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Exploring the Impact of Demographic Factors on Economic and Sectoral Dynamics: A Comparative Study of Selected South Asian Countries

Bilal Tariq[1], Mazhar Abbas[2,3], Zabair Arshad[1], Md. Abdul Kafi[2], Nor Hasni Bt. Osman[2], Nura Abubakar Allumi[2], Mohd Kamarul Irwan Abdul Rahim[2], Mohd Rizal Bin Razalli[2*]

[1] Department of Economics, COMSATS University Islamabad, Vehari Campus, Vehari 61100, Pakistan
[2] School of Technology Management & Logistics, Universiti Utara Malaysia, Sintok 06010, Malaysia
[3] Cholistan Institute of Business Administration (CIBA), Cholistan University of Veterinary & Animal Sciences (CUVAS), Bahawalpur 63100, Pakistan

Corresponding Author Email: rizal@uum.edu.my

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ABSTRACT

The research aims to explore the influence of demographic factors on economic growth as well as sectoral development. Research reveals which factors have more influence on economy and which sector is more affected by demographic variables. This study utilizes panel data to investigate the effect of demographic changes on economic growth. The analysis employs the pooled mean group/autoregressive distributed lag model (PMG/ARDL) to estimate the impact. The ARDL model is used to estimate the long run relationship between variables and short run dynamics as well. To determine the stationarity of the variables, panel unit root tests such as the Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) tests are employed. The findings of ARDL indicate that economic growth (GDP) is adversely affected by death rate (DR), population growth (PG) and migration (LNMIG), whereas birth rate (BR) and life expectancy (LE) have a positive impact on GDP over long term. This research contributes to the existing literature by offering a unique perspective on the interplay between demographics and economic growth within the South Asian context, potentially uncovering region-specific trends, challenges, and opportunities that may differ from other parts of the world. The research suggests policies for education, healthcare, investment, family planning, and migration policies to overcome the influence of these factors. Additionally, the research addresses the sustainable development goals that help to improve sustainability in these economies.

1. INTRODUCTION

Demographic changes and economic growth play pivotal roles in shaping the development and progress of countries like India, Bangladesh, and Pakistan. Let's delve into a concise explanation of these concepts: Demographic Changes: Demographic changes encompass the transformations and trends occurring in a country's population structure. These changes encompass factors such as population size, age distribution, fertility rates, mortality rates, and migration patterns. Understanding demographic changes is vital as they have significant ramifications for a country's social, economic, and political dynamics. In recent decades, India, Bangladesh, and Pakistan have undergone substantial demographic changes. These nations boast large and swiftly expanding populations, with a notable proportion of young individuals. The presence of this youth bulge presents both opportunities and challenges for economic growth, contingent upon its effective management. Economic growth refers to the expansion of a country's production of goods and services over time. It is commonly measured using indicators such as gross domestic product (GDP), per capita income, employment rates, and investment levels. Economic growth plays a vital role in improving living standards, reducing poverty, and fostering overall development. In recent years, India, Bangladesh, and Pakistan have experienced varying degrees of economic growth. India has emerged as one of the world's fastest-growing major economies, driven by sectors like services, manufacturing, and information technology. Bangladesh has undergone a remarkable economic transformation, characterized by sustained GDP growth propelled by exports of garments, remittances, and industrial development. Pakistan has also witnessed economic growth, although it has faced challenges such as political instability and security issues that have hindered its full potential. The connection between demographic changes and economic growth is intricate and interrelated. A favorable demographic profile, marked by a significant working-age population, can result in a demographic dividend that acts as an engine for economic growth. This demographic dividend occurs when the working-age population surpasses the dependent population (children and the elderly), leading to increased

labor supply, productivity, and savings. This, in turn, can stimulate economic growth and development. It is important to note that effectively harnessing the demographic dividend requires the creation of adequate employment opportunities, investment in education and skills training, and the implementation of sound policies and infrastructure (Figure 1).

