Does finance matter for health in the PICs? A case study of Fiji

Krishal Prasad Reserve Bank of Fiji
Shelvin Karan Reserve Bank of Fiji
Nirodha Javawardena Griffith University
Samsul Alam De Montfort University
Parmendra Sharma Griffith University

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Krishal Prasad[a], Shelvin Karan[a], Nirodha Jayawardena[b,c], Samsul Alam[d] and Parmendra Sharma[b,c]

[a] Reserve Bank of Fiji
[b] Department of Accounting, Finance and Economics, Griffith University
[c] Griffith Asia Institute, Griffith University
[d] Leicester Castle Business School, De Montfort University, Leicester, UK

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About the Authors

Krishal Prasad
Mr Krishal Prasad is currently a Senior Economist at the Reserve Bank of Fiji (RBF). He holds a Master of Commerce, Post Graduate Diploma in Economics and a Bachelor of Commerce in Accounting and Economics from the University of the South Pacific (USP). He has been with RBF for the past seven years, working across the Publications and Statistics Unit, Financial Conditions Unit and is currently based in the External Conditions Unit. Prior to joining the RBF, he was a Teaching Assistant with the School of Accounting and Finance at USP. His research areas include socio economic issues, monetary policy, macroeconomics and financial sector issues. He has authored the RBF working paper titled 'Financial Sector Development in Fiji Post 2000" and co-authored paper with Griffith University titled 'Finance and Socio-economic development in Fiji: Some stylized facts'.

Shelvin Karan
Mr Shelvin Karan is currently Manager Domestic Conditions Unit at the Economics Group of the Reserve Bank of Fiji. He has around 12 years of central banking experience and has previously worked in External Conditions and Publications & Statistics Units at the RBF. Shelvin has also spent two years as a Local Economist at the International Monetary Fund's Resident Representative Office for Pacific Islands where he worked as desk Economist for Papua New Guinea and Tuvalu. Mr Karan has a Master of Commerce and Bachelor of Arts degrees from the University of the South Pacific.

Nirodha Jayawardena
Dr Nirodha Jayawardena is a Senior Research Associate at Griffith Business School. Dr Jayawardena completed her PhD in Finance from Griffith Business School. She graduated with a first-class Honors in Statistics from the University of Colombo, Sri Lanka. Her research interests include: Social and Affordable Housing, Economic Modelling and Quantitative Finance.

Samsul Alam
Dr Samsul Alam is currently a lecturer in Economics at Leicester Castle Business School in De Montfort University, UK. He received a PhD in Economics from Griffith University, Australia and was a contracted lecturer and tutor at Griffith before moving to UK. At Griffith, he joined the South Pacific Central Banking projects, including mentoring and co-authoring joint policy research working papers. He has published his research in Annals of Tourism Research, Journal of Travel Research, Journal of Sustainable Tourism, Transportation Research Part D: Transport and Environment, Journal of Business Ethics, Journal of the Asia Pacific Economy, Applied Economics, Emerging Markets Review, Social Indicators Research, etc. His research interest includes tourism economics, resource and environmental economics and development economics.

Parmendra Sharma
Dr Parmendra Sharma is a senior lecturer and the program convenor of the South Pacific Centre for Central Banking at Griffith University. His publications are beginning to fill the huge vacuum in the literature relating to South Pacific's financial sector, including on issues such as determinants of bank interest margins, profitability and efficiency. His recent publications include Factors influencing the intention to use of mobile value-added services by women-owned micro enterprises in Fiji), Microfinance and microenterprise performance in Indonesia (International Journal of Social Economics), A first look at the trilemma vis-à-vis quadrilemma monetary policy stance in a Pacific Island country context, (Review of Pacific Basin Financial Markets Policy), Mobile value added services in Fiji: Institutional drivers, industry challenges and adoption by women micro entrepreneurs (Journal of Global Information Management) and Bank reforms and Efficiency in Vietnamese Banks: Evidence based on SFA and DEA (Applied Economics).

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Abstract

This study investigates the impact of financial development on life expectancy in the context of Fiji. Government expenditure, inflation, and private credit by deposit money banks to GDP are included as additional determinants of life expectancy over the period of 1980 to 2017. Our empirical findings from the Gregory and Hansen (1996) cointegration test confirm the long-run equilibrium relationship among life expectancy, financial development, government expenditure, inflation, and private credit by deposit money banks to GDP. Further, our results from variance decomposition and impulse response analysis suggest that financial development enhances life expectancy both in the short- and long-run. The findings of our study offer a substantial contribution to policy formulation and knowledge creation.

Keywords: Life expectancy, Financial development, Inflation, Government expenditure, Fiji.

1. Introduction

The *finance-growth* nexus is now largely settled in the literature—the relationship is widely accepted to be positive, i.e., finance promotes growth. Development of the financial sector thus becomes imperative for better economic growth and development prospects. Literature is also emerging to explore the relationship between finance and other key seemingly correlated macroeconomic variables such as poverty and income inequality. As well, literature is emerging on the *finance-health* nexus with the question obviously being—does finance or financial development matter for the health of a country's citizens i.e., public health. This question is timely, important and intriguing, underpinned especially by two key motives—United Nation's (UN) Sustainable Development Goals (SDGs) and the rising national budget allocations to the public health sector.

UN's SDG # 3—*good health and well-being*—sets various ambitious targets including substantial reductions to mortality rates, an end to preventable deaths of new-borns and epidemics such as AIDS, tuberculosis and malaria, and substantial reductions to premature mortality from non-communicable diseases by 2030. While achievable, these targets are likely to require sustained and increased investments at national level, and continuous support from the entire global community, in light especially of constrained public budgets. Indeed, budget allocations to the health sector has anything but increased over the years, across both the developed and developing worlds. In 2017, for instance, global health expenditure mounted to US$7.8 trillion which is around 10 percent of the world's Gross Domestic Product (GDP). In the same year, growing at 2.6 percent annually— more than its economic growth rate—Germany's health sector comprised 11.2 percent of the nation's GDP. Health spending in China amounted to US$511.3 billion, 5.4 percent of the entire economy and projected to rise further. In fact, the health sector continues to expand faster than the overall economy. Between 2000 and 2017, according to the World Health Organisation, global health spending in real terms grew by 3.9 percent a year while the economy grew by 3.0 percent a year. Public spending represents about 60 percent of global spending on health and grew at 4.3 percent a year between 2000 and 2017. However, this growth has been decelerating in recent years, from 4.9 percent a year growth in 2000–2010 to 3.4 percent in 2010–2017.

