Role of remittances in small Pacific Island economies: an empirical study of Fiji

T.K. Jayaraman*

Faculty of Business and Economics,
School of Economics,
University of the South Pacific,
Suva, Fiji Islands
E-mail: jayaraman_tk@usp.ac.fj
*Corresponding author

Chee-Keong Choong

Faculty of Business and Finance,
Centre for Economic Studies,
Universiti Tunku Abdul Rahman (Perak Campus),
Jalan Universiti, Bandar Barat,
Kampar, Perak 31900, Malaysia
E-mail: choongck@utar.edu.my

Ronald Kumar

Faculty of Business and Economics,
School of Government, Development and International Affairs,
University of the South Pacific,
Suva, Fiji Islands
E-mail: ronaldkmr@yahoo.com

Abstract: In the context of the ongoing current global economic downturn, mobilisation of foreign exchange earnings has assumed considerable importance. By adopting an augmented Solow model approach, this paper examines the long-run growth effects of Fiji's inward remittances during a three-decade period (1979–2008). The study finds that remittances have had a positive and significant effect on economic activities. This paper also discusses some important policy implications arising out of the study findings.

Keywords: remittances; economic growth; augmented Solow model approach; Pacific Island economies; Fiji.

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Biographical notes: T.K. Jayaraman is an Associate Professor in the Faculty of Business and Economics at the University of the South Pacific, Suva, Fiji Islands. He received Master's and PhD degrees from the University of Hawaii, which he earned as an East-West Centre Grantee and as a Fulbright Fellow.

Before joining the University of the South Pacific in 1998, he was with Asian Development Bank, Manila, Philippines as a Senior Economist.

Chee-Keong Choong is an Assistant Professor in the Faculty of Business and Finance, Centre for Economic Studies at the Universiti Tunku Abdul Rahman (Perak campus), Malaysia. He received his PhD (Financial Economics) degree from Universiti Putra Malaysia, Malaysia. His current research areas include applied macroeconomics, international and financial economics.

Ronald Kumar has a Bachelor's in Mathematics and Computer Science and is a graduate student in the School of Governance, Development and International Affairs at the Faculty of Business and Economics, University of the South Pacific, Suva, Fiji Islands.

1 Introduction

In recent years, remittance inflows have become an important source of foreign exchange earnings for small Pacific Island Countries (PICs),[1] whose export earnings are severely constrained by a limited range of exportable commodities and distant markets for them. In the context of current global economic downturn resulting in decreased earnings from exports of traditional agricultural commodities as well as declining numbers of tourist arrivals from the recession affected advanced countries, greater reliance is now placed on inward remittances from overseas resident islanders. There are several studies undertaken about the importance of remittances including a World Bank study of 2006 and empirical studies by Browne and Leeves (2007) and Prakash (2009), which have mostly investigated the impacts of remittances on household incomes and expenditures.

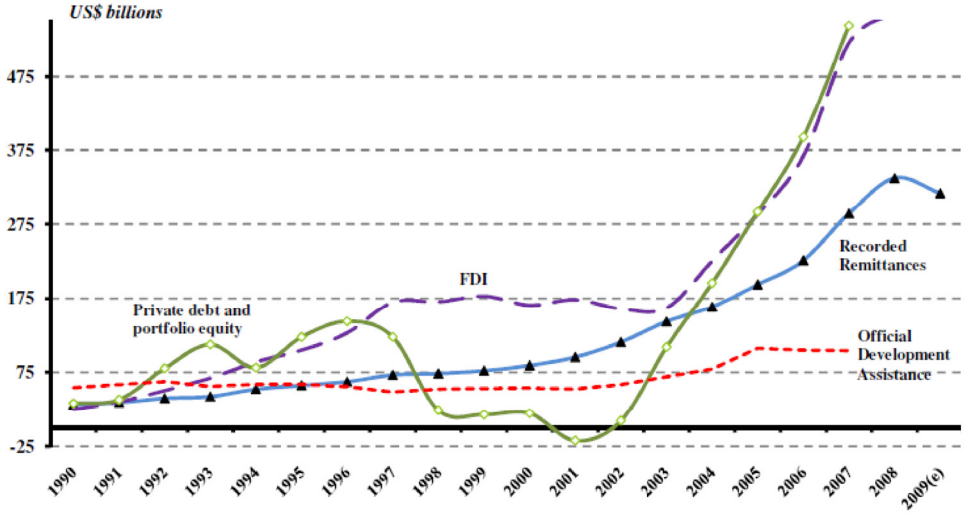
However, there is no study available so far on the growth nexus between remittances and growth in PICs. This paper seeks to fill the gap with a case study on Fiji, which unlike other PICs, has a longer and consistent time series data of national accounts and other relevant variables. The study, which covers a 30-year period (1979–2008), adopts an augmented Cobb–Douglas production function approach along the lines of Solow growth model. Our objective is to investigate whether there has been any long-run relationship between per capita real GDP, per capita physical capital stock and remittances through cointegration tests.

This paper is organised into five sections. Section 2 provides a brief review of economic literature on the linkages between remittances and growth; Section 3 examines recent trends in inward remittances of Fiji; Section 4 outlines the methodology adopted to undertake the empirical study and discusses the results. Finally, Section 5 presents conclusions with some policy implications.