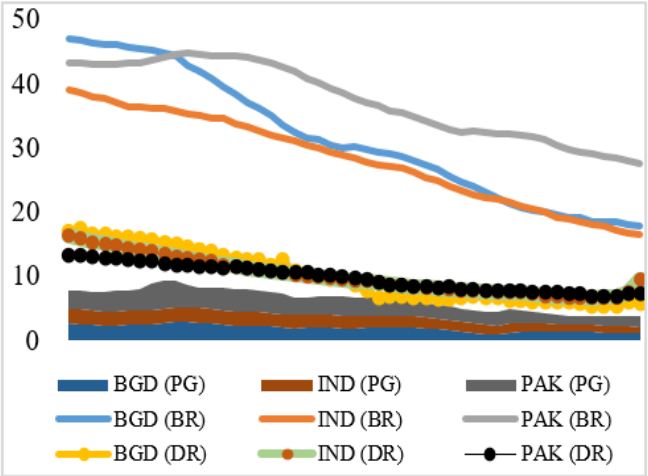

Figure 1. Birth rate, death rate and population growth rate

2. LITERATURE REVIEW

Population has traditionally been treated as one of the factors, along with the availability of natural resources, capital accumulation, and technological advancement, that define economic growth in the development of economic growth theories. The Solow growth model explains how technical expansion, labor force expansion, and capital stock growth interact to influence a nation's overall productivity of goods and services [1]. There are three approaches to explain how the population influences economic development Bloom and Canning [2] There are pessimistic, optimistic, and neutral opinions.

2.1 Review of existing literature

Younger populations demonstrate more robust investment growth, both in absolute terms and as a percentage of GDP, compared to economies with an older population. The relationship between consumption and output growth shows a negative correlation with both older and younger dependents, while individuals in the later stages of their careers positively influence both consumption and output. Furthermore, the age composition of a country's population significantly influences interest rates [3]. The male working-age population exerts a greater influence on economic growth compared to the female working-age population. While the dependency ratio of the young age population adversely affects economic growth more than the older population [4]. Utilizing the Auto Regressive Distributive Lags (ARDL) assessment procedure. Khan and Tariq [5] revealed that the population dependency ratio significantly reduces economic growth by 14.9% in the long run.

The fertility rate has a negative and significant impact on economic growth. While on the other hand population growth and crude death rate have positive and significant impacts on economic growth [6]. The gross domestic product per capita (GDPPC) is adversely affected by the infant mortality rate, while the fertility rate positively influences GDPPC in these economies [7]. In the long run, an increase of 1% in rural population is associated with a decline of 1.337% in rice production and a decline of 0.122% in maize production. The expanding rural population contributes to an elevated dependency ratio, and due to limited arable land, the excessive utilization of mineral fertilizers becomes necessary, ultimately leading to soil depletion over time [8]. Population growth as well as rural and urban population growth has a negative and significant impact on economic growth [9]. Population growth and unemployment demonstrate an inverse relationship with economic growth, indicating that a rise in population growth and unemployment rates is likely to lead to a decline in the country's economic growth [10]. Kaoje et al. [11] indicate that the death rate has a detrimental effect on economic growth, whereas the birth rate has a positive impact. Furthermore, the labor force negatively affects economic growth, likely due to the fact that modern technology has a more advantageous impact on economic growth compared to the labor force. In an alternative model where population growth serves as the dependent variable, it is discovered that other independent variables such as the labor force, corruption, and GDP have a positive influence on population growth.

Faruk and Abdullahi [12] demonstrate a positive and noteworthy correlation between net migration and short-term economic growth. However, over the long term, it was observed that net migration has an adverse and significant impact on economic growth. This indicates that a considerable number of skilled professionals are departing the country in search of improved job opportunities and living standards elsewhere. The research revealed that both male and female migrants contribute negatively to overall economic growth. This phenomenon is commonly known as "brain drain," where highly skilled individuals emigrate from Africa to other regions, resulting in a depletion of human capital [13].

3. DATA AND METHODOLOGY

3.1 Data source

All variable data, including GDP, IND, SRV, AGRI, BR, DR, PG, MIG, and LE, has been collected from the World Bank's World Development Indicator (WDI) data portal. The data was collected from the period of 1973 to 2021. The data for all these variables is available at World Bank data portal. Bangladesh became independent in 1972 therefore the data included in the research is from 1973-2021.

3.2 Methodology

The objective of this study is to determine the relationship between demographic variables such as birth rate, death rate, population growth, life expectancy ratio, migration and economic growth by employing the pooled mean group (PMG) autoregressive distributed lag (ARDL) models. The PMG/ARDL technique improves on the standard ARDL model and is designed specifically for panel data analysis and incorporates both cross-sectional and time-series elements. It facilitates the examination of short-term dynamics while allowing for the analysis of the long-term link between

variables [14]. Previous research such as Abbas et al. [15] used PMG/ARDL model in their estimation.