The effect of financial development on health runs through income growth and poverty reduction. The increased incomes of households make them able to consume nutritious food, visit doctors when they get sick, insure against health and property catastrophes, send their children to school, and uplift their social prestige and dignity. Financial development affects life expectancy via better health. Easier access to finance leads to income generating opportunities for the lower-middle income families. For those already having their own enterprises, finance provides additional avenue to expand their entrepreneur skills. Higher income level advances the human potential towards nutritious food, rewarding education and better health. Claessens and Feijen (2007) further note that higher level of income resulting from country-level effects of financial development on health go through credit, savings, and insurance channels as these can greatly help financing health care and help in smoothing income in the face of health shocks.

In these circumstances, access to affordable private health insurance and households' willingness and ability to allocate and expend on health-related expenditures become imperative. At the same time, the health and well-being related SDGs are equally important. The question is *how can finance help*? The answer seems to unravel via the following channels: income effect, educational effect, infrastructure development, and risk management. Access to affordable and appropriate financial services (if financial

development works) such as insurance, credit, and savings is likely to result in better health care, living and working conditions of individuals and households. Better education opportunities too, emanating from access to finance, is likely to create awareness and reduce health hazards. Investment in infrastructure such as transportation and hospitals are another finance-oriented channel that might yield better public health. Risk-management as well is likely to support healthier conditions, especially in times of crisis.

On the other hand, where access to affordable financial services remains a challenge, public health at large is likely to be adversely affected; moreover, in times of crises, liquidity constraints and consolidations might lead to declining health conditions, reflecting ultimately in lower life expectancies and higher mortality rates.

This study provides comprehensive evidence on equity of the health financing system in Fiji, a small Pacific island state. The health systems of such states are paid less attention in the international literature. Our study evaluates financial development in Fiji by using private sector credit by deposit money banks to GDP and health by life expectancy as the main proxies, while other independent variables include government expenditure and inflation. The study contributes to the existing literature as follows. Firstly, it designs a theoretical model to investigate the relationship between financial development and health attributes. Secondly, it examines econometrically the impact of financial development on health. Lastly, our study draws policy lessons through which health policy and financial policy can be integrated together to widen the access of cheaper and better health services and contributes to the betterment of Fiji.

Our empirical findings from the Gregory and Hansen (2007) cointegration test reveal that there is a long-run equilibrium relationship among life expectancy, financial development, government expenditure, inflation, and private credit by deposit money banks to GDP. Further, the variance decomposition and impulse response analysis indicate that financial development increases life expectancy both in the short- and long-run.

The rest of the paper is structured as follows. Section 2 provides the review of the literature. Section 3 provides description of data and methodology. Section 4 looks at the empirical results and discussion while Section 5 concludes with policy recommendations.

2. Literature review

Over time, human's life expectancy has increased, and overall quality of life has improved. Numerous studies have tried to assign various factors to these phenomena. Mor et al. (2014) state that financial development impacts health status of individuals and families through two principal channels; the income or growth or returns channel and the volatility or financial protection or risk channel. Considering the growth channel, there are substantive empirical evidence that financial development of a country is one of the important enablers of growth. The advocates of the first school of thoughts argued that financial development is indispensable for economic growth (Goldsmith,1969; Levine,1997; McKinnon,1973; and Schumpeter,1911).

Among existing studies, Bhatta (2013) examined the relationship between financial development and health using a simple Vector Auto Regression (VAR) framework for Organisation for Economic Cooperation and Development (OECD) and South Asian countries for 1990 to 2010 but used a more comprehensive set of indicators for health – life expectancy, infant mortality and low birth weight and focused on the transmission channels of financial development to health. The paper suggests that financial development leads to better health outcomes in both OECD and South Asian economies. However, the income channel is more profound in OECD countries while the credit channel is more instrumental in South Asian countries. In developing countries of South Asia, financial development also promotes higher level of education which leads to better health outcomes.

In a similar vein, Akhmat et al. (2013) used panel cointegration techniques and data from 1988 to 2008 to show that financial development, economic growth and human capital are co-integrated and financial indicators have a statistically significant positive effect on human capital and domestic credit in the South Asian Association for Regional Cooperation (SAARC) countries[1]. They also find that domestic credit, private sector credit and broad money are good at explaining the positive relationship. A similar study by Sehrawat et al. (2014) uses the Autoregressive Distributed Lag (ARDL) bounds test approach to confirm a long run relationship between Human Development Index (HDI) indicators and financial development in India for the period 1980 to 2012. The paper also uses the Granger causality test to show that the relationship is unidirectional causality that runs between financial development indicators and HDI. Additionally, the variance decomposition results in the paper show that broad money supply influences HDI the most.

A related study by Alam et al. (2015) using quarterly data from 1990 to 2013 shows that financial development, education expenditure and economic growth have significant positive impact on life expectancy in India. Similar results were noted by Akinboade et al. (2013) in South Africa where results support the income channel and show that improving access to private sector credit and rising per capita incomes lead to improvements in health outcomes. The paper also notes that increased access to credit improves spending on food, and there is a long run relationship between per capita spending on food, per capita income and financial sector development.

However, the impact of financial development in health-related outcomes can be multi-faceted and via different channels as reflected by Zakaria et al. (2016), in related study of South Asian countries where it was found that financial development leads to declining fertility rates. The paper suggests that alternative financial tools reduces incentives for households to have many children given that children were traditionally used to secure old age in this region. Declining fertility rates can be positive for health outcomes for both women and children.

