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Article

Macroeconomic Factors Affecting Out-of-Pocket Payments for Health: Evidence from Panel Data Analysis of SAARC Countries

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Abstract: This paper explores factors affecting Out-of-Pocket payments for healthcare expenditures in SAARC countries. The specific objectives of the paper were to compare healthcare expenditure patterns amongst the SAARC countries and explore the macroeconomic, demographic and social factors influencing OOP payments for healthcare these countries. The model selection tests suggest that the fixed effect model is the most appropriate for the data, though the random effect model also provides valuable insights. Fixed effect model result showed that a 1 per cent change in GDP per capita, consumer price index, population aged 65 years and above causes change in out-of-pocket payments for healthcare by 1.08 per cent ($p < 0.01$), 0.09 per cent ($p < 0.05$), 1.20 per cent ($p < 0.01$), 0.64 per cent ($p < 0.01$) respectively. Whereas, the random effect model result showed that a 1 per cent change in GDP per capita, remittance inflow per capita, consumer price index, population aged 65 years and above, mean years schooling and domestic general government expenditure causes change in out-of-pocket payments for healthcare by 1.47 per cent ($p < 0.01$), 0.72 per cent ($p < 0.01$), 0.06 per cent ($p < 0.05$), 0.18 per cent ($p < 0.05$), 0.64 per cent ($p < 0.01$) respectively. The fixed effect model explains over 98 per cent of the variation in OOP payments, while the random effect model accounts for over 87 per cent. The analysis concludes that macroeconomic factors such as GDP per capita, consumer price index (CPI), and the percentage of the population aged 65 and above significantly influence OOP healthcare payments in SAARC countries. However, the impact of remittance inflows and mean years of schooling on OOP payments remains inconclusive.

Keywords: macroeconomic factors; health expenditure; out-of-pocket payments; panel data analysis

Introduction

Background of the Study

Healthcare expenditure analysis is crucial for understanding the broader economic impact of healthcare expenditure on economic growth, employment generation, and overall economic stability, making it an important consideration for policymakers (Radmehr & Adebayo, 2022; Yang & Usman 2021; Welfens, 2020). The better understanding of intricate relationship between healthcare expenditure and its various economic and social determinants is essential for resource optimization to ensure better health outcome (Mbau et al., 2023; White-Williams et al., 2020). The population health outcome improvement has become the significant priority of the government in contemporary world to enhance ability, efficiency and quality of life of workforce (Wu et al., 2021; WHO, 2016). Healthcare financing strategy is a crucial component to determine the accessibility and quality of healthcare services for citizens within a society or a nation (Guida & Carpentieri, 2021; Tzenia, 2019). Essentially, provision of optimal resource allocation to public healthcare sector with its efficient utilization is a sufficient condition for preparing healthy population and getting better health outcome (WHO, 2019). But, out-of-pocket (OOP) payments for health found to be the major healthcare financing source in low-income countries, even the larger than the government expenditure (Asante et al., 2016).

The increasing trend of OOP payment for health is creating financial hardship by forcing common people to choose between health expenses and other necessities (Rahaman et al., 2022; Sriram & Khan, 2020) and this is a serious cause of welfare loss of common people (O'Donnell, 2019). The OOP payments for health includes all health care expenditure incurred by households or individuals in the form of direct payments to healthcare providers, but these expenditures are not reimbursed by any public or private health insurance scheme (Paris et al., 2010; Mossialos and Thomson, 2002). The OOP payments for healthcare can create a financial hardship to people to access healthcare services thereby increasing incidence of poverty (Diaz-Castro et al., 2021). Therefore, OOP payments for healthcare is regarded as an inherently regressive source of financing, meaning that poor households face a higher relative burden of OOP payments as compared to higher income households (Eza et al., 2022; Wang et al., 2020; Thomson et al., 2019; Lorenzoni et al., 2019).