2 A brief literature survey

Remittances, which are defined as private income transfers from one or more family members living and working abroad back to the remaining family unit in the home country (Chami et al., 2006), have surpassed official development assistance to developing countries (Figure 1). Furthermore, remittances have been growing substantially (Table 1), increasing from US$22 billion in 1985–1989 to US$338 billion in 2008 (World Bank, 2009b).

Figure 1 Remittances and capital flows to developing countries[a] (see online version for colours)



[a]FDI, Private debt and portfolio equity and remittances available up to 2008 and remittances for 2009 are estimated.

Source: World Bank (2006, 2009a,b), *Global Economic Prospects 2009* (World Bank), IMF Balance of Payments Statistics Yearbook (2008) and Global Development Finance (2008).

Table 1 Remittance, capital inflows to developing countries from 1990 to 2009[a]

Year	*Remittances (in US$ billions)*	*FDI (in US$ billions)*	*Private debt and portfolio equity (US$ in billions)*	*ODA (US$ in billions)*
1990	31	25	33	54
1991	34	35	38	58
1992	40	50	80	62
1993	42	67	112	56
1994	52	89	81	59
1995	57	105	122	59
1996	62	128	144	56
1997	71	169	122	49
1998	73	170	23	52
1999	77	178	18	53
2000	84	166	19	54
2001	95	173	(17)	52
2002	116	161	9	58
2003	143	162	109	69
2004	163	226	196	79

Table 1 Remittance, capital inflows to developing countries from 1990 to 2009[a] (continued)

Year	*Remittances (in US$ billions)*	*FDI (in US$ billions)*	*Private debt and portfolio equity (US$ in billions)*	*ODA (US$ in billions)*
2005	194	289	292	107
2006	226	368	393	104
2007	289	520	543	104
2008	338	562	n.a.	n.a.
2009[a]	317	n.a.	n.a.	n.a.

[a]Estimated by World Bank (2009a) and Global Financial Indicators from World Bank; n.a = not available.

Source: The World Bank – Briefing 3: Remittance Trends 2007 (updated 10 July 2008).

The role of remittance inflows in reducing poverty levels in developing countries has been well recognised, as they enable the recipient families to increase consumption (Buch and Kuckulenz, 2004; Maclellan and Mares, 2005; Ratha, 2007). Overall, remittances spent on expenditures beyond daily consumption also enhance investment thereby raising productive capacities of the economy. Further, remittances have become an increasingly important source of development finance, supporting the balance of payments and contributing to investment. In regard to poor households, they help in developing human capital by contributing to education and healthcare needs and foster entrepreneurial development through investments in businesses, especially during economic crises and natural disasters (UNESCAP, 2010).

Maclellan and Mares (2005) point out that migration has become an outlet for many PICs including small islands states. Three phases of emigrants' motivations behind steady remittances evolving over their careers have been identified by an IMF study (Browne, 2006). In the first phase, remittances are meant for meeting basic consumption needs of families living in home countries; and later the expenditures extend to cover telephones, sound systems, computers and outboard motors. The second phase is for human capital investment for the next generation, which includes support for schooling in the home country and later for support for higher education abroad. The next phase focuses on future retirement needs if migrants decide to return home, including the long-term needs such as real estate purchases.

The common means of sending remittances in the Pacific region are through postal mails, and visiting migrant's or migrant's relatives or friends. Brown and Ahlburg (1999) in their study on PICs confirm that remittances sent or contributed are largely through informal channels than through formal channels. The formal channels used by remitters in the region include Western Union money transfers, bank drafts and automated teller machines (ATM). The transaction costs involved in sending remittances to PICs through legal, banking channels have been high (Irving et al., 2010).

Sending through formal channels strengthens the process of financial sector development. The latter is signified by the presence of deposit accepting banking institutions and the process of financial deepening.[2] Implementation of financial sector reforms in PICs, including deregulation of interest rates and encouraging new entrants to the banking sector for allowing greater competition among the banking institutions, has facilitated a healthy shift in remittance flows from informal to formal banking arrangements. As and when remittances are deposited with financial institutions, a cash economy begins to evolve; and, if the reserves in the banks go up, the latter tend to give

more loans. Consequently, a large number of people would then be able to have access to increased credit facilities for education, home mortgages and small business enterprise (Browne, 2006).

In their study, Browne and Leeves (2007) conclude that remittances, aside from augmenting consumption, tend to support business activities by enabling reallocation of household resources from traditional subsistence to commercial activities. Prakash (2009) in his investigation finds that inward remittances, which are utilised for greater consumption, education, and housing, have a poverty reducing effect.

3 Recent trends in remittance inflows

In the Pacific region, Fiji, Samoa and Tonga have been receiving substantial remittance inflows in absolute terms as compared to other PICs. However, only in the case of Tonga, Samoa and Kiribati, remittance inflows account for a large proportion of their respective gross domestic products (Table 2).

3.1 Fiji's remittance inflows

Fiji's key indicators are given in Table 3. There has been a stable growth in inward remittances as a percentage of GDP until 2002 (Figure 2). During the period 1984–2002, the inward remittances in absolute terms capped to about US$40 million. However, from 2002 onwards, the economy witnessed a surge in the numbers (Figure 3). On an average, the economy received about US$165 million per year within the surge period. It is interesting to note that despite the 2007 financial crisis, remittance inflows to Fiji have remained relatively high in absolute terms, aside from being the largest among the PICs. This trend in remittances appears to be supported by the rising out-migration (Table 4).