For Fiji, research on the impact of financial development on various socio-economic indicators is in its infancy stage. Prasad et al. (2018) makes a good starting point by using stylized facts to test for the relationship between financial development and socio-economic indicators such as economic growth, poverty, income inequality and health. The results support commonly held perceptions and shows that Fiji's financial system has grown steadily from 1990 and has a positive relationship with socio-economic indicators such as economic growth, poverty and income inequality reduction and health. Life expectancy was used as a proxy for health and shows positive relationship to growth in financial development indicators.

Most studies on life expectancy and ultimately health outcomes have focused on health expenditure, primarily government spending on health. Nixon et al (2006) used a fixed effects model using data from 1980 to 1995 of 15 European Union countries to test the relationship between various lifestyle, environmental and occupational factors and health outcomes specifically life expectancy and infant mortality. The results show that increased health expenditures are associated with significant improvements in infant mortality rates. However, the improvement in life expectancy was found to be marginal, implying that other factors may have a more profound effect. A related study also using panel data but for 44 sub-Saharan African countries by Novignon et. Al (2012) using data from 1995 to 2010 found quite similar results. In this paper, results show that both private and public health care spending influences health outcomes by improving life expectancy at birth and reduces child and infant mortality rates.

Farag et al. (2012) used data from 133 low and middle-income countries for the years 1995, 2000, 2005, and 2006 and showed that government health spending had a significant effect on reducing infant and child mortality but the success depended on the level of good governance in the country, indicating that good governance increases the effectiveness of health spending.

However, the link between higher health care spending and improved health outcomes are not always so clear. A study by Pierard (2015) using Canadian data from 1994 to 2015 found that increased provincial health care expenditure had limited effect on self-assessed health status or a Health Utility Index. The author postulates that health expenditure is a "noisy" indicator and little variation in spending over the period makes the relationship difficult to estimate. Spithoven (2008) also explains that sometimes Baumol effect and higher administration and pharmaceutical costs may explain why higher health care spending does not necessarily lead to improved health care outcomes.

Mazumdar (2001) uses an explanatory model to assess the increase in life expectancy between 1960 and 1995 using initial life expectancy, calorie intake, adult literacy, per capita income and doctors per population as variables. The results of the paper show that expansion in adult literacy and improved medical facilities tend to increase life expectancy of the total population. However, the results also show that calorie intake and per capita income do not play a significant role in life expectancy at birth beyond a certain level of per capita income while the effects of safe drinking water and improved sanitation is unclear in the model.

Another interesting barometer for increased life expectancy is increased trade and foreign direct investment. Alam et al. (2015) uses time series data from 1972 to 2013 to measure the impact of trade openness and foreign direct investment (FDI) on life expectancy in Pakistan. The results confirm cointegration of variables and show that trade openness and FDI increases life expectancy in the long run. Ling et al. (2015) does a similar study on impact of trade openness on life expectancy in Malaysia using time series data from 1960 to 2014. The results using Vector Error Correction Model (VECM) Granger causality also show that economic growth and increased trade, that is higher exports and imports have positive impact on life expectancy.

In summary, it can be concluded that the literature on the linkage between financial development and health indicators are still limited overall and almost negligible for the PICs. Most studies so far have focused on South Asia where the population is much larger and financial development more pronounced. Considering this existing gap in the literature, this study aims to narrow the gap and findings of the study would be vital for both policymakers and academics.

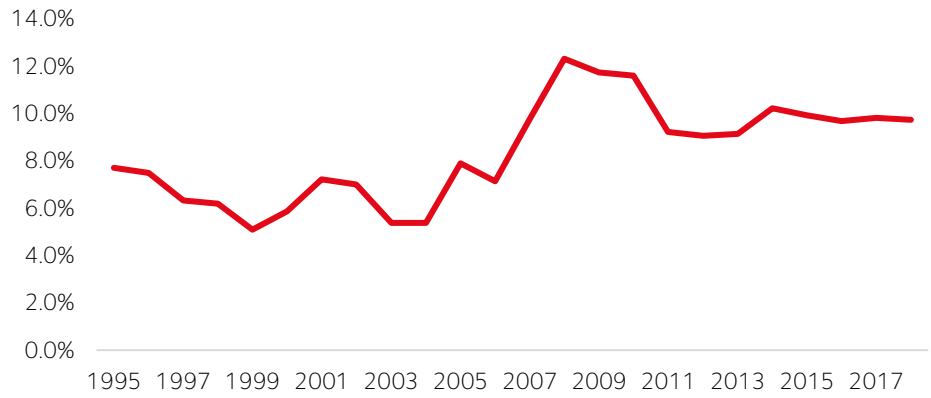
3. Study context

3.1 Financial development trends in Fiji

The landscape of Fiji's macroeconomic environment and financial development setting has evolved immensely over the past two decades. In 2018, Fiji's gross domestic product totalled $11.56 billion compared to $0.98 billion in 1980, led by broad based growth across various sectors of the economy. The Fijian economy has maintained a steady pace of growth despite external and domestic shocks, chief of which were political instability and natural disasters. One of the sectors that contributed significantly towards the growth is the financial and insurance activities sector and it currently makes around 9.4 percent of GDP and is ranked amongst the top five sectors in terms of weights (Figure 1).

This has come about on account of successive reforms, policies and ongoing expansion and resilience in the domestic economy. Fiji's financial sector has expanded in line with economic growth, evident in its increasing contribution to total GDP over the past decades.