Likewise, several studies have asserted OOP payment for healthcare as catastrophic when it surpasses a certain threshold of a household's consumption or income (Aregbeshola & Khan, 2021; Imlak & Shabda, 2016; Damme et al., 2004). Eventually, households can be impoverished or further pushed into poverty due to OOP payments for healthcare (Wagstaff et al., 2018). Therefore, inadequacy of public healthcare delivery service compels people to bear overall healthcare cost from their own income and cause serious financial hardship for low-income households (Sirag & Mohamed, 2021; García-Díaz et al., 2018). Many developing countries lack resources for equal healthcare access, leading to financial hardship due to out-of-pocket health expenses, as a growing portion of the world's population spends significant amounts on medical care which has been regarded as a threat to universal health coverage (Sirag & Mohamed, 2021).

Hence, increasing trend of OOP payment for healthcare remains a serious welfare problem worldwide (Al-Manawi, 2021). Obviously, the SAARC region is not free from this serious issue. The specific objectives of the paper are to compare healthcare expenditure patterns amongst the SAARC countries and explore the macroeconomic, demographic and social factors influencing OOP payments for healthcare these countries.

Chaudhuri and Roy (2008) study indicated that payments increased with increasing ability to pay (ATP), but the consequent financial burden (payment share) decreased with increasing ATP, indicating a regressive system during the study periods. However, share of payments increased with ATP, indicating a progressive system. When comparing across years, they found horizontal inequities in all the years that worsened between 1992 and 1998 but improved by 2002. In contrast, the poor either incurred higher OOP payments for healthcare or were discouraged from seeking treatments until their illness became more serious.

Habib et al. (2016) investigated the relationship between health care expenditure (HCE) and economic growth and to the causality between HCE and economic growth in the selected SAARC countries. They employed the Panel cointegration and panel causality analysis over the period 1995–2012. The study used variables like per capita income, labor force, literacy rate, and elderly population as indicators of human and physical capital. Panel unit root and cointegration tests are used to examine long-term and short-term relationships. The study reveals that income elasticity of health care expenditure (HCE) is less than unity in both long and short run, with unidirectional causality from per capita GDP to HCE in South Asian countries.

Subedi(2016) found the significant contribution of remittance inflow on household healthcare provision and healthcare wellbeing in Nepal. Imlak et al. (2017) examined healthcare expenditures in seven South Asian countries, focusing on out-of-pocket spending. It identifies the Maldives as having the highest per capita health expenditure, while India has the highest out-of-pocket expenditure. The study uses a panel data pooled OLS model to examine factors affecting out-of-pocket expenditure, emphasizing final household expenditures as a determinant. This contributes to understanding healthcare financing in developing economies and informs policy decisions.

Grigorakis et al. (2018) study concluded that GDP growth and governmental debt as a share of GDP in OECD and European countries do not have a statistically significant impact on OOP spending. Their study found a positive influence of unemployment rate on OOP payments for healthcare. Likewise, government expenditure as a share of GDP presents different influences in

static and dynamic models. Governmental and PHI financing indicate a significant negative effect on OOP expenditures.

Sriram (2019) examined the impact of Public Health Insurance Programs on hospitalizations and inpatient OOP health expenditures. He asserted that OOP payment for healthcare account for 62.6 percent of total health expenditure, with 12.4 percent of the population below the poverty line. Berloff and Giunti (2019) examined impact of household's remittance receipt on household healthcare expenditure. The study found the impact of remittances on health capital investments of households left behind, with particular attention to healthcare expenditure.

Kanmiki et al. (2019) found the evidence that national health insurance program is significantly contributing to a reduction in out-of-pocket payment for primary healthcare in public health facilities of Ghana. Ebaidalla and Ali (2021) investigated factors influencing out-of-pocket health expenditure in Sub-Saharan Africa (SSA) and found economic factors like per capita income, trade openness, and inflation significantly impact OOP health expenditure.