Table 2 PICs: remittances (US$ millions): 1970–2008

	Fiji	*Kiribati*	*PNG*	*Samoa*	*Solomon Islands*	*Tonga*	*Vanuatu*
1970–1974	n.d.	n.a.	n.a.	n.a.	n.a.	2 (7.5)	n.a.
1975–1979	4 (0.5)	2 (4.5)	10 (0.6)	10 (13.2)	n.n.	6 (16.4)	n.a.
1980–1984	8 (0.7)	2 (6.9)	5 (0.2)	19 (19)	n.a.	10 (16.5)	8 (7.0)
1985–1989	26 (2.2)	4 (15.8)	9 (0.3)	34 (33.8)	n.a.	19 (22.5)	8 (6.0)
1990–1994	24 (1.6)	6 (19.3)	17 (0.4)	37 (28.1)	n.a.	21 (15.4)	12.2 (6.4)
1995–1999	30 (1.5)	7 (15.2)	13 (0.3)	44 (19.6)	2 (0.6)	61 (37.7)	22 (8.3)
2000–2004	73 (3.6)	7 (13.3)	11 (0.3)	54 (18.9)	4 (1.6)	61 (37.7)	22 (8.3)
2005	184 (6.2)	7 (11.4)	13 (0.3)	110 (25.9)	7 (2.4)	66 (30.6)	5.1 (1.4)
2006	165 (5.2)	7 (11.3)	13 (0.2)	108 (24.0)	20 (6)	72 (30.5)	5.0 (1.2)
2007	165 (4.8)	7 (9.0)	13 (0.2)	120 (22.9)	20 (5.1)	100 (39.6)	5.5 (1.1)
2008	175 (4.7)	9 (10.7)	13 (0.2)	135 (24.0)	20 (4.8)	100 (36.9)	7.0 (1.2)

Note: Figures in parentheses denote percentages to GDP; the fiver-year interval periods are averaged.

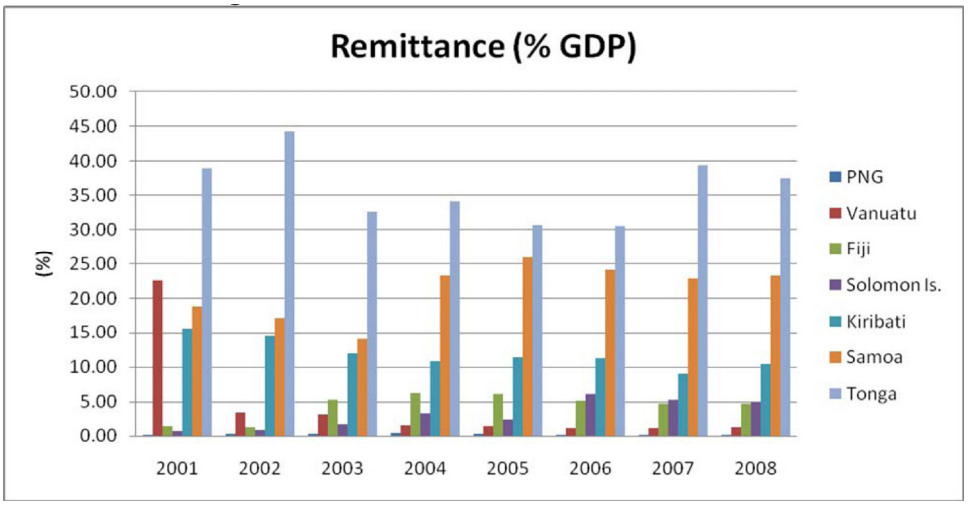
Source: World Bank (2008, 2009a).

Table 3 Fiji: selected key indicators

Land area (sq km^{-1}:'000)	18.3
Population (2008:'000)	838.7
Per capita GDP (US$) current prices (2007)	4,016.3
Aid per capita in US$ (2007)	68.9
Aid as percentage of GNI (2001–2007)	2.0
Annual average growth rate in percent (2004–2009)	0.6
Annual average inflation in percent (GDP deflator) (2001–2008)	4.1
Fiscal balance of central government as percent of GDP (2004–2006)	–4.9
Current account balance as percent of GDP (2001–2008)	–13.5

Source: World Bank (2009b), ADB (2009a) and UNESCAP (2007).

Figure 2 Trends of remittances in seven PICs (see online version for colours)

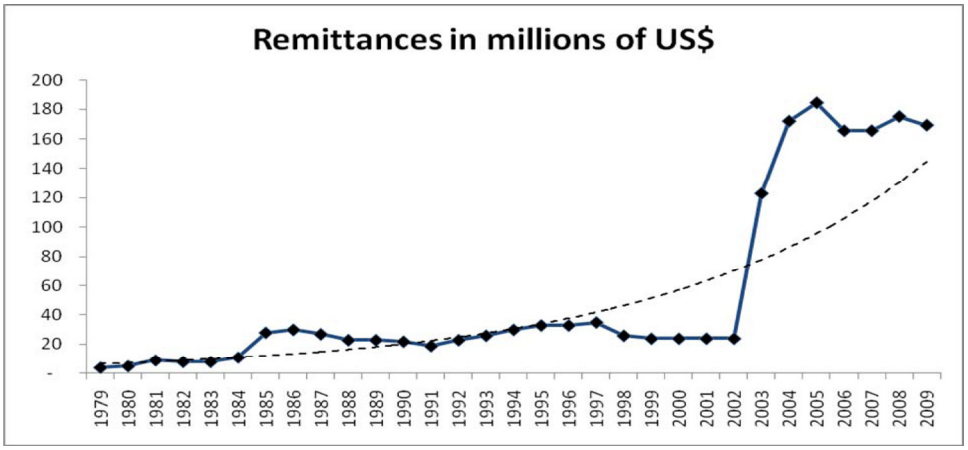


Source: World Bank (2008, 2009a).

