Exploring the Linkages between Population Growth and Economic Growth for South Asian Countries

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Abstract

The present study investigates the impact of population on economic growth by using the panel ARDL cointegration technique for long run and error correction model to determine the short run dynamics of system to panel data for selected south Asian countries. The empirical findings indicate that population growth rate causes the low GDP growth rate in long run for selected countries. The results also reveal that there is no short run causality from population growth to GDP growth. Findings from the study support the conventional wisdom, which stipulates that high population growth has an adverse effect on economic growth. In countries like Pakistan, India and Bangladesh, carefully planned population growth strategy could be beneficial for economic growth and eventually poverty alleviation.

Keywords: Population Growth, Economic Growth, South Asian Countries

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INTRODUCTION

The effects of demography on economic performance have been the subject of intense debate in relevant literature for nearly two centuries among researchers and policy makers. The relationship between population growth and development has attained massive attention as a controversial topic in the economic development literature; that whether population growth stimulates or retards economic growth and standard of living in developing countries. The proponent group of economists argues that high population growth would increase the size of market and encourage the utilization of economies of scale. Greater population density has particular advantages for provision of education, transportation; sanitation. Division of labor is enhanced by large-scale production and, in turn, encourages technical change. On the other side, the opponent group of economist argument holds that deleterious effects of high rates of population growth on saving and investment, and therefore, future growth. Similarly, high rate of population tend to imply high dependency burdens and result in lowered private saving. They believe that a high rate of population growth is a cause of poverty that impedes economic development. Empirical studies on the long-run relationship between population and economic growth rates have produced mixed results in the existing literature. For instance, Easterlin (1967), Kuznets (1967), Simon (1992), Thirwlwall (1972), Coale and Hoover (1958), and Blanchet (1991) found insignificant relationship between population and economic growth rates. On other hand, Kelly and Schmidt (1994), Coale and Hoover (1958), Blanchet (1991) found that economic and population growth rates are negatively related with respect to less developed countries. Dawson and Tiffin (1998) and Thornton, John (2001) by using cointegration analysis found that economic growth rate and population growth rate do not have long run relationship in case of India and Latin America countries, respectively. In 1950, the world population was 2.52 billion which increased to 6.06 billion in 2000 and is likely to reach 8.3 billion by the year 2030. While, the population size will remain almost

stationary in the more developed world during the period 2000 to 2030 around 1.2 billion, it is likely to grow from 4.87 billion to 7.1 billion during the same period in the less developed regions. Therefore, most of the growth in population size is going to be occurred in the less developed countries (UN 2001). These trends provide a good ground for research on South Asian countries and present paper focuses on three South Asian countries namely, India, Pakistan and Bangladesh. South Asia is included among those regions, which are highly populated. Currently, its population is around 1.45 billion, almost 22.1% of world's population; it contains more than 40 percent of the world's poor. In order to explore the robust empirical results for policy analysis the present study investigates the long run and short run dynamic relationship between population and economic growth by using Auto regressive Distributive Lag (ARDL) approach to co integration for South Asian countries. To the best of our knowledge, no attempt has yet been made to study the long run and short run dynamic relationship of population growth and GDP growth by using Auto regressive Distributive Lag (ARDL) approach to co integration for South Asian countries The plan of the paper is as follows: section 2 provides an overview of demographic and economic variables in selected South Asian countries, data sources and econometrics methodology is discussed in Section 3, the empirical findings are presented and analysed in section 4. The section 5 presents a concluding summary.

Trends of Demographic and Economic Indicators

Table 1: Demographic Indicators

		Bangladesh	India	Pakistan
Population Growth	1970's	2.53	2.29	3.13
	1980's	2.49	2.12	2.67
	1990's	1.76	1.77	2.48
	2000-07	1.91	1.52	2.41
Mortality Rate (per 1000 Adult)	1970's	382	270	287
	1980's	365	239	231
	1990's	157	221	160
	2000-07	215	157	155
Population Density Growth (Tous: Hectares)	1970's	2.53	2.30	3.11
	1980's	2.48	2.12	2.73
	1990's	1.76	1.78	2.43
	2000-07	1.95	1.49	2.51
Fertility Rate (per Woman)	1970's	6.5	5.5	7.0
	1980's	5.6	4.7	6.5
	1990's	4.7	3.5	5.5
	2000-07	3.1	2.4	4.4

