)	1289.90 (0.17)
Remittances	--	0.10 (0.59)	-0.10 (0.42)	-2.43 (0.03)*	-0.53 (0.60)
<b>Indigenous-Fijians</b>					
No. of Migrants (predicted)	-731.33 (0.11)	-132.19 (0.66)	-280.65 (0.09)**	847.92 (0.45)	-163.48 (0.67)
Remittances	--	-0.09 (0.49)	-0.13 (0.11)	-0.99 (0.02)*	0.24 (0.10)**
<b>Tongan</b>					
No. of Migrants (predicted)	-144.20 (0.58)	114.14 (0.28)	776.04 (0.00)*	105.28 (0.71)	350.16 (0.01)*
Remittances	--	0.01 (0.85)	-0.13 (0.24)	-0.20 (0.21)	0.51 (0.00)*

+ Excluding remittances, \* sig 5%, \*\* sig 10%



The complete set of coefficient estimates are presented in the appendix (Appendix Table A.2). Note that remittances include both cash and in-kind transfers.<sup>11</sup> Test statistics for exogeneity in the 3SLS regressions are shown in Appendix Table A.3 and suggest that the instruments pass the Hausman-Wu Test for the Indigenous Fijian sample and are in general satisfactory in the other two cases with some concern in one equation in each case.

From the results in Table 7 it can be seen that the impact of migration and remittances on income sources differs substantially across the three sub-samples. As discussed previously, the number of migrants could affect household income negatively or positively; the former due to there being fewer income earners remaining, with the latter applying if having migrants opens new income-generating possibilities, by, say reducing risk and providing insurance for family farming or business activities. The only evidence we find of positive effects from migration is in Tonga where income from subsistence farming and business activities is significantly increased by the number of predicted migrants. This would suggest that having more migrants may, in some cases, enable the household to redirect resources to development of self-employed and business activities as opposed to reliance on wage income or income from other sources. It could also capture help and support that come from migrants other than direct material support through remittances. It has been identified that Tongan migrant households, very often with their members spread across a number of countries, can act as a stimulus to and conduit for agriculture-related business activities, such as the production of food crops for export to migrant communities in Auckland and Sydney, appropriately described in the South Pacific literature as ‘trans-national corporations of kin’ (Marcus 1981; Bertram, 1986; Brown and Connell, 1993). The positive association between the number of migrants and subsistence income in Tonga could also reflect the fact that households with high levels of migration in Tonga have much older household heads than in Fiji. The correlation between these two variables is 0.61 in Tonga and 0.17 in Fiji. Hence, migrants may often be supporting older relatives especially in rural areas, where migrant offspring constitute, in effect, a pension fund for the elderly.

---

<sup>11</sup> Having observed previously that some households without migrants receive remittances and some households receive remittances from both from migrant members and non-migrant members, future work, beyond the scope of this study, will attempt to split the two sources of remittances and compare their effects on household income.

In Tonga, remittances are associated with increasing income from business activities, reinforcing the notion that communities with a long history of migration and high levels of remittance-dependence are able to reallocate their income-generating activities away from traditional sources of income, thereby becoming more oriented towards business activities.

In Fiji remittance and migration have distinctly different effects between Indo-Fijian and Indigenous-Fijian households. Indo-Fijians exhibit no effects on income sources from migration but in Indigenous-Fijian households the number of migrants has a negative impact on subsistence income, indicating that as more migrants leave the household, the less reliant the household becomes on subsistence activities. This effect is reinforced by the inflow of remittances, which also have a negative effect on subsistence income. This suggests that migration and remittances are facilitating the transformation of Indigenous-Fijian households away from subsistence to other forms of income generation. Although we observe no positive impacts of migration alone on other income sources, the remittances that flow to Indigenous-Fijian households appear to stimulate business income generation (though not to the degree that they do in Tonga) and reduce reliance on wage income, suggesting that both migration and remittances have a strong influence on these households' resource allocation and thereby on the community's economic transformation away from traditional, subsistence activities. It is also worth noting that the positive effect of remittances on business income is found in the cases of Tongans and Indigenous-Fijians, where income from business activities is still a very small component of total household income in comparison with Indo-Fijians (see Table 4). Similar impacts are not observed in the case of the of the Indo-Fijian community, which is also very much less dependent on subsistence agriculture, across all income levels.

