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AN EMPIRICAL ANALYSIS OF THE TIME  
PATTERN OF REMITTANCES AND TONGAN  
MIGRANTS IN NEW ZEALAND

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# **An Empirical Analysis of the Time Pattern of Remittances and Tongan Migrants in New Zealand\***

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## **ABSTRACT**

Altruistic motivation of sending remittances is a decentralised decision of the migrants. A phenomenon known in the literature as remittances decay hypothesis suggests that the pattern of remittances follows an inverted U shape. We examine whether remittances have declined based on the length of absence of Tongan migrants in New Zealand (NZ). Results from a survey analysis for 309 households indicate that at the early stages of migration remittances increase and it declines over the length of stay in NZ. The time period at which remittances reach the maximum point after which it starts to decline is about 17 years.

**Keywords:** Microeconomic Behaviour, Remittances, Decay Hypothesis, Migration, Tonga

**JEL Classification:** D01, F22, F24, O15, O56

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# The Time Pattern of Remittances and Tongan Migrants in New Zealand: Some Econometrical Results

## 1. INTRODUCTION

The Pacific islands' migration to New Zealand since the late 1960s has been particularly significant primarily from the Polynesian states and this is due to historical ties and economic and social development opportunities. Remittances from the international migrants to family members at home have been an importance source of household income and consumption expenditures of the recipient families. The stability of remittance flows has been a key factor in the wellbeing literature of the remittances-recipient households. In the Pacific remittance is a crucial avenue towards economic regeneration through growth and is mainly used for households' consumption purposes for food, housing, durable and non-durable goods, education, health, savings, and small-medium business development. The impacts of remittances depend largely on the sustainability of this flow and the migrant households send remittances not only in monetary form but also include in-kind remittances that are not recorded in the official statistics. Besides supporting the expenditures in the cash economy, remittances are also allocated to religious and community funds and projects. The Tongan community in New Zealand makes up the second highest population of Pacific People amidst the migrant communities at 20.4% of total Pacific Peoples, in the census period 2001-2013. A significant impact of migration has been marked by higher remittance flows to Tonga. The focus of this paper is to empirically examine the sustainability of remittances flows from New Zealand to Tonga to evaluate whether or not remittances decay over time.

The Pacific Islands have sizeable migration flows mainly to Australia, New Zealand, and the United States which include movement of these nations' educated labour force and those employed under seasonal employment schemes. The highest rate of tertiary educated emigrants in East Asia and the Pacific region were from the Pacific nations in 2000 (World Bank, 2011).<sup>1</sup> Remittances, as a private flow, have assisted the recipient households' socio-economic status as the changes in expenditure patterns and consumption lead to enhanced wellbeing and savings-investment nexus for development (Cordova, 2005) and their impact on the households' welfare development (Acosta, Fajnzylber and Lopez, 2008). Remittances allow households to earn higher income, improve their standard of living, and play a larger role in community development (Asian Development Bank (ADB), 2005, Organisation for Economic Co-operation and Development (OECD), 2006).

While the sustainability of remittances is crucial it depends largely on several factors including the characteristics of the remitting household, ability to send money, and family ties (Fuka, 1985; Walker and Brown 1995; Simati and Gibson, 2001; Connell and Brown, 2004, Makina and Masenge 2015). With a growing diaspora from Tonga over time, remitting financial and non-financial assistance (i.e., food, clothing, electrical items, household items, and agriculture

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<sup>1</sup> Eight of the top 10 Pacific migrant nations are Samoa: 75.4%, Tonga: 75.2%, Fiji: 62.2%, Marshall Islands: 39.4%, Federated States of Micronesia: 37.8%, Papua New Guinea: 28.5%, Palau: 26.1%, Kiribati: 23.1%.

and farm machinery) forms a vital part of the communities where strong family linkages have been strengthened and maintained. The motivation of remittances reflects migrants' concern for the family members and also a derived satisfaction from an increased welfare of their relatives. A survey of 309 households from Auckland, Hamilton, Palmerston North, and Wellington was conducted from July 2012 to December 2013 to examine whether remittances to Tonga has declined with the households' length of absence.

Two key studies on the remittances functions in the Pacific and migrants' remittances over time in the case of Australian Tongans and Samoans have been examined by Brown (1997, 1998). To our knowledge no empirical evaluation has been undertaken to examine the remittances decay hypothesis and assess the linkage between remittances and absence of the Tongan migrants in New Zealand. The study contributes to the determinants of households' demand, supply, and behavioural characteristics and estimate if an inverted U-profile exists for the length of stay and age of Tongan migrants. The findings provide some implications based on various demand, supply and behavioural characteristics of the household and the economic and social factors that show the unique covariates of the remittances-decay nexus.

Tonga has a very high magnitude of remittance inflows being the second largest recipient nation amongst the Pacific island countries in terms of its share to Gross Domestic Product (GDP). Cultural and social ties between families may remain to be very strong evident in large remittances sent for family support and other purposes although the households' resettlement in New Zealand has been for a long period. Moreover, the influence of migrant remittent-household behaviour may change as households' domestic commitments increase and there is a greater integration into the host country. The next section discusses a brief review of the remittances decay hypothesis and remitters' characteristics, followed by the model specifications and empirical results in the penultimate section. The analytical test for inverted U-hypothesis of remittances in the case of New Zealand Tongan migrants indicate the time period at which remittances reach the maximum point after which it starts to decline. The average length of absence for the survey participants of Tongan migrant households is 17 years. Conclusions in the final section provide some policy implications.