There have been conducted the studies around the world focusing in this issues. But, the majority of the empirical literatures have investigated the potential drivers of OOP payments for health based in microeconomic approach (Fan and Savedoff, 2012; Meng et al., 2011; Clemente et al., 2004; Musgrove et al., 2002). In other words, there are found two categories of literature relating to factors associated with OOP payments for health. firstly, most of the previous literatures are based on the microeconomic approach of analysis meaning that the studies have focused on the household healthcare expenditure data. Secondly, macroeconomic analysis of the individual country to explore the determinants of OOP payments for health based the time series data. Although, the second types of literature are limited. But, the panel data analysis based on multiple countries are scares and the study of SAARC on the same issue is lacking. This paper employed macroeconomic approach to investigate potential macroeconomic determinants of Out-of-Pocket (OOP) payment for healthcare in SAARC countries using panel data analysis. Therefore, it contributes to existing literature by expanding understanding of macroeconomic parameters and governmental expenditures' impact on OOP spending and filling the gap in responsiveness to PHI funding.

Data and Methodology

Research Design

This paper used panel data analysis technique because of the utilization of time series data combined with the cross section observations of the entities. Panel data analysis is an econometric method analyze the data that involves observations on multiple entities (individuals, firms, countries) over multiple time periods (Hsiao, 2022; Bliese et al., 2020). Since, the panel data regression technique combines time series of cross-section observations and gives more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency (Gujarati, 2021). Therefore, the rationale for using panel data analysis lies in its ability to capture both cross-sectional and temporal variations, providing several advantages over purely cross-sectional or time-series analyses (Epskamp, 2020).

Specification of the Model

Panel data allow for the efficient use of available information by combining cross-sectional and time-series dimensions (Beck, 2001). Likewise, this often leads to a larger sample size, increasing the precision of estimates which is equally important to control for the individual heterogeneity, autocorrelation, heteroscedasticity and addressing endogeneity (Antonakis et al., 2021). The panel data can be micro-panel or macro-panel according to the time they cover. Based on the Baltagi (2013) proposition, this is a micro-panel data analysis as it covers 16 times periods. Since, Baltagi (2013) stated that panels up to 20 periods should be considered micro panel, and panels with more than 20 periods should be macro-panel. Final remark on the choice of the model is that the panel data technique can better detect and measure effects that simply cannot be observed in other techniques

such as pure cross-section or pure time series model (Gurarati, 2021). Therefore, the present study adopts the empirical model as follows:

$$y_{it} = \alpha + X_{it} \beta + \mu_i + \varepsilon_{it}; i = 1, 2, \dots, N; t = 1, 2, \dots, T$$

In equation (1), y_{it} represents the vector of dependent variable OOP payments for healthcare for country i at time t . The symbol α denotes fixed intercept and X represents the vector of the exogenous variables of the model. The vector of the coefficients of explanatory variables is denoted by β and ε_{it} is the vector of random error. The random effects term is given by μ_i (where μ_i and ε_{it} are independent). This paper follows a simple model of panel data estimation as suggested by Hsiao (2014) and Elhorst (2003). In the present study, the specific form of the equation derived from the generic form Equation (1) is given in Equation (2) as follows:

$$OOPC_{it} = \alpha + \beta_1 GDPC_{it} + \beta_2 RMp_{cit} + \beta_3 DGHE_{it} + \beta_4 CPI_{it} + \beta_5 Pop65_{it} + \beta_6 MYS_{it} + \mu_i + \varepsilon_{it}$$

In Equation (2), The symbol α denotes fixed intercept, $\beta = 1, 2 \dots 6$ denotes coefficients for respective explanatory variables and ε_{it} is the vector of random error. The random effects term is given by μ_i (where μ_i and ε_{it} are independent). In the model, $OOPC_{it}$ denotes out-of-pocket payments for healthcare to the country i at a time t . Similarly, $GDPC_{it}$, RMp_{cit} , and $DGHE_{it}$ represents the GDP per capita, remittance inflow per capita, and domestic general government expenditure on health for i th country at a time t respectively which are also variables of interest. Likewise, CPI_{it} , $Pop65_{it}$ and MYS_{it} represents consumer price index, population percentage with age 65 years and above and mean years of schooling for i th country at a time t respectively which are control variables for this study.