Figure 1: Financial Sector Share of GDP (%)

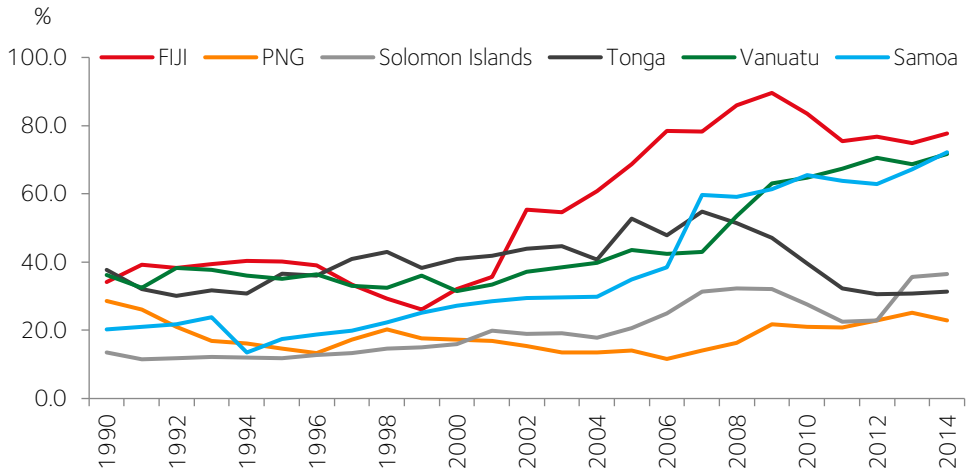


Source: Fiji Bureau of Statistics and Reserve Bank of Fiji

Fiji's financial system comprises the banking industry2, insurance, foreign exchange dealers, the Fiji National Provident Fund (FNPF), capital markets and other non-bank financial institutions (NBFIs)3. The financial developments over the decades have included further market reforms, changes in RBF policies and the entry of new institutions, as the market responded to the changing financial landscape. This has been generally evident in the improvements in size, profitability and efficiency indicators across various segments of Fiji's financial sector. While considerable competition exists in the banking industry, amongst commercial banks and LCIs, new entrants could still benefit the sector and improve the enabling environment for increased financial intermediation.

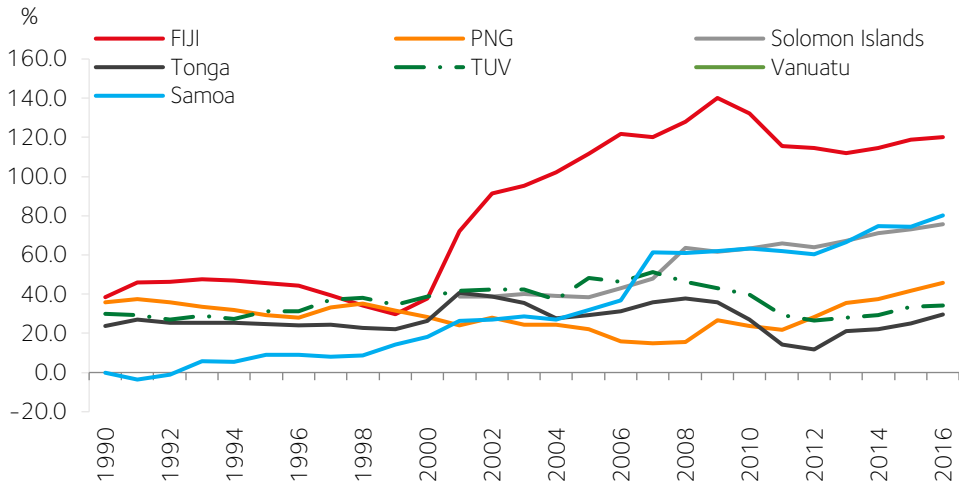
In terms of cross-country comparison, Fiji has made progress in the financial sector development over the past three decades and is at par with comparable countries, especially when compared to the PICs. Indicators such as domestic credit to the private sector (Figure 2) and financial system deposit to GDP (Figure 3) show that Fiji outperforms the PICs. This is not surprising given that Fiji compared to other PICs has more banks and a fast-evolving private sector which demands more credit.

Figure 2: Domestic credit to the private sector (% of GDP) for PICs



Data Source: Global Financial System Database

Figure 3: Financial system deposits to GDP (%) for PICs



Data Source: Global Financial System Database

The transformation in the financial sector over the years has had a positive impact on various socio-economic indicators in Fiji as shown by Prasad et. al. (2018). The paper made preliminary findings that financial development is positively related to life expectancy and suggest that financial sector development should be encouraged by the policymakers in order to increase health quality of the mass people.

3.2. Health sector trends

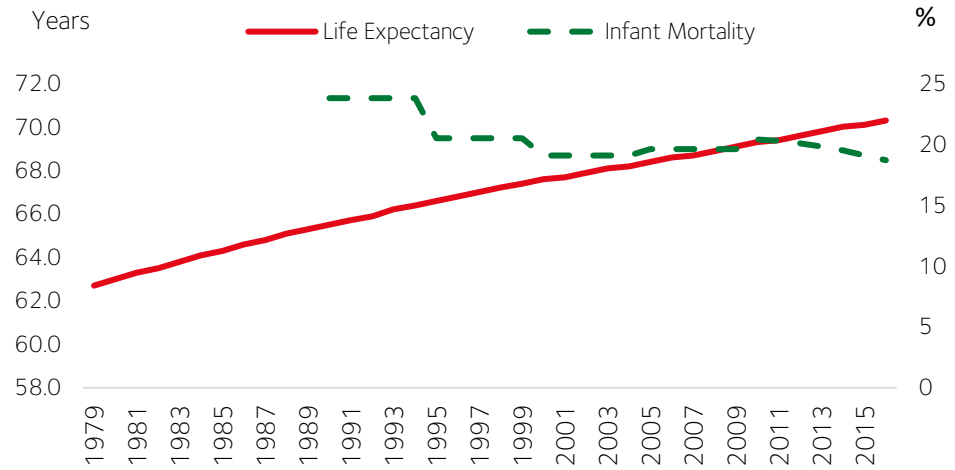
The government of Fiji has recently endorsed a proposal to increase total government health spending to at least 5% of GDP with the expressed aim of expanding access to quality services for the poor. The Ministry of Health and Medical Services (MoHMS) Corporate Plan 2015 notes the government is 'examining a variety of healthcare financing options' to promote financial risk protection. This will require robust evidence on who currently pays for and who benefits from health financing.

