



# Does central government health expenditure and medical technology advancement determine economic growth rates in the Pacific island countries?

Suwastika Naidu and Anand Chand

*School of Management and Public Administration/*

*Faculty of Business and Economics, University of the South Pacific, Suva, Fiji*

## Abstract

**Purpose** – The main aim of this paper is to empirically test a model that has central government health expenditure and advancement in medical technology as two separate determinants of economic growth rates in the Pacific island countries (PICs).

**Design/methodology/approach** – The data used in this research have been collected from WHO and ADB database for the periods between 2000 and 2012. The model used to test the main research question is based on the variant Cobb-Douglas production function with constant returns to scale.

**Findings** – This research found that health expenditure has a significant impact on the economic growth rate of the PICs. This study also found that the contemporary level of usage of advanced medical technology in the PICs is relatively low as compared to the total population of the country. If the PICs need to achieve high levels of economic growth rates, governments of the PICs need to improve its expenditure in the health sector. Good and qualified doctors need to be hired and the medical education has to be made more competitive. Improvement in the health services in the PICs will reduce mortality, improve per capita health and improve the national economic welfare of Oceania region.

**Research limitations/implications** – Data availability was the major limitation in this research. Data were available for only seven PICs.

**Practical implications** – This research has implications for the academics, practitioners, and policy makers.

**Social implications** – The research findings from this research have implications for the society as it shows that health expenditure is positively related to economic growth rates.

**Originality/value** – In the context of the PICs, no studies have been conducted that have analysed the relationship between health expenditure, medical technology advancement and the economic growth rate of the PICs. This research seeks to build and extend the existing state of research on augmented Cobb-Douglas production function and health economics in the PICs.

**Keywords** Asia-Pacific, Public policy, Public sector management, Public sector organizations

**Paper type** Research paper

## 1. Introduction

In the recent decade, the government of the Pacific island countries (PICs) have made little progress towards achieving health outcomes outlined in the strategic development plan of each of the PICs. Some of the reasons for the inability of the government in the

---

The authors of this paper would like to thank the anonymous referees for their comments.



---

PICs to achieve health outcomes are global economic crisis, civil war in the Solomon Islands, decline in Fiji's sugar industry and other socio-economic and political factors (Australian Aid, 2012). Some of the important health service delivery challenges facing the PICs are dealing with infectious and non-communicable diseases, decline in the quality of child health, poor sanitation and malnutrition (Australian Aid, 2012). It is clearly evident that the government of the PICs need to increase its expenditure on health service delivery. In order to do this, well qualified doctors and nurses need to be hired, attitude of staffs in the hospitals need to be changed and out of country referrals have to be reduced (Australian Aid, 2012).

Against this backdrop, the main aim of this paper is to empirically test whether central government health expenditure and advancement in medical technology are two determinants of economic growth rates in the seven PICs; namely: Fiji, Tonga, Cook Islands, Samoa, Vanuatu, Kiribati, and Papua New Guinea. This paper is divided into four sections. Section 2 of this paper provides the overview of health sector in the PICs. Section 3 reviews the existing literature. Section 4 outlines and discusses the research methodology used in this paper. Section 5 discusses and evaluates the research findings and Section 6 discusses and evaluates the policy implications, limitations of this research and directions for future research.

This research needs to be conducted for two reasons. First, this research builds on and extends the existing state of research on the augmented Cobb-Douglas production function and health economics in the PICs. Second, the findings of this study are important for the policy makers, academics and practitioners.

## **2. Overview of the health sector in the PICs**

The PICs are a group of small island developing states located in the Pacific Ocean. Collectively, these small island developing states are called Oceania region (International Labour Organisation, 2001). There are three major divisions of islands within the PICs, namely; the Micronesia (Guam, Kiribati, Marshall Islands and Palau), the Polynesia (Samoa, Tonga, Tuvalu, Cook Islands, Niue and Tokelau) and the Melanesia (Fiji, PNG, Solomon Islands and New Caledonia). The PICs have limited financial resources to invest in infrastructure, social security, health services, education and transportation (International Labour Organisation, 2001).