3.2 Fiji's financial sector

Fiji's financial sector comprises three major sectors: commercial banking system, insurance industry and non-bank financial institutions. In addition to five commercial banks, there are three non-bank licensed credit institutions, which cater to the credit needs of the private sector in various areas, which include consumer credit, real estate, transport and storage and wholesale and retail trade. The insurance sector covers life insurance and general insurance services. There are two life insurance companies, eight general insurance companies and five insurance brokers with a large number of insurance agents. A major proportion of assets of insurance institutions are invested in government securities as well as in term deposits with commercial banks.

Figure 3 The trend of remittances in Fiji from 1970 to 2009 (see online version for colours)



Source: World Bank (2009a).

Table 4 Fiji's demographic profile

Year	*Net migration (–)*	*Population growth rate (percent)*	*Population (five year average)*
1966–1970	(13,273)	2.1	520,304
1971–1975	(13,760)	2.0	553,683
1976–1980	(22,677)	1.9	609,236
1981–1985	(11,911)	2.2	680,956
1986–1990	(69,692)	0.4	719,123
1991–1995	(34,785)	1.2	748,793
1996–2000	(42,000)	0.8	787,451
2000–2005	(42,000)	0.7	815,254
2006–2008	n.a.	0.5	834,286

Source: World Development Indicators (WDI), World Bank (2009b).

In addition to these institutions, there is a state-sponsored pension institution, known as Fiji National Provident Fund (FNPF), which collects a stipulated percentage of the salaries of employees in the formal sector matched by a similar contribution from the employers. The FNPF's investments are concentrated in fixed income securities, the bulk of which is in long-term government and government guaranteed bonds. Its short-term funds are kept with commercial banks as deposits of varying duration or invested in government short-term treasury bills.

Banking activities are largely confined to urban areas, where formal sector activities are concentrated. As the country's capital market is still in its infancy, Fiji has no vibrant bond and equity markets and there are no attractive financial assets other than saving and time deposits for savers to invest in. Further, as more rural bank branches are opened and mobile van banking facilities are introduced, the ratio of broad money, comprising narrow money and quasi money (savings and time deposits) to GDP has been on the rise.

4 Modelling, methodology, data and results

Our study on the investigation of nexus between remittances and Fiji's economic activities covers a 30-year period (1979–2008). Table 5 presents the data used in this study. The study focuses on possible linkages between expenditures out of remittances facilitated by financial sector development and GDP during this period. There is substantial body of literature on the subject on how the financial sector development plays a critical role in reallocating resources to the most productive investments, which in turn lead to higher economic growth (Beck et al., 2000; King and Levine, 1993; Levine et al., 2000). For an updated survey, the reader is referred to Rao et al. (2008).

We, therefore, make an assumption that as remittances received by rural and urban households increase over time, surplus funds after satisfying consumption needs are mobilised by financial sector institutions and are invested in activities, which are oriented towards production of agricultural output as well as processed primary consumer goods for domestic consumers and foreign markets. These include production of tropical fruits and vegetables and processed food products for overseas residents of Fiji origin.

We hypothesise that:

1 remittances, expressed as percent of GDP positively affect economic activities

2 financial sector development, proxied by broad money (narrow money plus quasi money) and expressed as percent of GDP and economic activities are directly related.

We start with the conventional Cobb-Douglas production function, along the lines employed by Luintel et al. (2008) and Rao et al. (2008) and by assuming constant returns to scale and Hicks–neutral technical progress:

$$y_t = A_t k_t^a, \quad 0 < \alpha < 1 \tag{1}$$

where y = per worker output, A = stock of technology and k = capital per worker.

The augmented Solow model assumes that the evolution of technology is given by

$$A_t = A_o e^{g^T} \tag{2}$$

where A_o is the initial stock of knowledge and T is time.

On the lines of Rao et al. (2008), we assume for our purpose that

$$A_t = f(T, \text{REM}, \text{FD}) \tag{3}$$

where REM = remittances as percent of GDP and FD = $M2$ as percent of GDP.

The effect of REM and FD on total factor productivity (TFP*)* can be captured with REM and FD as shift variables into the production function[3] leading to:

$$A_t = A_o e^{g^T} \text{REM}_t^{\beta} \text{FD}^{\lambda} \tag{4}$$

$$y_t = \left(A_o e^{g^T} \text{REM}_t^{\beta} \text{FD}_t^{\lambda} \right) k_t^{\alpha} \tag{5}$$

We can obtain from the above:

$$\Delta L y^* = g + \beta \Delta \text{LREM} + \lambda \Delta \text{LFD} \tag{6}$$

where L denotes logs of respective variables and the g is the TFP computation due to other likely growth factors, which are not included in the analysis.

