

Empirical Relationship of Mortality Rate and GDP Per Capita in Sri Lanka

G.Y. N. Gunathilaka

Department of Economics and Management, Vavuniya Campus of the University of Jaffna

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Introduction

Infant mortality is an important indicator which represents the probability of death of an infant before his or her first birthday. It symbolizes a country's socio economic development towards the standard of human well-being in a broader area. According to the Central Bank annual report 2017, the infant mortality rate was recorded as 8.5 per thousand live births. There was a considerable decline in infant mortality in the post-liberalized era as compared to the pre-liberalized period. According to the UNICEF publication "Every Child Alive - The urgent need to end new born deaths" stated that Sri Lanka is the first among 52 low-income countries in the world with regard to infant mortality rates and also the World Bank named Sri Lanka as a role model for other countries with regard to upgrading the health sector. On the other hand, the mortality rates can be considered as indices which provide a baseline for the country's initiatives towards sustainable development. There are relatively less studies which have examined the factors affecting the infant mortality in the Sri Lankan context. "Demographic transition theory mentioned that the infant mortality tends to decline due to upgrading in living standard and also in the medical technology" (Lee, 2003). The study is initiated to take necessary steps for further improvements in maternity and child health in Sri Lanka.

Objective

The study objective is to identify the relationship between infant mortality with birth rate and per capita GDP of Sri Lanka over the period from 1980 to 2016.

Methodology

Time series data were extracted from the World Bank database for the period 1980-2016. Since study involves time series data, the researcher applied the Augmented Dickey Fuller (ADF) unit root test to check the stationarity of the series. This study applies multiple linear regression model which consists of Birth Rate (BR), change in GDP per capita (GDP) and change in Infant Mortality Rate (IMR) to examine the relationship. The model can be depicted as follows;

$$IMR = \beta_0 + \beta_1 BR + \beta_2 GDP + \epsilon \dots \dots \dots (1)$$

Normality test, Breusch-Godfrey Serial Correlation LM test and Heteroskedasticity test were used to establish the validity of the above model. Finally, the study applied the Granger Causality model to find the causal relationship between the variables mentioned above. Further, Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC) were selected to decide the optimum lag-length of it.

Results and Discussion

The results of the Augmented Dickey-Fuller unit root test revealed that the change in mortality rate, birth rate and GDP per capita were stationary at level of the series. The estimated result of the multiple linear regression model shows that there is a significant relationship between BR and IMR since the p value is recognized to be statistically significant at 0.01 level. As far as the association between Δ GDP and IMR, it is not significant at 1% or 5% or 10% level. It has a negative impact on Δ GDP. The R^2 of the estimated model was 0.501. It implies that 50.1% of the variability in the dependent variable is explained by the predictors named BR and Δ GDP. Further, the F value was found to be 16.577 at $p < 0.01$. Hence, it can be inferred that the model is good at explaining the changes in the outcome variable.

Durbin-Watson statistics (DW=2.01) and Breusch-Godfrey Serial Correlation LM Test (p-value=0.4993) show that the estimated model is free from serial correlation. Further Breusch-Pagan-Godfrey Heteroskedasticity Test shows a p value of 0.8510. Since the p value is greater than 0.05, it is an indication of constant variance leading to the absence of heteroskedasticity in the time series. Therefore, residual diagnostic tests suggested that the above estimated model is more robust in predicting outcome.

Table 1: Results of Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
Δ GDP does not Granger Cause BR	32	4.47292	0.0081
BR does not Granger Cause Δ GDP		2.64438	0.0596
Δ IMR does not Granger Cause BR	32	3.68756	0.0184
BR does not Granger Cause Δ IMR		2.18451	0.1027
Δ IMR does not Granger Cause Δ GDP	32	1.42392	0.2577
Δ GDP does not Granger Cause Δ IMR		3.30102	0.0282

According to the AIC and SC, suggested optimum lag length is 4 to run the granger causality model. Results of the Granger Causality as stated in the table 1 explores that causal relation between Δ GDP and BR at 1% while, there is a causal relation between BR and Δ GDP at 10% by indicating bi-directional causality. There is a one directional causality from Δ IMR to BR but not vice versa. Further, results show one-way causality from Δ GDP to Δ IMR but there is no causality from Δ IMR to Δ GDP. Ali et al., (2015), Hojman (1996) and Mogford (2004) found that Birth Rate and GDP per capita positively impact on child mortality which are the same as this study. Further, the findings here show that there was no significant relationship between GDP per capita and infant mortality rate. This finding is contradictory to the results of O'Hare (2013), Schell (2007) and Amouzou & Hill (2004).

Conclusion

This study was directed towards identifying the empirical relationship of Birth Rate and GDP Per Capita with Infant Mortality Rate in Sri Lanka during the period 1980 to 2016. Results show that the birth rate had a negative significant association with Infant Mortality Rate in Sri Lanka and finally the researcher has concluded that there is a bidirectional as well as unidirectional causal relationship among the variables used in the study. Birth Rate and GDP per capita are not the only factors determining infant mortality. There might be factors which may have a greater explanatory power. For example, factors like immunization, child birth weight, contraceptive use and level of mother's education might have a profound impact on infant mortality which have not been considered in this study. Therefore, researchers can add more insight into this thought by taking into account these variables in their future research. Even though Sri Lanka is progressing towards a low Infant Mortality Rate, the government should pay attention to improving further so as to bring forward its Human Development Index on par with developed countries.

References

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