The Augmented Dicky-Fuller (ADF) and Phillips-Peron (PP) tests are both panel unit root tests that are utilized to assess the stationarity of both independent and dependent variables.

$$\Delta\Pi = \vartheta_0 + \vartheta_1\Pi_{t-1} + \sum_{i=t}^{m}\lambda_i\ \Delta\Pi_{t-1} + \partial_t \qquad \text{(Model 1)}$$

$$\Delta\Pi = \vartheta_0 + \vartheta_1\Pi_{t-1} + \vartheta_1 t + \sum_{i=t}^{m}\lambda_i\ \Delta\Pi_{t-1} + \partial_t \qquad \text{(Model 2)}$$

Unit root and cointegration tests are now important to incorporate in empirical investigations in order to address the inherent limitations of traditional analysis [7]. To this end, this particular study investigates the stationarity of the employed dataset utilizing the Augmented Dickey-Fuller (ADF) model. Below are the equations used for the tests of the ADF model:

In the context of a time series, "t" denotes a specific point or period and is also referred to as the residual, however, the variable observed throughout time is indicated by. A time series is said to be I(0), or integrated of order zero when it is stationary without the requirement for any differencing. Conversely, if the series' first difference generates stationarity, it is described as integrated of order one, or I(1).

$$\mathrm{GDP_t} = \alpha_0 + \beta_1 BR_{it} + \beta_2 DR_{it} + \beta_3 PG_{it} + \beta_4 LNMIG_{it} + \beta_5 LE_{it} + \varepsilon_{it} \qquad \text{(Model 1)}$$

$$\mathrm{GDP_{IND}} = \alpha_0 + \beta_1 BR_{it} + \beta_2 DR_{it} + \beta_3 PG_{it} + \beta_4 LNMIG_{it} + \beta_5 LE_{it} + \varepsilon_{it} \qquad \text{(Model 2)}$$

$$\mathrm{GDP_{SRV}} = \alpha_0 + \beta_1 BR_{it} + \beta_2 DR_{it} + \beta_3 PG_{it} + \beta_4 LNMIG_{it} + \beta_5 LE_{it} + \varepsilon_{it} \qquad \text{(Model 3)}$$

$$\mathrm{GDP_{AGRI}} = \alpha_0 + \beta_1 BR_{it} + \beta_2 DR_{it} + \beta_3 PG_{it} + \beta_4 LNMIG_{it} + \beta_5 LE_{it} + \varepsilon_{it} \qquad \text{(Model 4)}$$

Model Specification:

Model 1 explores the correlation between Gross Domestic Product (GDP) and time (t), with GDP as the dependent variable. It takes into account various demographic factors, specifically the birth rate (BR), death rate (DR), population growth rate (PG), log of net migration (LNMIG), and life expectancy ratio (LE). In this context, the country is denoted by "i" and time by "t". Models 2, 3, and 4 are derived from Model 1 and aim to assess and break down the influence of independent variables (BR, DR, PG, LNMIG, and LE) on different sectors of the economy. The decomposed dependent variables in Models 2, 3, and 4 are Gross Domestic Product within the Industrial Sector (GDPind), Gross Domestic Product within the Services Sector (GDPsrv), and Gross Domestic Product within the Agriculture Sector (GDPagri), respectively. These four models are utilized to analyze the impact of independent variables on various sectors of GDP, allowing for an individual and holistic examination of how these demographic variables affect the economies in question. Prior studies, including those by Kaoje et al. [11] have also employed multiple models to decompose the effects of independent variables on different dependent variables shown in Table 1.

Table 1. Variable description

Variable Name	Variable Code	Explanation
Gross Domestic Product	**GDP**	Sum of gross value added by all resident producers + product taxes - subsidies not included in the value of the products Annual Growth Rate in Percentage
Industrial Sector	**IND**	Industry (including construction) and value added (Annual Growth Rate in Percentage)
Services Sector	**SRV**	Services, value added (Annual Growth Rate in Percentage)
Agriculture Sector	**AGR**	Agriculture, forestry, and fishing, value added (Annual Growth Rate in Percentage)
Population Growth	**PG**	Annual population growth rate in Percentage
Birth Rate	**BR**	Number of live births occurring during the year. (Per 1,000 people estimated at midyear)
Death Rate	**DR**	Number of deaths occurring during the year. (Per 1,000 people estimated at midyear)
Migration	**MIG**	Net migration is the number of immigrants minus the number of emigrants, including both citizens and noncitizens
Life Expectancy	**LE**	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life

4. RESULTS AND DISCUSSION

Table 2 provides an overview of the summary statistics for all variables. The average GDP value is 5.06, while the average Birth Rate (BR) stands at 32.20. The mean values for the variables DR, PG, LNMIG, LE, IND, SRV, and AGRI are 9.86, 2.08, 14.08, 61.30, 6.61, 5.64 and 3.17 respectively.