The present study is based on the pooled cross-section data and yearly time series data from 2006–2021 for the seven SAARC countries viz; Nepal, Bhutan, Bangladesh, India, Maldives, Sri Lanka and Pakistan. Afghanistan is in the excluded from the analysis because of a lack of data and its continuity. The empirical data was collected from the World Bank statistics on the World Development Indicators. All the variables were converted to natural log to avoid skewness within data (log-log model).

Empirical Results and Discussion

Healthcare Expenditure Scenario in SAARC Region

The South Asian Association for Regional Cooperation (SAARC) region has a diverse socio-economic landscape, presenting a complex interplay of factors influencing healthcare financing (Rahman & Tiwari, 2021; Bhattarai & Budd 2019). Nevertheless, the SAARC countries have made significant improvement in healthcare infrastructure and services in recent times (Rahman et al., 2018). Despite this, the issue of out-of-pocket expenditure remains a challenge, hindering equitable access to healthcare and exacerbating financial vulnerabilities for individuals and households in SAARC region (Kumar et al., 2011). The mean OOP payments for healthcare for the SAARC countries is estimated to be about 49 percent of the total healthcare expenditure and 0.14 percent of GDP (Mohapatra, 2022). This is a concrete evidence of welfare loss of common people. Health economists are interested to compare health expenditures across different countries to identify best practices and learn from variations in expenditure patterns. This can provide better insights into potential areas for improvement and efficiency gains.

Table 1. Healthcare Expenditure Comparison SAARC and World.

Healthcare Expenditure Indicators	World	SAARC
Current health expenditure(CHE) as percent of GDP	10.89	3.05
Current health expenditure per capita USD	1535	189
Current health expenditure per capita USD	1177	56

OOP payments for health as percent of CHE	16.36	53.37
OOP payments for health per capita USD	193	101
Domestic general government health expenditure as percent of current health expenditure	63.42	34.55
Domestic general government health expenditure per capita in USD	956	66

Note: Data source is World Health Organization 2021.

Among the various dimensions of healthcare financing, OOP payments for health remains a critical aspect, reflecting the financial burden borne directly by individuals and households. This paper delves into the macroeconomic determinants shaping the patterns of out-of-pocket healthcare spending across the SAARC region. Healthcare financing is a crucial element in determining the accessibility and quality of healthcare services within any given population. While some countries within the SAARC region have made significant strides in healthcare infrastructure and services, the issue of out-of-pocket expenditure remains a challenge, hindering equitable access to healthcare and exacerbating financial vulnerabilities for individuals and households. This paper contributes to the existing body of knowledge by investigating the macroeconomic factors that influence out-of-pocket healthcare spending in SAARC countries. By understanding the determinants of individual healthcare expenditures, policymakers can formulate targeted interventions to mitigate financial barriers and enhance the overall efficiency of healthcare systems in the region. The SAARC region, comprising eight member countries, exhibits considerable heterogeneity in terms of economic development, healthcare infrastructure, and social indicators. But, this study covers seven countries viz., India, Nepal, Bhutan, Bangladesh, Pakistan, Shri Lanka and Maldives due to data availability consideration. The data are taken for 16 years from 2006 to 2021. This study aims to identify commonalities and variations in the macroeconomic determinants affecting out-of-pocket expenditure, providing valuable insights for tailored policy interventions at both regional and national levels. In the subsequent sections, relevant literature, outline the conceptual framework guiding our analysis, and present the methodology employed to examine the macroeconomic determinants of out-of-pocket healthcare spending in the SAARC region. This research aspires to inform evidence-based policy decisions that contribute to the enhancement of healthcare accessibility and financial protection for individuals across the diverse landscapes of the SAARC nations.

Panel Unit Root Test Results

The panel unit root test results at level and first difference are presented in Table 2, Table 3, Table 4 and Table 5. In this study, four panel unit root tests: Levin, Lin, and Chu (2002), Im, Pesaran, and Shin (2003), Augmented Dickey–Fuller (ADF) and PP–Fisher Chi-square are employed on each selected variable without trend and with trend. The empirical test results suggest that few variables are stationary in their level form but many variables are stationary at first difference.

Table 2. Levin, Lin, and Chu Unit Root Test Result.