## **2. A BRIEF OVERVIEW OF REMITTANCES DECAY LITERATURE**

The motivations of remittances reflect pure altruism (migrant's concern for family members, thus migrants derive satisfaction from the increased welfare of relatives); pure self-interest (for asset accumulation and investment in home areas); implicit family agreement (repayment of informal/implicit loan for investment in education, migration costs); and portfolio management decisions (savings not needed for personal or family consumption are invested in portfolio management choices). The remittance decay hypothesis, first noted by Stark (1978), stipulates that the level of remittances sent by migrants will decline over time as migrants' commitment and attachment to their relatives and home country weakens. Martin (1993) and Martin and Taylor (1995) note that in the case of Europe the industrial revolution led to a significant migration pattern that subsided with the eventual increase in income. The convergence of economic growth in home countries leads to a downward trend in remittances flows that reflect

an inverted U shape. Based on the remittances decay hypothesis the length of stay outside the home country can influence the remitting behaviour.

The two theories of remittances, namely, altruism and loan repayment theories, point out some insights into the rationale of the remittance decay hypothesis (Poirine, 1995, 1997). He notes the theoretical aspects of remittances decay which has been discussed and empirically examined for several developing countries. The remittance decay hypothesis suggests that the amount of remittances sent by migrants to their countries of origin declines over time. Some studies however note that the passage of time does not significantly influence migrants' remittance behaviour and that remittances are maintained at high levels over long periods (see Hunte, 2004). If remittances do not decline over time an analysis of the decay hypothesis provides various behavioural and other motivational characteristics of why remittances would continue through time.

Rather than querying what motivates a migrant to remit, the remittances decay hypothesis focuses on the factors that influence the continued existence of migrant/non-migrant relationships in which remittances are sent. Consequently, a decision on whether to increase, continue, or reduce remittance flows indicates the process of household reconstitution abroad (Makina and Masenge 2015). Family reunification is the underlying social process that determines household remittance behaviour. Remittances are not simply sent but also exchanged for resources accessible through the maintenance of relationships with family members, which is linked to the weakening of the altruism motive. Also, as families reunite in the new homeland, less money is sent back to the country of origin (Fuka, 1985, Vete, 1995). Furthermore, the participation by households in migrant networks positively influences remittance behaviour (see Makina and Masenge, 2015 for a discussion).

A key finding of the remittances decay hypothesis is the length of absence of a migrant from the home country can influence remittance behaviour. From the host country's perspective Brown (1997) notes that the extent to which remittances decline is based on the migrant's duration of absence, and from the source country's perspective, the extent to which remittances are potentially responsive to variables other than the needs of dependents in the source country. Other factors have been noted such as a time effect, composition effect, and size effect that impacts on the level of remittance flows to home countries (Brown, 1998). A key factor for remitters in the host country is that they may also reduce the level of remittances given a higher number of dependents in the migrant household (Connell and Brown, 2004).

Several case studies have examined the Pacific Islands' remittance flows, its determinants, and the decay hypothesis. While some studies provide support to this hypothesis other assessments do not indicate that remittances decay over time. Tongamoa (1987) notes that amongst the Tongans in Sydney remittances level increased during the first few years of migration, up to around seven years, but then began to decline, although the migrants who had been in Australia for more than 18 years still sent remittances. Forsyth (1992) notes that in the South Pacific remittances decay due to the longer duration of migrants' stay abroad and the number of dependents at migrant's home in the host country. Remittances form an important source of income that impact on the households in Tonga (Ahlburg, 1991). An analysis by James (1991) on the issue of remittance at the Tongan village level, and Marcus (1993) on Tonga's

contemporary globalizing strategies notes that it contributes to improving wellbeing. A small sample qualitative evaluation by Loomis (1990) found little evidence of remittance decay in the case of Cook Islanders in New Zealand.

Vete (1995) using a qualitative analysis of the Auckland Tongan community's patterns of remittances and their remittances behaviour notes that commitment to remitting money declined due to the number of dependents in New Zealand households. In estimating the country-specific analysis of the Tongan and Western Samoan migrants in Australia, Brown (1998) notes that remittances from the nurses' households did not decline significantly over time compared with what has generally been predicted. However, by taking other migrant households in the same sample the results indicate that remittances showed a sharp decline after 15 years absence. The migrants are motivated by factors other than altruistic family support, including asset accumulation and investment in the home countries. The analysis by Makina and Masenge (2015) for migrants from Zimbabwe in South Africa provides evidence of remittance decay hypothesis and the inverted-U pattern of remittances.

The finding for migrants' remittances from New Zealand to Tuvalu does not support that remittances decrease with the length of time they spend in the host country (Simati and Gibson, 2001). According to ADB, "the period until the 1990s indicates that remittances in the Pacific was aligned with high volume, social significance, and its relatively conservative use for consumption and social events" (ADB, 2005, p.7). Studies have noted the sustainability debate of remittances by the first generation migrants; however, there is a lack of empirical analysis on remittance habits and their possible impact on the behaviour of subsequent generations.<sup>2</sup> The second and third generation Pacific Islanders born and raised away from the island homes may remit less (Morton-Lee, 2003). It is noted that kin and home country links between second generation New Zealand Samoans and Australian Tongans are declining while migrant Tongans elsewhere maintain home country linkages (Muliaina, 2001; Morton-Lee, 2004). In evaluating the remittances flows to Tonga we fill the gap of empirical analysis that includes New Zealand born Tongans in the decay hypothesis discourse.