The median value for DR is 9.39, and PG ranges from a minimum of 0.80 to a maximum of 4.42. The standard deviation for SRV is 2.51. The remaining variables, both dependent and explanatory, have their own median, minimum, and maximum values, as well as standard deviations. These statistics are based on a total of 146 observations.

According to the data presented in Table 3, the variables GDP, SRV, IND, and AGRI demonstrate correlations with independent variables including BR, DR, PG, LNMIG, and LE. Our findings suggest that GDP and SRV have negative correlations with BR, DR, PG, and LNMIG. Conversely, these dependent variables exhibit positive correlations with LE. On the contrary, the remaining dependent variable, AGRI, shows negative correlations with BR, DR and LNMIG, but a positive correlation with PG and LE. Lastly, IND has a positive link with all the independent variables except LE.

Table 2. Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
GDP	5.06	5.17	9.63	-5.83	2.48	146
IND	6.61	6.60	69.69	-12.59	6.77	146
SRV	5.64	5.73	12.49	-8.23	2.51	146
AGRI	3.17	3.28	15.64	-12.77	3.89	146
BR	32.20	32.15	46.96	16.42	8.66	146
DR	9.86	9.39	17.43	5.24	3.14	146
PG	2.08	2.11	4.42	0.80	0.72	146
LNMIG	14.08	14.09	15.03	11.30	0.42	146
LE	61.30	61.24	72.81	49.16	6.10	146

Table 3. Correlation Matrix

	GDP	IND	SRV	AGRI	BR	DR	PG	LNMIG	LE
GDP	1.00								
IND	0.36	1.00							
SRV	0.53	0.20	1.00						
AGRI	0.54	0.04	-0.03	1.00					
BR	-0.20	0.06	-0.15	-0.06	1.00				
DR	-0.19	0.11	-0.13	-0.08	0.83	1.00			
PG	-0.11	0.01	-0.04	0.00	0.88	0.61	1.00		
LNMIG	-0.04	0.00	-0.03	-0.09	-0.30	-0.26	-0.59	1.00	
LE	0.21	-0.07	0.15	0.09	-0.86	-0.97	-0.64	0.24	1.00

Unit root test Firstly, some of the previous studies which used panel unit root test in order to correctly apply the Panel ARDL technique which is suitable for I(0) and I(1) variables only. Remember this is not suitable for I(2) variables. Some of the stationarity test such as Dickey and Fuller [16] and Phillip-Perron (PP, 1988) tests are explained in Table 4. The results of the stationarity test indicate that, at the given significance level, the variables of economic growth (GDP), industrial sector (IND), services sector (SRV), agricultural sector (AGRI) and migration (LNMIG) are stationary at level. Where GDP, SRV, IND, AGRI are stationary at 1% significance level in both ADF and PP tests. Moreover, LNMIG is stationary at level with 1% and 5% significance level in PP and ADF respectively. Birth rate (BR), death rate (DR), population growth rate (PG), and life expectance (LE) are non-stationary at level but stationary at 1st difference. DR and BR were stationary at 5% level of significance in ADF test at 1st difference while all the remaining variables are stationary at 1% level of significance in both ADF and PP tests. This is evident from their probabilities exceeding 0.05, leading us to reject the null hypothesis, which suggests that these variables possess either a unit root or are non-stationary. On the other hand, the death rate (DR) and life expectancy ratio (LE) exhibit stationarity at the given level since their p-values are less than 0.05. To address the issue of non-stationarity, we performed additional tests, namely the Augmented Dickey-Fuller and Phillips and Peron Test, focusing on the first difference of the variables.