Variables	At Level					At first difference				
	Intercept	p-value	Intercept	&	p-value	Intercept	p-value	Intercept	&	p-value
OOPpc	-2.42	0.00	-4.58		0.00	-5.53	0.00	-5.76		0.00

GDPpc	-2.83	0.00	-1.96	0.02	-4.45	0.00	-5.24	0.00
RMpc	-3.07	0.00	-0.95	0.16	-3.23	0.00	-2.29	0.01
CPI	-1.52	0.06	-4.08	0.00	-7.39	0.00	-6.28	0.00
Pop65+	-2.44	0.00	-3.56	0.00	-0.82	0.20	-0.34	0.36
MYS	-2.42	0.00	0.69	0.75	-0.24	0.40	-2.13	0.01
D-								
GGHE	-0.76	0.22	-1.82	0.03	-5.76	0.00	-4.57	0.00

Source: Calculated by author.

Table 3. Im, Pesaran and Shin Unit Root Test Result.

Variabl es	At Level					At first difference				
	Interce pt	p- value	Intercept Trend	&	p- value	Interce pt	p- value	Intercept Trend	&	p- value
OOPpc	-0.92	0.18	-1.88		0.03	-4.48	0.00	-3.20		0.00
GDPpc	-0.50	0.31	0.81		0.79	-3.36	0.00	-2.87		0.00
RMpc	-0.44	0.33	1.10		0.86	-2.72	0.00	-1.81		0.03
CPI	-0.63	0.26	-2.24		0.01	-6.31	0.00	-4.34		0.00
Pop65+	0.26	0.60	-0.68		0.25	0.15	0.56	1.04		0.85
MYS	1.42	0.92	1.36		0.91	-0.94	0.17	-0.69		0.25
D-										
GGHE	1.71	0.96	-1.21		0.11	-4.98	0.00	-2.97		0.00

Source: Calculated by author.

Table 4. ADF—Fisher Chi-square Unit Root Test Result.

Variabl e	At Level					At first difference				
	Interce pt	p- value	Intercept Trend	&	p- value	Interce pt	p- value	Intercept Trend	&	p- value
OOPpc	23.31	0.06	27.37		0.02	45.93	0.00	35.55		0.00
GDPpc	16.11	0.31	8.69		0.85	36.42	0.00	32.47		0.00
RMpc	14.53	0.41	10.94		0.69	31.45	0.00	-1.81		0.03
CPI	14.65	0.40	28.65		0.01	62.80	0.00	45.85		0.00

Pop65+	19.38	0.15	32.07	0.00	18.62	0.18	13.70	0.47
MYS	10.35	0.74	7.25	0.92	21.35	0.09	20.50	0.12
D-								
GGHE	4.96	0.99	19.82	0.14	50.57	0.00	33.07	0.00

Source: Calculated by author.

Table 5. Philip-Peron—Fisher Chi-square Unit Root Test Result.

Variab le	At Level			At first difference					
	Interce pt	p- value	Intercept Trend	&	p- value	Interce pt	p- value	Intercept Trend	& p- value
OOPp									
c	53.28	0.00	48.18		0.00	60.35	0.00	50.86	0.00
GDPp									
c	44.74	0.00	19.98		0.13	68.89	0.00	85.79	0.00
RMpc	26.48	0.02	13.61		0.48	80.96	0.00	101.44	0.00
CPI	19.25	0.16	36.94		0.00	115.34	0.00	95.21	0.00
Pop65									
+	8.95	0.83	4.42		0.99	7.08	0.93	2.29	1.00
MYS	8.28	0.87	9.50		0.80	32.83	0.00	40.96	0.00
D-									
GGHE	11.27	0.66	29.10		0.01	92.32	0.00	69.40	0.00

Source: Calculated by author.

Table 2 shows the result of Levin, Lin, and Chu (2002) unit root test. The result shows that the variables OOPpc, GDPpc, CPI, Pop 65, MYS and D-GGHE are stationary at level and remaining variables such as RMpc and MYS are stationary after first difference. Therefore, the null hypothesis of non-stationarity of the series of the included variables can be rejected.