The only point of commonality of remittance effects in the two Fijian communities is their inverse relationship with wage income. This is particularly strong in Indo-Fijian households for whom wages are by far the most important income source across all income levels (see Table 4). Rather than stimulating alternative income generating activities for this community, remittances would appear to be a substitute for income from domestic wage labour activities, thereby acting more as a poverty alleviation mechanism and a supplement to domestic income.

## 6. Conclusions

This paper analysed the combined impacts from out-migration and remittance-inflows on the composition of household income, in two Pacific island economies, Fiji and Tonga. Because of the observed differences in migration histories and the structure of earnings between the two main ethnic groups in Fiji, separate analysis of the Indo- and Indigenous-Fijian sample was undertaken. This comparative study provided two important extensions of previous research in this area. First, our dataset allowed for the inclusion of both cash and in-kind remittances in the analysis, and it included subsistence agricultural as one of the household's economic activities and income sources. Second, the comparative analysis of two small, island economies, and two distinct ethnic communities within one of them, allowed for investigation of the implications for the impacts of migration and remittances of different migration histories, patterns and motivations, and different economic structures and associated differences in composition of household earnings.

Amongst both communities in Fiji, where remittance-motivated migration is a relatively more recent phenomenon, remittance income appeared to be particularly related to family need (altruism). In neither country were any significant impacts of migration or remittances on income from cash agricultural activities found. In Tonga, strong positive effects of migration on household income were observed, in relation to subsistence agriculture and non-agricultural business activities. It was also found that the positive effect of migration on business income among Tongan households was reinforced by the inflow of remittances. However, unlike Fiji, neither migration nor remittances in Tonga appeared to affect wage income of households.

These findings reinforce the notion that households in communities with a long history of migration and more permanent, high levels of remittances are able to restructure their income-generating activities away from traditional sources of income, becoming more oriented towards business activities, mainly self-employed.

In contrast, amongst Indigenous-Fijians, both out-migration and remittances were found to have *reduced* household earnings from subsistence income, while, like Tonga, remittances also had a positive impact on earnings from business activities. They were also associated with reduced earnings from wages. Although Fiji has a more industrially-developed economy, the Indigenous-Fijian community has traditionally been more heavily reliant on subsistence agriculture and earns a very

small proportion of income from non-agricultural business activities. Our findings suggested that as new migration opportunities have arisen, remittances provided more scope for households to reallocate their resources, thereby facilitating the community's economic transformation away from traditional subsistence activities and waged-employment, towards other, business-oriented activities.

The impact of remittances on business income in Tonga also occurred in a situation where business income is still a very small percentage of total household income. Here however, because of their much longer history of migration and remittance dependence, remittance-recipient household heads are considerably older compared with Indigenous-Fijians. This would possibly explain why, in Tonga, remittances are also associated with recipient households' increased earnings from subsistence activities, a likely favoured activity among retirees.

Thus, the answer to the question of the net impact of migration and remittances is considerably more complex than often perceived, and, as this study shows, is likely to be contingent on the history and phase of the community's migration development, as well as the stage it is at in its economic transformation from a subsistence to a market- and business-oriented economy.