### **3. NEW ZEALAND TONGAN MIGRATION AND REMITTANCES**

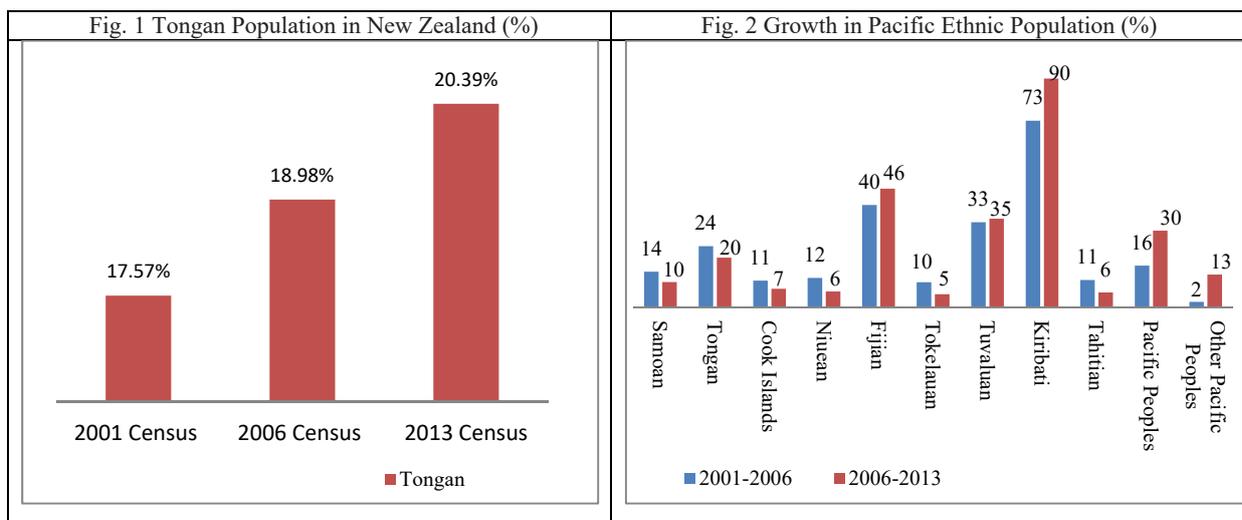
The Pacific Islands have a sizeable migration flow to Australia, New Zealand, Canada, the United States, United Kingdom, and other Pacific nations. More recently, remittances form a substantial flow through the temporary labour schemes, such as the Australia's Seasonal Worker Scheme and New Zealand's Recognised Seasonal Employer scheme. Besides permanent migration, the Pacific islands have large off-shore labour markets through specific employment abroad (for example, teachers, nurses, caretakers, sports personnel, and security officers). Remittances as a vital source of income have increased per capita income of the recipient households and have enhanced a range of consumption expenditures.

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<sup>2</sup> See Maclellan and Mares (2006) on the specific motives and remittances sustainability. New generations are likely to act as individuals rather than perceiving as members of wider transnational social groupings.

### 3.1 Migrants and Flow of Remittances to Tonga

The Samoan and Tongan communities in New Zealand make up the highest and second highest population amidst the migrant communities at 48.7% and 20.4% of total Pacific Peoples, respectively, for the census period 2001-2013 (Fig. 1). The growth in New Zealand’s Pacific ethnic population over this period (Fig. 2) suggests a large diaspora over time. Samoa and Tonga are amongst the top 10 recipients of remittances in the East Asia-Pacific region in terms of GDP share (World Bank, 2014). Based on remittances to GDP ratio, Samoa and Tonga have been ranked 5<sup>th</sup> and 6<sup>th</sup> in the world in 2012 and 2013, respectively (World Bank, 2014) and the two largest remittance recipients as a share of GDP amongst the PICs (Fig. 3), while Fiji receives the highest level in total monetary value (World Bank, 2016).