The capital stock utilised for the study has been built up by a perpetual inventory method. As regards labour, we use population as a proxy, since we do not have a consistent time series on employment. Data on remittances are sourced from *World Development Indicators* issued by World Bank (2009b), whereas data on financial indicators are taken from International Financial Statistics of International Monetary Fund (2009). Appendix provides information on data sources.

4.1 Bounds testing approach

Since the number of observations is small, (30 observations from 1979 to 2008), we prefer the bounds testing approach under autoregressive distributed lag (ARDL) procedure developed by Pesaran et al. (2001). Excellent expositions of ARDL bounds testing approach are available in Narayan (2005) and Narayan and Smyth (2006). While observing that bounds testing approach is a variant of general to specific approach (GETS), Rao (2007) notes that both GETS and autoregressive distributed lag model (ARDL) bounds testing procedures do not require pretesting of unit roots and that unlike in GETS, however, it is possible to use bounds testing approach for investigating cointegration of the levels of the variables, irrespective of their order. With a view to meeting the criticism that it is difficult to accept that variables of different orders are cointegrated, we conduct unit root tests first and ensure they are of the same order before entering them into analysis. This would also enable us to conduct further analysis in terms of error-correction model (ECM) in first differences if the variables are of $I(1)$.

Table 5 Fiji: GDP, remittances and financial indicators

	Real GDP	*Remittances*	*Exports of goods and services*	*Money and quasi money*	*Private sector credit*
Year/variables	*Growth rate (percent)*	*REM (as percent of GDP)*	*XGS (as percent of GDP)*	*M2 (as percent of GDP)*	*PRCE (as percent of GDP)*
1981–1985	–0.1	1.1	43.4	34.5	24.1
1986–1990	2.9	2.1	53.3	40.9	28.6
1991–1995	2.5	1.6	55.5	52.0	39.5
1996–2000	2.1	1.5	62.2	43.3	33.4
2001	2.0	1.5	60.7	39.1	28.6
2002	3.1	1.3	61.5	37.5	28.2
2003	1.0	5.3	59.9	40.1	30.2
2004	5.2	6.3	53.8	43.6	33.1
2005	0.7	6.2	55.7	46.4	38.9
2006	3.5	5.2	48.5	50.0	44.0
2007	–6.8	4.9	51.7	57.9	45.6
2008	0.2	5.0	49.2	55.8	48.2

Note: The fiver-year interval figures are averaged.

Source: Data from World Development Indicators, World Bank (2009b) and Statistical Database System Online, ADB (2009b).

We use two unit root tests to examine the time series properties of the variables, namely ADF and Ng-Perron (Ng and Perron, 2001) test statistics. We find that all variables are non-stationary in levels. However, they are found to be stationary on first differences (Table 6). The next step is to examine the existence of a long run relationship between per worker output, capital per worker, remittances and financial development measure ($M2$) by using bounds test. For econometric analysis, all variables are duly transformed into their natural logs. In the estimation procedure, we add trend variable (TREND).

The ARDL equations are given as follows:

$$\begin{aligned}\Delta Ly_t = {} & \beta_{10} + \beta_{11} Ly_{t-1} + \beta_{12} Lk_{t-1} + \beta_{13}\mathrm{LREM}_{t-1} + \beta_{14}\mathrm{LFD}_{t-1} + \beta_{15}\mathrm{TREND} \\ & + \sum_{i=1}^{p} \alpha_{11i} \Delta Ly_{t-i} + \sum_{i=0}^{p} \alpha_{12i} \Delta Lk_{t-i} \\ & + \sum_{i=0}^{p} \alpha_{13i} \Delta\mathrm{LREM}_{t-i} + \sum_{i=0}^{p} \alpha_{14i} \Delta\mathrm{LFD}_{t-i} + \varepsilon_{1t}\end{aligned} \tag{7}$$

$$\begin{aligned}\Delta Lk_t = {} & \beta_{20} + \beta_{21} Ly_{t-1} + \beta_{22} Lk_{t-1} + \beta_{23}\mathrm{LREM}_{t-1} + \beta_{24}\mathrm{LFD}_{t-1} + \beta_{25}\mathrm{TREND} \\ & + \sum_{i=0}^{p} \alpha_{21i} \Delta Ly_{t-i} + \sum_{i=1}^{p} \alpha_{22i} \Delta Lk_{t-i} \\ & + \sum_{i=0}^{p} \alpha_{23i} \Delta\mathrm{LREM}_{t-i} + \sum_{i=0}^{p} \alpha_{24i} \Delta\mathrm{LFD}_{t-i} + \varepsilon_{2t}\end{aligned} \tag{8}$$

$$\begin{aligned}\Delta\mathrm{LREM}_t = {} & \beta_{30} + \beta_{31} Ly_{t-1} + \beta_{32} Lk_{t-1} + \beta_{33}\mathrm{LREM}_{t-1} + \beta_{34}\mathrm{LFD}_{t-1} + \beta_{35}\mathrm{TREND} \\ & + \sum_{i=0}^{p} \alpha_{31i} \Delta Ly_{t-i} + \sum_{i=0}^{p} \alpha_{32i} \Delta Lk_{t-i} \\ & + \sum_{i=1}^{p} \alpha_{33i} \Delta\mathrm{LREM}_{t-i} + \sum_{i=0}^{p} \alpha_{34i} \Delta\mathrm{LFD}_{t-i} + \varepsilon_{3t}\end{aligned} \tag{9}$$

$$\begin{aligned}\Delta\mathrm{LFD}_t = {} & \beta_{40} + \beta_{41} Ly_{t-1} + \beta_{42} Lk_{t-1} + \beta_{43}\mathrm{LREM}_{t-1} + \beta_{44}\mathrm{LFD}_{t-1} + \beta_{45}\mathrm{TREND} \\ & + \sum_{i=0}^{p} \alpha_{41i} \Delta Ly_{t-i} + \sum_{i=0}^{p} \alpha_{42i} \Delta Lk_{t-i} \\ & + \sum_{i=0}^{p} \alpha_{43i} \Delta\mathrm{LREM}_{t-i} + \sum_{i=1}^{p} \alpha_{44i} \Delta\mathrm{LFD}_{t-i} + \varepsilon_{4t}\end{aligned} \tag{10}$$