## References

- Bertram, G. (1986) "Sustainable Development in South Pacific Micro-economies" *World Development*, 14: 809-822
- Bertrand, M., E. Duflo and S. Mullainathan (2004) "How Much Should we Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, 119(1): 249-275.
- Brown, R.P.C. (1995) "Hidden Foreign Exchange Flows: Estimating Unofficial Remittances to Tonga and Western Samoa" *Asian and Pacific Migration Journal*, 4(1): 35-68.
- Brown, R.P.C. (1997) "Estimating Remittance Functions for Pacific Island Migrants" *World Development*, 24(4): 613-26.
- Brown, R.P.C. (1998a) "Do Pacific Island Migrants' Remittances Decline Over Time? Evidence from Tongans and Western Samoans in Australia" *Journal of Contemporary Pacific*, 10(1): 107-51.
- Brown, R.P.C. (1998b) "Comparative Labour Market Performance of Visaed and Non-Visaed Migrants: Pacific Islanders in Australia" *Journal of Population Economics*, 11(3): 395-411.
- Brown, R.P.C. and J. Connell (1993) "The Global Flea-Market: Migration, Remittances and the Informal Economy in Tonga" *Development and Change*, 24(4):611-647.
- Brown, R.P.C., J. Connell, E. Jimenez, and G. Leeves (2006) "Cents and Sensibility: the Economic Benefits of Remittances", Ch.3 in *At Home and Away: Expanding Job Opportunities for Pacific Islanders through Labour Mobility*, Washington: The World Bank, 2006b.
- Brown, R.P.C. and E. Jimenez (2006) "Estimating the Net Effects of Migration and Remittances on Poverty and Inequality: Comparison of Fiji and Tonga", Paper presented at UNU-WIDER Project Meeting on 'Fragility and Development', Fiji, 30 November – 1 December.
- Brown, R.P.C. and B. Poirine (2005) "Weak vs. Strong Altruism: A Model of Migrants' Remittances with Human Capital Investment and Intrafamilial Transfers" *International Migration Review* 39(2): 407-38.
- Bauer, T. Epstein, G. S, and I. Gang (2002) "Herd Effects or Migration Networks ? The Location Choice of Mexican Immigrants in the US", CEPR Discussion Paper 3505, London, CEPR.
- van Dalen, H., Groenwold, G., and J. School (2005) "Out of Africa: what drives the pressure to emigrate?" *Journal of Population Economics*, 18, 741-778.
- Epstein, G. S. and I. Gang (2006) "The Influence of Others on Migration Plans" *Review of Development Economics*, 10: 652-665.
- Filmer, D. and Pritchett, L. H. (2001) Estimating wealth effects without expenditure data – or tears: an application to education enrollment in states of India, *Demography*, 38, 115-132.
- Marcus, G.E. (1981) "Power on the Extreme Periphery: the perspective of Tongan elites in the modern world system" *Pacific Viewpoint*, 22(1): 48-64.
- Ozden, C. and M. Schiff (2006) *International Migration, Remittances and the Brain Drain* (eds) Washington D.C: The World Bank/Palgrave Macmillan.

- Ravallion, M. and L. Dearden. (1988) "Social Security in a Moral Economy: An Empirical Analysis for Java" *The Review of Economics and Statistics*, 70(1): 36 – 44.
- Stanwix, C. and J. Connell (1995) "To the Islands: The Remittances of Fijians in Sydney," *Asia Pacific Migration Journal*, 4(1): 69-88.
- Stark, O and D. Bloom (1985) "The New Economics of Labor Migration", *American Economic Review*, 75: 173-78.
- Stark, O. and D. Levhari (1982) "On Migration and Risk in LDC's" *Economic Development and Cultural Change*, 31(1): 191-196.
- Taylor, J. (1992) "Remittances and inequality reconsidered: Direct, indirect and intertemporal effects." *Journal of Policy Modelling*, 14(2): 187-208.
- Taylor, J. and T. Wyatt (1996) "The shadow value of migrant remittances, income and inequality in a household-farm economy." *The Journal of Development Studies*, 32(6): 899-912.
- Taylor, J., S. Rozelle, and A. de Brauw (2003) "Migration and incomes in source communities: A new economics of migration perspective from China." *Economic Development and Cultural Change*, 75-101.
- World Bank (2006a) *Global Economic Prospects: Economic Implications of Remittances and Migration*. Washington, DC: The World Bank.
- World Bank (2006b) *At Home and Away: Expanding Job Opportunities for Pacific Islanders through Labour Mobility*", Washington: The World Bank, 2006.