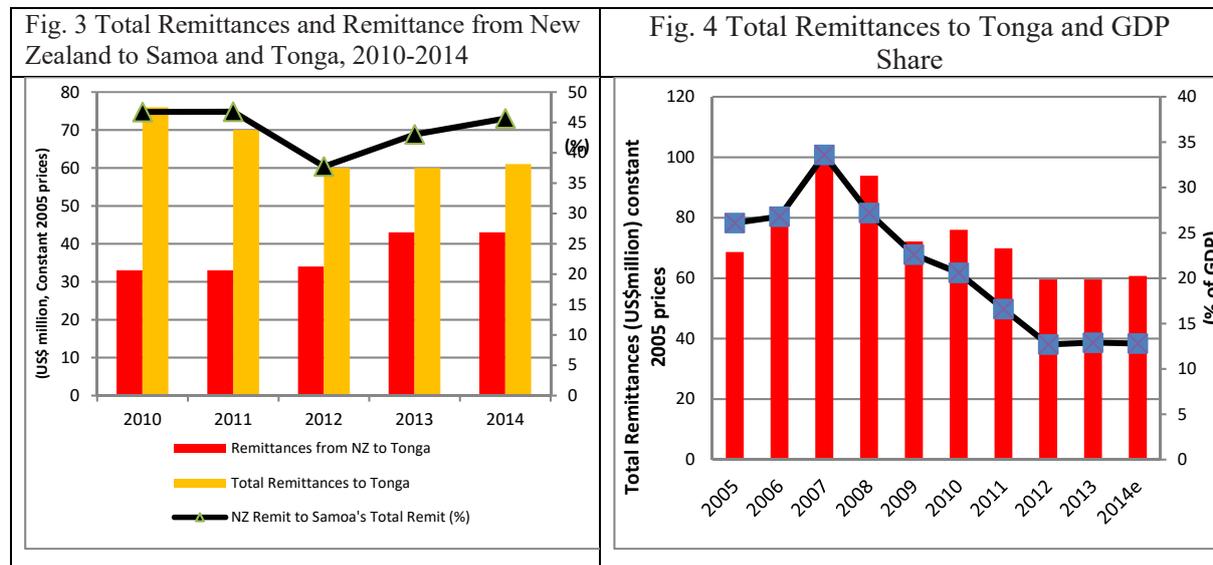


Source: Statistics New Zealand, [www.stats.govt.nz](http://www.stats.govt.nz).

Total remittances are larger for many Pacific Island countries primarily due to a greater number of educated migrants, higher income levels in Australia, New Zealand, and the United States, and also an increase in the number of temporary workers. When comparing remittances to the other main capital flows of foreign aid, foreign direct investment, and tourism revenue and export earnings from major commodities, remittances accounts as the largest foreign exchange earner in Tonga. Remittances and foreign aid have also increased to provide disaster relief in the aftermath of cyclones and the tsunami. Based on Fig. 3, New Zealand’s remittances share to Tonga of 43.4% (US\$33 million) in 2010 increased to 70.5% of total remittances in 2014 (US\$43 million). Tonga’s 2007 remittances to GDP share of 35% declined significantly to 12.8% of GDP in 2014 (Fig 4). It increased marginally to 12.9% (US\$60 million) in 2013 to an estimated value of US\$61 million in 2014. A crucial impact of migration is marked by a substantial increase in remittance flows to this Pacific island nation over time.

The level of remittances to GDP share for Tonga suggests that it is of considerable development relevance for these countries’ households, communities and macroeconomic development. As noted, the motivation of remittances reflects migrants’ concern for family members and the derived satisfaction from the increased welfare of their relatives. For the recipient country, remittances increase per capita income and assist in improving the socio-economic conditions in the recipient households. Although the remittances level in Tonga has declined since 2008 it

still remained the second highest contributor as a share of GDP in the Pacific. The high remittances to GDP share suggest that it is a vital source of income for sustenance of families' welfare.



Source: World Bank (2016).

### 3.2 Migrant Characteristics and Remitting Behaviour

A total of 309 New Zealand Tongan households surveyed were facilitated through the church congregations, Tongan early childhood centres, and community-based organizations in four North Island cities.<sup>3</sup> In addition, a snowballing approach was utilised as the participants provided referrals and passed the survey forms to their families and friends. An informant method was also used where members of the migrant communities were interviewed to establish further contacts. These approaches: snowballing and key informant methods, which are applied in various studies (see Brown, 1997; other studies noted above), were useful in increasing the sample size. The 309 sample size of New Zealand Tongan migrants reflects a relatively large representation of the community to evaluate the remittance behaviour of migrants using qualitative and quantitative data analysis.

Based on the household characteristics, the qualitative analysis shows information on all respondents' demographic, economic, financial and social indicators that influence their decisions to send several forms of remittances to Tonga (Table 1). The household heads' gender categories indicate 83% male and 17% female of the survey respondents with an average age of 48 years. Their families' place of residence show 52% parents, 7.5% spouse and 60% siblings reside in Tonga, and 21.5% parents live in New Zealand. Also, 57% of the households received a visitor from Tonga in the 12 months preceding the survey period. For educational attainments, 55% of the household heads have tertiary/university qualifications and almost 38% have secondary education. The employment status of the households indicates that 69%

<sup>3</sup> The survey followed ethics clearance, the participants were informed of confidentiality nature of the data and that only average values will be discussed from this survey. The questionnaire covered the participants' demographic, economic, social, financial details of the household and family members.

are employed as professionals such as teachers, nurses, doctors, accountants, lawyers and administrators besides 5.2% that are enrolled as tertiary students.

**Table 1: Composition of Tongan-New Zealander Migrant Households**

<b>Household Characteristics</b>	<b>% of households</b>	<b>Household Characteristics</b>	<b>% of households</b>
Gender: Male / Female	83% / 17%	Household size 1-3 persons	40.78%
Average Age	48 years	Household size 4-6 persons	45.63%
Average Income	\$59,920	Household size 7-10 persons	13.59%
Parent in Tonga	51.78%	Average Remittances	\$3,295
Parents in NZ	21.50%	Remit Goods-in-kind	\$1,034
Parents deceased	26.71%	Remit religious/community fund	\$816
Spouse in Tonga	7.44%	Remit via Banks/Western Union	38%
Siblings in Tonga	59.56%	Send via relatives/carry personally	62%
<b>Education (Household Head)</b>	<b>% of households</b>	<b>Length of absence (years)</b>	<b>% of households</b>
Primary	5.18%	Household away 7-14 years	49.85%
Secondary	38.51%	Household away 15-21 years	25.18%
Technical	36.89%	Household away 22-29 years	15.18%
University	19.12%	Household away 30+ years	8.09%
<b>Occupation</b>	<b>% of households</b>	<b>Assets and Intention</b>	<b>% of households</b>
Employed	68.69%	Home and land ownership NZ	39%
Unemployed	5.83%	Home and land ownership Tonga	25%
House Person	5.50%	Investment in NZ	28%
Retired	13.99%	Inherit in Tonga	52%
Student	5.18%	Intent to return	34%

Note: Total of households surveyed are 309.