The number of lags that yielded the best results was determined through a series of tests and criteria, including the LR test statistic, Final Prediction Error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC), and Hannan-Quinn information criterion (HQ). The findings of these tests can be found in Table 5. Interestingly, all the lag selection criteria produced similar results. Specifically, SC and HQ consistently indicated that a lag order of 0 and1 respectively was the most optimal. While FPE and AIC indicate that lag order 3 was the optimal lag. In the end the LR criteria indicate that lag order 4 was the most optimal lag.

The results from the long-term ARDL analysis shown in Table 6 reveal important insights regarding the relationship between various variables. The optimal lag length of panel ARDL model (4, 4, 4, 4, 4, 4) was chosen for estimation following LR criteria as well as ARDL automatic lag selection. The coefficient value for the birth rate (BR) is 0.60, indicating that a 1% increase in BR is associated with a significant increase of 0.60% in GDP.

Table 4. Panel unit root test results

	Phillips and Peron (Fisher Chi-Square)		ADF (Fisher Chi-Square)	
	t-statistics	Prob.	t-statistics	Prob.
	Level			
GDP	89.15*	0.00	35.09*	0.00
IND	72.45*	0.00	83.90*	0.00
SRV	80.21*	0.00	31.48*	0.00
AGRI	109.35*	0.00	69.13*	0.00
DR	10.52	0.10	7.21	0.30
BR	0.51	1.00	0.99	0.99
PG	1.16	0.98	2.30	0.89
LNMIG	27.26*	0.00	13.41**	0.04
LE	4.40	0.62	1.58	0.95
	1st Difference			
GDP	65.60*	0.00	120.91*	0.00
IND	114.12*	0.00	115.55*	0.00
SRV	89.92*	0.00	110.70*	0.00
AGRI	55.26*	0.00	124.87*	0.00
DR	62.49*	0.00	16.19**	0.01
BR	33.01*	0.00	15.19*	0.02
PG	19.94*	0.00	34.19*	0.00
LNMIG	122.89*	0.00	64.65*	0.00
LE	66.00*	0.00	22.31*	0.00

Note: All the variables are estimated with individual intercept. And *, **, *** signify 1%, 5% and 10% level of significance.
Source: Author's Calculations

Table 5. Optimal lag selection using var

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1205.8	NA	1100.897	18.35515	18.87417*	18.56606
1	-1176.23	54.71577	899.9175	18.1527	19.01773	18.50422*
2	-1153.93	39.94535	820.7187	18.05863	19.26966	18.55075
3	-1133.43	35.48768	770.1084*	17.99151*	19.54855	18.62424
4	-1117.61	26.44198*	776.4322	17.99422	19.89728	18.76756

Table 6. PMG/ARDL long run results

			Dependent Variable GDP	
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
BR	0.60	0.20	3.08	0.00**
DR	-0.32	0.27	-1.18	0.24
PG	-8.02	2.12	-3.78	0.00*
LNMIG	-5.91	1.71	-3.46	0.00*
LE	0.22	0.11	2.03	0.05**
			Dependent Variable IND	
BR	0.79	0.29	2.77	0.01**
DR	-0.14	0.37	-0.37	0.71
PG	-12.12	3.07	-3.95	0.00*
LNMIG	-7.86	2.72	-2.89	0.01**
LE	0.24	0.13	1.88	0.06***
			Dependent Variable SRV	
BR	0.46	0.12	3.86	0.00*
DR	-0.03	0.15	-0.18	0.86
PG	-5.14	1.24	-4.14	0.00*
LNMIG	-1.60	1.19	-1.34	0.19
LE	0.47	0.04	10.97	0.00*
			Dependent Variable AGRI	
BR	-0.14	0.16	-0.89	0.38
DR	-0.11	0.31	-0.36	0.72
PG	5.58	1.60	3.47	0.00*
LNMIG	3.75	1.09	3.44	0.00*
LE	0.01	0.18	0.07	0.94

These findings align with previous studies, such as Ilori and Akeju [7]. Conversely, the coefficient value for the death rate (DR) is -0.32, suggesting that a 1% increase in DR corresponds to an insignificant decline of -032% in GDP. Furthermore, the variable PG has negative impact as 1% increase in PG leads to -8.02% decline in GDP as some previous studies showed and support these findings such as Asim et al. [9], and Lubbock et al. [10]. LNMIG also has a negative and significant impact on GDP. Specifically, a 1% increase in LNMIG leads to a considerable decrease of -5.91% in GDP as previously shown in the study of Faruk and Abdullahi [12]. While a similar increase in LE is associated with a rise of 0.22% in GDP. These findings are consistent with the research conducted by Ullah and Ahmed [6].