## Appendix

Table A.1 Remittances and Income Equations: Variable Names and Definitions

Variable	Definition
Remittances	US\$ received by HH in all forms, cash and in-kind
Business Income	HH Cash income in US\$
Farm Income	HH Cash income in US\$
Wage Income	HH Cash income in US\$
Subsistence Income	HH income converted to US\$
No of Migrants (predicted)	Predicted number of migrants in household
<i>Household Characteristics:</i>	
Young dependents	Number of HH members < 14 years of age
Household Size	Total number 'eating from same pot'
Household Head Experience	Age – years education – 6 years
Household Head Education:	
Primary	Dummy variable = 1 if primary, otherwise 0.
Secondary	Omitted category
Tertiary	Dummy variable = 1 if >12 years edu. otherwise 0.
Wealth Index	Created using PCA from list of assets held*
Location - Capital	HH living in capital city
Av Education migrants	Migrants' average years education for HH
Destination:	
US migrants	Dummy for migrant in USA = 1, otherwise 0
AUS/NZ migrants	Omitted category
Other Country migrants	Dummy for other countries, incl. Middle east =1
Wedding	Dummy for HH member married in 2004 =1
Loans 2003	Dummy for having borrowed in 2003 = 1
Agricultural land/capita	Area of land per HH member (Acres)
Business duration	Years of business operation
<i>Village/District characteristics</i>	
Mean length of absence of households' migrants, for village/district	Maximum length of stay overseas of return migrant in HH stay (years) expressed as HH average n community (omitting current observation)

\* See Brown *et al.* (2006) Section 5 for a detailed discussion of how the wealth index was created using principal components analysis.

Table A.2 Three Stage Least Squares Estimates Migration and Remittances Effects on Income Sources (p-values in brackets)

<b>Indo-Fijian</b>	<b>Remittances</b>	<b>Farm Income</b>	<b>Subsistence Income</b>	<b>Wage Income</b>	<b>Business Income</b>
No. of Migrants (predicted)	-63.92 (0.66)	112.38 (0.42)	-101.23 (0.30)	-458.14 (0.68)	1289.90 (0.17)
Remittances	--	0.10 (0.59)	-0.10 (0.42)	-2.43 (0.03)	-0.53 (0.60)
<i>Household Characteristics:</i>					
Household Size	-13.77 (0.68)	37.53 (0.22)	31.09 (0.14)	483.84 (0.04)	-10.45 (0.96)
Household Head Experience	--	13.49 (0.02)	6.25 (0.12)	-5.33 (0.90)	--
Household Head Education*					
Primary	-326.22 (0.08)	-401.22 (0.06)	-341.86 (0.02)	618.13 (0.69)	-653.39 (0.60)
Tertiary	6.926 (0.04)	146.46 (0.45)	-5.07 (0.97)	3436.32 (0.02)	68.424 (0.95)
Wealth Index	-12.67 (0.75)	--	--	1761.52 (0.00)	684.19 (0.00)
Location - Capital	109.63 (0.50)	--	-103.65 (0.24)	1703.84 (0.12)	-874.78 (0.39)
Av Education migrants	41.40 (0.00)	-11.13 (0.43)	4.91 (0.61)	-69.47 (0.50)	-130.71 (0.16)
Destination Country**					
US migrants	422.57 (0.00)	--	--	--	--
Other Country migrants	767.33 (0.00)	--	--	--	--
Wedding	838.57 (0.00)	--	--	--	--
Loans (2003)	-252.84 (0.18)	--	--	--	--
Agricultural land per capita	--	444.21 (0.00)	119.12 (0.00)	--	--
Business duration	--	--	--	--	213.95 (0.00)
Observations***	192				

\*Omitted category, Household Head education level is secondary.

\*\* Omitted category, migrants in Australia, New Zealand.

\*\*\* Some observations lost due to incomplete data for some variables.



Table A.2 (cont.)