The health sector in Fiji is always the focus of the Government in announcing the National Budget. It is one of the few sectors that receives increased allocation every year. This suggests that more has to be done in order to improve the access to health care for the people of Fiji. The major challenge is the provision of services to a population that is scattered over many islands. The logistical problems of ensuring reliable, uninterrupted and good quality

primary health care on remote outer islands include infrequent transport links, costly communication and high operational cost. While a good portion of the primary health care is free and subsidized by government, according to the World Health Organisation the percentage of out of pocket payments, especially for drugs and specialized health services varies, and can reach up to 35 percent of total health spending. This calls for increase in development of financial infrastructure so that the service is accessible to the wider population.

Statistics shows that life expectancy has somewhat increased in Fiji over the years while at the same time the infant mortality rate has decreased (Figure 4). This could suggest that with more financial development, the affordability has improved for people to access better or private health care.

Figure 4: Life Expectancy and Infant Mortality Rate



Data Source: Global Financial System Database

Given that assumed relationship of the financial sector development and health care it is important that this relationship is empirically explored.

4. Data and methodology

4.1. Data and model specification

We use yearly time series dataset for the period of 1980-2017. Life expectancy (LE) is measured by the average number of years of life (female and male), financial development is measured by domestic credit for private sector lending (DCPSGDP), inflation (INF) is measured as changes in consumer price index, government expenditure (GOVTEXP) is measured by allocations as per National Budget, Unemployment rate is measured by the number of unemployed individuals divided by the number of individuals in the labour force. All the required data on the selected variables was sourced from the World Development Indicators (WDI) online data source maintained by the World Bank.

Following the existing literature, we define life expectancy is a function of domestic credit for private sector lending (DCPSGDP), government expenditure (GOVTEXP), inflation (INF), unemployment (UEP), years in school (SCH), education spending (EDU), Gini Coefficient (GC) and private credit by deposit money banks to GDP(GFDD). The functional form is as follows:

$$LE_t = f(DCPSGDP_t, INF_t, GOVTEXP_t, UEP_t, GFDD_t) \quad [1]$$

To achieve the objectives of the study, three steps will be performed to test for causality between macroeconomic variables and life expectancy. First, testing will be performed for unit root in macroeconomic variables to determine the order of integration. Second, the long run relationship between the variables in the equation will be tested using the cointegration technique, which allows for a one-unknown structural break. Finally, the variance decomposition and impulse response analysis is carried out to check the dynamic interactions and strength of causal relations.

4.2. Unit root tests with structural breaks

Zivot and Andrews (henceforth, ZA) (1992) unit root test is conducted in this paper to determine the order of integration. The main advantage of this test is that it deals with a structural break as endogenous. ZA uses three models to test a unit root, shift in the intercept, shift in the slope, and shift in both intercept and slope. The regression form can be written as:

$$y_t = \gamma_1 + \alpha y_{t-1} + \beta t + \theta DU_t + \mu DT_t + \sum_{j=1}^{k} \rho_i \Delta y_{t-1} + \epsilon_t \quad [2]$$

where Δ is the first difference operator, $DU_t$and DT_t are indicator dummy variables for a mean shift and a trend shift, respectively; $DU_t = 1$ and $DT_t = t - TB$ if $t > TB; 0$ otherwise. TB denotes the time at which the structural break occurs. The date of a structural break is determined according to the smallest t-statistics. $t = 1 \ldots . . T$ denotes an index of time, and ϵt is a white noise disturbance. The lag length is determined using the Akaike Information Criterion (AIC). Asymptotic distribution of the minimum t-statistic and critical values are provided by Zivot and Andrews (1992).

4.3. Cointegration analysis

The Gregory and Hansen (1996) cointegration tests (henceforth, GH) is an extension of the residual-based tests that take into account the possibility of a one-time unknown structural break in the intercept alone or in both intercept and coefficient vector. The null hypothesis

under these tests is that there is no cointegration with a structural break against the alternative that there is cointegration with a structural break. Gregory and Hansen indicate that, when the standard ADF test is used in the cointegration analysis without taking into account the one-time regime shift, it may lead to misleading conclusion that the long run relationship between the dependent variable and its determinants does not exists. They propose three models:

Level shift (C): $y_t = \gamma_1 + \gamma_2 DU_t + \gamma_3 x_t + \epsilon_t$ [3]
Level shift (C/T): $y_t = \gamma_1 + \gamma_2 DU_t + \beta t + \gamma_3 x_t + \epsilon_t$ [4]
Level shift (C/S): $y_t = \gamma_1 + \gamma_2 DU_t + \gamma_3 x_t + \gamma_4 x DU_t + \epsilon_t$ [5]

They also propose three test statistics, namely $ADF^* = inf_{t \in T} ADF(t)$ which is the modified version of the Engle and Granger (1987) cointegration test, and $Z_t^* = inf_{t \in T} Z_t(t)$ and $Z_a^* = inf_{t \in T} Z_a(t)$, which are both modified versions of Phillips and Ouliaris (1990). The breakpoint is the smallest value of these three test statistics. The modified Mackinnon (1991) critical values are used instead of the critical values which are used in the Engle and Granger method.

In addition, we adopt an innovation accounting by simulating variance decomposition analysis (VDA) and impulse response function (IRF) for further inferences. VDA and IRF serve as tools for evaluating the dynamic interactions and strength of causal relations among variables in the system. The VDC indicate the percentages of a variable's forecast error variance attributable to its own innovations and innovations in other variables. Thus, from the VDA, we can measure the relative importance of macroeconomic variables in accounting for fluctuation in life expectancy. Moreover, the IRF traces the directional responses of a variable to a one standard deviation shock of another variable. This means that we can observe the direction, magnitude and persistence of life expectancy to variation in the macro economic variables.