There are two steps in examining the relationship between *Ly*, *Lk*, LREM and LFD. Firstly, we estimate Equations (7)–(10) by ordinary least squares techniques. Secondly, the existence of a long-run relationship can be traced by imposing a restriction on all estimated coefficients of lagged level variables equating to zero. Hence, bounds test is based on the *F*-statistics (or Wald statistics) with the null hypothesis of no cointegration $(H_0 : \beta_{i1} = \beta_{i2} = \beta_{i3} = \beta_{i4} = 0)$ against its alternative hypothesis of a long-run cointegration relationship $(H_1 : \beta_{i1} \neq \beta_{i2} \neq \beta_{i3} \neq \beta_{i4} \neq 0)$.

The results of the bounds test are reported in Table 7. The results confirm the presence of a long run relationship amongst the variables when real output (RGDP) is set

as the dependent variable. The computed *F*-statistic is 14.359, which is greater than the upper critical values provided by Pesaran et al. (2001) and Narayan (2005) at 1% significance level. Hence, the null hypothesis of no cointegration is rejected for this equation. However, the respective computed *F*-statistics in the equations with other variables as dependent variables are found not statistically significant even at 10% significance level.

Table 6 Results of unit root tests

	ADF		*Ng and Perron*	
Variable	*Level*	*First difference*	*Level*	*First difference*
Y	–3.013	–4.098**	–8.166	–13.825**
K	–2.500	–3.509**	–14.221	–8.439**
REM	–2.621	–3.915**	–13.322	–13.268**
FD	–3.393	–4.078**	–10.483	–13.315**
Critical value				
1%	–4.324	–3.689	–23.8	–13.8
5%	–3.581	–2.972	–17.3	–8.1
10%	–3.225	–2.625	–14.2	–5.7

**Denotes the rejection of the null hypothesis at the 5% level of significance.

Note: The ADF critical values are based on McKinnon. The optimal lag is chosen on the basis of Akaike Information Criterion (AIC). The null hypothesis for both ADF and Ng-Perron tests is a series has a unit root (non-stationary) while the null hypothesis of the KPSS test does not contain unit root (stationary).

Table 7 Results of bound tests

Dependent variable			*Computed F-statistic*	
Ly			14.359***	
Lk			2.475	
LREM			2.181	
LFD			1.552	
	Pesaran et al. (2001)[a]		Narayan (2005)[b]	
Critical value (%)	*Lower bound value*	*Upper bound value*	*Lower bound value*	*Upper bound value*
1	3.74	5.06	4.768	6.670
5	2.86	4.01	3.354	4.774
10	2.45	3.52	2.752	3.994

***Indicates significance at 1% level.

[a]Critical values are obtained from Pesaran et al. (2001), Table CI(iii) Case III: Unrestricted intercept and no trend, p.300.

[b]Critical values are obtained from Narayan (2005), Table case III: unrestricted intercept and no trend, p.10.

Having confirmed the existence of a long-run relationship between per capita output and per capita capital stock, remittances and *M*2, we now proceed to estimate the long run equation by using the ARDL model. As it was found that the trend variable was not significantly different from zero, it was dropped from the estimation procedure. The long-run equation is:

$$\begin{aligned} Ly &= -1.415 + 0.310Lk + 0.120\,\mathrm{LREM} + 0.449\,\mathrm{LFD} \\ t &= (-4.660)^{***}\,(3.162)^{**}\,(4.710)^{***}\,(4.270)^{***} \end{aligned} \tag{11}$$

The estimated coefficients of all the explanatory variables influencing the dependent variable, per capita output, have positive signs and are found to be statistically significant. The coefficient of per capita capital stock is positive and is also statistically significant at 5% level. The magnitude of the coefficient, denoting the capital productivity share, is 0.31, which is also consistent with the stylised value of one third (Rao et al., 2008).

Among the shift variables, which are the main focus of attention of our study, we find that the impact of remittances on per worker output is positive and significant. As the estimated long-run equation has all the variables in logs, the coefficients are elasticities of output with respect to the relevant variables. For example, *ceteris paribus*, a 1% increase in REM would increase per capita output by 0.12% while a 1% rise in *M*2 would increase per capita output by 0.45%. The findings of positive impact of remittances on output are consistent with the findings of empirical studies undertaken in other regions (Giuliano and Ruiz-Arranz, 2009). It also emerges that growth is directly associated with financial sector development in Fiji, which is in line with standard studies (Beck and Levine, 2004; King and Levine, 1993; Levine et al., 2000).