<b>Indigenous-Fijian</b>	<b>Remittances</b>	<b>Farm Income</b>	<b>Subsistence Income</b>	<b>Wage Income</b>	<b>Business Income</b>
No. of Migrants (predicted)	-731.33 (0.11)	-132.19 (0.66)	-280.65 (0.09)	847.92 (0.45)	-163.48 (0.67)
Remittances	--	-0.09 (0.49)	-0.13 (0.11)	-0.99 (0.02)	0.24 (0.10)
<i>Household Characteristics:</i>					
Household Size	-29.08 (0.61)	22.01 (0.63)	22.87 (0.36)	455.72 (0.00)	7.15 (0.87)
Household Head Experience	--	1.49 (0.85)	1.57 (0.72)	3.738 (0.86)	--
<i>Household Head Education*</i>					
Primary	-348.07 (0.31)	448.30 (0.18)	-341.19 (0.06)	-905.44 (0.30)	-82.90 (0.77)
Tertiary	-1178.23 (0.00)	-243.04 (0.51)	-364.28 (0.09)	975.95 (0.37)	97.69 (0.79)
Wealth Index	114.05 (0.08)	--	--	868.34 (0.00)	53.04 (0.33)
Location - Capital	968.06 (0.01)	--	-40.409 (0.83)	1425.28 (0.13)	-410.83 (0.21)
Av Education migrants	52.35 (0.07)	-11.48 (0.69)	20.73 (0.19)	88.74 (0.24)	-21.97 (0.40)
Destination Country**					
US migrants	88.07 (0.88)	--	--	--	--
Other Country migrants	2850.93 (0.00)	--	--	--	--
Wedding	-133.37 (0.79)	--	--	--	--
Loans (2003)	-282.88 (0.27)	--	--	--	--
Agricultural land per capita	--	375.78 (0.00)	282.15 (0.00)	--	
Business duration	--	--	--	--	5.00 (0.57)
Observations***	207				

Table A.2 (cont.)

<b>Tongan</b>	<b>Remittances</b>	<b>Farm Income</b>	<b>Subsistence Income</b>	<b>Wage Income</b>	<b>Business Income</b>
No. of Migrants (predicted)	-144.20 (0.58)	114.14 (0.28)	776.04 (0.00)	105.28 (0.71)	350.16 (0.01)
Remittances	--	0.01 (0.85)	-0.13 (0.24)	-0.20 (0.21)	0.51 (0.00)
<i>Household Characteristics:</i>					
Household Size	-0.96 (0.99)	95.91 (0.00)	194.01 (0.00)	184.96 (0.00)	-12.39 (0.71)
Household Head Experience	--	-1.31 (0.82)	-10.07 (0.32)	-9.79 (0.49)	--
<i>Household Head Education*</i>					
Primary	-162.49 (0.83)	461.46 (0.19)	29.26 (0.96)	-73.93 (0.93)	-246.69 (0.57)
Tertiary	-149.70 (0.80)	-209.28 (0.39)	21.82 (0.96)	3212.83 (0.00)	1119.91 (0.00)
Wealth Index	281.55 (0.00)	--	--	449.30 (0.00)	-176.80 (0.00)
Location - Capital	-11.79 (0.97)	--	-560.76 (0.02)	1228.05 (0.00)	220.06 (0.26)
Av Education migrants	133.36 (0.00)	4.35 (0.78)	23.68 (0.39)	16.30 (0.66)	-81.27 (0.00)
Destination Country**					
US migrants	397.06 (0.04)	--	--	--	--
Other Country migrants	1963.94 (0.01)	--	--	--	--
Wedding (2004)	3964.14 (0.00)	--	--	--	--
Loans (2003)	63.76 (0.86)	--	--	--	--
Agricultural land per capita	--	1061.46 (0.00)	1957.28 (0.00)	--	--
Business duration	--	--	--	--	47.549 (0.01)
Observations	500				

\*Omitted category, Household Head education level is secondary.

\*\* Omitted category, migrants in Australia, New Zealand.

### 3SLS Endogeneity Test Statistics

Table A3 Endogeneity Tests: Hausman – Wu Chi-squared values\*

	Remittances (14)	Farm Income (9)	Subsistence Income (9)	Wage Income (9)	Business Income (9)
Indo-Fijian	12.86	27.26	16.13	6.14	1.73
Indigenous-Fijian	2.90	12.42	4.97	6.42	15.42
Tongan	18.00	7.00	13.50	14.00	25.00

\* Figures in brackets are degrees of freedom

To test that the instruments used are exogenous the Hausman-Wu test is employed. The test is conducted by taking the residuals from each remittance and source income equation and regressing them on all exogenous variables in the system and the first derivatives of the negative binomial estimator. The chi-squared distributed statistic is  $N \times R^2$  where  $N$  is the number of observations and  $R^2$  is the goodness of fit of that regression. The test statistics suggest there is no significant correlation between the exogenous instruments and the residuals of the individual equations.