The size of the households indicates that over 46% of the households have 4 to 6 persons, 43% with 1 to 3 dependents, and 14% of the households have 7-10 dependents. The average level of remittances sent to Tonga was NZ\$3,295 per household. This was mainly sent through travelling relatives or carried personally or through Banks/Western Union. An average value of NZ\$1,034 goods-in-kind (that included food, clothing, phone, computer, household items, and farm equipment) were sent with travelling relatives, carried personally, and also shipped to Tonga. This reflects the level of informal remittances not recorded in the official statistics. The lowest reported remittances value was NZ\$250 and the maximum monetary and goods value was NZD\$8,589 for the sample households. Besides supporting the expenditures of households in Tonga's cash economy, remittances with an average value of NZ\$816 per household were sent for religious and community funds. Remitting financial and non-financial assistance represent a crucial part of the communities where family linkages have been maintained if not strengthened. Remittances to the recipient households, which include monetary and goods-in-kind, show that the parents received the largest share while the siblings, uncles, and aunts (kin) got a lower amount.

The length of stay of the households in New Zealand averaged around 18.8 years reaching the maximum period at 32.48 years. Almost 50% of total households surveyed have resided between 7 and 14 years in New Zealand with those between 15 and 21 years at 25%. The sample also includes a smaller proportion (7%) of those household heads that were born in New Zealand. The findings on household assets show that 39% of the households have house and land ownership in New Zealand, whereas 25% own a house and land in Tonga. The sample also indicates that 28% of the households have investments such as bonds, shares, and savings

in financial institutions. A large proportion (52%) of the households also indicates that they will inherit land in Tonga and 34% have expressed an intention to return to Tonga.<sup>4</sup>

Some of the earlier survey studies are discussed to highlight the households' motivations for giving remittances in the Pacific islands. Most remittances have primarily been given to parents or children and secondarily to brothers and sisters (Fuka 1985, Tongamoa 1987; James 1991; Rensel 1993). Tongamoa's study of Tongans in Sydney points out that while parents were the major recipients, brothers and sisters received substantial amount of remittances; a smaller proportion is given to other kin. A case study of the Tongan village in Ha'apai by Evans (1996, 2001) shows that over 60% of the remittances went to the parents and 10% from husbands to their wives. Fuka's study of Tongans in New Zealand notes the correlation between the number of dependents in Tonga and the size of remittances where the larger the number of dependents in the host country, the less likely it is for the household to remit.<sup>5</sup>

Morton Lee's (2004) study on Tongans in Melbourne notes that very few under the age of thirty sent money or goods directly and even the older migrants sent goods less frequently. While few migrants remitted regularly, most of them sent on requests for particular purposes, and those who did not remit had no family left in Tonga. Also, Samoans born in New Zealand or those arrived as small children were not asked directly to remit; however, their parents had asked them to send remittances (Muliaina, 2001).<sup>6</sup> These studies also note that women tend to remit more frequently than male. Tuvaluan women in New Zealand were specifically referred to as the most reliable remitters (Simati and Gibson 2001). Tongan non-remitters in Auckland were more likely to be males, although the average sum sent by men was higher than women; women sent 15% of their net incomes compared to 11% for men (Fuka 1985). Women in Auckland stressed that families selected them to be migrants as they are more likely to remit a higher share of their incomes than men (Muliaina, 2001). As evident in the above studies, Brown and Poirine (2004) posited that remittances are neither a function of pure altruism or pure self-interest but are better explained as 'impure altruism'.

#### **4. EMPIRICAL ESTIMATION: MODEL SPECIFICATIONS, METHODOLOGY AND RESULTS**

To ensure better social protection and poverty reduction in developing countries the remittances literature has argued that the sustainability of remittance flows are crucial. This depends on numerous factors within the sending households which are based on several characteristics of the household head and family ties. The decision to remit is based on two

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<sup>4</sup> Ahlburg and Brown (1997) study of the Tongans and Samoans in Australia note that there is also a correlation between the intent to return and the level of remittances, while intending returnees also accumulated more financial capital at home.

<sup>5</sup> Those who remitted to the parents noted, "whenever I have some spare money," "we no longer remit because none of us are in Tonga", and to the siblings and grandparents were, "when they write and ask" (Fuka 1985).

<sup>6</sup> While they did not decline the requests, ... "they would like to escape this obligation." Some 60% who visited Samoa believe they noted development opportunities, "...in the form of land and marine resources which their relatives appeared not to have noticed" (Muliaina 2001). He notes that those who remit faced some challenges as postponing retirement to meet remittance requests and putting them in arrears with mortgage payments. Also, purchasing of the house has been deferred in the case for Tongans in Sydney's northern suburbs (Faiva, 1989).

stages, that is whether to remit and conditional upon that decision is how much to remit will occur simultaneously. In estimating the remittances decay hypothesis several studies have examined the remitting behaviour of households and of non-remitters by applying the Tobit model. As such, both these migrant households' behaviour is captured in this methodology that provides a consistent parameter estimates (Brown, 1997, Makina and Masange, 2015).<sup>7</sup>