Generally, the PICs have a weak health care system characterised by lack of funding, corruption, inefficiency in management, lack of skilled doctors and nurses and inadequate technologies to meet the increasing demand for its health services (World Health Organisation, 2013). Island states like Vanuatu are currently facing problems related to improving its health service coverage. Majority of Vanuatu's population are scattered over many small islands. As a result of this, many logistical problems have arisen in the delivery of health services. The government of Vanuatu is faced with high health service delivery operational expenditure and this has resulted in Vanuatu's population to be faced with disruptions in the health services. These disruptions in the health services have resulted in the deterioration of the quality of overall health care services in Vanuatu (World Health Organisation, 2013). Another similar case is of Kiribati, whereby population distributions over 33 atolls are causing logistical problems for the health service providers. The World Health Organisation has designed a draft health system strengthening strategy that emphasises on improving the seven main areas of health care service delivery in Kiribati, namely; information,

workforce, financing, leadership, governance, medical products and technologies (World Health Organisation, 2013). Table I shows the central government expenditure on health services in the seven PICs.

Table I show that the central government of the PICs, such as, Fiji, Samoa, Papua New Guinea and Vanuatu have invested more financial resources in the health sector service delivery as compared to the Cook Islands, Tonga and Kiribati. In the case of Fiji, the central government expenditure on health services have increased from FJ\$82 million in 2000 to FJ\$152 million in 2012. The central government expenditure for the Cook Islands increased from NZ\$6,195 thousand in 2000 to NZ\$13,866 thousand in 2012. For Samoa, the central government expenditure on health services increased from Tala 30 million in 2000 to Tala 67 million in 2012. The central government health expenditure for Tonga increased from Pa'anga 15,855 thousand in 2000 to Pa'anga 21,927 thousand in 2012. For other PICs such as Papua New Guinea (Kina 158 million in 2000 to Kina 199 million in 2012), Vanuatu (Vatu 904 million in 2000 to Vatu 976 million in 2012) and Kiribati (AUS\$ 8,830 thousand in 2000 to AUS\$ 14,792 thousand in 2012), the central government expenditure on health services has increased in the last ten years.

Table II shows the medical technology usage in hospital in the PICs.

Table II shows that in countries such as Kiribati and Vanuatu none of the females between the ages of 50 and 60 years are able to use mammograms. Hence, the females have to go for out of country referrals. In the case of Cook Islands, the total density per million females aged between 50 and 60 years using mammography is 200 followed by 98.99 for Samoa, 31.94 for Fiji, 25 for Tonga and 0.40 for Papua New Guinea. The total density/million population: computed tomography is 11 for Cook Islands followed by 5.46 for Samoa, 3.49 for Fiji and 2 for Tonga. Other advanced medical technology services such as magnetic resonance imaging is only available to Fiji and the Cook Islands. Gamma camera or medicine, linear accelerator and positron emission

No.	Year	Seven PICs						
		Fiji (FJ\$ <sup>a</sup> )	Cook Islands (NZ\$ <sup>b</sup> )	Samoa (Tala <sup>a</sup> )	Tonga (Pa'anga) <sup>b</sup>	Papua New Guinea (Kina) <sup>a</sup>	Vanuatu (Vatu) <sup>a</sup>	Kiribati (AUS\$) <sup>b</sup>
1	2000	82	6,195	30	15,855	158	904	8,830
2	2001	90	9,832	29	11,500e	174	908	10,360
3	2002	100	8,237	34	12,800e	174	926	11,392
4	2003	108	9,516	37	10,251	169e	925	13,160
5	2004	111	9,430	38	13,378	172e	790	13,754
6	2005	114	11,414	40	36,230	181e	810	13,147
7	2006	114	10,865	47	15,855	185e	923	13,009
8	2007	119	11,542	50	21,821e	192e	1,052	14,561
9	2008	112	11,963	58	24,635e	190e	928e	17,637
10	2009	121	14,848	71	20,770e	193e	978e	14,613
11	2010	114	13,360	64	22,408e	195e	986e	14,259
12	2011	140e	13,390e	67	22,604e	198e	964e	15,503e
13	2012	152	13,866e	67e	21,927e	199e	976e	14,792e