In contrast, the variable LNMIG (likely representing migration) has a negative impact on GDP, as a 1% rise in migration leads to a decline of -5.91 in GDP. It is worth noting that all the variables in the analysis exhibit p-values less than 0.05, indicating high statistical significance. This suggests that the estimated coefficients are unlikely to have occurred by chance. A p-value of 0.0000 typically indicates a strong level of statistical significance, reinforcing the notion that there is a genuine and meaningful relationship between the independent variables and the dependent variable.

When considering the industrial sector (IND) and as well as services sector (SRV) as the dependent variable, the independent variables DR, PG, and LNMIG have a negative impact on IND and SRV. On the other hand, BR and LE have a positive impact on IND and SRV. Except DR all other variables are statistically significant in the estimation. In addition, LNMIG is statistically insignificant, when SRV is the dependent variable. In the case of the agriculture sector (AGRI) as the dependent variable, BR and DR have a negative and insignificant impact on AGRI. However, the remaining independent variables, including PG, LNMIG, and LE, have a positive impact on IND. Among these, PG and LNMIG were the only statistically significant variables, while the LE was deemed insignificant.

Table 7 reveals the findings of our analysis of the short-term relationship between variables. In terms of GDP and IND, the explanatory variables BR, DR and LE have a harmful effect, while PG and LNMIG contribute positively to GDP and IND in the short run. When examining the agricultural sector as the dependent variable, all independent variables, except PG, exert a negative influence on AGRI, whereas PG has a positive impact on the agricultural sector. Regarding the services sector (SRV), DR, PG and LE have a negative impact, whereas BR and LNMIG positively affect SRV. The co-integration equation is also known as ECT (error correction term), which shows the deviation of the variable from equilibrium. The coefficient of co-integration equation of variable GDP is -1.26 which means that 1.26 percent of deviation from long run equilibrium corrected each period. Moreover, the co-integration coefficient of variable IND, SRV and AGRI is -1.6, -2.33 and -2.49, which revels that these variables correct 1.66 percent of IND, 2.33 percent of SRV and 2.49 percent each year. The negative value of coefficient of co-integration equation shows the deviation from the long run equilibrium corrected over time. The p-vale of co-integration equation of GDP, IND and SRV is significant at 1% while the p-value of

SRV is significant at 5% level of significance, which shows that all the variables are co-integrated and have long run relationship. Some previous studies such as Ilori & Akeju [7] supported the negative and greater than one coefficient of co-integration equation in results.

Table 7. PMG/ARDL short run results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
	Dependent Variable GDP			
COINTEQ	-1.26	0.33	-3.86	0.00
D(BR)	-6.36	7.10	-0.90	0.37
D(DR)	-16.58	6.43	-2.58	0.01**
D(PG)	135.35	139.08	0.97	0.33
D(LNMIG)	11.61	6.96	1.67	0.10
D(LE)	-6.85	2.94	-2.33	0.02**
	Dependent Variable IND			
COINTEQ	-1.66	0.4	-3.41	0.00
D(BR)	-4.47	7.35	-0.61	0.55
D(DR)	-17.64	10.67	-1.65	0.10
D(PG)	81.46	115.26	0.71	0.48
D(LNMIG)	0.16	15.45	0.01	0.99
D(LE)	-6.15	4.65	-1.32	0.19
	Dependent Variable SRV			
COINTEQ	-2.03	0.96	-2.12	0.04
D(BR)	1.74	2.47	0.71	0.48
D(DR)	-12.43	6.27	-1.98	0.05**
D(PG)	-30.24	45.88	-0.66	0.51
D(LNMIG)	5.12	5.41	0.95	0.35
D(LE)	-1.98	3.75	-0.53	0.60
	Dependent Variable AGRI			
COINTEQ	-2.49	0.40	-6.22	0.00
D(BR)	-2.07	3.66	-0.56	0.57
D(DR)	-8.85	4.59	-1.93	0.06***
D(PG)	99.11	116.00	0.85	0.40
D(LNMIG)	-7.48	4.47	-1.67	0.10
D(LE)	-7.16	2.11	-3.40	0.00*

4.1 Discussion

As the BR (birth rate) rises, the supply of labor and human capital in a country can also rise, which indicates that the GDP can grow at a faster rate. Furthermore, when the birth rate increased the economy's consumer base expanded. While an increased birth rate leads to a greater number of young people. The younger demographic consumes more and is more productive than the elderly generation, which boosts the need for savings and housing and promotes the industrial sector (INDS). Increasing BR positively influences SRV (services sector) because increasing birth rate increases the demand for schooling, healthcare facilities and entertainment services which boosts the services sector. According to Ab-Rahim and Tariq [17], BR positively influences the economic sectors.