5. Empirical results

5.1. Unit root analysis results

Figure 5: Log values of Financial development variables and macro-economic factor

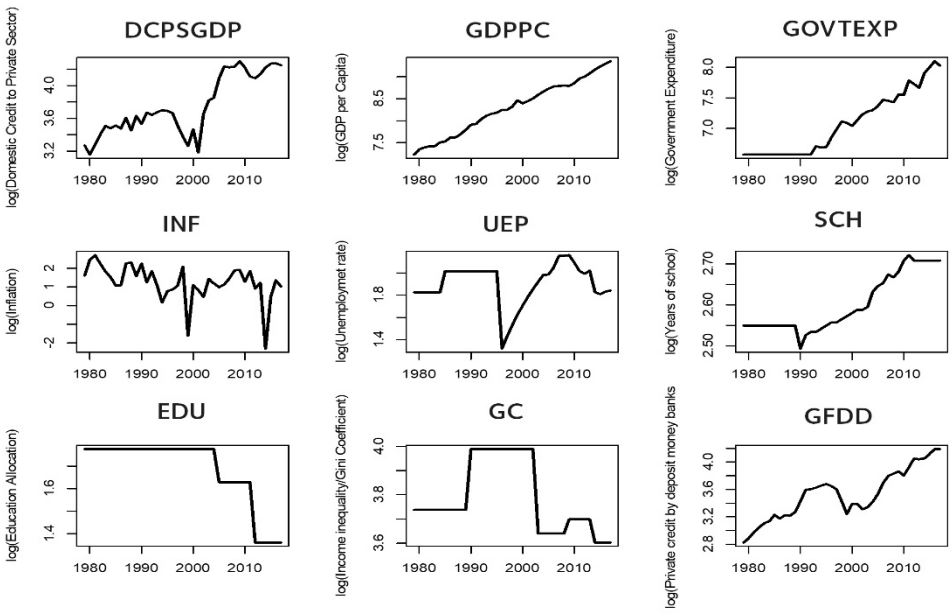


Figure 5 shows evidence of trend and structural breaks, especially for Domestic credit for private sector lending (DCPSGDP), inflation (INF), unemployment (UEP), years in school (SCH), education spending (EDU), Gini Coefficient (GC) and Private credit by deposit money banks to GDP(GFDD). Therefore, if we neglect the structural breaks in our analysis, then we may conclude that the series are not stationary or that the relationship between life expectancy and economic variables are unstable. The plot of the log-level series shows that DCPSGDP, GDPPC, GOVTEXP, INF, SCH and GFDD variables have a trend. Thus, the unit-root tests are run with constant and trend for these variables. The selection of the lag length is determined by applying the AIC. The results of the ADF and PP unit root tests are reported in Table 1. The results indicate that all variables except inflation has a unit root at levels. However, all variables are stationary in the first difference.

Table 1: Results of unit root tests without structural breaks

Variables	ADF		PP	
	Levels	First difference	Levels	First difference
LE	-2.01(1)	-5.28 (0)***	-1.61(3)	-50.2(3)***
DCPSGDP	-1.75(1)	-3.45 (0)*	-10.5(3)	-52.3(3)***
GDPPC	-2.36(1)	-4.77 (0)***	-14.6(3)	-40.9(3)***
GOVTEXP	-2.26(1)	-5.71 (0)***	-5.49(3)	-34.8(3)***
INF	-5.47(0)**	-6.61 (0)***	-36.1(3)***	-48.7(3)***
UEP	-0.178(1)	-6.01 (0)***	-10.6(3)	-37.0(3)***
SCH	-1.87(1)	-6.54 (0)***	-4.74(3)	-40.9(3)***
EDU	-1.37(1)	-6.00 (0)***	-4.08(3)	-36.5(3)***
GC	-0.348(1)	-6.00 (0)***	-5.49(3)	-37.0(3)***
GFDD	-2.1782(1)	-4.23(0)**	-7.25(3)	-24.2(3)***

*Note: *,**,*** denote significance at 10%,5% and 1% respectively. The number of lag order is shown in parentheses.*

Figure 5 shows that other than LE, GDPPC and GOVTEXP variables all the other study variables have a structural break. Therefore, the ZA unit root test is utilised. The lag length is chosen by AIC. The results of the ZA test is reported in Table 2. ZA test suggests that DCPSGDP, INF and GFDD series are I (1).

Table 2: ZA unit root test results

Variables	Levels	Break date	First difference	Break date
DCPSGDP	-1.026(2)	1997	-0.389(2)**	1998
INF	-0.041(2)	2013	-0.581(2)***	2010
UEP	-2.227(2)***	1995	-0.347(2)*	1994
SCH	-5.130(2)***	2001	-0.310(2)*	2000
EDU	0.361(2)***	2011	-0.410(2)**	2009
GC	0.500(2)***	2002	-0.139(2)	1999
GFDD	-1.318(2)	2009	-5.714(2)*	1996

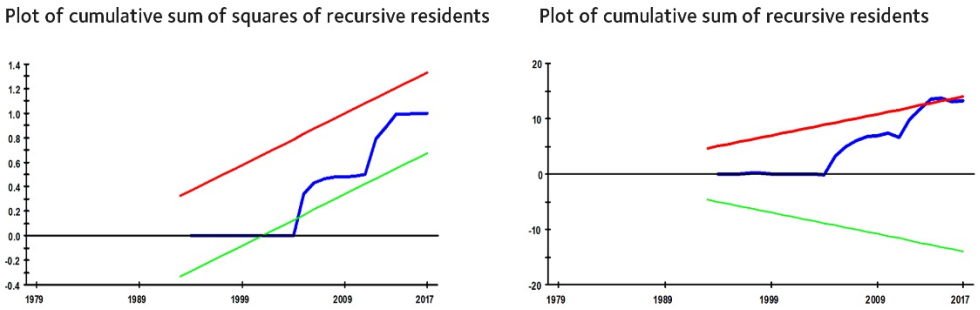
*Note: *,**,*** denote significance at 10%,5% and 1% respectively. The number of lag order is shown in parentheses.*

The ZA unit root test confirms the existence of structural breaks. The results of the ZA suggest that we should proceed in our analysis only with variables that are from order one, LE, GDPPC, GOVTEXP, INF, DCPSGDP, and GFDD. In order to account for the multicollinearity we check the variance inflation factor (VIF) of the selected variables and find that GDPPC has a VIF value >10. Consequently, we should drop GDPPC, UEP, SCH, EDU and GC from the cointegration analysis.