**Table I.**

Central government expenditure on health services in the seven PICs

**Notes:** <sup>a</sup>Millions of dollars; <sup>b</sup>Is thousands of dollars; e is the estimates by the authors of this paper for those years for which the data is missing

**Source:** Asian Development Bank (2013) database and PricewaterhouseCoopers (2012)

No.	Medical technology	Seven PICs							Tonga
		Fiji	Kiribati	Papua New Guinea	Samoa	Vanuatu	Cook Islands		
1	Total density/million females aged between 50 and 69 years using mammography	31.94	0	0.40	98.99	0	200e	25e	
2	Total density/million population: computed tomography	3.49	0	0.44	5.46	0	11e	2e	
3	Total density/million population: gamma camera or medicine	0	0	0	0	0	0e	0	
4	Total density/million population: linear accelerator	0	0	0	0	0	0e	0	
5	Total density/million population: magnetic resonance imaging	1.16	0	0	0	0	4e	0	
6	Total density/million population: positron emission tomography	0	0	0	0	0	0e	0	
7	Total density/million population: radiotherapy	0	0	1.15	0	0	0e	0	
8	Total density/million population: telecobalt unit	0	0	1.15	0	0	0e	0	

**Note:** e is the estimates by the authors of this paper for those years for which the data is missing  
**Source:** The World Health Organisation (2013) database

**Table II.**  
Medical technology  
usage in hospital in  
the PICs for year 2010

tomography are not available in the PICs. Radiotherapy and telecobalt unit is only available in Papua New Guinea while it is not available to other PICs.

### 3. Literature review

Globally many studies have been conducted on various health issues faced globally. There are four issues that have been the focus of many studies; namely, the nexus between per capita income, health and gross domestic product (Slade and Anderson, 2001), evaluation of the health technologies (Oliver, 2003), the impact of the changes in the private health care expenditure on the households (Hopkins and Cumming, 2001) and health insurance reforms (Hussey and Anderson, 2003). To date, none of the studies have been conducted that have used central government expenditure on health services and advancement in health technology as predictor variables of economic growth rates in the PICs. In the context of the PICs, very few studies have been written on health sector service delivery. The following paragraphs will review those studies that are related to this study. The studies selected for literature review have been based on two criteria. First, studies that were directly relevant to the topic of central government health expenditure, advancement in medical technology and economic growth rates have been selected. Second, studies that were recent and published in international ranked referred journals were also selected for the reviews.

To begin with, Bhargava *et al.* (2001) modelled the effects of population health rate on economic growth and found that adult survival rates positively affect economic growth rates of the developing countries. Slade and Anderson (2001) study titled “The relationship between per capita income and diffusion of medical technologies” analysed the diffusion in the medical technologies of the Organisation for Economic Cooperation and Development (OECD) countries from 1975 to 1995 and concluded that rich countries are the early adopters of technology while the dependence of technology on income declines over a period of time. Building onto this study, Asfaw and Braun (2004) used the household level data to investigate how the community health insurance schemes help the poor households in Ethiopia. This study concluded that the health insurance scheme is a measure to protect the health sector from economic reforms and shocks. In this study, the authors used the double-bounded dichotomous choice contingent valuation method. Tountas *et al.* (2005) study titled “The unexpected growth of the private sector in Greece” emphasised that the unexpected rapid growth of the insurance sector of Greece can be attributed to the improvement in the standard of living in Greece and the growth of the private sector health insurance schemes. Hopkins (2006) examined the economic stability and the health status of the East Asian economies such Indonesia, Malaysia and Thailand. This study underlined that the Indonesian and the Thai Government have followed the World Bank’s advice to reduce health expenditure. As a result of this, there was increase in the mortality rates in Indonesia and Thailand. However, this increase in the mortality rates was short lived. The main lessons learnt from this study were the importance of the developing countries governments to provide safety nets in order to adjust the central government health expenditure to reduce the impacts of economic shocks on the health sector.

Hartwig (2008) used the Baumol’s theory to find out what drives the health expenditure in the 19 OECD countries. This research found that health care expenditure by individual households in the OECD countries is driven by wage increase in excess of productivity growth. Building onto this study, Pammolli *et al.* (2012)

study titled “The sustainability of the European health care system: beyond income and ageing” examined the determinants of the health care system in Europe. This study found that high income levels in the European countries lead to high health care expenditure.