Table 3 shows Im, Pesaran and Shin (2003) unit root test result. The result shows that the variables OOPpc, and CPI are stationary at level and remaining variables other than Pop 65 and MYS are stationary after first difference. Therefore, the null hypothesis of non-stationarity of the series of the included variables can be rejected.

Table 4 shows the result of ADF—Fisher Chi-square Unit Root Test Result. The result shows that the variables OOPpc, CPI, and Pop 65 are stationary at level and remaining variables other than MYS are stationary after first difference. Therefore, the null hypothesis of non-stationarity of the series of the included variables can be rejected.

Table 5 shows the Philip-Peron—Fisher Chi-square Unit Root Test Result. The result shows that the variables OOPpc, CPI, and D-GGHE are stationary at level and remaining variables other than

Pop 65 are stationary after first difference. Therefore, the null hypothesis of non-stationarity of the series of the included variables can be rejected.

All four panel unit root tests viz; Levin, Lin, and Chu (2002), Im, Pesaran, and Shin (2003), Augmented Dickey–Fuller (ADF) and PP – Fisher Chi-square are employed on each selected variable without trend and with trend. Based on the empirical test result, it can be concluded that some variables are stationary in their level and others are stationary after first difference. Therefore, they can be included in the panel data analysis model.

Descriptive Statistics

Table 6 depicts the key descriptive statistics of the included variables in the model for the selected SAARC countries covering the study period 2006 to 2021. Table 6 clearly reveals that mean and standard deviation of per capita OOP payments for healthcare of selected SAARC countries, are USD 52.65 and USD 62.81 respectively. Here, mean per capita OOP is less than standard deviation meaning that there is great variation in OOP payments for healthcare amongst the select countries. Similarly, Maldives has highest average OOP USD 196.90 and India has lowest average with USD 15.19. Likewise, mean and standard deviation of per capita GDP are USD 2723.2 and USD 2572.1 respectively. Maldives has highest per capita GDP with USD 8274.4 and Nepal has lowest with USD 783.89. In overall, mean and standard deviation for remittance inflow per capita are USD 496.30 and USD 497.63. Per capita remittance inflow for Maldives is highest and Nepal has lowest with USD 1231.2 and USD 72.91 respectively. In overall, mean and standard deviation of CPI are 6.8 per cent and 3.69 per cent respectively, while Pakistan has highest 9.01 per cent and Maldives has lowest 4.18 percent. In overall, mean and standard deviation of population percentage with age 65 years and above are 5.45 per cent and 1.61 per cent respectively, while Sri Lanka has highest 8.77 per cent and Pakistan has lowest 3.87 percent. Furthermore, in overall, mean and standard deviation of mean years of schooling (MYS)are 5.68 years and 2.3 years respectively, while Sri Lanka has highest 10.42 years and Pakistan has lowest 3.29 years. Finally, in overall per capita domestic general government health expenditure (D-GGHE) for the selected countries are USD 89.07 and USD 171.2 where standard deviation is greater than mean implying that there is great variation. Maldives has highest figure USD 467.11 and Bangladesh has lowest figure USD 5.88 (Table 6).

Table 6. Descriptive Statistics of the variables included in the model.

	Overall	Bangladesh	Bhutan	India	Sri Lanka	Maldives	Nepal	Pakistan
Variables	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
	SD	SD	SD	SD	SD	SD	SD	SD
OOPpc	52.65	20.92	15.19	30.87	60.73	196.90	21.16	20.07
(in USD)	62.81	9.53	4.8	5.29	14.89	36.86	8.23	3.17
GDPpc	2723.2	1200.5	2588.5	1489.8	3302.5	8274.4	783.89	1269.4
(in USD)	2572.1	599.67	714.26	390.19	1004	1888.3	280	224
RMpc	496.3	275.93	836.71	185.82	723.71	1231.2	72.91	126.77
(in USD)	497.63	123.86	292.82	59.19	275.23	643.54	25.01	27.78
CPI	6.8	6.98	6.12	7.06	7.3	4.18	7.37	9.01
	3.69	1.74	2.45	2.74	5.25	4.11	2.64	4.42