#### 4.1 Model Specifications and Methodology

The two part analysis for evaluating the remitting behaviour is to first test if remittances decline over time and if a non-linear association exists between a household's remittances and the length of stay (eq. (1a)). If the estimates for  $\beta t_i^2$  (eq. 1a) indicate a decline in remittances, the next step is to estimate the time period at which the remittances reach the maximum point in which it starts to decline (eq. (2a) and (2b)). The non-linear relationship of time is reflected by the coefficients  $\omega$  and  $\beta$ , where the expected sign for  $\omega$  is positive and  $\beta$  is negative. These expected signs of  $\omega$  and  $\beta$  coefficients represent a parabolic relationship between the length of time the migrant is away from the home country and the amount of remittances sent by the household. It reveals that the effect of remittances on a certain time period is 0. Therefore, before this threshold time period the effect on remittances is positive; it becomes negative after a certain time period. Hence, at the early stages of migration remittances increase and reach a maximum at a threshold time period and thereafter with longer time period away from the home country it has a decreasing effect on remittances.

To measure at what time period the level of remittances begins to decline; we estimate the threshold (turning) point of this parabolic relationship. The specification for the inverted U-hypothesis in Tonga's case (based on Makina and Masange, 2015) is as follows:

$$R_i = \omega t_i + \beta t_i^2 + X_i \gamma + \mu_1 \quad \text{with } R_i = \max(0, R_i) \quad (1a)$$

where  $R_i$  is the amount of remittances in NZ\$ by  $i^{\text{th}}$  individual, as well as non-remitters, i.e.,  $R_i = \max(0, R_i)$ ,  $t_i^2$  is the squared term of time spent in New Zealand, and  $X_i$  is the vector for household characteristics.

To distinguish the demand-side, supply-side socio-economic, behavioural characteristics, and the time pattern that impacts on the level of remittances sent to the home country, the model is extended in the framework to distinguish these categories which takes the following specific form:

$$R_i^* = \alpha_0 + \sum_{j=1}^3 \beta_{ij} D_{ij} + \sum_{k=1}^3 \gamma_{ik} S_{ik} + \sum_{p=1}^7 \delta_{ip} B_{ip} + \sum_{q=1}^2 \omega_{iq} T_{iq} + \varepsilon_i^* \quad (1b)$$

where

$R_i^*$  is the amount of remittances in New Zealand dollar remitted by the  $i^{\text{th}}$  household which take into consideration that some migrants have not remitted at all, this provides a combination of discrete and continuous distribution;

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<sup>7</sup> Tobin (1958) applied this methodology to analyse the household expenditure on durable goods where these expenditure include zero. Recent studies that have applied this methodology include Brown (1997) Simati and Gibson (2001). See also a number of studies that have applied this method in Makina and Masange (2015).

$D_{ij}$  is the  $j^{\text{th}}$  demand-side characteristic of the  $i^{\text{th}}$  household head, it includes if the household head and spouse have at least one parent living in home country (Parent); if the spouse lives in home country (Spouse), support the In-laws, had visitors in the preceding 12 months (Visitor);

$S_{ik}$  is the  $k^{\text{th}}$  supply-side characteristic of the  $i^{\text{th}}$  household head, it includes income level (Income); value of assets held in New Zealand less the value of debts (Assets); the number of persons living in the household (Size);

$B_{ip}$  is the  $p^{\text{th}}$  behavioural characteristic of the  $i^{\text{th}}$  household head, i.e., (Age); expects to inherit assets from a parent living in the country of origin (Inherit); intend to return to country of origin (Intent); business investment (Invest), Education attainment (Education). Access to Bank services, support charitable/religious organisations in home country (Community funds);

$T_{iq}$  is the  $q^{\text{th}}$  time-pattern for length of time spent in New Zealand of the  $i^{\text{th}}$  household;

$\alpha_0$  is a constant term,  $\beta$ ,  $\gamma$ ,  $\delta$ ,  $\omega$  are the estimated coefficients and  $\varepsilon$  is the error term.

If a result of an inverted U-shape is observed, the next step is to estimate the threshold point of time at which remittances changes its direction, i.e., the turning point is based on equations (1b). Based on Makina and Masange (2015), to measure the threshold period at which remittances reach the maximum point (number of years) after which it starts to decline is computed based on the first order derivative of the function  $f(x)=0$  where the maximum time period  $f(x) = R$ . With  $R_i = \max(0, R_i)$ , to solve for time period  $t$ , the equation is as follows:

$$\frac{df(x)}{dt} = \omega t_i + \beta t_i^2 + X_i \gamma + \mu_2 = \omega + 2t \quad (2a)$$

The maximum point is estimated solving equation (2a) as

$$\omega + 2t = 0 \quad (2b)$$

where  $t_i$  is the time of living in New Zealand;  $t_i^2$  is the squared term for time spent living in New Zealand to capture the non-linear pattern of remittance-sending households;  $\omega$ ,  $\beta$ ,  $\gamma$  are the estimated coefficients;  $X_i$  is the demand-side, supply-side and behavioural characteristics of  $i^{\text{th}}$  individual (the socio-economic characteristics);  $\mu$  is the error term.