DR has a negative influence on economic growth as DR declines the healthcare expenditures will also decline which boosts the other economic activities in the Ilori and Akeju [7].

PG has a negative influence on these economic sectors as well as overall GDP. As the population rises, the demand for food, water, employment and other resources in the economy will be increased. Due to limitations, it is not possible to meet the increasing demand of population therefore it affects economic growth negatively. While PG increases consumption which leads to a decline in savings and therefore investment will also be reduced which affects IND negatively. Moreover, increasing PG demand more healthcare facilities and education services but due to overcrowding it is not possible and leads to a harmful influence on SRV. The AGRI sector mostly depends on labor force therefore increasing PG positive influence the AGRI sector. Agarwal [18] provides support to these findings of population growth.

Migration has an adverse impact on economic growth and other sectors except Agri because migration leads to reduce the skilled and professional population departing from the country in search of employment and better living standard [12, 13]. While people from other countries share advanced methods, technologies and remittances to support their families which they use in traditional agriculture to increase production.

5. CONCLUSION AND POLICY IMPLICATION

5.1 Conclusion

The study aims to explore the relationship between demographic changes and economic growth in Pakistan, India, and Bangladesh. Additionally, it examines how these changes impact the development of different sectors in these South Asian countries. The study utilizes panel data spanning from 1973 to 2021, employing the pooled mean group (PMG) and autoregressive distributed lag (ARDL) approaches for both long run and short-run estimations.

The findings of the study reveal that both birth rate (BR) and life expectancy (LE) have a positive influence on economic growth, while death rate (DR), population growth (PG), and migration (LNMIG) negatively affect GDP in the long run. Moreover, BR and DR have a negative effect on the agricultural sector, whereas PG, LNMIG and LE have a

positive impact. The industrial sector is positively affected by BR and LE, while the remaining variables have a negative influence. Finally, the services sector is positively influenced by BR and LE, but negatively affected by BR, DR, and LNMIG.

In contrast, the short-run results show a different pattern, as PG positively affects the agricultural sector, while all other variables have a negative impact on agriculture. Furthermore, PG and LNMIG have a positive influence on the industrial sector, whereas BR, DR, and LE have a negative impact. Lastly, DR, PG and LE negatively affect the services sector, while all other variables have a positive impact on services in the short run.

5.2 Policy implications

Policymakers should focus on implementing effective population control measures. This may include promoting family planning, providing education and access to contraception, and addressing the root causes of migration to manage population growth more efficiently.

To provide support and incentives for agricultural development. This can include investing in infrastructure, providing access to credit and technology, and implementing policies that ensure a sustainable and profitable agricultural sector.

Governments can create a favorable business environment by reducing bureaucratic hurdles, providing incentives for investment, and fostering innovation and research and development activities. Additionally, policies that facilitate the ease of doing business and attract investments in the services sector can be beneficial [19].

Policymakers can consider temporary measures, such as providing support and resources to migrant workers in the agricultural sector, while also addressing the challenges faced by the services sector due to migration [20].

5.3 Sustainable development goals

The research addresses significant challenges in Pakistan, aiming to achieve several Sustainable Development Goals (SDGs), including SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 5 (Gender Equality), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production).

5.4 Limitations

There are few limitations on the study. Firstly, the research includes only some of the demographic variables in the estimation whereas there are many external variable that affects the economic growth and influence the results. Secondly, the study does not incorporates any diagnostic test in the estimation. Thirdly, the research does not address the issue of endogeneity and heterogeneity in estimation. Lastly, the study not used the alternative estimators to check the robustness.

5.5 Future research directions

There are some suggestions for future research as first of all future researchers can incorporates the other variables such as education, employment, gender based roles, household size etc. for reliable results. Moreover, future researchers can utilize the diagnostic tests and as well as alternative estimators to check the robustness and more accurate results. Finally, the researchers can address the endogeneity and heterogeneity so the impact of demographic variables on economic growth is more accurate and understandable.

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