Source: World Development Indicators

Table 1 presents demographic trend of three south Asian countries. Population growth rate in Pakistan was declining steadily in 1970s and it averaged 2.7% in 1980s and reached 2.4 percent in 1990s and 2000 onward. Population growth rate is still higher comparatively and according to UN projections, Pakistan will become the fourth most populous country by the year 2050. In terms of population growth rate, India and Bangladesh have more declining trend than Pakistan. In 1970's it was 2.29 % for India and 2.53% for Bangladesh but, and declined to 1.52% for India, and 1.91% for Bangladesh in 2000-07. Although, it is showing a declining trend over decades, but still very high as compare to other countries of the world. Similarly, there are indications of a downward trend; fertility rates in Pakistan but still remain high. In the 1970s and 1980s the total fertility rate (TFR - total number of children that would be born per woman if current fertility rates persisted) was 7 per woman and 6.5 per woman respectively. TFR dropped to 5.5 children during the 1990s and 4.5 children during 2000-07. In India, fertility rate was 5.5 children per woman in 1970s but now it is 2.4 children on average per woman in 2000-07. For Bangladesh TFR were 6.5 children in 1970s and 3.1 children in 2000-07. Pakistan's population density grew at an accelerating rate of 3.11% in 1970s, showing steady declining to 2.73% in 1980s and reduced to 2.43% in 1990's but again show a rising trend; population density grew at 2.51% in 2000-07. Population density in Pakistan is higher than other countries. Although, till 1990s, population density show a declining trend in case of all three countries, but, in case of Pakistan and Bangladesh once again showing an increasing trend and reached 2.51 in case of Pakistan and 1.95 for Bangladesh relative to 2.43 in 1990s for Pakistan and 1.76 in case of Bangladesh in 1990s. In India, population density growth showing a declining trend from 1970s to 2000-07. A table (2) show that the highest mortality rate is in Bangladesh while Pakistan's rank is third the respect to mortality rate. The mortality rate was 387 per thousand adult in 70s, declining to 231 per thousand adult in 80s, 160 per thousand adult in 90s and 155 per thousand adult in 2000-07.

Pakistan's growth performance in the decades of 70s and 80s was impressive as compare to 90s. As the Table (2) show that growth rate of real GDP was 4.7 and 6.3 in 70s and 80s respectively, which declined 3.9 in 90s and increase to 4.7% in 2000-07. A large part of high growth in 70s and 80s was spent simply on sustaining a very high pace of population expansion (3%). Pakistan's higher population growth rate is reflected by lower growth rate of GDP per capita growth high than other countries (Table: 2). Growth performance of India drastically increases from 3.1% in 1970 to 5.8% in 1980 and reached to 6.5% in 2001-07. Growth performance of Bangladesh is showing upward trend from 1.8% in 1970s to 5.5% in 2001-07.

Table 2: Trends in GDP and Per Capita Income Growth

		Pakistan	India	Bangladesh
Growth in GDP Per Capita	1970's	1.5	0.8	-0.7
	1980's	3.5	3.6	2.2
	1990's	1.4	3.6	2.9
	2000-07	4.4	4.9	3.5
Growth in GDP	1970's	4.7	3.1	1.8
	1980's	6.3	5.8	4.8
	1990's	3.9	5.5	4.8
	2000-07	4.7	6.5	5.5
GDP Per Capita(Constant 1995 $)	1970's	281.7	217.8	213.0
	1980's	391.7	273.9	258.9
	1990's	493.1	388.8	323.6
	2000-07	549.6	507.8	395.9

Source: Complied by authors based on data from World Development Indicators

The model consists of variables, Population Growth Rate (PG), GDP growth rate (GR), inflation rate (INF), investment rate (INV) and Market exchange rate(ER). The data for the study consist of annual observations. The data regarding all variables for Pakistan, Bangladesh and India are obtained from World Development Indicators, published by the World Bank. The sample spans from 1972 to 2010.

Table 3 represents descriptive statistics and bivariate correlations. The estimates of table (3) indicate that GDP growth rate and population growth rate are negatively correlated in all three countries.

