

The relationship between population and economic growth: Empirical evidence from Sri Lanka

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Introduction

The relationship between population and economic growth has recently spawned a large number of empirical studies. But, there is no consensus among researchers about the effects of population growth on economic growth. Therefore, empirical studies have found evidence in favor of negative and positive effects as well as of no effects at all. According to Darrat and Al-Yousif (1999), there are mainly three schools of thought regarding the relationship between population growth and economic growth. The first one is the conventional view, which states that rapid population growth leads to lower economic growth and poverty. The second one, the Revisionist school, takes the opposite view, arguing that higher population growth increases the stock of human capital, thus contributing to economic growth. Finally, the Transition theory describes that population growth is in part due to changes in income; populous countries are populous as a result of being economically poor.

The study by Furuoka (2009) in Malaysia, using Johansen cointegration test and the Error Correction Model (ECM), found that there exist a long-run equilibrium relationship between the population growth and per capita Gross Domestic Product (GDP) growth. Dao (2013), using forty five African countries stated that there is a negative effect of population growth upon economic growth. On the other hand some studies found no evidence of any relationship between population growth and economic growth (Singha & Jaman, 2012). Therefore, present study attempts to examine the relationship between population growth and economic growth of Sri Lanka.

Methodology

In this study, several econometric methods were employed to examine the relationship between two variables, GDP (Sri Lanka's real Gross Domestic Product) and Population (Sri Lanka's total population) over the period 1977-2016. The data were obtained from the Central Bank Reports and Department of Census and Statistical reports. All the data were transformed into log form for the purpose of the analysis.

The empirical analysis in the present study was done in three stages. In the first stage, unit root tests were used to determine whether the time series data are stationary. Analysis of non-stationary data may produce spurious results because estimates obtained from such data will possess non constant mean and variance. In this regard Augmented Dickey Fuller (ADF) test was used to test for unit roots. In the second stage, cointegration test was carried out in order to analyze whether the pairs of variables were cointegrated or moved jointly in the long-run. Cointegration rank is estimated using Johansen methodology. Johansen's approach derives two likelihood estimators for the Cointegration rank; a Trace test and a maximum Eigen value test. In the third stage, Granger causality test was used to analyze causality between population growth and economic growth in Sri Lanka.

Results and discussion

It is clear from Table 1 that the null hypothesis of no unit roots for all the time series are rejected at their first differences since the ADF and PP test statistic values are less than the critical values at 0.01 levels of significances. Thus, the variables are stationary and integrated of same order $I(1)$.

Table 1 Results of unit root tests

ADF Unit Root Test						
	Level			First Difference		
	Intercept	Trend and Intercept	None	Intercept	Trade and Intercept	None
GDP	0.723	-2.755	4.593	-9.541***	-9.151***	-1.978***
Population	-1.539	-5.201***	2.301	-7.032***	-7.026***	-9.847***
PP Unit Root Test						
	Level			First Difference		
	Intercept	Trend and Intercept	None	Intercept	Trade and Intercept	None
GDP	0.771	-2.927	4.749	-8.265***	-8.016***	-5.226***
Population	-1.686	-5.191***	4.732	-21.224***	-35.209***	-10.745***

*** significance at 1 percent level, ** significance at 5 percent level

Table 2 show the results of Johansen Cointegration test. The Trace test and Max-eigenvalue test indicate that the GDP and Population growth are cointegrated and have a long-run association.

The Granger causality test was employed to examine the causality between population growth and economic growth in Sri Lanka. According to the results in Table 3, the null hypothesis that population growth did not Granger-cause GDP could not be rejected. Therefore, population growth in Sri Lanka does not

Granger-caused the country's real per capita GDP growth. However, the null hypothesis that GDP did not Granger-cause population growth could be rejected at the 0.05 level of significance. Thus GDP growth in Sri Lanka causes the population growth.

Table 2 Results of Cointegration test

Unrestricted co-integration Rank Test (Trace)					
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05 value	Critical	Prob.**
None*	0.382	20.392	15.494		0.008
At most 1 *	0.095	3.531	3.841		0.060

*Trace test indicates 1 cointegrating eqn(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values*

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)					
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05 value	Critical	Prob.**
None *	0.382299	16.86130	14.26460		0.0190
At most 1	0.095976	3.531480	3.841466		0.0602

*Trace test indicates 1 cointegrating eqn(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values*

Table 3 Result of Granger Causality test

Null Hypothesis:	F-Statistic	Prob.
Population growth does not Granger Cause GDP growth	1.64546	0.2084
GDP growth does not Granger Cause population growth	4.07342	0.0262

Conclusion

The study confirmed the existence of a long-run relationship between population growth and economic growth in Sri Lanka. The study further found presence of uni-directional causality that is running from GDP growth rate to population growth but not vice versa. Overall, the study suggests that there is a relationship between economic growth and population growth in Sri Lanka.

Keywords: *Causality, cointegration, GDP, population*

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