A number of diagnostic tests such as Jacque-Bera normality test, serial correlation LM test, heteroskedasticity ARCH test and Ramsey RESET mis-specification test were applied to Equation (4). This equation performs reasonably well as the disturbance terms are normally distributed and serially uncorrelated with homoskedasticity of residuals, confirming the model has a correct functional form. Besides, the CUSUM and CUSUM of Squares plot show that the parameters of the model are stable over time.[4]

4.2 Granger causality test

Since it is found that there is cointegration between the variables, we proceed to conduct VECM tests in their first differences and conduct Granger causality tests. Results are shown in Table 8. The results confirm the existence of a unidirectional relationship. We find in the long run, the linkage runs only from per capita capital stock, remittances and *M*2 to per capita output, as error-correction term (ECT) has a correct sign only in the equation with per capita output as dependent variable and is also statistically significant at 1% level. In contrast, ECT in other equations is not significant even at 10% significance level. This duly confirms the existence of only one cointegration vector, as was obtained by the bounds test approach.

The Granger causality test results show that in the long run, there is a unidirectional linkage running only from all explanatory variables, including remittances and financial sector development indicator to per capita output. Further, it is noted that remittances and financial sector development also influence growth in the short run.

Table 8 Granger causality tests

Dependent variable	*F-statistics*				
	ΔLy	*ΔLk*	*ΔLREM*	*ΔLM2*	*ECT (t-statistics)*
Δ*Ly*	–	3.335*	4.428**	5.326**	–0.2938*** (–3.421)
Δ*Lk*	18.365***	–	2.341	3.693**	–0.0291 (–1.349)
ΔLREM	2.646*	2.831*	–	3.752*	–0.6172 (–1.523)
ΔL*M*2	0.009	0.304	0.088	–	–0.1829 (–1.636)

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

Note: Figures in parentheses are *t*-statistics.

To sum up, empirical results confirm the hypothesis that Fiji's remittance inflows contribute to GDP and that the domestic financial sector is crucial in channelling remittance inflows into the banking system to finance productive investment projects, and boosting real output.

5 Conclusions and policy implications

Inward remittance inflows have been a great support to all PICs, as they supplement their real resources by increasing their foreign exchange reserves. Viewed against the background of declining foreign exchange earnings from traditional commodity exports with the dimmed prospects of tourism consequent to the depressed global economic conditions, annual remittance inflows have assumed far greater importance than ever before.

The objective of this paper was to study the long-run growth effects of remittances received by Fiji, by employing an augmented Solow growth model which assumes constant returns to scale production function. The model was duly extended by including two shift variables, namely remittances as percentage of GDP, and a variable representing financial sector development, namely broad money as a percentage of GDP for an empirical study of the relationship between remittances and economic growth in Fiji during a 30-year period (1979–2008). The study findings are that remittances have had a positive and significant effect on economic activities. The policy implications are clear:

- development of financial sector is critical to growth, since it channels remittance inflows into the banking system
- decision makers should devise appropriate incentive measures to encourage the remittance recipient families to deposit them in financial institutions, which would contribute to accumulation of higher domestic savings and greater resource mobilisation
- incentive measures can include offering higher interest rates for remittances than available for domestic currency deposits, similar to the policy used by the South Asian countries in attracting deposits from their non-resident nationals
- government of Fiji in consultation with financial institutions should review the current structure of fees and other charges levied on inward remittances at both ends

with a view to removing the hurdles that come in the way of remitting funds through formal, financial channels for promoting greater flows of resources to developing countries.

Aware of the importance of financial sector development, the Reserve Bank of Fiji launched the most innovative scheme to date, with a view to promoting greater financial inclusion by bringing savers in the rural areas into the banking system (Reserve Bank of Fiji, 2010). Known as E-Money Project, the scheme when made fully effective in the next six months of 2010, would bring about decisive changes in the financial landscape. The Project is expected to cover inward remittances from overseas. In that case, inward remittances would play a far greater role than ever before in Fiji's economy.

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References

Asian Development Bank (ADB) (2009a) *Asian Development Outlook 2009: Rebalancing Asia's Growth*, Asian Development Bank, Manila, Available at: http://www.adb.org/Documents/Books/ADO/2009/default.asp. Accessed on 09 February 10.

Asian Development Bank (ADB) (2009b) *Statistical Database System Online*, Asian Development Bank, Manila, Available at: https://sdbs.adb.org/sdbs/index.jsp. Accessed on 28 December 2009.

Beck, T. and Levine, R. (2004) 'Legal institutions and financial development', *NBER Working Paper No. W10417*.

Beck, T., Levine, R. and Loayza, N. (2000) 'Finance and the sources of growth', *Journal of Financial Economics*, Vol. 58, pp.261–300.

Browne, C. (Ed.) (2006) *Remittances and Migration*, Pacific Island Economies, Washington, DC: International Monetary Fund.

Brown, R. and Ahlburg, A.D. (1999) 'Remittance in the Pacific', *International Journal of Social Economics*, Vol. 26, pp.325–344.

Browne, R. and Leeves, G. (2007) 'Impacts of International Migration and Remittances on Source Country Household Incomes in Small Island States: Fiji and Tonga', *Discussion Paper No. 347*, School of Economics, The University of Queensland, Australia.

Buch, M.C. and Kuckulenz, A. (2004) 'Worker remittances and capital flows to developing countries', *Discussion Paper No. 04-31*, April, Centre for European Economic Research ZEW, Germany, Available at: ftp://ftp.zew.de/pub/zew-docs/dp/dp0431.pdf. Accessed on 06 January 2010.