Table 3: Descriptive Statistics and Correlation Matrix

	GR	PG	INV	INF	ER
Mean	5.30	3.27	19.82	8.95	52.48
Median	5.73	3.52	12.04	7.80	17.45
Maximum	9.85	7.74	262.90	30.00	1016.70
Minimum	-5.24	-7.36	-0.14	3.10	4.79
Std. Dev.	3.09	3.19	41.40	5.64	164.00
Skewness	-1.17	-1.09	5.68	2.16	5.71
Kurtosis	4.96	4.70	33.90	8.51	34.10
Jarque-Bera	14.53	11.87	1672.16	75.73	1693.12
Probability	0.00	0.00	0.00	0.00	0.00
GR	1	-0.69	0.67	-0.23	-0.21
PG	-0.69	1	0.68	0.03	0.24
INV	0.67	0.68	1	0.38	0.42
INF	-0.23	0.03	0.38	1	0.59
ER	-0.21	0.24	0.42	0.59	1

MATERIALS AND METHODS

The Panel ARDL Bounds Testing Approach

To study of long-run relationships between two variables (GDP growth rate and population growth rate in our case) require a test of unit root. Different tests of unit root often give different results and the lower the length of the series the lower is the power of the standard tests. For this reason, we now make use of the bounds testing procedure proposed by Pesaran, Shin and Smith (1996, 2001) to test for the existence of a linear long-run relationship. The test is the standard Wald or F statistic for testing the significance of the lagged levels of the variables in a first difference regression. Once a long run relationship is established, and then the long run and error correction estimates of the panel ARDL model can be obtained from Equation (1). A general error correction representation of Equation (1) is formulated as follows:

$$\Delta GRit = \delta + \psi \sum_{j=1}^{p} \Delta GR_{it-j} + \beta_0 \sum_{j=1}^{p} \Delta PG_{it-j} + \beta_1 \sum_{j=1}^{p} \Delta INV_{it-j} + \beta_2 \sum_{j=1}^{p} \Delta INF_{it-j} + \beta_3 \sum_{j=1}^{p} \Delta ER_{it-j}$$
$$+ \lambda_1 GR_{it-1} + \lambda_2 PG_{it-1} + \lambda_3 INV_{it-1} + \lambda_4 INF_{it-1} + \lambda_5 ER_{it-1} + \mu \quad \text{E(1)}$$

Where $\lambda_1$and λ_2's as the long-run multipliers, Ψ's and β's as short-run dynamic coefficients. When the long run relationship exists among the variable, then there is error correction representation. So, the following error correction model is estimated is the third step.

$$\Delta GRit = \beta_0 + \beta_1 \sum_{j=1}^{p} \Delta GR_{it-j} + \beta_2 \sum_{j=1}^{p} \Delta PG_{it-j} + \beta_3 \sum_{j=1}^{p} \Delta INV_{it-j} + \beta_4 \sum_{j=1}^{p} \Delta INF_{it-j} + \beta_5 \sum_{j=1}^{p} \Delta ER_{it-j} + \lambda EC_{it-1} \quad \text{.....E (2)}$$

The error correction term in the model indicates the speed of adjustment back to long run equilibrium after a short run shock. To ensure the goodness of fit of model, the diagnostic and stability tests are also conducted, the diagnostic test examine the serial correlation, functional form, normality and heteroscidasticity associated with selected model.

RESULTS

Testing of the Panel unit root hypothesis

To test the unit root hypothesis to all variables, Pesaran and Shin (W-Stat) and Levin, Lin & Chu (t-Stat) were applied to panel series, while ADF test, PP test were applied to individual cross sections. A summary of these test results is provided in Table 2. First, these tests were applied with the variables in levels, followed by their first difference form. Results show that the variables are having different order of integration which enables us to apply Auto Regressive Distributive Lag Modal (ARDL).

Table 4: Panel Unit Root Test

Variables	Im, Pesaran and Shin (W-Stat)		Levin, Lin & Chu (t-Stat)	
	Level	1st diff:	Level	1st diff:
GR	-4.67*	-6.78*	-3.26*	-5.16**
PG	-1.06	-3.98*	-1.32	-5.04*
INV	-1.01	-3.68*	-1.28	-4.28**
INF	-6.23*	-8.32*	-5.42*	-11.24*
ER	-8.82*	-9.12*	-6.17*	-7.51*

* Represents significant at 1%, ** Represents significant only at 5%

Lag Selection of Panel ARDL

After finding that the underlying regressors in the model, i.e. in our case variables of GDP growth rate and Population growth rate are integrated of mix order for each country, the two-step panel ARDL cointegration is used to find out for long run and short run dynamic relationship between GDP growth rate and Population growth rate . In the first stage, the order of lag length on estimating the conditional error correction version of the panel ARDL modal is usually obtained from unrestricted vector autoregressive (VAR) by means of Schwartz Bayesian Criteria (SBC) and Akaike Information Criteria which is 2, based on the minimum value (AIC) as shown in table below:

Table 5: Lag Length Selection

Lag	AIC	FPE	SBC	F-stat:
1	4.73	1.79	4.67	9.62*
2	4.98*	1.09*	4.26*	11.48*
Short Run Diagnostic test-statistics				
Serial correlation LM =0.19 (0.21)				
J-B value= 1.38 (0.39)				
Hetro test=1.08 (0.21)				
RESET =1.53(0.29)				

Note: p-value in parenthesis

Overall, our results parts of which are displayed in table 4 provide some evidence in favor of the existence of a long run relationship between the per capita GDP growth rate and population growth rate. The results of bound testing approach show that calculated F statistics is (11.48) which is higher than upper bound critical value at 1% level of significant implying that the null hypothesis of no co integration can not be accepted and there is indeed a co integration relationship among the model. Hence we have a long run relationship between GDP growth and population growth rate in case of three South Asian countries. Having found a long run relation relationship we applied the ARDL method to estimate the long run and short run coefficients (see Pesran et al 2001 details). Long run relationships are shown in Table 7 to test the percentage increase or decrease of change we regressed the GDP growth rate on linear term of population growth rate.

Table 6: Estimated Long Run Coefficients using the Panel ARDL Approach

Dependent Variable GR ARDL (2 1 2 2 2)		
Regressors	Coefficient	p- value
PG	-0.82	0.00
INV	0.34	0.04
INF	-0.72	0.08
ER	0.02	0.04
R-Squared = 0.89		R-Bar-Squared = 0.87
F-stat. = 10.39(0.00)		

As table (6) shows that all estimated long run coefficients of variables is significant and have expected signs. The population growth rate which is core variable in the present study has negative sign and significant at 1 percent level for all three countries. The results support the conventional wisdom and

indicate that high population growth rate leads to lower economic growth in long run. The results strongly support the view that one of the reasons of lower economic growth is a high population growth rate developing country.

Table 7: Error Correction Representation of Panel ARDL Model

Dependent Variable ΔGR		ARDL (2 1 2 2 2)
Regressors	Coefficient	P- value
ΔPG	-0.12	0.13
ΔINV	3.34	0.36
ΔINF	21.6	0.09
ΔER	13.35	0.02
EC (-1)	-0.45	0.09
R-Squared = 0.92 R-Bar-Squared =0.91 F-stat: = 8.67[.00] DW-statistic = 1.94		

The estimated lagged error correction term ECt-1 is negative and highly significant, supporting the co integration among the variables represented by equation 1. The feed back co efficient is -0.45 suggests that about 45% dis equilibrium is corrected in the current year. The result also suggests that in the short run population growth rate and investment rate have no significant impact on GDP growth rate in all three countries, while inflation rate and exchange rate have significant impact on GDP growth rate in all three countries. This implies that in the short run when population growth rate increase the production and income level also increase which leads to higher GDP but the picture on other hand is opposite in the long run.

DISCUSSION AND CONCLUSION

This paper has examined the long run relationship between economic growth and population growth for Pakistan, India and Bangladesh by using panel ARDL co integration approach. The empirical results indicate that there is exhibit a reliable long run causal relationship between population and GDP growth rates for selected south Asian countries. The results reveal that population exert negative impact on economic growth .Therefore, high population growth tends to lower growth rate of GDP in long run in these countries. Similarly, there is short run no causality from population to GDP growth rate for all three countries.

On the basis of empirical findings, it is recommended that the carefully planned population growth strategy coupled with institutional and policy changes could be beneficial to these countries. Human resources development strategies have been used as a weapon against poverty in many developing countries. Since human resources crucial role in the process of economic development and hence poverty reduction but this is only possible to huge investment in human resources in development region .Due to masses population the per capita investment on human resources is extremely low and thus not contributing positively in the development of human resources. High population and low real per capita income couples with poor social indicators during the past four decades eroding the economic and social progress of this region. Enhancement of education levels, improvement of health status and skilled labor, all can contribute greatly to the reduction and alleviation of poverty. Thus, Human capital formation will play vital role to sustain high growth rates in medium to long term. In the first place, the ability to reduce population growth rate will critically depend upon human resource development, especially education of woman.

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