In the context of the PICs, no studies have been conducted that has analysed the relationship between central government health expenditure, medical technology advancement and the economic growth rate. This research seeks to build and extend the existing state of research on the relationship between central government health expenditure, medical technology advancement and the economic growth rate in the PICs.

#### 4. Research methodology

The main aim of this paper is to empirically test whether central government health expenditure and advancement in medical technology are two determinants of economic growth rates in the PICs. The best model identified by the authors of this paper to test this relationship is the augmented Cobb-Douglas production function. The augmented Cobb-Douglas production function was developed by Charles Cobb and Paul Douglas. Initially, this model was applied to the US context to examine the contributions of capital, labour and technology to the total output that is produced in an economy (Auerbach and Kotlikoff, 1998). Later on authors such as Hopkins and Cumming (2001) and Oliver (2003) started applying the augmented Cobb-Douglas production function in other economies such as New Zealand and Japan.

There are two reasons for using the augmented Cobb-Douglas production function in this paper. First, the Cobb-Douglas production function can simultaneously handle multiple predictor variables in the generalised form (Murthy, 2002). Second, the Cobb-Douglas production function is able to effectively address the issues of multicollinearity and heteroscedasticity in panel data (Murthy, 2002). The data used in this research has been collected from two major sources for the periods between 2000 and 2012. First, the Asian Development Bank database was used to collect data on central government expenditure on health services in the seven PICs and economic growth of the seven PICs. Second, the World Health Organisations database was used to collect data on medical technology usage in hospitals in the PICs.

The model used to test the main research question is based on the variant Cobb-Douglas production function with constant returns to scale. The derivation of the model for this research is as follows (Wong *et al.*, 2005):

$$Y = A^0 K^\alpha L^\beta \quad (1)$$

whereby:

- Y is the output.
- $A^0$  is the disembodied factor productivity.
- K is the stock of physical capital.
- L is the labour employed.
- B and  $\alpha$  is the elasticities of labour and capital.

Dividing both the sides with L and multiplying the right hand side by  $(L^\alpha/L^\alpha)$ :

$$\frac{Y}{L} = A^0 \left(\frac{K}{L}\right)^\alpha L^{\alpha+\beta-1}$$

Assuming that our model has constant returns to scale,  $\alpha + \beta = 1$  the equation is further modified as follows:

$$\frac{Y}{L} = A^0 \left(\frac{K}{L}\right)^\alpha$$

The next step is to take the natural logs of both the sides of the equation, hence we get:

$$\ln\left(\frac{Y}{L}\right) = \ln A^0 + \alpha \ln\left(\frac{K}{L}\right)$$

Taking the first difference of the equation, we get:

$$\Delta \ln\left(\frac{Y}{L}\right) = \Delta \ln A^0 + \alpha \left[ \ln\left(\frac{K}{L}\right) \right] \quad (2)$$

Our model assumes that economic growth is a disembodied factor productivity that is explained by stock of physical capital, measured by central government expenditure in providing the stock of physical capital to be used in providing the health services and medical technology advancement, hence; our equation is as follows:

$$\Delta \ln A^0 = B^0 + \varnothing \text{HEXP} + \gamma \text{TECHADV} \quad (3)$$

where:

$B^0$  is constant.

HEXP is the health expenditure by the central government.

TECHADV is medical technology advancement.

The next step is to substitute equation (3) into equation (2), hence; we get:

$$\Delta \ln\left(\frac{Y}{L}\right) = B^0 + \varnothing \text{HEXP} + \gamma \text{TECHADV} + \alpha \left[ \ln\left(\frac{K}{L}\right) \right]$$

In order to control for the convergence effect of poor nations in the PICs having faster growth rates, the base year value of  $(Y/L)$  was also included in the equation.

#### 4.1 Measurement of variables

*Central government expenditure on health services.* The central government expenditure on health services was measured as the percentage of gross domestic product. The central government expenditure on health services is used by the health sector to purchase capital equipment and to fund the general expenditure of the health sector in the seven PICs. The central government expenditure on health services was averaged for the period of 12 years (from 2000 to 2012).