The survey of New Zealand-Tongan remittance flows to their country of origin reflects if there is support for the decay hypothesis; a list of variables and definitions is presented in the Appendix Table 1. The Tobit methodology applied here follows the studies by Brown (1997) on the remittances decay hypothesis for the Tongan and Western Samoan migrants in Australia; Simati and Gibson (2001) for the Tuvaluan community in New Zealand, and the approach by Makina and Masange (2015) on the time pattern of remittances from Zimbabwean migrants to South Africa. The use of the Tobit maximum likelihood approach provides consistent parameter estimates based on the total dependence between the variables that influence the two parts of the remittance decision made by the migrant to remit and the level of remittances. In this case, the respective coefficients have the same effect on this two-part decision. According to Brown (1997), this method allows the identification of a set of variables that are most significant in influencing the remittance behaviour of the individuals.

## 4.2 Empirical Results

The Tobit results for remittance decay hypothesis includes the Tongan households that remit (i.e., 246 uncensored remittance sending households) and non-remitters (63 censored non-remittance sending households) included in this analysis (Table 1). The estimated model diagnostic likelihood ratio (LR) test indicates no concerns. The result for non-linear representation by a second degree polynomial function is noted in terms of the inverted U-pattern. The coefficient for the Length of stay (time) is positive and significant that increases the level of remittances; it suggests that remittances increase in the early stages of migration. The estimated squared term for the length\_stay<sup>2</sup> coefficient (i.e., longer period away from the home country) shows a negative and statistically significant impact. The results identify the existence of a non-linear relationship between remittances and the longer length of stay in the form of an inverted U-pattern. The support for the inverted U-hypothesis implies that remittances decline as Tongan migrants stay longer in the host country.

The computed decay pattern result indicates the estimated time period when remittances reach the maximum point and after which it starts to decline. The estimated time length at which remittances reach the maximum point is about 17 years after which it starts to decline (based on the first order derivative) shown at:  $\omega+2t=0$  for the estimated period for the inverted U hypothesis. Thus, remittances rise to a period of around 17 years after which New Zealand-Tongan migrants' remittances tend to decline. The results which show a decline in remittances are also noted by Brown (1998) in the case of Australia's Tongan and Samoan migrants. In the case of remittances from New Zealand-Tuvaluans, Simati and Gibson (2001) find no evidence of the remittance decay hypothesis as such remittances do not decrease with the length of time that Tuvaluan migrants spent in New Zealand.

**Table 2: Determinants of Remittances for New Zealand-Tongan Migrants**

Dependent variable = annual amount of NZ\$ sent by Tongan migrants		
Explanatory variable	Coefficient	t-statistic
length_stay	223.204	2.02**
length_stay <sup>2</sup>	-6.656	-2.57***
Parent	1623.507	2.19**
In-law	-1620.112	-2.09**
Spouse	2075.284	1.64*
Visitor	771.421	1.08
Income	0.0202	3.48***
Investment (assets)	553.408	0.76
Dependents in NZ	-236.444	-1.40
Gender	1272.488	1.44
Age	117.751	0.75
Age <sup>2</sup>	-0.928	-0.60
Education	-3005.83	-1.82**
Access to Bank services	3363.86	3.73***
Intent to return	-153.830	-0.23
Inherit	133.201	0.20
Community funds	1772.535	2.18**
Constant	-5427.407	-1.46
Observations	309	
Left-censored observations	63	
Uncensored observations	246	
LR $\chi^2_{(17)}$	90.89	
Log likelihood	-2491.7468	

Note: \*, \*\* and \*\*\* at 10%, 5% and 1% level, respectively.

In examining the behavioural characteristics of the households, the demand-side variables estimated here reflect whether or not the level of remittances supports the families in the home country of Tonga. Both the estimated Parents and Spouse coefficients are positively significant. Thus, remittances from the migrant households increase to support the senders' Parents and also the Spouse living in Tonga. The findings reflect a significant relationship between migrants' remittances and the surviving parent and spouse which suggest that migrants do not lower the level of remittances to support the parent and assist the spouse. The positive migrant remittance behaviour of New Zealand-Tuvaluan remitters supporting the parents is also noted by Simati and Gibson (2001). The other demand side support for the family is for the In-laws in Tonga; the estimated coefficient is negative and significant which indicates that this relationship is not seen to support the surviving In-laws in the home country. The Visitor coefficient is positive for the number of visitors from Tonga to the migrants' households in New Zealand. The estimated positive coefficient though insignificant suggests stronger family ties between these households in New Zealand and Tonga.

The supply-side result for income coefficient is positive and significant indicating that remittances to Tonga increase with the senders' level of income. The estimated magnitude of income coefficient of 0.02 shows the marginal propensity to remit by around 2%, thus a rise in income will tend to raise remittances sent to Tonga. This finding is similar to the results in studies by Brown (1997, 1998) and Simati and Gibson (2001) of Australia-Tonga and Australia-Samoa, and New Zealand-Tuvalu remittances flows, respectively. Remittances are responsive to household income as this varies with the migrants' economic conditions and employment opportunities. Asset accumulation does not significantly increase remittance to Tonga and it does not alter the migrants' behaviour. The estimated negative Dependent coefficient shows that remittances decline with the number of dependents in the household though the estimated coefficient is not significant at the conventional level. Essentially, the number of dependants in the migrants' household in the host country does not affect the flow of remittances to Tonga. Overall, the impact of supply-side factors on the migrants' remittances decisions are not responsive to any cyclical fluctuations in the households' income from the negative economic conditions.