Pop65+	5.45	4.75	5.49	5.52	8.77	4.38	5.17	3.87
	1.61	0.44	0.44	0.6	1.33	0.19	0.62	0.2
MYS	5.68	5.62	3.29	5.72	10.42	5.68	4.09	4.74
	2.3	0.77	1.17	0.75	0.24	1.48	0.72	0.3
D-GGHE	89.07	5.88	64.76	13.87	54.67	467.11	7.67	8.06
(in USD)	171.2	2.42	21.86	4.69	13.82	185.97	4.14	3.74

Notes: In the Table 6 above, SD, OOPpc, GDPpc, RMpc, D-GGHE, CPI, Pop65+, and MYS denotes standard deviation, Out-of-pocket payments for health, Gross Domestic Product per capita, remittance inflow per capita, domestic general government health expenditure per capita, consumer price index, percentage of population with age 65 years and above, and mean years of schooling. Source: Calculated by author based on World Development Indicators (WDI).

Appropriate Model Section Test

The standard tests for model selection such as Chow test, Hausman test, and Bruesch Pegan Test was done. Chow test is a test of hypothesis to select either Common Effect (CE) or Fixed Effect (FE) model. This test is most appropriately used in estimating panel data. If null hypothesis (H_0) is not rejected, then we select CE ($p > 0.05$) and if alternative hypothesis (H_1) is selected we select FE ($p < 0.05$). The Chow test result is given in Table 3 that clearly shows the rejection of null hypothesis and selection alternative hypothesis. This implies fixed effect model is appropriate (Table 7). Similarly, Hausman test is a statistical test to select either Fixed Effect(FE) or Random Effect(RE) model. If null hypothesis (H_0) is not rejected, then we select RE ($p > 0.05$) and If alternative hypothesis (H_1) is selected we select FE ($p < 0.05$). The Hausman test result is given in Table 4 that clearly shows the rejection of null hypothesis and selection alternative hypothesis. This implies fixed effect model is appropriate. Essentially, Bruesch Pegan Test or Test Lagrange Multiplier (LM) is a statistical test to select either Common Effect(CE) model or Random Effect(RE) model. If null hypothesis (H_0) is not rejected, then we select CE ($p > 0.05$) model and if alternative hypothesis (H_1) is selected we select RE ($p < 0.05$) model. The Bruesch Pegan test result is given in Table 7 that clearly shows the rejection of null hypothesis and selection alternative hypothesis. This implies random effect (RE)model is appropriate (Table 7).

Table 7. Test for selection of appropriate model.

Test	Test Statistics	P value	Selected Model/ Conclusion
Model Selection Test			
Chow Test	Cross-section $F=63.30$		Fixed Effect Model
	Cross-section $\chi^2=176.53$	0.00	Fixed Effect Model
Hausman Test	$\chi^2= 379.78$	0.00	Fixed Effect Model
Bruesch Pegan Tests			
Breusch-Pagan LM	66.468	0.00	Random Effect Model
Pesaran scaled LM	7.016	0.00	
Pesaran CD	2.303	0.02	

Source: Calculated by authors.

Estimated Result of Panel Regression Model

The estimated result presented in Table 7 clearly shows the appropriateness of panel data model. It is evident from Table 7 that the appropriate panel model is Fixed effect model based on the Chow test and Hausman test. But, Breusch-pegan test result suggest the random effect model as a robust model. Therefore, estimated result of both model is reported hereunder.

Estimated Result of Fixed Effect Model

The Chow test and Hausman test result presented in Table 7 suggests the Fixed effect model is appropriate. Based on this, estimated result of fixed effect model is presented in Table 8 below. The estimated result shows that coefficients of all the explanatory variables other remittance per capita, mean years of schooling, domestic general government health expenditure are statistically significant. In other words, the explanatory variables GDP per capita(GDPpc), percentage of population with age 65 years and above significant at 1 per cent ($p < .01$) and consumer price index(CPI) are significant at 5 per cent ($p < .05$). But, coefficients for other variables are statistically insignificant. Although the coefficient for remaining all coefficients variables other than remittance per capita bear expected sign consistent with the economic theory. But, unexpectedly the coefficients of the explanatory remittance inflow per capita bears negative sign which is inconsistent with underlying theory. Similarly, the value of coefficient of variation is 0.981 which implies that the explanatory variables included in the model explains more than 98 per cent variation in the dependent variable (Table 8).