*Advancement in medical technology.* Advancement in medical technology was measured as percentage of the total population in the seven PICs. Data for eight different medical technologies was extracted from the World Health Organisation database and the average of data for eight different medical technologies was taken to be used in the analysis.

*Log of base year gross domestic product per worker.* Log of base year gross domestic product per worker was calculated for 12 years (from 2000 to 2012) and the average was taken to be used in the analysis.

*Growth in capital investment per worker.* Capital investment per worker was extracted from the Asian Development Bank database and the growth in capital investment per worker was calculated for the 12 years (from 2000 to 2012). The average of the growth rate in capital investment for 12 years was taken in the analysis.

*Economic growth rate.* Economic growth rate was extracted from the World Bank database for 12 years (from 2000 to 2012) and the average of the 12 years data was taken to be used in the analysis.

### 5. Research findings and discussions

Linear least square regression model was used for testing the model derived in Section 4. Tables III and IV show the mean, standard deviation, standard error mean and Pearson's correlation coefficient of the variables.

Table III shows that the mean of economic growth rates is 0.038571, advancement in health technology is 0.002007, central government health expenditure is 0.051429, log of

Variables	Mean	SD	SE mean
Economic growth rates	0.038571	0.0267261	0.0101015
Advancement in health technology	0.002007	0.0036013	0.0013612
Central government expenditure on health services	0.051429	0.0211570	0.0079966
Log of base year gross domestic product per worker	3.620000	0.7581776	0.2865642
Growth of capital investment per worker	16.285714	6.5743006	2.4848521

**Table III.**  
Mean, standard deviation and SE mean of the variables

**Source:** Created by Authors (2013)

		ERG	TEC	HLTH	LG/W	(GCI/W)
Economic growth rates	Pearson correlation	1				
	Sig. (one-tailed)					
Advancement in health technology	Pearson correlation	0.451				
	Sig. (one-tailed)	0.155				
Central government expenditure on health services	Pearson correlation	0.055	0.134			
	Sig. (one-tailed)	0.454	0.387			
Log of base year gross domestic product per worker	Pearson correlation	-0.667	0.689*	0.340		
	Sig. (one-tailed)	0.051	0.044	0.228		
Growth of capital investment per worker	Pearson correlation	0.365	0.379	0.195	-0.552	1
	Sig. (one-tailed)	0.210	0.201	0.337	0.099	1

**Note:** Correlation is significant at: \*0.05 level (one-tailed)

**Source:** Created by Authors (2013)

**Table IV.**  
Pearson's correlations coefficient

base year gross domestic product per worker is 3.62, and growth of capital investment per worker is 16.285714. Table IV shows that advancement in health technology and central government health expenditure are positively correlated to economic growth rates. Log of base year gross domestic product per worker is negatively correlated to economic growth rate while growth in capital investment per worker is positively correlated to economic growth rate. Table V shows one sample *t*-test of the five variables that are tested in this paper. These five variables are mean of economic growth rates, advancement in health technology, central government health expenditure, log of base year gross domestic product per worker and growth of capital investment per worker.

Table V shows that variables such as economic growth rates, advancement in health technology, central government expenditure on health services and log of base year gross domestic product per worker and growth in capital investment per worker are all significant variables in the model. The test results show that economic growth rates has a *t*-value of 3.818, advancement in health technology has a *t*-value of 4.474, central government expenditure on health services has a *t*-value of 6.431, log of base year gross domestic product per worker has *t*-value of 12.632 and growth of capital investment per worker is 6.554. Table VI shows the results of the linear least square regression model.

Table VI shows that in the context of the seven PICs, central government expenditure on health services plays a key role in economic growth rates. Based on the results, central expenditure on health services ( $p < 0.05$ ) has a significant impact on economic growth rates. Medical technology in the PICs has not been widely used because the PICs lack skills and the expertise to use these technologies. This is the main reason that the use of advanced medical technologies does not have a major impact on economic growth rates of the PICs. However, Table IV shows that the more medical technologies that the PICs use, the higher will be the economic growth rates.