From the behavioural side factors of household head remitting to country of origin, Age of the younger household head shows a positive impact in sending remittances; however, for the older households (Age<sup>2</sup>), flow of remittances decline although both these coefficients are not significant. Female household heads tend to remit more than males though not significantly.<sup>8</sup> The estimated significant negative education coefficient supports the view that migrants with higher education remit more than primary level of education remitters. This result support Poirine's (1997) view that remittances compensate family loans in the home country for spending on the migrant's education. The migrant's Intent to return to Tonga does not increase remittances. Access to bank services indicates that the migrant sends a larger amount of remittances through the formal channels to Tonga rather than informal channels, the results are

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<sup>8</sup> The female household heads made up 17% of the sample size. The coefficient though insignificant at the conventional level shows a weak positive relationship in sending higher level of remittances to Tonga. Tongan women are more likely to remit to sisters and daughters after the needs of parents have been satisfied (Gailey 1992). Female recipients and dispensers of remittances take responsibility for their investment decisions and the management appears to be strengthened as time passes (Fuka 1985; Latailakepa 1997).

similar to Brown and Poirine (2005) and Makina and Masenge (2015). The positive Inherit variable indicates that a migrant is motivated by inheritance and continues to remit to the household members, however this is not significant. The estimated Community funds coefficient is positive and significant; it suggests that migrant communities support various Tongan charitable/religious organisations in the home country. The practice of *Tokoni*, for Community and religious donations to church-based programs is of considerable importance where remittances are used for a variety of activities like school and church activities, and investment in building sports grounds and other local infrastructure.

## 5. CONCLUSION

This study presents the empirical results which evaluate the flow of remittances and the decay hypothesis based on the survey of New Zealand-Tongans residing in Auckland, Hamilton, Palmerston North, and Wellington. Tonga is the second largest recipient of remittances in terms of GDP share amongst the Pacific Island countries. The level of remittances suggests this source of income has significant development relevance, particularly for the households, community, and Tonga's economy.

The empirical findings in the case of Tonga provide evidence of the remittances decay hypothesis and the inverted-U time pattern in the flow of remittances from Tongan migrant households in New Zealand. The linear result shows a positive increase in remittances in the initial stages of migrants' stay in New Zealand, and the non-linear quadratic time coefficient shows a decline in remittances with a longer length of stay. The time length at which the remittances level decay is 17 years. The findings lend support to the remittances decay hypothesis which posits that as families reunite in the new homeland and become firmly established, remittances to Tonga decline. The decline in remittance seen after 17 years suggests that the convergence of household income in home country leads to a downward trend in remittances flows as shown by the inverted U pattern. It confirms that the length of stay outside the home country influences remittance behaviour.

The decline in remittances may be associated with the households' demand, cost of living and decline in economic opportunities, decline in migration opportunities and the increase in the number of New Zealand born Tongans. As a result, their social and economic ties and commitment are increasingly likely to be with each other rather than with their kin at home. Albeit the above, the strong communal ethos and cultural ties held by Tongan households in both countries have contributed to the flow of high levels of remittances over the years. The support for parents, spouse, and the community is significant that suggest that sustenance for the families' wellbeing does exist through monetary and goods-in-kind remittances and charitable donations for welfare activities, consumption, and community and religious programs.

The findings also support the view from the demand-side factors that remittances flows from New Zealand to Tonga are based on altruistic motivation driven by the need to support the parent, spouse, and visitors. The behavioural factors that reduce remittances to some extent are the number of dependents in the host country though not significantly; however, migrants

with higher educational levels remit more. A high income level of the household head increases the level of remittances to Tonga. Although younger and older household heads postulate an inverted U behaviour, the level of remittances from older household heads does not decline significantly. Other behavioural factors that influence higher flows is access to bank as remitters utilise formal channels and support for community and religious organisations in Tonga. It renders support towards the remitters' altruistic motivation to assist community's development projects in the home country.

Remittance is a significant development resource for Tongan households, communities, and the economy; therefore, it is crucial for policy makers to explore strategies that would ensure the sustainability of these flows and leverage their development potential. A policy to use formal channels through lower bank charges may incentivise remitters to send more frequently which may sustain remittance flows. This will also ensure that more accurate data is captured as more people use formal channels. Initiatives targeted at increasing the productive use of land, small and medium enterprises, and other livelihood activities will optimise the developmental benefits of remittances. The commercial banks in collaboration with the public sector can support the contributions of remittances to community projects, adoption of savings incentives, and investments in socio-economic infrastructure development.

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## APPENDIX

**Table 1: List of Variables, Tongan Migrants in New Zealand**

<b>Variables</b>	<b>Descriptions</b>
<i>Dependent variable</i>	Annual amount of NZ\$ sent by Tongan migrant
<i>Explanatory variable</i>	
Length of Stay in NZ	Number of years
Parent	Household head's parent (at least 1) in Tonga (Yes = 1, No = 1)
In-laws	Household head's in-laws (at least 1) in Tonga (Yes = 1, No = 1)
Spouse	Household head's spouse in Tonga (Yes = 1, No = 1)
Visitor	Household houseguests from overseas in the preceding 12 months (Yes=1, No=1)
Age	Household head age
Age_sq	Household head age squared
Gender	Male = 1, Female = 0
Education	1 = primary, 0 = others
Dependents in NZ	Number of dependents in NZ
Income	Total annual household head's income
Intent to return	Return to Tonga (Yes =1, staying in the NZ = 0)
Access to bank services	Send remittances through banks in NZ (Yes = 1, No =0)
Investment	Have portfolio investment in NZ (Yes = 1, No = 0)
Inherit	Household head expects inheritances (Yes = 1, No = 0)
Charity	Household head donates to community and religious funds (Yes = 1, No = 1)