5.2. Cointegration analysis results

The long run relationship between the variables in equations will be tested using the cointegration technique, which allows for a one-unknown structural break. The results of the ZA test suggest that we should proceed in our analysis only with variables that are from order one and VIF<10, LE, GOVTEXP, INF, DCPSGDP and GFDD. In this section, the long run relationships between LE and selected macro-economic variables are investigated by using both stability and cointegration techniques. Before proceeding with the cointegration analysis, we test the stability of the model by the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests proposed by Brown et al. (1975). Figure 6 shows the plot of CUSUM and CUSUMSQ test statistics for the LE ~ *f*(GOVTEXP, INF, DCPSGDP and GFDD) model. The results of both tests indicate that the model is stable in the long run, since the test statistics fall inside the critical bounds of 5% significance.

Figure 6: CUSUM plots



The straight lines represent critical bounds at 5% significanct level

In the next step we investigated the long run relationships between LE and selected macro-economic variables using the cointegration technique, which takes into account a one-time unknown structural break. Perron (1988) indicated that ignoring the presence of potential structural breaks can lead to wrong results not only in the unit root tests but also in the

cointegration tests. In addition, Kunitomo (1996) pointed out that the traditional cointegration tests, which don't allow for structural breaks, may lead to spurious cointegration.

The Gregory and Hansen (1996) cointegration test carried out to test the cointegrating relationship of the variables. The null hypothesis under these tests is that there is no cointegration with a structural break against the alternative that there is cointegration with a structural break. They propose three models:

Level shift (C): $y_t = \gamma_1 + \gamma_2 DU_t + \gamma_3 x_t + \epsilon_t$ [1]
Level shift (C/T): $y_t = \gamma_1 + \gamma_2 DU_t + \beta t + \gamma_3 x_t + \epsilon_t$ [2]
Level shift (C/S): $y_t = \gamma_1 + \gamma_2 DU_t + \gamma_3 x_t + \gamma_4 x DU_t + \epsilon_t$ [3]

They also propose three test statistics, namely $ADF^* = inf_{t \in T} ADF(t)$ which is the modified version of the Engle and Granger (1987) cointegration test, and $Z_t^* = inf_{t \in T} Z_t(t)$ and $Z_a^* = inf_{t \in T} Z_a(t)$, which are both modified versions of Phillips and Ouliaris (1990). The breakpoint is the smallest value of these three test statistics. The modified Mackinnon (1991) critical values are used instead of the critical values which are used in the Engle and Granger method.

Table 3: Gregory and Hansen tests results

	Model	Break date	ADF	Break date	Z_t^*	Break date	Z_a^*
LE~ *f*(GOVTEXP,	C	1986	-4.44 (0)	1986	-4.49	1986	-24.83
INF, DCPSGDP,	C/T	1999	-6.17*(0)	1999	-6.24*	1999	-41.84
GFDD)	C/S	1983	0.846 (1)	1983	-3.369	1983	-20.310

*Note: *,**,*** denote significance at 10%,5% and 1% respectively. The number of lag order is shown in parentheses.*

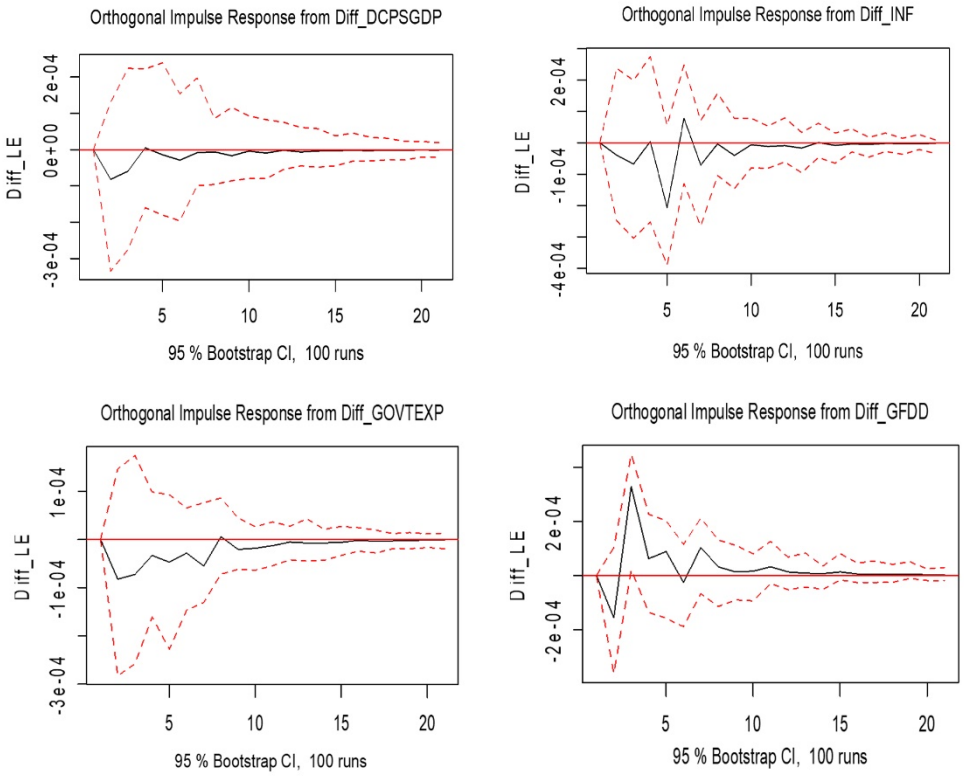
The results of the GH are reported in Table 3. The results indicate that the null hypothesis of no cointegration is rejected in favour of the existence of one cointegration with a one-time unknown structural break in the GH (C/T) model. The breakpoints are consistent across models. Even if it is possible to determine the exact date of a structural break, the full effect of this structural break would not occur instantly (Enders, 2010).