## 6. Conclusions and policy implications

This research found that central government health expenditure has a significant impact on economic growth rate of the PICs. This study also found that the level of usage of advanced medical technology in the PICs is relatively low as compared to the total population of the country. Economic growth rates has a *t*-value of 3.818, advancement in

Variables	<i>t</i>	df	Sig. (two-tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Economic growth rates	3.818	6	0.009*	0.0385714	0.013854	0.063289
Advancement in health technology	4.474	6	0.041**	0.0020066	-0.001324	0.005337
Central government expenditure on health services	6.431	6	0.001*	0.0514286	0.031862	0.070996
Log of base year gross domestic product per workers	12.632	6	0.000*	3.6200000	2.918803	4.321197
Growth of capital investment per worker	6.554	6	0.001*	16.2857143	10.205500	22.365928

**Table V.**  
One sample *t*-test  
of the variables

**Note:** Significant at: \* $p < 0.01$  and \*\* $p < 0.05$   
**Source:** Created by the Authors (2013)

Model	Unstandardized coefficients		Standardized coefficients	<i>t</i>	Sig.
	B	SE	$\beta$		
Constant	0.171	0.139		1.233	0.343
Economic growth rates	2.375	6.371	0.320	0.373	0.745
Advancement in health technology	0.054	0.15	0.233	0.371	0.026 **
Central government expenditure on health services	0.041	0.040	0.169	0.029	0.015 **
Log of base year gross domestic product per workers	0.021	0.003	0.244	0.339	0.006 *
Adjusted $R^2$	0.957				
$\Delta F$	11.186				

**Table VI.**  
Results of the linear least square regression model

**Notes:** Significant at: \* $p < 0.01$  and \*\* $p < 0.05$ ; dependent variable: economic growth rates

health technology has a *t*-value of 4.474, central government expenditure on health services has *t*-value of 6.431, log of base year gross domestic product per workers has *t*-value of 12.632 and growth of capital investment per worker is 6.554.

The findings of this research have implications for the policy makers. First, the logistical issues faced in Kiribati, Vanuatu and other PICs can be reduced in delivering the health services by using an e-health/telemedicine system (World Health Organisation, 2013). This system has been used in the case of the Solomon Islands and was proved to be helpful in reducing the logistic problems and the need for out of country referrals for the patients. Second, governments of the seven PICs need to increase its expenditure on the health sector. Every year, the central government health expenditure that is allocated in the budget of the PICs is relatively low as compared to the large amount of improvement work that is needed in the health sector. Some of the priority areas that the government of the seven PICs can focus on are efficiency of health service delivery, training and development of health staffs, reducing out of country referrals and introducing the use of advanced technology in the health sector of the seven PICs (World Health Organisation, 2013).

Third, capacity building of the medical professionals in order to improve the health care service delivery. Doctors and nurses can be sent to overseas universities for education purposes so that doctors and nurses are well trained to handle different kinds of health related issues. The quality of medical education provided at the Fiji School of Medicine and the Fiji School of Nursing needs to be improved. Lack of capital expenditure on the medical education sector is one of the primary reasons that PICs are producing poor quality of doctors and nurses. Fourth, medical data collection is poor in the PICs. Epidemiologists need these kinds of data for empirical analysis of medical issues. Having correct data and at the right place and at the right time is important to identify outbreaks of certain diseases, and strengthen government decision making on certain health related issues. Fifth, government should provide subsidies on pharmaceutical products so that low income households are able to afford these products. Currently, the pharmaceutical products available in the pharmacies are of poor quality because pharmacies usually prefer to import cheap medicines. Pharmaceutical products that are cheap rather than quality focused are not as highly effective as quality focused pharmaceutical products.

The limitation of this research is that data from only seven PICs are used this research. Other PICs countries, such as Palau, Tuvalu, Niue and Tokelau could have been included

in this study but there was insufficient data available in the World Health Organisation and Asian Development Bank database. Another limitation of this research is that this study was limited only to the augmented Cobb-Douglas production function.

Based on the limitation of this research that is identified above, the authors of this paper propose that future researchers should also include data from other PICs, such as Palau, Tuvalu, Niue and Tokelau in the analysis. Future research can also use the causality test to test the relationship between central government health expenditure, advancement in medical technology and economic growth rates.