Chami, R., Cosimano, T.F. and Gapen, M.T. (2006) 'Beware of emigrants bearing gifts: optimal fiscal and monetary policy in the presence of remittances', *IMF Working Paper WP/06/61*, International Monetary Fund, Washington, DC.

Giuliano, P. and Ruiz-Arranz, M. (2009) 'Remittances, financial development, and growth', *Journal of Development Economics*, Vol. 90, pp.144–152.

International Monetary Fund (2009) *International Financial Statistics*, CD ROM December 2009, IMF, Washington, DC.

Irving, J., Mohapatra, S. and Ratha, D. (2010) 'Migrant remittance flows: findings from a global survey of central banks', *World Bank Working Paper No: 194/2010*, Washington, DC: World Bank.

King, R.G. and Levine, R. (1993) 'Finance and growth: Schumpeter Might Be Right', *The Quarterly Journal of Economics*, Vol. 108, pp.717–737.

Luintel, K.B., Khan, M., Arestis, P. and Theodoridis, K. (2008) 'Financial structure and economic growth', *Journal of Development Economics*, Vol. 86, pp.181–200.

Levine, R., Loayza, N. and Beck, T. (2000) 'Financial intermediation and growth: causality and causes', *Journal of Monetary Economics*, Vol. 46, pp.31–77.

Maclellan, N. and Mares, P. (2005) *Remittances and Labour Mobility in the Pacific – A Working Paper on Seasonal Work Programs in Australia for Pacific Islanders*, Swinburne Institute for Social Research, Melbourne, Available at: http://researchbank.swinburne.edu.au/vital/access/manager/Repository/swin:5609. Accessed on 24 August 2009.

Narayan, P.K. (2005) 'The saving and investment nexus for China: evidence from cointegration tests', *Applied Economics*, Vol. 37, pp.1979–1990.

Narayan, P.K. and Smyth, R. (2006) 'The residential demand for electricity in Australia: an application of the bounds testing approach to cointegration', *Energy Policy*, Vol. 33, pp.467–474.

Ng, S. and Perron, P. (2001) 'Lag length selection and the construction of unit root tests with good size and power', *Econometrica*, Vol. 69, pp.1519–1554.

Pesaran, M.H., Shin, Y. and Smith, R. (2001) 'Bounds testing approaches to the analysis of level relationships', *Journal of Applied Econometrics*, Vol. 16, pp.289–326.

Prakash, N. (2009) 'The development impact of workers' remittances in Fiji', MA Thesis, Massey University, Palmerston North, New Zealand.

Rao, B.B. (2007) 'Estimating short and long-run relationships: a guide for the applied economist', *Applied Economics*, Vol. 39, pp.1613–1625.

Rao, B., Singh, T.A., Singh, R. and Vadlamannati, K.C. (2008) 'Financial developments and the rate of growth of output: An alternative approach', *MPAR Paper No. 8605*, Available at: http://mpra.ub.uni-muenchen.de/8605/. Accessed on 28 June 2010.

Ratha, D. (2007) *Leveraging Remittances for Development*, Migration Policy Institute, Washington, DC: World Bank.

Reserve Bank of Fiji (2010) 'E-Money Fiji', *Governor's Statement at the Launching of E-Money Project*, 9 June 2010, Reserve Bank of Fiji, Suva.

United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) (2007) *Economic and Social Survey*, *2007*, UNESCAP, Bangkok.

United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) (2010) *Economic and Social Survey*, *2010*, UNESCAP, Bangkok.

World Bank (2006) Home and Away: Expanding Job Opportunities for Pacific Islanders through Labour Mobility, Washington, DC: World Bank.

World Bank (2008) *World Development Indicators 2008 CD ROM*, Washington, DC: World Bank.

World Bank (2009a) *Migration and Remittance Data*, Washington, DC: World Bank, Available at: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,contentMDK:21352016~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html. Accessed on 29 December 2009.

World Bank (2009b) *WDI Online Word Development Indicators*, Washington, DC: World Bank, Available at: http://ddptxt.worldbank.org/ext/DDPQQ/member.do?method=getMembers&userid=1&queryId=6. Accessed on 28 December 2009.

Notes

[1]The 14 independent PICs, which are members of the formal inter-governmental organisation, known as Pacific Islands Forum are: Cook Islands, Fiji, Kiribati, Federated States of Micronesia, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

[2]The term financial deepening refers to rise in the ratio of broad money (currency and demand deposits plus savings and time deposits) to GDP.

[3]In the estimation procedure in order to accommodate the likely contribution of other variables, which are not included and hence ignored, to TFP, one can include time trend to the production function.

[4]The CUSUM and CUSUM of squares plots are not reported in order to conserve space. However, the results are available upon request.

Appendix

Definitions and data sources

Y = Real GDP in Fiji dollar (million).

K = Capital stock estimated with the perpetual inventory method with 4% rate of depreciation.

L = Labour force (total population).

XGS = Total exports of goods and services as a percent of GDP.

REM = Workers remittances received (percent of GDP).

$M2$ = Broad money.

Source: Data on real GDP are from the UN database at http://unstats.un.org/unsd/snaama/selectionbasicFast.asp.

Other variable data are extracted from World Development Indicators and IMF (2009) CD ROM.