Table 8. Fixed Effect Model output describing determinants of OOP payments for healthcare per capita USD in selected SAARC countries in years 2006–2021.

Dependent variable: Out-of-pocket payments for health per capita USD					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
lnGDPpc	1.08	0.18	6.14	0.00	
lnRMpc	-0.15	0.13	-1.17	0.24	
lnCPI	0.09	0.03	2.72	0.01	
lnPop65+	1.20	0.41	2.96	0.00	
lnMYS	0.00	0.14	0.01	0.99	
lnD-GGHE	0.15	0.11	1.34	0.18	
Constant	-6.47	0.88	-7.37	0.00	
R-squared	0.981				
Adjusted R-squared	0.975				
F-statistic	162.323				
Prob(F-statistic)	0.000				

Source: Calculated by authors.

Estimated Result of Random Effect Model

The Breusch-pegan test result suggest the random effect model as a robust model. Based on this, estimated result of random effect model is presented in Table 9 below. Unlike fixed effect model, the estimated result of random effect model shows that coefficients of all the explanatory variables are statistically significant. In other words, the coefficients of the explanatory variables GDP per capita, remittance inflow per capita, mean years of schooling is significant and domestic general government health expenditure are significant at 1 per cent ($p < .01$). Likewise, consumer price index and percentage of population with age 65 years and above, at 5 per cent ($p < .05$). But, unexpectedly the coefficients of the explanatory variables such as remittance per capita and population percentage with age 65 years and above bears negative sign which are inconsistent with underlying theory. But all the remaining coefficients belonging to respective variables bear expected sign consistent with the economic theory. Similarly, the value of coefficient of variation is 0.879 which implies that the

explanatory variables included in the model explains more than 87 per cent variation in the dependent variable (Table 9).

Table 9. Random Effect Model output describing determinants of OOP payments for healthcare per capita in selected SAARC countries in years 2006–2021.

Dependent variable: Out-of-pocket payments for health per capita USD					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
lnGDPpc	1.47	0.09	17.25	0.00	
lnRMpc	-0.72	0.04	-19.78	0.00	
lnCPI	0.06	0.02	2.52	0.01	
lnPop65+	-0.18	0.08	-2.17	0.03	
lnMYS	0.64	0.06	10.64	0.00	
lnD-GGHE	0.12	0.04	3.43	0.00	
Constant	-4.79	0.44	-10.91	0.00	
R-squared	0.879				
Adjusted R-squared	0.872				
F-statistic	127.546				
Prob(F-statistic)	0.000				

Source: Calculated by authors.

Conclusion and Recommendations

The study employed panel data analysis to explore the macroeconomic, demographic and social factors influencing OOP payments for healthcare these countries. The model selection tests (Chow, Hausman, and Breusch-Pagan) suggest that the fixed effect model is the most appropriate for the data, though the random effect model also provides valuable insights. The analysis concludes that macroeconomic factors such as GDP per capita, consumer price index (CPI), and the percentage of the population aged 65 and above significantly influence OOP healthcare payments in SAARC countries. The findings indicated the need for comprehensive healthcare reforms in SAARC countries, focusing on macroeconomic factors like income levels and inflation to improve healthcare accessibility and affordability for their populations. However, the impact of remittance inflows and mean years of schooling on OOP payments remains inconclusive and sometimes contradictory to economic theory. Therefore, policymakers should prioritize economic policies that enhance GDP growth, support aging population, optimize remittance use, and stabilizes prices to alleviate the financial burden of healthcare on individuals. In this, regard governments of the regions can make significant strides to address the root of economic factors influencing OOP payments, such as income levels and inflation, in improving healthcare accessibility and affordability for their populations.

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