5.2 Variance decomposition and impulse response analysis

Table 4: Variance decompositions

Horizon	Percentage of forecast variance explained by innovations in:				
	LE	*DCPSGDP*	*INF*	*GOVTEXP*	*GFDD*
(a) Variance decomposition of LE					
1	1.000	0.000	0.000	0.000	0.000
3	0.860	0.009	0.005	0.010	0.115
5	0.829	0.008	0.038	0.012	0.113
10	0.815	0.009	0.046	0.015	0.116
15	0.814	0.009	0.046	0.015	0.117
20	0.814	0.009	0.046	0.015	0.117
(b) Variance decomposition of DCPSGDP					
1	0.046	0.954	0.000	0.000	0.000
3	0.042	0.687	0.195	0.023	0.053
5	0.042	0.633	0.229	0.026	0.071
10	0.050	0.619	0.225	0.028	0.078
15	0.051	0.617	0.225	0.028	0.079
20	0.051	0.617	0.225	0.028	0.079
c) Variance decomposition of INF					
1	0.004	0.002	0.994	0.000	0.000
3	0.004	0.029	0.885	0.020	0.062
5	0.008	0.030	0.847	0.034	0.081
10	0.009	0.030	0.840	0.037	0.084
15	0.009	0.030	0.839	0.037	0.085
20	0.009	0.030	0.839	0.037	0.085
(d) Variance decomposition of GOVTEXP					
1	0.067	0.035	0.015	0.884	0.000
3	0.079	0.070	0.054	0.571	0.225
5	0.077	0.070	0.101	0.529	0.223
10	0.077	0.068	0.117	0.509	0.229
15	0.078	0.068	0.117	0.508	0.229
20	0.078	0.068	0.117	0.508	0.229
(e) Variance decomposition of GFDD					
1	0.022	0.173	0.000	0.005	0.800
3	0.018	0.216	0.154	0.038	0.574
5	0.018	0.215	0.167	0.040	0.560
10	0.020	0.213	0.167	0.042	0.558
15	0.020	0.213	0.167	0.042	0.558
20	0.020	0.213	0.167	0.042	0.558

Figure 7: Impulse response functions



Next, variance decomposition and impulse response analysis is conducted to examine the short run and long run causality relations between life expectancy and macro-economic variables. The results of variance decomposition and impulse response functions (IRF) are displayed in Table 4 and Figure 7 respectively. From Figure 7, the IRF can produce the time path of dependent variables in the VAR, to shocks from all the explanatory variables (GDPPC, INF, EDU). It could be seen that, at any dependent variable, any shock of the explanatory variables makes the impulse responses die out to zero. This implies that the system of equation developed, to compute the variance decomposition analysis is a stable system.

6. Conclusion and policy implications

The purpose of this study is to examine the effect of financial development on life expectancy in Fiji. In order to implement this purpose, we used annual time series data for the period of 1980 to 2017. Our empirical findings from the Gregory and Hansen (1996) cointegration test reveal that there is a long-run equilibrium relationship among life expectancy, financial development, government expenditure, inflation, and private credit by deposit money banks to GDP. Further, the variance decomposition and impulse response analysis indicate that financial development causes life expectancy both in the short- and long-run.

The results of our study bear some important policy implications. The key findings reveal that financial development increases life expectancy significantly. Lower life expectancy discourages adult training and damages productivity. Countries with weak health and education conditions find it harder to achieve sustained growth. Indeed, economic evidence confirms that a 10% improvement in life expectancy at birth is associated with a rise in economic growth of some 0.3-0.4 percentage points a year. Moreover, poor health standards and emergence of deadly communicable diseases has become an obstacle for the development of sectors like the tourism industry, on which Fiji relies.

Policy choices cannot be taken lightly. Health financing, through out-of-pocket expenditures, is inequitable and can expose whole populations to huge cost burdens that block development and simply perpetuate the disease/poverty trap. On the other hand, health systems need financing and investment to improve their performance, yet this need cannot in turn impose an unfair burden on national spending or competitiveness. In this respect, Fiji government should consider financial sector as an instrument to improve public health. Financial policies are usually highly oriented towards the rich and elite but less friendly to the poor. A poor household generally needs high collateral as well as interest rates to get credit from Bank and, in most of the cases, they cannot access financial services due to the high cost against the loan. Therefore, we argue that policy makers should design financial policies that encourage and incentivise commercial banks and other financial institutions to improve access to finance for the poor. These can include subsidies to the financial institutions, credit guarantee schemes or subsidies to the borrowers as a contribution towards the collateral or deposit. Policies should also be geared towards improving financial literacy to ensure people get benefit from greater access to financial services. Our results also indicate inflation negatively affects life expectancy. In this connection, the Fijian government should continue the current practice of price control on basic food items and at the same time look at other initiatives such as reducing taxes and duties on basic food items. In addition, incentivising and promoting the agricultural sector will also assist in boosting domestic supply and help supress prices of local fresh produce.

While our study is one of the pioneer studies that investigates the relationship between financial development and life expectancy in Fiji, the reader should keep a few limitations in their mind. First, due to the lack of long time series data on other health indicators like infant mortality and child mortality, our study mainly focuses on life expectancy. Thus, future studies may investigate this issue by including child mortality and infant mortality once the data for these variables become available. Second, the findings of this study are derived from Fiji's context and therefore, the findings cannot be generalized for other countries. In this regard, future studies can conduct a comparable study among PIC's which may provide more robust findings.

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Notes

1 Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka.

2 Includes commercial banks and licensed credit institutions (LCIs).

3 The public NBFIs include state-owned enterprises engaged in financial intermediation but which are not depository corporations, for example the FNPF. However, due to its market share, the FNPF is analysed separately in this paper.The private NBFIs includes privately owned and controlled corporations engaged in financial intermediation but which are not depository corporations, for example life insurers, non-life insurers, unit trusts, finance companies, pawn brokers, insurance brokers, restricted foreign exchange dealers and money changers.

GRIFFITH ASIA INSTITUTE

Griffith University Nathan campus
Nathan Queensland 4111, Australia

Phone: +61 7 3735 3730
Email: gai@griffith.edu.au

griffith.edu.au/asia-institute

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