### References

- Asfaw, A. and Braun, J. (2004), "Can community health insurance schemes shield the poor against the downside health effects of economic reforms: the case of rural Ethiopia", *Health Policy*, Vol. 70 No. 1, pp. 97-108.
- Auerbach, A.J. and Kotlikoff, L.J. (1998), *Macroeconomics: An Integrated Approach*, 2nd ed., MIT Press, Cambridge, MA.
- Australian Aid (2012), *Achieving Education and Health Outcomes in the PICs: Is There a Role for Social Transfers*, Australian Aid, Canberra.
- Bhargava, A., Jamison, D.T., Lau, L.J. and Murray, C.J.L. (2001), "Modelling the effects of health on economic growth", *Journal of Health Economics*, Vol. 20 No. 3, pp. 423-440.
- Hartwig, J. (2008), "What drives health care expenditure? Baumol's model of unbalanced growth revisited", *Journal of Health Economics*, Vol. 27 No. 3, pp. 603-623.
- Hopkins, S. (2006), "Economic stability and health status: evidence from East Asia before and after the 1990s economic crisis", *Health Policy*, Vol. 75 No. 3, pp. 347-357.
- Hopkins, S. and Cumming, J. (2001), "The impact of changes in private health expenditure on New Zealand households", *Health Policy*, Vol. 58 No. 3, pp. 215-229.
- Hussey, P. and Anderson, G.F. (2003), "A comparison of single and multi-payer health insurance systems and options for reform", *Health Policy*, Vol. 66 No. 3, pp. 215-228.
- International Labour Organisation (2001), "Overview of the PICs", paper presented at 13th Asian Regional Meeting, Bangkok, Thailand.
- Murthy, K.V.B. (2002), "Arguing a case for Cobb-Douglas production function", *Review of Commerce Studies*, Vol. 20 No. 1, pp. 75-91.
- Oliver, A. (2003), "Health economic evaluation in Japan: a case study of one aspect of health technology assessment", *Health Policy*, Vol. 63 No. 2, pp. 197-204.
- Pammolli, F., Riccaboni, M. and Magazzini, L. (2012), "The sustainability of the European health care systems: beyond income and aging", *The European Journal of Health Economics*, Vol. 13 No. 5, pp. 623-634.
- PricewaterhouseCoopers (2012), *Fiji National Budget Commentary*, PricewaterhouseCoopers, Suva.
- Slade, E.P. and Anderson, G.F. (2001), "The relationship between per capita income and diffusion of health technologies", *Health Policy*, Vol. 58 No. 1, pp. 1-14.
- Tountas, Y., Karnaki, P., Pavi, E. and Sauliotis, K. (2005), "The unexpected growth of the private sector in Greece", *Health Policy*, Vol. 74 No. 2, pp. 167-180.
- Wong, P.K., Ho, Y.P. and Autio, E. (2005), "Entrepreneurship, innovation and economic growth: evidence from GEM data", *Small Business Economics*, Vol. 24, pp. 335-350.
- World Health Organisation (2013), *World Health Statistics 2013*, World Health Organisation, Manila.

**About the authors**

Suwastika Naidu is currently a PhD scholar at the University of the South Pacific. She has written a number of research articles in international referred journals and has also presented a number of papers in academic conferences. Suwastika Naidu is the corresponding author and can be contacted at: [naidu\\_s@usp.ac.fj](mailto:naidu_s@usp.ac.fj)

Dr Anand Chand is currently an Associate Professor at the University of the South Pacific. He has a BA from the University of Tasmania, Australia, Post-Graduate Diploma in HRM and Industrial Relations from the University of the South Pacific, Post-Graduate Diploma in Business Studies from the University of Canterbury, New Zealand, MA in Sociology/HRM from the University of the South Pacific, MA in Social Science Research Methods from the University of Manchester, UK and PhD from the University of Cardiff, UK. He has been teaching and researching at the University of the South Pacific for the last 23 years and also while in the UK, he taught at the University of Cardiff, UK for six months. He has written a number of research articles in international referred journals and has also presented a number of papers in academic conferences.